

REVIEW OF THE NEARCTIC SPECIES
OF *CHRYSOCLISTA* STAINTON
(LEPIDOPTERA, AGONOXENIDAE)

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The four Nearctic species of *Chrysoclista* are reviewed, *C. grandis* sp. n., described from specimens collected in the mountainous regions of the United States of America, is characterized by its large wingspan and the large bright orange coloured section of the forewing. Comparison with the three other species of Nearctic *Chrysoclista* is given; external characters and genitalia are illustrated; and the biology is discussed.

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Key words. – *Chrysoclista*; Agonoxenidae; taxonomy; new species; North America; Nearctic.

The genus *Chrysoclista* is a small genus with five species described from the Palaearctic and three from the Nearctic region, of which *Chrysoclista linneella* Clerck has a Holarctic distribution. Outside the Holarctic three species have been placed in *Chrysoclista*, two from the Oriental region (Meyrick 1917, 1928) and one from Australia (Meyrick 1921), but their generic placement requires confirmation.

The Palaearctic species were recently reviewed by Karsholt (1997). The nomenclature of the genus was settled by the ICZN (1986), see also Diakonoff & Hepner (1977). *Chrysoclista* has earlier been considered to belong to the 'Cosmopterygidae' by Fletcher (1929) and to the Momphidae by Riedl (1969), but the recent assignment to the Agonoxenidae is well established (Leraut 1980, Hodges 1983, 1999, Karsholt & Razowski 1996).

Recently a fourth Nearctic species was found in the Southwest of the United States. Because little has had been published on the Nearctic species of *Chrysoclista* and the male and female genitalia have not been described before, a review of this genus is given together with the description of the new species.

MATERIAL AND METHODS

Material of *Chrysoclista* species was obtained from the Smithsonian Institution, National Museum of Natural History, Washington DC, USA (USNM), the Centre for Land and Biological Resources Research,

Ottawa, Canada (CNC); The Natural History Museum, London, UK (BMNH) and the Finnish Museum of Natural History, Helsinki, Finland (MZHF). Holotype label data are quoted exactly as they appear with additions between brackets[]; a slash denotes the end of a line of print, and a semicolon separates data on different labels.

Genitalia preparations were made following the methods described by Landry & Wagner (1995), but the male genitalia were given an extra staining with Eosine prior to embedding. This method highlights the sclerotization and provides a darker orange or reddish coloration.

The adults are illustrated in watercolour. For this purpose a colour slide was made and the right side of the moth was illustrated by projecting a mirror image. If the specimen involved was not in perfect condition, additional material has been used to improve the picture. The watercolours in this paper have been printed at 80% of the original size.

TAXONOMY

Genus *Chrysoclista* Stainton

Chrysoclista Stainton, 1854: 240. Type species: *Phalaena linneella* Clerck, 1759: pl.12, fig. 18, by subsequent designation by Fletcher 1928: 25.

Glyphipteryx auct. nec Curtis, 1827 [which is an unjustified emendation of *Glyphipterix* Hübner, [1825] (ICZN, 1986)]



Figs. 1-2. *Chrysoclista* spp., male habitus. – 1, *C. grandis*, holotype; 2, *C. cambiella*, Canada, Alberta.



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Figs. 3-4. *Chrysoclista* spp., male habitus. – 3, *C. vellella*, Canada, British Columbia; 4, *C. linneella*, Germany, Dortmund

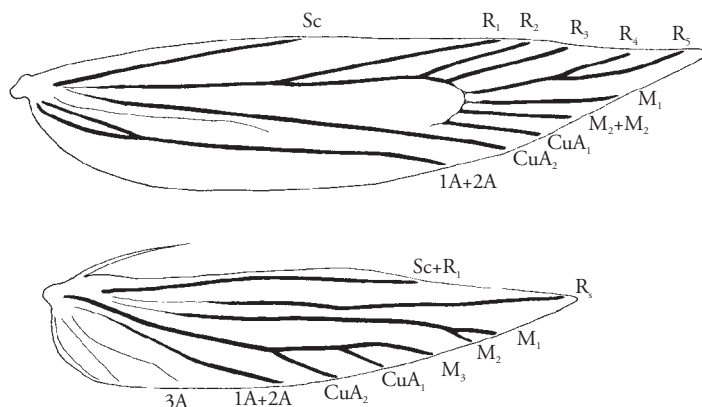


Fig. 5. *Chrysoclista linneella*, wing venation, slide JCK 2097.

