

# THE GENUS *SCROBIPALPA* IN THE NETHERLANDS (LEPIDOPTERA: GELECHIIDAE)

*Maurice Jansen*

The genus *Scrobipalpa* is a huge genus with about 70 species in Europe, 11 of which occur in The Netherlands. Half of the European species are more or less restricted to coastal or inland saline habitats. The Netherlands, with its many coastal salt marshes, harbours rich populations of various *Scrobipalpa* species, and provides ideal opportunities for studying their biology and taxonomy. Most species can only be reliably identified by the genitalia, because of the small differences between species and the great variability in wing pattern. Since the literature is difficult to access and incomplete, the Dutch species are here redescribed and illustrated and keys are provided for externals and genitalia. An overview of biology and ecology is given and maps show the distribution in The Netherlands.

The genus *Scrobipalpa* Janse is one of the largest gelechiid genera in the Palaearctic region and comprises world-wide more than 200 species. A large part of these species have been described by D. Povolný. However no outline, classification or even a checklist has yet appeared. Although some representatives are known from Africa and Australia, the genus is particularly rich in the Palaearctic region. A few species are recorded from North America but most of these are considered to be recent accidental introductions from Europe. Up to now host plants are known for only 39 species; 20 of these feed on Asteraceae, 12 on Chenopodiaceae and 7 on Solanaceae (Povolný 1980). Most species occurring in The Netherlands are living on halophytes and are more or less confined to coastal or inland saline habitats (Jansen 1995).

The great variability in external appearance and the small differences in genitalia make the species of *Scrobipalpa* notoriously difficult to identify. A lot of available material had not been identified previously and the status of several species occurring in The Netherlands was badly known. The need for modern identification keys and additional biological data prompted this study.

## MATERIAL AND METHODS

Distribution maps were compiled exclusively on the basis of specimens examined. The different symbols for periods before and since 1980, are to distinguish old records. They do not infer any increase of the species, because recently more attention has been paid to these moths. Maps were compiled with the programmes ORDE and EISKAART (Vorst & Fokker 1996, 1998).

Standard methods for the preparation of the genitalia were followed. For male genitalia the 'unrolling technique' was used (Pitkin 1986, Huemer 1987): at one side the vinculum is severed from the tegumen. In this way these complex structures are spread out and can be better shown on photographs. Female genitalia were stained with chlorazol black. The terminology of the genitalia mainly follows Sattler (1987), who thoroughly described the details one must take care of during the preparation.

Information is given about the adult morphological characters and the wing patterns, including the major varieties and forms. The terminology of the wing pattern follows Heath et al. (1976).

Type material has not been examined. Many synonyms are mentioned in the various checklists but it is uncertain whether the type specimens have really been studied recently. For this reason only very few synonyms are mentioned here.

Biological data are mainly derived from personal observations and reliable observations of others and supplemented by literature data. Flight period data are based on collecting dates only, not on emergence dates of indoor breeding. Adults often emerge considerably earlier indoors or outdoors close to houses.

Host plants are mentioned if they occur in Northwest Europe. Nomenclature of host plants follows Van der Meijden (1996). European plant names, not included in that work follow Flora Europaea (Tutin et al. 1964-1980). Nomenclature of plant communities follows Schaminée et al. (1998).

#### THE SYSTEMATIC POSITION OF *SCROBIPALPA*

The Dutch species of *Scrobipalpa* were originally described in *Gelechia* Hübner, *Lita* Treitschke, *Anacamptis* Curtis, *Tinea* Linnaeus, *Phthorimaea* Meyrick or *Gnorimoschema* Busck. Janse (1949) erected *Scrobipalpa* as a new genus. Povolný (1964) erected the tribe Gnorimoschemini in which *Scrobipalpa* is by far the largest genus. Sattler (1988a) showed that *Scrobipalpa* Janse, 1951 cannot be separated from *Ilseopsis* Povolný, 1965. Although the status of *Scrobipalpa* as a separate genus is generally accepted, it is poorly defined from other genera and predominantly based on characters of the male genitalia.

In The Netherlands the Gnorimoschemini are represented by the genera *Caryocolum* Gregor & Povolný, *Gnorimoschema* Busck, *Phthorimaea* Meyrick, *Scrobipalpa* Janse and *Scrobipalpula* Povolný (Jansen 1998). *Scrobipalpa* can be separated from *Caryocolum* by the presence of a well developed gnathos and from *Gnorimoschema* by the straight sacculus, which is never hook shaped and by the well developed vincular processes. In *Scrobipalpa* the gnathos is fairly straight whereas

in *Scrobipalpula* it is constricted medially.

*Phthorimaea* has an oval gnathos and a very wide saccus which is rounded off towards the tip.

Povolný & Weismann (1958) recorded the differences between *Phthorimaea* and *Scrobipalpa* in male and female genitalia and larval chaetotaxy.

#### THE NORTHWEST EUROPEAN *SCROBIPALPA* SPECIES

About 60-70 *Scrobipalpa* species are known from Europe, eighteen of which occur in Northwest Europe. In The Netherlands eleven species have been found. The following seven species are not native to the Dutch fauna but have been collected in neighbouring countries. Some of these could be expected to be found in The Netherlands.

##### *S. brahmiella* (Heyden, 1862)

Feeding on *Jurinea*, only found in a single locality in Belgium (Sattler 1987); Karsholt & Razowski (1996) also record the Czech Republic, Slovakia, Germany, France and Austria.

##### *S. clintoni* Povolný, 1968

Feeds on *Rumex crispus* and has been recorded from Great Britain, Denmark, Germany and Sweden (Povolný 1968, Sattler 1988b); Karsholt & Razowski (1996) record also Norway, Russia, Estonia and Latvia.

##### *S. murinella* (Herrich-Schäffer, 1855)

Hostplant *Antennaria dioica*. Recorded by Karsholt & Razowski (1996) from fifteen European countries including an erroneous record from The Netherlands.

##### *S. pauperella* (Heinemann, 1870)

Feeds on various species of Asteraceae e.g. *Centaurea scabiosa* and has been recorded from eleven European countries (Karsholt & Razowski 1996).

##### *S. reiprichi* Povolný, 1984

Hostplant unknown, collected in Norway (Karsholt et al. 1986) and the Czech Republic.

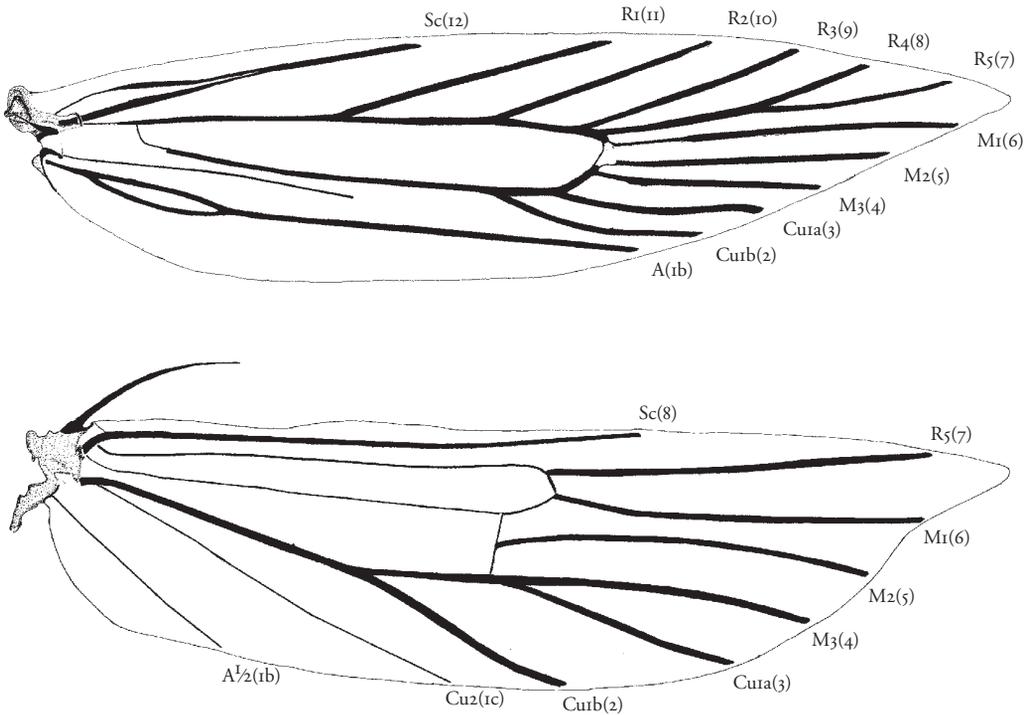


Figure 1  
 Venation of a *Scrobipalpa* species, with abbreviated names of veins. Top: forewing, bottom: hindwing.  
 Figuur 1  
 Benoeming van de vleugeladers (afgekort) van een *Scrobipalpa*. Boven: voorvleugel, onder: achtervleugel.

*S. stangei* (E. Hering, 1889)

Hostplant: *Triglochin* spp. and recorded by Karsholt & Razowski (1996) from Denmark, Germany, Norway, Sweden, Finland, Latvia, Germany and Great Britain.

*S. suaedella* (Richardson, 1893)

Feeding on *Suaeda* spp. especially *S. fruticosa* and recorded from Germany, Great Britain (Povolný 1967a, Tiedemann 1987), France, Sardinia, Spain, Portugal and Italy (Karsholt & Razowski 1996).

**GENERAL MORPHOLOGY**

**Adult**

Head convex; ocelli present; proboscis well developed; length of labial palpus about twice the eye diameter, recurved; first segment short; second seg-

ment slightly longer than third, roughly scaled beneath to form two ridges, leaving a groove between; third segment smoothly scaled, somewhat compressed laterally; antennae simple, shorter than forewing, scape without pecten; head smoothly scaled. Wingspan: 9.0-17.5 mm. Forewing ground colour cream-white to chocolate brown, mottled with a combination of spots, dots and lines; stigmata absent or present, if present regularly surrounded by a ferruginous brown group of scales; ferruginous brown lines are especially present in the fold, near the stigmata and along the veins but may be found on other places of the wings as well. Wing venation (fig. 1): forewing: A2 with a loop at base, R4 and R5 stalked; M1 often reduced at its base for a variable part of its length; sometimes shortly stalked with R4+5. Hindwing: M3 coalescing with CUI .

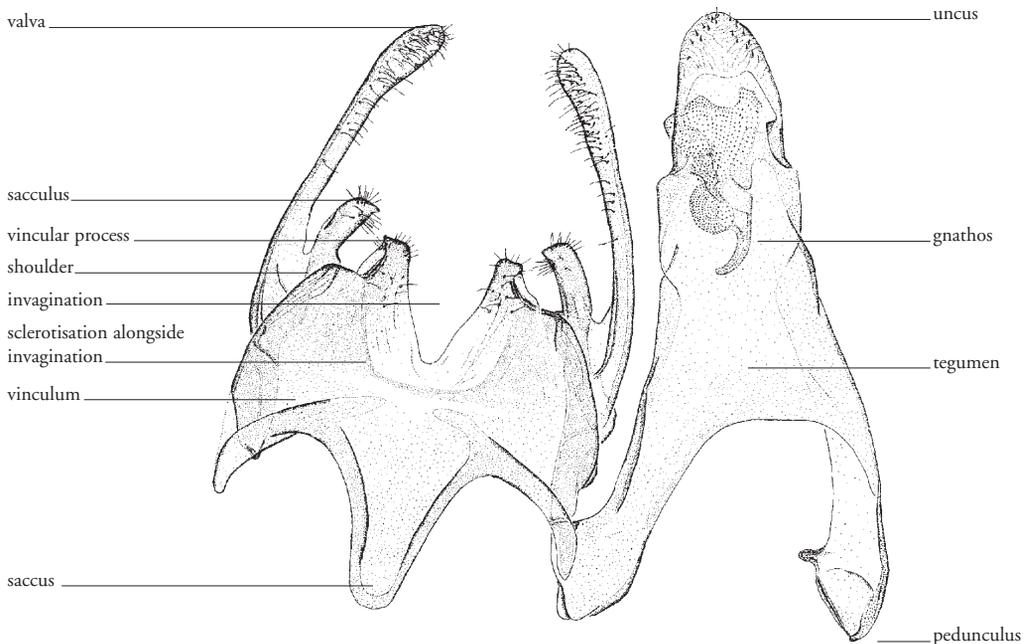


Figure 2  
Male genitalia of *Scrobipalpa instabilella*, with terminology of the parts.  
Figuur 2  
Mannelijke genitaliën van *Scrobipalpa instabilella*, met benoeming van de onderdelen.

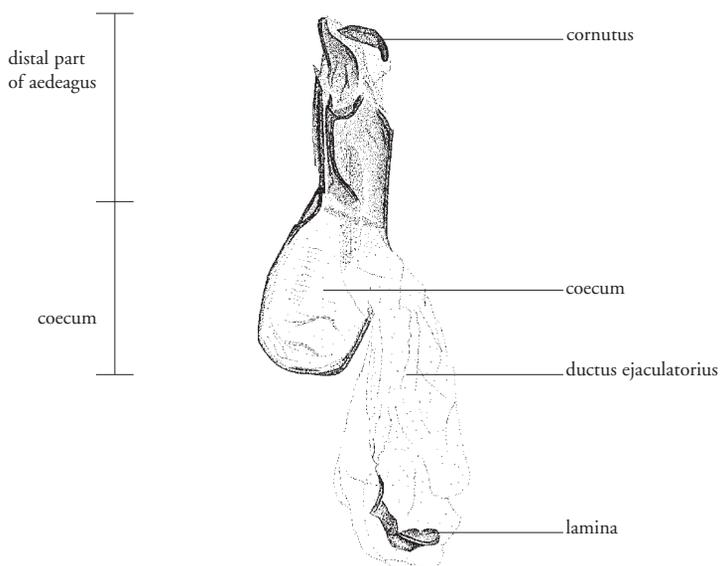


Figure 3  
Aedeagus of *Scrobipalpa instabilella*, with terminology of the parts.  
Figuur 3  
Aedeagus van *Scrobipalpa instabilella*, met benoeming van de onderdelen.

Plate 1

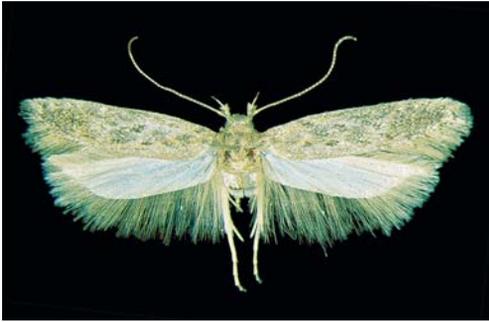
Adults of *Scrobipalpa* species. Photographs E. J. van Nieukerken.



1 *S. acuminatella*, Petten (Province of Noord-Holland), coll. Koster.



2 *S. artemisiella*, Egmond (Province of Noord-Holland), coll. RMNH.



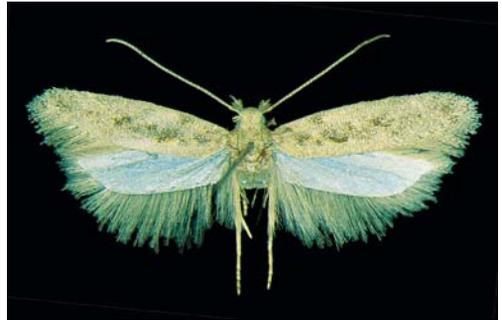
3 *S. atriplicella*, Callantsoog, Zwanenwater (Province of Noord-Holland), coll. Koster.



4 *S. costella*, Neeltje Jans (Province of Zeeland), coll. Jansen.



5 *S. instabilella*, Stroodorpepolder (Province of Zeeland), coll. Jansen.



6 *S. instabilella*, Callantsoog, Zwanenwater (Province of Noord-Holland), coll. Koster.



1 *S. nitenella*, Petten, de Putten (Province of Noord-Holland), coll. Koster.



2 *S. obsoletella*, Zuidgors (Province of Zeeland), coll. Jansen.



3 *S. ocellatella*, San Prospero, Modena (Italy), coll. Parenti.



4 *S. proclivella*, Son (Province of Noord-Brabant), coll. Van der Wolf.



5 *S. salinella*, Woensdrecht (Province of Noord-Brabant), coll. RMNH.



6 *S. samadensis*, Zuid Sloe (Province of Zeeland), coll. Van der Wolf.

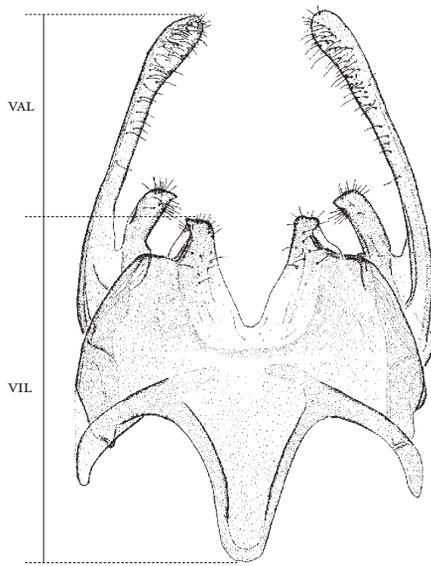


Figure 4  
Male genitalia of *Scrobipalpa instabilella*, with measurements.

Figuur 4  
Mannelijke genitaliën van *Scrobipalpa instabilella*, met de plaats van de metingen.

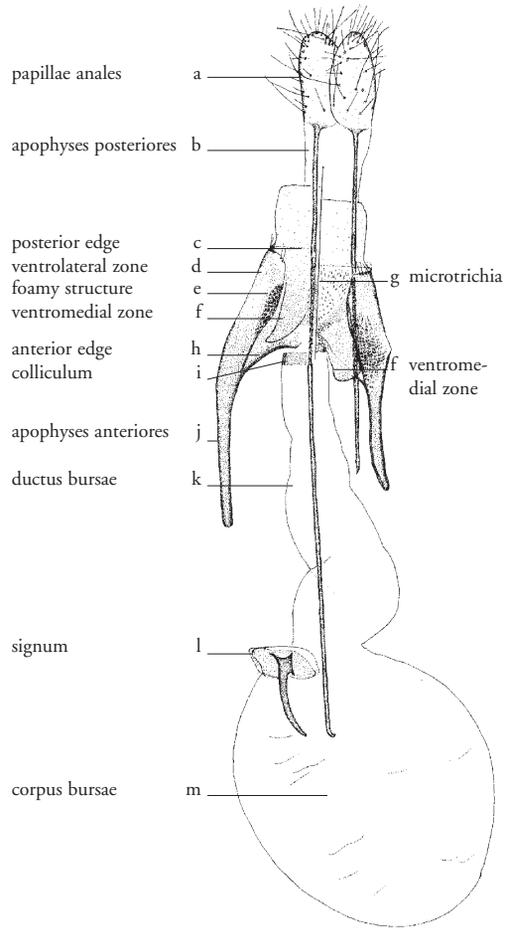
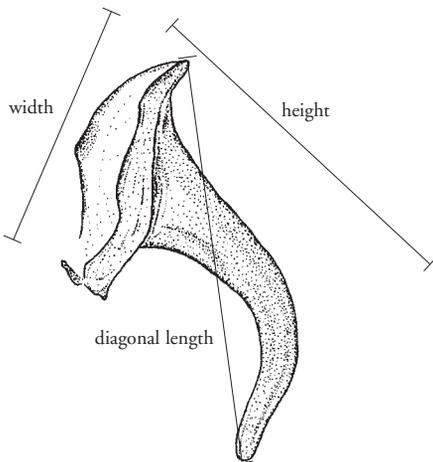


Figure 5  
Female genitalia of *Scrobipalpa*, with terminology of the parts.

Figuur 5  
Vrouwelijke genitaliën van *Scrobipalpa*, met benoeming van de onderdelen.

Figure 6  
Signum of *Scrobipalpa acuminatella*, with measurements.

