

**FURTHER OBSERVATIONS ON THE NESTING BEHAVIOR OF
CRABRO ADVENA SMITH (HYMENOPTERA:
CRABRONIDAE)¹**

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Abstract.—Data are presented which significantly extend the range of variability in the nesting behavior of *Crabro advena* Smith. When compared with several previous reports on this species, our observations revealed shallower nests, much smaller prey, and many more prey per provisioned cell. A new prey family, Tephritidae, was predominant among the cell contents of one nest.

In 1897 Patton published the first observations on *Crabro advena* and stated that females provisioned their nests with Muscidae, Sarcophagidae, and Tachinidae. Evans (1960) studied this species and reported on nest construction, prey carriage, final closure, and nest architecture. He noted the following families of prey: Muscidae, Rhagionidae, Tabanidae, Otitidae, Calliphoridae, and Sarcophagidae.

Kurczewski and Acciavatti (1968) studied the nesting behavior of *C. advena* in mid-September and reported on nest structure, prey transport, and provisioning activities. They found 2-6 flies per cell, and noted the prey families Otitidae, Anthomyiidae, Muscidae, Calliphoridae, and Sarcophagidae. Kurczewski et al. (1969) made additional observations on *C. advena* in late May and early June. Burrow construction, provisioning behavior, nest structure, and cell dimensions were recorded. The species preyed upon Rhagionidae, Syrphidae, Anthomyiidae, Muscidae, and Tachinidae.

Evans et al. (*in press*) reported on seven species of *Crabro* including new data on *C. advena*. Observations were made on prey carriage, nest structure, cell contents, and parasitism. The families Syrphidae, Muscidae, Calliphoridae, Sarcophagidae, and Tachinidae were recorded as prey.

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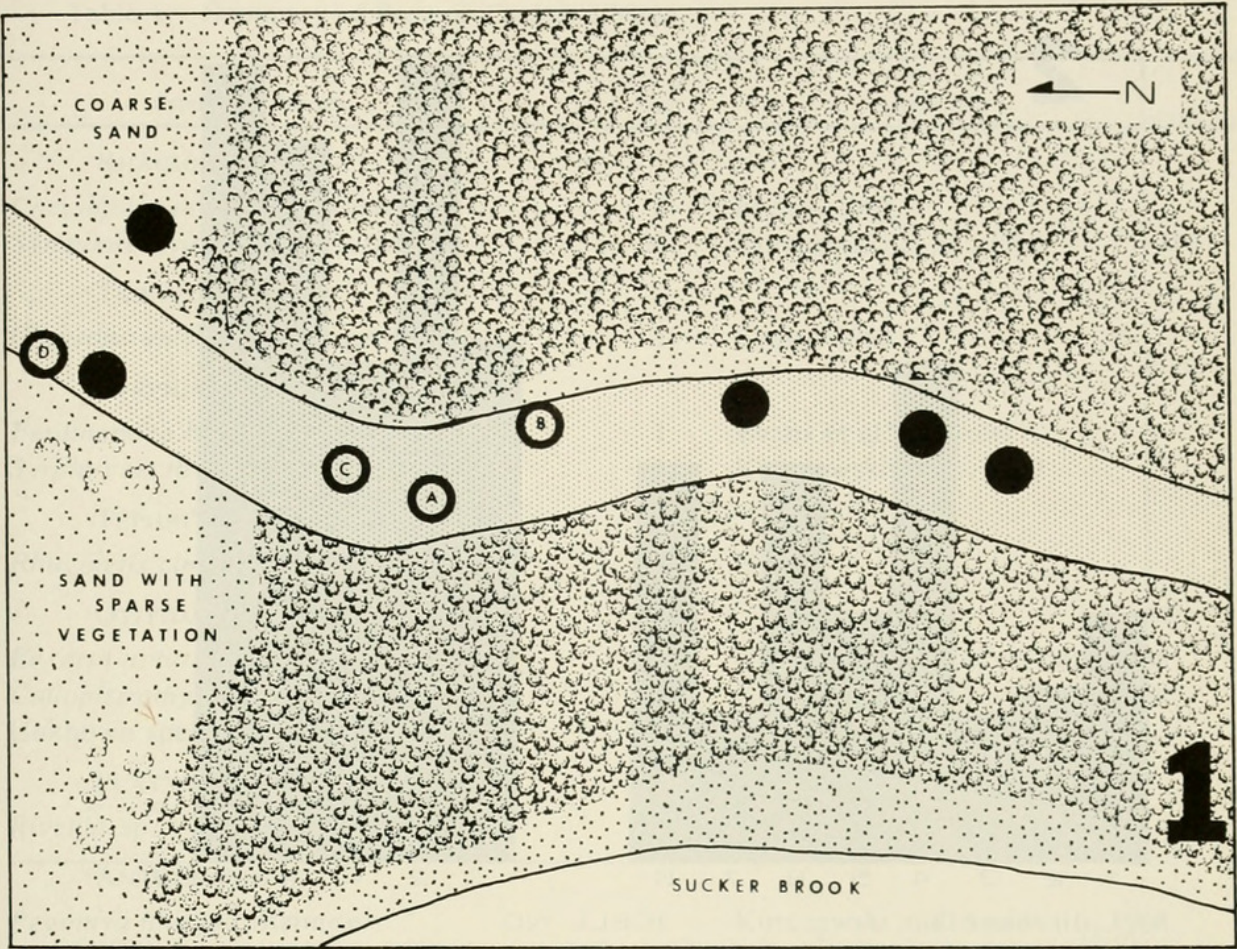