The genus *Chrysoclista* is characterized by a combination of the following characters: head smoothly scaled; ocelli absent; haustellum developed, short, scaled; labial palpus cylindrical, porrect with third segment slightly angled upwards; antenna four-fifths to just slightly shorter than length of forewing, sometimes slightly serrate distally; scape without pecten; forewing lanceolate and with orange ground colour, often with some distinct patches of raised scales; 11 veined, R_1 , R_2 and R_3 close together, R_2 and R_3 parallel, CuA_2 almost straight. Hind wing about two-thirds width of forewing, lanceolate, often acutely pointed, length of dorsal cilia one and a half times width of wing, R_5 separate from M_1 , $1A + 2A$ strongly developed and separate (fig. 5). Male genitalia: symmetrical; uncus rudimentary or absent; gnathos a pair of lobes or arms, often dentose distally, this in contradiction with the usual club-shaped processes covered with rows of spines in Agonoxenidae; tegumen short and broad with small socii; valva simple, broad with rounded or truncated apex; juxta lobes pronounced; vinculum large, with or without a short saccus; aedeagus long, tubular, bent, with or without cornuti. Female genitalia: apophyses posteriores about one and a half to twice the length of apophyses anteriores; antrum rather small, with or without sclerotization; ductus bursae long and narrow; corpus bursae elongated and without signa.

Immature stages are only partly known. The larva lives under the bark of a tree where it feeds on the cambium. *Chrysoclista linneella* lives on *Tilia* sp. (Sinev 1986); other species, of which some of the biology has been revealed, live in a similar way on different species of *Salix*.

Checklist

Only species from the Palaearctic (P) and Nearctic (N) regions that belong with certainty to *Chrysoclista* are listed.

Chrysoclista Stainton, 1854

1. *abchasic* (Sinev, 1986) P
2. *cambiella* (Busck, 1915) N
3. *grandis* sp. n. N
4. *lathamella* Fletcher, 1936 P
5. *bimaculella* (Haworth, 1828), nec (Thunberg, 1794) *razowskii* Riedl, 1965
6. *linneella* (Clerck, 1759) P, N *schaeffere* Duponchel, 1828 *gemmatella* Costa, [1836]
7. *splendida* Karsholt, 1997 P *bimaculella* auct. *razowskii* auct.
8. *villega* (Busck, 1904) N
9. *zagulajevi* Sinev, 1979 P

Key to species, based on external characters

1. Forewing with blackish brown edging on dorsum not interrupted; antenna with white section apically2
- Forewing with blackish brown edging on dorsum interrupted at base and in middle; antenna uniformly coloured *C. grandis*
2. Forewing with broad blackish brown edging on basal part of costa, a yellowish white costal streak and a silver metallic streak at dorsal side of apex..3
- Blackish brown edging on costa of forewing narrow; streaks on costa and dorsal side of apex absent *C. linneella*
3. Forewing with silver metallic spots, first dorsal spot with a small patch of raised blackish brown scales; male with white anal tuft
- Forewing with pale golden metallic spots, first dorsal spot almost completely covered by a large patch of raised blackish brown scales; male with anal tuft greyish brown..... *C. villega*
- Forewing with pale golden metallic spots, first dorsal spot almost completely covered by a large patch of raised blackish brown scales; male with anal tuft greyish brown..... *C. cambiella*

Key to species, based on genitalia

1. Male: valva and juxta lobe tapering distally and with rounded apex. Female: antrum tubular and simple; lamella antevaginalis without sclerotized markings.....2
- Male: valva truncate, juxta lobe widening distally, with a large semicircular excavation and dentose apex. Female: antrum with rectangular dilation and triangular sclerotization in lamella antevaginalis.....*C. linneella*
2. Male: gnathos arm short, with long setae distally, juxta lobe less than half the length of valva. Female: dorsal wall of antrum smooth.....3
- Male: gnathos arm long and slender, with short setae, juxta lobe more than half the length of valva. Female: dorsal wall of antrum covered with fine spines.....*C. cambiella*
3. Male: valva club-shaped. Female: dorsal wall of antrum without spines.....*C. vilrella*
- Male: valva parallel-sided. Female: unknown.....*C. grandis*

Chrysoclista grandis sp. n.
(figs. 1, 6, 7)

Type material. – Holotype ♂: [UNITED STATES], Colo[rado]: Chaffee Co./ 2 mi ESE of/ Buena Vista, 8430' / August 23, 1997/ leg. D. J. Wright; 38° 49' 49" N/ 106° 05' 10" W; Gen. prep. JCK 5060 ♂; HOLOTYPE ♂ / *Chrysoclista grandis* Koster (USNM). – Paratypes: UNITED STATES: 1 ♂: same data as holotype (without abdomen) (USNM); 1 ♂, California, Inyo Co., E. Sierra Nevada, Glacier Lodge 15 km W Big Pine, 2600 m, river cr., 21-22.vii.1998, blacklight, L. Kaila & S. Timonen (MZHF).

