

## *Chaetorellia acrolophi* White & Marq.

**INVASIVE SPECIES ATTACKED:** Diffuse knapweed (*Centaurea diffusa* Lam.)  
Spotted knapweed (*Centaurea biebersteinii* auct.)

**TYPE OF AGENT:** Seedhead feeding fly

**COLLECTABILITY:** Not available for general distribution

**ORIGIN:** Switzerland

### DESCRIPTION AND LIFE CYCLE

#### Adult:

*Chaetorellia acrolophi* adults are 4-5 mm long and have orange-yellow coloured abdomens with overall spotting. Their wings are clear with light brown bands and their eyes are bright green. The flies emerge in early June, coinciding with knapweed bud formation. Mating occurs immediately and oviposition starts within two days. Females lay eggs during their entire life span, depositing an average of 69 eggs each. Eggs are placed individually, or in small groups of 2-4 underneath the bracts of unopened 4-5 mm diameter floral buds. Within a lab environment, adults survive up to four weeks; 17 days in the field. There are two complete generations (eggs to adults) and part of a third generation (eggs to larvae) each year. A rare third generation is possible when ideal habitat conditions are present.

#### Egg:

The 0.9 x 0.2 mm shiny white, elongated eggs have a long filament which is thickened at one end. Eggs incubate for 4-5 days.

#### Larva:

The larvae remain white coloured through the three instars which last 10-15 days. The first instar penetrates the bud horizontally and moves towards the bud centre, feeding on immature florets until it reaches the developing seeds. Second and third instars feed on bud contents. Mature larvae prepare a puparium.

#### Pupa:

Pupae develop in a puparium that is arranged vertically in the seedhead.

#### Overwintering stage:

The third instar larvae overwinter in seedheads and pupate the following spring.

### EFFECTIVENESS ON HOST PLANT

*C. acrolophi* larva feeds on inside floral buds and reduces the plants ability to produce seeds.

### HABITAT AND DISTRIBUTION

#### Native:

The native European distribution is from Spain and the European Alps, east to northern Greece, and north to southwestern (former) USSR. It occurs in the southern regions of Austria, France and Switzerland, the central region of Turkey, the eastern section of Romania and the east and central portions of Hungary. In western Switzerland, *C. acrolophi* densities were greatest on steep, dry, south slopes. In its native environment it does not build up high populations in thick



Fig. 1. *C. acrolophi* adults mating on spotted knapweed



Fig. 2. *C. acrolophi* puparium in spotted knapweed seedhead

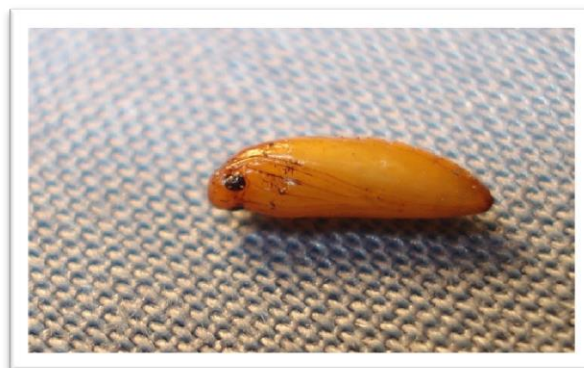


Fig. 3. *C. acrolophi* pupa

stands, showing a desire to be among widely spaced plants with mixed vegetation.

#### North America:

*C. acrolophi* has the ability to seek out isolated sites which are normally avoided by competing bioagents. Initially it was predicted that *C. acrolophi* preferred very dry south-facing slopes; this may not be the case in North America where establishment has been found in moist areas of Mont. and Oreg.

#### British Columbia:

*C. acrolophi* has been released into the Bunchgrass, Coastal western hemlock, Interior cedar-hemlock, Interior Douglas-fir and Sub-boreal spruce biogeoclimatic zones.

Establishment and dispersal has occurred in each of the release zones except the Sub-boreal spruce zone. It has also been found dispersed into the Montane spruce and Ponderosa pine zones. Specific *C. acrolophi* habitat has not been determined, but it appears to be tolerant of variable climates.

### BRITISH COLUMBIA RECORD

#### Origin:

*C. acrolophi* populations in B.C. originated from Swiss Valais, Switzerland.

