EPPO Datasheet: *Epitrix subcrinita*

Last updated: 2020-11-13

IDENTITY

Preferred name: *Epitrix subcrinita*
Authority: (Leconte)
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Coleoptera: Chrysomelidae
Other scientific names: *Epitrix subcarinata* Crotch
Common names: western potato flea beetle
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EPPO Categorization: A1 list
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EU Categorization: Emergency measures
EPPO Code: EPIXSU



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Notes on taxonomy and nomenclature

The flea beetle genus *Epitrix* is made up of 162 described species worldwide, the majority of which originate from the Neotropics. The Palearctic species of *Epitrix* were revised by Döberl (2000) and a key to Holarctic species is provided in Bienkowski & Orlova-Bienkowskaja (2017). Due to their small size, high diversity, and difficult to distinguish morphological characters, identification of *Epitrix* species including *E. subcrinita* can be difficult for non-experts and misidentifications may be present in published research.

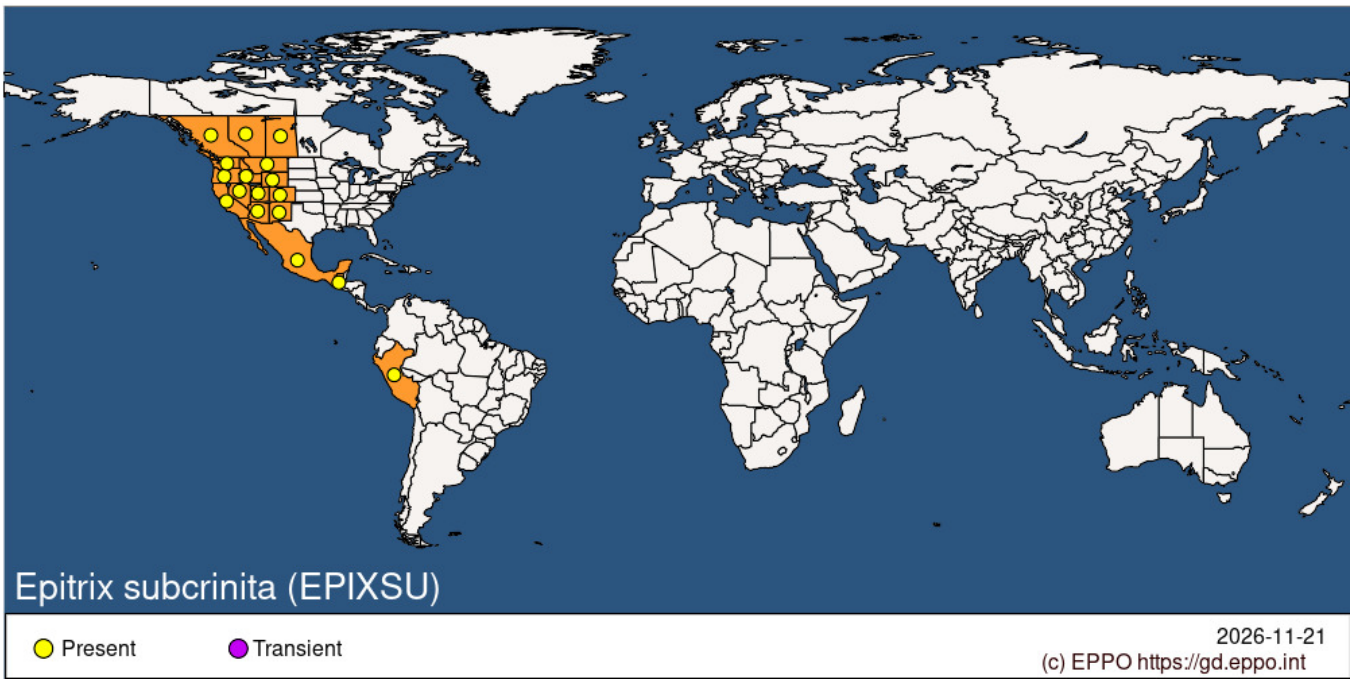
HOSTS

As with most *Epitrix*, *Epitrix subcrinita* are primarily specialists on Solanaceae. Adults feed above ground on leaves while larvae feed on roots. Due to the subterranean habitat of the larvae most host records are based on adults feeding on foliage. Many of these records may be incidental as adult flea beetles are known to opportunistically feed on plants that they are not able to complete their lifecycle on (Clark *et al.*, 2004). Under laboratory conditions Landis (1948) reported rearing *E. subcrinita* to adulthood on *Capsicum frutescens*, *Solanum dulcamara*, *Solanum villosum*, *Solanum tuberosum*, and a single larva was successfully reared on the non-solanaceous plant *Cucurbita pepo*.

