

In view of the intensity of surveys in southwestern British Columbia, the absence of records of these weevils in this region is noteworthy. However, it would be premature to conclude that neither species occurs in this area, until there have been extensive surveys for root damage; most records of *H. warreni* in the Okanagan - West Kootenay region are for reared specimens, and there are no perching records in some localities where there is a high incidence of root damage. An analysis of 11 years' Survey collections showed that the frequency of perching records was almost three times as great in the Prince George

Forest District and Yukon Territory as in the Kamloops and Nelson Forest districts of southern British Columbia. While this may merely reflect a higher population level in the northern areas, the scarcity of adults in collections from some southern localities where root damage is common suggests that a difference in the behaviour of the insects may be responsible for the disparity. Climatic factors in the northern regions, such as lower daytime temperatures or short summer nights may be more conducive to diurnal activity than are conditions prevailing in southern British Columbia.

#### References

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## ANNOTATED LIST OF FOREST INSECTS OF BRITISH COLUMBIA PART XIII. BREPHINAE, GEOMETRINAE, STERRHINAE AND LARENTIINAE (GEOMETRIDAE)

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Members of the subfamilies Brephinae, Geometrinae, Sterrhinae and Laurentiinae are not regarded as economically important forest insects in British Columbia. Only three species are known to have reached epidemic proportions: *Epirrita autumnata omissa* Harr. in 1954 on apline fir in the central Interior; *Rheumaptera* sp. in 1962 on western white birch in the Skeena River Valley; and *Operophtera bruceata* Hlst. in 1958 and 1959 on trembling aspen and willow in north-eastern British Columbia: all were of short duration.

Larvae of Brephinae differ from those of the other three sub-families in having four pairs of abdominal

prolegs regularly graduated in size. The larvae of Geometrinae, Sterrhinae, and Laurentiinae have only one pair of abdominal prolegs. The body may be short and stout or twig-like with lobed sides, prominences and enlarged tubercles; or slim and tapered with a sharply bilobed head. The larvae range from green, buff, brown, grey, or black. They are solitary defoliators of conifers and broadleaved trees and shrubs. The number of collections per host is shown in brackets only when fewer than five. Pupation may occur in the litter on the forest floor or in silken cocoons in the foliage or bark crevices of trees or shrubs.

#### BREPHINAE

**Brephos infans oregonensis** Swett—*Alnus* spp., *Betula papyrifera* Marsh (2 records). Distributed throughout southern British Columbia including

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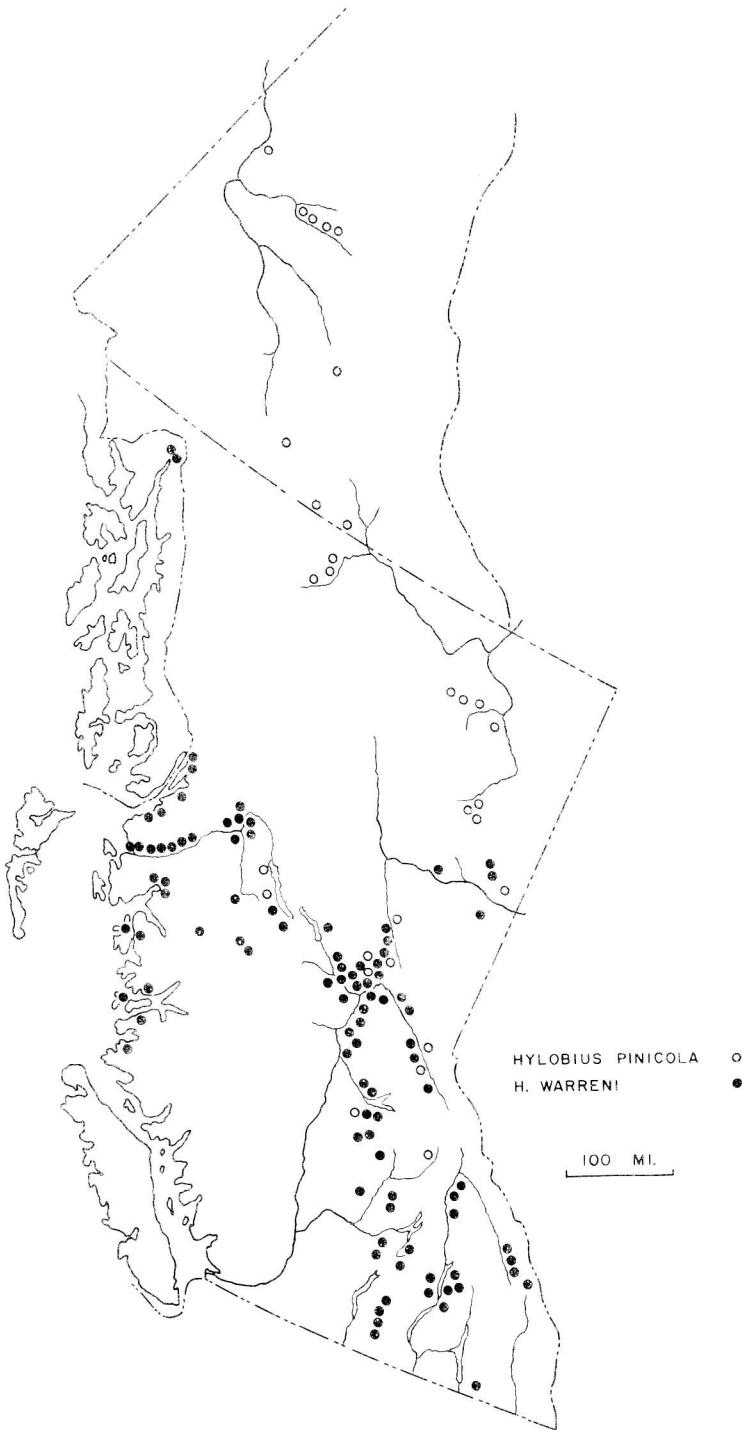


