



Damsel bugs

useful as predators
but need help

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The Sacramento Valley of northern California annually produces 10 percent of California's 1.2 million acres of hay alfalfa. This important livestock feed crop is frequently damaged by a complex of insect pests including the Egyptian alfalfa weevil, *Hypera brunneipennis* Boheman, and the western yellow-striped armyworm, *Spodoptera praefica* (Grote), which sometimes require insecticide treatment. As the first step in improving the pest-management program for this crop, we determined which insect predators were present in northern California hay alfalfa, their abundance, and their range.

One of the most abundant groups of insect predators in insecticide-treated hay alfalfa fields is the Hemiptera. To determine the numbers and seasonal influences on these predators in northern California hay alfalfa, we made two types of surveys. The first, conducted in 1973, was an extensive area survey covering the major producing counties of Butte, Colusa, Glenn, Sutter, and Yolo. The second was an intensive three-year local survey conducted in Yolo County from 1972 to 1975.

Thirty-one species representing 11 families of Hemiptera were collected in the two surveys. The total included 14 carnivorous and 17 herbivorous species. In many cases the division into herbivore or carnivore is not distinct, because some carnivores, especially *Geocoris* spp., frequently take plant juices, and herbivores, such as *Lygus* spp., may prey on other insects.

The five predaceous species in the genera *Orius* (one species), *Geocoris* (two species), and *Nabis* (two species) comprised 72 percent of the 49,054 specimens collected in the intensive survey (see table). During July, these five species reached a density of 18 individuals per square foot, which makes them the most abundant and important group of insect predators in alfalfa under present management conditions.

The only other common hemipterans found were the lygus bug complex (*Lygus hesperus* Knight and *L. elisus* Van Duzee), which are important pests. This group constituted 27 percent (13,098 individuals) of the intensive survey total. All other species in these surveys were considered visitors; they were rarely found and were collected only as adults, which indicates that they do not normally feed and reproduce in alfalfa fields. Possible exceptions are the seed bugs, *Peritrechus tristis* Van Duzee and *Embelethis vicarius* Horvath, which may feed on weed seeds present in the field.

Species composition differed little among the surveyed counties. Most of the species

collected in the extensive survey were represented by only one, two, or three specimens, with the exception of those previously discussed. We attribute the differences found in visitor species to limitations inherent in an extensive survey: the small number of sample units relative to size of the area surveyed; the nature of the vegetation bordering the sample area from which visitors may immigrate; and variations in management practices among fields.

Because the damsel bugs, *Nabis alternatus* Parshley and *N. americanoferus* Carayon, were frequently the most abundant hemipterous predators in alfalfa, we also examined their seasonal population trends and feeding behavior. Their numbers, as determined by D-Vac sampling, increased rapidly beginning in April-May, reached the first peak in June-July, the second and highest peak in July-August, and a third but smaller peak in September-October (fig. 1). *Nabis americanoferus* was always more abundant than *N. alternatus*. Harvesting the alfalfa by cutting the entire field drastically reduced the numbers of nymphs and adults collected in D-Vac samples.

Laboratory and field observations of damsel bugs indicate that both adults and nymphs feed most commonly on eggs and early stages of the alfalfa caterpillar (*Colias eurytheme*), western yellow-striped armyworm (*Spodoptera praefica*), lygus bug (*Lygus hesperus*), pea aphid (*Acyrtosiphon pisum*), leafhopper (*Aceratagallia obscura*), and thrips (*Frankliniella occidentalis*). These prey are abundant in alfalfa during the same months that damsel bugs are prevalent (fig. 2, 3). Seasonal relationships in damsel bug numbers and numbers of each prey species indicate a significant ($P = 0.05$) positive correlation only with lygus bugs, leafhoppers, pea aphids, thrips, and lepidopteran larvae (from highest to lowest).

On the average, we found an adult damsel bug consumed a maximum of 42

first-stage lepidopteran larvae, 24 first-stage lygus nymphs, or 5 pea aphids during a 24-hour period. This means that the damsel bugs in 1 acre of alfalfa (283,000 bugs at peak population) could kill 12 million lepidopteran larvae, 6 million lygus nymphs, 1 million aphids, or some combination of these and other prey, in 24 hours. This is assuming high prey density and therefore little search time. Also assumed is that damsel bug nymphs eat as many prey as do damsel bug adults. We have found that, as the bugs develop, each stage eats more than the preceding one, but never as much as the adult damsel bug.

