

# Parasitism of *Lygus* spp. (Hemiptera: Miridae) by *Peristenus* (Hymenoptera: Braconidae) in the Pacific Northwest

D.F. MAYER

DEPARTMENT OF ENTOMOLOGY, IAREC WASHINGTON STATE UNIVERSITY  
PROSSER, WA 99350

C.R. BAIRD

UNIVERSITY OF IDAHO, 29603 U OF I LANE, PARMA, ID 86660

and B. SIMKO

OREGON STATE UNIVERSITY, 710 S.W. 5TH AVE., ONTARIO, OR 97914

## ABSTRACT

Fourth- and fifth-instar lygus bug nymphs (*Lygus* spp.) were collected from different plants from May through the first week of October in Washington in 1996 and 1997. In 1997, nymphs were also collected from alfalfa seed fields near Ontario, Oregon and Parma, Idaho. Nymphs were dissected under a binocular microscope and the number of nymphs parasitized by a *Peristenus* larva recorded. In 1996 and 1997, *Peristenus* was found in all areas of WA sampled (parasitism rate 32% and 14% respectively) and at Parma, ID but not near Ontario, OR. The *Peristenus* found in Pacific Northwest lygus bugs is apparently a new species, as yet undescribed.

**Key words:** *Peristenus*, *Lygus*, parasites, biological control

## INTRODUCTION

*Lygus* bugs (*Lygus* spp.) are serious pests of alfalfa and vegetable seeds, apples, peaches and other crops in the Pacific Northwest. The problem has been increased by insecticide resistant *Lygus* populations in several areas (Xu and Brindley 1994). There is little published information on parasites attacking lygus in the Pacific Northwest.

*Peristenus* spp. wasps are known to oviposit in the 1<sup>st</sup>-, 2<sup>nd</sup>-, and 3<sup>rd</sup>-instar nymphs of mirids (Lim and Stewart 1976). The Braconid larva feeds internally, primarily in the abdomen of the lygus nymph. The adverse effects of its feeding are not immediately fatal to the bug. Final-instar parasite larvae emerge from the 5<sup>th</sup>-instar nymph or adult of the host and spin cocoons in soil debris (Brindley 1939).

Clancy and Pierce (1966) reported *Peristenus pallipes* Curtis from *Lygus* spp. in Idaho. About 5% of 1,851 of the *Lygus* collected in Utah and southern Idaho alfalfa fields in June 1963 were parasitized by *P. pallipes*. Musebeck *et al.* (1951) also reported *P. pallipes* from *Lygus* spp. in Idaho. The *P. pallipes* from Idaho may be misidentified in light of new work on *Peristenus* taxonomy. There have been no reports of *Peristenus* being found in Oregon or Washington. *Peristenus wallisi* Foerster has been reported from British Columbia (Loan 1974).

European *Peristenus* have been introduced on the eastern seaboard and have had a substantial impact on lygus populations in the East (Day 1996). We feel these introductions should not be made in the Pacific Northwest until the identity and biology of native species is determined. Here we report results of initial surveys and studies to determine the status of *Peristenus* infesting

lygus in the Pacific Northwest.

## MATERIALS AND METHODS

In early October 1995, we collected 5<sup>th</sup>-instar lygus bug nymphs from an alfalfa hay field near Prosser, WA for rearing experiments and found several that contained a parasite. On 9 October, we collected several hundred 5<sup>th</sup>-instar nymphs from the same field. Fifty-five lygus nymphs from this collection were placed in individual plastic Petri dishes containing cotton soaked in 50 vol/vol sugar syrup and held in the laboratory. After the parasites emerged and pupated, each cocoon was put in a separate gelatin capsule until adult emergence. Also, seventy-five nymphs from this collection were dissected under a binocular microscope.

In 1996 (83 collections) and 1997 (100 collections), 4<sup>th</sup>- and 5<sup>th</sup>-instar lygus bug nymphs were collected from alfalfa (*Medicago sativa* L.) hay, seed, and waste land, carrot (*Daucus carota* L.), white clover (*Trifolium repens* L.), hoary cress (*Cardaria draba* (L.) Desv.) mint (*Mentha piperita* L.) and pepperweed (*Lepidium campestre* (L.) R.Br.) using a sweep net. Collections were made from May through the first week of October in the Touchet Valley, lower Yakima Valley, upper Yakima Valley and the Columbia Basin of WA. In addition, in 1997 12 samples of adult lygus were collected from the upper Yakima Valley. In 1997, lygus bug nymphs were also collected from alfalfa seed fields near Ontario, OR in June. In 1996 and 1997, we sampled an experimental alfalfa seed field weekly at Prosser, WA and in 1997 a seed field near Parma, ID. In both alfalfa seed fields, lygus were abundant all season and no insecticides were applied in 1996 or 1997.