Host list: *Capsicum frutescens, Datura innoxia, Hyoscyamus niger, Leucophysalis nana, Lycium, Nicandra physalodes, Nicotiana alata, Nicotiana attenuata, Physalis alkekengi var. franchetii, Physalis lobata, Physalis longifolia, Physalis pubescens, Solanum carolinense, Solanum dulcamara, Solanum lycopersicum, Solanum melongena, Solanum nigrum, Solanum rostratum, Solanum triflorum, Solanum tuberosum, Solanum umbelliferum, Solanum villosum*

GEOGRAPHICAL DISTRIBUTION

E. subcrinita occurs throughout western North America including Canada, the United States, and Mexico. It is also reported from Guatemala and Peru, but due to the high diversity of species in the neotropics and the lack of any formal revisions these records should be treated with some caution until more taxonomic research is conducted. There are currently no known introduced populations of *E. subcrinita*.



North America: Canada (Alberta, British Columbia, Saskatchewan), Mexico, United States of America (Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming)
Central America and Caribbean: Guatemala
South America: Peru

BIOLOGY

Due to the lesser agricultural impact of *E. subcrinita* compared to *E. tuberis* in North America its biology and control methods have not been as well studied, particularly in recent years. The distribution and seasonality of the two species in Washington state were studied in Webster (1932), seasonality of adults and tuber damage in British Columbia were studied by MacCarthy (1953), overwintering patterns were studied by Davis and Landis (1947), host rearing tests were performed by Landis (1948), and the life history of beetles from western Washington State were studied by Jones (1944).

Adult *E. subcrinita* feed on leaves and produce ‘shot-hole’ symptoms while the larvae feed on roots and tubers. The Jones (1944) study is the most complete study of the biology of *E. subcrinita*. Under laboratory conditions the full life cycle of *E. subcrinita* was found to take an average of 49.2 days at approximately 21° C. In western Washington state they have two broods in July and September with the highest population in September. The beetles disperse by flying low to the ground on calm days mostly after noon.

E. subcrinita overwinters as adults, primarily in vegetative litter (Davis and Landis, 1947).

DETECTION AND IDENTIFICATION

Symptoms

Both larvae and adults have chewing mouthparts. The adults riddle the leaves with small circular holes (1.0-1.5 mm diameter) that produce the characteristic ‘shot-hole’ symptom in the potato foliage, which is common to all *Epitrix* species. The adult insects can be detected on the foliage and jump promptly when approached. On windy days, they are less active.

Tuber damage by *E. subcrinita* is generally regarded as lesser than that of *E. tuberis* based on some studies (e.g. Jones, 1944), but other research has found that they are capable of creating damage comparable to that of *E. tuberis* as described by Hoerner & Gillette (1928) (MacCarthy, 1950). Different types of tuber injury can be produced by the

larval feeding. The larva may tunnel underneath the skin, producing winding superficial trails ('worm-tracks') or may feed outside, penetrating only partially into the potato, almost at a right angle to the surface (Hoerner & Gillette, 1928), originating a pit which mostly penetrates up to 3 mm but may reach 6 mm, and later becomes filled with dark corky material, described as 'slivers' (Gentner, 1944; Wallis, 1953; Morrison *et al*., 1967). 'Slivers' may show on the tuber's surface as a black point, or a raised rugose elevation in the skin ('pimples'). The 'worm-track' type of injury is the most easily recognizable. Rough skin, deep cracks and scab-like lesions are sometimes associated with the larval attack.