Diagnosis

C. grandis differs externally from other *Chrysoclista* species by the larger wingspan, the large bright orange coloured section of the forewing and the lack of the white apical section of the antenna. The male genitalia resemble those of *C. vilrella*, but differ by the shorter and wider tegumen and the distally gradually tapering valvae.

Description

Male (fig. 1). Wingspan 15-17 mm. Head: frons, vertex, neck tufts and collar shining bronzy grey; labial palpus yellowish white, first segment very short, second segment almost twice as long as third segment, basal half externally greyish brown, third segment pale yellow with some greyish irroration externally; scape bronzy grey dorsally, ochreous-white ventrally; antenna grey, indistinctly annulated dark grey, ventrally lighter. Thorax and tegula shining bronzy grey. Legs:

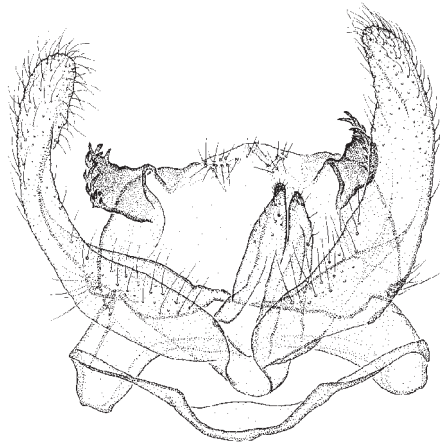
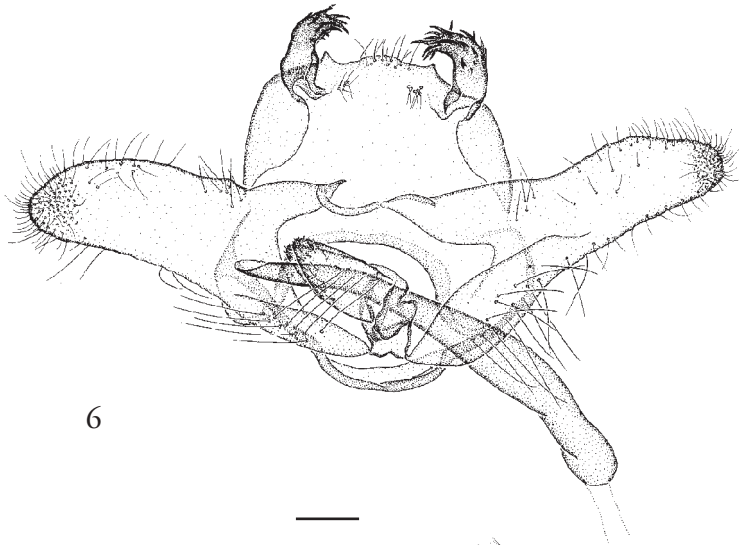
shining dark brownish grey, femur of hindleg anteriorly white, tibia of midleg with an indistinct white medial spot and white apical band, tibia of hindleg with a very broad white medial ring and white apical ring, tarsi white at joints, spurs ochreous-white. Forewing ground colour bright orange, edged shining blackish brown at base, along costa, around apex toward tornus, interrupted by a shining yellowish white costal streak at four-fifths, edging on costa at basal half narrow and irrorated by some shining pale golden metallic scales, a wing pattern of three tubercular, blackish-brown edged, pale golden metallic spots, the pale golden metallic scales with some greenish and bluish reflection, first spot below fold at one-third of wing length, the broad blackish brown edging underneath connected to a narrow blackish brown line on dorsum from one-fifth to two-fifths, in fold connected to a similar line toward base and about as long as the dorsal line, second spot subcostally before one-half, sometimes elongated and pointing towards tornus, third and largest spot on tornus, protruding towards costa and reaching beyond middle of wing, both dorsal spots in the centre with a patch of raised blackish-brown scales, ciliary line indistinct; cilia dark brown on costa and apex, greyish brown toward dorsum. Hind wing shining brownish grey, some veins in apical area sometimes with bluish or purplish reflection, cilia greyish brown. Underside forewing shining greyish brown with greenish and purplish gloss, veins in apical area with some orange scales; hind wing shining brownish grey with some greenish and purplish gloss. Abdomen dorsally grey to dark grey with some bluish and purplish gloss, especially on T II, ventrally shining dark grey with golden reflection, segments banded shining greyish white posteriorly, anal tuft pale ochreous.

Female. – Unknown.

Male genitalia (figs. 6, 7). – Vinculum broad and rounded, saccus absent. Uncus a very shallow hump. Gnathos arms short and broad, strongly dentose distally. Valva broad at base, narrowing at one-half length, apex rounded and bent inward. Juxta lobes short, less than half the length of the valva, tapering distally with dentose apex. Aedeagus slightly longer than the valva, gradually tapering distally, bent at basal one-fourth, no cornuti.

