

# *Bradyrrhoa gilveolella* (Treitschke)

**INVASIVE SPECIES ATTACKED:** Rush skeletonweed (*Chondrilla juncea* L.)

**TYPE OF AGENT:** Root feeding moth

**COLLECTABILITY:** Not established

**ORIGIN:** Greece

## DESCRIPTION AND LIFE CYCLE

### Adult:

*Bradyrrhoa gilveolella* adult moths are 11-13 mm long and are creamy, buff coloured with three brown bands that traverse their anterior wings. Their wingspan is from 25 mm to 28 mm across. The moths' emergence is variable depending on the climate. Normally, the first generation appears in May. After adult emergence, egg-laying occurs within 2-8 days onto the soil surface at the base of plants or onto stems. The second generation appears in June to September<sup>3</sup>.



Fig. 2. *B. gilveolella* eggs



Fig. 3. *B. gilveolella* larvae

### Egg:

The eggs are 0.65 to 0.8 mm long and 0.45 wide. At the time they are laid the eggs are creamy white and darken during the incubation period<sup>3</sup>.

### Larva:

The newest larvae have pink bodies and brown heads. As the larvae develop they change to an ivory-cream colour. Newly hatched larvae may descend downward from the host plant by a silk thread and crawl over the soil surface to a plant. Once in contact with the plant, they begin to feed into the stem base then move downward and attach themselves to the root. The larvae continue to develop within loosely spun silk feeding tubes. Generally there is one or two larvae/root, but as many as three to 10 can be found. When mature, the larvae will measure 20-26 mm long with a 1.6-2.6 mm wide head capsule<sup>3</sup>.

### Pupa:

The pupae develop below the soil surface within the feeding tubes. Pupae are about 11-14 mm long by 3 mm wide. They are light brown coloured with a smooth appearance. Once pupation is complete, the emerging adults use the feeding tube to exit the root<sup>3</sup>.

### Overwintering stage:

In Russia, the second generation overwinters as dormant larvae. In Greece, they also overwinter as dormant larvae, but the generations are not as distinct because of the shorter winter. Populations emerge earlier



Fig. 1. *B. gilveolella* adult on rush skeletonweed plant

in Greece, starting in late April to early May<sup>3</sup>.

## EFFECTIVENESS ON HOST PLANT

Larvae feed on rootstock and dissect sections of the root which interrupts the flow of nutrients and reduces the plant's root reserves. The larvae feeding also can destroy adventitious buds near the root crown. The feeding reduces plant vigor, reproductive ability and can kill small plants. The damage to larger plants causes them to be susceptible to pathogenic fungi. Large plants can survive minor attack, but heavily infested plants can be killed. *B. gilveolella* is capable of two overlapping generations each year. The overlapping of the generations is predicted to extend the larva feeding period for the plants' entire growing season<sup>3</sup>.

## HABITAT AND DISTRIBUTION

### Native:

*B. gilveolella* is generally found in southern Russia from Kazakhstan to Ukraine, west to Turkey, Romania, Bulgaria, Yugoslavia, Macedonia and Sicily. Populations can also be found in Greece, Iran, Azerbaidjan and Karadj. It is notably absent in Portugal, Spain, southern France and mainland Italy. In Russia the climate has low to very low sub-zero temperatures with three months of hot summer and little precipitation. In Greece, the habitat has mild wet winters and hot summers, with less than 500 mm of rainfall. In their native habitat, they appear to prefer sandy soils. Compacted soils are not suitable, even if sand is part of its composition<sup>3</sup>. The moth has been found present on heavier soils in Greece and Bulgaria, but it is more common on plants growing in lighter soils<sup>1</sup>.

### North America:

*B. gilveolella* is beginning to establish well at sites in Idaho. The established sites include those: with loose-textured soils, including those with sand or granite; on south facing slopes; at 1158 m elevation; where the average plant density is 116 stems/m<sup>2</sup>; at transition zones between ponderosa pine/*Symphoricarpos albus* and *Purshia tridentate*/*Pseudoroegneria spicata* types; where the mean annual temperature is 8.3°C; and, with an annual rainfall of 615 mm<sup>1</sup>. At field sites in Idaho, the peak emergence period appears to be getting longer with adults emerging both earlier and ending later in the summer<sup>2</sup>.

