The Dutch species of *Phyllonorycter* with dark-sprinkled forewings, with *P. populifoliella* as an addition to the Dutch list (Lepidoptera: Gracillariidae)

J. H. KUCHLEIN & C. J. M. ALDERS

KUCHLEIN, J. H. & C. J. M. ALDERS, 2000. THE DUTCH SPECIES OF *PHYLLONORYCTER* WITH DARK-SPRINKLED FOREWINGS, WITH *P. POPULIFOLIELLA* AS AN ADDITION TO THE DUTCH LIST (LEPIDOPTERA: GRACILLARIIDAE). – *ENT. BER., AMST.* 60 (1): 12-19.

Abstract: Of the *Phyllonorycter*-species with dark-powdered forewings four are now known from The Netherlands. Identification keys to these species are presented, based on external characters as well as male genitalia. Moreover, bionomics, faunistics and changes in their distributional limits are discussed. One species new to The Netherlands is reported here: *P. populifoliella*.

J. H. Kuchlein, Tinea foundation, Institute of Systematics and Population Biology, University of Amsterdam, Plantage Middenlaan 64, 1018 DH Amsterdam, The Netherlands.
C. J. M. Alders, Venlosingel 32, 6845 JB Arnhem, The Netherlands.

Introduction

The species of *Phyllonorycter* belonging to the *populifoliella*-group (see Snellen, 1882), have some characteristic external features in common. The forewing is nearly always more or less dark-sprinkled, not shining as in the other *Phyllonorycter*-species, and the pale strigulae are usually diffuse. Accordingly, in the keys for the identification of species of *Phyllonorycter* the group is almost immediately keyed out (see e.g. Hering, 1932; Benander, 1945; Bradley et al., 1969; Emmet et al., 1985). Moreover, the species of this group have similar bionomics and their distributional ranges are much alike.

Three species of the *populifoliella*-group were already reported for our country in the sixties of the last century, viz. *Phyllonorycter pastorella* (Zeller), *P. sagitella* (Bjerkander) and *P. comparella* (Duponchel) (De Graaf & Snellen, 1866, 1869). All three were rare at the time, but then *P. pastorella* and *P. sagitella* became extreme rarities for a long period of time. However, during the last decennium they have been recorded from quite a lot of new localities and are now often numerous where they occur. Moreover, recently one species was found new to The Netherlands: *P. populifoliella* (Treitschke).

The dynamism in their occurrence, added to considerable identification problems makes it worthwile to pay attention to the Dutch species of the *populifoliella*-group.

Dutch species of the *Phyllonorycter populifoliella*-group

The numbering of the species of *Phyllonorycter*, belonging to the *populifoliella*-group, is in accordance with the Dutch checklist (Kuchlein, 1993). Arrangement and nomenclature of the *Phyllonorycter*-species in this list are based on Emmet et al., 1985.

258 *Phyllonorycter pastorella* (Zeller, 1846)

262 *Phyllonorycter sagitella* (Bjerkander, 1790)
= *tremulae* (Zeller, 1846)

262a *Phyllonorycter populifoliella* (Treitschke, 1833)

263 *Phyllonorycter comparella* (Duponchel, 1843)

Identification

Identification of adults without dissection is difficult. The moths look similar and the species are variable, especially in the amount of dark suffusion. Consequently, it is not easy to describe the discriminating characters, and this difficulty makes the construction of identification keys for the species of this group problematic. By using the keys mentioned in the introduction, determination of the moths is hardly possible. Accordingly, the subjoined new identification key for adult moths, based on their external appearance, is presented here with great reserve.

Also dissection does not solve all problems, because the female genitalia of the *Phyllonorycter*-species are weakly sclerotized, which makes it difficult to prepare good slides. Hence it is recommendable to leave female genitalia in the abdomen. As a result of these problems we give neither key nor figures for female genitalia. The structure of the male genitalia of the species belonging to the genus *Phyllonorycter*, differs greatly. In the greater part of the Dutch species the genitalia are asymmetrical, but the dark-sprinkled species belong to a group with symmetrical genitalia. Identification of the dark-sprinkled species by means of male genitalia is relatively easy as appears from the key given below.

Key based on external characters

1 Vertex and frons white or whitish, not mixed with dark parts .... *P. pastorella* (part)
Wingspan 6.9 - 9.0 mm. Pale forms of *P. pastorella*. Antenna unicolorous white or pale ochreous, darker annulated. In forewing pale markings pure white; white basal streak connected with first dorsal strigula; in palest specimens white markings more or less connected. These forms cannot be considered as dark sprinkled!