For each sample in WA, a minimum of 30, 4<sup>th</sup>- or 5<sup>th</sup>-instar nymphs or adults in 1996 and 1997 were swept from the plants and the bugs put in a vial with Kahle's fixative (Martin 1977). The vials were stored in the laboratory. During the winter, 30 bugs from each sample were dissected under a binocular microscope and the number of nymphs parasitized by a *Peristenus* larva was recorded. In ID, 4<sup>th</sup>- and 5<sup>th</sup>-instar nymphs were aspirated from a sweep net and frozen. Seven samples of 50 nymphs were taken during the summer and were dissected under a microscope and examined for *Peristenus* parasitism. Duplicate samples of Idaho nymphs were sent alive by overnight Federal Express to W.H Day, United States Department of Agriculture Beneficial Insects Laboratory, Newark, Delaware for rearing and identification.

## RESULTS AND DISCUSSION

All 18 adult *Peristenus* that emerged from WA in 1995 were sent to P.M. Marsh, retired Research Entomologist, who determined them to be *Peristenus* sp. probably *pallipes* although these specimens were not compared with specimens at the United States National Museum Collection. The adult *Peristenus* from ID in 1997 ( $N=30$ ) were examined by W.H. Day, USDA and S. Shaw, University of Wyoming and were determined to be a new species as yet undescribed (Personal Communication). In addition, hundreds of lygus nymphs from ID have been sent to W. H. Day and have been reared for parasite emergence.

In 1995, during the 7 days after the lygus were put into Petri dishes, parasite larvae emerged from 18 of the nymphs, a parasitism rate of 32.7%. All were sent for identification. Of the 75 5<sup>th</sup>-instar nymphs from this collection dissected under a binocular microscope, 25 contained a parasite larva in various stages of development, a 33% parasitism rate.

In 1996 and 1997, *Peristenus* was found in all areas of WA sampled and at Parma, ID but not near Ontario, OR (Table 1). The percent of the samples with at least one parasitized lygus bug was highest in the Upper Yakima Valley although the mean percentage parasitism of those samples between areas was not significantly different. More extensive sampling in ID and OR in 1998 may reveal more widespread lygus parasitism than is currently known.

*Peristenus* was collected from lygus bugs feeding on all the plants sampled with the exception of carrot and mint of which only a few samples were collected (Table 2). The percent of the samples with at least one parasitized lygus bug was highest from hoary cress though the mean percent parasitism of those samples was not very different between the plant hosts.

**Table 1**

The number of lygus bug nymph samples by area, the percent of samples with at least one nymph parasitized by *Peristenus* and the mean and range of percent parasitism in those collections. WA, OR 1996-97.

Location	# of samples	% of samples with <i>Peristenus</i>	Mean % (range) of parasitism
Touchet Valley, WA	65	36.6	30.7 (2.6-80)
Lower Yakima Valley, WA	59	33.9	14.4 (2.9-55.3)
Upper Yakima Valley, WA	22	70.1	23.6 (3.4-41.5)
Columbia Basin, WA	35	28.1	17.3 (2.2-53.5)
Ontario, OR	4	0	0

**Table 2**

The number of lygus bug nymph samples by plant host, the percent of samples with at least one nymph parasitized by *Peristenus* and the mean and range of percent parasitism in those collections. WA 1996-97.

Plant	# of samples	% of samples with <i>Peristenus</i>	Mean % (range) of parasitism
Alfalfa hay	57	24.6	15.7 (2.9-43.8)
Alfalfa seed	40	30.0	23.4 (2.2-69.8)
Alfalfa wild	22	63.6	30.1 (8.0-63.6)
Carrot	1	0	0
Clover	3	33.3	3.4
Hoary Cress	8	37.5	32.3 (8.1-80)
Mint	2	0	0
Pepper Weed	8	75	32.7 (3.1-62.1)

*Peristenus* larvae were found from May through the first week of October in WA and from July through October in ID (Table 3). It is difficult to determine from the data if a population peak occurred, although the preliminary data suggest a peak in July. In the alfalfa field in WA sampled weekly, *Peristenus* were found from 17-23 June through the first week of October and the highest percent parasitism was found during mid-July and again in mid-August (Table 4). In ID, weekly sampling was begun in early July and the highest percent parasitism was noted on 2 July and again in late August.

