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SHORT COMMUNICATIONS

Parasitoids Reared From *Polistes* (Hymenoptera: Vespidae: Polistinae) Nests in Missouri, With a State Record of *Elasmus polistis* Burks (Hymenoptera: Elasmidae)

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ABSTRACT: In Missouri, 177 specimens of the ectoparasitoid *Elasmus polistis* Burks (Hymenoptera: Elasmidae) were reared from nests of two paper wasp species: *Polistes exclamans* Viereck and *Polistes metricus* Say (Vespidae). This represents the first record of *E. polistis* in the state. Herein, we also report the coincidental emergence of 87 individuals of the polyphagous parasitoid *Dibrachys cavus* (Walker) (Hymenoptera: Pteromalidae) and *E. polistis* from the same *P. metricus* nest. Other parasitoids reared from *Polistes* nests are also reported, including *Pachysomoides fulvus* (Cresson) (Hymenoptera: Ichneumonidae), and *Chalcoela iphitalis* Walker (Lepidoptera: Pyralidae).

A suite of facultative and obligate ectophagous insects have been reported from *Polistes* nests in the United States (Rau, 1941; Nelson, 1968). It is clear that in many instances, these parasites have influenced heavily the evolution of sociality, nest architecture, and life histories of paperwasps (Wilson, 1971; Jeanne, 1975; Yamane, 1996). However, one common parasitoid species has remained elusive until recently. Unknown before 1971, *Elasmus polistis* Burks was described as a "primary parasite" of species of *Polistes* from the United States (Burks, 1971). Host species of *Polistes* from which *E. polistis* was first reported include *Polistes annularis* (L.) in Georgia, *Polistes exclamans* Viereck in Pennsylvania, and *Polistes fuscatus* (F.) in Maryland (Burks, 1971). Additional host records include *Polistes dorsalis* (F.) in Florida (Macom and Landolt, 1995), *Polistes major* (Beauvois) (Krombein et al., 1979) location unknown, and *Polistes metricus* in Texas (Reed and Vinson, 1979). *Elasmus polistis* also has been reported from Oklahoma, reared from *Polistes exclamans* (Nelson, 1976).

Larval *E. polistis* preys upon pre-imaginal stages of species of *Polistes* in the United States (Reed and Vinson, 1979). Reed and Vinson (1979) described the life history and behavior of the parasitoid in detail. Females of *E. polistis* oviposit in capped cells on prepupae or non-pigmented pupae (Reed and Vinson, 1979). Although an actual oviposition event was not observed in the laboratory, Reed and Vinson (1979) suggested that females were likely ovipositing into a cell from within an adjacent cell. The larvae fed externally upon the *Polistes* hosts, and as many as 103 *E. polistis* pupae were found on a single host (Reed and Vinson, 1979). Life cycles of other parasitoids of *Polistes* reported in the present study also have been described in detail. A pyralid moth, *Chalcoela iphitalis* Walker, was reported as the most ubiquitous ectoparasitoid of *Polistes* in Illinois (Nelson, 1968), and the life history was described by Rau (1941) and Strassmann (1981). Another parasitoid, *Pachysomoides fulvus* (Cresson) (Ichneumonidae), is widespread, occurring from New York south to Florida, west to British Columbia and California (Krombein et al., 1979), although this wasp is less common than the moth *Chalcoela iphitalis* (Nelson, 1968).

A total of 22 nests of *Polistes metricus* were collected from 12 Missouri counties from June–August 1999: Bates (1), Boone (8), Buchanan (3), Caldwell (1), Callaway (3), Cass (1), Cooper (1), Crawford (1), Macon (1), Pettis (1), and Saline (1). A total of 3 nests of *Polistes exclamans* were collected from 3 Missouri counties from June–July 1999: Buchanan (1), Greene (1), and Howard (1). One *Polistes fuscatus* nest from Cass County was collected on 14 June 1999. One *Polistes annularis* nest was collected from Boone County on 6 June 1999. Adult *Polistes*, if present, were collected in the field from each nest, and were then killed and pinned. Nests were maintained at ~20°C, placed in glass jars covered with fine cheesecloth, and located near a large window where a natural L:D cycle could be achieved. Due to time constraints,

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Table 1. Summary of parasitoids[1] reared from *Polistes* spp. nests from Missouri, U.S.A. during summer 1999.