Fig. 1. Nesting habitat of *Crabro advena*, Cranberry Lake, N.Y. Open circles denote nests which were excavated and studied; closed circles are other nests.

Our information on *C. advena*, obtained at Cranberry Lake, New York in August 1978, differs significantly from all of these previous reports in the aspects of cell depth, number of prey per cell, and size and kind of prey.

This study was conducted along a sandy road, which paralleled Sucker Brook, on the property of the SUNY College of Environmental Science and Forestry's Cranberry Lake Biological Station. Predominant vegetation in the area was sugar maple (*Acer saccharum*), yellow birch (*Betula allegheniensis*), and poplar (*Populus tremuloides*), with an understory of perennial herbs and shrubs. Nests were randomly scattered along a segment of the road 25 m long (Fig. 1), with the majority situated where there was little or no overhanging vegetation. The sand of the road was fine-grained and easily compacted. A hard-packed organic layer was present 3–10 cm beneath the sand.

The tumulus of nest A was 5.0×1.8 cm, with the entrance 0.5 cm in diameter. The burrow extended downward almost vertically for 3 cm and then veered toward a cluster of 7 cells. The cells were oriented with the narrower end toward the entrance. The average cell depth was 2.64 (1.7–

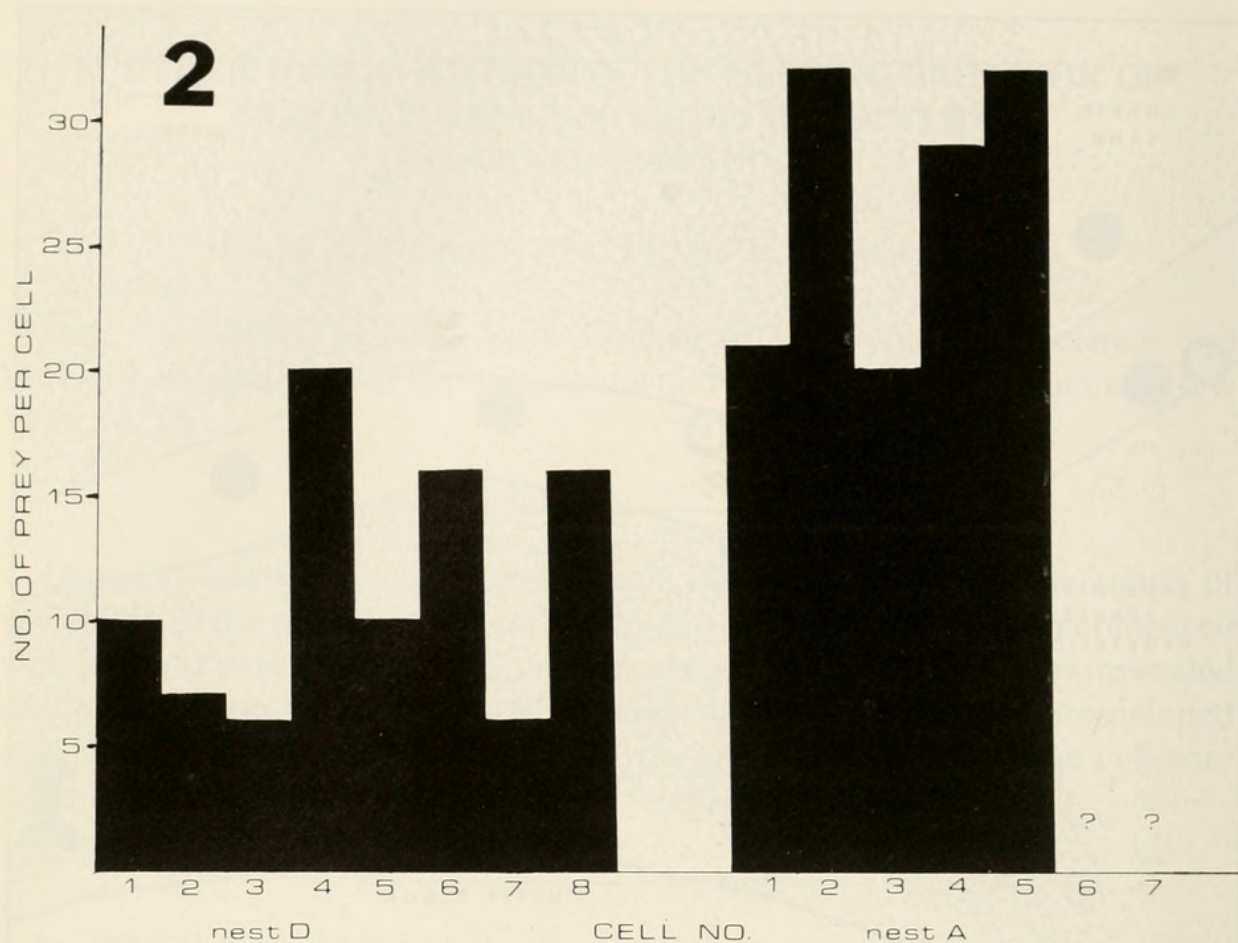


Fig. 2. Number of prey per cell in two nests (A, D) of *Crabro advena*, Cranberry Lake, N.Y.

4.4) cm. The average number of prey per cell was 26.8 (20–33) (Fig. 2). Cells 6 and 7 contained last-instar larvae, the others, younger larvae and eggs. The prey consisted of 132 *Fannia* sp. and 1 *Mydaea flavicornis* Coquillett (Muscidae), and 1 *Eulasiona comstocki* Townsend (Tachinidae).

Nest *B* was incomplete, with only four cells. Cells 1 and 2 contained late instar larvae; cells 3 and 4 contained 6 and 15 flies, respectively, with an egg in each. Prey consisted of 21 *Mydaea flavicornis*.

Nest *C* contained only a burrow 5 cm long, with three paralyzed flies stored at the end. The flies were identified as *Pegomya winthemi* (Meigen) (Anthomyiidae), *Fannia* sp., and *Mydaea flavicornis*. The female provisioned her nest at 1900 hours (EDT). She flew directly into the burrow with the prey clutched venter-up with the mid-legs.

The female of nest *D* was also observed provisioning at 1900 hours. At 1928 hours she flew into her nest with a fly clasped venter-up as before. Two minutes later she emerged, made an orientation flight, and flew away. She returned in three minutes with prey and reentered the nest as before.

Table 1. Summary of Prey of *Crabro advena*.