Morphology

The genus *Epitrix* is a group of small flea beetles with uniform appearance which can be recognized by the presence of characteristic rows of setae on the elytra (Deczynski, 2016). The morphological identification to species is made by specialists, on the basis of the habitus and genitalia of the adult insects. The identification keys and illustrations presented in EPPO Standard PM 7/109 (2) (EPPO, 2017) allow *E. subcrinita* to be distinguished from the related potato species *E. cucumeris*, *E. papa* and *E. tuberis*. Out of these species *E. subcrinita* is distinctive due to its brown, brassy color.

The immature stages of *E. subcrinita* have not been formally described, but are similar in appearance to other *Epitrix* larvae such as *E. cucumeris* and *E. tuberis*.

Eggs

The eggs are whitish, spherical and minute.

Larva

The larvae are whitish with a brown head, slender, cylindrical, and about 5 mm long.

Pupa

The pupa is white and approximately 2.5 mm long.

Adult

The adults are small brassy dark brown beetles with rows of short white hairs across the elytra, 1.76-2.27 mm long, with testaceous antennae. The hind femurs are enlarged, adapted to jumping.

Detection and inspection methods

Detection is made by visual inspection of the foliage of potato or other host plants, looking for shot-hole symptoms and adult flea beetles. On potato, the tubers are inspected visually for symptoms of larval injury (EFSA, 2019). The 'worm-track' type of injury is the most easily recognizable. The 'slivers' are best detected if the potato tubers are peeled with a knife.

The identification of the species requires the collection of insect specimens for analysis. Adult specimens may be collected with a sweep-net or with a mouth aspirator. The larvae are very difficult to detect and collect because of their small size and translucent color, and also because of their feeding behavior. When present at potato harvest, the larvae may be hidden inside the 'worm tracks', or may expose the terminal part of the abdomen protruding outside the tuber, while feeding.

The identification of all *E. subcrinita* stages can be made reliably by non-specialists, using molecular methods (DNA barcoding on cytochrome c oxidase subunit I (COI) gene) (EPPO, 2016a; Germain *et al.*, 2013; Mouttet *et al.*, 2016). The reference sequences of these species are available in EPPO-Q-bank and BOLD databases.

PATHWAYS FOR MOVEMENT

Adult *E. subcrinita* can fly, and this is one of the main means for local dispersal of the species (Jones, 1944). Additionally, some hosts of *E. subcrinita* can be common weeds in disturbed areas such as *Solanum nigrum* and *S. dulcamara*. Populations on these hosts can serve as reservoirs to infest agricultural areas, and due to the close proximity of these weeds to human dwellings their spread may be aided by human transport and corridors of host plants such as roadside weeds.

The main pathway for long distance spread is through the commercial transport of potato tubers (seed or ware potatoes), when associated with soil and plant debris (EPPO, 2016b; 2017).

When potatoes are harvested in an infested field, adults, pupae and larvae of *E. subcrinita* may be present in the stubble, soil, and tubers. Adult beetles may be carried passively on the surface of potatoes, or with the soil adhering to potato tubers. This possibility would be higher in exports of seed potatoes, because potatoes are not washed.

The soil of host plants for planting could also contain and spread immature stages of the pest (EPPO, 2011).

PEST SIGNIFICANCE

Economic impact

The amount of damage caused by *E. subcrinita* to potato tubers has been debated due to conflicting results. The tuber flea beetle *E. tuberis* which often co-occurs with *E. subcrinita* is known to make tunnels in the tubers which can reduce the value of the crops. Some research has indicated that this damage is associated with *E. tuberis* and weak or absent when only *E. subcrinita* is present (Webster 1932, Jones 1944, Fulton & Branham 1960). However, under laboratory conditions MacCarthy (1960) found that *E. subcrinita* produced tuber damage comparable to that of *E. tuberis*.

The reduction of the leaf area by adult feeding should have a minor impact on yield losses, because it is compensated by the fast growth of the potato plants, as demonstrated experimentally by Senanayake *et al.* (1993) for *E. cucumeris*. However, young plants grown after the emergence of the beetles can be killed by high populations with significant feeding (Webster & Baker, 1929).

