

# **Development of a Phenological Model for the Denver Billbug in Central Oregon Kentucky Bluegrass Seed Production, 2009**

Marvin Butler, Glenn Fisher, Sujaya Rao, Linda Samsel, and Kandy Marling

## **Abstract**

On April 10, 2009 pitfall traps were placed in a commercial bluegrass seed production field showing a high level of Denver billbug (*Sphenophorus cicatristriatus*) activity. This field had been identified during the fall of 2008. On May 11, 2009 pitfall traps were placed in four additional commercial bluegrass fields that were identified earlier in the spring with high to moderate levels of the Denver billbug. Eight pitfall traps were placed in each field where the insect damage appeared. Traps were checked weekly from April 20 through November 12 and adult billbugs were counted. The last week of May and the first week of June saw the highest activity in the pitfall traps of the adult billbug in all locations. Sod samples were taken bi-weekly from May 26 through November 24. Sod samples were placed into Berlese funnels and the number of adult billbugs and larva were determined. The sod samples were screened for non-mobile larvae or pupae. About June 22 small larvae started appearing in the sod samples, indicating a newly hatched generation of billbug.

## **Introduction**

The Denver billbug (*Sphenophorus cicatristriatus*) has occasionally been observed in central Oregon Kentucky bluegrass (*Poa pratensis*) seed production fields. During insect sampling from 1996 through 2007 for sod webworm (*Chrysoteuchia topiaria*) and cutworms (*Protagotis obscura*) the Denver billbug was collected at low levels in occasional fields, but has never been considered an important pest. During the fall of 2008, high levels of the billbug were found in one field, with moderate levels in two others. There are four life stages: egg, larvae, pupa, and adult. Billbugs do most of their damage while in the larval stage and can cause significant damage to grass seed fields. Left uncontrolled, populations tend to double annually. Pitfall traps and sod sampling will provide the data needed to develop a phenological model and control strategy for the Denver billbug in central Oregon.

## **Methods and Materials**

Five commercial bluegrass seed production fields with moderate to severe billbug damage were selected for sampling during the 2009 season. Eight pitfall traps were placed in field no. 4 on April 10, 2009 and eight traps were placed on May 11, 2009 in field nos. 1, 2, 3, and 5. The traps were checked weekly from April 10, 2009 to June 30, 2009 when they were removed for harvest; they were placed back into four of the five locations on September 25, 2009. Weekly sampling resumed through November 12, 2009.

Eight, 12-inch-diameter sod samples, 3 inches in depth, were collected every 2 weeks from May 26, 2009 through November 24, 2009. Sod samples were not taken during July and August due to harvest. These samples were taken within 3 to 5 ft of the pitfall traps and were kept refrigerated while waiting for processing. Sod samples were processed for 4 days using Berlese funnels. Insects were collected and identified. The samples were screened for any non-mobile adults or larvae.

## Results and Discussion

The number of adult billbugs collected in the pitfall traps ranged from 0 to 27 per trap from April 10 through June 30, 2009. The last week of May and the first week of June saw the highest activity of adults in the pitfall traps, then tapered off through the summer and into the fall (Table 1). With the exception of one field, adult numbers during the fall were very low compared to the spring numbers (Table 2).

The number of billbug larvae collected from sod samples taken from May 26, 2009 to November 24, 2009 ranged from 0 to 56 per field (Tables 3 and 4). Mid-June saw a high number of small larvae from four locations indicating a newly hatched generation of billbugs. One field showed higher numbers of small larvae during late May and early June. The location of this field is at a lower elevation, which may explain why the larvae count was higher earlier in the season compared to mid-June for the other locations. Because of the lower elevation and higher temperatures, insect development was 1 to 2 weeks ahead of the other locations. It appears that the Denver billbug overwinters both as adults and larvae.

Random samples of adult billbug and larvae were sent to Dr. Sujaya Rao at Oregon State University for DNA sampling. The results for the 12 adult billbugs show they were of the Denver billbug species. The objective of the study was to determine if molecular markers could be identified for separation of three billbug species: *Sphenophorus parvulus* (bluegrass billbug), *S. cicatristriatus* (Rocky Mountain billbug) and *S. sayi* (currently no common name). The three species are indistinguishable as larvae and current species identification is based on adult characteristics. Based on reports from other parts of the United States, the bluegrass billbug and the Rocky Mountain billbug have the potential to cause major economic damage to Oregon's grass seed industry. There are no reports of damage by the third species, *S. sayi*. Presently, little is known about the life cycle of these species in Oregon. Hence, molecular markers that allow identification at the larval stage will facilitate studies on evaluation of the possible risks presented by each species to grass seed farmers in Oregon.

Table 1. Number of adult billbugs collected in pitfall traps from Kentucky bluegrass fields located on the Agency plains near Madras, Oregon, during the spring of 2009.

Field	Collection dates								
	April 20	April 27	May 18	May 21	May 27	June 8	June 16	June 22	June 30
	----- Adults per field-----								
1	-- <sup>1</sup>	--	1	3	9	14	7	2	1
2	--	--	1	1	14	17	7	2	0
3	--	--	1	0	6	2	1	4	3
4	0	0	5	--	17	27	4	8	12
5	--	--	6	0	1	3	2	4	--

<sup>1</sup>Traps not collected.

Table 2. Number of adult billbugs collected in pitfall traps from Kentucky bluegrass fields located on the Agency plains near Madras, Oregon, during the fall of 2009.

Field	Collection dates							
	Sept. 18	Sept. 25	Oct. 2	Oct. 8	Oct. 15	Oct. 23	Nov. 5	
	----- Adults per field-----							
1	1	0	0	0	0	0	0	
2	-- <sup>1</sup>	--	--	--	--	--	--	
3	1	0	0	--	--	0	0	
4	--	6	9	7	10	6	2	
5	0	1	1	0	1	0	--	

<sup>1</sup>Traps not collected due to bluegrass being removed after harvest.

Table 3. Number of billbug adults and larvae collected from sod samples taken from Kentucky bluegrass fields located on the Agency plains near Madras, Oregon during the spring of 2009.

Field	Collection dates							
	May 26	June 9	June 22	July 7	May 26	June 9	June 22	July 7
	-----Adults per field-----				-----Larvae per field-----			
1	1	0	2	1	1	0	18	7
2	3	6	4	-- <sup>1</sup>	17	9	8	--
3	1	1	3	0	0	0	28	0
4	0	6	3	10	37	19	7	16
5	4	0	1	--	2	3	6	--

<sup>1</sup>Sample not collected.

Table 4. Number of billbug adults and larvae collected from sod samples taken from Kentucky bluegrass fields located on the Agency plains near Madras, Oregon during the fall of 2009.

Field	Collection dates					Collection dates				
	Sept. 22	Oct. 8	Oct. 23	Nov. 5	Nov. 24	Sept. 22	Oct. 8	Oct. 23	Nov. 5	Nov. 24
	-----Adults per field-----					-----Larvae per field-----				
1	1	4	6	3	3	53	56	34	20	11
2	-- <sup>1</sup>	--	--	--	--	--	--	--	--	--
3	3	0	0	0	0	12	19	19	16	6
4	10	9	7	4	2	16	2	8	12	1
5	2	1	--	--	--	4	14	--	--	--

<sup>1</sup>Sample not collected due to bluegrass being removed after harvest.