



Biological Control Agents for Utah Weeds: *Ceutorhynchus litura*, a Stem-mining Weevil of Canada Thistle

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Canada thistle (*Ceutorhynchus litura* [L.] Scop.) is found in crops, pastures, and rangelands (e.g., along creek banks) throughout Utah. The weed grows primarily as a perennial, propagating by both seed and roots. Its vigorous spreading by roots largely accounts for its ability to crowd out other vegetation and achieve high stem densities in local areas.

The stem-mining weevil, *Ceutorhynchus litura* (F.), was introduced from Europe to Canada in 1965 and to the United States in the early 1970s to feed on Canada thistle. The weevil restricts its feeding to this weed and a few close relatives. It attacks rosettes of Canada thistle in early spring, before the thistle bolts, and is particularly abundant in Europe on thistles growing in cultivated soil. *Ceutorhynchus litura* thrives under diverse climatic regimes. Therefore, it was thought to hold considerable promise for biological control of Canada thistle in North America. This fact sheet describes the biology and natural history of this insect and summarizes research results concerning its effectiveness as a biological control agent.

Biology of the Weevil

The weevil has a single generation each year. Adults (1/8" long with long "snouts" and mottled gray-black with a distinctive gray cross on the back) spend the winter in the soil

(generally in the upper 5 cm). They emerge in early spring as the first thistle rosettes begin to appear. The adults are present for several weeks, mating and feeding on young foliage of the Canada thistle; unfortunately, adult feeding appears to have little adverse effect on weed vitality. Even at high densities, the adults are difficult to find in the field, as they fall off the host plant when disturbed and remain motionless on the ground where they are well-camouflaged. They also spend much of their time on or near the ground and, consequently, are not easy to collect with a sweep net.

When ready to lay her eggs, a female weevil chews a hole (1/10" in diameter) in a thistle leaf on a young rosette, generally in the main vein. She then turns around and lays one to five eggs in the hole. Over her lifetime, she may lay up to 100 eggs.

When the larvae hatch a week or so later, they tunnel through the leaf into the lower stem and root collar; when several larvae are present, the main vein turns black from the tunnelling and, several days later, the leaf dies. In the stem and root collar, the larvae mine the pith; they avoid the vascular bundles, however, and hence generally do not cause the stem to die during the growing season (but see below). A stem mined by larvae can be readily distinguished from an unmined stem; the latter has a white, soft pith whereas the interior of a stem attacked by the weevil becomes blackened with the speck-like feces ("frass") of the larvae.

In early summer when they have fed fully, the larvae emerge from the thistle shoot through small exit holes that they chew near or just below ground level. They work their way into the soil, and enter the pupal stage in which they transform into adults. After two to three weeks, adults emerge from the soil (in late June and July) and feed on thistle foliage until heavy frosts occur in fall. They may feed intensely at high densities, with attacked leaves bearing many small feeding punctures. Adults may copulate in late summer and early fall, but females do not lay eggs until the following spring.

The weevils tend to aggregate in dense patches of Canada thistle. Upon release at new locations, they spread slowly; in field studies in Canada, they spread 90 m in 6 years at one site and 3 km in 12 years at another. A long-term study in Montana revealed that the weevils spread at least 200 m in 7 years and 9 km in 15 years. At the same time, levels of infestation at the sites of release slowly increased. After 10 years of local increase in Montana, the weevil infested over 80% of stems.

Effects of Weevil Feeding on Canada Thistle Populations

Larval mining does not prevent vigorous growth of attacked thistle stems under favorable conditions for the weed. Female weevils tend to lay their eggs in early developing stems; such stems generally grow taller than those developing later in the season. Consequently, under otherwise favorable conditions for thistle growth, stems mined by weevils are generally taller on average at the end of the growing season than are unmined stems. When attacked by only one or two weevil larvae, vigorous thistle stems are often able to kill these larvae by surrounding them with gall tissue. But when the weevil attacks a Canada thistle growing under less favorable conditions, the weevil can adversely affect weed vigor during the growing season.

Initial field studies in Canada suggested that weevil feeding may also aid in the spread of the

thistle rust *Puccinia punctiformis* (Str.) Rohl., but this was not confirmed in subsequent research. However, weevil feeding may allow a variety of other micro-organisms (including other pathogens) to enter the thistle stem, with adverse consequences for the thistle: field studies in Montana indicate that underground parts of stems are much more subject to winter-kill if the aboveground stem is attacked by weevils during the growing season. Furthermore, roots with stems mined by weevils produce fewer new stems the following spring than do roots with stems escaping attack.

It is presently unclear how effective the weevil will be in causing decline in thistle densities. Fluctuations in thistle density could not be consistently associated with varying levels of weevil attack in field studies performed in Canada. But ranchers in Montana have reported sharp declines in Canada thistle in some instances, apparently associated with release and subsequent population build-up of weevils. Research to date suggests that population reduction of the thistle is unlikely until the weevil reaches high numbers and infests a very high percentage (90-95%) of stems, such that stem recruitment from unattacked plants is unable to compensate for winter-kill death of shoots following weevil attack. USU Extension has initiated long-term studies of population densities of the weevil and the weed in riparian stands of Canada thistle in Rich County; future results from these studies will shed further light on the potential of this biocontrol agent.

Commercial Availability of the Weevil

The weevil may be purchased at fairly moderate cost from private collectors, particularly in Montana (contact USU Extension Entomology for further details). You should be aware, however, that some field populations of the weevil are now infected with the pathogen *Nosema*; insist that the weevils be checked for pathogens before they are sent to you. Also be aware that if you decide to obtain weevils for release in Utah from a collector in another state, you are required to receive permission prior to such releases from the State Entomologist at the State of Utah Department of Agriculture (Salt Lake City).

Sources of Additional Information

Evans, T. 1993. Biological control of weeds through use of introduced insects. USU Extension Entomology Fact Sheet No. 87

Rees, N. E. 1990. Establishment, dispersal, and influence of *Ceutorhynchus litura* on Canada thistle (*Cirsium arvense*) in the Gallatin Valley of Montana. *Weed Science*, Vol. 38: 198-200

[Additional information is available in the scientific literature. In particular, see:

Peschken, D.P. and A.T.S. Wilkinson. 1981. Biocontrol of Canada thistle (*Cirsium arvense*): releases and effectiveness of *Ceutorhynchus litura* (Coleoptera: Curculionidae) in Canada. *Canadian Entomologist*, Vol. 113: 777- 785

Zwolfer, H. and P. Harris. 1966. *Ceutorhynchus litura* (F.) (Col. Curculionidae), a potential insect for the biological control of thistle, *Cirsium arvense* (L.) Scop., in Canada. *Canadian Journal of Zoology*, Vol. 44: 23-38]

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