BRIEF NOTE

BEHAVIOR OF *GELIS* SPECIES' PARASITIZING *BATHYPLECTES*, PARASITOIDS OF THE ALFALFA WEEVIL.[1]

Since 1957, in the eastern United States, USDA personnel have supervised introduction and establishment of several exotic parasitoid species to control the alfalfa weevil, *Hypera postica* (Gyllenhal) (Coleoptera: Curculionidae). *Bathyplectes curculionis* (Thomson) is the most widespread and abundant of the parasitoids, though *B. anurus* (Thomson) is more closely synchronized with populations of the host and was expected to become an effective agent of biological control (Brunson and Coles, 1968).

Hyperparasitization, or secondary parasitization of parasitoids by other parasitoid species, is a potential threat to the success of biological control. Native parasitoids occasionally expand their host preferences to include introduced biological control agents. Native *Gelis* species have parasitized both *Bathyplectes* species in the USA for many years (Puttler, 1966; Day, 1969). Female *Gelis* oviposit through the cocoon of *Bathyplectes* species after the latter have emerged from their alfalfa weevil host. Caldwell and Wilson (1975) reported that *Gelis* sp. parasitized up to 21% of *B. curculionis* larvae in an Indiana alfalfa field. They reported data on the biology of one *Gelis* sp. as a parasitoid of *B. curculionis*.

FIELD COLLECTIONS

Gelis species were collected in routine sweep-net samples of alfalfa foliage. These are wingless, antlike, ichneumoid wasps of 2 forms: a brown form, averaging 22 antennal segments, indistinguishable from that figured by Caldwell and Wilson (1975), and a black form averaging 18 antennal segments, very similar to one collected by Poinar and Gyrisco (1963). These are probably separate species.

I collected (from an alfalfa field near Apple Creek, Wayne Co., Ohio (6/27/75)) 10 *B. anurus* cocoons from which emerged 5 brown and 2 black *Gelis* parasites. Thus, 70% of this small sample of hosts was parasitized. From the same locality, I collected 10 weekly 0.9 m^2 samples of alfalfa foliage and litter. From 21 May to 18 June 1974, 40 cocoons of *B. anurus* and 14 of *B. curculionis* were retrieved and 12 *B. anurus* and 2 *B. curculionis* cocoons contained a solitary ectoparasitic larva.

SEARCHING BEHAVIOR

To simulate field conditions, 48 hours old brown *Gelis* were individually placed in each of 6 flower pots containing alfalfa plants and 6 to 12 *Bathyplectes* cocoons on the soil and on the plants. *Gelis* moved rapidly and continuously over foliage and ground litter. They regularly tapped their abdomen on the substrate as they moved, perhaps depositing a trail pheromone (Price, 1970). They fed readily on honeydew secreted by aphids and mealybugs, and on water droplets on the plants.

When a female encountered a host cocoon, she immediately and vigorously tapped it with her antennae as Caldwell and Wilson (1975) have described. She mounted it and inserted her ovipositor for 0.33 to 2.5 hr. Cocoons of *B. anurus* often jumped about as *Gelis* probed. Day (1970) reported that this behavior often dislodged ovipositing females of the smaller hyperparasitoid *Dibrachys cavus*. In the present study *Gelis* females were not dislodged, but rather embraced the jumping cocoons and rode them as they hopped about.

INTERFERENCE BEHAVIOR

Three fresh female *Gelis* were then placed on the soil of each of 4 flowerpots. Physical contact between two parasitoids normally resulted in a swift reversal of direction by each. One encounter became a 12 second grappling session during which the intertwined combatants fell from the plant. I saw no apparent avoidance of trails of previous females, but *Gelis* did avoid *Bathyplectes* cocoons on which a female previously had spent 20 min. or more. Of 11 host cocoons that

[1]Manuscript received April 1, 1976 and in revised form June 10, 1976 (#76-34).

had received extended *Gelis* visits, only 2 were visited for more than 1–2 seconds by other females. In all other cases, *Gelis* females tapped rapidly with their antennae, then walked quickly away. Cocoons that the first female had not discovered were probed readily by subsequent females.

HOST PREFERENCE

Female *Gelis* were confined for one week in each of two plastic petri dishes containing either 10 cocooned alfalfa weevil pupae or 5 cocooned alfalfa weevil pupae and 5 fresh *B. curculionis* cocoons. Observations were replicated 3 times for each *Gelis* type during 1975. One week after *Gelis* were removed, the cocoons were dissected and parasitization noted. All but one *B. curculionis* cocoon contained *Gelis* larvae. Where parasitoids had a choice, no alfalfa weevil pupae had been parasitized, but where alfalfa weevil pupae were the only available host each black *Gelis* had parasitized at least one alfalfa weevil pupa. Brown *Gelis* failed to parasitize any alfalfa weevil pupae.

Apparently two *Gelis* "species" parasitize cocooned larvae of *Bathyplectes* species in Ohio alfalfa fields. Solitary ectoparasites, probably *Gelis*, occurred in 30% of field-collected *B. anurus* cocoons from Apple Creek, Wayne Co., in 1974. Caldwell and Wilson (1975) suggested that *Gelis* spp. might seriously suppress the impact of *B. curculionis* in controlling the alfalfa weevil. From my studies it seems that inter-female interactions, both physical and chemical, limit dense concentrations of *Gelis* in the field by stimulating dispersal. Moreover, black *Gelis* apparently can parasitize alfalfa weevil pupae as an alternate host when *Bathyplectes* cocoons are unavailable. In such cases *Gelis* may function as a beneficial addition to the parasitoid complex controlling the alfalfa weevil biologically. —DAVID J. HORN, *Department of Entomology, The Ohio State University, Columbus, Ohio 43210.*

Acknowledgments. R. V. Dowell, J. K. Flessel, and D. R. Lewis contributed some of the living parasitoids used. G. L. Leibee helped me wade through mounds of hay generated from field samples and R. V. Dowell, R. S. Horn, D. R. Lewis and G. S. Wegner read and helped improve the manuscript. The work was supported, in part, by funds from the Graduate School, The Ohio State University.

LITERATURE CITED

Brunson, M. H. and L. W. Coles. 1968. Introduction, establishment and recovery of alfalfa weevil parasites in eastern United States. USDA Spec. Pub. 12.

Caldwell, D. L. and M. C. Wilson. 1975. Studies on *Gelis* sp., a hyperparasite attacking *Bathyplectes curculionis* cocoons. Envir. Entomol. 4: 333–336.

Day, W. H. 1969. Biological notes on *Dibrachys cavus*, a secondary parasite attacking parasites (*Bathyplectes* spp.) of the alfalfa weevil in the eastern United States. J. Econ. Entomol. 62: 1225–6.

——— 1970. The survival value of its jumping cocoons to *Bathyplectes anurus*, a parasite of the alfalfa weevil. J. Econ. Entomol. 63: 586–9.

Poinar, G. O., Jr. and G. G. Gyrisco. 1963. Hymenopterous parasites of the alfalfa weevil, *Hypera postica*, in New York. J. Econ. Entomol. 56: 533–4.

Price, P. W. 1970. Trail odors: recognition by insects parasitic on cocoons. Science 170: 546–7.

Puttler, B. 1966. Biological notes on some hyperparasites of *Bathyplectes curculionis* (Thomson). J. Econ. Entomol. 59: 483.