

THE GENUS *BRYOTROPHA* IN THE NETHERLANDS (LEPIDOPTERA: GELECHIIDAE)

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The genus *Bryotropa* is one of the notoriously difficult genera of drab micromoths, of which often large numbers can be collected. They occur especially in open areas, such as heaths and dunes, but some occur in forests and urban areas. All are said to feed on mosses, but very little information is actually available on biology. Since no recent identification work is available for the European species, the nine Dutch species are here redescribed and illustrated, and keys are provided for externals and genitalia. The maps show the distribution in The Netherlands.

Among the microlepidoptera, the gelechiid genus *Bryotropa* Heinemann, is generally considered to be one of the more difficult groups. The genus *Bryotropa* has a Holarctic distribution but it seems to center in Europe and the Mediterranean. About species are known from this region, nine of which occur in The Netherlands. The species within this genus are often difficult to separate because of individual variation and a tendency to develop ecological forms. Studies on *Bryotropa* are scarce and often confusing. The genitalia in particular have been poorly described. The present paper gives a guide to the identification of the Dutch *Bryotropa*'s on external features and genitalia. The detailed distribution in The Netherlands is shown in maps.

METHODS

The measurements of the wingspan are given to the nearest half millimetre. In all, more than . specimens and over genitalia preparations were studied. Though some unrolled preparations (i.e. Pitkin) were also made, the male genitalia were usually embedded in a lateral position in order not to distort the shape of the gnathos.

GENERAL MORPHOLOGY (figs. -)

Species of *Bryotropa* are medium sized gelechiid moths with a wingspan of - mm. Members of this genus can be recognized by a single erect scale, pecten, on the first antennal segment, which is very unusual in the Gelechiidae. The labial palpus has a conspicuous furrowed brush on the underside of segment , segment is as long as or longer than segment . The exception is *B. galbanella*, where segment does not have a furrowed brush while segment is shorter than segment (fig.). The forewing is stretched, converging from the middle. The ground-colour is usually brown to very dark greyish brown, but can also be light brown, ochreous or even whitish. The wing markings comprise of a plical and two discal stigmata (fig.). The costal patch is opposite or slightly basad of the tornal patch, they are often fused to form a fascia. The hindwing is as broad as the forewing, trapezoidal with a pointed apex.

Male genitalia (fig.). The uncus is broad and smooth (very narrow in *B. domestica*), the socii at the base of the uncus are rather small, carrying several strong setae, in other species the socii are indistinct, consisting of lateral frames at the base of the uncus set with long hairs. The gnathos is

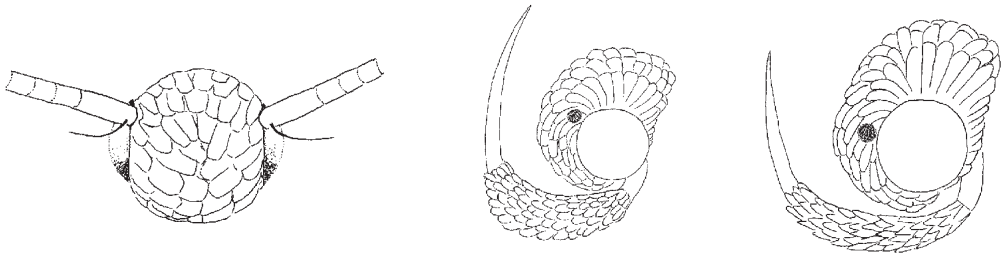


Figure -
 Head of *Bryotropha* species. – frontal view (labial palpa removed), showing single pecten scale on base of antenna; lateral view of *B. terrella*, palpus with segment longer than segment ; lateral view of *B. galbanella*, palpus with segment shorter than segment .

Figuur -
 Kop van een *Bryotropha*-soort. – frontaal aanzicht (labiale palpen verwijderd). De enkele 'pecten schub' aan de basis van de antenne is zichtbaar; lateraal aanzicht van *B. terrella*, palp met segment langer dan segment ; lateraal aanzicht van *B. galbanella*, palp met segment korter dan segment .

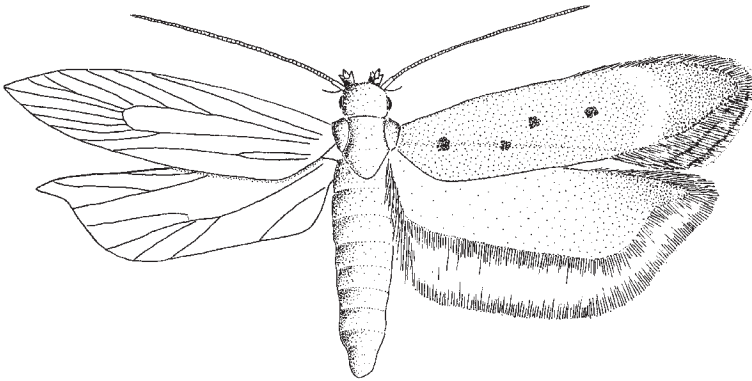


Figure
 Schematic view of moth with venation and forewing pattern.
 Figuur
 Schema van een mot met vleugeladering en kleurpatroon op voorvleugel.

well-developed, variable in shape but always hooked and with an acute apex. The tegumen is broad. The weakly sclerotized valva is simple and straight (club-shaped in *B. domestica*), the ventral margin carries a highly sclerotized falciform process, the sacculus (sacculus absent in *B. domestica*). Aedeagus long and slender with bulbous base and whip-like apex (whip-like apex absent in *B. domestica*).

Female genitalia (figs. ,). Segment well-sclerotized; the posterior margin dorsally concave or with a weak extension (dorsal tongue), ventrally smooth or with a more or less strong excavation. Ventral groove present, widening towards antrum. The distal end of the ventral groove there is often marked by a heavily sclerotized rim or v-shaped extension (fig.). Lamella postvaginalis often present, antrum usually short. Ductus bursae long; ductus seminalis arises about halfway

between antrum and bursa. Bursa oval with a large plate-like signum which either has two transverse folds or is more or less rectangular with strong spines on the corners.

LIFE HISTORY

Relatively little is known about the immature stages of *Bryotropha*. It is generally assumed that they all feed on mosses. The caterpillar has four pairs of abdominal prolegs and resides in a silken gallery in the food plant. It feeds externally. Pupation occurs in a an open network cocoon. The moths emerge several weeks later. All species, with the possible exception of *B. desertella*, seem to be univoltine. *Bryotropha* species are nocturnal and become active around dusk, they are often attracted to light.

CHECKLIST

- Bryotropha Heinemann,
- basaltinella (Zeller,)
- umbrosella (Zeller,)
- mundella* (Douglas,)
- portlandicella* (Richardson,)
- affinis (Haworth,)
- similis (Stainton,)
- fuliginosella* (Snellen,)
- senectella (Zeller,)
- terrella (Denis & Schiffermiller,)
- desertella (Douglas,)
- galbanella (Zeller,)
- domestica (Haworth,)

KEYS TO BRYOTROPHA SPECIES

Based on external features

- Labial palpus with segment shorter than segment (fig.), segment without a conspicuous furrowed brush . . . *B. galbanella*
- Labial palpus with segment longer than segment (fig.), segment with a conspicuous furrowed brush
- Small species, wingspan - mm
- Large species - mm

- First discal stigma above plical stigma (pl. : , :)
- First discal stigma distal of plical stigma (pl. : , , :-)
- Ground colour dark greyish brown wing-markings moderately prominent (pl. :), wingspan - mm *B. basaltinella*
- Ground colour ochreous grey, wingmarkings very prominent (pl. :), wingspan - mm *B. domestica*
- Ground colour clearly grey or whitish (pl. : ,) *B. umbrosella* (part)
- Ground colour otherwise
- Ground colour blackish
- Ground colour whitish brown, ochre, light or dark brown
- Patch of conspicuous pale scales beyond plical stigma (pl. : , : ,)
- Plical stigma without patch of conspicuous pale scales
- Pale scales white; costal and ternal patch well-developed, rarely fused; forewing very dark without pale irroration (pl. :)
- *B. umbrosella* (part)
- Pale scales yellowish; costal and ternal patch often fused to a thin fascia, forewing with pale irroration (pl. : ,) . . . *B. affinis* (part)
- Forewing with pale irroration
- *B. affinis* (part)
- Forewing without pale irroration
- Costal and ternal patches well-developed, white, contrasting with very dark ground-colour (pl. :) *B. umbrosella* (part)
- Costal and ternal patches absent or ill-defined, yellowish or whitish; if well-developed, yellow (pl. : ,) *B. similis*
- Wingmarkings prominent, ground colour ochre, to very light brown (pl. : ,); small species, wingspan - mm . . . *B. affinis* (part)
- Wingmarkings obscure, ground colour ochre, light to dark brown
- Fringe with one dark cilia line; head with yellow cheeks, contrasting with dark vertex (pl. : ,); wingspan - mm . . . *B. senectella*
- Fringe with two dark cilia lines; vertex, frons and cheeks concolourous (pl. :), wingspan

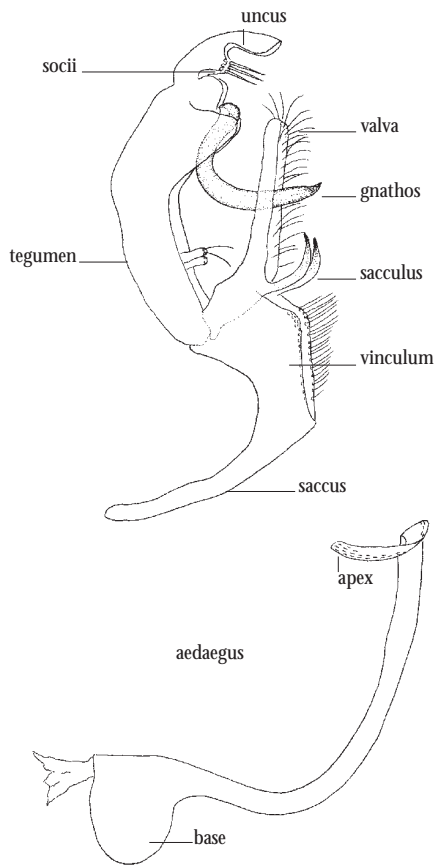


Figure
Male genitalia of *Bryotropha umbrosella* lateral view,
with terminology.
Figuur
Mannelijke genitaliën van *Bryotropha umbrosella* lateraal
aanzicht, met terminologie.