– Vertex from whitish to brown, always mixed with darker parts 2
Antenna annulated, sometimes less distinct.

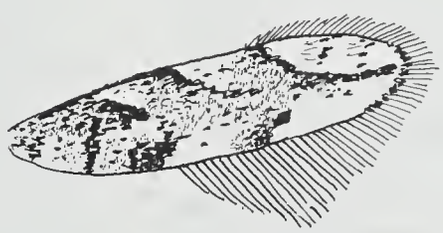
2 In forewing apex with blackish streak; second pale costal strigula at an angle of circa 30° to 45° on costa 3

– In forewing apex with blackish dot (sometimes elliptical) or with dispersed blackish scales; second pale costal strigula at an angle of circa 45° to nearly 90° on costa ... 4
In forewing dark markings giving the impression of blocks and triangles.

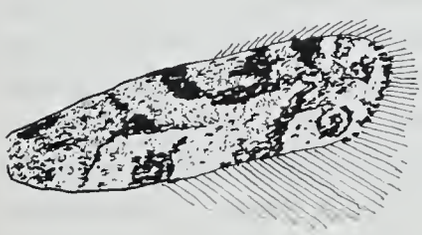
3 Antenna annulated, except the distal part, which is whitish (exceptionally indistinctly annulated). In forewing dark markings hardly or not dark-edged distally (fig. 1) ..... *P. comparella*

Wingspan 7.0 - 8.0 mm. In forewing pale colour whitish; four white costal strigulae (light scaling near base not included).

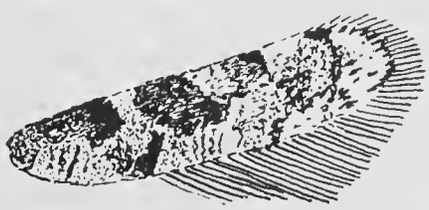
1



2



3



4

Fig. 1-4. Forewings of *Phyllonorycter*-species. 1, *P. comparella*; 2, *P. sagitella*; 3, *P. pastorella*; 4, *P. populifoliella*.

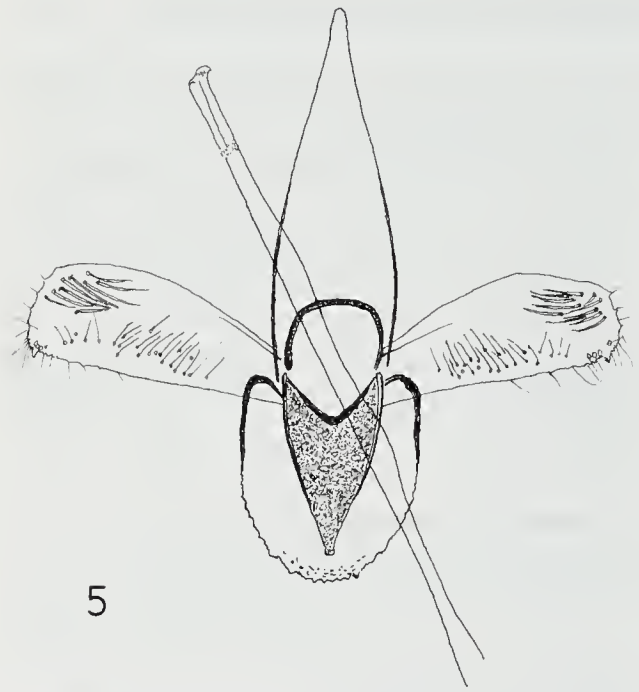


Fig. 5. Male genitalia of *Phyllonorycter populifoliella*.

– Antenna annulated entirely. In forewing dark markings edged blackish brown distally (fig. 2) ..... *P. sagitella*
Wingspan 7.0 - 8.0 mm. In forewing pale colour yellowish white; five pale costal strigulae.

4 In forewing second costal strigula at an angle of circa 45° to 60° on costa (less obvious in heavily suffused specimens) (fig. 3) ..... *P. pastorella* (part)
Wingspan 6.9 - 9.0 mm.

– In forewing second costal strigula at an angle of circa 60° to nearly 90° on costa (fig. 4) ..... *P. populifoliella*
Wingspan 7.0 - 8.4 mm.

