

# *Rhinusa antirrhini* (Paykull)

**INVASIVE SPECIES ATTACKED:** Dalmatian toadflax (*Linaria dalmatica*)  
Yellow toadflax (*L. vulgaris*)

**PREVIOUSLY KNOWN AS:** *Gymnaetron antirrhini*, *Gymnetron antirrhini*

**OPERATIONAL FIELD GUIDE:** *Rhinusa antirrhini* – Operational field guide to the propagation and establishment of the biocontrol agent *Rhinusa antirrhini* (toadflax seed-feeder) B.C. Ministry of Forests and Range

**TYPE OF AGENT:** Seed feeding beetle (weevil)

**COLLECTABILITY:** Mass

**ORIGIN:** Yugoslavia

## DESCRIPTION AND LIFE CYCLE

**Note:** Unless noted otherwise, the information provided represents both strains of *Rhinusa antirrhini*

### Adult:

Adults are oval, black bodied and 5 mm long when on Dalmatian toadflax. The rostrum (nose) is curved and pointed and from the side it appears tapered. All but the tip of the rostrum is covered with pubescence. Their bodies have fine yellow-brown hairs arranged in rows. Adults appear in May when plants are 20 - 30 cm tall. They feed first on tender new growth which initiates branching lateral growth, then they move to the flowers to feed on pollen and young seeds. Several adults can be present in a single bloom. *Rhinusa antirrhini* normally lay eggs from June through August, often having to delay oviposition until *Brachypterolus pulicarius* damage has subsided. When the flowers have enlarged to just about full size, the females will prepare oviposition sites by chewing into the green pods. A single egg is inserted into each cavity, but up to eight may be laid into each pod. The cavities are covered with a yellow secretion. Females lay an average 54 eggs, but they range from 10 to 132 eggs and will continue to lay as long as suitable flowers are available, even though eggs or new larvae may not survive the winter. New adults from the spring mating will emerge in August and September but not mate or oviposit, instead they overwinter. Adults that emerged in spring and early summer will live until September.



Fig. 1. *R. antirrhini* adults (credit Powell et al. 1994)

### Egg:

The eggs are oval but flattened, and 0.49 x 0.27 mm in length. Incubation takes 12 - 17 days. Within one week of oviposition, a wart-like or nipple-like protrusion can be seen just above the oviposition point. At the same time, the egg is lifted into the protrusion, which prevents it from becoming damaged while also placing the egg deep into the developing seeds. The seeds nearest the egg swell abnormally, 8 - 10 times larger, and become pale coloured.

### Larva:

Full grown larvae are 0.54 mm long and have a clear, dark-brown head. Typical to weevils, their distinct "C" shape can be easily identified in pods when broken open. The first larvae instars feed on the pale enlarged seeds. Several larvae can occupy a single seed pod chamber. The final instar may feed on regular developing seeds.

### Pupa:

Pupation takes 10 - 15 days, occurring within the seedpod where mature larvae build an oval cell. *R. antirrhini* can be identified by two pointed horns at the top of their thorax. New adults emerge through the upper opening of dried seed capsules.



Fig. 2. Toadflax seed pods oviposition point showing wart-like protrusion (credit Powell et al. 1994)

### Overwintering stage:

Adults overwinter within soil duff. Sometimes they will also spend winters above ground inside the dried seed capsules.

## EFFECTIVENESS ON HOST PLANT

Larvae feed on seeds, completely destroying all the seeds in the capsule that they occupy. Adults feed on foliage which can add to plant stress and reduces vigour. Adult pollen and flower feeding also contribute to decreased seed production. On yellow toadflax *R. antirrhini* can reduce seed production by 20-25%.

## HABITAT AND DISTRIBUTION

### Native:

The native distribution of *R. antirrhini* is from north Africa (Algeria) into the Baltic countries and is frequently found in the cool moist habitats of Europe.

### North America:

There are two strains of *R. antirrhini*; each showing a preference for either Dalmatian or yellow toadflax varieties. Unlike the strain on Dalmatian toadflax, the strain found on yellow toadflax is believed to have been unintentionally introduced. The first North American published record indicates it was present in Massachusetts in 1909, (earliest Canadian specimens were found in 1917 in Que.).

### Dalmatian toadflax:

- *R. antirrhini* habitat is limited to where summers are warm to hot and winters are mild. Adequate snow cover adds protection where winters may be harsh. It prefers open sunny locations and is common on south and west aspects. Dense stands growing in well drained soils are ideal.

### Yellow toadflax strain:

- Commonly found and establishes easily on host plants in a variety of climates.

### British Columbia:

#### Dalmatian toadflax strain

- *R. antirrhini* establishes easily in the Thompson - Okanagan, and Kootenay climates. Releases were made in the Bunchgrass, Interior Douglas-fir, Montane spruce, Ponderosa Pine and Sub-boreal spruce biogeoclimatic zones. Establishment and dispersal have been found in all except the Sub-boreal spruce zones.

#### Yellow toadflax strain

- The adventive strain of *R. antirrhini* was first located in the 1950s. The adventive strain is commonly found on yellow toadflax throughout many areas of the province and no assisted dispersal has been done. Dispersal sightings occur in the Boreal white and black spruce, Coastal western hemlock, Interior cedar hemlock, Interior Douglas-fir, Montane spruce and Sub-boreal spruce biogeoclimatic zones.