Biology

Adults collected from late July till late August. All three specimens have been collected at light at rather high altitudes. The locality in California was at the edge of the very dry Mojave Desert but with a somewhat moister climate, as is usual for mountains. There was a small river with quite lush vegetation, and most trees were conifers (L. Kaila in litt.).



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Figs. 6-7. *Chrysoclista grandis*, male genitalia. – 7, Holotype, valvae spread and aedeagus in situ, USA, Colorado, slide JCK5060; 8, Paratype, valvae not spread, aedeagus removed, USA, California, slide JCK4395. Scale 0.1 mm.

Distribution

Western United States, in the mountains of California and Colorado.

Etymology

The name *grandis* alludes to the large wingspan and the bright appearance.

Chrysoclista cambiella (Busck, 1915)
(figs. 2, 8, 11)

Psacophora cambiella Busck, 1915: 81.

Diagnosis

C. cambiella resembles *C. vellella*, but can be distinguished by the pale golden metallic markings and the large patch of raised scales in the first dorsal spot of the forewing. In the male also by the greyish brown anal tuft. In male genitalia the slender gnathos arms and the long juxta lobes are characteristic. Female genitalia resembling those of *C. vellella*, but can be distinguished by the little spines on the wall of the ostium, the wrinkled section of the ductus bursae and the more pronounced sinuous anterior edge of the eighth tergum.

Description

Male (fig. 2). Wingspan 12 mm. Head: frons vertex and collar shining brownish grey with greenish and purplish reflections; labial palpus first segment very short, whitish mixed with pale brown, second segment one-fifth longer than third segment, yellowish white dorsally, yellow ventrally, third segment yellow but ventrally and apically blackish brown; scape shining dark brown; antenna shining dark brown with purplish and greenish reflections, apical part silvery white. Thorax and tegula shining brownish grey with greenish and purplish reflections. Legs: shining brownish grey, femur and tibia of mid- and hindlegs with a greyish white streak anteriorly, tibia of hindleg with white medial and apical rings, spurs ochreous-white. Forewing ground colour bright reddish orange, broadly edged shining blackish brown with greenish and purplish reflections, a wing pattern of three round tubercular, pale golden metallic spots with strong purplish reflection, first subdorsal at one-third length, almost covered by a large patch of raised blackish brown scales, second subcostal before one-half length with a narrow bundle of raised blackish brown scales, third subdorsal at two-thirds length and with a dorsal extension and with a patch of raised blackish-brown scales of medium size, a long pale golden metallic streak underneath blackish brown costal edging from middle of first dorsal spot directed toward base and bending upwards just before base of wing, a short pale golden metallic subcostal streak op-

posite of second dorsal spot, beyond this streak a pale yellow streak on costa into termen, a silver to pale golden metallic streak at dorsal side of apex, cilia dark greyish brown. Hindwing dark greyish brown with strong purplish reflection, cilia dark greyish brown with purplish gloss. Underside forewing shining dark brown with greenish and purplish reflections; hindwing as forewing. Abdomen dorsally dark brown with purplish and greenish gloss, ventrally shining brownish grey with reddish golden reflection, segments broad banded pale grey posteriorly, anal tuft greyish brown dorsally, ochreous-grey ventrally.

Female. Wingspan 13 mm. As for male except underside hind wing narrowly edged yellowish white dorsally.

Male genitalia (fig. 8). – Vinculum broad, narrowing distally and with a round cavity. Uncus not noticeable. Gnathos arms slender and bent, broader at base, short and scarcely dentate distally. Juxta lobes long and narrow, gradually tapering distally, about three-fourths of length of valva. Aedeagus longer than valva, slightly sinuous and without cornuti.

Female genitalia (fig. 11). – Apophyses posteriores about three-fifths of the length of apophyses anteriores. Anterior edge of eighth tergum sinuous, posterior edge slightly concave. Antrum funnel shaped, inner surface covered with fine spines. Ductus bursae narrow, slightly widening toward corpus bursae and just slightly shorter than the latter, with a fine wrinkled section anterior of the ductus seminalis. Corpus bursae protracted-oval, distal half with granular sclerotization, densest toward entrance of ductus bursae.