Key based on male genitalia

1 Valva ending distally in a large lobe, apically provided with a stout, curved spine (fig. 6) ..... *P. pastorella*
Aedeagus approximately two times longer than valva.

– Valva not ending in a lobe, apically not provided with a stout, curved spine 2

2 Valva with apex flat, not tapered. Sternite of abdominal segment viii with caudal margin slightly dentated. Aedeagus nearly two times longer than valva (fig. 5) .... *P. populifoliella*
Valva with a small tooth on ventral corner of distal margin.

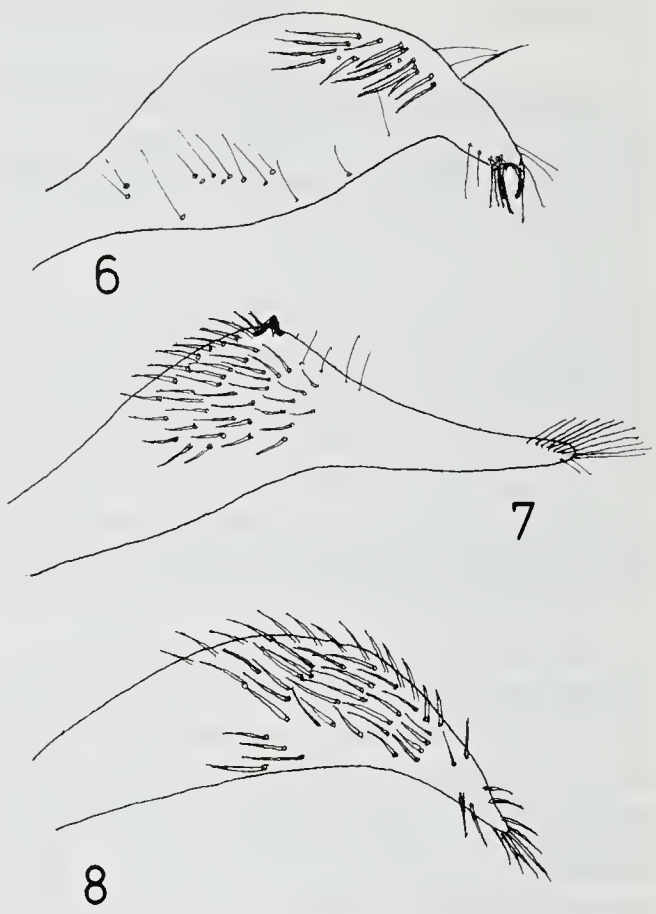


Fig. 6-8. Valvae of *Phyllonorycter*-species. 6, *P. pastorella*; 7, *P. sagitella*; 8, *P. comparella*.

– Valva with apex distinctly tapered, albeit often slightly rounded. Sternite of abdominal segment viii with caudal margin smooth. Aedeagus less than one and a half times longer than valva 3

3 Valva with a thick, short tooth in the middle near dorsal margin; distal half of valva provided with setae (fig. 7) ..... *P. sagitella*

– Valva without such a tooth, distal half of valva only with setae at apex (fig. 8) .... *P. comparella*

Bionomics

The bionomics of the species of the *populifoliella*-group show some resemblance. First their foodplants belong to the Salicaceae, and second, their phenology is different from that of the other Dutch *Phyllonorycter*-species.

In our judgement all four species are monophagous or feed on closely related plant-species. The larvae of *P. pastorella* live on smooth leaved *Salix*-species (e.g. *S. alba* L.)

(preferably on shrubs), those of *P. populifoliella* live on black poplar (*Populus nigra* L.) (also preferably on smaller trees) and those of *P. comparella* on white poplar (*Populus alba* L.) or grey poplar (*Populus canescens* L.). In literature additional foodplants for these species have been reported (e.g. Bradley et al., 1969; Kuznetsov, 1990). However, other foodplants than the ones mentioned above need confirmation, because of possible errors due to the great similarity of the species.

The phenology of the four species is unique among the Dutch *Phyllonorycter*-species. They are bivoltine; the second generation of moths emerges in autumn, then overwinters, and survives until following May. All other species of *Phyllonorycter* hibernate as a pupa or, less frequent, as a larva. For breeding the second generation of moths of the species belonging to the *populifoliella* group, the mines can best be collected late August or early September.