Fig. 1.—Location of points where *Hylobius pinicola* and *H. warreni* have been collected in British Columbia and the Yukon Territory.

Vancouver Island; rare on forest trees.

**LARVA:**  $1\frac{3}{8}$  inches; head immaculate light green; ocelli black; body bright green; indistinct, pale yellowish-white dorsal, addorsal and subdorsal lines; spiracles, medium buff outlined with black; broad yellowish-white subspiracular stripe; four pairs of abdominal prolegs, very small on third abdominal segment, gradually increasing on fourth and fifth to reach normal size on sixth; venter faintly marked with irregular, pale yellowish-green lines.

**Leucobrephos brephoides** Wlk. — *Salix* spp. (2 records), *Betula* sp. (1), *Alnus* sp. (1). Interior British Columbia from Wingdam, Peachland, Larkin, Hupel, and Mile 178 Alaska Highway; rare. **LARVA:**  $1\frac{1}{8}$  inches; head medium green marked with light brown on frons and sides; ocelli, dark brown, area between ocelli, whitish; body velvety, grass green with bluish-green venter, dorsum with three pairs of fine yellowish lines; spiracles, dark brown outlined with black; broad, yellow subspiracular stripe; four pairs of abdominal prolegs, similar to *B. infans*; mid-ventral line, white.

#### GEOMETRINAE

**Nemoria darwiniata** Dyar — *Salix* spp. (3 records), *Arbutus menziesii* Pursh. (1), *Symphoricarpos racemosa* Michx. (1). Southern British Columbia, Enderby, Cascade, Vancouver and Victoria; common on shrubs but rare on forest trees. **LARVA:**  $\frac{7}{8}$  inch, head small, square, medium brown; body yellowish-brown to reddish-brown with four pairs of lateral lobes on A2-5; prominent dorsal tubercles on TI and cervical shield; cone-like tubercles on TII and III and A1, 6 and 7; venter of abdomen suffused with dark brown.

**Nemoria unilinearia** Tayl.—*Thuja plicata* Donn. (1 record). British Columbia: Sidney; rare. **LARVA:** similar to *N. darwiniata*, but green.

**Mesothea viridipennata** Hlst. — *Salix* spp., *Alnus* sp. (1 record). Vanderhoof, Mud River, Wasa Lake and

Vancouver Island. **LARVA:** 1 inch; head small, granular, sharply bilobed with angles half as high as height of head, brown or yellowish-green shaded with brown; body granular, tapering to front, yellowish-green to reddish-brown; paler specimens with brown dorsal line and faintly raised addorsal lines, indistinct on TI-III; dorsal and addorsal lines less conspicuous on dark specimens; two prominent addorsal tubercles inclined toward head on TI; cervical shield tapering to a point; dark specimens with subspiracular area and venter dark reddish-brown; pale pinkish ventral line; A2-5 on pale larvae marked with reddish-brown subspiracular spots, bases of prolegs reddish-brown; venter immaculate.

