

Cheilosia urbana (Meigen)

INVASIVE SPECIES ATTACKED: Orange hawkweed (*Pilosella aurantiaca*), Meadow hawkweed (*P. caespitosa*), King devil hawkweed (*P. floribunda*), queen devil hawkweed (*P. glomerata*), mouse-ear hawkweed (*P. officinarum*), and tall hawkweed (*P. piloselloides*)

Previously known as: *Cheilosia praecox* (Zetterstedt)

TYPE OF AGENT: Root feeding hover fly

COLLECTABILITY: Not available for general distribution

ORIGIN: Switzerland and Southern Germany

DESCRIPTION AND LIFE CYCLE

Adult:

Cheilosia urbana adults are dark coloured flies that closely resemble other *Cheilosia* species found on European hawkweeds and are reminiscent in appearance of a small common house fly⁴ DeClerck-Floate pers. comm., May 2018). Minute differences found on the foot claw, the femur, and the third antennae segment distinguish *C. urbana* from its closely related European species: the base of the claw is yellow-brown coloured with black tips; about one third or more of the third femur has a wide yellow marking; and, the third antennae segment is oval shaped with a somewhat wide and rounded top (apex). *C. urbana* produces one generation per year. In lab experiments at 20°C, the lifespan of males was about nine days while the lifespan of females was about 13 days, whereas under semi-natural conditions, females lived an average 27 days⁴. In Europe, field studies found adults begin to emerge, males first then females, in early spring soon after the arrival of only a few sunny days as the temperatures begin to warm, noting the females appeared to be more active in the afternoon⁴ (G. Cortat pers. comm., Oct. 2017). Newly emerged females must feed for about five days for their eggs to mature. In Europe, gravid females are found in April until the end of May. When the female is ready to oviposit, she flies to rosettes and will walk over the leaves with her ovipositor extended as she investigates its suitability. When she finds a suitable rosette, she then turns and backs into position and oviposits a single egg near the stem of the host plant. In the lab, an average of 74 eggs were laid per female with a maximum of 184 eggs. During the screening tests carried out from 1997 to 1999, observations indicated 96.8% to 100% of all females produced and laid eggs⁴.



Fig. 1. *C. urbana* adult

Egg:

C. urbana eggs are oval and elongated in shape and are 0.86 mm long by 0.32 mm wide. With magnification, the eggs appear to have a net-like structure over their surface. Eggs are white-coloured when first laid and those that are fertile turn gray, allowing one to identify non-viable eggs. At 12°C, the eggs hatch in about 10 days, however, at 20°C the eggs will hatch in half that time⁴.

Larva:

C. urbana has three larval instars. The larva has long hair-like structures called "setae" that can be observed with magnification. Newly hatched first instar larva move into the soil and begin to feed on the outside of the host plant roots. The larva can move freely through the soil to seek out roots to feed on⁴. During screening tests, the best larvae survival rates occurred when five or 10 larvae were transferred onto the host plant. However, when fewer larvae occurred on a plant, each were heavier³. Larvae favour mature plants with healthy roots (R. DeClerck-Floate pers. comm. Mar. 2017).



Fig. 2. *C. urbana* adult

Pupa:

In late September, mature third instar larva prepare to pupate in the soil. As in the larva stage, the pupa also has the long hair-like structures called "setae".

Overwintering stage:

C. urbana pupa overwinter just below the soil surface⁴.

EFFECTIVENESS ON HOST PLANT

C. urbana larva feeding on the roots' outer layers creates cavities which subsequently allow for secondary attack from other pathogens. In open field plots in Switzerland, larva transfers were carried out on meadow hawkweed to test the potential efficacy of *C. urbana*. The study results showed that 92% of all plants in the control plots developed floral heads while only 17% of the plants infested with 12 *C. urbana* larvae produced stems. During this study, meadow hawkweed plants that began with longer and wider leaves were more able to bolt than the plants with shorter leaves. Data containing the comparison between plants infested with the 12 *C. urbana* larvae versus control plants showed:

- 89% fewer flower heads containing viable seed;
- 81% fewer stolons; and,
- Reduced plant aerial biomass by 51%⁴.