### British Columbia:

At this time, releases have occurred only in the Interior Douglas-fir biogeoclimatic zone.



Fig. 4. *B. gilveolella* adult on propagation tent wall



Fig. 5. *B. gilveolella* adult on soil surface inside propagation tent

## BRITISH COLUMBIA RECORD

### Origin:

The first *B. gilveolella* released in B.C. were lab reared in Idaho from populations that originate from Lake Prespa, Greece<sup>3</sup>.

### History:

*B. gilveolella* was first introduced to B.C. in 2007 as adult moths and infested plants received from the University of Idaho and were released into two propagation tents in the north Okanagan. During their transport, some of the moths oviposited eggs into the shipping containers. These eggs were returned to Agriculture and Agri-Food Canada's labs in Lethbridge where they were transferred onto potted rush skeletonweed host plants and incubated in growth chambers. Later that same year, the plants were returned to B.C. and transplanted into the same north Okanagan location. Supplemental shipments of adults and larvae (larvae were reared from an egg shipment) received from Idaho were added to the tents in 2008 and 2011. The propagation plots yielded a small population, but the numbers did not build. In 2012 and 2013, adults collected from the propagation tents were released into an open field site near the Okanagan propagation tents. At this time, no establishment has been confirmed at the nearby field site.

### Propagation results:

In 2006, rush skeletonweed propagation plots were established in the North Okanagan near Vernon. In 2007, 12 and 15 moths were released into two established propagation tents. Later in September, 52 plants containing 246 larvae were returned to B.C. and transplanted into two new propagation tents. In August 2008, three adults emerged from the plots that had received the infested transplants. In 2011, 47 adults and 1467 eggs were received from the U.S. The adults were released into the plots and the eggs were incubated in the lab. From the egg shipment, 898 larvae emerged over several days and were quickly transported to and transferred onto established plants in the tents. The eggs that did not hatch during the incubation time were also transferred to tented plants, with hope they too would eventually hatch. In 2012, the decision was made to dismantle the propagation tents. The tents remained intact long enough in 2012 to allow for a small emerging population of 14 adults to be collected and transferred to a nearby open field/trial site.



Fig. 6. *B. gilveolella* adult on tissue just about to be released into the field

### Field results:

In 2012, the shipment of 570 adults received from Montana was delayed at Canada customs for several days before they eventually arrived in B.C. At the time of release 190 moths had perished. Many of the remaining 380 adults were noticeably in poor condition during their release at the field (trial) site in the north Okanagan near Vernon. In 2013, Montana provided 254 more adults. This shipment arrived without delay and the moths were in excellent condition. With the loss of only 17 adults, the remaining 237 were released at the same field site. Since the field release and trial set up in 2012, positive establishment has not been confirmed. Slow establishment is not unexpected based on observations in Montana where *B. gilveolella* was not recovered for several years after they were released. The trial was sampled prior to the releases in 2012 and plans are to continue with yearly vegetation sampling and biocontrol monitoring.

### Notes:

- *B. gilveolella* does not conflict with other rush skeletonweed biocontrol agents and is otherwise expected to compliment the effectiveness of other agents such as *Puccinia chondrillina* and *Eriophyes chondrillae*<sup>3</sup>.
- *B. gilveolella* is the only root feeding biocontrol agent for rush skeletonweed in North America<sup>3</sup>.

### REFERENCES

1. Littlefield, J., unpublished data, 2012, Montana State University, Bozeman, Montana, (October 12, 2011).
2. Littlefield, J., unpublished data, 2013, Montana State University, Bozeman, Montana.
3. Wikeem, B. and S. Wikeem. 2005. A petition for the introduction and field release of the *Chondrilla* root moth, *Bradyrrhoa gilveolella* (Treitschke) for the biological control of rush skeletonweed (*Chondrilla juncea* L.) in British Columbia, Canada.