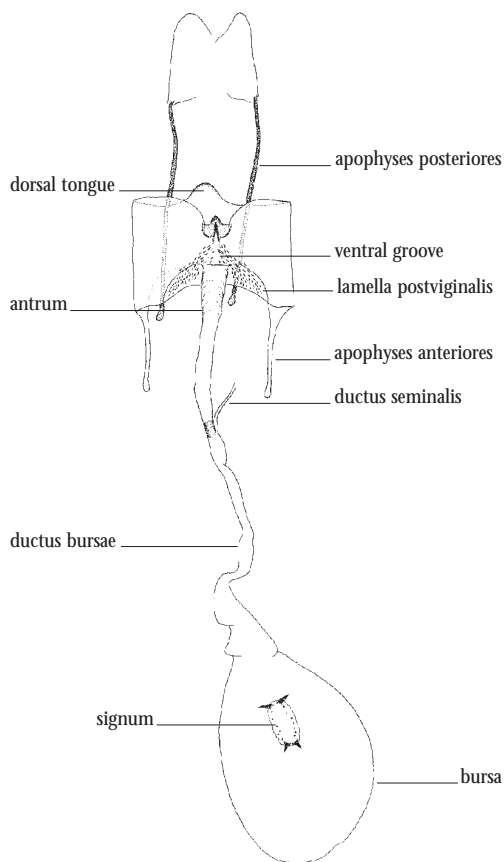


Figure
Female genitalia of *Bryotropha umbrosella*, ventral view,
with terminology.
Figuur
Vrouwelijke genitaliën van *Bryotropha umbrosella*,
ventraal aanzicht, met terminologie.

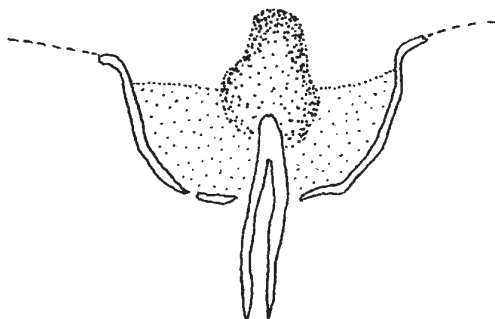


Figure
Female genitalia of *Bryotropha umbrosella*, distal part of
ventral groove in detail.
Figuur
Vrouwelijke genitaliën van *Bryotropha umbrosella*,
distale deel van de ventrale groeve in detail.

Plate
Adults of *Bryotropha* species. Photographs E. J. van Nieukerken.



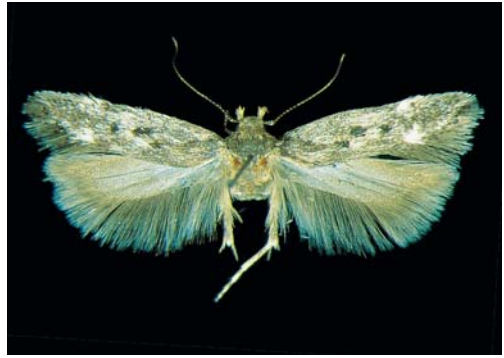
B. basaltinella, Twello (Province of Gelderland), coll. Wolschrijn.



B. umbrosella, dark form, Callantsoog, Zwanenwater (Province of Noord-Holland), coll. Koster.



B. umbrosella, Terschelling (Province of Friesland), coll. Bot.



B. umbrosella, Ameland (Province of Friesland), coll. Kuchlein.



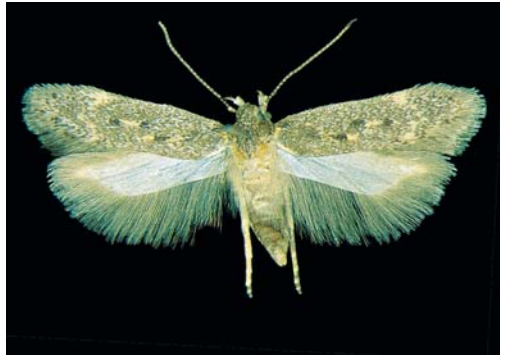
B. umbrosella, pale form, Callantsoog, Zwanenwater, (Province of Noord-Holland), coll. Koster.

Plate

Adults of *Bryotropha* species. Photographs E. J. van Nieuwerkerken.



B. affinis, Venray (Province of Limburg), coll. Rutten.



B. affinis, Callantsoog, Zwanenwater (Province of Noord-Holland), coll. J.C. Koster.



B. affinis, Callantsoog, Zwanenwater (Province of Noord-Holland), coll. J.C. Koster.



B. affinis, Callantsoog, Zwanenwater (Province of Noord-Holland), coll. J.C. Koster.



B. similis, Vierlingsbeek (Province of Noord-Brabant), coll. Rutten.



B. similis, Vierlingsbeek (Province of Noord-Brabant), coll. Rutten.

Plate
Adults of *Bryotropha* species. Photographs E. J. van Nieukerken.



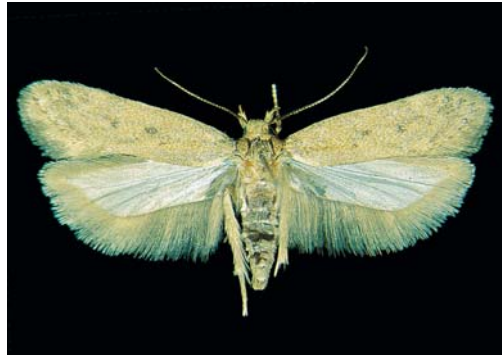
B. senectella, Venray (Province of Limburg), coll. Rutten.



B. senectella, Callantsog, Zwanenwater (Province of Noord-Holland), coll. Koster.



B. terrella, Huygevoort (Province of Noord-Brabant), coll. Kuchlein.



B. terrella, Ameland (Province of Friesland), coll. Kuchlein.



B. desertella, Callantsog, Zwanenwater (Province of Noord-Holland), coll. Koster.



B. desertella, Amsterdamse Waterleidingduinen (Luchterduinen) (Province of Noord-Holland), coll. Wolschrijn.

Plate

Adults, larvae and habitats of *Bryotropha* species. Photographs E. J. van Nieukerken (, ,), author (), C. van der Berg (,).



B. galbanella, Bussloo (Province of Gelderland), coll. Wolschrijn.



B. domestica, England, Norwich, coll. Rutten.



B. affinis, caterpillar.



Loonse en Drunense duinen (Province of Noord-Brabant). Habitat of *B. affinis*, *B. senectella* and *B. desertella*.



Hoge Veluwe (Province of Gelderland). Habitat of *B. affinis*, *B. similis* and *B. senectella*.



Coepelduinen, Katwijk (Province of Zuid-Holland). Habitat of *B. umbrosella*, *B. affinis* and *B. desertella*.