Figuur 6  
Signum van *Scrobipalpa acuminatella*, met de plaats van de metingen.

salinity: geographic: tides:	saline or brackish			fresh water	
	coastal			inland	
	salt marsh	storm- flood zone	non-tidal		
<i>S. instabilella</i>	•				
<i>S. ocellatella</i>	•	•			
<i>S. samadensis</i>	•	•			
<i>S. salinella</i>	•	•	•		
<i>S. ninentella</i>	•	•	•	○	○
<i>S. obsoletella</i>		•	•	•	•
<i>S. atriplicella</i>				•	•
<i>S. acuminitella</i>				•	•
<i>S. costella</i>				•	
<i>S. artemisiella</i>				•	•
<i>S. proclivella</i>					•

Table 1  
Distribution of  
*Scrobipalpa* species over  
the various ecological  
zones in The  
Netherlands. An open  
circle denotes less fre-  
quent occurrence.  
Tabel 1  
Verspreiding van  
*Scrobipalpa*-soorten over  
de verschillende ecologi-  
sche zones in Nederland.  
Een cirkel geeft een min-  
der hoge dichtheid aan.

Male genitalia (fig. 2, 3). Uncus caudally widened, rounded off or concave. Gnathos well developed, hook-shaped. Valva slender, caudally weakly swollen and rounded. Saccus well developed with a characteristic shape and length. Vinculum posterior margin with two characteristic vincular processes and a V-shaped invagination, which varies in shape and relative length, generally well developed, fairly straight or more or less curved. Saccus well developed, with strongly sclerotized margins, appearing as a branched structure. Posterior margin with a gap in the sclerotization in middle. Saccus anteriorly sometimes projecting somewhat beyond pedunculi. Tegumen wide, anteriorly arched. Aedeagus well developed, with a toothlike cornutus. Coremata absent or present. The following measurements are used (fig. 4)  
VIL = length vinculum plus saccus (including vincular process)  
VAL = length valva, measured from tip of valva to tip of vincular process.

Female genitalia (fig. 5). Sternite VIII well sclerotized, wide and long, more or less with a foamy sculpture; ventral zone membranous or only partly sclerotized, generally with many microtrichia and with two lon-

gitudinal depressions which can extend beyond anterior edge, ventro-medial zone generally as long as ventrolateral zone, sometimes exceeding anterior edge. Bursa copulatrix membranous, oval, clearly demarcated into corpus and ductus bursae or not. Colliculum present as a narrow sclerotized ring in ostium. Signum well developed, fairly straight to strongly curved, usually with one or more teeth (see for the Dutch species also Jansen 1998). Measurements of signum are explained in fig. 6.

#### REMARKS

Identification of *Scrobipalpa* species without a detailed examination of the genitalia is virtually impossible. The many intermediate forms between the species make it an illusion to identify them by wing markings alone. The simplified key, presented here, is therefore only meant as a first guide for series of specimens based on the most striking external characters. In the wings the length of the stalks and the difference in distance between the veins at origin vary in almost all species. There are only small differences between *Scrobipalpa* and related genera within the tribe Gnorischomenini.



Figure 7-12

Male genitalia of *Scrobipalpa* species, prepared with unrolling technique, with slide numbers. 7 *S. acuminatella*, vV371; 8 *S. artemisiella*, MJ1094; 9 *S. atriplicella*, MJ580; 10 *S. costella*, MJ573; 11 *S. instabilella*, MJ533; 12 *S. nitentella*, MJ537.

Figuur 7-12

Mannelijke genitaliën van *Scrobipalpa*, geprepareerd met de 'unrolling' techniek, met preparaatnummers. 7 *S. acuminatella*, vV371; 8 *S. artemisiella*, MJ1094; 9 *S. atriplicella*, MJ580; 10 *S. costella*, MJ573; 11 *S. instabilella*, MJ533; 12 *S. nitentella*, MJ537.

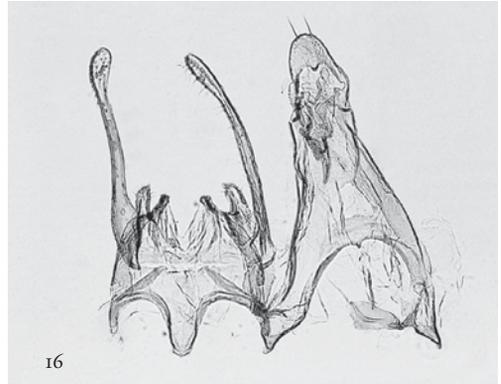


Figure 13-18

Male genitalia of *Scrobipalpa* species, prepared with unrolling technique (except 18), with slide numbers. 13 *S. obsolete*, MJ597; 14 *S. ocellatella*, MJ1071; 15 *S. proclivella*, Wf2556; 16 *S. salinella*, MJ519; 17 *S. samadensis*, MJ98; 18 *S. acuminatella*, prepared in traditional way, Wf1830.

Figuur 13-18

Mannelijke genitaliën van *Scrobipalpa*, geprepareerd met de 'unrolling' techniek (behalve 18), met preparaatnummers. 13 *S. obsolete*, MJ597; 14 *S. ocellatella*, MJ1071; 15 *S. proclivella*, Wf2556; 16 *S. salinella*, MJ519; 17 *S. samadensis*, MJ98; 18 *S. acuminatella*, prepared in traditional way, Wf1830.

Some characters of the genitalia are more or less variable e.g. the number of teeth of the signa, the length of the valvae and the apophyses anteriores, the shape and the length of the saccus and the width of the corpus bursae. These variations can be found either within populations or between populations originating from different regions. Very little attention has been paid to larvae hitherto. Benander (1937) has made some notes concerning the chaetotaxy and some other structures of *S. acuminatella*, *S. artemisiella*, *S. atriplicella*, *S. obsoletella* and *S. samadensis*. Pupae of *S. artemisiella*, *S. atriplicella*, *S. niten-tella*, *S. proclivella* and *S. samadensis* have been described by Patočka (1989). Pupae of *S. acumi-natella* were described by Millière (1862) and Patočka (1989).

**ECOLOGY**

Most *Scrobipalpa* species are more or less confined to saline ecosystems, and the presence of each species depends on the presence of the host plant, the salinity and the adaptation to tidal submergence (table 1). The influence of other environmental conditions, such as light and temperature or soil conditions, needs further study. In table 1 the occurrence of larvae of *Scrobipalpa* species in different habitats is presented. In each site various different habitats may be present.

**CHECKLIST**

**Scrobipalpa** Janse, 1949

- Type species: *Gelechia aptatella* Walker, 1864
- acuminatella* (Sircom, 1850)
- artemisiella* (Treitschke, 1832)
- atriplicella* (Fischer von Röslerstamm, [1841])
- costella* (Humphreys & Westwood, 1845)
- instabilella* (Douglas, 1846)
- obsoletella* (Fischer von Röslerstamm, [1841])
- ocellatella* (Boyd, 1858)
- nitentella* (Fuchs, 1902)
- seminella* Pierce & Metcalfe, 1935
- proclivella* (Fuchs, 1886)

- salinella* (Zeller, 1847)
- salicorniae* Hering, 1889
- samadensis* (Pfaffenzeller, 1870)
- plantaginella* Stainton, 1883

**KEYS TO SCROBIPALPA SPECIES**

**Wing pattern of adults**

*Remark:* All species possess more or less ferruginous-brown lines or groups of scales on the wings, especially in the fold, near the stigmata and along the veins. Pattern and intensity of colour differ both between species and within species. Sometimes such coloration is absent. The wing-span can also be very variable and from several species dwarfs are known. The great variability makes a reliable identification from a single specimen difficult. Some more characteristic forms as found in *S. instabilella* and *S. acuminatella*, form unfortunately only a small proportion of the populations.

- 1 Forewings with a dark subtriangular costal blotch extending not far from base, to hind fascia and reaching the fold, including the black dots, contrasting with the ochreous-fuscous to reddish-brown coloration of the rest of the wing, in males the contrast is much weaker; legs with reddish coloration (pl. 1:4) . . . . . *S. costella*
- Forewings without such a contrasting triangular blotch, but regularly covered with a net shaped pattern or a mix of spots and lines of different colours . . . . . 2
- 2 Forewing ground colour cream-white, covered with a net shaped pattern of fuscous scales and a pale fascia at about three-quarters. Generally two or three stigmata each consisting of two small black spots ringed with ground colour (pl. 2:3) . . . . . *S. ocellatella*
- Forewing never cream-white with a net shaped pattern but only with a mix of spots and lines . . . . . 3
- 3 Forewings almost unicolorous chocolate-brown to pale brown-grey. Colour of cilia contrasting with forewing, more or less yellowish (pl. 1:1) . . . . . *S. acuminatella*

- Cilia not contrasting with unicolorous forewing . . . . .4
  - 4 Wingspan less than 14.5 mm . . . . .5
  - Wingspan more than 14.5 mm; a group of 4-7 blackish spots form sometimes a part of a dark central longitudinal suffusion (pl. 2:6) . . . . .*S. samadensis*
  - 5 Wingspan less than 12.5 mm . . . . .6
  - Wingspan 12.5-14.5 mm . . . . .7
  - 6 Wings relatively short and broad; pale grey to greyish ochreous, wingspan 10-11.5 mm (pl. 2:4) . . . . .*S. proclivella*
  - Wings dark greyish-brown to deep chocolate-brown; ferruginous streaks always present; wingspan 10.5-12.5 mm (pl. 1:2) . . . . .*S. artemisiella*
  - 7 Forewings in centre with spots or small dots that differ mostly in colour from the surrounding coloration . . . . .8
  - Forewings marbled with many streak-like markings that do not differ in colour from the rest of the wing . . . . .9
  - 8 Forewing always with tiny black dots in centre; pattern very variable; sometimes a dark longitudinal suffusion is present that runs from the beginning to the end of the row of markings and continues as a blackish line to the tip (pl. 1:5,6) . . . . .*S. instabilella*
  - Forewings without tiny black dots, only with larger spots which are on average as wide as the eye . . . . .9
  - 9 Spots in centre well developed, two always circular, one more or less oval; wings unicolorous chocolate-brown with much ferruginous-brown (pl. 2:5) . . . . .*S. salinella*
  - Ground colour pale greyish-ochreous with almost no ferruginous-brown coloration; markings never chocolate-brown (pl. 2:2) . . . . .*S. obsoletella*
  - 10 Forewings predominantly marbled with greyish to pale fuscous scales (pl. 2:1) . . . . .*S. nitentella*
  - Forewings marbled with dark fuscous and dark greyish brown groups of scales; frequently with a dark streak alongside the costa and from the costa reaching the fold (pl. 1:3) . . . . .
- . . . . .*S. atriplicella*
- ### Male genitalia
- 1 Vincular process and sacculus equal in length (figs. 21, 25, 27) . . . . .2
  - Vincular process shorter than sacculus (i.e. figs. 19, 20, 22) . . . . .4
  - 2 Valva projecting beyond uncus; vincular process very slender, tip with an arched sclerotization; vinculum only slightly longer than valva up to process (figs. 9, 21) . . . . .*S. atriplicella*
  - Valva not projecting beyond uncus; vincular process less slender, valva much shorter than vinculum including saccus . . . . .3
  - 3 Vincular process wider than sacculus (figs. 15, 27) . . . . .*S. proclivella*
  - Vincular process at top and base as wide as sacculus, in the middle narrower than sacculus (figs. 13, 25) . . . . .*S. obsoletella*
  - 4 Vinculum lateral margin with an arched shoulder, next to vincular process (figs. 23, 28) . . . . .5
  - Vinculum lateral margin without shoulder, evenly curved (i.e. figs. 19, 20, 22) . . . . .6
  - 5 Aedeagus slender, about 7.5x as long as width of distal part (fig. 39); sclerotization alongside vincular invagination rounded off (fig. 28) . . . . .*S. salinella*
  - Aedeagus rather stout, about 4.5x as long as width of distal part (fig. 34); sclerotization alongside vincular invagination flattened (fig. 23) . . . . .*S. instabilella*
  - 6 Valva curved inwards in proximal half, near sacculus (figs. 22, 26) . . . . .7
  - Valva straight in proximal half (i.e. fig. 19) . . . . .8
  - 7 Sclerotization alongside invagination almost absent; invagination funnel shaped, narrow; vincular process protruding, triangular; sacculus long and straight (fig. 22) . . . . .*S. costella*
  - Sclerotization alongside invagination well developed; invagination almost rectangular; vincular process not protruding; sacculus flattened, only a little longer than wide (fig. 26) . . . . .*S. ocellatella*
  - 8 Vincular process small, away from median emargination (fig. 19) . . . . .*S. acuminatella*
  - Vincular process continuous with median

- emargination (i.e. fig. 20) . . . . .9
- 9 Vincular process wider than sacculus, well sclerotized, as long as wide, with a truncate tip (fig. 29) . . . . .*S. samadensis*
- Vincular process as wide as sacculus or narrower, weakly sclerotized, tip rounded or pointed (figs. 20, 24) . . . . .10
- 10 Vincular process curved inward, sacculus straight and narrowed at tip (fig. 24) . . . . .*S. nitentella*
- Vincular process not curved inward, tip of sacculus as wide as base or a little broadened (fig. 20) . . . . .*S. artemisiella*

**Female genitalia**

- 1 Transition from ductus to corpus bursae gradual (figs. 52, 59, 62) . . . . .2
- Transition from ductus to corpus bursae abrupt (i. e. fig. 53, 64) . . . . .4
- 2 Sternite VIII with foamy sculpture (i.e. fig. 43) . . . . .3
- Sternite VIII without foamy sculpture (fig. 41); signum small: diagonal length 90 µm, without teeth (fig. 52) . . . . .*S. acuminatella*
- 3 Apophyses anteriores bend inward; ventromedial zone with two processes which are flattened near anterior edge (fig. 51); signum straight, diagonal length 200 µm (fig. 62, 63) . . . . .*S. samadensis*
- Apophyses anteriores bend outward; ventromedial zone with two processes which end club shaped near anterior edge (fig. 48); signum strongly bend, diagonal length 175 µm (fig. 59) . . . . .*S. ocellatella*
- 4 Signum on left side of corpus bursae (fig. 54) . . . . .*S. atriplicella*
- Signum on right side of corpus bursae (i.e. figs. 55, 56) . . . . .5
- 5 Longitudinal depressions of ventromedial zone not reaching anterior edge (figs. 44, 45) . . . . .6
- Longitudinal depressions of ventromedial zone protruding beyond anterior edge (figs. 42, 46) . . . . .8
- 6 Colliculum square to 1.7x as long as wide; edge forms an almost right angle with apo-

- physes anteriores; ventrolateral zone rectangular (fig. 44) . . . . .*S. costella*
- Colliculum 4-5x as wide as long; ventrolateral zone and transition from anterior edge to apophyses anteriores rounded off . . . . .7
- 7 Ventral zone of sternite VIII near anterior edge constricted, at narrowest point narrower than ductus bursae at colliculum (fig. 50); signum normally without teeth, diagonal length 195 µm (fig. 61) . . . . .*S. salinella*
- Ventral zone of the sternite VIII hardly constricted, wider than ductus bursae at colliculum (fig. 45); signum with teeth, diagonal length 250 µm (fig. 56) . . . . .*S. instabilella*
- 8 Ventromedial process of the sternite VIII slightly longer than wide, clearly defined and at least as wide as lateral zone (fig. 49) . . . . .*S. proclivella*
- Ventromedial process of the sternite VIII at least 3x as long as wide, slightly narrower than lateral zone . . . . .9
- 9 Colliculum 1.5-2.5x as wide as long; sternite VIII with well developed foamy sculpture (fig. 46) . . . . .*S. nitentella*
- Colliculum about 3x as wide as long; sternite VIII with weakly developed foamy sculpture . . . . .10
- 10 Corpus bursae practically spherical; signum in transition zone between corpus and ductus; apophyses anteriores more or less parallel (fig. 42) . . . . .*S. artemisiella*
- Corpus bursae oval; signum remote from entrance of ductus, penetrating less than half of corpus bursae; apophyses anteriores diverging anteriorly (fig. 47) . . . . .*S. obsoletella*

**Female genitalia, based on signum (fig. 63)**

- 1 Diagonal length of signum shorter than 225 µm . . . . .2
- Diagonal length of signum longer than 225 µm . . . . .6
- 2 Signum with many teeth (fig. 60) . . . . .*S. proclivella*
- Signum without teeth, or with only a single tooth . . . . .3
- 3 Curved in middle over 90°; one small tooth

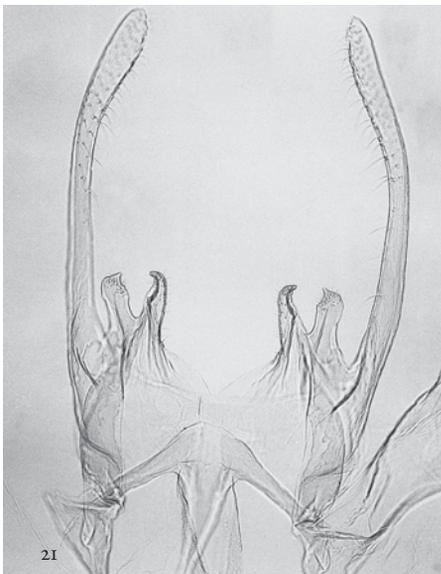
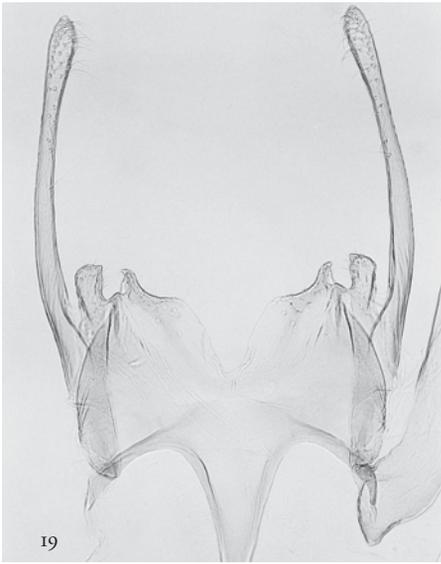


Figure 19-22  
Male genitalia of *Scrobipalpa* species, detail of vinculum and valva, with slide numbers. 19 *S. acuminatella*, vV371; 20 *S. artemisiella*, MJ1094; 21 *S. atriplicella*, MJ580; 22 *S. costella*, MJ573.

Figuur 19-22  
Mannelijke genitaliën van *Scrobipalpa*, detail van vinculum en valva, met preparaatnummers. 19 *S. acuminatella*, vV371; 20 *S. artemisiella*, MJ1094; 21 *S. atriplicella*, MJ580; 22 *S. costella*, MJ573.

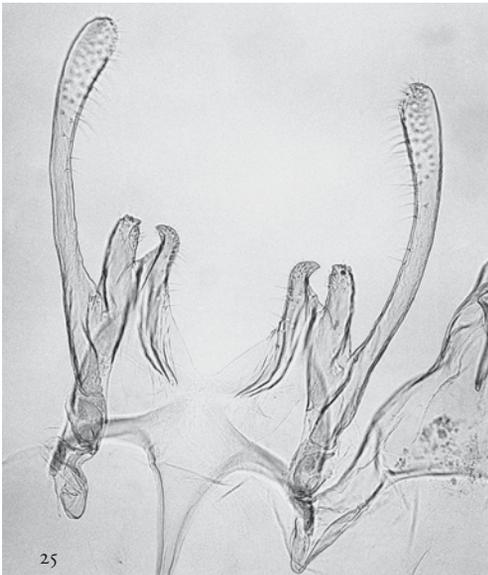
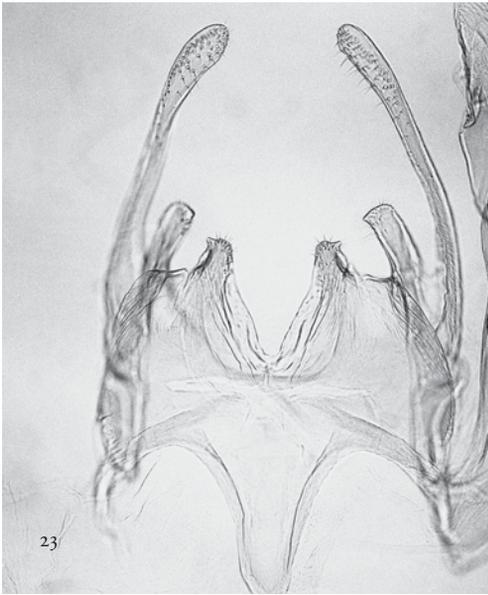


Figure 23-26

Male genitalia of *Scrobipalpa* species, detail of vinculum and valva, with slide numbers. 23 *S. instabilella*, MJ533; 24 *S. nitentella*, MJ537; 25 *S. obsoletella*, MJ597; 26 *S. ocellatella*, MJ1071.