Family and Species	No. of Prey	Reference
RHAGIONIDAE		
<i>Chrysopilus proximus</i> (Walker)	2	Evans, 1960
<i>Symphoromyia pluralis</i> Curran	36	Kurczewski et al., 1969
TABANIDAE		
<i>Chrysops univittata</i> Macquart	1	Evans, 1960
SYRPHIDAE		
<i>Ferdinanda buccata</i> Loew	1	Evans et al., <i>in press</i>
<i>Syrphus rectus</i> Osten-Sacken	1	Kurczewski et al., 1969
TEPHRITIDAE		
<i>Rhagoletis cingulata</i> (Loew)	68	Nest D
OTITIDAE		
<i>Euxesta notata</i> (Wiedemann)	1	Kurczewski and Acciavatti, 1968
<i>Callopistromyia annulipes</i> (Macquart)	1	Kurczewski and Acciavatti, 1968
Unknown species	1	Evans, 1960
PLATYSTOMATIDAE		
<i>Rivellia</i> sp.	3	FEK (unpublished records)
ANTHOMYIIDAE		
<i>Pegomya finitima</i> Stein	1	Kurczewski and Acciavatti, 1968
<i>Pegomya lipsia</i> (Walker)	1	Krombein, 1979
<i>Pegomya winthemi</i> (Meigen)	1	Nest C
<i>Hydrophoria conica</i> (Wiedemann)	261	Kurczewski et al., 1969; FEK (unpublished records)
<i>Hylemya platyura</i> (Meigen)	4	FEK (unpublished records)
<i>Chirosia flavipennis</i> (Fallén)	3	FEK (unpublished records)
MUSCIDAE		
<i>Fannia scalaris</i> (Fabricius)	23	Evans, 1960; Kurczewski and Acciavatti, 1968
<i>Fannia</i> sp.	134	Nests A, C, D
<i>Muscina assimilis</i> (Fallén)	24	Kurczewski and Acciavatti, 1968; Kurczewski et al., 1969; Evans et al., <i>in press</i>
<i>Musca autumnalis</i> DeGeer	11	Kurczewski and Acciavatti, 1968; Evans et al., <i>in press</i>
<i>Musca domestica</i> Linnaeus	1	Evans et al., <i>in press</i>
<i>Mydaea flavicornis</i> Coquillett	22	Nests A, B, C
<i>Mydaea</i> sp.	1	Evans et al., <i>in press</i>
<i>Coenosia tigrina</i> (Fabricius)	8	Kurczewski and Acciavatti, 1968
<i>Quadrularia laetifica</i> Robineau-Desvoidy	1	Evans et al., <i>in press</i>
<i>Phaonia</i> sp.	1 ♀	FEK (unpublished record)
CALLIPHORIDAE		
<i>Pollenia rudis</i> (Fabricius)	87	Krombein, 1951; Evans, 1960;

Table 1. Continued.