In The Netherlands adults are rarely observed in the field. Thus far no adults of *P. sagitella* and *P. populifoliella* have been found. Of *P. comparella* and *P. pastorella* some adults were collected. The latter species was found, resting on stems of willow (Snellen, 1882) and in thatched roofs (Doets, 1949); J. A. W. Lucas and J. H. Kuchlein saw an adult on a willow-leaf. Only once a specimen was taken at light (*P. pastorella* by J. W. A. Lucas).

Faunistics

Most localities of *Phyllonorycter comparella* are situated in the coastal dunes, the others are scattered all over the country. Most probably this pattern has not changed notably during the last century. The distribution map (fig. 9) is similar to the one given by Kuchlein (1993). However, this does not hold for the other species, and of these species faunistical data from The Netherlands are discussed below.

Phyllonorycter pastorella (fig. 10). Since the sixties of the 19th century this species was reported from only ten localities, mainly situated near the large rivers (Kuchlein, 1993). A considerable number of localities were discovered (also in the fluviatile phytogeographical district) in 1994 and subsequent years. These localities are De Laar (Arnhem, 1994), Malburgen (Arnhem, 1994, 1995), Meinerswijk (Arnhem, 1995), Rijkerswoerd (near Elst, 1994, 1995, 1997), and Tiel (1995) (all situated in the province of Gelderland), and also Blauwe Kamer (near Rhenen, province of Utrecht, 1995). The second author found the mines numerous at all these localities, except near Tiel, where only one mine was found. Moreover, J. B. Wolschrijn collected six mines near Deventer (province of Overijssel) in 1996. Furthermore, the first author collected three mines near Bunnik (province of Utrecht) in 1995, and, together with J.A.W. Lucas, six mines near Wieldrecht (province of Zuid-Holland) in 1996. Finally, two adults were caught at Klein Profijt (near Rhoon, province of Zuid-Holland) (J. A. W. Lucas).

Phyllonorycter sagitella (fig. 11). In the second half of the 19th century found in five localities (Kuchlein, 1993). After a century of silence round this species Koster collected mines at Losser (province of Overijssel) in 1985 (Huisman & Koster, 1998), and the first author collected two mines in the Mariapeel (province of Limburg) in 1986. Furthermore, T. Rutten discovered one mine near Maashees (province of Noord-Brabant) five years later, and also one mine near Vierlingsbeek (province of Noord-Brabant) in 1992. The localities Mariapeel and Maashees were revisited afterwards, but we could not find a trace of *P. sagitella*. Large numbers of this species have not been found in our country until A. Schreurs (pers. comm.) discovered the species in Zuid-Limburg, in 1994. In that year he observed hundreds of mines in the Schinveldse Bossen. The next year we collected, together with A. Schreurs, a large number of mines at this locality and on the Bouwberg (near Brunssum, province of Limburg). Subsequently, the mines have been found by the first author at Langweer (province of Friesland) in 1994, in the Kruisvennen (near Ospel) in 1998 and at Abdissenbosch in 1996 (both province of Limburg) and by the second author at Susteren in 1998 (also province of Limburg).

Fig. 9-12. Distribution-maps of *Phyllonorycter*-species. 9, *P. comparella*; 10, *P. pastorella*; 11, *P. sagitella*; 12, *P. populifoliella*.

Phyllonorycter populifoliella (fig. 12). Not reported earlier from The Netherlands. The first author discovered 24 mines near Eysden (province of Limburg) on 18 October 1995. In spite of the late collecting-date one moth emerged the same month. A second locality was discovered by him near Ambij (province of Limburg), one day later. Thus far further findings of *P. populifoliella* have been restricted to the province of Limburg: Maastricht in 1996 (A. Schreurs), Bouwberg (near Brunssum) in 1995 and 1996 (second author) and the Kruisvennen (near Ospel) (first author) in 1998. At the locality near Eysden mines were also present in 1996 and in 1997.

These faunistical data on the species of the *populifoliella*-group suggest that generally conditions in The Netherlands for three spe-

cies have improved recently, because many new populations of *P. pastorella* and *P. sagitella* were discovered, and one species enriched the Dutch fauna: *P. populifoliella*. In *P. comparella* this phenomenon is less pronounced or absent.

