NOTE

Predation of Early-Instar Gypsy Moth Larvae by a Generalist Predator, *Anatis labiculata* (Say) (Coleoptera: Coccinellidae)[1, 2]

Stephen P. Cook and Ralph E. Webb

USDA-ARS, Insect Biocontrol Lab
Building 402, BARC-EAST
Beltsville, MD 20705
USA

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By definition, generalist predators feed on a variety of prey species and are generally not closely linked to the populations of any one prey species. With the gypsy moth, *Lymantria dispar* L. (Lepidoptera: Lymantriidae), there is considerable evidence to suggest that small mammalian predators can have a significant impact on population dynamics of the moth at low moth densities (Bess et al., Harvard For. Bull. 22, 1947; Campbell and Sloan, Environ. Entomol. 6: 315-322, 1977; Campbell and Sloan, Environ. Entomol. 6: 323-330, 1977; Smith, Wild. Soc. Bull. 13: 166-174, 1985; Cook et al., Environ. Entomol. 23: 360-366, 1994. There are also several invertebrate predators which feed on immature gypsy moth. Among these are the pentatomid *Dinorhynchus dybowski* Jakolev (Schaefer et al., Environ. Entomol. 8: 744-751, 1979), the paper wasp *Polistes jadwigae* Torre-Dalla (Furuta, Appl. Entomol. Zool. 12: 313-324, 1983), the dermestid *Cryptoropalum ruficorne*, (Mason and Ticehurst, Can. Entomol. 116: 1675-1677, 1984), various ants (Campbell, USDA For. Serv. Agric. Inf. Bull. 381, 1975; Smith and Lautenschlager, USDA For. Serv. Tech Bull. 1584: 96-125, 1981; Weseloh, USDA For. Serv. Gen. Tech. Rep. Rep. NE-123: 489-499, 1989; Weseloh, Environ. Entomol. 22: 587-594, 1993), spiders (Furuta, Appl. Entomol. Zool 18: 464-474, 1977), and harvestmen in the arachnid order Opilones (Smith and Lautensclager 1981). Further, Drooz (USDA For. Serv. Misc. Publ. No. 1426, 1985) listed gypsy moth among the prey taken by *Anatis mali* (Say) (Coleoptera: Coccinellidae), and Mason (Ann. Entomol. Soc. Amer. 69: 948-958, 1976) reported two coccinellid species, *A. rathvoni* (LeConte) and *Neomsia subvittata* (Mulsant), to be found in association with another lymantriid, the Douglas-fir tussock moth, *Orgyia pseudotsugata* (McDunnough). During late May 1994, we observed two immature

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[2] Use of trade names does not imply endorsement or criticism of the products named.

Anatis labiculata (Say) feeding on gypsy moth larvae at a site in Green Ridge State Forest, Flintstone, MD. *Anatis labiculata* has not been previously reported to prey upon gypsy moth. Therefore, we were interested in establishing it in the laboratory if *A. labiculata* would readily prey upon early instar gypsy moths, the predominant life stage in the forest at the time of our observation.

Anatis labiculata larvae and pupae were collected from tree foliage from 1-9 June 1994. There was an active gypsy moth infestation at the site which had been treated with Gypchek (1×10^{12} polyhedral inclusion bodies per ha) on 13 May 1994. Larval *A. labiculata* were maintained individually, without food, in 30-ml plastic cups with moistened filter paper for one day and pupae were maintained until adult eclosion. All rearing and experiments were conducted at 21° C, in a 16:8 h (L:D) cycle.

From one to five first- or second-instar gypsy moth larvae were placed in two different arenas with individual *A. labiculata* larvae to test their ability to feed on early instar gypsy moths. Feeding trials using immature *A. labiculata* were initiated on 2 June 1994. Three immature *A. labiculata* were placed in individual 240-ml plastic cups with two first-instar gypsy moth larvae, and predation was monitored after one day. Five immature *A. labiculata,* one per dish, were placed in 10-cm Petri dishes with dampened filter paper and one second-instar gypsy moth and four other *A. labiculata* were placed in similar dishes, one per dish, with two second-instar gypsy moth larvae. Predation was measured at one and two days for these two feeding trials. Six additional immature *A. labiculata* were placed in 240-ml plastic cups, one per cup, with five second-instar gypsy moths on white oak leaves and allowed to feed for three days.

Adult *A. labiculata* also were placed in arenas with first- or second-instar gypsy moth larvae to test their ability to feed on these early-instar gypsy moths. Adult feeding trials were conducted from 6-16 June 1994. On the day of eclosion, 19 adult *A. labiculata* were placed in individual 240-ml plastic cups with dampened filter paper, white oak leaves, and five first-instar gypsy moths. The day following consumption of the final first-instar larvae, the *A. labiculata* adults (n=13) were transferred to a second, identical arena with five second-instar gypsy moth larvae and feeding was again monitored daily for three days.