Figuur 23-26

Mannelijke genitaliën van *Scrobipalpa*, detail van vinculum en valva, met preparaatnummers. 23 *S. instabilella*, MJ533; 24 *S. nitentella*, MJ537; 25 *S. obsoletella*, MJ597; 26 *S. ocellatella*, MJ1071.

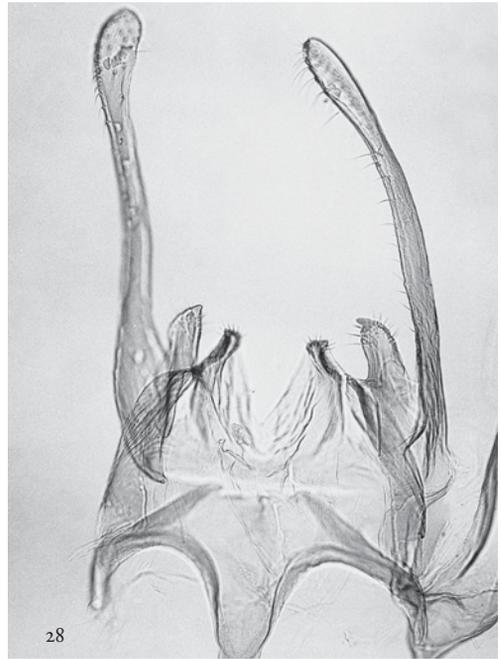


Figure 27-29  
 Male genitalia of *Scrobipalpa* species, detail of vinculum and valva, with slide numbers. 27 *S. proclivella*, Wf2556; 28 *S. salinella*, MJ519; 29 *S. samadensis*, MJ98.

Figuur 27-29  
 Mannelijke genitaliën van *Scrobipalpa*, detail van vinculum en valva, met preparaatnummers. 27 *S. proclivella*, Wf2556; 28 *S. salinella*, MJ519; 29 *S. samadensis*, MJ98.

- near base . . . . .4
- Moderately curved at two-thirds or in middle; without teeth . . . . .5
- 4 First part near base with one small tooth and parallel sides, narrowing towards tip of signum gradually (fig. 53) . . . . .*S. artemisiella*
- First part near base without tooth and directly narrowing towards tip (fig. 59) . . . . .*S. ocellatella*
- 5 Innerside composed of two straight margins, which meet just below middle and form an obtuse angle; width of flat top 2-3x whole length; ending acute (fig. 61) . . . . .*S. salinella*
- Innerside gradually curved; width of flat top as long as complete length; ending blunt (fig. 52) . . . . .*S. acuminatella*
- 6 Basal part broad, almost parallel-sided, squarish; a short row of teeth at mid-length (fig. 56) . . . . .*S. instabilella*
- Signum otherwise shaped . . . . .7
- 7 Teeth small in number, fairly small, irregular shaped . . . . .8
- Teeth in several rows, well developed . . . . .9
- 8 Long and slender; teeth acute, one small tooth basally (fig. 54) . . . . .*S. atriplicella*
- Stout; teeth more or less blunt; without basal teeth (fig. 62) . . . . .*S. samadensis*
- 9 Several rows of well developed teeth along whole length; signum gradually narrowing (fig. 57) . . . . .*S. niventella*
- Well developed teeth absent from distal part; signum rapidly narrowing . . . . .10
- 10 Small teeth present in basal part, signum rapidly narrowing in basal half, distal half less narrow (fig. 58) . . . . .*S. obsoletella*
- Small teeth absent from basal part; signum gradual narrowing in basal three-quarters, distal quart narrow (fig. 55) . . . . .*S. costella*

**DESCRIPTION OF THE SPECIES**

*Scrobipalpa acuminatella* (Sircom)  
(figs. 7, 18, 19, 30, 41, 52, 63, 64; pls. 1:1, 3:1,2, 6:1)

**Diagnosis**

The obscure markings and drab coloration of the forewing, in contrast with the less dark coloured

cilia are characteristic. The male genitalia possess a characteristic vinculum with a small sickle-shaped posterior process which makes them easy to identify. *S. acuminatella* is the only Dutch species with a bursa of twice the length of the apophyses posteriores. In *S. proclivella* the apophyses posteriores are 1.4x as long as bursa, in all other species 2x to 3x as long. Besides it is the only species with an uninterrupted anterior edge near colliculum. The species can be separated from *S. proclivella* by an on average larger wingspan.

**Adult (pl. 1:1)**

Wingspan: male 12-14.5 mm; female 10.5-13.5 mm; venation see Povolný (1991). Forewings almost unicolorous chocolate brown to pale brown grey, indistinctly mixed with ferruginous-brown; sometimes more or less covered with ferruginous-brown lines, generally with two indistinct red-brown to chocolate brown basal streaks. Stigmata mostly absent; if present consisting of four or five scales. Occasionally with a costal triangular pre-apical spot. Cilia-line more or less shining yellowish, with black scales which form indistinct little spots. Hindwings with a rather acuminate tip, pale grey, with greyish-ochreous cilia. First abdominal segments dark grey.

Male genitalia (figs. 7, 18, 19, 30) VIL 1.3x VAL. Valva weakly curved along whole length; sacculus slightly longer than process of vinculum. Distal part of sacculus with dorsal edge rounded. Vinculum: posterior process small, sickle-shaped, away from median invagination; invagination broadly funnel-shaped; sclerotization along invagination broadly V-shaped and flattened anteriorly at tip; shoulder not developed. Uncus rounded off, often slightly longer than valva. Saccus variable, distally tapered or more or less rounded and normally not extending anteriorly beyond pedunculi. Aedeagus (fig. 30) length 550 µm; lamina in ductus ejaculatorius well sclerotized. Coremata absent.

Female genitalia (figs. 41, 52, 63). Sternite VIII anteriorly much wider than posteriorly; margins curved at anterior half; ventral zone weakly scler-

rotized, ventromedial and ventrolateral zone without foamy sculpture; ventromedial zone with a platelike depression with small microtrichia in centre, posteriorly rounded, not reaching anterior edge; anterior edge well developed, medially without an opening; posterior edge with two deep invaginations; posterior and inner margin of ventrolateral zone with broad rim; space between ventrolateral zone and platelike depression membranous, about half the width of colliculum; transition from anterior edge to apophyses anteriores abrupt. Apophyses anteriores approximately as long as or slightly shorter than sternite VIII; length 200 µm. Apophyses posteriores length 850 µm; 4x as long as anteriores. Colliculum variable, almost square to length-width ratio 2:5. Bursa (fig. 52) length 175 µm; 8.7x as long as apophyses anteriores and 2x as long as apophyses posteriores; transition from ductus to corpus gradual, less gradual narrowed in its posterior part. Signum (fig. 52, 63) small, height 80-90 µm, width at base 85-90 µm, diagonal length 150 µm; strongly curved at an angle of almost 90° at two-thirds, without teeth.

#### Larva (pl. 3:1,2)

Briefly described by Millière (1862), Spuler (1910) and Meyrick (1928). Body yellowish grey, more or less tinged with rosy, especially on the hind segments, on each segment four red-brown spots. Head brown. Prothoracic plate almost black. Anal plate chocolate brown.

#### Biology

Host plants: *Cirsium arvense*, *C. palustre*. Stainton (1865) recorded *Centaurea scabiosa* and Sorhagen (1886) *Serratula tinctoria* and *Carduus nutans*. Records of *Cnicus*, *Onopordum* and *Artemisia campestris* (Sattler 1987) have to be confirmed. Recently the species was reared from *Tussilago farfara* by Bland (1992) and a larva was found between leaves of *Carlina vulgaris* (O. Karsholt in litt.). Records from *Centaurea scabiosa* (such as Sorhagen 1886) belong partly to *pauperella* and partly to other species.

Larva: lives in a lower leaf in a branched brownish

mine, which often occupies more than half of the leaf width. Larvae move from one leaf to another and are frequently hiding beneath the midrib.

Voltinism (fig. 64): bivoltine, hibernates as a pupa. Adults were collected from 30.IV-23.IX whereas one specimen was caught on 3.XI.1992. The first flight has its peak in the beginning of May. The second half of June *S. acuminatella* is very rare after which the second generation starts flying and has its peak at the end of July. Full-grown larvae were found in the first three weeks of July and the second half of September. Pupation occurs in a silky cocoon in litter on the ground. Sattler (1987) records only one generation in the northern part of Great Britain and the Alps. Stainton (1865) observed larvae spinning a cocoon inside the mine and recorded observations from Hofmann who collected larvae on *Cirsium* in July which passed the winter in their cocoons. The moth flies at dusk and frequently comes to light.

#### Ecology

Moths and larvae have been found in all habitats in which the host plants are growing. At the coast (pl. 6:1) larvae have been found on *Cirsium arvense* which is a common element of the *Cakiletea maritima* communities whereas on inland sites it is especially found in open plant communities alongside the banks of rivers and creeks.

#### Distribution (fig. 64)

*S. acuminatella* is a palearctic species which is widely distributed in Europe, Asia Minor and Central Asia. In The Netherlands it is common and was recorded for the first time by De Graaf & Snellen (1871) from a specimen caught by Medenbach de Rooy at Arnhem on 11.VII.1870.

#### *Scrobipalpa artemisiella* (Treitschke)

(figs. 8, 20, 31, 42, 53, 63, 65; pls. 1:2, 3:3,4, 6:6)

#### Diagnosis

Its habitat in combination with the generally dark wing markings with the characteristic brownish

streaks on the forewings and the small wingspan distinguish *S. artemisiella* from other species. The male genitalia differ from *S. atriplicella* in the valvae which are hardly longer than the uncus and the shape of the vincular process. The male genitalia from *S. stangei*, not native in The Netherlands, are almost indistinguishable from those of *S. artemisiella*. *S. stangei* however feeds on *Triglochin* spp. on salt marshes and is larger, wingspan 14-16 mm. The triangular and rectangular sculpture in the ventromedial zone of the female distinguish *S. artemisiella* from the other species.

#### Adult (pl. 1:2)

Wingspan: 10.5-12.5 mm; venation see Povolný (1991). Forewings: dark greyish-brown to deep chocolate-brown, with ferruginous streaks. Stigmata consisting of elongate black spots; additional small black spots along hind margin and apex of costa; spots on the fold may be absent; cilia greyish-ochreous. Markings and streaks varying in intensity and number. Abdomen: grey with pale ochreous anal tuft. Hindwings: shining fuscous-grey, darker at tip.

Male genitalia (fig. 8, 20, 31). VII 1.4x VAL. Valva posterior half weakly bent inward; sacculus anteriorly as wide as distally; truncated and with a little tooth directed inward. Vinculum: posterior process slightly shorter than sacculus, at base twice as wide as at top; incision at the top directed outwards and weakly arched to crescent-shaped; median invagination V-shaped; sclerotization alongside invagination of hind edge of vinculum only weakly developed in the two processes; sacculus slightly wider than distance between vincular process and sacculus; shoulder of vinculum moderately developed. Uncus with posterior margin flat, either slightly concave or slightly rounded; not distinctly exceeding valvae and pedunculi. Saccus not distinctly exceeding valvae nor extending anteriorly beyond pedunculi. Aedeagus (fig. 31) length ca 550 µm. Coremata present.

Female genitalia (fig. 42, 53, 63). Sternite VIII with

many microtrichia; longitudinal depressions of ventromedial zone and part of ventrolateral zone beyond anterior edge; ventromedial zone with three triangles without foamy sculpture, one between the two depressions above colliculum and two between depressions and ventrolateral zones above anterior edge; depressions medially and posteriorly with well developed foamy sculpture; ventrolateral zone with well developed foamy sculpture; anterior edge present and heavily sclerotized at its ventromedial and ventrolateral part, medially with an opening, somewhat narrower than colliculum; transition of anterior edge to apophyses anteriores gradual. Apophyses anteriores 500 µm; straight. Apophyses posteriores 4.7x as long as posteriores. Colliculum about 4x as wide as long. Bursa (fig. 53) 1625 µm; 0.7x as long as apophyses posteriores, 3.2x as long as apophyses anteriores; spherical to oval; slightly longer than wide; transition from ductus to corpus bursae abrupt; corpus bursae clearly demarcated. Signum (fig. 53, 63) small, height 90 µm, width at base 70-75 µm, diagonal length 165 µm; bend at right angle in middle; a very small tooth near base; in transition zone between ductus and corpus bursae.

#### Larva (pl. 3:3,4)

*Green form*: described by Stainton (1865), Spuler (1910), Snellen (1882) and Meyrick (1928).

Body pale green with a wide greyish green dorsal line, which is darker in the middle. Head pale brownish green, ocelli black; anal plate green. Subdorsal line and lateral line hardly visible. Pinacula pale green, two subdorsally on each segment and one laterally; legs and prolegs pale green.

*Brown form*: briefly described by Hering (1957) and Heckford (1995).

General appearance dull reddish brown; head dark reddish brown. Prothoracic shield dark greyish brown, in the middle with a narrow longitudinal line; the other parts of the segment paler; third thoracic segment with same colour as abdominal segments; second thoracic segment intermediate in brightness between first and third seg-

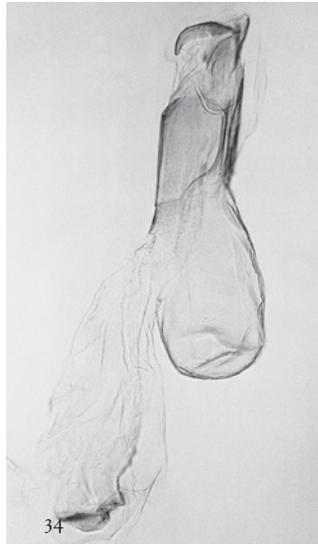
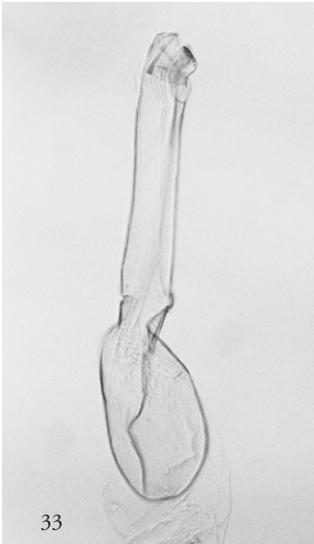


Figure 30-35

Aedeagus of *Scrobipalpa* species, with slide numbers. 30 *S. acuminatella*, vV371; 31 *S. artemisiella*, MJ685; 32 *S. atriplicella*, MJ580; 33 *S. costella*, MJ573; 34 *S. instabilella*, MJ533; 35 *S. nitentella*, MJ537.

Figuur 30-35

Aedeagus van *Scrobipalpa*, met preparaatnummers.

30 *S. acuminatella*, vV371; 31 *S. artemisiella*, MJ685; 32 *S. atriplicella*, MJ580; 33 *S. costella*, MJ573; 34 *S. instabilella*, MJ533; 35 *S. nitentella*, MJ537.

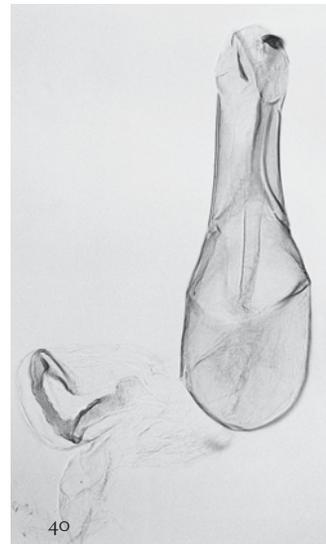
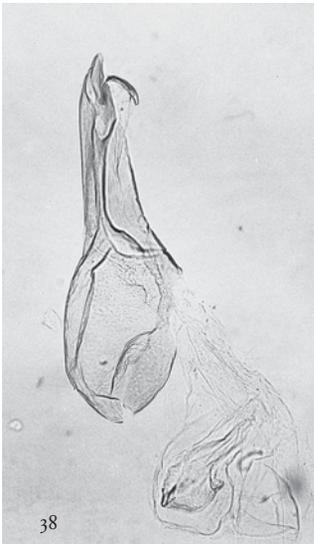


Figure 36-40

Aedeagus of *Scrobipalpa* species, with slide numbers. 36 *S. obsoletebella*, MJ606; 37 *S. ocellatella*, MJ1071; 38 *S. proclivella*, Wf2556; 39 *S. salinella*, MJ519; 40 *S. samadensis*, MJ98.

Figuur 36-40

Aedeagus van *Scrobipalpa*, met preparaatnummers.

36 *S. obsoletebella*, MJ606; 37 *S. ocellatella*, MJ1071; 38 *S. proclivella*, Wf2556; 39 *S. salinella*, MJ519; 40 *S. samadensis*, MJ98.

ment; third thoracic segment and abdominal segments with five dull greyish brown lines mixed with reddish: one dorsal, two subdorsal and two lateral lines; in between and beneath these lines three rows of pinacula present in reddish grey zones.

Pinacula dark reddish brown; lateral side of thoracic segments with two pinacula and the rest of the body with only one row; dorsal side with two rows; anal plate dark greyish brown; legs dark greyish brown, prolegs reddish grey.

### Biology

Host plants: *Thymus pulegioides*. Snellen (1882) frequently observed larvae only on *Thymus serpyllum*: this may be partly the result of misidentification of the host plant. Emmet (1988) only recorded *T. drucei*, which is not native in the Netherlands. Gregor & Povolný (1954) mentioned *Centaurea paniculata* and Povolný (1990) *Achillea clavенаe* but these records need confirmation.

Larva: the larva makes a small brownish mine, it later lives hidden between spun shoots and stems in a web of silky threads in which it makes a cocoon.

Voltinism (fig. 65): univoltine; hibernation stage and site unknown, possible as a young larva.

Adults were collected from 27.v-31.viii, mostly in July. Two brown and one green larvae were found on *Thymus pulegioides* on 17.v.1998; these pupated late May in a white cocoon in the soil; adults emerged on 3.vi.1998. This is in accordance with records by Michaelis (1977), Stainton (1865) and Treitschke (1832). The moths fly freely at dusk, are caught in small numbers during the day and come occasionally to light.

### Ecology

In The Netherlands *Scrobipalpa artemisiella* was frequently found both in coastal and inland sites during 1862 to 1880; Snellen (1882) recorded the species as common where the host plant was growing. This century, however, it was only found in one site near Egmond in the dunes (pl. 6:6), first by Doets in 1951, and later in great numbers by various collectors in 1993-1998. During the 20th

century most inland sites of the hostplant disappeared due to environmental changes. The fairly open landscape consisting of large areas of heathland, grazed by sheep, changed dramatically into a woodland scenery with only small remnants of heathland. Other sites in the dunes have disappeared after enlargement and construction of new residential quarters and increasing tourism.

Abroad, Stainton (1854, 1865) recorded *S. artemisiella* from sandy, gravelly and chalky places and in Switzerland it occurs in alpine valleys.

Michaelis (1977) recorded the species common on limestone and occasionally on sandhills.

### Distribution (fig. 65)

*S. artemisiella* is widely distributed over large parts of the Palearctic region, extending from Europe to Mongolia. In The Netherlands it was recorded first by De Graaf & Snellen (1866). The first specimen was caught at Overveen by Schuyt on 21.vi.1863.

### *Scrobipalpa atriplicella* (Fischer von Röslerstamm)

(fig. 9, 21, 32, 43, 54, 63, 66; pls. 1:3, 3:5)

### Diagnosis

Forms of *S. instabilella*, *S. nitentella*, *S. instabilella*, *S. obsoletella*, *S. salinella* and *S. samadensis* resemble *S. atriplicella* specimens with indistinct stigmata. Some specimens have forewings with pale yellowish ground colour, in which more ochreous and fuscous scales are present than usual. Another form is indifferent dark grey with an obsolete pattern, and also chocolate brownish specimens can be found.

The male genitalia can be recognised by the long slender valva which exceeds the uncus; and the slender vincular processes. The female genitalia are distinctive in the position of the signum at the left side of the corpus bursae. It is therefore important to observe in slides (and during preparation) whether the ductus bursae is rotated or not. It can be distinguished from *S. artemisiella* by the slender longitudinal depressions of the ventromedial zone which are far beyond anterior

Plate 3

Caterpillars of *Scrobipalpa* species. Photographs by author.