HABITAT AND DISTRIBUTION

Native:

C. urbana is considered common and widespread in Europe within the distribution of the native *Pilosella* species. The European distribution of *C. urbana* occurs from southern Sweden and Finland south to Spain and Italy and east to Northern Asia. *C. urbana* is also noted to occur in alpine habitats⁴. The flies prefer protected sites such as that afforded by forest openings (R. De Clerck-Floate pers. comm., Mar. 2017).

North America:

It is believed *C. urbana*'s preferred habitat in Europe is similar to where the target plants occur in the north-western and north-eastern parts of the U.S.A. and the south-western and south-eastern parts of Canada⁴. During the screening process in Switzerland, late frosts and cool temperatures affected and delayed the adult emergence period in the spring².

The first North American *C. urbana* release was made in the fall of 2017 in B.C, Canada.

British Columbia:

In B.C., the predicted preferred sites would include small forest openings that provide some protection from prevailing wind.

C. urbana has been released at one site in the Interior cedar hemlock biogeoclimatic zone at an elevation of 507 m.



Fig. 3. *Chelisia urbana* release site near Revelstoke in the Interior cedar hemlock zone

BRITISH COLUMBIA RECORD

Origin:

C. urbana was approved for release in Canada and the U.S.A. in the spring of 2016¹. The *C. urbana* population released at Revelstoke, B.C. originates from the southern Black Forest in Southern Germany (R. De Clerck-Floate pers. comm., Mar. 2017). The original stock arrived in the spring of 2017 at the Agriculture and Agri-Food Canada quarantine facility in Lethbridge, Alta. The shipment included 24 adults from field collections and 500 eggs from these females². Once in Lethbridge, the eggs were transferred to potted orange hawkweed plants and kept in a controlled environment to encourage continued development.

History:

In October 2017, six clay pots with well-established orange hawkweed plants and potentially infested with 47 *C. urbana* developing pupae were transplanted into a small, but high-density patch of orange hawkweed within a stand of mixed hawkweed on a site near Revelstoke, B.C. The following spring, a small fly was observed on the underside of an orange hawkweed leaf before it flew to an adjacent plant and walked along the leaf margin and leaf surface. There was speculation it may be a *C. urbana* adult that had emerged from the potted plant release, but positive identification could not be confirmed. In early May 2018, 150 eggs were transferred onto both orange and meadow hawkweeds at the same site. A few weeks later in June, five adult flies were added to the site. Over the next several years, additional populations reared in quarantine at Lethbridge will be released in B.C. at varying locations as they become available.

Field results:

The initial *C. urbana* release was made near Revelstoke within a forest opening where a mixed stand of king, meadow, orange, queen and whiplash hawkweeds occur. Whiplash is the dominant species, followed by queen, king, orange, and meadow hawkweed. In addition, tall hawkweed is also present, however, its density has not been verified. Currently, it is too early to determine the establishment of *C. urbana* or its preferred habitat.

NOTES

- Screening for potential hawkweed biocontrol agents in Switzerland began in 1993 for New Zealand⁵.
- *C. urbana* is one of five *Cheilosia* species screened and released in New Zealand on mouse-ear hawkweed.
- Since its introduction to New Zealand in 2002, *C. urbana* releases have been made at 13 sites, with five to 78 adults each, but no populations have been found to survive.
- Voucher specimens of the *C. urbana* populations used in the screening project are retained at the following locations:
 - Collections of Christian F. Kassebeer;
 - New Zealand Arthropod Collection; and,
 - CABI, Delemont, Switzerland.
- Voucher specimens of the *C. urbana* populations released in North America were later provided to and housed in the national collections in the U.S.A., Canada and Mexico.
- The specimens used to test the host range of *C. urbana* were identified by C. F. Kassenbeer (formerly University of Kiel)⁴.

REFERENCES

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