The gypsy moth larvae used for this study were from a standard (NJSS) strain maintained at the Otis Methods Development Center, USDA-APHIS, Otis ANGB, MA and reared on semi-synthetic diet (Bell et al., USDA For. Serv. Tech. Bull. 1584: 599-633, 1981).

The immature *A. labiculata* tested ranged in size from 9 to 15 mm and were capable of feeding on both first- and second- instar gypsy moth larvae (Table 1). All three *A. labiculata* offered first-instar larvae consumed both larvae during the one-day trial. Of the *A. labiculata* offered second-instar gypsy moths, 53.3% consumed at least one larva.

Newly-emerged *A. labiculata* adults began feeding on first-instar gypsy moth larvae the first day of exposure, but not until day 3 did substantial predation occur (Fig. 1). These same *A. labiculata* then preyed upon second-instar gypsy moth larvae at a rate comparable to their third day consumption rate of first-instar larvae (Fig. 1). Two possible explanations for the delay in the onset of

Table 1. Daily consumption of early-instar gypsy moth (GM) larvae by immature *A. labiculata* (AL) in laboratory feeding trials.

GM instar	Arena*	No. GM per *AL*	n	GM remaining on day ($\bar{x}$ + SEM)			
				0	1	2	3
1	Large	2	3	2	0.0 ± 0.0	–	–
2	Small	1	5	1	0.8 ± 0.2	0.4 ± 0.2	–
	Small	2	4	2	2.0 ± 0.0	1.3 ± 0.3	–
	Large	5	6	5	5.0 ± 0.0	4.7 ± 0.2	4.5 ± 0.3

* The large arena was a 240-ml plastic cup and the small arena was a 10-cm plastic Petri dish.

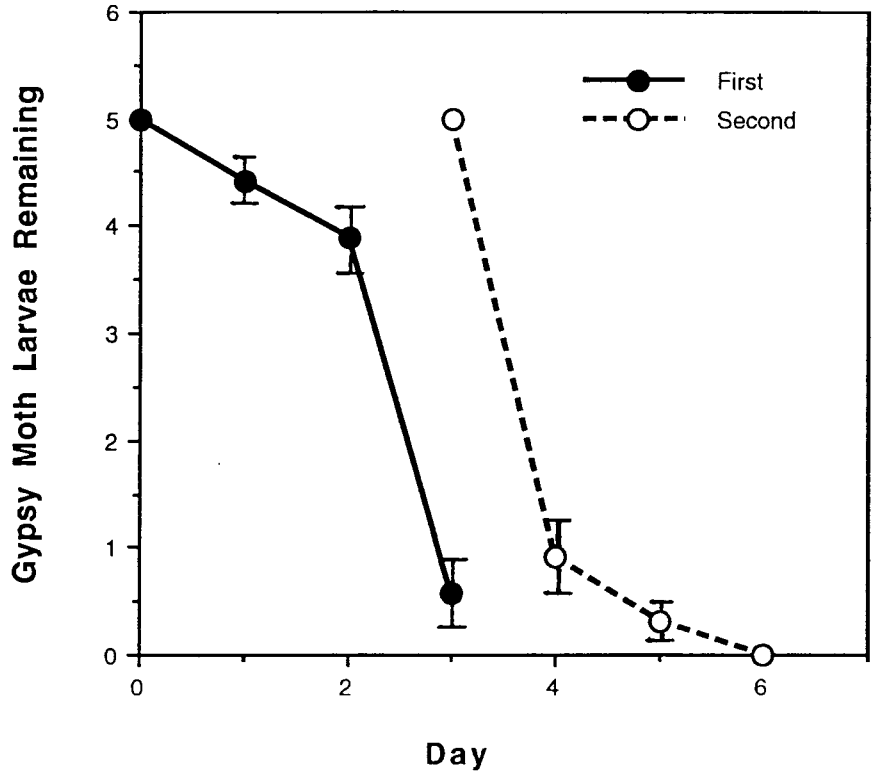

Fig. 1. Average daily consumption (± SEM) of first, then second instar gypsy moth larvae by newly-eclosed adult *A. labiculata*.

predation are that adult *A. labiculata* do not normally initiate significant feeding immediately upon eclosion or that they must learn to recognize gypsy moth larvae as an acceptable prey item.

This is the first reported case of *A. labiculata* feeding on gypsy moth in field observations or laboratory trials. Both immature and adult *A. labiculata* were capable of feeding on first- and second-instar gypsy moths in the laboratory trials. Members of the genus *Anatis* are generally considered to be arboreal aphid predators, but many coccinellids will expand their prey range when preferred prey species are scarce (Gordon, J. New York Entomol. Soc. 93: 1-912, 1985). Additional laboratory and field studies would be required to determine daily predation rates and consumption of gypsy moth larvae when other prey items are available. However, these feeding trials identify another generalist predator that is capable of feeding on early instar gypsy moths and whose potential impact on local moth populations should be evaluated.

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