#### STERRHINAE

**Cosymbia pendulinaria** Gn.—*Betula* spp. *Alnus* spp. Throughout British Columbia; common. **LARVA:** 1 inch; head small; pale yellowish-buff heavily marked with brown or pale tan, pale vertexal lines; body (two color phases with intermediates): (a) pale green with indistinct white dorsal and subdorsal lines, usually with brown spot anterior to spiracle on A1; subspiracular area of abdomen marked with pale greyish-brown; venter immaculate; (b) dorsum irregularly mottled with contrasting patches of brown, yellow, white and reddish-orange, A1-6 with oblique lateral stripes of dark brown and pale yellowish-buff; dark brown or black spot anterior to spiracle on A1; venter mottled with shades of brown; ventral line on A1-5 irregular pale yellowish green; (c) intermediates, pale green; dorsum lightly marked with shades of brown; spot anterior to spiracle on A1 usually brown or tan; venter mottled with brown and tan; yellowish-green, irregular ventral line.

**Cosymbia dataria** Hlst — *Quercus garryana* Dougl. Southern Vancouver Island; rare. **LARVA:** 1 inch; head small, tan; body similar to dark phase of *C. pendulinaria*.

## LARENTIINAE

**Nyctobia limitaria** Wlk. — *Picea glauca* (Moench) Voss., *P. engelmanni* Parry, *P. sitchensis* (Bong.) Carr., *P. mariana* (Mill.) BSP., *Tsuga heterophylla* (Raf.) Sarg., *Pseudotsuga menziesii* (Dougl.), *Abies lasiocarpa* (Hook) Nutt., *A. amabilis* (Dougl.) Forb., *A. grandis* (Dougl.) Lindl., *Thuja plicata* Donn., *Larix occidentalis* Nutt., *Pinus contorta* Dougl., *P. monticola* Dougl. (3 records), *Taxus brevifolia* Nutt. (1). Throughout British Columbia; common south of latitude 56°. LARVA: 1½ inches; head medium green, moderately retractile; body green, subdorsal lines pale green or yellowish-green; subspiracular stripe, pale yellow or yellowish-white; ventral line whitish or greenish-white.

**Cladara atrolifurata** Wlk. — *Alnus* spp., *Betula* sp. (1 record). Southern interior of British Columbia; rare. LARVA: 1 inch; head velvety green; body slender, immaculate, velvety green, small anal tubercles; venter pale bluish-green.

**Lobophora simsata** Swett — *Salix* spp., *Alnus rubra* Bong. (2 records), *Populus tremuloides* Michx. Vancouver Island, Queen Charlotte Islands, central and southern coastal regions of British Columbia; rare. LARVA: 7/8 inch; head small, light green; body short, smooth, light green, light yellow subdorsal lines; small anal tubercles; subspiracular area light yellowish-green; venter green, paler than dorsum.

**Lobophora magnoliatoidata** Dyar — *Salix* spp. (3 records), *Populus tremuloides* (1). Chilliwack, Vernon, Nelson and Donald Landing; rare. LARVA: 7/8 inch, similar to *L. simsata*.

**Operophtera bruceata** Hlst. — *Populus tremuloides*, *Salix* spp., *Betula* spp., *Alnus* sp. (1 record). Throughout interior British Columbia; common. LARVA ¾ inch; head small, pale green, immaculate, or marked with dark grey; body stout, pale green; yellow subdorsal lines; dorsum on some specimens marked with grey; supra- and subspiracular lines pale yellow, less distinct than subdorsal

line; some with grey or blackish subspiracular markings; venter immaculate, pale green.

**Operophtera occidentalis** Hlst. — *Populus tremuloides*, *P. trichocarpa* Torr. and Gray (1 record), *Salix* spp., *Acer* spp. (2), *Quercus garryana* (2), *Alnus rubra* (1). Southwestern, central coastal regions of British Columbia, occasionally common. LARVAE: ¾ inch; similar to *O. bruceata*; some specimens also with blackish markings.