- mm *B. desertella* (part)
- Ground colour light to dark brown, occasionally ferruginous, forewing rather broad, without indication of median streak (pl. : ,), wingspan - mm *B. terrella*
- Ground colour ochreous, light to dark brown, forewing rather narrow, regularly with faint median streak (pl. :), wingspan - mm *B. desertella* (part)

Based on male genitalia

- Sacculus absent, aedeagus with acute apex (fig. ,) *B. domestica*
- Sacculus present, aedeagus with whip-like apex
- Anterior end of gnathos and surface of vinculum covered with microtrichia (figs. -)
- Anterior end of gnathos and surface of vinculum without microtrichia (figs. -)
- Gnathos slender, very long and wavy (fig.) *B. galbanella*
- Gnathos very large and broad
- Apex of gnathos s-shaped (fig.) . *B. terrella*
- Gnathos without s-shaped apex (fig.) *B. desertella*
- Gnathos small and squat, length about twice greatest width
- Gnathos slender and longer, length clearly more than twice greatest width
- Gnathos gradually converging into a sharp sclerotized point, anterior end not protruding (fig.) *B. basaltinella*
- Gnathos angular, point not markedly sclerotized, anterior end bulbous, clearly protruding (fig.) *B. senectella*
- Gnathos thickened at or before the middle, tegumen covered with to spikes of different sizes (fig.) *B. similis*
- Gnathos without clear thickening, tegumen covered with or less small sized spikes (figs. ,)
- Curvation of gnathos gradual, with a large radius (fig.) *B. umbrosella*
- Curvation of gnathos rather abruptly, with a small radius (fig.) *B. affinis*

Based on female genitalia

- Signum with two transverse folds (figs. -) .
- Signum without two transverse folds (figs. -)
- Segment ventrally decorated with spines (fig.) *B. galbanella*
- Segment ventrally without spines
- Segment ventrally deeply excavated (fig.) *B. desertella*
- Segment not or slightly excavated
- Segment dorsally with shallow excavation, antrum triangular and heavily sclerotized (fig.) *B. terrella*
- Segment dorsally with small triangular scutulum, antrum short (fig.) *B. domestica*
- Spines on segment wedge-shaped, lamella postvaginalis without lobes (fig.) *B. umbrosella*
- Spines on segment small, needle-shaped (figs. , -)
- Lamella postvaginalis large with two lobes (fig.) *B. senectella*
- Lamella postvaginalis without lobes
- Signum posteriorly with two very long spines (fig.) *B. affinis*
- Signum posteriorly without two very long spines
- Signum square or rounded, rather small (fig.) *B. basaltinella*
- Signum rectangular, length nearly twice width (fig.) *B. similis*

DESCRIPTIONS OF SPECIES

Bryotropha basaltinella (Zeller)
(figs. , , ; pl. :)

Diagnosis

The position of the first discal right above the second plical stigmata *B. basaltinella* only shares with *B. domestica*. The latter has a larger wingspan (- mm compared to - mm for *B. basaltinella*), and a distinctly lighter ground colour, causing the wingmarkings to be more prominent.



Figure - Male genitalia of *Bryotropha* species, lateral view, aedeagus illustrated separately, with slide numbers. *B. basaltinella*, *B. umbrosella*, *B. affinis*, *B. similis*, *B. senectella*.

Figuur - Mannelijke genitaliën van *Bryotropha*, lateraal aanzicht, aedeagus apart getekend, met preparaatnummers. *B. basaltinella*, *B. umbrosella*, *B. affinis*, *B. similis*, *B. senectella*.

Description of imago (pl. :)

Wingspan - mm. Head with frons and cheeks pale ochreous to ochreous, vertex ochreous-grey to dark ochreous-grey yellow; antenna ochreous ringed fuscous; labial palpus with segment longer than segment , segment pale ochreous to ochreous, suffused fuscous on the outside, segment usually dark fuscous, sometimes suffused ochreous on the inside, occasionally ochreous all over. Thorax fuscous brown.

Forewing light to dark greyish brown, exposure of the pale ochreous bases of the scales can give the wing a speckled appearance; discal and plical stigmata blackish, usually clearly visible, first discal directly above plical, often fused, forming a large blackish patch just before the middle of the wing; patches of pale ochreous to ochreous scales often present basad and beyond the stigmata; costal and tornal patch ochreous and usually well-developed, often fused to form an irregular fascia, its inner margin angled at about °; subapical area irrorated with very dark scales, occasionally darkening this area; cilia ochreous to ferruginous with one dark ciliary line and conspicuous pale yellow tips. Hindwing of equal width to forewing, pale fuscous, darker towards apex; cilia ochreous with broad dark ciliary line and pale yellowish tips in dark specimens, uniformly ochreous in light specimens. Abdomen pale ochreous grey above, mixed ochreous and ochreous grey below; anal tuft of male pale ochreous.

Male genitalia (fig.). Gnathos squat, anterior end not protruding, gradually converging into a sharp sclerotized apex; tegumen alongside gnathos covered with to (occasionally up to) spines of different sizes; ventral margin of vinculum with a weak protrusion on the bending site.

Female genitalia (fig.). Segment with a small dorsal tongue; ventrally with shallow excavation, covered by a frame; ventral groove distally marked by a small, well-sclerotized, oval or horse-shoe-shaped rim; a moderate cover of tiny microtrichia lateral of the ventral groove; lamella postvaginalis rather small, width about times

greatest height; bursa rather small, signum square or rounded, with strong spines on the corners.

Life history

Larva creamy white with a pale brown dorsal line and dark spots; head and prothoracic plate blackish (Spuler). It feeds from March to May on moss growing on walls and roofs, food plant *Tortula ruralis* (Hedw.) G.M.S. (M.F.V. Corley personal communication). Imago univoltine from late May to late August. Although moderately common from the start of the season onwards, its main peak is from late July to mid August.

Distribution (fig.)

Local, confined to the southern and eastern part of The Netherlands where it is found in urbane areas. In several localities which have been investigated over a number of years (Nuenen, Twello, Venray), the moth has become very common in recent years.

Known from southern and central Europe. Absent from the northern part of Great Britain, absent also from Denmark and Fennoscandia.

Bryotropa umbrosella (Zeller)

(figs. , , ; pl. : -)

Diagnosis

The white costal and tornal patches on a very dark forewing, distinguish *B. umbrosella* from *B. affinis* and *B. similis*. Very light forms of *B. umbrosella* are greyish or greyish white, while light forms of *B. affinis* are yellowish or brownish (see under *B. affinis*). Dark specimens in which the stigmata are not bordered by white scales and in which the costal and tornal patches are rather indistinct, can resemble *B. similis*. The latter is somewhat larger and has a glossy appearance whereas *B. umbrosella* has a rather matt ground-colour.

Description of imago (pl. : -)

Wingspan . - . mm. Head with frons pale ochreous to ochreous, vertex very dark greyish brown; antenna dark fuscous; labial palpus with

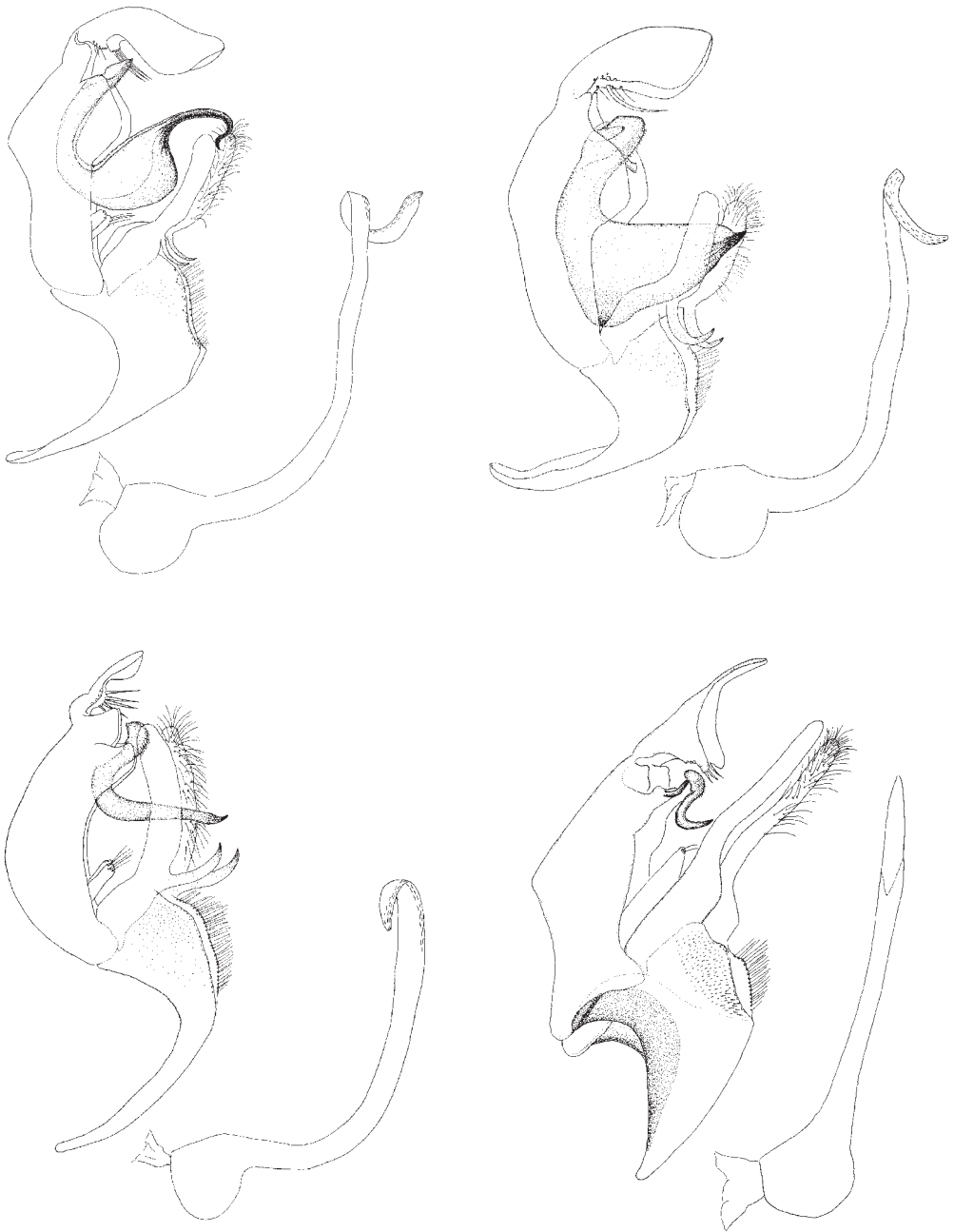


Figure -
 Male genitalia of *Bryotropha* species, lateral view, aedeagus illustrated separately, with slide numbers. *B. terrella*,
B. desertella, *B. galbanella*, *B. domestica*,

