

# USING PARASITES TO MANAGE LYGUS IN THE PACIFIC NORTHWEST

Craig R. Baird<sup>1</sup>

## ABSTRACT

*Peristenus howardi* Shaw, a braconid parasite of *Lygus* bugs, has been found parasitizing 70% or more of the *Lygus hesperus* nymphs in an Idaho alfalfa field. It has recently been described and named in the literature. There are three generations per season and generally some diapausing individuals in each generation. *Peristenus digoneutis* Loan, an introduced *Lygus* parasite, was released in Idaho alfalfa and has been recovered in very low numbers after three years.

**KEY WORDS:** *Lygus*, parasite, *Peristenus*, biological control

## INTRODUCTION

The earliest reports of *Lygus* parasites in the Pacific Northwest were by Musebeck et al. (1951) and Clancy and Pierce (1966) who reported *Lygus hesperus* being parasitized by a braconid, *Peristenus pallipes*. More recently, Mayer et al. (1998) found parasitized *Lygus* nymphs in Washington which were also tentatively identified as *Peristenus pallipes*. In light of a new species description, *P. pallipes* is probably an incorrect identification.

In 1996 an effort was begun to survey alfalfa in Idaho to determine the levels of *Lygus* parasitism as part of a program to release the European *Lygus* parasite, *P. digoneutis*, to aid in *Lygus* control. Sweep net samples in 1997 revealed surprisingly high parasitism of *Lygus* nymphs in an alfalfa field at the University of Idaho Parma Research and Extension Center where *P. digoneutis* had been released in 1996. Close examination of reared *Peristenus* wasp specimens from Idaho *Lygus* nymphs, however, showed them to be an undescribed species of *Peristenus*, not *P. digoneutis*, the introduced parasite, and not *P. pallipes* as reported in earlier literature (Pers. Comm. S.R. Shaw, Univ. Wyo. 1997).

Subsequent investigations have demonstrated this naturally occurring parasite to be common during June and July in unsprayed and uncut alfalfa at the Parma Research & Extension Center but less common in forage alfalfa at the UI Caldwell Research & Extension Center, Caldwell, Idaho. The undescribed species from Idaho has now been described by S.R. Shaw as a new species, *Peristenus howardi* (Day et al. 1999). The parasites taken from *Lygus hesperus* in Washington (Mayer et al 1998) have also been confirmed as the new species, *P. howardi* (Day et al 1999). For clarity, we refer to the new species, *P. howardi*, as the “Native *Lygus* parasite” and *P. digoneutis* as the “Introduced *Lygus* parasite”.

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<sup>1</sup> Craig R. Baird, Professor, University of Idaho, Parma Research and Extension Center, Parma, Idaho 83660. Published in Proceedings, *Lygus* Summit, 28 November 2000. Visalia, CA, University of CA Division of Agriculture and Natural Resources.

## METHODS

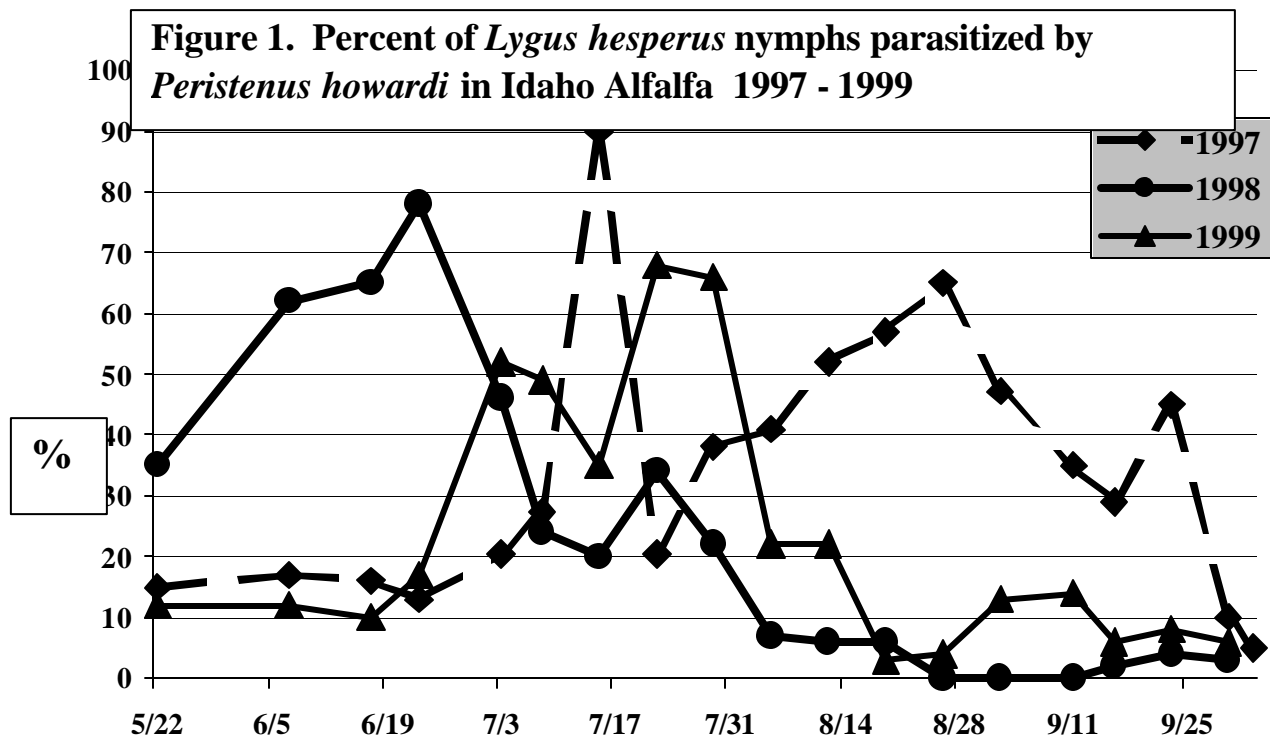
Alfalfa was maintained at the Parma Research and Extension Center without cutting or insecticide sprays from early May into October. Gravity irrigation was applied as needed to maintain the crop in green, vigorous condition to maximize *Lygus* development.