Geographical distribution

Nowadays there is a growing interest in the ecology of populations, occurring near the edge of species ranges (Ellis et al., 1999). Increase of knowledge of this neglected subject is not only of importance for scientific purposes, but also for the tenability of the ideas underlying present nature conservance policy (Ellis, 1998; Kuchlein & Ellis, 1997). Viewed in that light we shall examine the findings of the four species in North and North-west Europe during the last one and a half century.

The distributional ranges of the four species show a similar pattern, covering large parts of the Palaearctic Region in a broad belt from Western Europe to Central Asia, and even to Japan. In Europe they hardly reach the Mediterranean. However, the latitudinal position of the ranges differ somewhat. The sequence of the species, as they are treated below, is based on this position: from more southerly to more northerly.

Phyllonorycter comparella. The species occurs in England and is found there in 14 vice-counties (Emmet et al., 1985), but is missing in Scandinavia and Denmark. From North-west Germany only a few records are known (Füge et al., 1930; Grabe, 1955), and the same holds for Belgium (De Crombrugghe de Picquendaele, 1906; Janmoulle, 1976; De Prins, 1998). *Phyllonorycter comparella* is widely distributed in France (Lhomme, 1963), and is also found in Spain (Vives Moreno, 1994).

Apparently, The Netherlands are situated at the northern border of its range, and the Dutch coastal dunes seem to offer optimal conditions for this species in North-west Europe. There is no clear evidence for large fluctuations during the last 150 years.

Phyllonorycter pastorella. This species is not found in Great Britain, Scandinavia or Denmark. From North-west Germany only a few old records are known (Stollwerck, 1863; Sauber, 1904; Füge et al., 1930; Hartwieg, 1958). From Belgium reported twice in the 19th century (De Crombrugghe de Picquendaele, 1906), once in 1942 (Janmoulle, 1976), and once more recently (De Prins, 1998). From France a few published records are known (Lhomme, 1963), and the species was also reported from Spain (Vives Moreno, 1994).

It appears that The Netherlands are situated at the extreme north-west edge of the range; its occurrence there is practically restricted to the fluviatile phytogeographical district, where it is reported from an increasing number of new localities since 1994, usually in large numbers. As far as we know now such a favourable situation does not occur elsewhere in North-west Europe.

Phyllonorycter populifoliella. This species is not known from Great Britain and Scandinavia. From Denmark only two records are reported, from 1868 and 1938 respectively (Buhl et al., 1984). In North-west Germany quite a lot of older findings but only south of the line Westphalia - Hannover - Brunswick (Stollwerck, 1863; Speyer, 1867; Uffeln, 1930, 1935; Füge et al., 1930; Grabe, 1955). In Thuringia *P. populifoliella* was discovered at Bad Blankenburg in 1990, a locality, from which it has not been recorded before (Steuer, 1995). In France it is reported mainly from the eastern part of the country (Lhomme, 1963), and it has not been found in Spain.

As in *P. pastorella* this species evidently occurs in The Netherlands at the extreme north-west edge of its range. It colonized parts of Dutch Limburg recently, which means that a species with a mainly eastern distribution invaded The Netherlands from the south.

Phyllonorycter sagitella. From Great Britain a specimen is known dating from the mid-nineteenth century and the species is also recorded from three vice-counties in the second half of this century (Emmet et al., 1985). In Scandinavia it was found in South-east

Norway (Haanshus, 1933), in Sweden (Benander, 1946), and also in Finland (Krogerus et al., 1971). In Sweden *P. sagitella* was subsequently found in eleven new provinces (Benander, 1953; Svensson, 1974, 1975; 1979, 1980, 1981 & 1982) within a period of twenty years, which means that its northern limit shifted from 60° to 62° latitude. For Denmark Schnack (1985) only mentioned the island of Bornholm, but also there the situation changed quickly: one new locality in 1963 (Buhl et al., 1984) and five in 1992 (Buhl et al., 1993). From North-west Germany a considerable number of mainly old records are known south of the line Westphalia - Hannover - Brunswick (Stollwerck, 1863; Füge et al., 1930; Uffeln, 1938; Jäckh, 1942; Grabe, 1955; Hartwieg, 1958), but there are also some more recent findings: Essen (Ruhr), in 1968 and Bad Münstereifel (NSG Kuttenberg), in 1987, both by Mr W. Biesenbaum (pers. comm.). From Belgium a number of old records is known, scattered over the country (De Crombrugghe de Picquendaele, 1906; Lhomme, 1963; De Prins, 1998), and one recent finding (De Prins, 1998). In France the species was mainly found in the central part, and it has not been reported from Spain (Vives Moreno, 1994).

