Cochylis atricapitana (Stephens)

INVASIVE SPECIES ATTACKED: Tansy ragwort (*Senecio jacobaeae* L., *Jacobaeae vulgaris* Gaertn.)

Operational Field Guide: Tansy ragwort (*Cochylis atricapitana*) – Operational Field Guide to the Establishment of Tansy Ragwort Biocontrol Agents in British Columbia, Ministry of Forests and Range.

TYPE OF AGENT: Root crown feeding moth **COLLECTABILITY:** Limited

ORIGIN: Spain

DESCRIPTION AND LIFE CYCLE

Adult:

Cochylis atricapitana adults are fragile, 3 mm long moths with a wingspan of 7 mm[10]. However, another source describes the wingspan to be 12-16 mm. Their forewings are whitish to tan with a light pink hue in the white which is more pronounced in the females[3]. The forewings also have irregular brown, black and gray marks described as a band of 1mm wide brownish blotch that runs diagonally across the middle and end of the forewings[5]. The hind wings of the male moths are white with gray lines while the females' are dark gray. A dark tuft of scales (0.3 mm long) projects upward from behind the head[5, 3].

Fig. 1. *C. atricapitana* adult (Powell et al. 1994)

The adult moths emerge from pupation in spring (May-June) or summer (July to August) as they are capable of multiple generations each year[11]. The sex ratio of males to females is 1:1[5]. Females will oviposit an average of 158 eggs each but will oviposit as many as 355[8] singularly or sometimes in pairs typically along the secondary and tertiary veins on the underside of leaves[5]. Second generation (autumn) eggs are laid on rosette leaves. During the day, adults are inactive, remaining close to the ground near or on the plants, taking flight near dusk and becoming active during the night[11]. On rare occasions they have been found on rosettes in August. Nocturnal adults may be drawn to a black light. Larvae will exit a dying/drying up root and transfer to a new plant root (P. Harris pers. comm. August 2001).

Egg:

The oval, flat eggs measure 0.5 x 0.3 mm, are translucent white and gradually change to yellow. Developing larvae can

be observed through the egg surface[5]. Incubation at 24°C will cause the larvae to hatch after five days. Larvae develop through five instars which take approximately 33 days depending on the temperatures. First generation larvae (summer) mine under the epidermis of the leaves then into leaf-veins, petioles and the stems where they may move upwards into the flowers[11].

Fig. 2. *C. atricapitana* larva

Larva:

New larvae are creamy white with a black head and the body darkens with age[5, 3]. Development and pupation may take place in the stem [5]. Alternatively, these older larvae may leave the stem and climb externally up the plant to mine the developing shoots or flower buds. Here the spring larvae complete development and pupate. Second generation larvae mine the rosette leaves downward to the root crown, feeding and developing until hibernation. If the autumn generation overwinters as the fourth instar, feeding resumes the following spring when they feed on the root crowns or when they make their way upward into the lower central shoot area to pupate. If they overwinter as the fifth instar, they move into the soil and pupate the following spring[11].

Pupa:

Pupae are light brown, measure 7 x 1.5-2.0 mm and are enclosed in a creamy white silken cocoon that changes to pink [5,3]. As the new adults exit, they discard their pupal case at the exit point, which may be from the root crown, stem, bud or soil[5]. This process takes 40 days for completion[6].

Overwintering stage:

They can overwinter as fourth instar larvae or full grown fifth instar[11].

EFFECTIVENESS ON HOST PLANT

Adults do not feed on the plants. Larvae attack full-grown plants and rosettes during separate generations. High density attack of *C. atricapitana* can have significant impact on its host plant[11]. The first generation larvae feed on leaves, stems and flowers. The second generation larvae feed on the lower stems and root crown, but rarely on the roots[3]. Larvae feeding on the various plant parts has different effects on tansy ragwort: feeding down the leaf vein can cause the leaf to die which interferes with floral development; feeding and development in young stems causes them to thicken and suppresses flowering while feeding on older stems can kill them; feeding on flower buds can prevent flowering and decrease seed produced; feeding on rosette root crowns causes them to stop growing or die and creates blackening or browning at the rosette center; and, feeding on bolted root crowns and in stems cause stems to brown and die and plants may produce stunted bolts[4, 5, 3] (P. Harris, pers. comm. June 1994; S. Cesselli, pers. comm. Oct. 2012).