**Epirrita autumnata omissa** Harr. — *Tsuga heterophylla*, *T. mertensiana* (Bong.) Carr., *Abies lasiocarpa*, *A. amabilis*, *A. grandis*, *Picea engelmanni*, *P. glauca*, *P. sitchensis*, *Pseudotsuga menziesii*, *Thuja plicata*, *Pinus contorta* (2 records), *Larix occidentalis* (1), *Betula* spp., *Alnus* spp. Throughout British Columbia; common; an infestation of short duration recorded in 1954 near the Nation River Project Road. LARVA: 1¼ inches; head small, pale green flecked with brown on vertex and sides, some immaculate; body velvety green, dark olive green dorsal and lateral lines, narrow yellowish-green lines along inner side of laterals; whitish subspiracular stripe continuing onto anal plate; some specimens without dark dorsal and lateral lines; venter pale whitish or pale bluish-green.

**Epirrita pulchraria** Tayl. — *Tsuga heterophylla*, *T. mertensiana* (1 record), *Picea sitchensis*, *P. glauca*, *Abies amabilis*, *A. lasiocarpa*, *Pseudotsuga menziesii*. Western British Columbia south of 56° latitude; common in coastal regions but rare in the Interior; two specimens taken in flight at Blair Lake near Falkland represent the only records from the south central Interior. LARVA: 1¼ inches; head small, pale green; body "uniform, clear apple green with two wide, white subdorsal lines which continue around the anal margin." (Personal communication, D. Evans, Dept. of Forestry, Victoria, B.C.).

**Triphosa haesitata** Gn. — *Rhamnus purshiana* DC., *Quercus garryana*. Southwestern British Columbia; com-

mon; one record southern Interior. LARVA: 1 inch; head tan; "Body stout, dull lime green with fine, light addorsal, lateral and wide yellow spiracular lines; tan spiracles." (Personal communication, D. Evans, Department of Forestry, Victoria, B.C.).

**Hydria undulata** Linn.—*Salix* spp. *Populus tremuloides*. Central to southern British Columbia; rare. LARVA: 1¼ inches; head tan; body smooth, medium olive green, narrow light addorsal and subdorsal lines; anal shield tan marked with brown; supra-spiracular area dark brown; thoracic legs dark brown; posterior of anal prolegs marked with brown; venter yellowish-green.

**Lygris destinata** Moesch. — *Abies lasiocarpa*, *Tsuga heterophylla* (2 records), *Alnus* sp. (1), *Rhododendron albiflorum* Hook. (1). Central to southern British Columbia; rare. LARVA: 1¼ inches; head small, pale buff marked with dark brown, pale buff or whitish-buff line bordering upper side of ocelli; body slim, ochraceous, marked with dark brown, leaf-brown and pink; pale setal bases; fine pale addorsal lines on TI-III extending to apex; TII and III swollen lateral to TII with dark brown or blackish oblique stripe; pale inverted V pattern on A1-8, dark brown band on dorsum of A6 extending obliquely to venter; sides of anal prolegs leaf-brown, with a pale yellowish-white vertical stripe; irregular ventral line, dark brown alternating reddish-brown; venter banded alternately with leaf-brown and whitish-buff.

**Lygris xyliana** Hlst.—*Salix* spp., *Alnus* spp., *Tsuga heterophylla*, *Betula* spp., *Malus* spp., *Pinus monticola*, *Pseudotsuga menziesii* (1 record), *Sorbus sitchensis* Roem. (1). Throughout British Columbia; uncommon. LARVA: 1¾ inches; head small, pale golden-yellow with pale yellowish-brown markings; body slim, pale yellowish-orange finely maculated with pink; setal bases pale; TII wider than TI and III and marked with a leaf-brown band extending diagonally to

venter; small leaf-brown middorsal spot located centrally in an elliptical patch caudad on A1-5, A1-5 banded with brown extending to venter, paler on A1 and 2, side of anal proleg with a fine dark brown vertical line; venter of A1-5 banded with brown; pale yellowish-white between abdominal and anal prolegs.

**Plemyria georgii** Hlst.—*Alnus* spp., *Salix* spp., *Betula* spp., *Cornus stolonifera* Michx. (3 records), *Acer glabrum* Torr. (1). South of 57° latitude in British Columbia; uncommon. LARVA: 1 inch; head small, pale green; body very slender, smooth, pale green with yellow subdorsal lines; two whitish, prominent, pointed projections on upper posterior of anal prolegs; thoracic legs pinkish to reddish on some specimens; venter, immaculate.

**Dysstroma truncata** Hufn. — *Larix laricina* (DuRoi) K. Koch (2 records), *Alnus* spp. (2), *Picea* sp. (1). Miles 69 and 290 Alaska Highway; rare. LARVA: 1 inch; head small, yellowish-green; body slender, green, indistinct whitish subdorsal lines, reddish lateral lines, small points on anal shield; venter immaculate, pale green.