1 *S. acuminatella*, larva in mine, De Putten (Province of Noord-Holland).



2 *S. acuminatella*, external feeding larva, De Putten (Province of Noord-Holland).



3 *S. artemisiella*, brown form on *Thymus*, Wimmenum (Province of Noord-Holland).



4 *S. artemisiella*, green form on *Thymus*, Wimmenum (Province of Noord-Holland).



5 *S. atriplicella*, caterpillar on spun flowers of *Atriplex*, Twello (Province of Gelderland).



6 *S. costella*, leafmines on *Solanum dulcamara*, Neeltje Jans (Province of Zeeland).

Plate 4

Caterpillars of *Scrobipalpa* species. Photographs by author.



1 *S. costella*, larva in stem of *Solanum dulcamara*, Neeltje Jans (Province of Zeeland).



2 Habitat of *S. costella* at same locality.



3 *S. instabilella*, larva on spun leaves of *Atriplex portulacoides*, Stroodorpepolder (Province of Zeeland).



4 *S. instabilella*, larva on spun leaves of *Atriplex portulacoides*, Stroodorpepolder (Province of Zeeland).



5 *S. nitentella*, leafmines on *Atriplex prostrata*, Terschelling, Boschplaat (Province of Friesland).



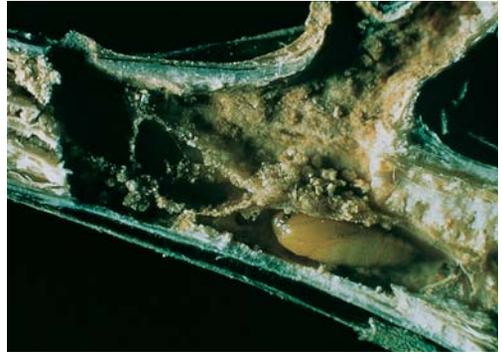
6 *S. nitentella*, external feeding larva on *Atriplex prostrata*, Terschelling, Boschplaat (Province of Friesland).

Plate 5

Caterpillars of *Scrobipalpa* species. Photographs by author, 1, 2 by Dieter Stüning, Bonn.



1 *S. obsoletella*, larva in stem of *Atriplex prostrata*, Germany.



2 *S. obsoletella*, pupa in stem of *Atriplex prostrata*, Germany.



3 *S. ocellatella*, larva on leaf of *Beta maritima*, Het Zwin (Province of Zeeland).



4 *S. salinella*, external feeding larva on *Salicornia* spec., Zierikzee (Province of Zeeland).



5 Plant of *Salicornia* spec., showing damage by *S. salinella* in top, Zierikzee (Province of Zeeland).



6 *S. samadensis*, larva on piece of wood, Het Zwin (Province of Zeeland).



1 Terschelling, Boschplaat (Province of Friesland), tidal saltmarsh with transition to the dunes, habitat of *S. acuminatella*, *S. atriplicella*, *S. costella*, *S. instabilella*, *S. nitentella*, *S. obsoletella*, *S. salinella* and *S. samadensis*.



2 Rilland (Province of Zeeland), seedike with tidal brackish marsh, habitat of *S. nitentella* and *S. obsoletella*.



3 Het Zwin (Province of Zeeland), tidal saltmarsh with transition to the dunes, habitat of *S. instabilella*, *S. nitentella*, *S. ocellatella*, *S. salinella* and *S. samadensis*.



4 Slikken van Bommeneede (Province of Zeeland), non-tidal brackish marsh with *S. nitentella* and *S. salinella*.



5 Inlaag 1887, Ellewoutsdijk (Province of Zeeland), inland saline habitat, with *S. salinella* and *S. instabilella*.



6 Egmond, Wimmenum (Province of Noord-Holland), partly grazed dunes, habitat of *S. artemisiella*.

edge with the colliculum in between. These depressions partly overlap the lateral zone in *S. atriplicella* whereas in *S. artemisiella* there exists a triangular space between depressions and lateral zone.

#### Adult (pl. 1:3)

Wingspan: 11-15.5 mm. Forewings whitish in pale specimens but regularly heavily irrorate, with greyish-fuscous to blackish fuscous scales. Stigmata small to fairly large, suffused and ill defined; indistinct fascia at three-quarters, sometimes absent. Frequently with a dark streak along the costa and broad dark oblique streaks from costa to fold. Hindwings: pale greyish-fuscous, sprinkled with dark fuscous and dark greyish-brown groups of scales.

Male genitalia (figs. 9, 21, 32). VII about I.IX VAL. Valva with proximal part fairly straight, from one-third below tip curved inwards; exceeding uncus, slender, slightly wider at tip; tip of sacculus about twice as broad as tip of vincular process, tooth well developed. Vinculum: posterior process as long as sacculus, slender, hook-like, with tip turned outward; median invagination of hind edge of vinculum V-shaped; only posterior part of sclerotization present, alongside invagination, in the direction of vincular process, developed; shoulder absent. Uncus posterior margin concave, occasionally more or less rounded. Saccus: hardly extending anteriorly beyond pedunculi. Aedeagus (fig. 32) length 615  $\mu\text{m}$ ; ductus ejaculatorius weakly sclerotized. Coremata absent.

Female genitalia (figs. 43, 54, 63). Sternite VIII with well developed foamy sculpture with many microtrichia, both zones closely contiguous, border a straight line; anterior edge membranous; longitudinal depressions far beyond anterior edge; transition of anterior edge to apophyses anteriores very gradual. Apophyses anteriores 375  $\mu\text{m}$  (taken from the end of the foamy sculpture of the sternite VIII); continuous with outer margin of sternite VIII. Apophyses posteriores 4.5x as long as antero-

res. Colliculum 4-5 x as wide as long. Bursa (fig. 54) length 2500  $\mu\text{m}$ ; 6.6x as long as apophyses anteriores and 1.2x as long as apophyses posteriores; transition from ductus to corpus bursae abrupt; corpus clearly defined; corpus spherical to oval shaped, slightly longer than wide. Signum (fig. 54, 63) on left side of corpus bursae; in transition zone between ductus and corpus bursae; slightly arched along whole length, very narrow and only widened at basal one third; concave side with a few teeth along basal third; height 300-325  $\mu\text{m}$ ; width at base 140-155  $\mu\text{m}$ , diagonal length 300  $\mu\text{m}$ .

#### Larva (pl. 3:5)

Larvae found in The Netherlands in 1997 appeared greenish-yellow with five pale rosy-reddish lines. Head ochreous yellowish to pale brownish and prothoracic shield yellowish-brown to dark brown, regularly with a few brownish or blackish dots along sides. Legs green and claws blackish-brown. Spuler (1910) recorded indistinct lines with brownish spots which may be absent. Chaetotaxy described by Bautista-Martínez et al. (1995). Fischer von Röslerstamm [1841] observed larvae which were dark-green with dark or pale rosy-reddish lines.

#### Biology

Host plants: *Atriplex prostrata*, *Chenopodium album* and *C. ficifolium*. Fritzsche & Keilbach (1994) recorded all kind of varieties of *Beta vulgaris* subsp. *vulgaris*.

Egg: described by Bautista-Martínez et al. (1995) and not easy to find. Eggs are deposited singly on the inflorescence among the floral buds or in small groups on the underside of young leaves. Larva: larvae live in a silken gallery between young leaves, flowers, and seeds which are spun together (Fischer von Röslerstamm, [1841], Snellen 1882, Bankes 1894).

Voltinism (fig. 66): bivoltine, hibernating as pupa. Bautista-Martínez et al. (1995) recorded four larval instars and observed pupation in the soil, inside the stem (Fischer von Röslerstamm [1841]) or in a slight silken cocoon among dead

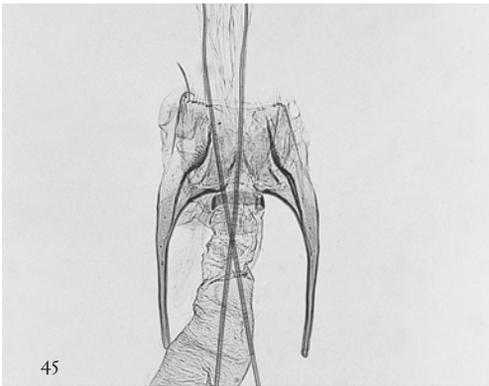
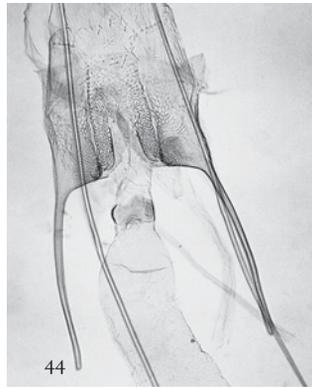
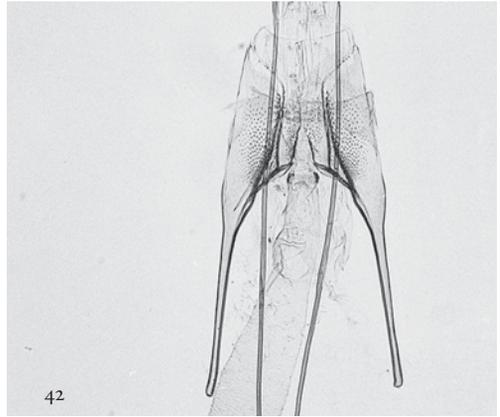
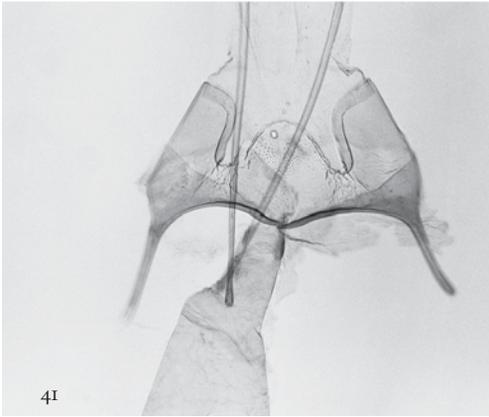


Figure 41-46

Female genitalia of *Scrobipalpa* species, sternite VIII, with slide numbers. 41 *S. acuminatella*, vV176; 42 *S. artemisiella*, MJ617; 43 *S. atriplicella*, MJ63; 44 *S. costella*, MJ574; 45 *S. instabilella*, MJ131; 46 *S. nitentella*, MJ134.

Figuur 41-46

Vrouwelijke genitalia van *Scrobipalpa*, sterniet VIII, met preparaatnummers. 41 *S. acuminatella*, vV176; 42 *S. artemisiella*, MJ617; 43 *S. atriplicella*, MJ63; 44 *S. costella*, MJ574; 45 *S. instabilella*, MJ131; 46 *S. nitentella*, MJ134.

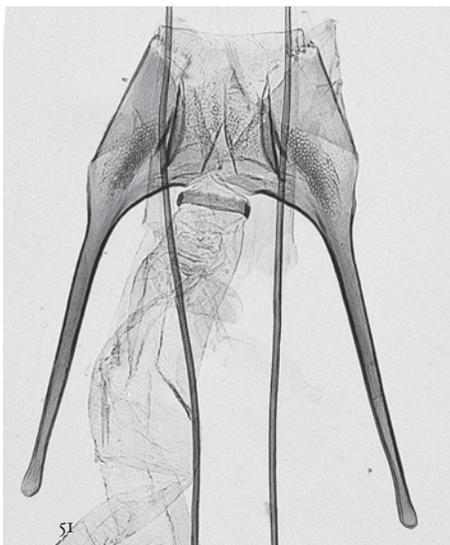
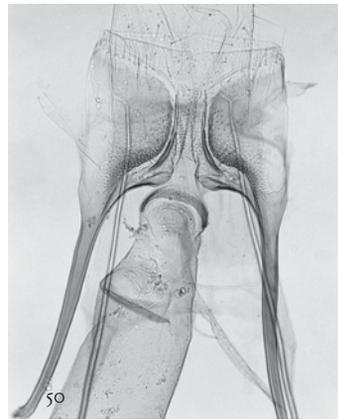
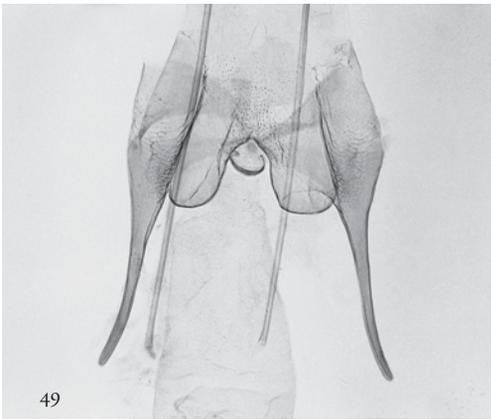
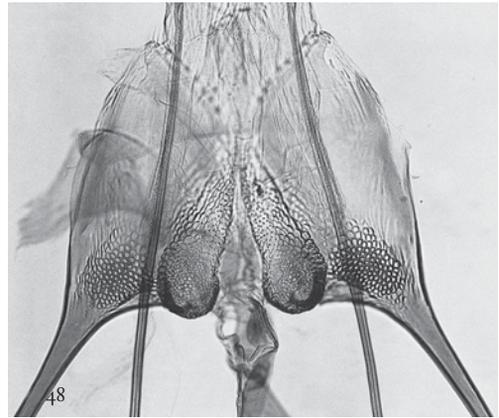
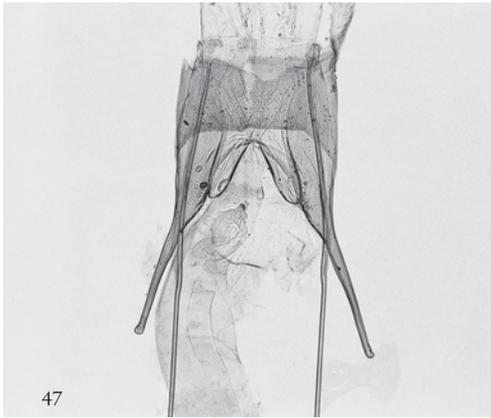


Figure 47-51  
 Female genitalia of *Scrobipalpa* species, sternite VIII,  
 with slide numbers. 47 *S. obsoletella*, Wf1586; 48 *S. ocel-*  
*latella*, MJ655; 49 *S. proclivella*, Wf1858; 50 *S. salinella*,  
 MJ1082; 51 *S. samadensis*, Wf951.

Figuur 47-51  
 Vrouwelijke genitalia van *Scrobipalpa*, sterniet VIII, met  
 preparaatnummers. 47 *S. obsoletella*, Wf1586; 48 *S. ocel-*  
*latella*, MJ655; 49 *S. proclivella*, Wf1858; 50 *S. salinella*,  
 MJ1082; 51 *S. samadensis*, Wf951.

leaves. In The Netherlands the larvae were found from late May to late June and from September to the first half of October; adults were collected from 13.IV-25.IX. The first generation has its peak in the beginning of May and fly till June, when *S. atriplicella* becomes fairly rare; a second generation flies from early July with a peak in August. The moths are on the wing at dusk and have been frequently caught at light.

### Ecology

*S. atriplicella* can be considered as a synanthropic species, which is a permanent element of man-made habitats such as arable fields and gardens. These nitrophilic, sunny and open sites provide the best growing conditions for Chenopodiaceae. Further it lives in dynamic natural habitats which were formed by erosion or sedimentation (pl. 6:1). The species can be caught on sea dykes, but larvae has never found on plants in the aerohaline zone (storm-flood zone with salt spray) where the host plant can survive due to the permanent desalination of rain water. Gross (1956) recorded *S. atriplicella* from the dunes on the island Borkum.

### Distribution (fig. 66)

*S. atriplicella* is a common species in a vast part of the palearctic region. Povolný (1967b) recorded it as introduced and established into the United States and as a pest species in Mexico. In The Netherlands it is common; it was first recorded by de Graaf & Snellen (1866). The earliest specimen known was caught in Rotterdam by Snellen on 28.IV.1862.

*Scrobipalpa costella* (Humphreys & Westwood) (figs. 10, 22, 33, 44, 55, 63, 67; pls. 1:4, 3:6, 6:1,2)

### Diagnosis

The triangular costal blotch, the shape of the vincular process of the male genitalia together with the rectangular shape of the ventral lateral zone and the rectangular angle with apophyses anteriores distinguish *S. costella* from the other species. The valvae of *S. ocellatella* are stronger curved.

### Adult (pl. 1:4)

Wingspan: 9.5-15.5 mm. Forewings mixed reddish-brown and ochreous-fuscous, scattered with greyish- to blackish-brown scales. A dark triangular costal blotch starting not far from base, ending at the distal fascia and reaching fold, including the black dots. Generally an irregular angled fascia at three-quarters; stigmata regularly indistinct if surrounded with dark fuscous scales of the triangular blotch; reniform stigmata, like those in *S. ocellatella* sometimes ringed with ochreous-fuscous. Legs: yellowish, scattered greyish. Forelegs and midlegs partly pale reddish on outer face.

Female: apex and termen partly with a web shaped suffusion of greyish- to blackish-brown scales. Costal blotch contrasting darker, consisting predominantly of blackish-brown scales. Cilia dark greyish brown with five, sometimes hardly distinguishable, ochreous lines; in basal half very long and narrow scales. Hindwings dark grey, terminally and along fringe darker.

Male: web shaped suffusion covers complete wing, with the same mix of colours as costal blotch. Black dots well developed but sometimes hardly separately visible. Costal blotch only slightly darker than ground colour, often mixed with greyish fuscous or brownish scales. Hindwings as in female but mixed with dark brown.

Male genitalia (figs. 10, 22, 33). VII 2x VAL. Valva: sacculus slender, more than 3x as long as wide, slightly longer than process of vinculum, gradually tapering posteriorly and ending in a sharp tooth. Valva weakly curved between basal one-third and mid-length. Vinculum: posterior processes irregular triangular, broad at base and distinctly tapered, well distinguishable from other vincular parts by two sharp sclerotized ridges, continuous with median emargination; median invagination narrow V-shaped; sclerotization alongside invagination almost absent; shoulder absent. Uncus flat, slightly concave or slightly rounded off; exceeding valvae (best visible in tra-

ditional slides). Saccus extending anteriorly beyond pedunculi; posterior thickened margins forming a right angle. Aedeagus (fig. 33) rather slender; length 850  $\mu\text{m}$ , cornutus rounded and strongly sclerotized; ductus ejaculatorius weakly sclerotized. Coremata present.

Female genitalia (figs. 44, 55, 63). Sternite VIII: ventrolateral and ventromedial zone with well developed foamy sculpture; anterior edge membranous, triangularly shaped between depressions, forming an almost right angle with apophyses anteriores, longitudinal depressions almost rectangular, about 10x as long as wide, not reaching anterior edge, not closely contiguous to ventrolateral zone; ventrolateral zone rectangular, about 3x as long as wide; lateral margin irregularly hunch-backed. Apophyses anteriores 375  $\mu\text{m}$ ; straight; same length as sternite VIII. Apophyses posteriores 4.6x as long as anteriores. Colliculum square to 1.7x as broad as long. Bursa (fig. 55) length 1400  $\mu\text{m}$ ; 3.7x as long as apophyses anteriores and 0.8x length of apophyses posteriores; transition from ductus to corpus abrupt; corpus bursae clearly demarcated, spherical; ductus distal of colliculum funnel-shaped, widening. Signum (fig. 55, 63) weakly curved; in transition zone between ductus and corpus; height 275-300  $\mu\text{m}$ ; width at base 125-150  $\mu\text{m}$ ; diagonal length 275  $\mu\text{m}$ , concave side with many long teeth along basal two-thirds.

#### Larva (pls. 3:6, 4:1,2)

Body of living specimens translucent and variable dull greyish green with five greyish to reddish lines, three dorsally and two laterally; head and mouthparts pale brown with darker spots, prothoracic plate dark brown to black, with a very thin brownish-grey longitudinal line; pinacula light brown with dark brown centre, each with one or two simple setae; legs dark brown, spotted light brown, base brownish grey, narrow ringed dark brown. Stainton (1866) described the head as black and the second and third segments dark purplish-brown but these get paler when the larva is nearly full fed.

#### Biology

Host plants: *Solanum dulcamara*.