In 1996, 41% of the samples collected in WA had at least one parasitized lygus nymph and the parasitism rate of those samples with at least one parasitized nymph was 32%. In 1997, 36% of the samples collected in WA had at least one parasitized lygus nymph and the parasitism rate of those samples with at least one parasitized nymph was 14%. In 1997, a total of 360 adult lygus were dissected and no *Peristenus* larvae were found.

**Table 3**

The number of lygus bug nymphs sampled in different months and the mean percent and range of percent parasitism by *Peristenus*. WA and ID 1996-97.

Month	Washington				Idaho	
	1996		1997		1997	
	<i>n</i>	% Parasitized	<i>n</i>	% Parasitized	<i>n</i>	% Parasitized
May	90	0	360	3.0	--	--
June	270	10.4	600	4.3	--	--
July	840	28.7	1,230	6.8	150	30.6
August	840	3.1	270	0.4	100	20.0
September	360	1.3	270	2.4	50	34.0
October	90	2.2	270	0.6	50	14.0

**Table 4**

The percentage of nymphs parasitized by *Peristenus* in samples from the same field on different dates. Field #1 at Prosser, WA and #2 at Parma, ID 1996-97.

Collection Period	Field #1		Field #2
	1996	1997	1997
May 20-26	0	0	--
May 27-2	0	0	--
Jun 3-9	0	0	--
Jun 10-16	0	0	--
Jun 17-23	0	15.2	--
Jun 24-30	1.2	2.8	--
Jul 1-7	9.3	0	54.0
Jul 8-14	7.6	20.4	8.0
Jul 15-21	14.8	24.5	30.0
Jul 22-28	26.4	7.5	--
Jul 29-Aug	40	13.2	--
Aug 5-11	10	0	--
Aug 12-18	55.3	0	12.0
Aug 19-25	10.0	0	--
Aug 26-Sep 1	0	0	28.0
Sep 2-8	2.9	9.6	34.0
Sep 9-15	8.6	0	--
Sep 16-22	0	2.2	--
Sep 23-29	0	0	--
Sep 29-Oct 5	2.8	1.4	14.0

## CONCLUSION

*Peristenus* spp. appear to be widespread in lygus nymphs in the Pacific Northwest on a number of different lygus bug host plants and they may be bivoltine. *Peristenus* may be a key factor in reducing overall lygus bug populations and further work is necessary to describe its biology and potential for suppression of lygus populations.

## ACKNOWLEDGEMENTS

We thank the Washington Alfalfa Seed Commission, the Washington Tree Fruit Research Commission, the Idaho Alfalfa Seed Commission and the Oregon Alfalfa Seed Commission for their support of this research. We thank W.H. Day, USDA Beneficial Insects Laboratory, Newark, DE for rearing the lygus nymphs and S. Shaw, University of Wyoming for parasite identification.

## REFERENCES

- Brindley, M.D. 1939. Observations on the life-history of *Euphorus pallipes* (Curtis) (Hymenoptera: Braconidae), a parasite of Hemiptera-Heteroptera. Proceedings Royal Entomology Society, London. (A) 14:51-56.
- Clancy, D.W. and H. D. Pierce. 1966. Natural enemies of some lygus bugs. Journal of Economic Entomology 59:853-858.
- Day, W.H. 1996. Evaluation of biological control of the Tarnished Plant Bug (Hemiptera: Miridae) in alfalfa by the introduced parasite, *Peristenus digoneutis* (Hymenoptera: Braconidae). Environmental Entomology 25(2):512-518.
- Lim, K.P. and R.K. Stewart. 1976. Parasitism of the tarnished plant bug, *Lygus lineolaris* (Hemiptera: Miridae), by *Peristenus pallipes* and *P. pseudopallipes* (Hymenoptera: Braconidae). The Canadian Entomologist 108: 601-608.
- Loan, C.C. 1974. The North American species of *Leiophrons* Nees, 1918 and *Peristenus* Foster, 1862 (Hymenoptera: Braconidae, Euphorinae) including the description of 31 new species. Le Naturaliste Canadien 101:821-859.
- Martin, J.E.H. 1977. The insects and arachnids of Canada. Part 1. Collecting, preparing, and preserving insects, mites and spiders. Canada Department of Agriculture Publication 1643.
- Musebeck, C.F.W., K.V. Krombein and H.K. Townes. 1951. Hymenoptera of America north of Mexico. Synoptic catalog. United States Department of Agriculture, Agriculture Monograph 2: 1,420 pp.
- Xu, G. and W.A. Brindley. 1994. Esterase isozymes in *Lygus hesperus*: Characterization and relationship with organophosphate resistance. Pesticide Science 42:273-280.

