Repeated Predation of Meadow Fritillaries (Boloria bellona) by Ambush Bugs (Phymata spp.)

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Source: The Journal of the Lepidopterists' Society, 67(1) : 57-59

Published By: The Lepidopterists' Society

URL: https://doi.org/10.18473/lepi.v67i1.a8

Journal of the Lepidopterists' Society
67(1), 2013, 57–59

REPEATED PREDATION OF MEADOW FRITILLARIES *(BOLORIA BELLONA)* BY AMBUSH BUGS *(PHYMATA* SPP.*)*

Additional key words: *Eupatorium perfoliatum*, fen

The meadow fritillary (*Boloria bellona* Fabricius, 1775) is a common species of Nymphalidae found throughout Canada and the north-central and northeastern United States where it lives in open wet-grassy areas such as prairies, meadows, pastures and fields (Opler 1998; Brock & Kaufmann 2006; Schlicht et al. 2007). In the state of Iowa it is also known to inhabit fens (Schlicht et al. 2007), which are diverse open wetlands characterized by continuous surface to near surface saturation by groundwater, organic soil and non-emergent graminoid vegetation (Thompson et al. 1992; Amon et al. 2002). Nectar habits include many species of flowers, with a preference for members of the Asteraceae (Opler & Krizek 1984).

Ambush bugs (*Phymata* spp., Heteroptera: Phymatidae) are generalist sit-and-wait predators that feed on multiple species of florivorous insects, including members of the Nymphalidae (Balduf 1939). Preferred habitat is on vegetation in open areas with direct exposure to sunlight and wind (Balduf 1941). Seventeen species of *Phymata* are recognized in North America with a distribution that includes all of Canada and the eastern and southern United States (Arnett 2000).

On 8 July 2010 at approximately 2:30 p.m. Central Standard Time a group mortality of *B. bellona* was observed in a small (0.3 hectare) privately owned remnant fen in Muscatine County, Iowa, (41° 28' 6.59" N, 91° 3' 11.44" W). Six dead *B. bellona* were noted on the inflorescence of a common boneset plant (*Eupatorium perfoliatum* L.), whereas no other dead arthropods were observed. An ambush bug was then observed, partially exposed from the inflorescence of the common boneset, feeding on a recently captured seventh *B. bellona*. Closer inspection of the inflorescence revealed at least 3 ambush bugs concealed among the flowers. A more intrusive inspection of the inflorescence was not completed in order to limit disturbance of the *Phymata*, however no other predators were discovered.

Conditions at the time of observation were warm (30° C) and clear (0% cloud cover) with wind speeds of 13.0 kph (gentle breeze on the Beaufort Wind Scale). Although there was no direct evidence of predation by *Phymata* for the 6 dead *B. bellona*, the lack of other predatory species and their position on the inflorescence of the common boneset supported the conclusion that they were discarded *Phymata* prey. Balduf (1939) noted that under similar circumstances (i.e., warm sunny days with little to no wind) discarded *Phymata* prey were readily visible in the axils and flowers of plants used as ambush sites (i.e., ambush plants). Mortality was not observed for any other Lepidopteran species at the site.

A review of the literature found no published record of this phenomenon being described previously. Balduf (1939) found discarded remains of numerous species preyed on by *Phymata* on flowers, axils, and below ambush plants, but never described significant numbers of a single species. More recent unpublished data of *Phymata* predation on Lepidoptera as well have no records of group predation of a single species (David M. Wright, personal communication). An additional peculiarity of this observation was that pollinators typically avoid individual plants, specific species, and even entire patches as predation risk increases (Jones 2009), and the presence of *Phymata* specifically can deter flower visitation by nectivorous insects (Elliott & Elliott 1991, 1994). Despite the presence of other flowering Asteraceae in the fen (e.g., *Helianthus grosseserratus* M. Martens) no such avoidance by *B. bellona* was observed.

Also, the use of *Eupatorium* as an ambush plant by *Phymata* is infrequent (Balduf 1939; Punzalan et al. 2008). Balduf (1939) did not observe *Phymata* capturing any prey while utilizing *Eupatorium*. However, McAtee and Walton (1918) did observe *Phymata* successfully capturing flies (Diptera: Tabanidae) on *Eupatorium* and in Wisconsin Graenicher (1909) noted that *E. perfoliatum* was visited by as many as 113 different species, including both *Phymata* and *B. bellona*. This observation indicated that, contrary to previously published reports, *Phymata* utilized *E. perfoliatum* as an ambush plant quite effectively.

Although there is no direct evidence that the repeated mortality was the result of predation by *Phymata*, alternative hypotheses (e.g., disease, other predators, etc.) are unlikely. While only a single *Phymata* feeding on a *B. bellona* was observed, *Phymata* are not known to take dead insects as a food source (Balduf 1943), which would suggest that all of the dead *B. bellona* on the boneset were the result of *Phymata* predation since no other predators were present. Predation on Lepidoptera by ambush bugs is believed to be quite common (Fales

1976; Wright 1981); however, the literature is lacking on observations of such behavior (Pyle 1973; Wright 1981). The impact of predation on native populations of pollinators is crudely understood and regarded as a minor problem, though additional research is necessary to test this axiom (Kevan 1999). We concur with Wright (1981) and Kevan (1999) and suggest that additional observations of Lepidoptera predation by *Phymata* would aid in furthering the understanding of Lepidopteran and pollinator ecology.

ACKNOWLEDGEMENTS

We thank David M. Wright for his insight on *Phymata* predation on Lepidoptera.

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Received for publication 12 December 2012; revised and accepted 5 July 2012.