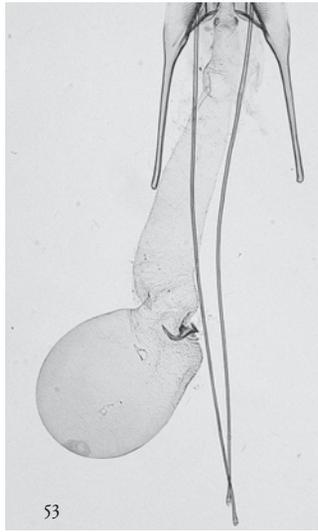
Larva: young larvae live in an opaque brownish blotch mine which is slightly puckered at the sides or in a broad, short contorting mine, starting from the corner of a lateral rib, with faeces irregularly spaced in the mine. Later it feeds in the stem. Older larvae eat the ribs, leave the mine and start mining elsewhere in the same leaf or in a neighbouring leaf. Occasionally leaves, fruits or stems are spun together. Usually the larva bores into a stem after leaving the mine and changes this residence a few times before pupation, causing withering of the terminal shoots. The larvae are disclosed by the presence of little pellets of excrement which are frequently ejected along the stem at the base of a leaf stalk. Pupation takes place outside the mine, in a loose silken cocoon between spun leaves or in the stem of the host plant. O. Karsholt (in litt.) observed many larvae pupating in sand.

Voltinism (fig. 67): univoltine, one prolonged generation; hibernating as larva. Adults have been collected from 19 July till late September, but four specimens have been found in October and November, the latest 16.xi.1990; this may represent a partial second generation due to the warm summer that year. Larvae were observed from mid September to May (abroad till June). Full-grown larvae have been found from December onwards, but younger, second stage larvae could also still be found in February. This agrees with observations of various authors (Snellen 1882, Stainton 1866, Buhl et al. 1996, Michaelis 1977). These data indicate that there is generally only one prolonged generation: no larvae have been found in early summer and autumn larvae vary in their developmental stage. There is no diapause and because they tend to continue their development under favourable conditions, emerging can easily be forced. From autumn larvae, kept indoors, adults emerge from November to February.

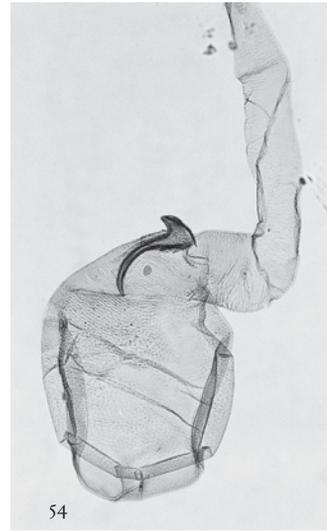
It is unknown whether eggs can survive in winter. The moth flies at dusk and is frequently taken at light.



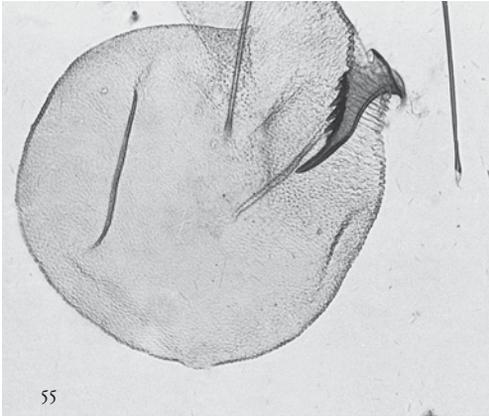
52



53



54



55



56

Figure 52-56

Female genitalia of *Scrobipalpa* species, bursa copulatrix with signum, with slide numbers. 52 *S. acuminatella*, vV176; 53 *S. artemisiella*, MJ617; 54 *S. atriplicella*, MJ63; 55 *S. costella*, MJ574; 56 *S. instabilella*, MJ131.

Figuur 52-56

Vrouwelijke genitalia van *Scrobipalpa*, bursa copulatrix met signum, met preparaatnummers. 52 *S. acuminatella*, vV176; 53 *S. artemisiella*, MJ617; 54 *S. atriplicella*, MJ63; 55 *S. costella*, MJ574; 56 *S. instabilella*, MJ131.

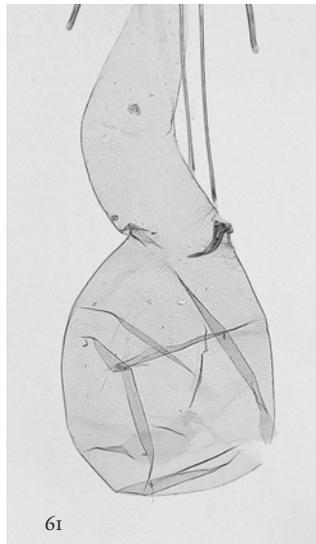
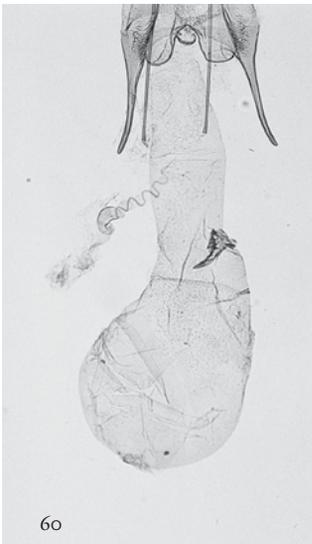
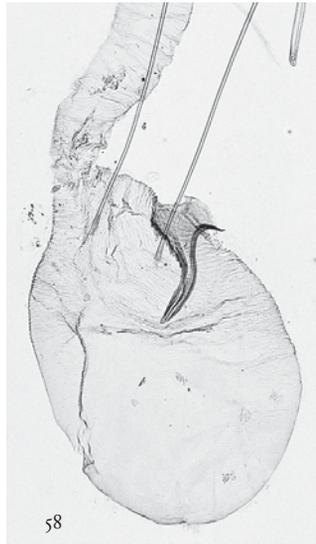
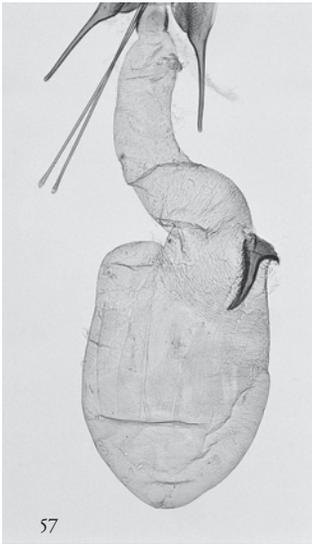


Figure 57-62

Female genitalia of *Scrobipalpa* species, bursa copulatrix with signum, with slide numbers. 57 *S. nitentella*, MJ134; 58 *S. obsoletella*, MJ596; 59 *S. ocellatella*, MJ655; 60 *S. proclivella*, Wfi858; 61 *S. salinella*, MJ1082; 62 *S. samadensis*, Wf951.

Figuur 57-62

Vrouwelijke genitalia van *Scrobipalpa*, bursa copulatrix met signum, met preparaatnummers. 57 *S. nitentella*, MJ134; 58 *S. obsoletella*, MJ596; 59 *S. ocellatella*, MJ655; 60 *S. proclivella*, Wfi858; 61 *S. salinella*, MJ1082; 62 *S. samadensis*, Wf951.

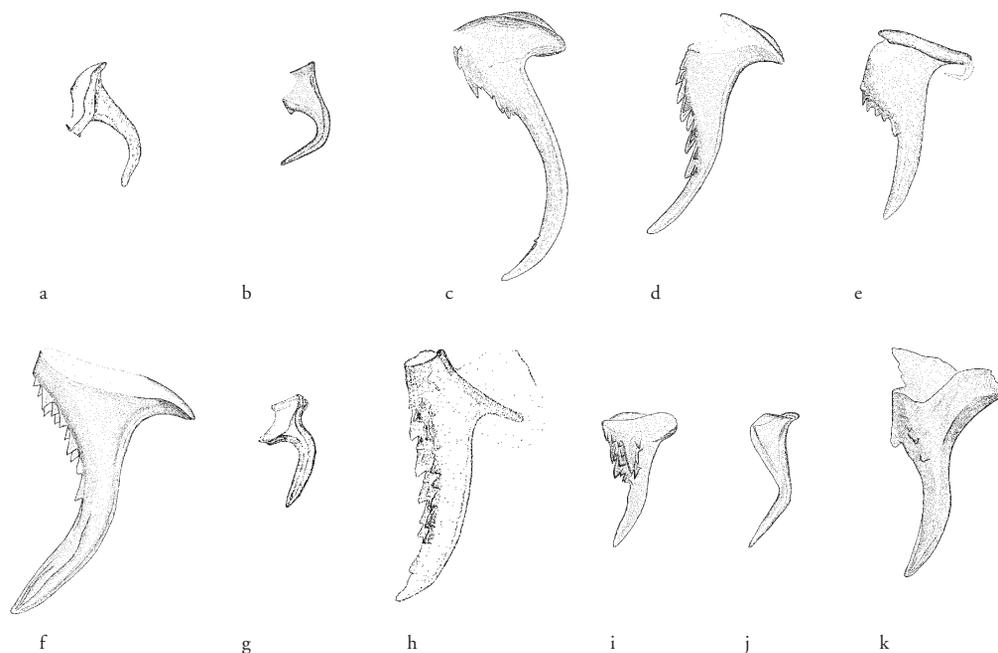


Figure 63

Form and relative size of the signum of *Scrobipalpa* species.

a. *S. acuminatella*, b. *S. artemisiella*, c. *S. atriplicella*, d. *S. costella*, e. *S. instabilella*, f. *S. obsoletella*, g. *S. ocellatella*, h. *S. nitentella*, i. *S. proclivella*, j. *S. salinella*, k. *S. samadensis*

Figuur 63

Vorm en relatieve grootte van het signum van *Scrobipalpa* soorten.

a. *S. acuminatella*, b. *S. artemisiella*, c. *S. atriplicella*, d. *S. costella*, e. *S. instabilella*, f. *S. obsoletella*, g. *S. ocellatella*, h. *S. nitentella*, i. *S. proclivella*, j. *S. salinella*, k. *S. samadensis*

### Ecology

Although *Solanum dulcamara* is a common plant in The Netherlands, *S. costella* is restricted to the coast. In the dunes it has been found on marshy sites with *Salix* spp. and *Phragmites communis*. At the artificial island Neeltje Jans (Oosterschelde) larvae have been found in high numbers in host plant stems. These were growing in dunes at the basis of the seedike on debris, partly covered with sand, in an open vegetation with *Ammophila arenaria*, *Hippophaë rhamnoides* and *Senecio jacobaeae* (pl. 6:1).

### Distribution (fig. 67)

*S. costella* is only known from Great-Britain, Denmark, France and The Netherlands. The species was recorded for the first time by De Graaf

& Snellen (1866). Snellen (1882) collected the first Dutch specimen in the dunes of Wassenaar on 30.VIII.1863. It only occurs along the coast and is occasionally observed in great number, but in Great Britain it has also been found in inland sites.

### *Scrobipalpa instabilella* (Douglas)

(figs 2, 3, 4, II, 23, 34, 45, 56, 63, 68; pls. 1:5,6, 4:3,4, 6:1,3-5)

### Diagnosis

The shape and size of the black dots distinguish *instabilella* from other species with spotlike markings (*S. salinella* and *S. obsoletella* in part) or streaklike markings (*S. nitentella*). A characteristic form (10-15% of the Dutch specimens, n = 550)

has a blackish longitudinal suffusion with dark-greyish scales of the markings which runs from base to the end of the markings and continues as a blackish line to the tip; various intermediate forms have been found. Such a form is absent in the other species.

*S. instabilella* is very similar in male genitalia to *S. salinella*. The most striking differences are the shape of the aedeagus and the presence of a little lump in the middle of the anterior edge of the tegumen in *salinella*. Minor differences can be found in the shape of the vincular process, the sacculus and the sclerotization along the invagination of the vinculum. Further, the uncus of *S. instabilella* is somewhat more slender. In the female genitalia it resembles *S. salinella*, but differs in width of the ventromedial zone which is more or less constricted.

#### Adult (pl. 1:5,6)

Wingspan: 11-15.5 mm. Forewing: very variable, ground colour varying from cream-white to brownish or greyish suffused with ochreous, fine dusted darker or paler; stigmata consist of a few scales which form small dots, regularly surrounded by ochreous scales; reniform stigma divided in two black dots; a greyish tinged, broadly V-shaped fascia at three-quarters may be present; in some unicolorous greyish forms, the stigmata and most other markings lacking. Hindwings vary from satin shining white in the greyish forms to shining brown-grey with brownish cilia in the dark forms. First abdominal segments: yellowish brown.

Male genitalia (figs. 2, 3, 4, 11, 23, 34). VIL 1.6-1.7x VAL. Valva: sacculus anteriorly as wide as at tip, outer margin convex, more or less truncate at tip and a small tooth directed inward. Vinculum: posterior processes distinctly shorter than sacculus, with a well developed tooth, fairly short and broad; median invagination V-shaped, anterior half more narrowing; sclerotization alongside invagination of hind edge of vinculum anteriorly flattened; distance between sacculus and posterior process of vinculum as broad as sacculus; shoulder well developed, almost rectangular. Uncus

rounded off; slightly exceeding valvae. Saccus: as long as pedunculi. Aedeagus (fig. 34) length 675-700  $\mu\text{m}$ ; distal part heavily sclerotized; width 150-175  $\mu\text{m}$ , edge well developed, cornutus rectangular bent inwards and in the tip generally curved at its whole length. Coremata present.

Female genitalia (figs. 45, 56, 63). Sternite VIII: anterior margin almost 2x as wide as posterior margin; ventromedial zone with only a few small microtrichia in centre; hardly constricted, wider than ductus bursae at colliculum; longitudinal depressions not reaching anterior edge, smoothly brown and laterally closely contiguous; ventrolateral zone medially with some foamy sculpture, microtrichia absent; anterior edge present ventrolaterally, strongly sclerotized, ventromedial part above colliculum membranous; transition from anterior edge to apophyses anteriores fairly gradual. Apophyses anteriores 425  $\mu\text{m}$ ; curved inward; transition of lateral margin of sternite VIII and apophyses anteriores arched; 2x as long as sternite VIII. Apophyses posteriores 4x as long as anteriores. Colliculum 4-5x as wide as long. Bursa (fig. 56) 1675  $\mu\text{m}$ ; less than 5x as long as apophyses anteriores; as long as apophyses posteriores; transition from ductus to corpus abrupt; corpus clearly demarcated; oval, as long as wide; ductus at transition half as wide as corpus, distinctly curved near corpus. Signum (fig. 56, 63) slightly S-shaped, height 245-260  $\mu\text{m}$ , width at base 105  $\mu\text{m}$ , diagonal length 250  $\mu\text{m}$ , in transition zone between ductus and corpus; with parallel sides at base and a few teeth in basal half.

#### Larva (pl. 4:3,4)

Head pale brown with darker irregular spots; clypeus grey; labrum chocolate brown; antennae with first segment grey and next segments brown; adfrons a narrow black line; body yellowish grey with three reddish-brown lines, the middle narrow and the other two at the outside broader with borders gradually changing in colour. Young larvae have a yellowish grey body without distinct lines. Setae simple with pinaculum pale brown and papilla almost chocolate-

brown; underside of body grey; prothoracic plate light-brown with darker irregular spots, posterior margin chocolate-brown, anterior margin whitish; prolegs and anal proleg yellowish-grey; legs upperside chocolate-brown and underside grey.

### Biology

Host plants: *Atriplex portulacoides*.

Larva: young mines were observed in the leaves of younger stalks; fresh mine hardly visible, older mines pale greenish blotches. The larvae occasionally leave the mine and start eating at another part of the hostplant. Quite often a greater part of the plant becomes peeled, however without killing the hostplant. Infestations can be found by searching for leaves which turn greyish, especially younger leaves and buds, which are spun together by silky threads. Also holes in stalks and leaves, eventually with excrements, show the presence of a larva.

After disturbance larvae secrete a green fluid.

Voltinism (fig. 68): univoltine, hibernates as a larva. Adults have been found from 9.VI-2.IX, most specimens were collected in July.

Larvae has been found early September and in spring till the 6th of May. Larvae found in winter and kept indoors, pupated mid May and gave emerging adults after two weeks. Pupation takes place during the first half of May. Normally larvae leave the plant to make a loose cocoon in plant debris on the soil but occasionally pupae can be found between spun shoots of the hostplant.

Banks (1894) noticed that larvae, after spinning, remain for weeks unchanged in their cocoons.

### Ecology

In The Netherlands *Scrobipalpa instabilella* is only found on coastal salt marshes (Jansen & Asselbergs 1993, Kuchlein 1993) (pl. 6:1,3,5). Here the species is common and often abundant where the hostplant is growing. In the daytime adults live hidden between the lowest twigs of *Atriplex portulacoides*. The moth flies at dusk and is frequently taken at light. Some countings on different sites in Het Zwin in 1984, revealed about hundred specimens per square meter.

*Atriplex portulacoides* occurs in salt marshes on creek banks on well drained silty soil, which get only submerged at spring tide and storm flood. This habitat occurs more frequently in the estuarine region in the south-western part of The Netherlands than in the Waddensea area. During the last decades there has been a rapid expansion of well developed *Halimionetum portulacoidis* communities in the Wadden area. This may have contributed to the increase of *S. instabilella* during the last decades. It is almost absent from brackish tidal salt marshes and non-tidal areas because of the absence of the host plant. Occasionally adults have been caught far away from sites of the hostplant.

In Denmark *S. instabilella* is on average several weeks later on the wing than *S. salinella* (O. Karsholt in litt.).

### Distribution (fig. 68)

*S. instabilella* is a palaearctic species which occurs in the largest part of Europe and northern Africa, especially along the coast of Western Europe. It was recorded for the first time in The Netherlands by Jansen & Asselbergs (1993), whereas the earliest Dutch specimen had been caught by Huisman at Ouddorp on 1.VII.1969. *S. instabilella* is a very common species which usually occurs in high numbers where the hostplant is growing.

### *Scrobipalpa nitentella* (Fuchs)

(figs. 12, 24, 35, 46, 57, 63, 69; pls. 2:1, 4:5,6, 6:1-4)

### Diagnosis

Adults can be confused with several other members of the genus. In general *Scrobipalpa nitentella* differs from *S. salinella* and *S. obsoletella* by the streaklike markings and the greyish appearance and from *S. instabilella* by the absence of small black dots. The male genitalia are easily distinguished from the other species by the combination of the long sacculus and the shape of the vincular process which is curved inward. It is the only species with a colliculum which is only twice as long as wide.

### Adult (pl. 2:1)

Wingspan: 9–14.5 mm. Forewings: cilia and ground colour generally bright ashy to pale greyish fuscous, sometimes unicolorous, occasionally ochreous or ferruginous-brown scales between stigmata and along costa, cloudy marbled with diffuse groups of tiny fuscous to orange brown spots which form longitudinal aggregations alongside the veins. Markings sometimes absent, only slightly darker than ground colour but larger than stigmatic spots. Stigmata dark greyish brown: orbicular and reniform stigma vary in size; claviform stigma often hardly visible, sometimes small and conspicuous; a weakly developed V-shaped fascia at three-quarters present or absent; pre-tornal markings if present, obsolete. Hindwings whitish-grey, terminally darker. First abdominal segments bright yellow.

Male genitalia (figs. 12, 24, 35). VIL 1.8x VAL.

Valva: about the same length as uncus; straight at its proximal part and curved at two-thirds of its length; sacculus anteriorly as broad as valva, gradual tapering posteriorly and ending in a sharp tooth, more than 3x as long as wide. Vinculum: posterior process notably shorter than sacculus, digitate, with blunt tip, curved inward at mid-length, with setae at tip; median invagination of vinculum pentagonal; sclerotization alongside invagination almost absent; shoulder absent. Uncus posterior margin rounded off; truncate. Saccus: with thick margins, extending anteriorly beyond pedunculi; unthickened part of posterior margin narrow. Aedeagus (fig. 35) length 750 µm; coecum oblong and ovally at its top; cornutus with two right angles; ductus ejaculatorius weakly sclerotized. Coremata absent.