Family and Species	No. of Prey	Reference
		Kurczewski and Acciavatti, 1968; Evans et al., <i>in press</i> ; Nest D
<i>Phaenicia sericata</i> (Meigen)	3	Kurczewski and Acciavatti, 1968; Evans et al., <i>in press</i>
<i>Lucilia illustris</i> (Meigen)	10	Evans et al., <i>in press</i>
<i>Calliphora terranova</i> Macquart	2	Evans et al., <i>in press</i>
SARCOPHAGIDAE		
<i>Blaesoxipha</i> sp.	1	Evans et al., <i>in press</i>
<i>Boettcheria latisterna</i> Parker	2	Evans et al., <i>in press</i>
<i>Metopia argyrocephala</i> (Meigen)	1	Evans et al., <i>in press</i>
<i>Opelousia obscura</i> Townsend	5	Evans 1960
<i>Sarcophaga scoparia</i> Pandelle	12	Kurczewski and Acciavatti, 1968
<i>Sarcophaga</i> sp.	6	Evans et al., <i>in press</i>
<i>Senotainia trilineata</i> (Wulp)	1	Evans et al., <i>in press</i>
<i>Senotainia</i> sp.	1	Kurczewski and Acciavatti, 1968
<i>Ravinia</i> sp.	1	Evans et al., <i>in press</i>
TACHINIDAE		
<i>Alophorella aeneoventris</i> (Walker)	1 ♀	Evans et al., <i>in press</i>
<i>Aplomyiopsis</i> sp.	3	Kurczewski et al., 1969
<i>Belvosia</i> (= <i>Triachora</i>) <i>unifasciata</i> (Robineau-Desvoidy)	1	Krombein, 1979
<i>Cryptomeigenia simplex</i> Curran	1 ♀	Evans et al., <i>in press</i>
<i>Cryptomeigenia</i> sp.	10 ♂	Evans et al., <i>in press</i>
<i>Eulasiona comstocki</i> Townsend	3	Nests A, D; Evans et al., <i>in press</i>
<i>Lespesia</i> sp.	1 ♂	Krombein, 1958
<i>Periscepsia helymus</i> (Walker)	4	Evans et al., <i>in press</i>
<i>Phryxe pecosensis</i> Townsend	3	Evans et al., <i>in press</i>
<i>Sitophaga</i> sp.	3 ♂	Evans et al., <i>in press</i>
<i>Winthema rufopicta</i> (Bigot)	2	Evans et al., <i>in press</i>
<i>Winthema</i> sp. nr. <i>occidentalis</i> Reinhardt	1 ♂	Evans et al., <i>in press</i>
Genus & sp. probably <i>Blondeliini</i>	1	Kurczewski et al., 1969

One minute later she again emerged, flew off, and returned 14 minutes later without prey. She then closed the entrance from the inside at 1948 hours. Although it rained heavily the next day, the wasp had reopened her nest. A distinct tumulus, 1.0 cm high and 3.0 cm wide, surrounded the entrance, 0.5 cm in diameter. The average cell depth was 4.56 (3.8–6.0) cm. The average number of prey per cell was 11.5 (6–20). Cells 1 and 2 contained small larvae. Cells 3–7 contained eggs, which were affixed across the sides of the “necks” of the flies. Prey comprised 68 *Rhagoletis cingulata* (Loew) (Tephritidae), 1 *Fannia* sp., and 1 *Eulasiona comstocki*.

DISCUSSION

Our data indicate significant differences from previous information on *C. advena* (Evans, 1960; Kurczewski and Acciavatti, 1968; Kurczewski et al., 1969) and underline much intraspecific variation within the species.

The nests at Cranberry Lake were shallower than any nests reported by previous workers. The mean depth of 19 cells of the four nests at Cranberry Lake was 3.4 cm. Kurczewski and Acciavatti (1968) found an average cell depth of 6.5 cm, Kurczewski et al. (1969), 6–7 cm, and Evans et al. (*in press*), 6–7 cm. The shallow nests may be related to the compacted organic layer 3–10 cm beneath the sand surface, although the cells did not extend into this layer.

Tephritidae is a new prey family for *C. advena*, and *Mydaea flavicornis* (Muscidae) and *Pegomya winthemi* (Anthomyiidae) are new prey species (see Table 1). Each *C. advena* female at Cranberry Lake was rather selective of the species of prey. Since no two females stocked their nests exactly the same, prey capture might have involved conditioning.

It is apparent in Fig. 2 that the number of prey per cell usually exceeded 10, with a maximum of 32. Previous data indicated that the number of prey per cell ranged from 4 to 10. Nests A and D contained a mean of 26.8 and 11.5 flies per cell, respectively. The flies, especially *Fannia* sp. and *Rhagoletis cingulata*, were smaller than the "typical" sized prey of *C. advena*. Typical prey usually comprise large muscoids. The 32 *Fannia* sp. per cell constituted a greater biomass than reported in previously recorded cells.

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Obrien, M F and Kurczewski, F E. 1980. "Further Observations On The Nesting behavior Of *Crabro advena* Smith." *Proceedings of the Entomological Society of Washington* 82, 668–674.

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