Figuur -
 Mannelijke genitaliën van *Bryotropha*, lateraal aanzicht, aedeagus apart getekend, met dianummers. *B. terrella*,
B. desertella, *B. galbanella*, *B. domestica*,

segment longer than segment , ochreous, heavily suffused fuscous on the outside. Thorax of same colour as forewing. Forewing very dark greyish brown; discal and plical stigmata blackish, but barely visible, first discal slightly beyond plical, a small patch of prominent white scales often beyond the plical, patches of white scales may also be present between and beyond the discal stigmata; costal and tornal patches well-developed, clear white, rarely fused; subapical area irrorate with very dark scales, cilia dark grey. Hindwing of equal width to forewing, pale fuscous, darker towards apex, cilia concolorous. Abdomen dark brownish grey above, light grey below, anal tuft of male ochreous to pale fuscous. Extreme local or ecological variations occur. Especially in coastal areas, specimens often have a lighter ground colour due to a weakly to heavily irroration with greyish white scales. Depending on the extend of this irroration the forewing can appear marbled with patches of dark and light scales, or even whitish all over (form *mundella*, pl. :).

Male genitalia (fig.). Gnathos slender, gradually bending forwards in a curve with a large radius. Tegumen alongside gnathos covered with to (occasionally none) small spines.

Female genitalia (fig.). Segment with a prominent dorsal tongue; ventrally with a well-sclerotized protrusion set in the middle of a semi-circular excavation, marking the distal end of the ventral groove; a large area lateral of the ventral groove densely covered with strong wedge-shaped microtrichia; lamella postvaginalis large without lobes, width about times the height; bursa oval to round, signum slightly rectangular, square or rounded with strong spines on the corners.

Life history

Larva reddish brown with a dark brown head and prothoracic plate, from April to early June. Food plants unknown; Spuler () mentions mosses growing on walls, but this is highly questionable given its preference for dry grounds and its absence from build up areas. Imago univoltine,

from late May to early August with a peak in June. The moths become active just before dusk (O. Karsholt personal communications).

Distribution (fig.)

Restricted to dry soils, often characterized by heather. Throughout most of Europe. Probably though, a more northerly species as it undoubtedly is much scarcer in southern Europe and absent from Italy (Karsholt & Huemer).

Remarks

Douglas () considered the white form of *B. umbrosella* a species of its own which he described as *B. mundella* (Douglas). For some time even the greyish forms were considered a genuine species: *B. portlandicella* (Richardson). However, a recent study confirmed that both *B. mundella* and *B. portlandicella* are synonyms of *B. umbrosella* (Rutten & Karsholt).

Bryotropha affinis (Haworth)

(figs. , , ; pl. : -)

Diagnosis

The speckled forewing, the ochreous scales beyond the plical and the ochreous costal and tornal patch are distinctive features. Both *B. umbrosella* and *B. similis* lack the speckled forewing; the former has clear white costal and tornal patches, the latter lacks the conspicuous light scales beyond the plical. The ochreous colour distinguishes extreme light forms of *B. affinis* from those of *B. umbrosella* (see there).

Description of imago (pl. : -)

Wingspan . - . mm. Head with frons pale ochreous to ochreous, cheeks ochreous, dorsally darkened, vertex dark blackish grey, sometimes mixed ochreous; antenna ochreous ringed fuscous; labial palpus with segment longer than segment , ochreous, more or less heavily suffused fuscous on the outside, segment usually darker than segment . Forewing dark greyish brown the greyish tone sometimes prominent, the exposed creamy to bright ochreous bases of the scales give

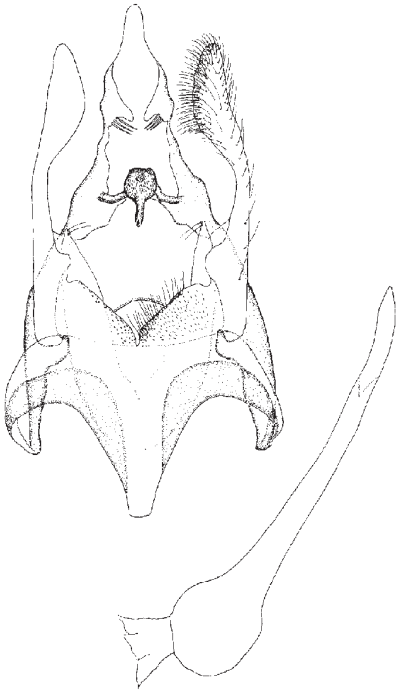


Figure
Male genitalia of *Bryotropha domestica*, ventral view, slide
Figuur
Mannelijke genitaliën van *Bryotropha domestica*, ventraal aanzicht, preparaatnummer

the forewing a speckled appearance; discal and plical stigmata blackish brown, first discal slightly beyond plical, beyond the plical nearly always a small patch of conspicuous pale ochreous to ochreous scales, similar scales can also be present basad of the plical and between and beyond the discal stigmata; costal and tornal patches pale ochreous to ochreous, occasionally whitish, often fused to form an irregular fascia, the inner margin angled at about 90° ; subapical area irrorate with very dark scales, slightly darkening this area; cilia brownish with a dark ciliary line and pale yellow tip. Hindwing pale fuscous, darker towards apex, cilia concolorous. Abdomen glossy ochreous grey, mixed creamy white and greyish brown below; anal tuft of male creamy brown to ochreous. Profound variations occur in coastal areas, here,

specimens are often not as dark as their inland counterparts due to a weak to heavy irroration with yellowish scales. In very light forms the stigmata are very distinct, the costal and tornal patches very indistinct, while dark scales are limited to the terminal area (pl. :).

Male genitalia (fig.). Gnathos slender, rather abruptly bending forwards about 90° ; tegumen alongside gnathos covered with to small spines.

Female genitalia (fig.). Segment with a small dorsal tongue; ventrally with a well-sclerotized protrusion set in the middle of a small excavation, marking the distal end of the ventral groove; a moderate cover of tiny microtrichia lateral of the ventral groove; width of lamella postvaginalis about five times greatest height; bursa oval to round, signum elongated trapezoidal, with two conspicuously large spines on the corners of the broad posterior side.

Life history

Larva (pl. :): head and prothoracic plate dark brown, body brown with small blackish spots, feeds on moss on walls in which it makes a silken gallery to live in. Full-grown larvae can be found from the end of March until early June. Pupa light brown, three segments with free movement. Pupation occurs in an open network cocoon. Imago: univoltine, from mid May to late August, most common in June and July. Active from dusk onwards (O. Karsholt personal communication).

Distribution (fig.)

Widespread and rather common on dry soils; somewhat less common in urbane areas.

Throughout Europe.

Bryotropha similis (Stainton)

(figs. , , ; pl. : ,)

Diagnosis

The dark and glossy forewing and the absence of conspicuous light scales beyond the plical distinguish *B. similis* from *B. affinis* and *B. umbrosella*.

Even in very dark forms of *B. senectella* the head has prominent ochreous cheeks contrasting with the greyish brown vertex; in *B. similis* the cheeks have the same colour as the vertex; also, when a fascia is present, the inner angle is approximately 90° in *B. similis* but 120° or less in *B. senectella*.

Description of imago (pl. : ,)

Wingspan . - . mm. Head with frons creamy to ochreous-grey, cheeks dark ochreous-grey or as vertex, vertex glossy dark grey-brown; antenna inconspicuously ochreous ringed fuscous; labial palpus with segment longer than segment , segment ochreous, weakly to heavily suffused fuscous on the outside, segment ochreous grey. Thorax dark fuscous. Forewing glossy greyish brown to blackish brown; discal and plical stigmata blackish, barely visible, first discal slightly beyond plical, a few inconspicuous pale whitish scales may be present beyond the plical; costal and tornal patches usually weakly developed, occasionally absent, sometimes well-developed, pale whitish, pale ochreous to bright yellow, sometimes fused to form a fascia with an inner angled of about 90° ; subapical area irrorate with very dark scales, often darkening this area; cilia variable, dark grey in dark specimens to ochreous with dark ciliary line in pale specimens, tips pale ochreous. Hindwing of equal width to forewing, fuscous, darker towards apex; cilia concolorous. Abdomen dark glossy fuscous above, pale fuscous below, anal tuft of male pale fuscous.

Male genitalia (fig.). Anterior end of gnathos ball-shaped, protruding; gnathos slanting back before abruptly curving forward, reaching its greatest width after the curvation, from there on converging into an acute apex. Tegumen alongside gnathos decorated with to spikes of different sizes.

Female genitalia (fig.). Segment with a small dorsal tongue; ventrally with a well-sclerotized protrusion set in the middle of a small excavation, marking the distal end of the ventral groove; a moderate cover of tiny microtrichia

lateral of the ventral groove; width of lamella postvaginalis at least five times greatest height; bursa oval to round, signum rectangular, length about two times the width, covered with several rows of small spines and with strong spines on the corners.

