

Trichosiocalus horridus (Panzer)

INVASIVE SPECIES ATTACKED: Nodding thistle (*Carduus nutans* L.)
Plumeless thistle (*Carduus acanthoides* L.)

TYPE OF AGENT: Rosette/root crown feeding beetle (weevil) **COLLECTABILITY:** Limited

ORIGIN: Germany

DESCRIPTION AND LIFE CYCLE

Adult:

Trichosiocalus horridus are oval, rounded, grey-brown mottled weevils that measure 3-4.5 mm long. Their shape is very similar to *Mogulones crucifer* (hound's-tongue agent) and they have visible hairs protruding from their bodies. They have a long rostrum (nose) that is 3-4 mm long. When disturbed and handled, they emit high pitched shrieks which can be heard when the weevil is held close to the ear. Adults emerge from plants in April and linger until the end of June or early July. Spring adults are usually present up to the end of Balsamroot flowering. Their spring presence is first made obvious by their circular feeding holes on rosettes while they congregate under leaves. They camouflage on the soil and are difficult to see. On bolting plants the adults hide in leaf axils and between floral bracts. When disturbed or frightened, they drop and roll themselves into a round ball, tucking in their heads and closely resembling soil particles. They aestivate through the warm summer months then reappear in September. Mating and ovipositing occurs in the spring and the fall. Females lay about 800 eggs (maximum 2000) during their life span. Females chew holes in the leaf mid veins on large rosettes and oviposit eggs individually or in clusters up to ten. Eggs may also be laid on the underside of leaf surfaces. Adults disperse easily, seeking scattered plants over large areas.

Egg:

Eggs are yellow-white in colour and measure 0.54 x 0.33 mm. During incubation the eggs become deeper yellow with brown dots which indicate developing larvae head capsules. Temperature varies the incubation period from 5-30 days. Most hatching will occur in 10-12 days.



Fig. 3. *T. horridus* larvae near crown on nodding thistle

Larva:

Larvae are white and slender with brown head capsules. There are three instars. Larvae that hatch from eggs laid in the vein will move through the vein and downward towards the crown. Larvae that hatch from eggs laid on leaf surfaces will move across the leaf and bore into the crown. Once they are inside the crown, they feed on tissue below the terminal bud. At 20°C, all three instars will complete development in 6-12 weeks (longer in lower temperatures). Mature larvae leave the root and enter the soil to pupate. They create a cell chamber made from silk and soil particles.



Fig. 1. *T. horridus* adult (credit Powell et al. 1994)

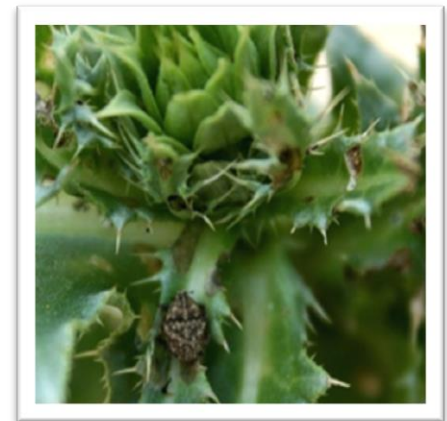


Fig. 2. *T. horridus* adult on nodding thistle

Pupa:

The pupae are about 4.3 mm long. Pupation takes 14-25 days.

Overwintering stage:

T. horridus can over winter in all stages as eggs, larvae, pupae or adults. The earliest summer generation adults to emerge may breed into September and produce a second generation which can overwinter as eggs, larvae or pupae.

EFFECTIVENESS ON HOST PLANT

Larvae mine the crown of rosettes and within bolted stems. Attacked buds fail to grow and when leaves are pulled back, the blackened mined cavity and possibly several larvae will be exposed. Attacked plants can develop multiple stems, which tend to be shorter and produce weaker flowers. Larvae that develop in leaf axils on bolted stems also produce decaying black cavities. Weak plants can die from attack. Adults feeding in high amounts contribute to reduced plant vigour. Some sites in the United States have been reported to have nodding thistle sites disappear in 5-6 years and plumeless thistle sites disappear in 10-12 years. There are reports that *T. horridus* dispersal increased from 600 km² to 4,300 km² in four years.



Fig. 4. *T. horridus* larva feeding on nodding thistle rosette



Fig. 5. *T. horridus* larva feeding evidence on bolting nodding thistle terminal

HABITAT AND DISTRIBUTION

Native:

Its native European distribution is from the Mediterranean to Russia where it occurs from sea level to 1,800 m.

North America:

T. horridus is suitable on sites that have long cool springs. They appear to favour areas on the fringes of forest openings and where host plants grow somewhat shorter than normal. They require dense thistle stands and large rosettes. In Canada, it is established in B.C., Alta., Sask., and Man.

British Columbia:

T. horridus releases have been made in the Bunchgrass, Coastal western hemlock, Interior cedar-hemlock, Interior Douglas-fir, Ponderosa pine and Sub-boreal spruce biogeoclimatic zones. Establishment has been confirmed in the Bunchgrass, Interior cedar hemlock, Interior Douglas-fir and Ponderosa pine zones.