Control

Contemporary methods of control for *E. subcrinita* have not been studied due to its minor status as a pest in North America compared to the more destructive *E. tuberis*. Methods of control used for *E. tuberis* and other *Epitrix* species, such as IPM strategies combining cultural measures for reducing the population of overwintered adults with insecticide treatments, may work for *E. subcrinita* as well. *E. subcrinita* tend to overwinter in vegetative litter while *E. tuberis* mainly overwinters in the soil, so destruction of litter may also help to reduce winter survival (Davis and Landis, 1947).

Phytosanitary risk

The present distribution of *E. subcrinita* in North America indicates that the species would find suitable climatic conditions in the EPPO region.

It is difficult to predict the potential economic impact of *E. subcrinita* due to the uncertainty of how much tuber damage they will cause in the field. If their damage is minimal then their impact would be comparable to that of *Epitrix cucumeris*, but if they exhibit tuber tunnelling behaviours then their impacts would be closer to *E. tuberis*. Since there are no known introduced populations of *E. subcrinita* it is uncertain how they would behave in a novel environment.

One could expect *E. subcrinita* to develop one or two generations per year in many of the potato-growing areas of Central and Northern Europe (EPPO, 2011), and possibly also in southern regions. While *E. subcrinita* could be controlled chemically, its presence could lead to a generalized use of insecticides on potato, rather than the occasionally targeted use against *Leptinotarsa decemlineata*, as at present in most EPPO countries. The problem

would arise even more acutely in countries where *L. decemlineata* has not been introduced (EPPO, 2011). Furthermore, the control of *E. subcrinita* would be critical in several EPPO countries, namely in a majority of the EU countries where insecticides used in North America are no longer authorized.

PHYTOSANITARY MEASURES

The import of seed potatoes from third countries is prohibited in several EPPO member countries, namely in the EU (EU, 2016), but sometimes authorized under derogation procedures, e.g. from Canada into the EU (EU, 2003).

Following the accidental introduction of the species *E. papa* and *E. cucumeris* in Portugal and Spain, *E. subcrinita* is subject, together with *E. cucumeris*, *E. papa*, and *E. tuberis*, to measures by several EPPO member countries to prevent their introduction and spread within the EPPO region.

Specific requirements related to *E. cucumeris, E. papa, E. subcrinita* and *E. tuberis* are recommended for seed potatoes (except micropropagative material and minitubers) and ware potatoes to be imported from third countries. According to EPPO Standard PM 8/1 (EPPO, 2017) seed potatoes should be washed or brushed so that they are free from plant debris with no more than 0.1% w/w of soil remaining; and where appropriate subject to transitional arrangements (pest-free area for *E. subcrinita* and origin from a pest-free potato production and distribution system for the pest, according to EPPO Standard PM 3/61 (EPPO, 2019)). Ware potatoes should either (a) originate from a pest-free area for *E. subcrinita* and *E. tuberis* according to EPPO Standard PM 3/61 (EPPO, 2019) or (b) measures as described in EPPO Standard PM 9/22 (EPPO, 2016b) for *E. subcrinita* should be implemented to ensure that there is no risk of spreading this pest, or (c) there should be absence of plant debris with no more than 0.1% w/w of remaining soil.

Additional requirements are recommended for soil or growing medium attached to rooted host plants from countries where *E. subcrinita* occurs (removal of soil and growing media, or production in a pest free area, or in a pest-free place under protected conditions, or production under screened greenhouse conditions with appropriate monitoring in the framework of a bilateral agreement) (EPPO, 2011).

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ACKNOWLEDGEMENTS

This datasheet was prepared in 2020 by Anthony Deczynski. His valuable contribution is gratefully acknowledged.

How to cite this datasheet?

EPPO (2026) *Epitrix subcrinita*. EPPO datasheets on pests recommended for regulation. Available online. https://gd.eppo.int

Datasheet history

This datasheet was first published online in 2020. It is maintained in an electronic format in the EPPO Global Database. The sections on 'Identity', ‘Hosts’, and 'Geographical distribution' are automatically updated from the database. For other sections, the date of last revision is indicated on the right.



Co-funded by the European Union