These distributional data demonstrate that recently *P. sagitella* shows a strong dynamism of its range borders in North-west Europe. The limit shifted considerably northward (Sweden), and north-westward (Denmark). Moreover, The Netherlands were recolonized in that period.

Generalizing for the species of the *populifoliella*-group it can be concluded that evidently these species gradually declined during the last 150 years in North-west Europe until recently, possibly with the exception of *P. comparella*. Then the distribution limits of *P. pastorella* and *P. populifoliella* shifted quickly in northern and north-western direction during the last decennia, whereas the progress of *P. sagitella* seems to be restricted to The Netherlands.

Acknowledgements

The authors highly value the cooperation with Mr A. Schreurs and Drs J. A. W. Lucas in the fieldwork. They thank Mr W. Biesenbaum (Velbert-Langenberg) and Mr W. de Prins (Antwerp) for information on recent findings. Moreover, they are thankful to the Institute of Systematics and Population Biology (Amsterdam) for the loan of specimens, the Agricultural University (Wageningen) for computer facilities, and to Drs J. H. Donner for the production of distribution-maps, using the programme STIPT (IKC Natuurbeheer, author: P. Frigge).

References

BENANDER, P., 1945. Sveriges Lithocolletider. – *Opuscula entomologica* 9: 79-137.

BENANDER, P., 1946. Catalogus Insectorum Sueciae. VI. Microlepidoptera. – *Opuscula Entomologica* 11: 1-82.

BENANDER, P., 1953. Catalogus Insectorum Sueciae, Additamenta. VI. Microlepidoptera. – *Opuscula Entomologica* 18: 89-101.

BRADLEY, J. D., S. N. A. JACOBS & W. G. TREMEWAN, 1969. A key to the British and French species of Phyllonorycter Hübner (Lithocolletis Hübner) (Lep., Gracillariidae). – *Entomologist's Gazette* 20: 3-33.

BUHL, O., O. KARSHOLT, K. LARSEN, E. PALM & K. SCHNACK, 1984. Fund of småsommerfugle fra Danmark i 1983 (Lepidoptera). – *Entomologiske Meddelelser* 52: 1-21.

BUHL, O., P. FALCK, B. JØRGENSEN, O. KARSHOLT, K. LARSEN & F. VILHELMSEN, 1993. Fund af småsommerfugle fra Danmark i 1992. (Lepidoptera). – *Entomologiske Meddelelser* 61: 135-147.

CROMBRUGGHE DE PICQUENDAELE, M. LE BARON DE, 1906. Catalogue raisonné des Microlépidoptères de Belgique. – *Mémoires de la Société Entomologique de Belgique* 13: 1-172, 14: 1-155.

DOETS, C., 1949. Lepidopterologische mededelingen over 1946-48. – *Entomologische Berichten, Amsterdam* 12: 413-417.

ELLIS, W. N., 1998. Cryptobiotabescherming: behoeden van het onbekende. – *Entomologische Bericlten, Amsterdam* 58: 105-112.

ELLIS, W. N., J. H. DONNER & J. H. KUCHLEIN, 1999. Is the Microlepidoptera fauna of The Netherlands shifting northward? – *Entomologische Berichten, Amsterdam* 11: 161-168.

EMMET, A. M., I. A. WATKINSON & M. R. WILSON, 1985. Gracillariidae. In: *The Moths and Butterflies of Great Britain and Ireland* (J. Heath & A. M. Emmet eds) *2. Cossidae - Heliodinidae*: 244-361. Harley Books, Colchester.

FÜGE, B., W. PFENNIGSCHMIDT, W. PIETZSCH & J. T. TROEDER, 1930. *Die Schmetterlinge der weiteren Umgebung der Stadt Hannover*: 1-140. Naturhistorische Gesellschaft zu Hannover, Hannover.

GRAAF, H. W. DE & P. C. T. SNELLEN, 1866. Microlepidoptera in Nederland waargenomen. In: J. A. Herklots. *Bouwstoffen voor eene Fauna van Nederland* 3: 234-

317 (incorrectly paged as 334-417). E. J. Brill, Leyden.

Graaf, H. W. de & P. C. T. Snellen, 1869. Microlepidoptera, nieuw voor de fauna van Nederland – *Tijdschrift voor Entomologie* 12: 203-215.