Fig. 6. *T. horridus* release site on nodding thistle near Merritt (Ponderosa pine zone)

BRITISH COLUMBIA RECORD

Origin:

The *T. horridus* populations released in B.C. originate from Germany.

History:

In 1979, the first *T. horridus* release was made with only 25 adults on nodding thistle west of Williams Lake along Highway 20 near Hanceville. No further releases were made until 1986-1988, when the weevil was introduced to five nodding and one plumeless thistle infestations in the Alexis Creek, Hanceville, Bridesville, and Princeton areas. In 1991, a population was released near Cloverdale on bull thistle. In 2003, a small population was collected from Princeton and introduced into tents at the Kamloops facility for propagation purposes. Subsequent propagated populations were collected and released into eight plumeless and nodding thistle infestations near Merritt, Kamloops, and Logan Lake areas. In 2007 and 2008, establishment of adult weevils was attempted on Marsh plume thistle and Scotch thistle infestations.

Propagation results:

In 2003, there appeared to be an increase of plumeless thistle and a resurgence of nodding thistle in the southern interior. It was decided to establish *T. horridus* in propagation tents in 2003 and rear collectable populations for redistribution. The rearing plots were established with 29 adults and one larvae infested root. From these few parents, 1499 adults were collected for field release in 2005. The rearing tents were maintained to test the weevil on two additional thistles (Scotch and marsh plume) that the weevil was purported in the literature to also attack. Small populations persisted in the tents for several years, but the weevils did not reach the quantities of 2005. Typically in the tents, a small population would appear in mid to late April and a second, larger flush would arrive throughout June, then reduce through July and reappear in September. While *T. horridus* was reared at the Kamloops Propagation Facility, 2123 adult weevils were collected from the tents and released into field sites. In 2012, it was decided *T. horridus* were present at sufficient field sites and in sufficient quantities to provide for future field collections and releases in B.C. so the propagation plots were dismantled.

Field results:

In the field, adults and larvae are present in April and May. Adults and their feeding can be seen on rosettes. The larvae and their central rosette damage can also be observed during this time. Ovipositing occurs not only on rosettes, but also on small bolting stems. By the time larva damage is visible, the bolting stems may be 50 cm high and when the stem leaves are pulled away the larvae can be observed. *T. horridus* shares most of its sites and host plants with *Rhinocyllus conicus*, *Larinus planus* and *Cassida rubiginosa*. *Platyptilia carduidactylus* (artichoke moth) is a native moth that is a general feeder found on thistles. Its larvae are also found in the centers of rosettes and the axils of bolted host plants. When monitoring sites for *T. horridus* and adults are not found, the suspected larvae feeding damage must be inspected closely to confirm the species present. This is done by pulling back the leaves and checking the larvae that are causing the damage. In the Kamloops area, adults also appear to emerge later when released onto plumeless thistle than on nodding thistle.

The earliest release in the Chilcotin was presumed to not establish after excavation disrupted the site a short time after the release was made. In 2002, *T. horridus* was located at a historical release site near Princeton. This sighting renewed the need to reinvestigate other *T. horridus* releases in B.C., including the original and subsequent sites in the Chilcotin. This renewed interest confirmed *T. horridus* had established in the Chilcotin. Evidence of the weevil was found among the widely-spaced, small patches and on isolated individual plants. In this area, some plants were stunted as short as 20 cm, but were still trying to flower. In 2006, all the 2005 release sites were monitored and all were found established. To date, all *T. horridus* releases have established when released onto nodding and plumeless thistles. However, no evidence has been found to confirm its establishment on bull, Scotch or marsh plume thistles. Future efforts will focus on dispersal monitoring, collection for redistribution on nodding and plumeless thistles if necessary, and to monitor for establishment on marsh plume thistle.

NOTES

- The weevil is most effective when released with *R. conicus*. The multiple stems resulting on the weakened plants from *T. horridus* feeding are beneficial for *R. conicus* survival.

REFERENCES

1. Harris, P. and L.T. Kok. 1986. Biological control of *Carduus* thistles with *Trichosiocalus horridus* (Panz.). Canadex, Insects-Diseases-Pests, Weed Control, Beneficial Insects. Agriculture and Agri-Food Canada, Ottawa.
2. Harris, P. 2003. Classical biological control of weeds established biocontrol agent *Trichosiocalus horridus*. Rosette-bud weevil. Agriculture and Agri-Food Canada. Updated April 11, 2003. http://res2.agr.ca/lethbridge/weedbio/agents/atrihor_e.htm (Accessed May 2003).



Fig. 7. *T. horridus* release site on Plumeless thistle near Dairy Creek, Kamloops area (Interior Douglas-fir zone)



Fig. 8. *T. horridus* dispersal location near Alexis Creek (Interior Douglas-fir zone)

3. Hayes, L. (editor). 2003. What's new in biological control of weeds? Landcare Research, New Zealand, 24(May): 8.
4. Powell, G.W., A. Sturko, B. Wikeem and P. Harris.1994. Field guide to the biological control of weeds in British Columbia. Min. For. Res. Program.