				Elasmus polistis				Other parasitoids[1]		
Nest	County	Host	1999 Emergence dates	Total	Female	Male	F:M ratio	*Chalcoela iphitalis*	*Pachysomoides fulvus*	*Dibrachys cavus*
1	Buchanan	*P. exclamans*	6/26–7/5	18	13	5	2.6	–	–	–
			7/5–7/11	19	10	9	1.11	–	–	–
			Nest 1 Total	37	23	14	1.64	–	–	–
2	Caldwell	*P. metricus*	6/26–7/5	95	86	9	9.56	–	–	–
			7/5–7/11	5	1	4	0.25	–	–	–
			7/11–7/16	1	1	–	–	–	–	25
			7/16–7/27	38	21	17	1.24	–	–	30
			7/27–7/31	–	–	–	–	–	–	6
			8/4–8/10	–	–	–	–	–	–	26
			Nest 2 Total	139	109	30	3.63	–	–	87
3	Crawford	*P. metricus*	8/29	1	–	1	–	–	6	–
4	Bates	*P. metricus*	7/7–7/8	–	–	–	–	22	–	–
5	Buchanan	*P. metricus*	7/11–7/13	–	–	–	–	6	–	–
6	Boone	*P. metricus*	7/21–7/27	–	–	–	–	–	29	–
Total				177	132	45	2.93	28	35	87

[1]Hosts of *Dibrachys cavus* in *Polistes* spp. nests are not known.

we were unable to record exact emergences that had occurred since the previous inventory of each jar. Intervals during which emergences occurred are given in Table 1. Only emerged adults were counted. Voucher specimens were placed in the Enns Entomology Museum, University of Missouri-Columbia.

A total of 37 *E. polistis* individuals emerged from one nest of *Polistes exclamans* and 140 from two nests of *Polistes metricus* (Table 1). Sex ratios, although extremely variable among nests, overall were female biased (F:M = 2.9) and similar to those found for summer and fall emergences of *E. polistis* in Texas (F:M = 3.1) (Reed and Vinson, 1979).

A total of 87 *Dibrachys cavus* (Walker) (Hymenoptera: Pteromalidae) emerged from one nest of *Polistes metricus*. Interestingly, the emergence of *Dibrachys cavus* individuals from nest #2 largely overlapped with the emergence of *E. polistis* from the same nest (Table 1). From 26 June to 16 July, 101 *E. polistis* emerged from nest #2, and from 11 to 16 July, 25 *Dibrachys cavus* individuals emerged from nest #2. This pattern continued with 38 *E. polistis* individuals emerging 16–27 July, and 30 *Dibrachys cavus* individuals emerging synchronously. Six *Dibrachys cavus* individuals emerged from 27 to 31 July and finally, 26 *Dibrachys cavus* individuals emerged from 4 to 10 August, all from nest #2. Although Rau (1941) reported dead *Dibrachys cavus* specimens from cocoons of the pyralid moth *Dicymolomia pegasalis* (Walker), a parasitoid of *Polistes*, we found no evidence of the silk webbing characteristic of both species of Pyralidae that are known to parasitize *Polistes* in the United States. *Dibrachys cavus* is highly polyphagous, and it is possible that the individuals in this case were parasitoids of *Polistes* immatures, the *E. polistis* immatures, or of some other parasitoid that did not emerge from nest #2.

In Texas, Reed and Vinson (1979) found 26% (nests collected from June to December) and Strassmann (1981) found 60% (June, July, and September) of *Polistes exclamans* nests to be parasitized by *E. polistis*. Eleven percent of the nests reported here (nests collected in June, $n = 16$; July, $n = 10$; and August, $n = 1$) were parasitized by *E. polistis*. *Chalcoela iphitalis* emerged from two *Polistes metricus* nests, and *Pachysomoides fulvus* also emerged from two *Polistes metricus* nests. Nelson (1968) found that 60% of *Polistes metricus* nests were infested with *Chalcoela iphitalis*, with overall parasitism rates for *Polistes* in Illinois at 40–48%. Because of the small sample size in the present study, the reported parasitism rates probably are not indicative of the true mean.

Elasmus polistis appears to be widespread across the eastern and southern United States, occurring in Pennsylvania (Burks, 1971), Maryland (Burks, 1971), Georgia (Burks, 1971), Florida (Macom and Landolt, 1995), Texas (Gillaspy, 1973), Oklahoma (Nelson, 1976), and now, Missouri. At least eight species of *Polistes* occur in Missouri (Hunt and Arduser, 1987), and it would be interesting in future studies to determine the breadth of the host range of *E. polistis*.

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