

LABORATORY EVALUATION OF *GEOCORIS BULLATUS*^{1/} AND *NABIS ALTERNATUS*^{2/} AS PREDATORS OF *LYGUS*^{3,4/}

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ABSTRACT

Adults of *Geocoris bullatus* were not effective predators against late nymphs and adults of *Lygus*, but adults of *Nabis alternatus* were effective against these stages. Both predators were effective against the young *Lygus* nymphs. Males of *N. alternatus* were almost as successful as females against small prey but were less effective against the late stage *Lygus*.

INTRODUCTION

Since pest management programs are being developed for alfalfa grown for seed in central Washington (Johansen et al. 1976), there is a need to determine the impact of these 2 groups of predators on populations of *Lygus*. In the laboratory study reported here, we attempted to establish what life stages of *Lygus* are most vulnerable to predation by *Geocoris* and *Nabis* spp.

MATERIALS AND METHODS

Studies were conducted in pint-size cages (Tamaki and Butt 1977) containing an alfalfa bouquet made of 4-5 stems in bloom or of seed bearing terminals cut 7-10 cm long. Such heavily packed stems provided both food and shelter for the *Lygus* and also made a more natural environment than the near-empty cages or petri dishes commonly used as arenas for studies of predator-prey interaction. Although only 1 predator was added to each cage, the number of *Lygus* was varied according to the size of the predator and prey. The intent was always to provide more prey than the predator could consume.

Each treatment of a particular life stage of the predator or prey was tested 2 times, 10 replicates per test, and each test lasted 5 days. All cages were checked daily to determine the condition of the insects and for maintenance. Cages were kept on laboratory benches under daylight fluorescent lights (16-hr photophase) at an average temperature of 24°C (range 18-32°).

For each treatment with a predator, a corresponding treatment without predators but with the same number of *Lygus* of the same stage was established. We were thus able to determine a corrected rate of predation by determining *Lygus* mortality in both situations.

Geocoris bullatus and *Nabis alternatus* were the predators used because they were the

most readily available species. They were collected in the field on alfalfa and red clover and from beneath the trees in an orchard. No work was conducted with the 1st instars of either *Geocoris* or *Nabis* because they were difficult to collect and equally difficult to observe. *Lygus* bugs were collected from seed-bearing lambsquarters, *Chenopodium album* L., and pigweed, *Amaranthus retroflexus* L., and were a mixture of *Lygus elisus* Van Duzee and *L. hesperus* Knight; *L. elisus* was predominant. We did not separate the collected nymphs so all are referred to as *Lygus* or lygus bug. During the collections, some field observations were made.

RESULTS AND DISCUSSION

Geocoris

Geocoris adults caged with large *Lygus*, either 4th- and 5th-stage nymphs or adults, consumed so few prey that the corrected mortality (Table 1) was probably all the result of laboratory conditions. In fact, *Geocoris* adults were not observed feeding on adult or late instar *Lygus* but were frequently observed feeding on young *Lygus*.

All other stages of *Geocoris* from 2nd- to 5th-stage nymphs did feed on young (2nd-3rd instars) *Lygus* nymphs.

Nabis

Since Perkins and Watson (1972) studied predation by *Nabis* nymphs in Arizona, we concentrated on the predation by the adult stage in our study (Table 2). *Nabis* adults consumed relatively few *Lygus* adults, but the rate was 3 times that of *Geocoris* adults. They also consumed more late-instar (5th and 4th) nymphs. However, *Nabis* adults consumed 14 times as many 2nd-stage *Lygus* nymphs as adult *Lygus*.

We also made a special test in which 5th-stage *Nabis* were caged with the 4th or 5th stages of *Lygus* so we could compare our results with those of Perkins and Watson (1972). Our 5th-stage *Nabis* consumed an avg of 0.41 ± 0.12 S.E. 5th-stage *Lygus* per day compared with 0.9 per day in Perkins and Watson's test or an avg of 1.33 ± 0.19 S.E. 4th-stage *Lygus* per day compared with 2.9 per day in their test. The data of Fye (1978),

^{1/} Hemiptera: Lygaeidae

^{2/} Hemiptera: Nabidae

^{3/} Hemiptera: Miridae

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TABLE 1. Predation rates (corrected) of life stages of Geocoris bullatus feeding on stages of Lygus.

Life stage of <u>Geocoris</u>	Life stage of <u>Lygus</u>	No. consumed per day (average \pm S. E.)
Adult	Adult	.08 \pm .05
Adult	4th-5th	.02 \pm .02
5th	2nd-3rd	1.57 \pm .20
4th	2nd-3rd	.89 \pm .11
2nd-3rd	2nd-3rd	.47 \pm .11

who also studied the feeding rates of *Nabis* on *Lygus* in Arizona, were likewise more in agreement with those of Perkins and Watson than with ours. Therefore, the consumption rates of *Nabis* in Washington were about $\frac{1}{2}$ those reported by 2 groups of workers in Arizona. The difference could reflect geographic differences, species differences, or differences in temperature (constant temperatures of 25° and 28° C for Perkins and Watson and Fye, respectively, and our range from 18° to 32° with an avg of 24°C). However, we feel that the heavy foliage

of alfalfa in the cages was probably the main cause of the lower efficiency of the predator. Thus our values may be more comparable to feeding rates in the field.

Nabis females consumed more prey than males (Table 3). However, the difference between the sexes was less when they were caged with smaller *Lygus* nymphs. Apparently, the male is almost as successful as the female against small prey but is less effective against larger prey.

TABLE 2. Predation rate (corrected) of adults of Nabis alternatus preying on stages of Lygus.

Life stage of <u>Lygus</u>	No. consumed per day (Average \pm S.E.)
Adult	.23 \pm .05
5th	1.09 \pm .14
4th	2.08 \pm .11
3rd	2.62 \pm .30
2nd	4.41 \pm .54

TABLE 3. Predation rate of adult male and female *Nabis alternatus* on life stages of *Lygus*.

Life stage of <i>Lygus</i>	Average no. of <i>Lygus</i> killed		% consumed by male
	♀ <i>Nabis</i>	♂ <i>Nabis</i>	
Adult	.43	.025	5
5th	1.52	.700	32
4th	2.72	1.820	40
3rd	3.40	2.565	43
2nd	5.66	5.300	48

CONCLUSION

Although adults of *Geocoris* occasionally prey on 4th, 5th, and adult stages of *Lygus*, this species is primarily a predator of the smaller nymphal stages of *Lygus* (1st-3rd instars). *Nabis* is an effective predator against large *Lygus* (4th, 5th and adults) but is more successful against smaller *Lygus*. The impact of *Geocoris* and *Nabis* on populations of *Lygus* therefore depends both on the number of preda-

tors and on the age distribution of the *Lygus* population.

Indexing Words:

Lygus
Geocoris bullatus
Geocoris pallens
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 Predators
 Biological control

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