

Larinus minutus Gyll.

INVASIVE SPECIES ATTACKED: Diffuse knapweed (*Centaurea diffusa*)
Spotted knapweed (*C. biebersteinii*)
Meadow knapweed (*C. debauxii*)

OPERATIONAL FIELD GUIDE: *Larinus minutus* – Operational Field Guide, B.C. Ministry of Forests and Range

TYPE OF AGENT: Seed feeding beetle (weevil)

COLLECTABILITY: Mass

ORIGIN: Greece

DESCRIPTION AND LIFE CYCLE

Adult:

Weevils are 5 - 10 mm long, mottled rusty brown, with a line of short yellowish hairs on their wing covers. Their rostrum (nose) is short, bent and blunt. They are strong fliers and readily take flight on hot days. Overwintered adults emerge in late spring before the plants have set bud and feed on foliage, stems and seedlings. Females require sufficient feeding on knapweed to develop mature ovaries. Mating occurs from late morning through mid-afternoon, beginning from the onset of the flowering period (usually four weeks after emergence). Females oviposit into fresh flowers that have just opened. They chew holes in the center of the bud, damaging 3 - 4 florets, and lay a single egg which they cover with a protective secretion. If the flower is large enough to support more larvae, the females will lay up to three eggs in diffuse and five eggs into spotted. An average of 130 eggs is laid over seven weeks, usually depositing seven eggs each day. Their life span is 97 days for males and 58 days for females. Although males appear to have a longer life span, more females are found in the field during knapweed flowering. Some adults will hibernate a second year, but it is not known if they will reproduce the following summer. In part of their native range in Greece, they avoid extreme high mid-day temperatures, seeking shade and moving onto lower plant parts. They browse on plant foliage until hibernation.

Egg:

Eggs are yellow, oval shaped and measure 1.28 x 0.84 mm. They require a minimum 13°C for development. At 32°C they hatch in 1.5 days and at 25°C they will hatch in 2.5 days.

Larva:

Larvae are small, white, slightly yellow, and "C" shaped, with light brown heads. There are three instars that complete development within the flower. Head capsule measurements are used to determine each instar. Newly hatched larvae feed on pappus and thereafter the entire flower head contents. At the early stage, multiple larvae will compete against each other, killing others until a number is achieved that the bud can support. The larvae mature in 17 days.

Pupa:

When occurring in spotted knapweed, they pupate in an upright, hard cocoon, 5 - 8 mm x 8 - 9 mm. In diffuse knapweed the cocoon is lighter weight or absent. Pupation lasts nine days. and new adults emerge by chewing through the pupal case, moving upward and out and leaving behind a dark cavity.

Overwintering stage:

Adults overwinter in cracks and crevices in the soil and in plant litter.



Fig. 1. *L. minutus* adult (credit Powell et al. 1994)



Fig. 2. Seedhead damage by *L. minutus* larva (credit Powell et al. 1994)



Fig. 3. Seedhead damage by *Larinus* spp.

EFFECTIVENESS ON HOST PLANT

Larvae feeding in flowers cause significant decreased seed production. In trials, *L. minutus* is the main seed feeder of the knapweed biocontrol agents and creates the most impact. Adults are reported to be heavy feeders on the early emerging spring seedlings and rosettes, thus adding to the control of knapweed species.

HABITAT AND DISTRIBUTION

Native:

Its native geographical distribution is from Bulgaria, Greece, Israel, Rumania, Caucasus Mountains, Kazakhstan, and southern western parts of the former USSR.

North America:

Typically *Larinus minutus* prefers dryer sites with higher temperatures than those tolerated by *L. obtusus*. It favours dense knapweed stands with little plant competition. It requires well drained, coarse soils; avoiding compacted sites. Open areas with south aspects at elevations between 300 and 800 have proven successful. *Larinus spp.* is the last of the seed feeding biocontrol agents to oviposit in the growing season and competing agents can limit its success.

British Columbia:

L. minutus has been released into the Bunchgrass, Coastal Douglas-fir, Coastal western hemlock, Engelmann spruce-subalpine fir, Interior cedar hemlock, Interior Douglas-fir, Montane spruce, Ponderosa pine, and Sub-boreal spruce biogeoclimatic zones. Establishment at release sites or at dispersal locations has been confirmed in all these zones.

BRITISH COLUMBIA RECORD

Origin:

The *L. minutus* populations released in B.C. originate from Greece.