Female genitalia (figs. 46, 57, 63). Sternite VIII with ventro-lateral and ventro-medial zone densely set with microtrichia and strong developed foamy sculpture, border between zones with a narrow overlap; ventro-lateral zones parallel sided and straight, anteriorly as wide as posteriorly; anterior edge a process like brown coloured hook curved inwardly, half as broad as collicu-

lum, anteriorly with a heavily sclerotized border, overlapping the ventro-medial zone; longitudinal depressions far beyond anterior edge; transition from longitudinal depressions to apophyses anteriores gradual. Apophyses anteriores 350 µm; in one line with lateral margin of sternite VIII and of about the same length; diverging anteriorly. Apophyses posteriores 5.4x as long as anteriores. Colliculum 1.5 to 2.5x as wide as long. Bursa (fig. 57) 2175 µm, 6.2x as long as apophyses anteriores; 1.1 x apophyses posteriores; transition from ductus to corpus bursae abrupt; corpus clearly demarcated; corpus irregularly oval, longer than wide. Signum (fig. 57, 63) gently curved, height 325 µm, width at base 160–180 µm, diagonal length 350 µm; in transition zone between ductus and corpus bursae; concave side with many strong teeth, almost to apex.

### Larva (pl. 4:5,6)

Described by Pierce & Metcalfe (1935). Body pale green with three lines, dorsal line brick red suffused with white, subdorsal lines reddish, paler than dorsal line, fairly vague anteriorly and broadened on abdominal segments; a transverse pinkish mark on each segment below the subdorsal line; reddish markings become paler to the end of the body; pinacula brown with black papilla, a few on each segment; anal plate pale yellowish. Head and prothoracic shield brown; a large dark brown spot on each side of the head and a little behind it.

### Biology

Host plants: *Atriplex prostrata*, *Salicornia europaea* and *Suaeda* spp.. Also recorded from *A. portulacoides* (Stüning 1988, Michaelis 1977, Povolný 1981), *A. littoralis* (Michaelis 1977), *A. nitens* (Povolný 1988), *Chenopodium* spp. (Emmet 1988) and *Beta maritima* (Michaelis 1977).

Larva: young larvae make a short spirally mine, which become soon an irregular and branched greenish-white mine.

Voltinism (fig. 69): univoltine, hibernate as a pupa. Full grown larvae live in spun galleries among the seeds, often partially exposed, from

mid August till the end of September leaving the mine to pupate in sand or debris. Pupa from September until June. Adults were caught from 3.VI-19.VIII; one specimen was found on 16.IX.1984, whereas one adult emerged on 25.IX. In rearings adults usually emerge already during winter (occasionally autumn) or early spring, much earlier than in the field, especially indoors (see also Stüning 1988). The moth is easily disturbed from the foliage of the foodplants during the day, is on the wing at dusk and is frequently taken at light.

### Ecology

In The Netherlands *Scrobipalpa nitentella* is common found on plants growing on debris washed ashore on the spring and storm flood strand lines of creek bank levees, dike faces and dune ridges (pl. 6:1,2,3,4). This is the growing site of the *Atriplicetum littoralis* community which is floristic composed by the presence of *Atriplex littoralis* and *A. prostrata*. It is suggested that the very large share of *Spartina* spp. foliage and stems in the total composition of debris during recent decennia has stimulated the occurrence of both *Atriplex* spp, especially *A. prostrata* (Beefink 1965). This may have contributed to the increasing number of *Scrobipalpa* specimens which has been found during the last decades. Inland tide-less saline meadows with salty seepage where the host plant is growing form also a characteristic habitat in which *S. nitentella* is a common faunal element (pl. 6:5). *S. nitentella* occurs on salt marshes at the coast of West European and Mediterranean countries but is also a common species of deserts and steppe with salty soils. Michaelis (1977) mentioned *S. nitentella* the commonest saltmarsh gelechiid of North Wales and recorded the larvae as plentiful at the coast in August and September.

### Distribution (fig. 69)

*Scrobipalpa nitentella* is widespread in the whole palaearctic region. In The Netherlands it was firstly recorded by Jansen & Asselbergs (1993) from Het Markiezaat, near Bergen op Zoom. The

first Dutch specimen is caught by Huisman at Melissant on 3.VII.1973. The species is confined to the coast and is a common species and not seldomly present in great numbers. It has rarely found on inland sites.

### *Scrobipalpa obsoletella* (Fischer von Röslerstamm)

(figs. 13, 25, 36, 47, 58, 63, 70; pls. 2:2, 5:1,2, 6:1,2)

### Diagnosis

Adults can be confused with several other members of the genus. Unicolorous specimens of *S. salinella* resemble 'typical' *S. obsoletella* specimens in having spots of the same size and the same shape. It is the palest species, on average paler than *S. nitentella* with almost no ferruginous-brown coloration. Male genitalia of *S. nitentella* and *S. artemisiella* have a sacculus which does not have the same length as the vincular process. The female genitalia differ from *S. atriplicella* by the shape of the sternite VIII which is less slender and by the foamy sculpture which is restricted to a narrow band of the ventrolateral zone. The female of *S. nitentella* has a strong developed foamy sculpture and a wider colliculum.

### Adult (pl. 2:2)

Wingspan 12-15 mm. Forewings: cilia and ground colour pale greyish-ochreous, sprinkled dark fuscous and ochreous-whitish; stigmata present or absent, dark fuscous, vary in shape and colour intensity, claviform stigma fairly small, reniform spot irregular oval to almost circular, occasionally of a bigger size as orbicular stigma, generally on average as wide as the eye; a V-shaped fascia at three quarters indistinct or absent or replaced by a few small spots. Hindwings: whitish-grey, terminally darker. First abdominal segments: dark yellowish grey.

Male genitalia (figs. 13, 25, 36). VII 1.8x VAL. Valva: weakly bent inward over whole length; widening gradually in posterior half; sacculus posteriorly almost as wide as anteriorly, ending

in a sharp tooth which is frequently hidden beneath tip. Vinculum: posterior processes continuous with median invagination of hind edge, as long as sacculus, apex strongly curved outward, ending in a sharp tooth without hairs or setae; median invagination posteriorly almost parallel sided and anteriorly V-shaped; sclerotization alongside invagination posteriorly with parallel sides and anteriorly almost round; shoulder absent. Uncus posterior margin rounded off. Saccus: narrow, lateral margins almost parallel; extending anteriorly beyond pedunculi; with a fairly thin wall. Aedeagus (fig. 36) length 625 µm; ductus ejaculatorius well sclerotized. Coremata absent.

Female genitalia (figs. 47, 58, 63). Sternite VIII longitudinal depressions of ventromedial zone tapered; foamy sculpture restricted to narrow longitudinal band along edge of ventro-lateral zone; ventro-lateral zone posteriorly almost twice as broad as anterior side, with a weakly sclerotized process curved inwardly, much smaller than colliculum, overlapping the ventro-medial zone; ventro-medial zone with microtrichia and a pair of longitudinal depressions, these far beyond anterior edge; anterior edge membranous, a processlike brown coloured hook starting from ventrolateral zone; transition from longitudinal depressions to apophyses anteriores gradual. Apophyses anteriores length 350 µm; not lying in one line with outer margin of sternite VIII; about the same length as sternite VIII. Apophyses posteriores 4.8x as long as apophyses anteriores. Colliculum about three x wider than long. Bursa (fig. 58) length 2350 µm; 7.3x as long as apophyses anteriores; 1.5x length of apophyses posteriores; transition from ductus to corpus bursae abrupt; corpus bursae clearly defined; corpus regularly oval shaped, slightly longer than wide. Signum (fig. 58, 63) height 350 µm, width of base 190-210 µm, diagonal length 420 µm; concave side with teeth in basal half; gently curved, remote from entrance of ductus, penetrating less than half of corpus bursae.

#### Larva (pl. 5:1,2)

Described by Meyrick (1928). Juvenile larvae are bright green; head and prothoracic plate black-brown; adult larvae yellowish-green; dots small, blackish-grey, each with a whitish hair; dorsally with a pale reddish-white longitudinal line and laterally occasionally rosy-tinged. Head pale brownish-ochreous, prothoracic plate blackish-brown, margins whitish; legs and prolegs greenish white.

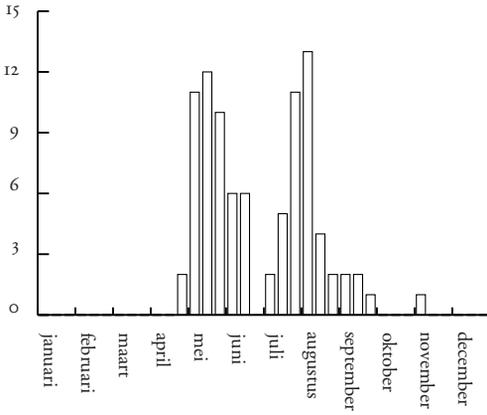
#### Biology

Host plants: no records from The Netherlands; abroad especially *Atriplex* spec., also found on *Chenopodium* spec. Langmaid (1995) found larvae feeding in spun fruits of *Atriplex glabriuscula* growing along the beach-line.

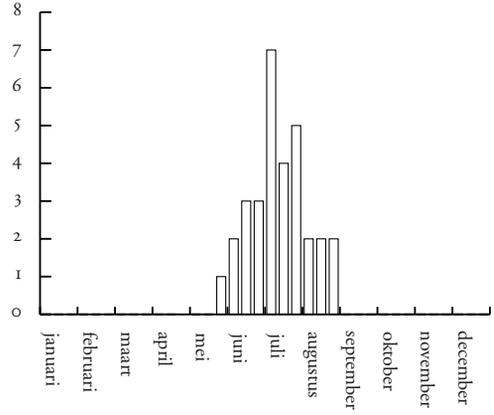
Larva: although normally living in the stem also recorded by Hering (1957) from irregular blotch-mines in the leaves. The larva ejects the frass from a small hole in the pith of the stem; frass spun together by silken threads. This hole is always present at the basis of a leafstalk or a lateral

branch. The activity of the larvae seems hardly to effect the vitality of the plant. The larva makes a dense cocoon of silk threads spun together in which it pupates. Stüning (1988) recorded up to 36 larvae in one stem, devouring the pith.

Pupation takes place in the stem close to a hole, which is still covered with the epidermal layer. Occasionally the larva leaves the mine and makes a cocoon between spun leaves or on earth under dead leaves. After 12-14 days the adult emerges, after which copulation takes place the same day. Voltinism (fig. 70): bivoltine, overwinters as a pupa. Larva can be found in June-July and again in September. The two generations overlap: the first one in May, the second one in August. In Denmark adults are only occasionally found during the first half of July (Karsholt in litt.). In The Netherlands adults have been caught in a malaise-trap, at dusk and at light from late April till late August. Larvae have not yet been found in The Netherlands.

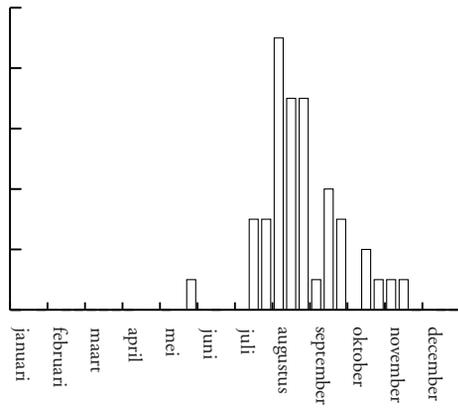
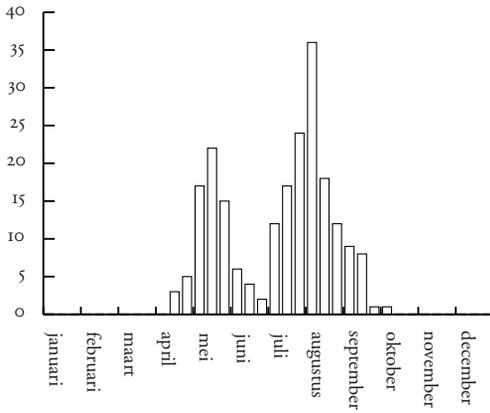


64 *S. acuminatella*



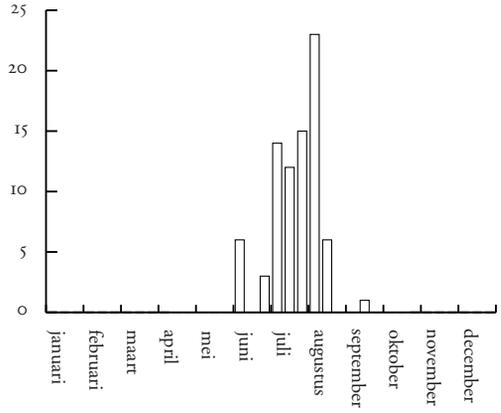
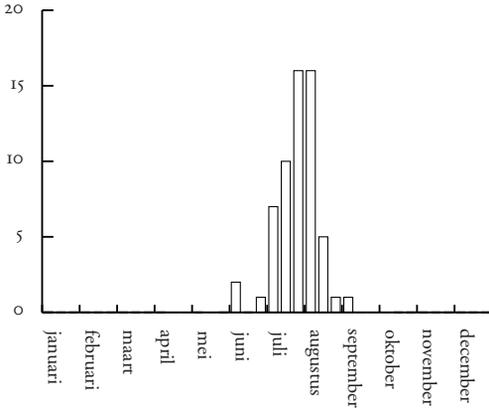
65 *S. artemisiella*

Figure 64-74  
Distribution and flight period of *Scrobipalpa* species in The Netherlands.  
Figuur 64-74o  
Verspreiding en vliegtijd van *Scrobipalpa* in Nederland.



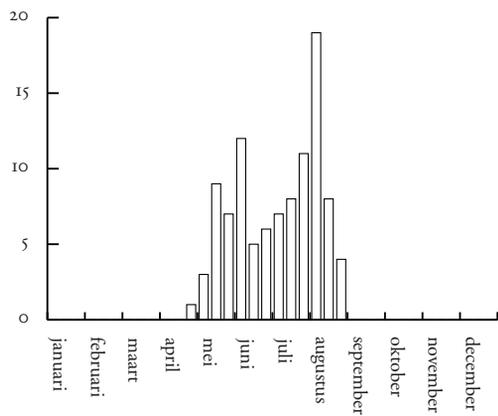
66 *S. atriplicella*

67 *S. costella*



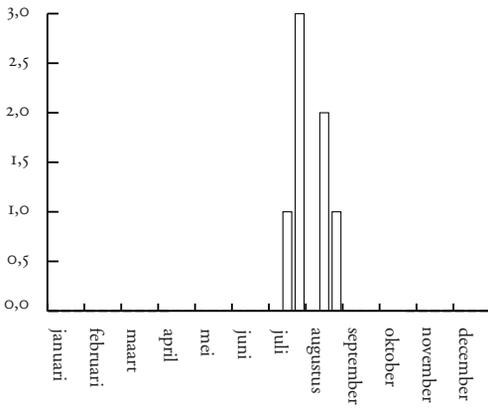
68 *S. instabilella*

69 *S. nitentella*

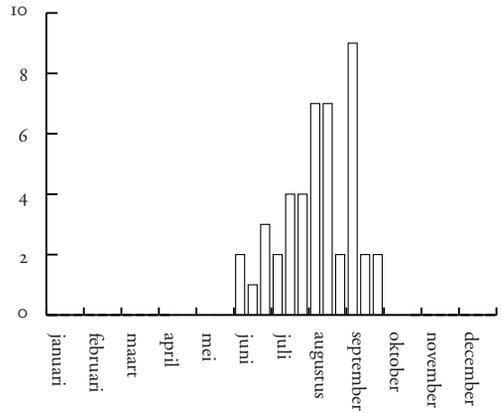


70 *S. obsoletella*

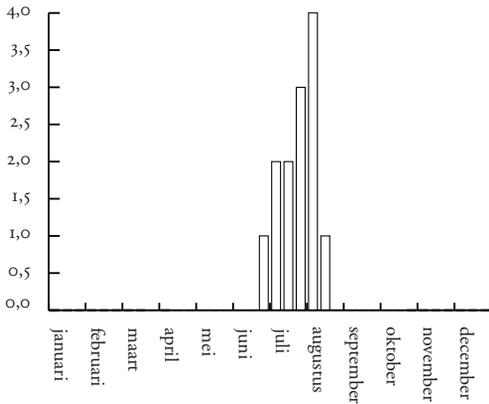
71 *S. ocellatella*



72 *S. proclivella*



73 *S. salinella*



74 *S. samadensis*

### Ecology

Fischer von Röslerstamm [1841] observed larvae always near human settlements, never in natural vegetations. In The Netherlands *S. obsoletella* is frequently found at the border of salt marshes (pl. 6:1,2) and on brackish inland sites along the coast. In contrast to Great Britain, where it is confined to the coast and widely distributed in the South, becoming more local northwards, in The Netherlands it is not confined to the coast, but has always been found in low numbers. Although *S. obsoletella* seems to have a fairly broad habitat range judging from its localities, little is known about ecology here because of absence of larval records. Abroad it is widespread on steppes and in deserts.

### Distribution (fig. 70)

*S. obsoletella* is a palaearctic species, which is introduced into the United States. Bentinck (1958) recorded the first specimen from Terschelling. The oldest specimen was caught by Wijnbelt in Amsterdam-Zuid on 26.v.1928. In The Netherlands it is widespread but occurring in small numbers.

### *Scrobipalpa ocellatella* (Boyd)

(figs. 14, 26, 37, 48, 59, 63, 71; pls. 2:3, 5:3, 6:3)

### Diagnosis

The adult is readily distinguished from most other species by the fold which has an ocellated spot. The female genitalia are very conspicuous by their club shaped protruding depressions of the ventromedial zone and the strong oval foamy sculpture of both depressions and lateral zone. The male genitalia are easy to recognize by the combination of the strong curved valva, the inclined vincular process and the wide and short sacculus.

### Adult (pl. 2:3)

Wingspan: 11-15 mm. Sexual dimorphism moderately pronounced; males darker and the ground colour of the subapical area suffused greyish fuscous, female paler, greyish fuscous scales restricted to the subbasal area and the costal area up to stig-

mata; wings of the male rather narrow and more pointed. Forewing: ground colour yellowish to pale ochreous, mixed with groups of buff tinged scales; stigmata, subbasal area and along costa up to fold suffused greyish fuscous; stigmata consisting of one or two small black spots, generally ringed with ground colour; regularly a pale ochreous V-shaped fascia present at tree-quarters; termen more or less with fuscous scales; cilia ochreous white, an indistinct fuscous line more strongly exposed at apex. Hindwing grey, slightly darker at apex; cilia concolorous. First abdominal segments: yellowish grey, same colour as the other abdominal segments.

Male genitalia (figs. 14, 26, 37). VIL about 1.5x VAL. Valva: strongly curved in posterior two-thirds; not exceeding uncus, only slightly wider at tip; sacculus with tip wider than base, longer than vincular process, tip much wider than tip of vincular process, tooth small but well developed. Vinculum: median invagination rectangular; not shouldered; sclerotization alongside invagination well developed, with a notch near posterior process, rounded off laterally and with a fairly flat tip. Uncus posterior margin strongly concave. Saccus: slightly extending anteriorly beyond pedunculi. Aedeagus (fig. 37) length 530  $\mu\text{m}$ . Coremata absent.

Female genitalia (figs. 48, 59, 63). Sternite VIII: ventrolateral and ventromedial zone with well developed foamy sculpture of partly globular shape; medial part of anterior edge membranous; depressions of ventromedial zone club shaped, protruding, a little beyond anterior edge, ending anteriorly almost semicircular, slightly overlapping the ventrolateral zone; ventrolateral zone an irregular quadrangle, posteriorly slightly wider. Apophyses anteriores 400-450  $\mu\text{m}$ , straight, clearly extending outwards. Apophyses posteriores about 1500  $\mu\text{m}$ , about 3.5x as long as anteriores. Colliculum almost rectangular. Bursa (fig. 59) length 1375  $\mu\text{m}$ , transition from ductus to corpus gradual, widening anteriorly. Signum (fig. 59, 63) at 3/5 bursa length; strongly curved in middle;

height 45  $\mu\text{m}$ , width at base 100  $\mu\text{m}$ , diagonal length 175  $\mu\text{m}$ ; without teeth.