#### History:

In 1991, a small number of *C. acrolophi* were released in the Lac du Bois grasslands near Kamloops another population was released into a propagation tent at the Kamloops Propagation Facility. Between 1992 and 1995, one more tent release and several more field releases were made as additional agents were shipped to B.C. The field releases occurred in the southern half of B.C. near Kamloops, Savona, Walachin, Broadwater, and Nelson. The flies were slow to establish and remained undetected until 2008. The first field collections began in 2011. Recent releases have occurred in different geographic areas and habitat than in the 1990's.

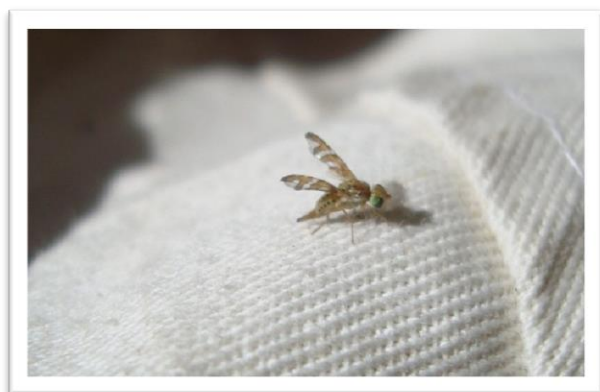


Fig. 6. *C. acrolophi* adult on sweepnet bag

presumed that *C. acrolophi* may become more evident. Establishment was found at one site soon after its release in the 1990's, however, subsequent monitoring did not reveal establishment until 2008. In 2011, *C. acrolophi* was found for the first time on diffuse knapweed. Seedhead sampling in May determined that *C. acrolophi* has established at several release and dispersal sites in the southern interior. In 2016 and 2017, temporal monitoring for adults was carried out near Kamloops and the resulting data indicated the adults were already emerging by mid-May and continued through to mid-August with the greatest number of adults found in the last week of July. The current focus is on determining the optimal time of year to collect for further redistribution into new geographic areas in B.C.



Fig. 4. Established *C. acrolophi* release site near Savona (Interior Douglas-fir zone)



Fig. 5. Established *C. acrolophi* release site near Yale (Coastal western hemlock zone)

#### Propagation results:

In 1991, 69 adult flies were released into rearing plots at the Kamloops Propagation Facility. Subsequent seedhead sampling showed *C. acrolophi* established and had an attack rate of 2%. Scientists speculated the plants lacked fertilization (pollination) and it was recommended future releases be made in the field where most knapweed heads are openly pollinated and where *C. acrolophi* had more opportunity to select heads with lower *Urophora* spp. present. However, in 1995 another 250 adults were released as an attempt to establish a tented population. The tented population failed to establish sufficient numbers for collection and in 2001 the tent was dismantled.

#### Field results:

*C. acrolophi* was originally released into relatively thick patches of knapweed; it is believed that the agent may have dispersed, seeking its preferred widely spaced infestations. As knapweed infestations continue to reduce in vigour and density, it is

## NOTES

- *C. acrolophi* may also attack purple starthistle (*C. calcitrapa*) and squarrose knapweed (*C. virgata* spp).
- When *U. affinis* is in high densities, *C. acrolophi* is a weak competitor.

## REFERENCES

1. Harris, P. 1989. Feeding strategy, coexistence and impact of insects in spotted knapweed capitula. In: Biological control of weeds. Proc. VII Int. Symp. Mar. 6-11, 1988, Rome, Italy, pp. 39-47.
2. Powell, G.W., A. Sturko, B.M. Wikeem and P. Harris. 1994. Field guide to the biological control of weeds in British Columbia. Min. For. Res. Program.
3. Turner, C.E., J.M. Story, S.S. Rosenthal and N.E. Rees. 1996. *Chaetorellia acrolophi*. Sect. II, The Knapweeds. In: Biological control of weeds in the west. N.E. Rees, P.C. Quimbly Jr., G.L.Piper, E.M. Coombs, C.E. Turner, N.R. Spencer, and L.V. Knutson, (editors). Western Soc. Weed Sci.
4. Wilson, L.M. and C. Bell Randall. 2003. Biology and biological control of knapweed. Forest Health Technology Enterprise Team.