**Dysstroma citrata** Linn. — *Tsuga heterophylla*, *Picea sitchensis*, *Pseudotsuga menziesii*, *Alnus* spp., *Salix* spp. A general feeder, found occasionally on other broadleaved trees and shrubs south of latitude 56° in British Columbia. LARVA: 1 inch; similar to *D. truncata* but rarely with reddish lateral lines.

**Dysstroma ethela** Hlst. — *Ribes* sp. (1 record). Anarchist Mountain. LARVA: 1 inch; similar to *D. truncata* but without reddish lateral lines. Body minutely spinulose with white setae.

**Dysstroma formosa** Hlst. — *Ribes* spp. Southern Interior; uncommon. LARVA: 1 inch; head small, yellowish-green; body slender, spinulose, pale green, minute whitish tubercles, in rows, form the subdorsal lines; indistinct, whitish lateral lines; small, whitish projections on upper poste-

rior side of anal proleg; broken yellowish-white ventral line.

**Dysstroma sobria** Swett — *Picea sitchensis*. Coastal British Columbia; rare. LARVA: unknown.

**Thera otisi** Dyar—*Juniperus communis* L. South of latitude 54°, interior British Columbia; uncommon. LARVA:  $\frac{3}{4}$  inch; head pale greenish-tan; body pale green, pale bluish-white addorsal lines, greenish-white subdorsal stripes extending onto anal plate, greenish-white subspiracular stripes bordered above with a pink to reddish, broken line on TI-III and A1-3; thoracic legs pink or marked with pink; venter unmarked.

**Stannoctenis morrisata** Hlst.—*Juniperus scopulorum* Sarg. Southern interior of British Columbia and Vancouver Island; common in small numbers. LARVA: 1 inch; head retractile, pale greenish-tan; body green with black setal bases; dark green dorsal line; irregular white subdorsal stripes, narrower on thorax but accentuated on posterior of each abdominal segment; posterior of A2-7 marked with a short reddish-brown line between the spiracles; posterior to subspiracular A1-7 marked with yellowish-buff and white; lower half of abdominal prolegs pale reddish-brown; subspiracular area of thoracic segments marked with white; diagonal reddish-brown markings, fading towards venter, on A1-8, lacking on A1 in some specimens; venter of abdominal segments indistinctly banded with yellowish-green.

**Rheumaptera hastata** Linn. — *Alnus* spp., *Betula* spp., *Salix* spp. South of latitude 55° in British Columbia; common. LARVA: 1 inch; head small, medium brown, marked on sides and front with dark brown; body stout, skin smooth, black; subdorsal lines formed by two rows of small, irregularly shaped, creamy-white spots, subdorsal lines lacking on some specimens; cervical shield dark brown; anal plate medium brown; broken, creamy-white to buff, supraspiracular and subspiracular stripes, coalesced

around the spiracles on TI and A1-3 on some but indistinct on other specimens; subventral setal bases outlined with creamy-white; band of creamy-white on lower abdominal prolegs; A9 below anal shield creamy-white, anal prolegs creamy-white, marked anteriorly with black and posteriorly with greyish-brown bordered with pink.

**Rheumaptera albodecorata** Blkmre. — *Betula* spp., *Alnus* spp., *Menziesia ferruginea* Smith (1 record). South of latitude 56° in British Columbia; rare. LARVA: 1 inch; head small, orange-brown, sides and front marked with dark brown; body stout, smooth, pale yellowish-buff; medium brown, irregular dorsal line, pale brown addorsal lines and medium brown subdorsal stripe; medium brown cervical shield and pale tan anal plate; broad yellowish-buff lateral stripe; venter medium brown indistinctly banded with pale brown; lower half of abdominal prolegs pale buff; anal prolegs pale buff marked anteriorly with brown and posteriorly with pale tan.

**Venusia cambrica** Curt. — *Alnus* spp., *Betula* spp., *Salix* spp. Throughout British Columbia; common. LARVA:  $\frac{3}{4}$  inch; head small, pale green; body stout, bright green; yellowish lateral lines extending to anal shield; some specimens sparsely or profusely marked with pink or dull red on dorsal, lateral and ventral areas.