#### Larva (pl. 5:3)

Body greenish grey, slightly indented between segments, tapering in the first two and last two about half; a reddish brown longitudinal series of blotches on each segment forming vague stripes, one dorsal, two subdorsal and two to four weaker lateral stripes; subdorsal stripes twice as wide as the dorsal one; head pale brown, base of antenna and clypeus greenish grey, labrum dark brown, mandibles ventrally purple grey; prothoracic plate pale brown, posterior margin brownish black; pinaculum brownish black, under magnification appearing as black dots, surrounded by greenish grey; anal plate greenish grey speckled with some pale brown spots, only marked by a thin brown line; legs brownish black, ventrally purplish grey. Spiracles inconspicuous.

#### Biology

Host plants: *Beta maritima*. Gregor & Povolný (1954) and Povolný (1980) also reported *Chenopodium maritimum*, *Atriplex portulacoides*, *Suaeda fruticosa*, *Salicornia europaea* and *Camphorosma monspeliaca*.

Larva: hibernating larvae were found in late March. Weismann (1959) studied larval development in relation to temperature and recorded 27.9 days during 17.1 °C and 12.7 days during 28°C. Voltinism (fig. 71): bivoltine, overwintering as larva. The pupa can be found in a loose silk cocoon, often mixed with earth, among dead leaves or on the soil surface. Up to eighty eggs are laid singly or in groups on the leaves, especially on the petioles close to the stem (Hammad et al. 1968). The young larvae mine into the midrib and later leave the mine and spin a silken web.

#### Ecology

In Northwest Europe, *S. ocellatella* has only been found along the coast. It has never been recorded from inland arable fields with sugar beets. In southern Europe and North Africa, it has,

however, regularly been reported as a serious pest of *Beta vulgaris* (Carter 1984). Povolný (1991) records the 13°C April-isotherm as the northernmost border for the occurrence of *S. ocellatella* as pest. In England larvae could only be found on isolated plants growing on rocky shores close to tidal debris (pers. comm. M. Parsons). In The Netherlands *S. ocellatella* has only been found in Het Zwin (on the Belgium border) which has the largest *Beta maritima* population (pl. 6:3). The site of the few plants where larvae were found, can phytosociologically be characterized by the presence of most diagnostic plant species of the *Asteretea tripolii* such as *Aster tripolium*, *Triglochin maritima*, *Plantago maritima*, *Atriplex portulacoides* and *Limonium vulgare*. Nearly all *Beta maritima* plants, however, grow in an almost non saline environment at the edge of the dunes, between *Hippophae rhamnoides* and tall herbs such as *Cirsium arvense* and *Ammophila arenaria*.

#### Distribution (fig. 71)

*S. ocellatella* is widely distributed over Europe and Asia and recorded from 24 countries (Karsholt & Razowski 1996) including Belgium and Great Britain. In Belgium it was recorded by Crombrughe (1906) from a record by Paux in the dunes of Nieuwpoort, about 50 km from the Dutch site. Recently a few specimens were also recorded from Denmark (Buhl et al. 1996). The only Dutch larvae were found by Honey, Jansen and Parsons on 24.III.1998, on *Beta maritima* plants in Het Zwin.

#### *Scrobipalpa proclivella* (Fuchs)

(figs. 15, 27, 38, 49, 60, 63, 72; pl. 2:4)

#### Diagnosis

A small uniform grey species. The male genitalia have a strong developed vincular process of equal length as the sacculus. The female genitalia are characterized by the protruding depressions of the ventromedial zone which are very wide and end in an arched tip.

#### Adult (pl. 2:4)

Wingspan: 10–11.5 mm. Forewings relatively short and broad. Ground colour pale grey to greyish ochreous, with ferruginous streaks in the fold and alongside the costa; finely sprinkled with darker scales but the amount of darker scales varies; stigmata or other markings absent or restricted to a few vague streak-like suffusions. Cilia pale grey to greyish ochreous, sometimes with darker scales. Hindwings: shining pale grey; cilia greyish-fuscous.

Male genitalia (figs 15, 27, 38). VII 2X VAL. Valva slightly concave at tip; sacculus fairly short and broad, distally rounded, with a short tooth; moderately sclerotized; as long as vincular process or slightly longer. Vinculum: posterior process short and much broader than sacculus, with hooked tip and strongly sclerotized, inner margin strongly arched, continuous with median emargination; median emargination V-shaped; sclerotization alongside invagination absent; shoulder absent. Uncus exceeding valva; posterior margin more or less concave; fairly broad. Saccus: wall thick; extending anteriorly beyond pedunculi. Aedeagus (fig. 38) length ca 500 µm. Coremata absent.

Female genitalia (figs. 49, 60, 63). Sternite VIII with anterior edge membranous, broadly arched, sometimes a very short sclerotized part visible, starting from ventrolateral zone; longitudinal depressions of ventromedial zone with foamy sculpture, protruding far beyond anterior edge, roundly and fairly broad, transition to apophyses anteriores abrupt, border between ventromedial zone and ventrolateral zone a straight line with a narrow fold-like overlap. Apophyses anteriores 325 µm; at the anterior end diverging; slightly curved outwards. Apophyses posteriores 3.6x as long as anteriores. Colliculum 4–5x wider than long. Bursa (fig. 60) length 1450 µm; 1.3x as long as apophyses posteriores and 4.6x as long as apophyses anteriores; transition from ductus to corpus abrupt; ductus half as broad as corpus, in the middle wider than near signum; corpus bullet-

shaped with a gradual transition towards signum. Signum (fig. 60, 63) height 150-170 µm; width at base 100 µm, diagonal length 170 µm; in ductus bursae near transition to corpus; weakly curved with some teeth in first half.

### Larva

Briefly described by Fuchs (1886), Spuler (1910) and Hering (1957). Body greenish yellow-grey or transparent, pale greenish yellow to greyish green with red-brown lines. Head and prothoracic shield fuscous.

### Biology

Host plants: *Tanacetum vulgare* and *Leucanthemella serotina* (Sattler 1987). Karsholt & Nielsen (1978) recorded only *Artemisia absinthum* as hostplant, but this is rare in The Netherlands and not growing on its localities. Larva: lives in a *Phyllonorycter*-like folded mine, later between leaves, from where it mines parts of the leaves which turn yellowish. Pupation occurs between spun leaves, on the soil (Karsholt & Nielsen 1978) or in the mine and occasionally outside the mine (Fuchs 1886). Voltinism (fig. 72) bivoltine, overwintering as pupa. Fuchs (1886) observed larvae at the end of September and the beginning of October, giving adults in the beginning of May. According to Sattler (1987) larvae can be found in May-June and September-October; adults fly in April-May and in July. In The Netherlands adults were collected in the period 13.VII-20.VIII.

### Ecology

In The Netherlands *S. proclivella* has been found in Best on two different sites. The first locality is a canal-verge along the Wilhelminakanaal with a sandy soil and an open vegetation, where the host plant is frequent. The other is an industrial site without a clear management, with a dry sandy soil and a sparse vegetation containing *Sedum acre* and *Artemisia vulgaris*; this site is now lost due to building activities (H.W. van der Wolf in litt.).

### Distribution (fig. 72)

*S. proclivella* is recorded from all over Central and southern Europe, including Denmark, but has not been recorded from the British Isles or the Scandinavian countries. In The Netherlands *S. proclivella* was for the first time recorded by Nieuwerkerken et al. (1993) from specimens caught by Van der Wolf in Son en Breugel in 1982. Recently three specimens were found in the collection of the Zoological Museum Amsterdam, collected by Langohr in Simpelveld, 13.VII.1972 and 25.VII.1972.

### *Scrobipalpa salinella* (Zeller)

(figs. 16, 28, 39, 50, 61, 63, 73; pl. 2:5, 5:4,5, 6:1,3-5)

### Diagnosis

Adults are easily recognized by the large, partly ferruginous tinged forewings. Unicolorous specimens without distinct characters differ from *S. obsoletella* by the less pointed tip of the hindwing, the relative broad wings and the colour of the markings on the forewing. *S. salinella* and *instabilella* share many characters of the male genitalia. The most striking differences can be found in the shape of the aedeagus and the presence of a little hump in the middle of the anterior edge of the tegumen in *salinella*. Minor differences are the shape of the vincular process and the sacculus and the sclerotization alongside the invagination of the vinculum. Moreover the uncus of *instabilella* is slightly more slender. The female genitalia resemble those of *S. salinella*, but differ in width of the ventromedial zone which is more or less constricted.

### Adult (pl. 2:5)

Wingspan 12-14 mm. Forewing: ground colour grey to cream-white, suffused with paler or darker grey scales or grey marbled, partly ferruginous-tinged especially in the fold and along subcosta. Generally an irregular sinuate V-shaped fascia at three-quarters present, which lacks in unicolorous specimens, but may be very distinct in other specimens. Stigmata sometimes absent but generally well developed, with the same size as the eye, kid-

ney-shaped, unicolorous chocolate-brown or ferruginous-brown to dark fuscous, sometimes mixed with dark scales; orbicular and claviform spot almost circular, reniform spot more or less longitudinal. Basal streak occasionally well developed, two spotlike markings at costa, one near apex and a smaller one near basal streak; cilia ochreous-fuscous, irregularly mixed with ochreous-fuscous to brown scales which occasionally form a distinct line. Hindwings: greyish-brown, paler basally, cilia ochreous-brown without darker scales. First abdominal segments: dark yellowish brown.

Male genitalia (figs. 16, 28, 39). VII 1.4x VAL. Valva: sacculus anteriorly wider than at tip, outer margin partly concave. Vinculum: posterior processes distinctly shorter than sacculus, more or less digitate; distance between sacculus and process less than sacculus width; tooth on process moderately developed, median invagination V-shaped; sclerotization alongside invagination almost circular. Shoulder moderately developed. Uncus rounded off, slightly exceeding valva. Saccus: not extending anteriorly beyond pedunculi. Aedeagus (fig. 39) length 675  $\mu\text{m}$ ; width of distal part 90  $\mu\text{m}$ , moderately sclerotized, edge fairly weakly developed, tip curved inward at an angle of 45°; cornutus at tip straight and only curved at distal third. Coremata present.

Female genitalia (figs. 50, 61, 63). Sternite VIII with ventromedial zone constricted, at narrowest point narrower than ductus bursae at colliculum; with microtrichia only in centre; longitudinal depressions of ventromedial zone weakly sclerotized, not reaching anterior edge, laterally alongside ventrolateral zone, with strong rim; ventrolateral zone medially with well developed foamy sculpture and some microtrichia and strongly sclerotized edge, bent inward; ventromedial and ventrolateral zone not closely contiguous but with some space inbetween; apophyses anteriores in one line with lateral margin of ventrolateral zone; anterior edge present ventrolaterally, weakly sclerotized, ventromedial part absent; transition from anterior edge

to apophyses anteriores abrupt, only small part of anterior edge of sternite sloping with apophyses anteriores. Apophyses anteriores 600  $\mu\text{m}$ , longer than in other species except *S. samadensis*; straight; 2.5x as long as sternite VIII. Apophyses posteriores 3.6x as long as anteriores. Colliculum 4-5x as wide as long. Bursa (fig. 61) length 1750  $\mu\text{m}$ ; about 3 x as long as apophyses anteriores; bursa 0.8x length of apophyses posteriores; transition from ductus to corpus bursae abrupt; corpus clearly demarcated, 1.5x as wide as ductus near transition; ductus near corpus not curved; corpus oval, longer than wide. Signum (fig. 61, 63) strongly curved in middle; height 120  $\mu\text{m}$ , diagonal length 195  $\mu\text{m}$ ; width of base 70  $\mu\text{m}$ ; in transition zone between ductus and corpus; narrow; normally without teeth, rarely with one or two teeth.

#### Larva

Described by Banks (1894) and Hering (1957). Head and prothoracic shield dark brown to black, prothoracic plate black. Body dull greenish grey with reddish dorsal, subdorsal and lateral lines; pinaculum small black; anal plate black; thoracic legs black, prolegs concolorous with body; red markings variable and may be obsolete.

#### Biology

Host plants: *Salicornia europaea*. Also recorded from *Suaeda maritima* (Kasy 1959) and *Spergularia* spp. (Hering 1957; Emmet 1988). Banks (1894) recorded *S. salinella* larvae from *Aster tripolium* which was doubted by Sattler (1987). Recently however, Heckford (1997) noted larvae feeding on leaves and cocoons in dead *Aster tripolium* stems. Courtois (1988) recorded many larvae in Lorraine (France) from *Aster tripolium* as well, a smaller number from *Atriplex prostrata* and very few from *Salicornia* spp. In 1995 a visit to Marsal showed that larvae were only present in high numbers on *Salicornia* spp.

Larva (pl. 5:4,5): makes a superficial gallery, spinning several shoots together by silk threads.

Larvae from *Aster tripolium* make a series of galleries in the leaves similar to those of *Bucculatrix*

*maritima*. Young larvae are endophageous miners, full grown larvae spin culms together which are often partially exposed. The pupa can be found in a cocoon on the hostplant and amongst plant debris.

Voltinism (fig. 73): unknown, probably both univoltine and bivoltine. The overwintering stage is still unknown. Martini (1916) found a 6 mm long larva in the first half of May between very young shoots of the hostplants and suggests that different larval instars and pupal cases can overwinter. Specimens which overwinter as a young larva would give adults in July whereas specimens which overwinter as a last instar larva give adults in May and later on in August. In The Netherlands adults were observed from I.VI-23.IX whereas larvae were found in July. The number of adults during the year shows three peaks: a small one with very low numbers at the end of June, a second one with the highest number at the end of July till the first half of August and the third in the first week of September. Martini (1916) recorded both young and full-grown larvae from *Salicornia* at Artern, Germany, from the end of June till the end of July and observed adults in the first half of May. Kasy (1959) and Bankes (1894) also give the species as having two or three broods. Zeller (1847) recorded adults from Syracuse (Sicily) from the end of April to May which may be due to the warmer climate. The moth flies at dusk and is regularly taken at light.

### Ecology

In The Netherlands *S. salinella* is found where the *Thero-Salicornion* community occurs, both in the tidal zone and in non-tidal areas (pl. 6:1,3,4,5). In non-tidal areas *S. salinella* is commonly found on wet meadows with seepage and a high salinity, on inland creeks and on the mud-zone alongside seadikes. In its distribution area *S. salinella* is also known from deserts, inland salt lakes and other arid environments. Only a minor part of the Dutch observations originates from the tidal zone and the moth is apparently absent from brackish salt marshes with high tides, such as along Dollard, Verdrongen Land van Saeftinghe,

Waarde and Bath. Therefore, it may be possible that the occurrence of *S. salinella* is rather negatively correlated with tidal submergence than with salinity.

### Distribution (fig. 73)

*S. salinella* is widespread in the palaeartic region and is reported from inland salty meadows in surrounding countries as for instance in Artern (Thuringia, Germany: Martini 1916) and Marsal (Lorraine, France: Courtois 1988). In The Netherlands it is confined to the coast, outside the tidal zone. The first specimen was recorded by Mac Gillavry (1929) and Bentinck (1930) provided detailed information of a larva found on *Salicornia* spp. at Woensdrecht on 27.VI.1929, which pupated 2.VII.1929 and emerged as adult on 19.VII.1929.

### *Scrobipalpa samadensis* (Pfaffenzeller)

(figs. 17, 29, 40, 51, 62, 63, 74; pls. 2:6, 5:6, 6:1,3)

### Diagnosis

*S. samadensis* is a large species with dark brown forewings which bear reddish ferruginous lines. The male genitalia are easily recognized by the shape and size of the vincular process and the shape of the sacculus. The female genitalia are easily recognized by the combination of a bursa which is not divided into ductus and corpus and the strongly sclerotization of the sternite VIII with a foldlike overlap between ventrolateral and ventromedial zone.

### Adult (pl. 2:6)

Wingspan: 13.5-17.5 mm; venation see Povolný (1981). Forewing: pale to dark grey with pale chocolate-brown. Stigmata generally consist of a group of 4-7 blackish spots which vary in size and shape which can be streaklike, spotlike, absent, rather small, indistinct or conspicuous; smaller spots are often found near base, costa and termen; reddish-brown scales follow the veins and regularly form a dark central longitudinal suffusion but may almost suffuse the whole forewing. Hindwings: pale satin grey. Cilia pale yellowish

brown. First abdominal segments dark yellowish brown.

Male genitalia (figs. 17, 29, 40). VIL 1.3x VAL; genitalia strongly sclerotized. Valva: rather narrow; sacculus 1.5-2.5x as long as wide. Vinculum: posterior processes broad, squat and flattened; slightly wider but distinctly shorter than sacculus; sclerotization alongside invagination posteriorly with parallel sides and anteriorly almost round; shoulder of vinculum well developed, curved upwards next to vincular process; median invagination V-shaped. Uncus broadly rounded off, slightly exceeding valvae. Saccus: not significantly extending anteriorly beyond pedunculi. Aedeagus (fig. 40) length ca 675 µm; lamina in ductus ejaculatorius as wide as coecum. Coremata present.

Female genitalia (figs. 51, 62, 63). Sternite VIII: anteriorly broader than posteriorly; laterally curved at anterior half; ventromedial and ventrolateral zone with well developed microtrichia on whole surface, longitudinal depressions almost reach anterior edge, space between depressions triangular; ventrolateral zone with well developed foamy sculpture and only some very small microtrichia; border between the two zones with a dark brown, foldlike overlap; anterior edge strongly sclerotized, ventromedial zone membranous, without foamy sculpture; transition from anterior edge to apophyses anteriores fairly abrupt. Apophyses anteriores length 625 µm, longer than in any other species, except *S. salinella*; almost twice as long as sternite VIII. Apophyses posteriores 4x as long as anteriores, longer than in other species except *S. artemisiella*. Colliculum length-width ratio 1:3 to 1:6. Bursa (fig. 62) 2650 µm; less than 5x as long as apophyses anteriores; 1.1 x length of apophyses posteriores; transition from ductus to corpus gradual, also in posterior part. In Great-Britain specimens are seen with an abrupt transition (M. Parsons in litt.). Signum (fig. 62, 63) height 210 µm, width at base 150 µm, diagonal length 220 µm, one to three small teeth at base, weakly curved at basal two-thirds.

### Larva (pl. 5:6)

Body dull yellowish to greyish yellow; markings consist of transverse series of blotches on each segment which form several lines; spiracular lines faintly pinkish to reddish-brown; subdorsal lines 2x as broad as dorsal line; pinaculum dark brown, black on last few segments; pinacula of mesothorax and metathorax on one transversal row; pinacula of abdominal segments partially longitudinally; epicranium brown, labrum and clypeus dull yellowish; prothoracic plate brown, posterior margin dark brown, with a thin lighter line down the middle; anal plate pale brown, posteriorly with long brown setae which form a half circular row; legs dark brown, ventrally dull yellowish; setae silky white except on last abdominal segment where they are brown. Both Richardson (1893) and Meyrick (1928) provided a brief description.

### Biology

Host plants: *Plantago maritimus*. Abroad reported from *P. coronopus* by various authors. Richardson (1893) reported also *P. lanceolata*.

Larva: young larva probably overwintering in young leaves, making a long and narrow mine. Later on, it lives in the upper part of the rootstock, depositing frass in the centre of the plant. Larvae are disclosed by the yellowish colouring leaves (Gudmann 1930). The pupae can be found inside a burrow in the rootstock.

Voltinism (fig. 74): uncertain due to the small number of adults and larvae collected in The Netherlands. Bankes (1894) recorded two generations in Great-Britain, giving larvae from October to May and from July to August and adults in June-July and in August-September. Stünig (1988) found one generation in northern Germany with larvae from October to May. In Denmark there is only one generation with moths flying from late June to late August, especially from the end of July to the first half of August (O. Karsholt in litt.). In The Netherlands specimens were mostly taken at light from 21.VI-4.VIII, whereas several larvae were found late March and early April 1998.

## Ecology

*Scrobipalpa samadensis* is found on saline and arid inland sites where the hostplants are growing (pl. 6:1,3). In The Netherlands the species is most frequently found along the coast on littoral grasslands with a gradient from salt marsh to dunes where the *Armerio-Festucetum littoralis* is well developed, as is the case on De Boschplaat on Terschelling, the Oosterkwelder on Schiermonnikoog and Het Zwin in Zeeuws-Vlaanderen. In the southwestern part of The Netherlands the populations of the host plant and are much smaller. This may have contributed to the higher number of *S. samadensis* specimens in the Wadden District. Michaelis (1977) recorded it as less frequent on sandhills and on shingle among *Plantago coronopus* in Wales.