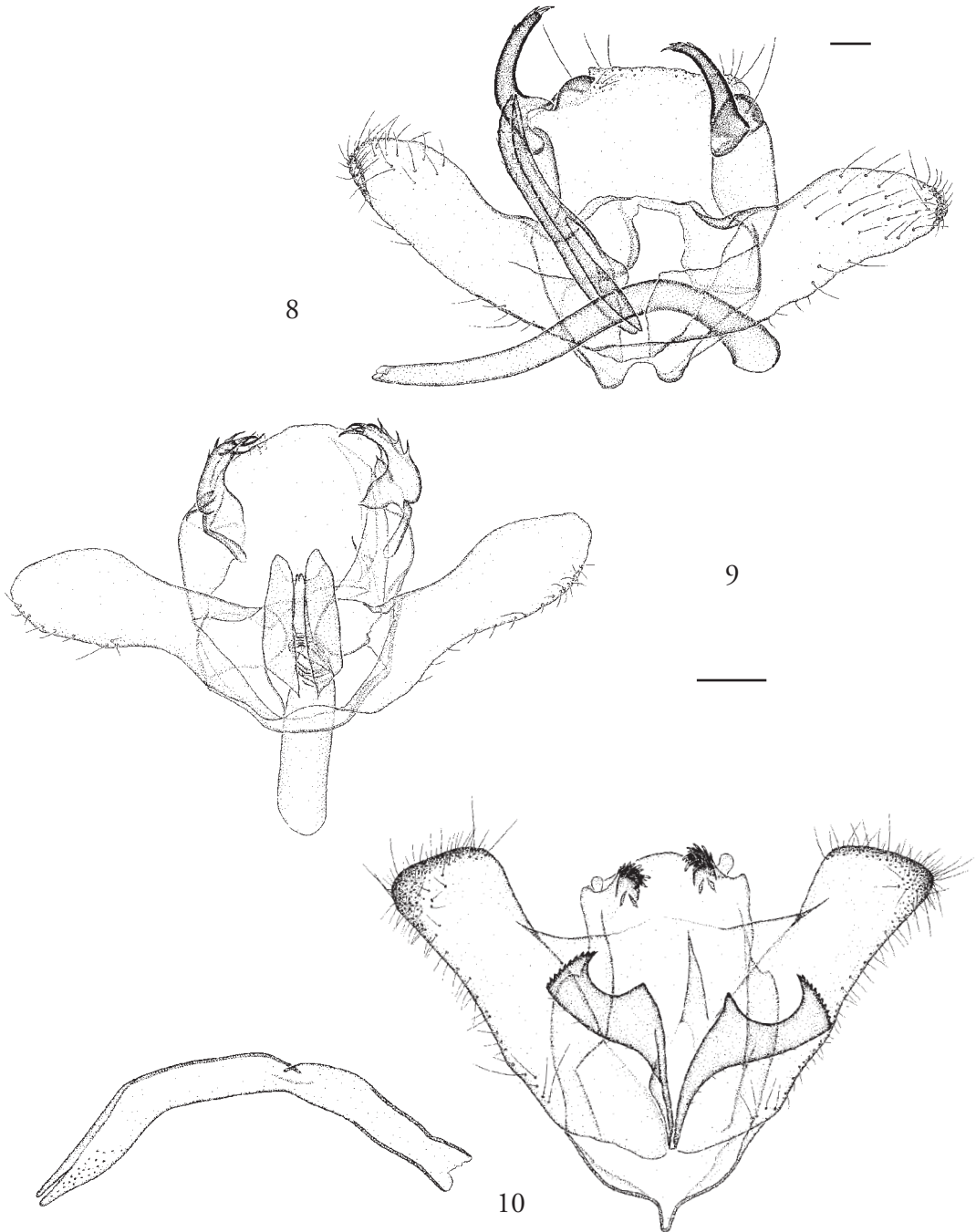
Biology

The larva bores in the cambium of *Salix* species (Busck 1915). Apart from the type series, also species from Idaho and British Columbia have been reared from *Salix*.