Life history

Larva: head and prothoracic plate dark brown; body brown, feeds on moss growing on walls (Meyrick). Possible foodplants are *Hypnum cupressifolium* Hedw., *Brachythecium rutabulum* (Hedw.) Schimp., *Tortula ruralis* (Hedw.) G.M.S., *T. intermedia* (Brid.) De Not., *Grimmia pulvinata* (Hedw.) Sm., *Bryum capillare* Hedw. and *B. caespitium* Hedw. (see Stainton). Imago: univoltine, occurring from early June to late August with a clear peak in early July.

Distribution (fig.)

Widespread and often common in open, sometimes sparsely vegetated country and urban areas; very rare in dune areas (L. Bot and J.C. Koster personal communications). Found throughout Europe, but definitively more common in the north.

Remarks

B. fuliginosella (Snellen), which was recently synonymised with *B. similis* (Karsholt & Riedl), is a brownish form of *B. similis* with blackish wingtips.

Bryotropha senectella (Zeller)

(figs. , , ; pl. : ,)

Diagnosis

The brownish colour distinguishes *B. senectella* from the three blackish species, *B. umbrosella*, *B. affinis* and *B. similis*. Other distinct features include the ochreous cheeks, contrasting with the vertex of the head, and colour and shape of the fascia. Very small forms of *B. desertella* have a more rounded forewing with several cilia lines, compared to only one in *B. senectella*.

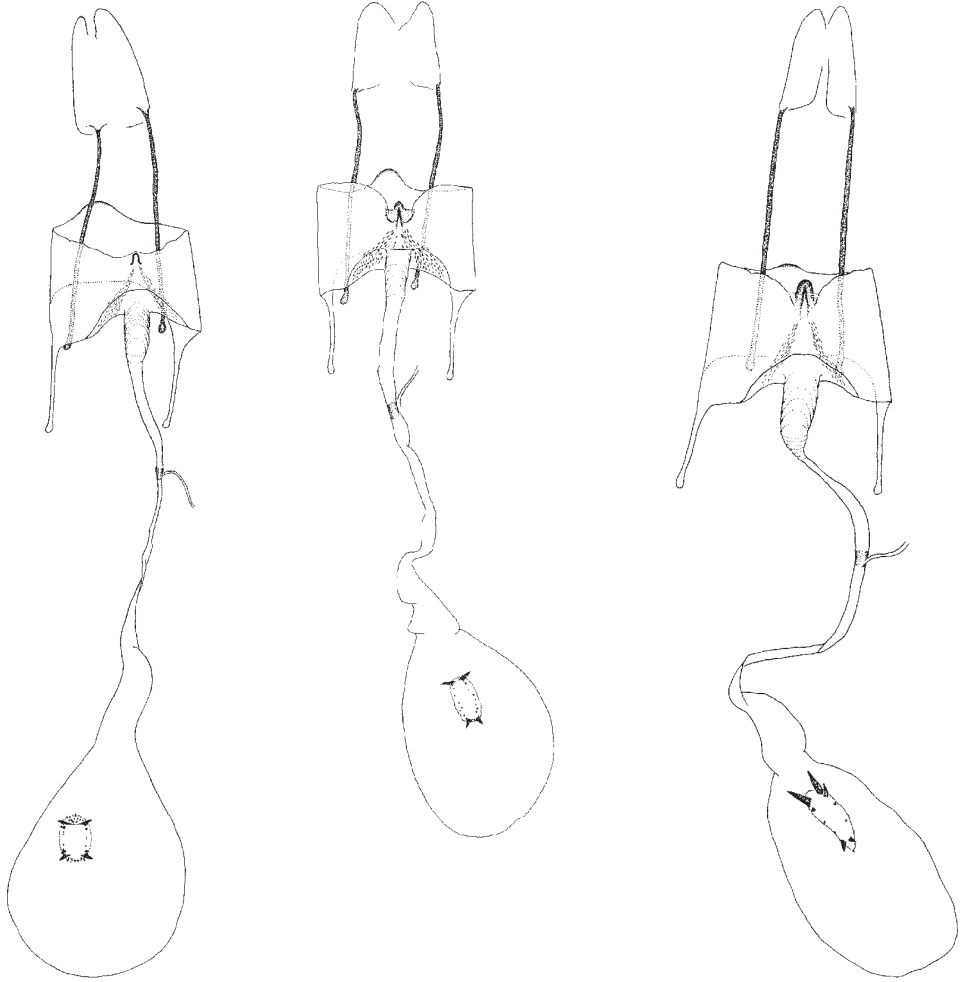


Figure -
 Female genitalia of *Bryotropha* species, ventral view, with slide numbers. *B. basaltinella*, 1, *B. umbrosella*, 2, *B. affinis*, 3.

Figuur -
 Vrouwelijke genitaliën van *Bryotropha*, ventraal aanzicht, met preparaatnummers. *B. basaltinella*, 1, *B. umbrosella*, 2, *B. affinis*, 3.

Description of imago (pl. : ,)

Wingspan - . mm. Head with frons ochreous, cheeks ochreous, rarely brown, vertex normally dark grey-brown, appearing as a small dark line running over the middle of the head, flanked by ochreous cheeks; antenna dark brown, labial palpus with segment longer than segment ,

ochreous, segment suffused fuscous on the outside. Thorax brown to dark brown. Forewing brown to very dark brown; discal and plical stigmata blackish, often rather obscure, first discal slightly beyond plical, a small patch of inconspicuous ochreous scales beyond plical, similar scales may also be present basad of plical and between

the discal stigmata; costal and tornal patches usually weakly developed, sometimes absent, light brown, occasionally orange-brown, when fused to form a fascia the inner angle is $^{\circ}$ or less, subapical area irrorate with dark scales, sometimes darkening this area and accentuating the fascia; cilia brown with one dark ciliary line and pale ochreous tips. Hindwing of equal width to forewing, pale brownish, darker towards apex, cilia concolorous. Abdomen dark ochreous grey to grey above, mixed ochreous and dark ochreous grey below; anal tuft of male ochreous.

Male genitalia (fig.). Gnathos squat, anterior end bulbous, clearly protruding, halfway with an abrupt bend forward; apex weakly sclerotized; tegumen alongside gnathos densely covered with to spines of different sizes; ventral margin of vinculum with clear protrusion at bending site.

Female genitalia (fig.). Segment with a prominent dorsal tongue; ventrally with a semi-circular excavation reaching until $/$ of the segment, covered by an indented frame; ventral groove distally with a small, moderately sclerotized, v-shaped rim; a large area lateral of the groove densely covered with microtrichia; lamella postvaginalis high with two lobes, width about four times greatest height; bursa rather small, signum square or rounded with strong spines on the corners.

Life history

Larva: head and prothoracic plate dark brown, body brown (Spuler), from April to May in moss on walls. Imago: univoltine, from mid-June to early September, peak from mid July to mid August.

Distribution (fig.)

Widely distributed and very common, especially on dry grounds. Throughout Europe.

Bryotropha terrella (Dennis & Schiffermüller)
(figs. , , ; pl. : ,)

Diagnosis

Only to be confused with large dark inland forms

of *B. desertella*. In general, *B. desertella* is smaller and more elegant due to a more narrow forewing, often with the indication of a median streak, a feature absent in Dutch forms of *B. terrella*.

Occasionally it is necessary to study the genitalia. Females can be recognized by brushing away some scales from the abdominal segment which reveals whether segment is excavated ventrally (*B. desertella*) or not (*B. terrella*).

Description of the imago (pl. : ,)

Wingspan - , mm. Head of same colour as forewing; antenna ochreous ringed fuscous; labial palpus with segment longer than segment , ochreous, weakly to heavily suffused fuscous on the outside, sometimes fuscous all over. Thorax of the same colour as forewing. Forewing variable, often dark brown or dark greyish brown, occasional ferruginous or light brown; discal and plical stigmata blackish brown, moderately well-developed, sometimes very diffuse, occasionally prominent; costal and tornal patches of the same colour as the forewing, fused to form a fascia with an inner angle of $^{\circ}$ or less, accentuated by the presence of dark scales basad but especially beyond, when these dark scales are absent the fascia is indistinct; terminal area lined with very dark scales, irroration with dark scales may darken the whole subapical area; cilia concolorous with at least two dark cilia lines and pale yellowish tips. Hindwing of equal width to forewing, pale fuscous, darker towards tip, cilia variable, concolorous in very dark specimens, ochreous with two dark cilia lines in pale specimens, tips pale ochreous. Abdomen ochreous grey to dark grey above, pale ochreous below; anal tuft in male ochreous. Sexual dimorphism weakly pronounced, very dark specimens are usually males, very light usually females.

Male genitalia (fig.). Uncus very broad; socii small with - strong setae; gnathos very large, anterior end covered with microtrichia, posterior end with a very characteristic s-shaped apex; sacculus comparatively small; surface of vinculum covered with microtrichia.