## Distribution (fig. 74)

*Scrobipalpa samadensis* is a western palearctic species, occurring almost all over Europe. It was recorded for the first time by Kuchlein (1993) from specimens collected by Bot on Terschelling in 1989. Later, specimens have been found in a private collection which were caught by Huisman at Melissant on 20.vii.1965.

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## REFERENCES

- Banks, E.R. 1894. *Lita instabilella*, Dgl., and its nearest British Allies. – The Entomologist's Monthly Magazine 30: 80-83, 125-128, 188-194.
- Bautista-Martinez, N., E. Prado-Beltran, J.L. Carillo-Sanchez & G. Vejar-Cota 1995. Morphology, biology and habits of immature stages of the Huauzontle borer *Scrobipalpa atriplicella* (Röslerstamm) (Lepidoptera: Gelechiidae). – Southwestern Entomologist 20: 357-365.
- Beeftink, W.G. 1965. De zoutvegetatie van ZW-Nederland beschouwd in Europees verband. – Mededelingen Landbouwhogeschool Wageningen 65: 1-167.
- Benander, P. 1937. Die Gelechiiden-Raupen. Eine vergleichend-morphologische Untersuchung. – Opuscula entomologica 2: 49-109.
- Bentnck, G.A. 1930. Eenige nieuwe soorten voor de Nederlandsche fauna. – In: Verslag van de Drie-en-zestigste Wintervergadering. – Tijdschrift voor Entomologie 73: xx-xxii.
- Bentnck, G.A. 1958. Vangsten van zeldzame Lepidoptera in 1957 en eerder, en vijf nieuwe soorten voor de Nederlandse fauna. – Entomologische Berichten, Amsterdam 18: 169-171.
- Bland, K.P. 1992. An instance of *Scrobipalpa acuminatella* (Sircom, 1850) (Lepidoptera: Gelechiidae) mining *Tussilago farfara* L. in Scotland. – Entomologist's Gazette 43: 101-102.
- Buhl, O., P. Falck, B. Jørgensen, O. Karsholt, K. Larsen

- & F. Vilhelmsen 1996. Fund af småsommerfugle fra Danmark i 1995 (Lepidoptera). – Entomologiske Meddelelser 64: 277-288.
- Carter, D.J. 1984. Pest Lepidoptera of Europe with special reference to the British Isles. – Junk, Dordrecht. [Series Entomologica 31]
- Courtois, J.H. 1988. *Scrobipalpa salinella* Zeller, espèce nouvelle pour la Lorraine (Lep., Gelechiidae). – Alexanor 14: 234-238.
- Emmet, A.M. 1988. A Field Guide to the smaller British Lepidoptera. – The British Entomological & Natural History Society, London.
- Fischer von Röslerstamm, J.E. 1834-[1843]. Abbildungen zur Berichtigung und Ergänzung der Schmetterlingskunde besonders der Microlepidopterologie als Supplement zu Treitschke's und Hübner's europäischen Schmetterlinge, mit erläuterndem Text. – Leipzig.
- Fritzsche, R. & R. Keilbach 1994. Die Pflanzen-, Vorrats- und Materialschädlinge Mitteleuropas. – Gustav Fischer Verlag Jena und Stuttgart.
- Fuchs, A. 1886. Microlepidopteren des unteren Rheingau's nebst einer allgemeinen topographisch-lepidopterologischen Einleitung. – Entomologische Zeitung 74: 39-83.
- Graaf, H.W. de & P.C.T. Snellen 1866. Microlepidoptera in Nederland waargenomen (vervolg). – In: J. A. Herklots (ed.). Bouwstoffen voor eene fauna van Nederland 3: 334-415.
- Graaf, H.W. de & P.C.T. Snellen, 1871. Microlepidoptera, nieuw voor de fauna van Nederland. – Tijdschrift voor Entomologie 14: 232-236.
- Gregor, F. & D. Povolný, 1954. Systematische und zoogeografische Studie über die Gruppe der Arten Gnorimoschemini Busck mit Rücksicht auf die richtige Diagnostik des Schädling *Gnorimoschema ocellatellum* Boyd. – Folia Zoologica et Entomologica 18: 83-95.
- Gross, F.J. 1956. Beitrag zur Schmetterlingsfauna der Insel Borkum. – Entomologische Zeitschrift 66: 149-150.
- Gudmann, F. 1930. Nogle biologiske Iagttagelser vedrorende Smaasommerfugle. – Flora og Fauna 36: 8-24.
- Hammad, S.M., K. El-Din Hussein Youssef & M. Abdel-Halim Assem 1968. The biology of the sugar-beet mining moth. – Bulletin Société Entomologique d'Égypte 12: 49-51.
- Heath, J. (ed). 1976. The moths and butterflies of Great Britain and Ireland 1. – Blackwell & Curwen Press, Oxford.
- Heckford, R.J. 1995. *Scrobipalpa artemisiella* (Treitschke) (Lep.: Gelechiidae), a larval description. – Entomologist's Record 107: 38.
- Heckford, R.J. 1997. Dead stems of *Aster tripolium* L. - pupation sites for *Coleophora atriplicis* (Meyrick) and *Scrobipalpa salinella* (Zeller) (Lepidoptera: Coleophoridae). – Entomologist's Gazette 48: 106.
- Hering, M. 1957. Bestimmungstabellen der Blattminen von Europa. – Junk, 's-Gravenhage. [3 delen]
- Huemer, P. 1987. Eine modifizierte Genitalpräparations-technik für die Gattung *Caryocolum* (Lepidoptera: Gelechiidae). – Mitteilungen der Schweizerischen Entomologischen Gesellschaft 60: 207-211.
- Janse, A.J.T. 1949. The Moths of South-Africa. Vol 5. – Transvaal Museum, Durban.
- Jansen, M.G.M. 1995. Biologische und ökologische Notizen über die in den Niederlanden vorkommenden Arten der Gattung *Scrobipalpa* Janse (Lepidoptera: Gelechiidae). – Verhandlungen Westdeutscher Entomologen Tag 1994 Düsseldorf: 163-169.
- Jansen, M.G.M. 1998. Bemerkungen zur Taxonomie der in den Niederlanden vorkommenden Arten der Gattung *Scrobipalpa* Janse (Lepidoptera: Gelechiidae). – Verhandlungen Westdeutscher Entomologen Tag 1997 Düsseldorf: 145-159.
- Jansen, M.G.M. & J.E.F. Asselbergs 1993. De Lepidoptera uit de getijzone van het Markiezaat, een voormalig schor in westelijk Noord-Brabant. – Entomologische Berichten, Amsterdam 53: 1-9.
- Karsholt, O. & E.S. Nielsen 1978. Remarks on Microlepidoptera new to the Danish fauna, with a review of the *Coleophora milvipennis* group (Lepidoptera). – Entomologiske Meddelelser 46: 1-16.
- Karsholt, O., K. Larsen & L. Aarvik 1986. A remarkable disjunction: *Scrobipalpa reiprichi* Povolný, 1984 discovered in Norway, with remarks on the characteristics of the species (Lepidoptera, Gelechiidae). – Nota Lepidopterologica 9: 191-199.
- Karsholt, O. & Razowski, J. (eds) 1996. The Lepidoptera of Europe. A distribution checklist. – Apollo Books, Stenstrup.
- Kasy, F. 1959. Halophile Lepidopteren des

- Neusiedlerseegebietes. – Verhandlungen Zoologisch-Botanischen Gesellschaft Wien, 98/99: 13-25.
- Kuchlein, J.H. 1993. De kleine vlinders. – Pudoc, Wageningen.
- Langmaid, J.R. 1995. An alternative feeding habit by the larva of *Scrobipalpa obsoletella* (Fischer von Röslerstamm) (Lepidoptera: Gelechiidae). – Entomologist's Gazette 46: 277.
- Mac Gillavry, D. 1929. Mededelingen. – In: Verslag van de Vierentachtigste Zomervergadering. – Tijdschrift voor Entomologie 72: lxxiv-lxxviii.
- Martini, W. 1916. Verzeichnis Thüringer Falter aus den Familien Pyralidae-Micropterygidae. – Deutsche Entomologische Zeitschrift Iris 30: 110-144.
- Meijden, R. van der 1996. Heukels' Flora van Nederland. 22e druk. – Wolters-Noordhoff, Groningen.
- Meyrick, E. 1928. A revised handbook of British Lepidoptera. – Watkins & Doncaster, London.
- Michaelis, H.N. 1977. Records of Gelechiidae (Lep.) from North Wales. – Entomologist's Gazette 28: 217-222.
- Millière, P. 1862. Iconographie et description de chenilles et lépidoptères. II. – Savy, Paris.
- Nieukerken, E.J. van, C. Gielis, K.J. Huisman, J.C. Koster, J.H. Kuchlein, H.W. van der Wolf & J.B. Wolschrijn 1993. Nieuwe en interessante Microlepidoptera uit Nederland (Lepidoptera). – Nederlandse Faunistische Mededelingen 5: 47-62.
- Patočka, J. 1989. Über die Puppen der Mitteleuropäischen Gelechiidae (Lepidoptera). 5. Teil, Tribus Gnorimoschemini. – Vestník Československé Společnosti Zoologické 53: 123-140.
- Pierce, F.N. & Metcalfe, J.W. 1935. *Phthorimaea obsoletella* F.v.R. and an allied species. – Entomologist 68: 97-98.
- Pitkin, L. 1986. A technique for the preparation of complex genitalia in microlepidoptera. – Entomologist's Gazette 37: 173-179.
- Povolný, D. 1967a. Ein kritischer Beitrag zur taxonomischen Klärung einiger Palaearktischer Arten der Gattung *Scrobipalpa* (Lepidoptera, Gelechiidae). – Acta Scientiarum Naturalis Brno 1: 209-250.
- Povolný, D. 1967b. Genitalia of some nearctic and neotropical members of the tribe Gnorimoschemini (Lepidoptera, Gelechiidae). – Acta entomologica Musei Nationalis Pragae 37: 51-127.
- Povolný, D. 1968. *Scrobipalpa clintoni* sp. nov. (Lep., Gelechiidae) a surprising discovery from Scotland. – Entomologist's Gazette 19: 113-118.
- Povolný, D. 1980. Die bisher bekannten Futterpflanzen der Tribus Gnorimoschemini (Lepidoptera, Gelechiidae) und deren Bedeutung für taxonomisch-ökologische Erwägungen. – Acta Universitatis Agriculturae 28: 189-210.
- Povolný, D. 1981. Über neue und wenig bekannte Arten der Tribus Gnorimoschemini (Lepidoptera, Gelechiidae) aus dem Mediterraneum. – Acta Universitatis Agriculturae 29: 365-397.
- Povolný, D. 1988. *Scrobipalpa nitentella* (Fuchs, 1902) species revocata und *S. indignella* (Staudinger, 1879) species bona sowie sonstige irrtümliche Urteile über die Gattung *Scrobipalpa* (Lepidoptera, Gelechiidae). – Deutsche Entomologische Zeitschrift 35: 369-378.
- Povolný, D. 1990. Zur heutigen Kenntnis von Nahrungspflanzen der Tribus Gnorimoschemini (Lepidoptera, Gelechiidae). – Acta Universitatis Agriculturae 38: 191-204.
- Povolný, D. 1991. Zur Bionomie und ökonomischen Bedeutung der Tribus Gnorimoschemini (Lepidoptera, Gelechiidae). – Acta Universitatis Agriculturae 39: 269-285.
- Povolný, D. & Weismann, L. 1958. Kritischer Beitrag zur Problematik der Rubenmotte *Phthorimaea operculella*. – Folia zoologica 7: 97-121.
- Richardson, N.M. 1893. On some members of the *instabilella* group of the genus *Lita* (*Gelechia*, partim), with descriptions of *L. suaedella*, n. sp. and *L. instabilella*, Douglas. – Entomologist's Monthly Magazine 29: 241-248.
- Sattler, K. 1987. Die an Compositen gebundenen *Scrobipalpa*-Arten des östlichen Österreichs (Lepidoptera, Gelechiidae). – Annalen des Natur-Botanik und Zoologie 88/89: 435-456.
- Sattler, K. 1988a. The systematic status of the genera *Iseopsis* Povolný, 1965, and *Empista* Povolný, 1968 (Lepidoptera: Gelechiidae: Gnorimoschemini). – Nota Lepidopterologica 10: 224-235.
- Sattler, K. 1988b. *Scrobipalpa clintoni* (Povolný, 1968) in Schleswig-Holstein - eine für Deutschland neue Kleinschmetterlingsart (Lepidoptera, Gelechiidae).

- Faunistisch-Ökologische Mitteilungen 6: 1-4.
- Schaminée, J.H.J., E.J. Weeda & V. Westhoff 1998. De vegetatie van Nederland. Deel 4: Plantengemeenschappen van de kust en van binnenlandse pioniermilieus. – Opulus Press, Uppsala/Leiden.
- Snellen, P.C.T. 1882. De vlinders van Nederland. Microlepidoptera, systematisch beschreven. 2 delen. – Brill, Leiden.
- Sorhagen, L. 1886. Die Kleinschmetterlinge der Mark Brandenburg und einiger angrenzenden Landschaften. Mit besonderer Berücksichtigung der Berliner Arten. – Friedländer & Sohn, Berlin.
- Spuler, A. 1910. Die Schmetterlinge Europa's. Kleinschmetterlinge. – Stuttgart.
- Stainton, H.T. 1854. Insecta Britannica, Lepidoptera: Tineina. – Lovell Reeve, London.
- Stainton, H.T. 1865. The Natural History of the Tineina Vol. IX. (1). – London.
- Stainton, H.T. 1866. How to find the larvae of *Gelechia costella*. – The Entomologist's Monthly Magazine 3: 115.
- Stüning, D. 1988. Biologisch-Ökologische Untersuchungen an Lepidopteren des Supralitorals der Nordseeküste. – Faunistisch-Ökologische Mitteilungen, Supplement 7: 1-118.
- Tiedemann, O. 1987. *Scrobipalpa suaedella* Richardson, ein für Deutschland neuer Kleinschmetterling. – Bombus 50: 300.
- Treitschke, F. 1832. Die Schmetterlinge von Europa 9. – Fleischer, Leipzig.
- Tutin, T.G., V.H. Heywood, N.A. Burges, D.M., Moore, D.H. Valentine, S.M. Walters & D.A. Webb (Eds) 1964-1980. Flora Europaea. 5 delen. – Cambridge.
- Vorst, O.F.J. & J.D. Fokker 1996. Orde 3.0. – Computerprogramma, Utrecht.
- Vorst, O.F.J. & J.D. Fokker 1998. Eiskaart 1.5. – Computerprogramma, Utrecht.
- Weismann, L. 1959. Beitrag zum Studium der Ursachen einer Variabilität in der Fruchtbarkeit der Rübenmotte *Scrobipalpa ocellatella* Boyd. – In: I. Hrdy (ed.) The ontogeny of Insects: 384-387. Praha.
- Zeller, B.C. 1847. Bemerkungen über die auf einer Reise nach Italien und Sicilien beobachteten Schmetterlingsarten IX. – Isis 11: 830-859.

## SAMENVATTING

### Het genus *Scrobipalpa* in Nederland (Lepidoptera, Gelechiidae)

*Scrobipalpa* is een geslacht van kleine, lastig uit elkaar te houden motjes. In heel Europa zijn ongeveer 70 soorten bekend. Doorgaans zijn de vleugels bruin- of grijsachtig met een tekening van stippels en strepen die bovendien erg kan variëren. Hierdoor kunnen de individuele soorten vaak moeilijk herkend worden. Aan de hand van de genitaliën kunnen soorten wel allemaal gedetermineerd worden. Omdat de literatuur over deze groep niet erg toegankelijk is en bestaande beschrijvingen soms erg onvolledig zijn, wordt dit artikel in het Engels geschreven. Met dit artikel zijn de elf Nederlandse soorten te determineren. De meeste hiervan zijn min of meer gebonden aan de kust. Van alle soorten worden naast beschrijvingen van de vleugeltekening en de genitaliën, ook de verspreiding, de biologie en de ecologie gegeven.

M.G.M. Jansen  
Plantenziektenkundige Dienst  
Sectie Entomologie  
Postbus 9102  
6700 HC Wageningen

## Nederlandse bijschriften bij de kleurenplaten

### Plaat 1

#### Imago's van *Scrobipalpa*.

1 *S. acuminatella*, Petten (Noord-Holland), coll. Koster, 2 *S. artemisiella*, Egmond (Noord-Holland), coll. RMNH, 3 *S. atriplicella*, Callantsoog, Zwanenwater (Noord-Holland), coll. Koster 4 *S. costella*, Neeltje Jans (Zeeland), coll. Jansen 5, 6 *S. instabilella*, 5 Stroodorpepolder (Zeeland), coll. Jansen, 6 Callantsoog, Zwanenwater (Noord-Holland), coll. Koster. Foto's E. J. van Nieukerken.

### Plaat 2

#### Imago's van *Scrobipalpa*.

1 *S. nitentella*, Petten, de Putten (Noord-Holland), coll. Koster, 2 *S. obsoletella*, Zuidgors (Zeeland), coll. Jansen, 3 *S. ocellatella*, San Prospero, Modena (Italy), coll. Parenti, 4 *S. proclivella*, Son (Noord-Brabant), coll. Van der Wolf, 5 *S. salinella*, Woensdrecht (Noord-Brabant), coll. RMNH, 6 *S. samadensis*, Zuid Sloe (Zeeland), coll. van der Wolf. Foto's E. J. van Nieukerken.

### Plaat 3

#### Rupsen van *Scrobipalpa*.

1, 2 *S. acuminatella*, rups in mijn en uitwendig etende rups, De Putten (Noord-Holland), 3, 4 *S. artemisiella*, bruine en groene vorm op *Thymus*, Wimmenum (Noord-Holland), 5 *S. atriplicella*, rups op *Atriplex*, Twello (Gelderland), 6 *S. costella*, bladmijnen op *Solanum dulcamara*, Neeltje Jans (Zeeland). Foto's M.G.M. Jansen.

### Plaat 4

Rupsen van *Scrobipalpa*. – 1 *S. costella*, rups in stengel van *Solanum dulcamara*, Neeltje Jans (Zeeland), 2 Habitat van *S. costella* op deze plaats, 3, 4 *S. instabilella*, rups op bladeren van *Atriplex portulacoides*, Stroodorpepolder (Zeeland), 5, 6 *S. nitentella*, bladmijnen en uitwendig etende rups op *Atriplex prostrata*, Terschelling, Boschplaat (Friesland). Foto's M.G.M. Jansen.

### Plaat 5

#### Rupsen van *Scrobipalpa*.

1, 2 *S. obsoletella*, rups en pop in de stengel van *Atriplex prostrata*, Duitsland, 3 *S. ocellatella*, rups op blad van *Beta maritima*, Het Zwin (Zeeland), 4, 5 *S. salinella*, uitwendig etende rups en plant van *Salicornia* spec., met beschadiging in de top, Zierikzee (Zeeland), 6 *S. samadensis*, rups op stukje hout, Het Zwin (Zeeland). Foto's door M.G.M. Jansen, 1, 2 door Dieter Stüning, Bonn.

### Plaat 6

#### Biotopen van *Scrobipalpa* in Nederland.

1 Terschelling, Boschplaat (Friesland), schor overgaand in duin, habitat van *S. acuminatella*, *S. atriplicella*, *S. costella*, *S. instabilella*, *S. nitentella*, *S. obsoletella*, *S. salinella* en *S. samadensis*, 2 Rilland (Zeeland), zeedijk met schor, habitat van *S. nitentella* en *S. obsoletella*, 3 Het Zwin (Zeeland), schor met overgang tot duin, habitat van *S. instabilella*, *S. nitentella*, *S. ocellatella*, *S. salinella* en *S. samadensis*, 4 Slikken van Bommenede (Zeeland), binnendijks schor met *S. nitentella* en *S. salinella*, 5 Inlaag 1887, Ellewoutsdijk (Zeeland), binnendijks schor, met *S. salinella* en *S. instabilella*, 6 Egmond, Wimmenum (Noord-Holland), deels begraasd duin, habitat van *S. artemisiella*. Foto's M.G.M. Jansen.