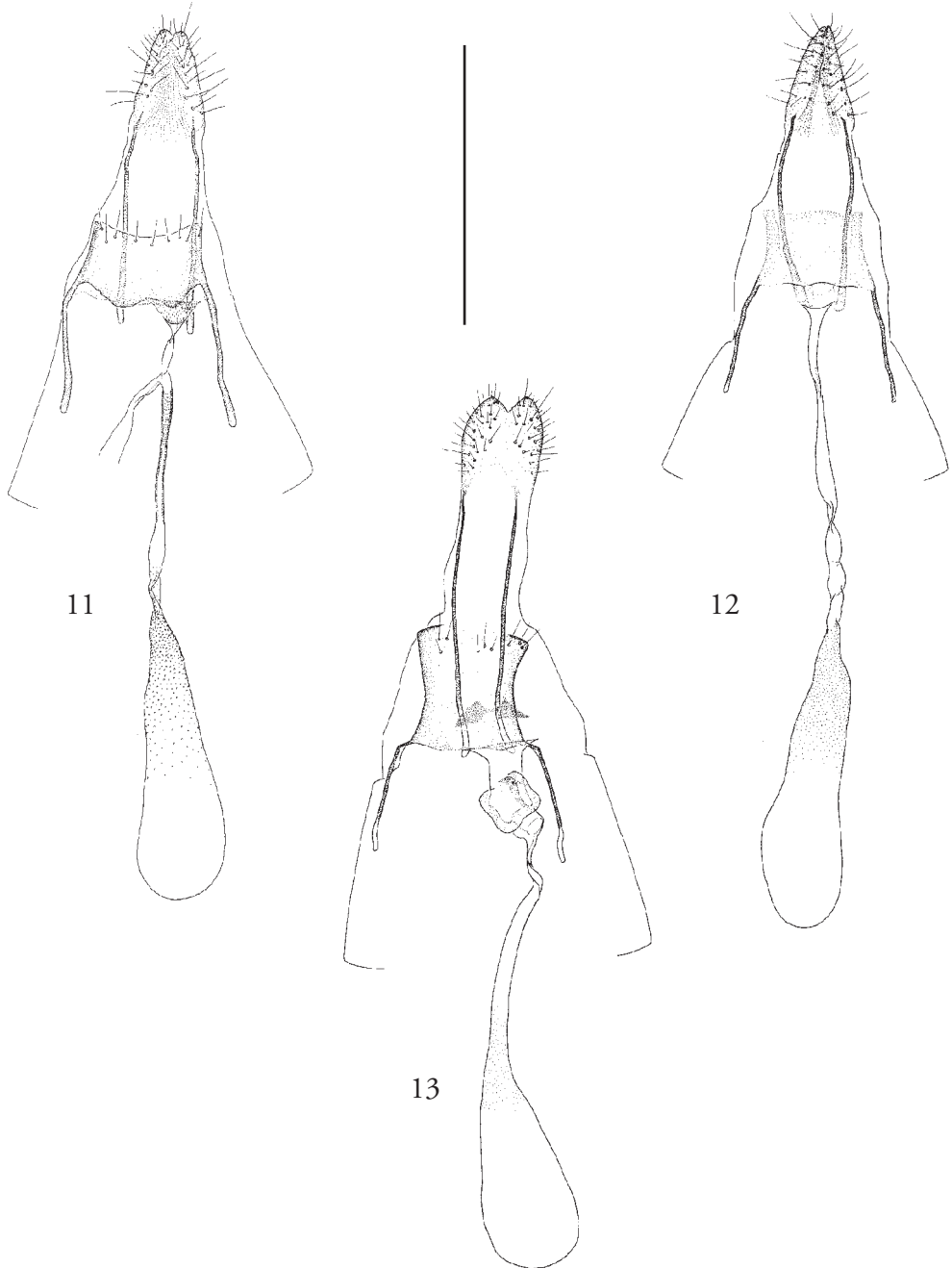
Distribution

United States (Oregon, Idaho, and Montana) and Canada (British Columbia and Alberta) (fig. 14).

Material examined. – CANADA: 1 ♂, Alberta, Waterton Lakes, 21.vii.1923, J. McDunnough (CNC); 1 ♀, British Columbia, Sidney, 30.v.1989, ex. *Salix* sp., R. Duncan (CNC); 1 ♀, British Columbia, Summerland, 2.vi.[19]81, A.N. Gartrell (CNC). – UNITED STATES: 1 ♂, Idaho, Nez Perce Co., Central Grade, 17.v.1961, reared from *Salix*, R. E. Stecker (CNC); 1 ♂, 1 ♀, Montana, Evaro, 15.v.1913, in cambium of *Salix*, Brunner (USNM); 1 ♂, Oregon, Corvallis, 26.v.1970, J. F. G. Clarke (USNM).



Figs. 8-10. *Chrysoclista* spp., male genitalia. – 8, *C. cambiella*, aedeagus in situ, USA, Oregon, slide JCK5061; 9, *C. villella*, aedeagus in situ, Canada, British Columbia, slide BMNH 29563; 10, *C. linneella*, aedeagus removed, Germany, slide JCK2098; Scales 0.1 mm.



Figs. 11-13. *Chrysoclista* spp., female genitalia. – 11, *C. cambiella*, Canada, British Columbia, slide JCK5146; 12, *C. villella*, Canada, British Columbia, slide JCK5062; 13, *C. linneella*, USA, New York, slide JCK4483. Scales 1 mm.