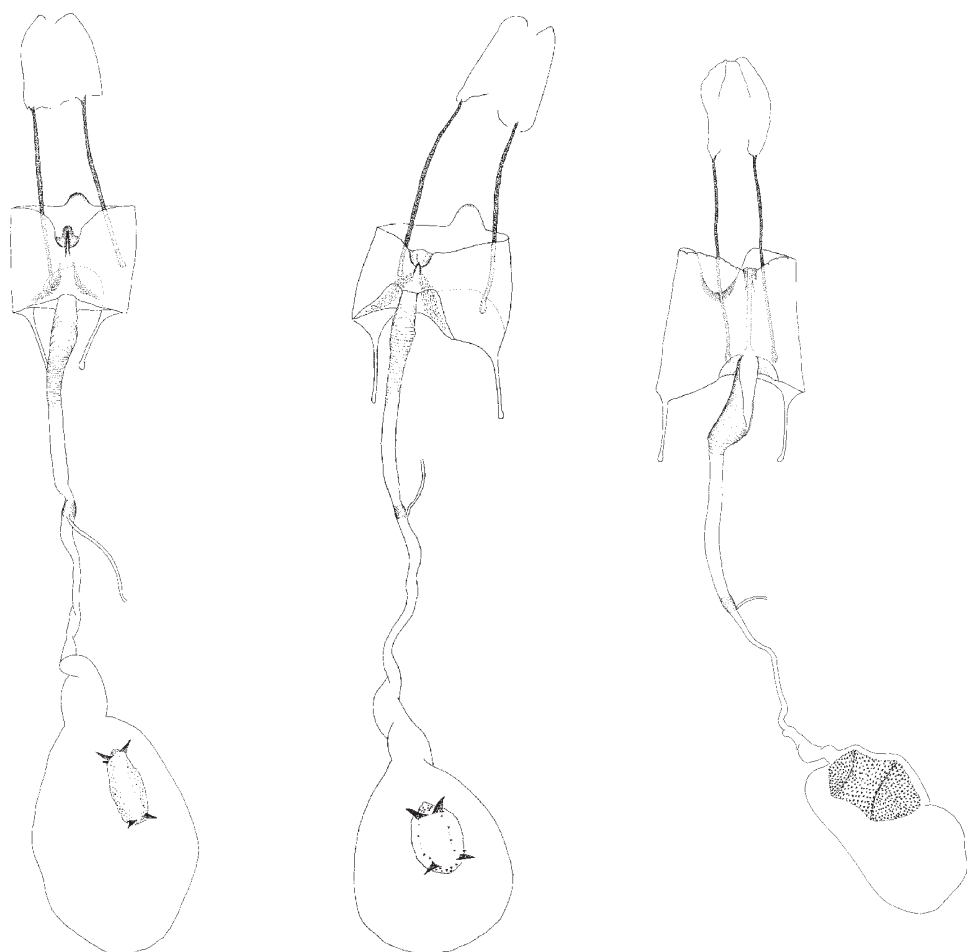


Figure - Female genitalia of *Bryotropha* species, ventral view, with slide numbers. *B. similis*, *B. senectella*, *B. terrella*.

Figuur - Vrouwelijke genitaliën van *Bryotropha*, ventraal aanzicht, met preparaatnummers. *B. similis*, *B. senectella*, *B. terrella*.

Female genitalia (fig.). Segment dorsally strongly concave with a heavily sclerotized rim; ventral side with a very narrow groove, widening towards the antrum; microtrichia absent; antrum heavily sclerotized, triangular in shape; ductus bursa very long, bursa oval, signum with two folds, middle section square.

Life history

Larva: head and prothoracic plate black; body grey-green with three indistinct longitudinal lines and black spots. The caterpillar lives in a silken gallery on the ground. Snellen () observed the caterpillar feeding on grasses. Imago: univoltine, from late May to late August, over most of this period very common.

Distribution (fig.)

Widespread and very common everywhere.
Throughout Europe.

Bryotropha desertella (Douglas)

(figs. , , ; pl. : ,)

Diagnosis

See under *B. terrella*.

Description of imago (pl. : ,)

Wingspan - mm. Head of same colour as forewing; antenna ochreous ringed fuscous, labial palpus with segment longer than segment , ochreous, weakly to heavily suffused fuscous on the outside. Thorax of the same colour as forewing. Forewing variable, ochreous, light brown, orange brown, dark brown or greyish, sometimes with a faint indication of a dark median streak; discal and plical stigmata blackish, often rather diffuse, first discal slightly beyond plical; costal and tornal patches usually of same colour as forewing fused to form fascia with an inner angle of ° or less, accentuated by dark scales basad and beyond; subapical area irrorate with very dark scales, sometimes darkening this area, in light forms the dark scales are restricted the terminal area; cilia concolorous with at least two dark cilia lines and pale yellow tips. Hindwing pale ochreous to pale fuscous, darker towards apex; cilia concolorous, in light forms with two dark cilia lines. Abdomen yellowish grey to grey above, pale ochreous to pale grey below, anal tuft of male pale ochreous to pale grey.

Male genitalia (fig.). Uncus very broad; socii very small with - strong seta; gnathos very large, triangular, anteriorly covered with microtrichia, posteriorly with a heavily sclerotized sharp apex; sacculus comparatively small; surface of vinculum covered with microtrichia.

Female genitalia (fig.). Segment dorsally concave with a weakly sclerotized rim; ventrally with a deep excavation to about / of the segment; microtrichia absent; antrum small and

weakly sclerotized; bursa oval; signum with two folds, middle section square.

Life history

Larva: unknown. Imago: univoltine. This earliest *Bryotropha* species can be found from mid May to late August. The graph of its flying period is unlike that of the other species in showing two clear peaks. The major one very early in the season, from late May to early June, the second one very late in the season, around mid August, hinting at the possibility of a second generation.

Distribution (fig.)

Widespread but with a clear preference for dryer grounds like heather landscapes where this moth can be very common. Throughout Europe.

Bryotropha galbanella (Zeller)

(figs. , , ; pl. :)

Diagnosis

The greyish ground colour of the forewing combined with the broad, unicolorous dark hindwings, immediately distinguish this rather large species from other *Bryotropha*.

Description of imago (pl. :)

Wingspan - . mm. Head with frons light to dark grey, vertex and cheeks pale ochreous grey; antenna ochreous ringed fuscous, pecten at the base of antenna sometimes absent; labial palpus with segment shorter than segment , segment without a ventral brush, ochreous, suffused greyish brown on the outside. Thorax dark greyish ochreous to dark greyish brown. Forewing dark greyish ochreous, irrorated with a large number of pale, creamy ochreous to orange-ochreous scales and a small number of very dark scales; discal and plical stigmata blackish, first discal slightly beyond plical, second discal very prominent; costal and tornal patches pale creamy ochreous, fused to form a fascia; terminal area outlined by small groups of very dark scales, separated by pale creamy-ochreous scales; cilia dark grey with pale ochreous tips. Hindwing of equal

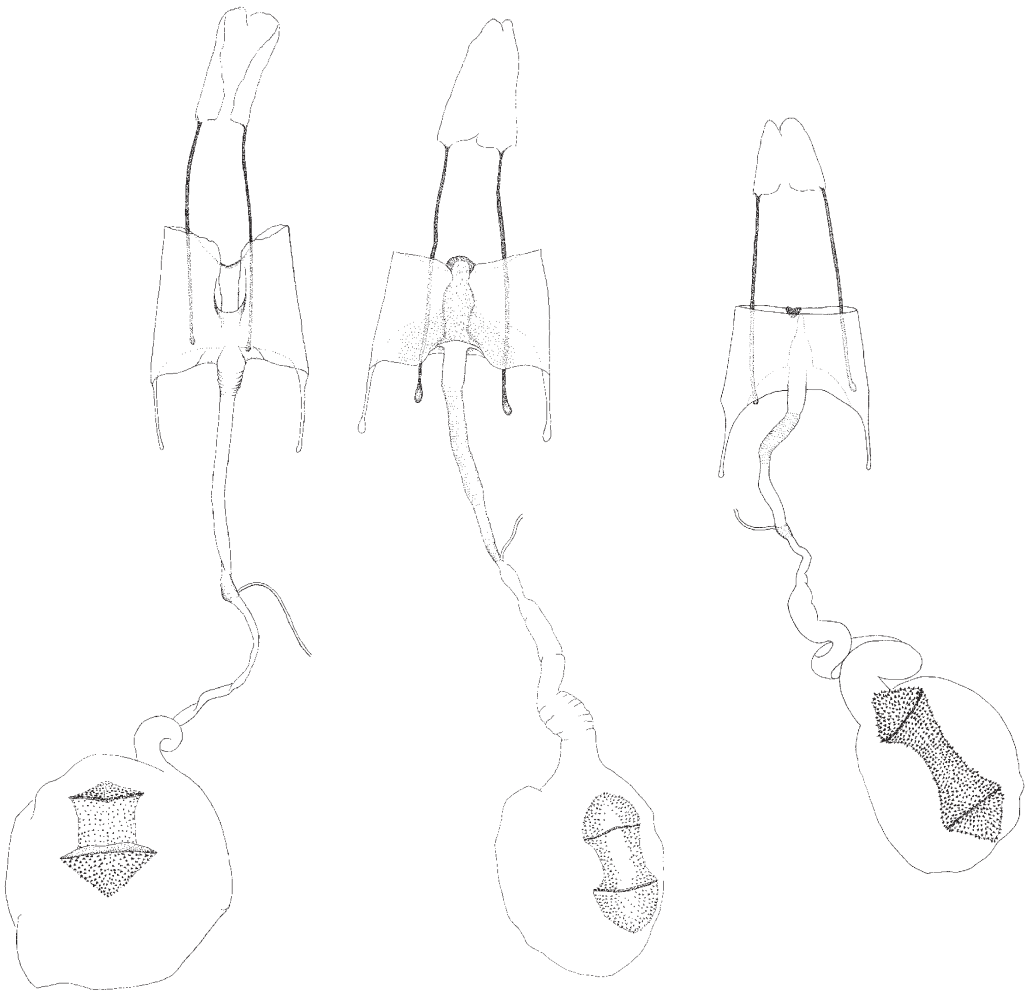


Figure -
 Female genitalia of *Bryotropha* species, ventral view, with slide numbers. *B. desertella*, , *B. galbanella*,
 , *B. domestica*, .