Alfalfa was sampled weekly with a 15-inch sweep net from early June through August or into September and October when weather permitted. *Lygus* nymphs were aspirated from the sweep net and shipped in cooled containers overnight to the USDA Beneficial Insects Research Laboratory in Newark, DE where they were reared for parasite emergence, development, and identification. Percent parasitism was determined by dissecting 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> instar nymphs from the samples each week (n=50).

Adult *P. digoneutis* wasps, the introduced *Lygus* parasite, were obtained from W.H. Day, USDA-BIRL, shipped by overnight freight, and released in the alfalfa at Parma, Idaho in June 1996, 1997 and 1998.

## RESULTS and DISCUSSION

*Lygus hesperus* nymphs infesting alfalfa grown at Parma, Idaho were found to be parasitized by an undescribed native braconid parasite. It has now been described and named *Peristenus howardi* (Day et al 1999). *P. howardi* has been reared through several generations since 1996 at the USDA-BIRL in Newark, DE and has readily parasitized *Lygus hesperus* and *L. lineolaris*, the tarnished plant bug, in the laboratory. In Parma, Idaho alfalfa, the earliest *P. howardi* larvae are found in *Lygus* nymphs in mid to late May and reach a peak parasitism of 68 to 90 percent in the *Lygus* population by late June to late July. Smaller peaks of parasitism occur in August with 5 to 10 percent of *Lygus* nymphs parasitized in September. Three peaks of parasitism occurred in the population during 1997-1999, however the peaks varied in magnitude and timing (Figure 1). The data are based on dissection of 50 nymphs per week without regard to *Lygus* density.



*Peristenus howardi* is thelytokous, i.e. each wasp produces only female offspring. Among nearly 1000 reared specimens, only one male has been found. This species has three generations per year and produces some diapausing individuals in each generation (Day et al. 1999). Thus far it has been positively identified in Idaho and Washington but probably occurs in Oregon, Nevada, Utah, Wyoming, Montana and perhaps British Columbia and Alberta. Other hosts are not known but it is likely that *L. lineolaris* may be parasitized in the west since it readily parasitized that species in laboratory tests in Delaware.

The introduced *Lygus* parasite, *P. digoneutis*, has been reared from *Lygus* nymphs since its introduction into Idaho alfalfa in 1996-98, although only a very few have been recovered from several thousand Idaho *Lygus* nymphs reared at USDA-BIRL. We do not claim that it is established in Idaho because of the low numbers recovered and the extremely mild winters in recent years. *P. digoneutis* is firmly established and spreading in the northeastern U.S. and is proving to be a useful tool in suppressing *Lygus* numbers (Day et al. 1996, 1998).

### **SUMMARY AND IMPLICATIONS FOR THE FUTURE**

*Peristenus howardi* is better understood now than during the mid-1990's when the investigations began. Further survey work must be done to determine its geographic range and host range. We do not know its impact on *Lygus* populations in Idaho alfalfa seed fields where it probably occurs in much lower numbers than in the test field. The fact that it is rearable in the laboratory on at least two host species makes it an encouraging biological control candidate for other regions such as the northeastern U.S. (Day, W.H., pers. comm., unpubl. data 2000).

As expected, *P. digoneutis* remains a mystery in Idaho. Although releases were very small in numbers, 100 to 200 adult wasps each year from 1996 through 1998, the few recoveries from reared Idaho *Lygus* nymphs are encouraging. If the species eventually establishes on a large scale, it may prove to be a useful supplement to *P. howardi* as a natural control agent of *Lygus* in many crops in Idaho.

### **ACKNOWLEDGEMENTS**

Several workers are active with *Peristenus* research and I wish to acknowledge their contributions to this work. Dr. William H. Day, USDA-BIRL, Newark, DE has pioneered the biological studies of these parasite species, the mass rearing and release and monitoring of parasite establishment in the Northeastern U.S. Dr. Dan Mayer, Washington State University, was the first to demonstrate parasitism of *Lygus* in the Pacific Northwest in the 1990's and now supervises a Ph.D. student, John Rumph, who is focusing on *Peristenus* research in Washington and the Pacific Northwest. Dr. Scott R. Shaw, University of Wyoming, a hymenoptera systematist, has provided specimen identification, a species description of *P. howardi*, and other taxonomic aid essential to this work. Kelley Tilmon, a Ph.D. student at Cornell University is presently completing work on DNA analysis of *Peristenus* species that will make significant contributions to identifying the various species. Many other workers have interest and have contributed in various ways. I also wish to thank the Idaho Alfalfa Seed Commission and the Washington Alfalfa Seed Commission for their financial support in these investigations.

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