

NEST REUTILIZATION IN NORTH AMERICAN *POLISTES*
(HYMENOPTERA: VESPIDAE):
TWO POSSIBLE SELECTIVE FACTORS

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Abstract.—An unusually high degree of nest reutilization by *Polistes* is described from a site in Michigan. Two possible factors governing the tendency to reutilize old nests are discussed in view of data on parasitism by a pyralid moth and reutilization observations from seven localities in North America. No clear tendency is demonstrated either to reutilize extensively where parasitism is apparently slight or for colonies based on old nests to be more productive in the early part of the season. This suggests unknown factors surrounding the reutilization of old nests.

Nests of social wasps of the genus *Polistes* are rarely reutilized (by social wasps) from year to year, even though paper-wasp nests in North America tend to be conspicuous and stable, often taking some years to disintegrate. For this reason, the discovery of a high degree of nest reutilization by *Polistes fuscatus* (F.) at a site in Michigan is of interest.

Observations were made on 26 May 1976 at Camp Crile, north of Chelsea, Michigan in Washtenaw County. All colonies at this time were in an early stage of growth, before emergence of the first worker adults (pre-emergence stage). The broods at Camp Crile and other Michigan and Ohio localities consisted of eggs and, infrequently, larvae. Early in the season, old nests (i.e. built the previous year or earlier) are readily recognized by their larger size and the presence of partial or entire pupal caps. A thorough search under the eaves of the camp's three main buildings turned up 54 old and 44 new nests. Of the old nests, 17 (31.5%) contained eggs, indicating that they were being used as bases for new colonies. The total number of active colonies, then, was 61, of which 17 (27.8%) were based on old nests. West Eberhard (1969), in her extensive study of this species further east in Washtenaw County, recorded only five cases of nest reutilization. And Katherine Noonan (pers. comm.), working also on *P. fuscatus* in eastern Washtenaw County, recorded 6 of 117 (5.1%) colonies based on old nests in 1976; this figure may be slightly low, as it is not based on a thorough survey, so that some reutilization colonies which failed early may have gone undetected.

It was my persistent impression at localities in Michigan and Ohio that egg-production in pre-emergence colonies kept pace with nest-construction and even led it in some cases. Nests with an egg in each cell were common, and I repeatedly noted cells with two eggs in them and nests in which there were eggs even in the barest beginnings of new cells or

Table 1. Percentage of old *Polistes* nests found to contain *Chalcoela* cocoons from samples at seven localities. All nests were collected in the last week of May or first week of June 1976, except for those from Georgia, which were collected in August 1976. Where *fuscatus* and *metricus* are found together, the data for the two species are lumped, as no tested way is known to distinguish between their old nests.

Locality	Species	Numbers of old nests examined	Percent parasitized
Washtenaw Co., Mich.: Camp Crile	<i>fuscatus</i>	54	0
Washtenaw Co., Mich.: Ann Arbor	<i>fuscatus</i>	42	7.1
Fulton Co., Ohio: Harrison L. St. Pk.	<i>fuscatus</i> , <i>metricus</i>	40	0
Delaware Co., Ohio: Delaware St. Pk.	<i>fuscatus</i> , <i>metricus</i>	30	36.6
Hocking Co., Ohio: Hocking Hills St. Pk.	<i>fuscatus</i> , <i>metricus</i>	31	0
Douglas Co., Kansas: Lone Star Lake	<i>fuscatus</i> , <i>metricus</i>	38	73.7
Oconee Co., Georgia: various localities	<i>annularis</i>	41	63.4

in concave angles at the edge of the nest where no new cell had been initiated. Because of the extreme seasonality of the environment for *Polistes* in the north temperate zone, especially near the northern limit of the range of the genus, it is expected that any adaptation which can accelerate colony growth in the crucial pre-emergence stage will confer substantial selective advantage. If cell-construction rate limits colony growth in this stage, as suggested by observations of oviposition keeping close pace with nest growth, then we can expect that large reutilized nests will contain strikingly more eggs than neighboring new nests with fewer available cells. Interestingly, this prediction is not upheld for the Camp Crile nests. Fifteen old nests averaged 98.8 cells (range 39–340 cells), while 27 new nests averaged 11.3 cells (range 0–37 cells); yet the old nests had an average of 8.8 eggs or larvae, while the new nests averaged 9.6 eggs or larvae. This is despite the fact that new colonies seemed to be under some pressure to build new cells, as 42.3% had all cells occupied and 19.2% had all cells but one occupied. The hypothesis can be entertained that reutilizing foundresses are somehow “inferior” and unable to successfully found in a normal manner; following large numbers of such colonies through their cycle would throw light on this idea.

Some probable disadvantages of nest reutilization are obvious. Old nests are often conspicuously unclean, containing debris from wasps, their nest symbionts and later inhabitants; the old nests at Camp Crile were

remarkably clean compared to old nests collected in Ohio and eastern Kansas around the same time. As pointed out by Hermann and Dirks (1975), reutilized nests may also harbor overwintered parasites or parasitoids. Starr (1976) suggested that the supposed brief adult life-span and short flight-distance of inseminated females of *Chalcoela* (Lepidoptera: Pyralidae) parasitoids would select for a tendency in *Polistes* not only not to reutilize, but, where *Chalcoela* is a strong factor, to found colonies far from previous-year nests.

Table 1 gives percentages of old nests showing evidence of past parasitism by *Chalcoela* at Camp Crile and six other localities. Parasitized nests were recognized by the presence of *Chalcoela*'s distinctive yellow-white pupal cocoons; these are resistant to weathering and cannot usually be removed by the wasps without destroying adjacent nest material (pers. obs.).

It is uncertain whether a firm correlation can be drawn between tendency to reutilize and relative absence of *Chalcoela*. Hermann and Dirks (1975) recorded no reutilization in the highly susceptible (pers. obs.) *P. annularis* (L.) in northeast Georgia, and I have observed only one old nest reutilized out of many in this species in Georgia. Likewise, in eastern Kansas I have observed only three cases of reutilization (each in *P. metricus* Say) out of many old nests of three species. At none of the Ohio localities mentioned in Table 1, or others not listed, did I observe any nest reutilization by either *P. fuscatus* or *P. metricus*. The absence of observed reutilization at the Fulton County and Hocking County localities, in the complete absence of *Chalcoela* parasitism, suggests other factors.

In conclusion, it appears *a priori* that *Chalcoela*, where it is prevalent and produces significant infestations, must serve as a powerful selective force against nest reutilization in *Polistes*. It is not clear, however, that old nests are a particularly valuable colony substrate in the absence of such parasitoid pressure. This is indicated by the absence of greatly accelerated early colony growth in the reutilized nests at Camp Crile and the absence of a conspicuous tendency to reutilize at three other localities for which fewer than 10% of old nests had evidence of parasitism by *Chalcoela*.

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