History:

L. minutus was approved for release in North America in 1990 and in 1991 the first adults were shipped to B.C. The first shipment was divided into several southern interior field releases and the rearing facility in Kamloops. That same year, a second generation was collected from the propagation tent and released near Castlegar. In 1994, field sites began to produce enough adults to become collection sources. Assisted redistribution is still ongoing and may occur in mixed populations with *L. obtusus*. In 1999, *L. minutus* was designated secondary status.

Field results:

From 1994 to 1998, there were 78,766 adults collected from field sites for redistribution. *L. minutus* and/or *L. obtusus* are observed to be widespread in the southern interior knapweed habitats.

Collection for redistribution:

Adults can be seen from June to late July. Sweeping for adults during peak emergence on hot days is rapid and effective. Use heavy sweepnet bags and aspirate clean collections as the adults climb towards the top opening. On hot bright days adults take flight quickly. When females are actively ovipositing, they will cling tenaciously to the plant. Care must be taken not to harm them when sweeping. It is best to collect *L. minutus* before this time (mid-July) so one can be assured the females transported to new sites will still have eggs to establish a new population.

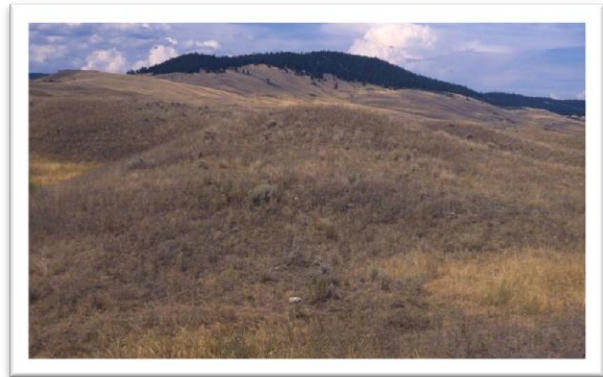


Fig. 4. *L. minutus* release and collection site in the Lac du Bois area of Kamloops on a mixed knapweed stand (bunchgrass zone)

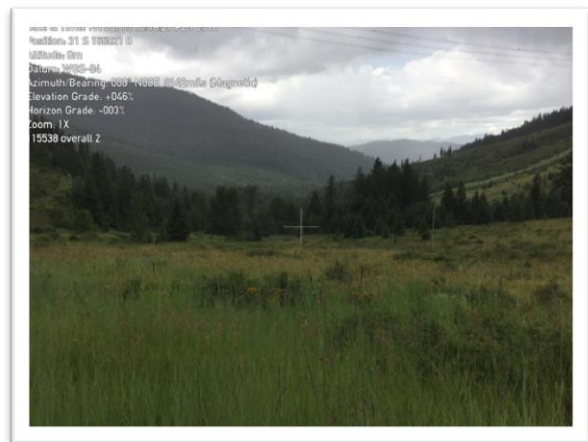


Fig. 5. *Larinus spp.* dispersal area near Christina Lake on diffuse knapweed (Interior cedar hemlock zone)

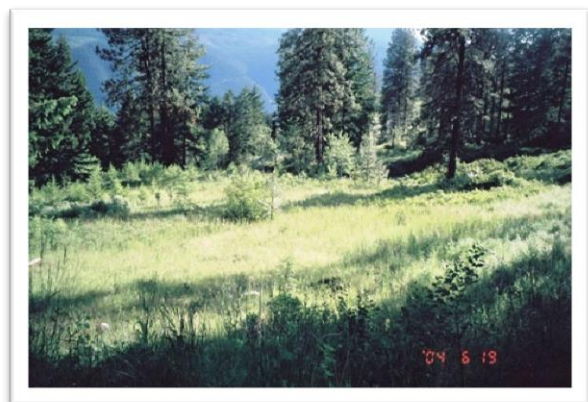


Fig. 6. *L. minutus* dispersal area near Grand Forks on diffuse knapweed (Ponderosa pine zone)

NOTES

- *L. minutus* can co-exist with *Urophora affinis* because the fly attacks the plants earlier and is shielded with a protective gall. *L. minutus* does, however, attempt to avoid using the same buds.
- A variation in adult size can be the result of competition for food during the larval development stage.
- *L. minutus* and *L. obtusus* are difficult to differentiate from each other in the field. The two species may co-exist at many sites in B.C.
- Recent genetic work on the *L. obtusus* and *L. minutus* is showing they may be variants of a single species.



Fig. 7. *L. minutus* dispersal site near Savona on spotted knapweed (Interior Douglas-fir zone)

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