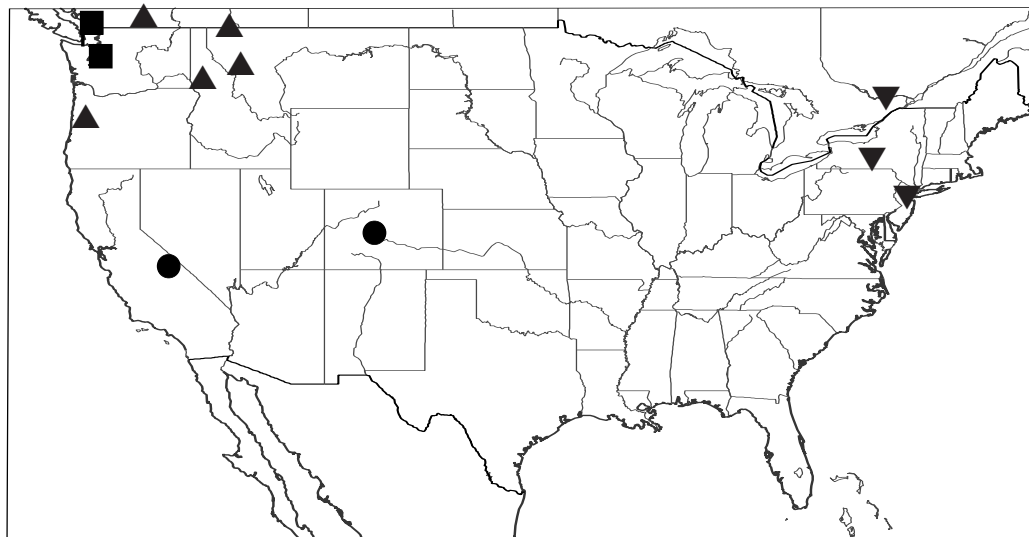


Fig. 14. Distribution of *Chrysoclista* species in the Nearctic region. ● *C. grandis*, ▲ *C. cambiella*, ■ *C. vellella*, ▼ *C. linneella*.

Chrysoclista vellella (Busck, 1904)
(figs. 3, 9, 12)

Cosmopteryx vellella Busck, 1904: 768.

Diagnosis

C. vellella can be distinguished from the similar looking *C. cambiella* by the forewing with the blackish brown costal and dorsal edging touching before middle and by the silver metallic markings. The male can easily be recognized by the shining white anal tuft. The male genitalia resemble those of *C. grandis*, but can be distinguished from this species by the longer and narrower gnathos arms and the club-shaped valva. Female genitalia resembling those of *C. cambiella*, but differs by the different shape of the eighth tergum and by the smooth antrum and ductus bursae.

Description

Male (fig. 3). Wingspan 10 mm. Head: frons shining bronzy brown, paler distally, vertex and collar shining dark brown with greenish and purplish reflections; labial palpus first segment very short, pale brownish grey, second segment one-fifth longer than third, shining white dorsally, brownish grey ventrally, third segment as for second segment, apex brownish grey; scape dark brown dorsally, yellowish white ventrally; antenna shining brown, the apical ca. 12 segments partly white, more white toward apex. Thorax and tegula shining dark brown with greenish and purplish reflections. Legs: shining brownish grey, femur and tibia shining greyish white at inner side, tibiae of mid- and hindlegs with white medial and apical rings, spurs

white. Forewing ground colour bright orange, anteriorly broadly margined with shining blackish brown which extends nearly to fold from base to one-half wing length, and posteriorly similarly margined, nearly meeting anterior dark margin distally, a wing pattern of three round tubercular, blackish-brown edged, silver metallic spots, first subdorsal at two-fifths length, second subcostal before one-half length, third subdorsal at two-thirds length, both dorsal spots in the centre with a patch of raised blackish-brown scales, a silver metallic band near base from costa to fold, a silver metallic streak on costa opposite of second dorsal spot, beyond this streak a yellowish-white streak on costa into termen, sometimes with some silver metallic scales at dorsal side, a silver metallic streak at dorsal side of apex, cilia dark greyish brown. Hindwing greyish brown with purplish reflection. Underside forewing shining bronzy brown with greenish and purplish reflections, hindwing as for forewing shining brownish grey. Abdomen dorsally shining dark brown with greenish and purplish reflections, ventrally shining brownish grey with greenish and purplish reflections, segments greyish white banded posteriorly, anal tuft shining white.

Female. Wingspan 10 mm. As for male except antenna with the apical ca. 18 segments white. Abdomen ventrally without greyish white posterior bands on segments, anal tuft greyish brown, further as male.

Male genitalia (fig. 9). – Vinculum broad and rounded, no saccus. Uncus hardly noticeable. Gnathos arms rather short, bent, distally with long setae. Valva narrowed in middle, apex rounded. Juxta lobes short, less than half the length of the valva, rounded

distally. Aedeagus longer than valva, gradually tapering distally, bent at basal one-third, cornuti absent.

Female genitalia (fig. 12). – Apophyses posteriores about one-half of the length of apophyses anteriores. Anterior edge of eighth tergum almost straight, lateral sides slightly concave. Antrum funnel shaped and membranous. Ductus bursae narrow, membranous and almost of equal width, about as long as the corpus bursae. Corpus bursae protracted-oval, distal half with fine granular sclerotization, densest toward entrance of ductus bursae.