**Venusia pearsalli** Dyar—*Alnus* spp., *Salix* spp., *Populus tremuloides*, *Quercus garryana* (2 records). *Cornus nuttali* Audubon (2), *Betula* sp. (1) *Populus trichocarpa* (1) *Acer circinatum* Pursh (1), *Crataegus* sp. (1). South of latitude 56° in British Columbia; common, particularly in south western regions. LARVA:  $\frac{3}{4}$  inch; similar to *V. cambrica* but without pink or red markings.

**Venusia duodecemlineata** Pack. — *Pseudotsuga menziesii*. Vancouver Island, rare. LARVA:  $\frac{3}{4}$  inch, pale green (Personal communication, D. Evans, Dept. of Forestry, Victoria, B.C.).



## ANNOTATED LIST OF FOREST INSECTS OF BRITISH COLUMBIA:

## PROC. ENT. SOC. B.C.

- Ross, D. A. and D. Evans. 1954. Part I—Lasiocampidae, Saturniidae, Liparidae. 51:40-43.  
 Ross, D. A. 1954. Part II—*Laspeyresia* spp. (Olethreutidae). 51:44.  
 Ross, D. A. and D. Evans. 1956. Part III—*Eupithecia* spp. (Geometridae). 52:36-38.  
 Ross, D. A. and D. Evans. 1956. Part IV—*Hydriomena* spp. (Geometridae). 52:38-39.  
 Ross, D. A. and D. Evans. 1957. Part V—*Dioryctria* spp. (Pyralidae). 53:10-11.  
 Ross, D. A. and D. Evans. 1957. Part VI—*Plusia* (*Syngrapha*) spp. (Noctuidae). 54:18.  
 Ross, D. A. and D. Evans. 1957. Part VII—*Apatela* (*Acronicta*) spp. (Noctuidae). 54:16-17.  
 Ross, D. A. and D. Evans. 1958. Part VIII—*Semiothisa* spp. (Geometridae). 55:40-41.  
 Ross, D. A. and D. Evans. 1959. Part IX—*Caripeta* spp. (Geometridae). 56:15.  
 Ross, D. A. and D. Evans. 1961. Part X—Notodontidae. 58:30-32.  
 Sugden, B. A. and D. A. Ross. 1963. Part XI—*Papilio* spp. (Papilionidae). 60:17-18.  
 Sugden, B. A. 1964. Part XII—Boarmiini and Melanolophiini (Geometridae). 61:36-39.

NOTES ON THE BIOLOGY OF THREE ARCTIID MOTHS FROM  
BRITISH COLUMBIA

HELMUT P. KIMMICH

*Neoarctia brucei* H. Edw.

*N. brucei* is not listed by Jones (1951). It inhabits the southern slopes of alpine meadows in Manning Park at altitudes of about 6,500 feet, and is rare in collections. With a wingspan of 35 mm, this is a moth of striking beauty having black forewings with broad rose coloured grid lines and bright red hindwings with heavy, broad spots, confluent at the outer margins.

After hibernation the small larvae appear in June, at first on bare spots around trees and later mostly along the edges of still remaining snow patches. There, with maximum exposure to the warmth of the sun, they rest in a curled position on the bare ground or walk swiftly, covering considerable distances in search of their favorite food plants: the tender sprouts and shoots of *Senecio*, mountain grass, phlox, and buds of *Vaccinium*. By the time the last snow patches have melted, the larvae have hidden in the thickets of fast-growing alpine flora. They reach maturity before the leaves of the dwarf *Vaccinium* turn dark green. The moth emerges in July after two weeks in the pupal stage. Flight and copula take place at dusk.

The female lays between 80 and 120 eggs in batches. The ovum is spherical and gold coloured. Hatching follows 10 days after oviposition and there are six larval instars. At maturity the larva measures 30 mm, the head is small and black, the body and tubercles are black, dotted with shiny spots, visible in the reflection of light, and with soft tufts consisting of black and white hairs, the white ones more numerous at the sides. The dorsum is adorned with tufts of pale olive green.

The pupa is 17 x 5 mm, with the wingcases translucent reddish, the mobile cremaster dusted with slate blue, the segments blackish and bordered, and the head furnished with inconspicuous bristles. It rests in a light cocoon of plant material.

Caged caterpillars are reluctant to accept substitutes for their native food plants. Taking only mature larvae and presenting them a variety of wild, native plants is critical for successful rearing. The picked plants preserved in tightly closed jars and kept cool, will prove satisfactory. However, a new brood emerging in confinement can be successfully reared on *Taraxacum* if they have not hibernated. Ample space, artificial