Figuur -
 Vrouwelijke genitaliën van *Bryotropha*, ventraal aanzicht, met preparaatnummers. *B. desertella*, , *B.*
galbanella, , *B. domestica*, .

or slightly greater width to forewing, apex blunt, dark grey, no local darkening; cilia dark grey with a yellow-orange base and pale ochreous tips. Abdomen dark ochreous grey to grey above, pale ochreous-grey below; anal tuft of male ochreous.

Male genitalia (fig.). Uncus very broad; socii with to strong setae; gnathos large, slender and slightly wavy, heavily sclerotized, ending in a sharp apex, anteriorly covered with microtrichia; valva long and broad; saccus rather wide; surface of vinculum covered with microtrichia.

Female genitalia (fig.). Segment dorsally weakly concave; ventrally with a bulbous protrusion, marking the distal end of the ventral groove; ventral groove with wavy margins; groove and lateral area with a dense cover of strong microtrichia; lamella postvaginalis small, triangular; antrum weakly sclerotized; ductus bursa rather long; bursa oval; signum with two folds, middle section clearly rectangular.

Life history

Larva: head and prothoracic plate dark fuscous brown, body brownish with dark spots. Food plants unknown. Imago: univoltine, from late May to mid August. Comes to light, yet is also easily disturbed during the day.

Distribution (fig.)

Local, mainly recorded from forests in the central and eastern part of The Netherlands. Abroad also local and rather rare, in Great Britain confined to the north.

Bryotropha domestica (Haworth)

(figs. , , ; pl. :)

Diagnosis

Only to be confused with *B. basaltinella* (see there).

Description of imago (pl. :)

Wingspan - mm. Head with frons pale ochreous, vertex pale ochreous to ochreous, often speckled with ochreous grey; antenna ochreous ringed fuscous; labial palpus with segment longer than segment , pale yellow, weakly to heavily suffused fuscous on the outside, segment darker than segment . Thorax pale ochreous to ochreous, often mixed with ochreous grey. Forewing greyish ochreous to dark greyish ochreous, the exposed pale ochreous to ochreous bases of the scales give the wing a much lighter appearance; discal and plical stigmata blackish, contrasting, first discal directly above the smaller plical, usually separate, sometimes fused, patches of ochreous scales often present beyond the plical

and between the discal stigmata; costal and tornal patches ochreous, the costal often much larger than the tornal, sometimes fused to form an irregular fascia, a conspicuous blotch of dark costal scales often present basad of the costal patch; subapical area irrorate with dark scales, usually darkening this area slightly; cilia concolorous with an indistinct dark ciliary line and pale ochreous tips. Hindwing of equal width to forewing, pale greyish, darker towards apex, cilia concolorous. Abdomen glossy pale ochreous grey above, mixed pale ochreous and ochreous grey below, anal tuft of male ochreous.

Male genitalia (fig.). Unlike any other *Bryotropha* species. Uncus narrow; gnathos small, anterior end covered with microtrichia; valva long and club-shaped; sacculus absent; vinculum rather small and densely covered with microtrichia.

Female genitalia (fig.). Segment dorsally with a small heavily sclerotized triangular shield; ventral groove indistinct, widening towards the antrum; microtrichia absent; antrum small but clearly sclerotized; signum very large, with two folds, middle section clearly rectangular.

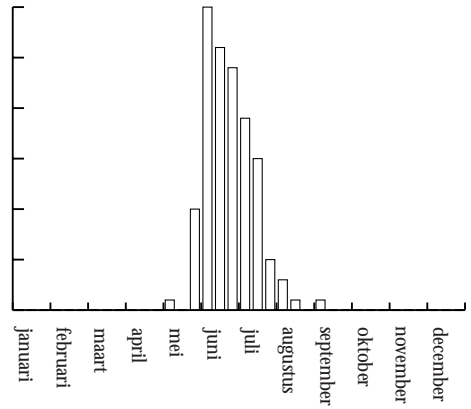
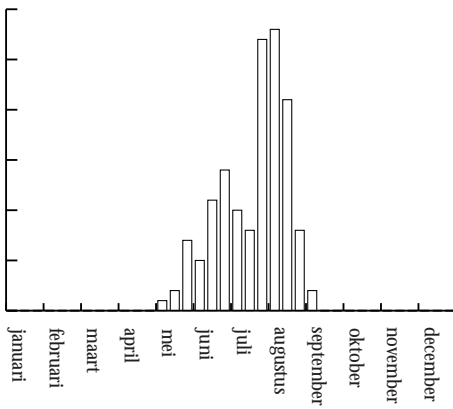
Life history

Larva: head and prothoracic plate dark brown; body brown with large blackish spots, separating it from the larva of *B. affinis* which has small black spots. Lives in a silken gallery in mosses growing on walls. Full-grown larvae can be found from the end of March until early June.

Pupa: light brown, three segments with free movement, last segments with hooked spines. Pupation occurs in an open network cocoon. Imago: univoltine, from mid May to early August.

Distribution (fig.)

Only one record known from the Netherlands: a specimen obtained during an excursion of the Leiden Museum () in the extreme south of the province of Limburg in (Doets).

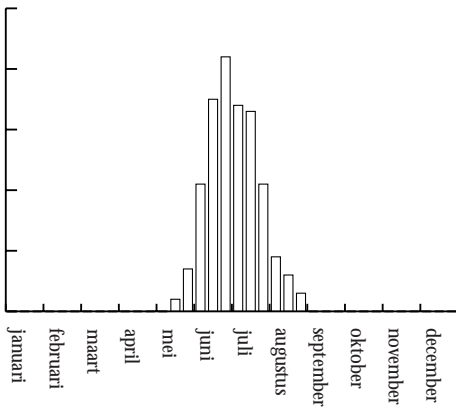


B. basaltinella

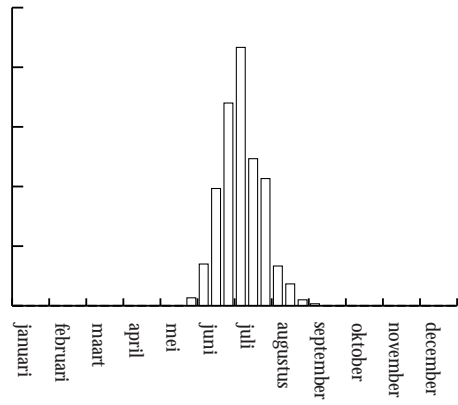
B. umbrosella

Figure - Distribution and flight periods of *Bryotropha* species in The Netherlands. Small dots: pre-records, big dots: records since .

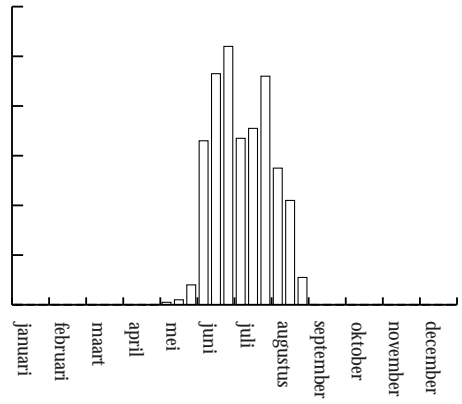
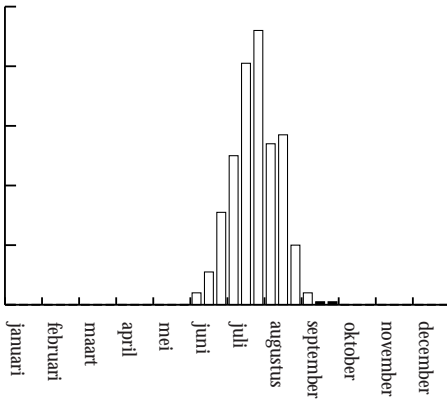
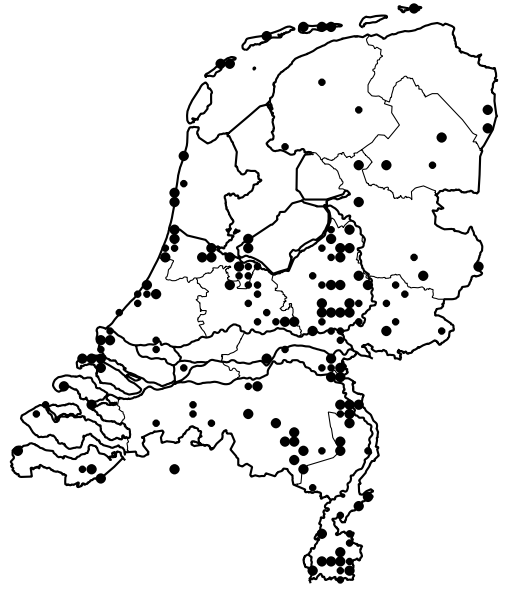
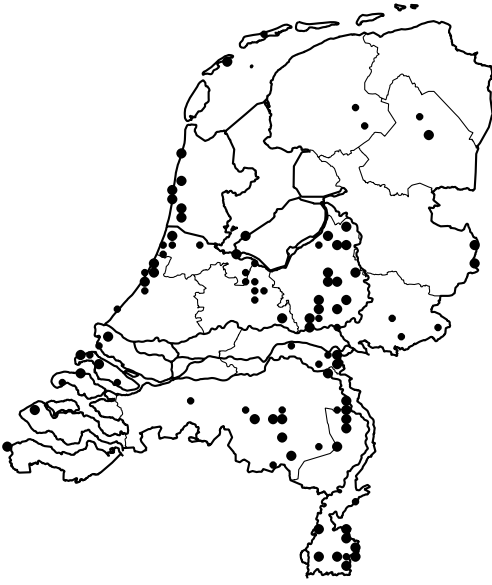
Figuur - Verspreiding en vliegtijd van *Bryotropha*-soorten in Nederland. Kleine stipjes : vóór , grote stippen: vanaf .



