

## NEST REUTILIZATION BY *POLISTES METRICUS* (HYMENOPTERA: VESPIDAE) AND POSSIBLE LIMITATION OF MULTIPLE FOUNDRESS ASSOCIATIONS BY PARASITOID<sup>1</sup>

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### ABSTRACT

The reutilization is reported of an old nest by three female wasps, and the condition of the nest and its constituent cells, is recorded at the end of the season. Larvae of the pyralid genus *Chalcoela* are believed to have been a major cause of the nest's apparent low productivity. It is postulated that strong parasitoid pressure by *Chalcoela* is a selective factor against nest-founding by associated multiple queens in some North American species of *Polistes*.

In late May, 1974 I observed a nest of *Polistes metricus* in a garage in Lawrence, Kansas which was unusual in two respects: 1) It was attended by three females; of approximately 100 nests of *P. metricus* which I observed in eastern Kansas in 1974 and 1975, only six others had two females prior to emergence of the first brood, and no other had three females; this is similar to Bohm's (1972) finding that 83 of 91 nests of *P. metricus* in eastern Kansas had only one female. 2) More unusual, the nest itself was an old one, constructed the previous year or earlier, consisting of 25 cells; only two incomplete peripheral ones contained any new paper. Many of the cells contained cocoons of the parasitoid *Chalcoela iphitalis* (Lepidoptera: Pyralidae), but despite this infestation and the generally poor condition of the paper, each cell contained a newly-laid wasp egg.

It is of course usual for *Polistes* to use nest cells more than once in the season, even if they have been parasitized, but use of the nest in any subsequent season is apparently very unusual. Rau & Rau (1918, p. 286) suspected that this occurred, but were unable to offer evidence. West Eberhard (1969, p. 26) recorded nest reutilization only five times in her extensive study of *Polistes fuscatus* and Marguerite Bohm (personal communication) and I have seen only one other case of it in *P. metricus*.

In late August, 1974 the nest was found to be deserted and contained no living brood. Of 30 exposed cells (many new cells had been built over cells of the old nest; the covered old cells are not included in this analysis), 19 had been clearly or probably parasitized. Four were incomplete and had not been used, three had probably

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produced adult wasps, and only four had clear traces of pupal caps, showing that they had produced adult wasps. This is an unusually poor result, even for the relatively unproductive *P. metricus*.

Fifteen cells contained at least one cocoon of *C. iphitalis*. Six cells contained dead larvae or pupae of *Polistes*, and nine had the characteristic intercellular holes made by *Chalcoela* larvae. The heavy infestation of this parasitoid was probably a primary cause of the colony's failure, and the presence of many *Chalcoela* cocoons in the old cells suggests that reutilization of the nest may have made the wasps unusually vulnerable to such an infestation.

*C. iphitalis* parasitizes a number of species of *Polistes* (Rau, 1941a, 1943, 1946; Nelson, 1968; Nelson & Crowell, 1970) and at least one other social vespid, *Mischocyttarus basimacula* (Rau, 1943). The life histories of *C. iphitalis* and the biologically similar *C. pegasalis* have been discussed by Rau (1941a) and Nelson (1968). Larvae of *C. iphitalis* feed on wasp larvae, and those of the last generation overwinter in their cocoons. Adults mate and lay eggs within a few hours of emergence in the spring (Nelson, 1968).

The quick succession of emergence, mating and oviposition in *C. iphitalis* suggests that it oviposits in nests close to those from which it emerges. Wasps which use old nests or which nest close to old nests (e.g. their parental nests) will thus be disadvantaged and would be expected to evolve defenses. It is not known whether *Polistes* can successfully repel invading *Chalcoela* females, but it seems unlikely that they remove parasitoid larvae or pupae from their nests. Nelson (1968) records that adult *Polistes* seem to disregard *Chalcoela* cocoons and even oviposit on them, as in the *P. metricus* nest under discussion.

One defensive strategy may be to build nests in locations which are difficult for the parasitoid to find. Nelson (1968) reports lower infestation rates for the tree-nesting *P. annularis* than for either of *P. exclamans* or *P. metricus*, and notes that nests in trees and shrubs and under bridges had a lower percentage of infestation than nests on or in buildings.

An alternative strategy might be to build nests far away from the parental nest site. This can be easily done by single foundresses, but for populations in which nest establishment is by a group of females (presumed sisters), either swarming and group migration or nest-site communication between foundresses would be required. There is no evidence that either of these exists in any temperate *Polistes*, the opinion of Rau (1941b) notwithstanding, and it is generally thought that multiple-foundress nests are built close to the parental nest by sisters returning to that site (West Eberhard, 1969). Heavy parasitization by *Chalcoela* or similar parasites or parasitoids is therefore a possible factor in preventing some populations from adopting the multiple-foundress method of nest establishment. *P. metricus* rarely uses this method.

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## LITERATURE CITED

- Bohm, Marguerite F. K. . 1972. Reproduction in *Polistes metricus*. Ph.D. thesis, University of Kansas, Lawrence.
- Nelson, J. M. 1968. Parasites and symbionts of nests of *Polistes* wasps. Ann. ent. Soc. Amer. 61:1528-39.
- Nelson, J. M., and R. Crowell. 1970. Notes on the nests and nesting habits of *Polistes* (Hymenoptera, Vespidae) in Big Bend National Park, Texas. Proc. West Virginia Acad. Sci. 42:57-60.
- Rau, P. 1941a. Observations on certain lepidopterous and hymenopterous parasites of *Polistes* wasps. Ann. ent. Soc. Amer. 34:355-66.
- . 1941b. The swarming of *Polistes* wasps in temperate regions. Ann. ent. Soc. Amer. 34:580-84.
- . 1943. The nesting habits of Mexican social and solitary wasps of the family Vespidae. Ann. ent. Soc. Amer. 36:515-36.
- . 1946. The nests and adults of colonies of *Polistes* wasps. Ann. ent. Soc. Amer. 39:11-27.
- Rau, P., and N. Rau. 1918. Wasp Studies Afield. Princeton Univ. Press, 372 p. Dover Press, 1970.
- West Eberhard, Mary Jane. 1969. The social biology of polistine wasps. Misc. Publ. Mus. Zool., Univ. Michigan 140:1-101.