## BRITISH COLUMBIA RECORD

### Origin:

The *R. antirrhini* populations released in B.C. originate from Yugoslavia. The adventive strain found on yellow and narrow-leaved Dalmatian toadflaxes throughout B.C. is believed to have originated in Eurasia.



Fig. 3 *R. antirrhini* adult on Dalmatian toadflax flower

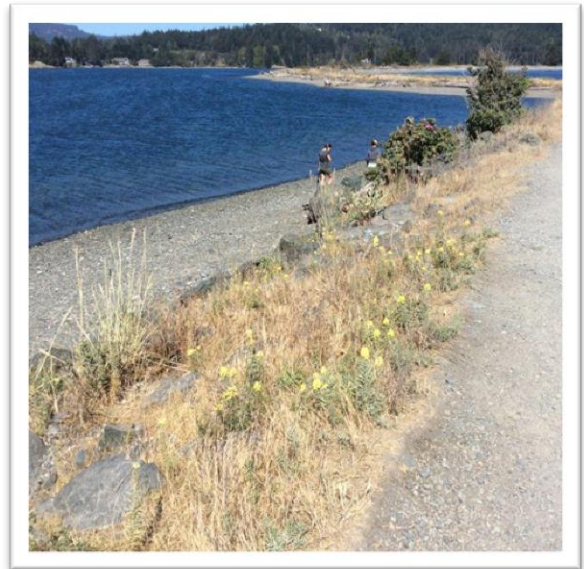


Fig. 4. *R. antirrhini* dispersal area near Sooke (Coastal western hemlock zone)



Fig. 5. *R. antirrhini* habitat and dispersal area near Chase on yellow and Dalmatian toadflax (Ponderosa pine zone)





Fig. 6. *R. antirrhini* dispersal area near Lac La Hache on yellow toadflax (Interior Douglas-fir zone)

### History:

*R. antirrhini* was first introduced into propagation tents in 1995 in Kamloops. The first field release in B.C. was made in 1996 near Kamloops onto Dalmatian toadflax. Early monitoring indicated no establishment at the field site and soon after access to the site was closed preventing further follow up. In 2008, *R. antirrhini* was designated secondary status. Assisted redistribution is ongoing; however suitable collection sites are limited due to the combined efficiencies of other biocontrol agents.

### Propagation results:

In 1999, the *R. antirrhini* rearing tents began to produce collectable populations. From 1999 to 2007, 15,937 adult weevils were collected from the tents for redistribution. In 2007, rearing tents were dismantled and the agent was reassigned to secondary status.

### Field results:

#### Dalmatian toadflax strain

- In the field, the overwintered adults emerge and can be observed during the same time *Mecinus janthinus* is collected (May and June). The generation resulting from the spring adults begin to appear in early August and last at least one month before they prepare to overwinter. Initially, the 1996 field release near Kamloops did not show establishment and soon after access to the site was restricted and no further monitoring could be done. In 2005, weevils were found in the vicinity of this release and subsequently positively identified as *R. antirrhini*. Dispersal monitoring was initiated and *R. antirrhini* was subsequently found great distances from the original release point. As well, the weevil has dispersed significantly in the North Thompson. It is probable it is widely spread in other parts of the southern interior, including Princeton, the Okanagan, and the Kootenays. By 2007, 98% of all treatment sites had established. *R. antirrhini* appear to be easier to tease from flowers than *R. neta*.
- *M. janthinus* attack creates delayed flowering which may affect oviposition of *R. antirrhini* females. This could cause them to disperse and/or oviposit later in the season. When competition is heavy among the bioagents, the few flowers blooming in late summer invites adults to congregate in large numbers. On a single plant, *R. antirrhini*, *R. neta*, and *M. janthinus* were found in August. In the rearing tents, adults have been observed mating and ovipositing well into late August. It is not known what success the late oviposited eggs and hatching larvae have for overwintering. Seed pods attacked by *Rhinusa spp.* can be detected by a pale, tan-coloured, grainy-textured substance that can be seen from the open end of the pod. When the pods are broke open, one or more larvae, pupae or developed adults can be found within unless the weevils have already emerged. New adults ready to emerge can often be seen with their heads or posteriors visible through the opening as they will have moved the grainy, tan particles aside for easy emergence. As well, adults may chew a hole through the pod wall to emerge as an alternative to the natural opening at the top.

#### Yellow toadflax strain

- Larvae were found in seedpods in early May at cool, semi-shaded locations in the Interior Douglas-fir zone. Adults were found in the southern interior during yellow toadflax bloom from late May through August.



Fig. 7. *R. antirrhini* dispersal area on yellow toadflax (Montane spruce zone)



Fig. 8. *R. antirrhini* dispersal area north of Barriere on Dalmatian and yellow toadflax (Interior Douglas-fir zone)

### Collection for redistribution:

Plants can be swept for adults from June through September. Aspirating is most effective and less damaging to the plants.

### NOTES

- When existing on the same plants as *R. neta* in their natural European habitat, *R. antirrhini* is 50% smaller.
- When combined with *B. pulicarius*, seed reduction can be 85 - 95%.



Fig. 9. *R. antirrhini* dispersal area near Kamloops on Dalmatian toadflax (Bunchgrass zone)

### REFERENCES

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