

# Biological Control of the Lily Leaf Beetle, *Lilioceris lili*: in New England



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Fig. 1: Lily leaf beetle adult



Fig. 2: Lily leaf beetle eggs

Lily leaf beetle, *Lilioceris lili* (Chrysomelidae) (Figs. 1-3), is native to Eurasia and first found in the United States in Boston, MA in 1992. This serious pest of native and cultivated lilies (Liliaceae) is currently distributed throughout much of New England (Fig. 4).

We surveyed for parasitoids of *L. lili* in France from 1996 - 1998. *Tetrastichus setifer* Thomson was the most abundant parasitoid reared from *L. lili* larvae collected during this survey.

Lily leaf beetle parasitoids were released in RI and MA in 2001-2002. From 2003-2006, with cooperators in other New England states, we released parasitoids in NH and ME as well as additional sites in RI and MA.



Fig. 3: Lily leaf beetle larva

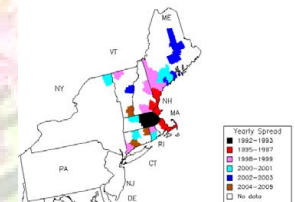


Fig. 4: Distribution of the lily leaf beetle (USDA APHIS PPQ NAPIS 2004)

## *T. setifer* Thomson (Hymenoptera: Eulophidae):

*T. setifer* (Fig. 5) will attack all instars of *L. lili* larvae. Parasitized larvae continue to feed and prepare a cocoon for pupation in the soil. After the cocoon is made, the *L. lili* larva becomes a mummy containing an average of 10 parasitoid larvae (Fig. 6). *T. setifer* host range tests indicated specificity to subfamily (Cricocerinae). No alternate hosts were regularly attacked. *Lema trilineata*, three lined potato beetle, was the only species that was also parasitized by *T. setifer* females (Table 1).

Table 1: *T. setifer* host range tests

Host	# larvae	# parasitized larvae
<i>Lilioceris lili</i>	333	118
<i>Lema trilineata</i>	73	1
<i>Crioceris asparagi</i>	46	0
<i>Galerucella spp.</i>	29	0
<i>Leptinotarsa decimlineata</i>	41	0
<i>Epilachna varivestis</i>	40	0
<i>Epilachna borealis</i>	39	0



Fig. 5: *Tetrastichus setifer*

Fig. 6: *T. setifer* larvae in *L. lili* mummy

Fig. 7: *T. setifer* larvae overwinter in the host cocoon in the soil.

## Methods:

We received approval from the USDA and State Departments of Agriculture to release *Tetrastichus setifer* in four New England states. *L. lili* larvae parasitized by *T. setifer* were collected in Europe by CABI Bioscience, and were sent to the URI Quarantine Lab for emergence. Adult *T. setifer* were released from 1999-2006 (Table 2, Fig. 8). We visited all release and control plots either weekly or biweekly during the summer, counting all life stages of *L. lili* on 40 lily stems per plot (adults, eggs, and four larval instars). To detect parasitism by *T. setifer* we dissected approximately 20 fourth instar larvae collected during each visit, when they were present in the plot.

We also received permits to release two additional parasitic wasps into New England study sites (Hymenoptera: Ichneumonidae) *Diaparsis jucunda* (Fig. 9) and *Lemophagus errabundus*. These sites were monitored in the same manner as the *T. setifer* release sites.

Table 2: Field releases of *Tetrastichus setifer* adults

Release Site	2001	2002	2003	2004	2005	2006
Wellesley, MA	810	-	-	-	-	-
Cumberland, RI	984	1,660	-	-	-	-
Kingston, RI	-	-	400	394	150	278
Cotuit, MA	-	-	140	350	280	-
Hudson, NH	-	-	375	500	150	-
Bridgton, ME	-	-	237	-	-	200
Concord, NH	-	-	-	-	-	288
Hampden, ME	-	-	-	-	-	279
Orono, ME	-	-	-	-	-	381



Fig. 8: *T. setifer* Release Sites



Fig. 9: *Diaparsis jucunda*

## Results/Discussion:

*Tetrastichus setifer* has been permanently established in Wellesley, MA for five seasons (Table 3), and the parasitism rate has remained high in most sites. In 2004 we noted a reduction in the number of lily leaf beetle larvae compared to 2003 (Fig. 10). This reduction in pest density was the result of three years of *T. setifer* parasitism. We have seen establishment of *T. setifer* in three other locations: Cumberland, RI, Bridgton, ME, and Hudson, NH. Parasitism of *T. setifer* has been detected five miles from the release site in Cumberland, RI (Fig. 11).

*Lemophagus errabundus* was detected in a lily garden approximately one mile from our Plainfield, MA release site in 2005, indicating that this parasitoid has established there. *Diaparsis jucunda* has not yet become established in New England.

Table 3: Recovery of *Tetrastichus setifer* parasitism

Location	Year Established	Peak larval par. 2006
Wellesley, MA	2002	38 %
Cumberland, RI	2003	100%
Bridgton, ME	2004	17%
Kingston, RI	-	80%
Concord, NH	-	40%
Hampden, ME	-	30%
Orono, ME	-	57%

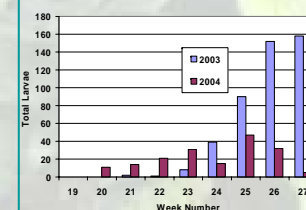


Fig. 10: Total larvae in Wellesley, MA (May 4 - June 29, 2003 and 2004)

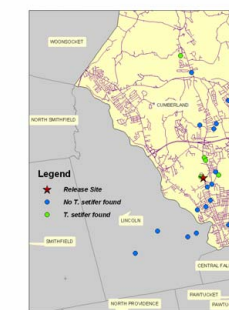


Fig. 11: Spread of *T. setifer* from Release sites

Special thanks to our New England cooperators:  
 Bruce Wenning, Audubon Society  
 Roberta Clark, UMASS Extension  
 Eleanor Grodin, University of Maine  
 Chris Rallis, NH Dept. of Ag Marketing  
 Lucia Terry, Perennial Point of View, ME  
 Michael Cherim, Green Spot, Ltd., NH  
 Trish Wesley Umbrell, MA Horticultural Society  
 Janet Weaver, Mud Meadow Farm & Gardens, ME  
 Melissa Pace, New England Lily Society  
 Ann Gibbs, Maine Department of Agriculture  
 Warren Summers, North American Lily Society