Biology

Unknown.

Distribution

Canada (British Columbia) and United States (Washington) (fig. 14).

Material examined. – CANADA: 1 ♂, 1 ♀, British Columbia, Fraser Mills, 19.vi.1922, L.E. Marmont (BMNH, USNM). – UNITED STATES: 1 ♂, Washington, Seattle (USNM).

Chrysoclista linneella (Clerck, 1759) (figs. 4, 5, 10, 13)

Phalaena linneella Clerck, 1759: Tab. 12, 8.

Oecophora schaefferella Duponchel, 1828: 482.

Elachista gemmatella Costa [1836]: 4.

Diagnosis

C. linneella differs from *C. cambiella* and *C. vilrella* by the forewing which has a narrower dark edging of the costa, the lack of the costal streak at four-fifths, and the presence of a silver metallic streak at dorsal side of apex. In the male genitalia the truncated valva in combination with the shape of the juxta lobes are characteristic. In the female genitalia the rectangular dilation of the antrum and the triangular sclerotization of the lamella antevaginalis are distinguishing characters.

Description

Male (fig. 4). Wingspan 10-11 mm. Head: frons shining leaden grey, vertex and collar shining dark brown; labial palpus first segment very short, dark grey, second segment slightly longer than third segment, white, ventrally with grey streak, third segment dark grey, dorsally with white streak; scape shining dark greyish brown, ventrally lighter; antenna shining dark greyish-brown, apical ±10 segments white. Thorax and tegula shining greyish brown. Legs: shining dark grey, tibiae of fore- and midlegs with a white medial streak, tibiae of hindlegs with white medial and apical rings, spurs white with grey tips. Forewing ground colour bright orange, broadly edged shining blackish brown,

narrowest on costa, a wing pattern of three round tubercular, blackish brown edged, silver spots, first on dorsum at one-third length and with a patch of raised blackish brown scales, second on costa before one-half length, third on dorsum at two-thirds length, two small silver streaks, one in the fold near the base and the other on costa opposite of the distal dorsal spot, cilia dark greyish brown. Hindwing brownish grey with shining bronze reflection, cilia dark greyish brown. Underside shining brown. Abdomen dark brown, ventrally shining grey, anal tuft light grey.

Female. Wingspan 12-13 mm. Third segment of labial palps almost white. Silver spots and streaks on forewing larger than in male. Abdomen ventrally darker as in male, anal tuft dark brown dorsally.

Male genitalia (fig. 10). – Vinculum with a short saccus. Uncus a low hump. Gnathos arms very short, rounded and strongly dentose. Tegumen longer than wide. Valva slightly widening distally with very blunt, almost square, apex. Juxta lobes strongly widening distally with a large semicircular excavation on inner surface in distal half, apex dentose. Aedeagus strongly curved, apex furcate.

Female genitalia (fig. 13). – Apophyses posteriores about twice the length of apophyses anteriores. Sclerotization of eighth tergum laterally concave, posterior edge slightly convex. Lamella antevaginalis with a triangular sclerotization. Antrum rather wide with a rectangular, weakly sclerotized, dilation. Ductus bursae narrow, gradually widening toward corpus bursae, less than 1.5 x length of corpus bursae. Corpus bursae oval, widening distally and with a weak granular sclerotization of the lower part of the ductus bursae and the upper part of the corpus bursae.

Variation. – Stainton (1854) mentioned a variety with the orange ground colour of the forewing replaced by fuscous. Also Karsholt (1997) found this dark form in the collection of the BMNH and described the forewing as uniformly blackish, with only an orange suffusion indicating the original orange ground colour. This form has been reported only from England.

Biology

The larva has a brown head and a yellowish white body. It tunnels under the bark of the trunk of *Tilia* sp. from August to April. Bright brown frass is extruded and is visible in the cracks of the bark, indicating the presence of the larva. Pupation takes place in the gallery, from May to June (Sinev 1986, Stainton 1859). Lhomme ([1948-1949]), however, mentioned that on two occasions imagines were obtained from dried leaves, indicating that the larva had left its gallery prior to pupation. The adult flies from the end of May till August and can be found resting on the trunk of the food plant.

Distribution

Europe, and introduced into eastern North America (Klots 1942) (fig. 14).

Material examined. – CANADA: 1 ♂, 1 ♀, Ontario, Ottawa, C.E.F., 26.v.1998, afternoon on bark and foliage of *Tilia cordata*, J.-F. Landry (CNC). – UNITED STATES: 1 ♂, 1 ♀, Ithaca, New York, 28.vii.1960, R.W. Hodges (USNM).

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