Fig. 3. *C. atricapitana* larva and feeding damage

However, if the plants have enough reserves, they can produce root buds in response to attack[1]. Plants that regenerate produce less foliage and no flowers while big rosettes that have sustained repeated attack in the autumn frequently perish the following spring when under attack again[11]. Measurements in Australia showed *C. atricapitana* stunted growth, reduced ragwort heights, killed rosettes and reduced the diameter of live rosette tissues[9]. Tansy ragwort plants may continue to survive but remain as a rosette for several years if they are damaged, nutritionally impoverished or subjected to strong competition, but secondary attack by fungi, bacteria and some insects accessing the plant following attack by *C. atricapitana* can also lead to plant death[12, 5].

First generation larvae (summer) mine under the epidermis of the leaves then into leaf-veins, petioles and the stems where they may move upwards into the flowers[11]. Feeding in the stem causes it to swell and an obvious hole and yellowish-brown cocoon is left behind when the moth exits [7].

HABITAT AND DISTRIBUTION

Native:

Native distribution includes North Africa, western and central Europe, England, Sweden, Poland, the former Czechoslovakia and south Russia. In southeast Europe it is most common in west-coast locations when tansy ragwort is abundant[3].

North America:

C. atricapitana is adapted to a wide variety of habitats where tansy ragwort grows, including high elevations. It is recommended for areas with early winters, where the season may be too short for other controlling agents such as *Longitarsus* spp. The moth is reported as able to adapt to all habitats supporting tansy ragwort[10].

British Columbia:

C. atricapitana has been released into the Coastal Douglas-fir, Coastal western hemlock and Interior Douglas-fir biogeoclimatic zones. Establishment and dispersal is restricted to the Coastal Douglas-fir and Coastal western hemlock zones. No establishment has been found outside the coastal habitats.

Fig. 5. Established *C. atricapitana* release site in Abbotsford (Coastal Douglas-fir zone)

BRITISH COLUMBIA RECORD

Origin:

The *C. atricapitana* released in B.C. originate from Spanish populations obtained from Australia[13].

History:

C. atricapitana was first released in the Fraser Valley and near Nanaimo in 1991. Release efforts continued throughout the Coastal Forest Region until 1996. In 1994, 70 larvae infested plants were transplanted into a tansy ragwort infestation in the Okanagan. The moth easily established in the coastal climate, but did not establish in the southern interior. In 2008, a second attempt was made by transferring 59 larvae infested roots into the Okanagan.

Field results:

In the lower mainland, larvae and adults can both be found in early August. No establishment of *C. atricapitana* has occurred at southern interior locations. The adults do not feed on the plants and are extremely small and difficult to locate therefore monitoring larvae is preferred over sweeping or observing adults. Dispersal sampling in the Fraser Valley has shown it to disperse up to seven and a half kilometers from the nearest release. General established release and dispersal areas include Abbotsford, Chilliwack, Nanaimo, Cedar, and Mudge and Salt Spring Islands.

Fig. 6. Established *C. atricapitana* release site near Cedar on Vancouver Island (Coastal western hemlock zone)

Collection for redistribution:

C. atricapitana are collected for redistribution as larvae inside infested plants. According to historic B.C. records, late autumn collections appear to be less successful to collect and transplant larvae infested plants than spring. If plants are plentiful, it is useful to dissect a few to ensure the plants are infested and to determine the average quantity of larvae being collected to transfer to a new location. However, root crown feeding larvae in their early instars may easily be confused with *L. jacobaeae* root feeding larvae (Harris pers. comm. June 1994). If the collection site also has *L. jacobaeae* present, collecting plants with first generation *C. atricapitana* larvae in the spring and early summer may be best so as to not disturb the *L. jacobaeae* which do not begin ovipositing until early fall. Collection of adult *C. atricapitana* would be best (P. Harris pers. comm. August 2001), but has not been performed to date in B.C. due to the difficulty of locating significant quantities of the moth in the dark, although they can be attracted with a black light. *C. atricapitana* is also easily bred in a greenhouse[2].

A minimum of 50-100 larvae[3] or 50 infested plants should be transplanted for a release of *C. atricapitana*[6]. At sites where *T. jacobaeae* are present in large numbers, their aggressive feeding of the flower buds, leaves and upper stems may negatively impact the flower and stem generation of *C. atricapitana* larvae[9].

NOTES

- Releasing two or more biocontrol agents that attack tansy ragwort plants via different modes and during varying times of the year, can increase their efficacy than if released alone[9].
- *C. atricapitana* can exist with *L. jacobaeae* on the same plants because they feed in different parts of the root[3].

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