NOTE

POTENTIAL HOST RANGE EXPANSION BY THE HYPERPARASITOID *GELIS SP.*: UTILIZATION OF *GLYPTAPANTELES FLAVICOXIS* (HYMENOPTERA: BRACONIDAE) BY A PARASITOID OF *COTESIA MELANOSCELA*

Key Words: *Glyptapanteles flavicoxis, Cotesia melanoscela, Gelis* sp., hyperparasitoid, host range expansion, gypsy moth parasitoid.

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INTRODUCTION

A significant component of the procedures in classical biological control is the quarantine of introduced material to prevent the inadvertant introduction of hyperparasitic species which can suppress the numerical increase or effectiveness of a primary parasitoid. *Cotesia* (= *Apanteles*) *melanoscela* (Ratzeburg), a bivoltine braconid parasitoid of early gypsy moth (*Lymantria dispar* L.) instars, is rendered relatively ineffective, particularly during its second overwintering generation, by about 14 of 35 - 40 hyperparsitoids that attack it (Cushman. 1927. J. Agric. Res. 34: 453-58; Muesebeck. 1927. J. Agric. Res. 34: 331-34; Muesebeck and Dohanian. 1927. U.S.D.A. Bull. 1487: 35 pp.; Proper. 1934. J. Agric. Res. 48: 359-76; Weseloh. 1978. Environ. Ent. 7: 662-65; Weseloh. 1979. Environ. Ent. 8: 86).

Even when exotic hyperparasitoids are effectively excluded, indigenous hyperparasitoid species may nevertheless hamper primary parasitoid effectiveness (Muesebeck and Dohanian 1927). Muesebeck and Dohanian (1927) noted that as a rule hyperparasitoids are better able to adapt themselves to a greater variety of hosts than are primary parasitoids, when preferred species are not available in sufficient numbers. Such adaptability may account for heavy parasitism of introduced primary parasitoids (like *C. melanoscela*), even though they were originally introduced without any of the hyperparasitoids that attacked them in their native habitats.

Glyptapanteles flavicoxis (Marsh) is a recently introduced species which has been released in Pennsylvania, New Jersey, Maryland, and several other states in the northeastern U.S.A. This gregarious endoparasitoid can produce hundreds of cocoons on a single host. If this species were to become established it would represent a new and abundant resource for indigenous hyperparasitoids.

The study determined if a hyperparasitoid (*Gelis sp.)* currently attacking an already established primary parasitoid (*C. melanoscela*) could successfully develop in a newly introduced primary parasitoid, *G. flavicoxis.*

MATERIALS AND METHODS

Gypsy moth larvae parasitized by *C. melanoscela* were field collected in Cecil County, Maryland, U.S.A. Two male and two female *Gelis sp.* (Poss. *cushmanii* Carlson) emerged between July 12 and July 15. The hyperparasitoids were allowed to mate and females were provided with one-day old cocoons in 454.6 cm^3 (16 oz.) cups. Species identification had not been confirmed prior to

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conducting the experiment and the parthenogenic capacity of *Gelis* was similarly unconfirmed. Therefore, the species was presumed to require mating. Females were left in cups with the cocoons for 5 days. The occurrence of successful reproduction and progeny sex ratios were noted for three generations.

RESULTS AND DISCUSSION

It is unlikely that the maximum development time for F_1 or F_2 individuals would be a limiting factor on the success of this hyperparasitoid since it attacks overwintering *C. melanoscela* cocoons (Musebeck and Dohanian 1927). These cocoons persist over an extended period of several months.

Indeed, species of the genus *Gelis* attack practically anything resembling the cocoons of their hosts, i.e., primary parasitoids (Muesebeck and Dohanian 1927). *Gelis sp.* (poss. *cushmanii* Carlson), a hyperparasitoid of *C. melanoscela,* is capable of parasitizing and successfully developing within a newly introduced and formerly unutilized species, *G. flavicoxis* (Table 1). Average maximum larval development time over 2 generations was 18.7 days for males and 18.3 days for females.

Table 1. Sex ratio and numerical increase of *Gelis sp.* (poss. *cushmanii* Carlson) developing on *G. flavoicoxis* over three generations.

Generation	Sex ratio (♀:♂)	No. of *G. flavicoxis* cocoon masses provided	Rate of change (adults) No.	%
Parental*	1.0:1.0	–	4	–
F_1	1.0:2.8	5	38	950
F_2	1.0:3.5	3	49	129
F_3	3.8:1.0	4	24	-51

* Emerged from field collected *C. melanoscela.*

Gelis sp. (poss. *cushmanii* Carlson) is a relatively rare species compared to many of the other 35 to 40 species which attack *C. melanoscela.* Although parthenogenic, males are produced (Muesebeck and Dohanian 1927). In our rearings although the number of *G. flavicoxis* dropped by the F_3 generation, from a maximum of 49 individuals, the F_3 generation still represented a six-fold increase from the initial numbers (Table 1). More important, by the F_3 generation the ratio of females to males was almost 4 to 1.

We conclude that Muesebeck and Dohanian's (1927) caveat dealing with the role of indigenous hyperparasitoids merits consideration and is demonstrated by the ability of *Gelis sp.* to attack and develop in a new host. Perhaps, greater attention should be devoted to the determination of the occurrence and effectiveness of the hyperparasitoid guild affecting similar parasitoid species existing in areas of potential releases. We would hypothesize that the greater the similarity between the established primary parasitoids and a newly introduced primary parasitoid, the greater the likelihood that established hyperparasitoids will expand their host range and alter the effectiveness of the newly introduced species, the established species, or both.

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