B. affinis

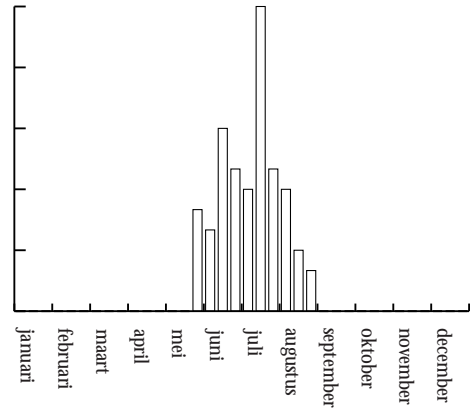
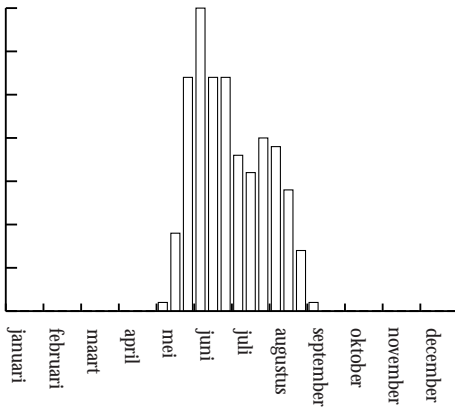


B. similis



B. senectella

B. terrella



B. desertella

B. galbanella (dots / stippen)
B. domestica (square / vierkant)

Abroad *B. domestica* is common in southern and central Europe, absent from Denmark and Fennoscandia, but very common in the southern part of Great Britain.

CONCLUSIONS

Nine species of *Bryotropha* are known from The Netherlands, eight of which are clear residents. Although some of the moths are rather local, none of them can be considered to be rare. Provided the specimens are in a good condition, *Bryotropha*'s can be readily defined on external features alone. Heavily worn and aberrant specimens can be recognised by their genitalia, which are specific. As shown before by Pierce and Metcalfe () and Svensson (), the gnathos is the single most important diagnostic characteristic in the male genitalia. The shape of the gnathos is the only reliable feature that separates *B. affinis* and *B. umbrosella*. The female genitalia contain several important diagnostic features making them much easier to define, but even here an identification should involve as many characteristics as possible.

Local or ecological variations

Despite a rather dull ground colour, *Bryotropha* species can be highly variable, especially in coastal (dune) regions. It is these variations which make *Bryotropha* such a difficult genus. Deviations from the nominal form are most common in *B. affinis*, *B. umbrosella* and *B. desertella*. Inland specimens have more constant features. They are darker, but on the average also distinctly larger than their coastal counterparts.

Distribution

Distribution maps were constructed on the basis of verified collection material only. This method relies on the local activities of collectors which explains the paucity of records from the north-east of the country (i.e. the provinces Groningen, Drenthe, Overijssel, Flevoland) since these areas have often been neglected. Incomplete as they might be, the data clearly show that most species

are unevenly distributed over The Netherlands. *Bryotropha terrella* is without doubt our most common *Bryotropha* species. It occurs virtually everywhere, although it is less abundant in very dry habitats. Also very common are *B. similis* and *B. senectella*. Both can be found in a wide variety of habitats, yet *B. similis* is remarkably rare in the dune area, whereas *B. senectella* is very common here, and in general prefers dryer soils than *B. similis*. A more pronounced preference for dry grounds is found in *B. affinis*, *B. desertella* and especially *B. umbrosella*. These three species are therefore not as widely distributed, *B. umbrosella* for example is completely restricted to very dry habitats. Even more local and confined to inland locations only are *B. galbanella* which only occurs in forest areas in the middle and eastern part of The Netherlands, and *B. basaltinella* which is almost exclusively found in urban areas.

Biology

The uneven distributions mentioned above most likely relate to the, as yet largely unknown, food plants and habitats of the larvae. Stone growing mosses have often been mentioned as food plants. Since the larvae seem to feed on a wide variety of food plants, it might well be true that caterpillars of all species have at one time or the other been found in stone growing mosses, yet the distribution patterns indicate that for most this cannot be the major habitat. Except *B. basaltinella*, no species has a preference for urban areas, the place to find moss covered walls. When occupying flat, stone growing mosses, the larval galleries stand out and are easy to detect. This might have led to the misconception that all species prefer wall growing mosses. *B. affinis* seems to prove this case. In Great Britain the larvae of *B. affinis* are only known from urban areas found in mosses growing on walls. The adults, however, have a distinct preference for dry soils, as they have in The Netherlands. Adults of all species can be found over relatively long periods of time. Time flight diagrams indicate that most have one generation only. In *B. desertella*, however, there's a clear second peak

in August. To test whether this might be an artefact, the data obtained before were compared with the data obtained between and from onwards. All three periods showed a distinct second peak in August, thus strongly suggesting the presence of a second generation.

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SAMENVATTING

Het genus *Bryotropha* in Nederland (Lepidoptera, Gelechiidae)

Het genus *Bryotropha* staat bekend als een notoir lastig geslacht van kleine bruine motjes. Die moeilijkheid komt door de variatie, maar vooral ook door gebrek aan bruikbare beschrijvingen.

Met dit artikel zijn de negen Nederlandse soorten te determineren. Vanwege het gebrek aan determinatieliteratuur in heel Europa is het in het Engels geschreven.

Behalve de maar één keer waargenomen *B. domestica*, zijn de meeste soorten vrij gewone verschijningen in ons land, zoals uit de kaarten blijkt.

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Duitsland

Nederlandse bijschriften bij de kleurenplaten

Plaat

Imago's van *Bryotropha*-soorten.

B. basaltinella, Twello (Gelderland), coll. Wolschrijn, *B. umbrosella*, donkere vorm, Callantsoog, Zwanenwater (Noord-Holland), coll. Koster, *B. umbrosella*, Terschelling (Friesland), coll. Bot, *B. umbrosella*, Ameland (Friesland), coll. Kuchlein, *B. umbrosella*, lichte vorm, Callantsoog, Zwanenwater (Noord-Holland), coll. Koster. Foto's E. J. van Nieukerken.

Plaat

Imago's van *Bryotropha*-soorten.

B. affinis, Venray (Limburg), coll. Rutten, - *B. affinis*, Callantsoog, Zwanenwater (Noord-Holland), coll. J.C. Koster, , *B. similis*, Vierlingsbeek (Noord-Brabant), coll. Rutten. Foto's E. J. van Nieukerken.

Plaat

Imago's van *Bryotropha*-soorten.

B. senectella, Venray (Limburg), coll. Rutten, *B. senectella*, Callantsoog, Zwanenwater (Noord-Holland), coll. Koster, *B. terrella*, Huygevoort (Noord-Brabant), coll. Kuchlein, *B. terrella*, Ameland (Friesland), coll. Kuchlein, *B. desertella*, Callantsoog, Zwanenwater (Noord-Holland), coll. Koster, *B. desertella*, Amsterdamse Waterleidingduinen (Luchterduinen) (Noord-Holland), coll. Wolschrijn. Foto's E. J. van Nieukerken.

Plaat

Imago's en rupsen van *Bryotropha*-soorten.

B. galbanella, Bussloo (Gelderland), coll. Wolschrijn, *B. domestica*, Engeland, Norwich, coll. Rutten, *B. affinis* rups, Loonse en Drunense duinen (Noord-Brabant). Habitat van *B. affinis*, *B. senectella* en *B. desertella*, Hoge Veluwe (Gelderland). Habitat van *B. affinis*, *B. similis* en *B. senectella*, Coepelduinen, Katwijk (Zuid-Holland). Habitat van *B. umbrosella*, *B. affinis* en *B. desertella*. Foto's E. J. van Nieukerken (, ,), auteur (), C. van de Berg (,).