As determined with D-Vac samples, the combined density of the four most important prey species is approximately 4 million individuals per acre at their mutual population peak in August or September. We can speculate that in 24 hours the damsel bugs in 1 acre will consume at least 20 percent (800,000) of these major prey species, which amounts to three prey per day per predator. Such speculation is based on laboratory data indicating that these two *Nabis* species require a minimum of about three prey per day for development and reproduction.

We might get the impression that the damsel bugs could eliminate their prey species in 2 weeks. This is not true for several reasons. First, they are general predators that also feed on prey species, such as thrips, to fill their nutritional needs. Second, damsel bugs also feed on eggs of the major species, which are much more abundant than the later developmental stages. Third, and most important, these prey reproduce at a tremendous rate, producing enough offspring to potentially replace themselves manyfold daily. Thus, what these predators consume is more or less replaced.

This is not to imply that damsel bugs are not important beneficials, but rather that they are most effective in controlling alfalfa pests when working with other beneficial species. To maintain high numbers of these necessary insects, we suggest harvesting alfalfa by a method such as border harvesting or strip-cutting—especially in the spring and late summer when pest species are most abundant. Conserving beneficials in the spring is particularly important, because the first spring generation gives rise to the summer generations essential in suppressing the pests of hay alfalfa and other valley crops.

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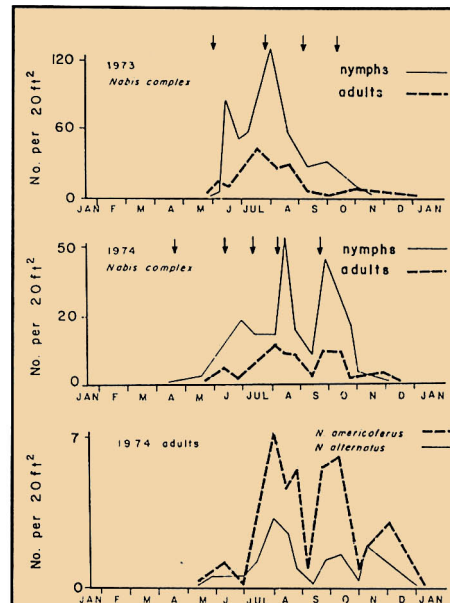


Fig. 1. Damsel bug population trends in alfalfa, Yolo County, California, 1973-74. Arrows show cutting dates.

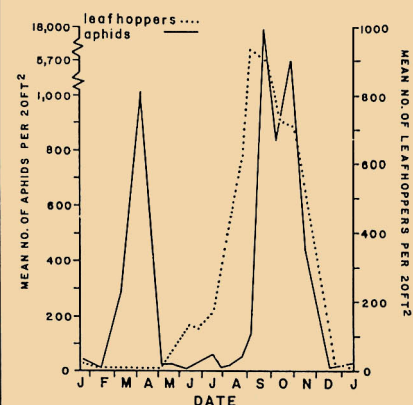


Fig. 2. Population trends of leafhoppers (Cicadellidae) and pea aphids in alfalfa, Yolo County, 1974.

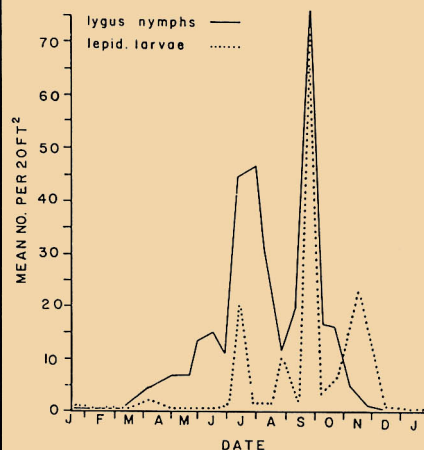


Fig. 3. Population trends of lygus bug nymphs and lepidopteran larvae in alfalfa, Yolo County, 1974.

Summary of Intensive Survey Results, Yolo County, 1972-75

Taxa	Feeding strategy	Peak number/100 sqft	Percent of total number (49,054)
Anthocoridae			
<i>Orius tristicolor</i>	Carnivore	448	28
Miridae			
<i>Lygus complex</i> *	Herbivore	320	27
Nabidae			
<i>Nabis complex</i> †	Carnivore	650	21
Lygaeidae			
<i>Geocoris atricolor</i>	Carnivore	507	16
<i>G. pallens</i>	Carnivore	221	6

*Consists of *Lygus hesperus* and *L. elisus*.

†Consists of *Nabis alternatus* and *N. americanoferus*.