Grabe, A., 1955. Kleinschmetterlinge des Ruhrgebietes. – *Mitteilungen aus dem Ruhrlandmuseum der Stadt Essen* 177: i-xv, 1-159.

Haanshus, K., 1933. Fortegnelse over Norges Lepidoptera. – *Norsk Entomologisk Tidsskrift* 3: 164-216.

Hartwieg, F., 1958. *Die Schmetterlingsfauna des Landes Braunschweig und seiner Umgebung einschlieszlich des Harzes, der Lüneburger Heide und des Sollings*: 1-148. Forschungsanstalt für Landwirtschaft Braunschweig-Völkenrode, Braunschweig.

Hering, M., 1932. Die Schmetterlinge nach ihren Arten dargestellt. Ein Handbuch zu ihrer Bestimmung als Grundlage für faunistisch - zoogeographische Arbeiten. – *Die Tierwelt Mitteleuropas* 6, Ergänzungsband: i-vii, 1-545.

Huisman, K. J. & J. C. Koster, 1998. Nieuwe en interessante Microlepidoptera uit Nederland in het jaar 1995 (Lepidoptera). – *Entomologische Berichten, Amsterdam* 58: 53-69.

Jäckh, E., 1942. Die Microlepidopteren - Fauna des rechtsseitigen Mittelrheintales nebst Beschreibung von Borkhausenia magnatella spec. nov. (Lep., Gelechiidae) (Fortsetzung). – *Zeitschrift des Wiener Entomologen - Vereines* 27: 230-241.

Janmoulle, E., 1976. Notes sur les Microlépidoptères de Belgique. – *Documents de Travail de l' Institut royal des Sciences naturelles de Belgique* 8: 1-31.

Krogerus, H., M. Opheim, M. von Schantz, I. Svensso & N. L. Wolff, 1971. *Catalogus Lepidopterorum Fenniae et Scandinaviae. Microlepidoptera*: 1-40. Helsingfors Entomologiska Bytesförening, Helsinki.

Kuchlein, J. H., 1993. *De kleine vlinders; handboek voor de faunistiek van de Nederlandse Microlepidoptera*: 1-715. Pudoc, Wageningen.

Kuchlein, J. H. & W. N. Ellis, 1997. Climate-induced changes in the microlepidoptera fauna of the Netherlands and the implications for nature conservation. – *Journal of Insect Conservation* 1: 73-80.

Kuznetsov, V. I., 1990. Gracillariidae (Lithocolletidae). In: Lepidoptera 2. Keys to Insects of the European Part of the USSR (G. S. Medvedev ed) 4. – *Keys to the fauna of the USSR* 130: 199-410. E. J. Brill, Leyden, Copenhagen, Cologne.

Lhomme, L. (ed.), 1963. Microlépidoptères 8. In: *Catalogue des Lépidoptères de France et de Belgique* 2: 1081-1253. Lhomme, Le Carriol par Douelle.

Prins, W. de., 1998. Catalogue of the Lepidoptera of Belgium. – *Documents de Travail de l' Institute royal des Sciences naturelles de Belgique*. 92: 1-236.

Sauber, A., 1904. Die Kleinschmetterlinge Hamburgs und der Umgegend. – *Verhandlungen des Vereins für Naturwissenschaftliche Unterhaltung zu Hamburg* 12: 1-60.

Snellen, P. C. T., 1882. *De vlinders van Nederland. Microlepidoptera, systematisch beschreven*: i-xiii, 1-1197. E. J. Brill, Leyden.

Speyer, A., 1867. Die Lepidopteren-Fauna des Fürstenthums Waldeck. – *Verhandlungen des Naturhistorischen Vereins der Preussischen Rheinlande und Westfalens* 24: 147-298.

Steuer, H., 1995. Die Schmetterlingsfauna um Bad Blankenburg (Thüringen). 45 Jahre Beobachtung, Forschung - Erkentnisse. – *Rudolstädter Naturhistorische Schriften*. Suppl. 1995: 1-175.

Stolwerck, F., 1863. Die Lepidopteren-Fauna der Preussischen Rheinlande. – *Verhandlungen des Naturhistorischen Vereines der Preussischen Rheinlande und Westphalens* 20: 44-247.

Svensson, I., 1974. Catalogus Insectorum Sueciae. VI. Microlepidoptera (1946). Additamenta II. – *Entomologisk Tidskrift* 95: 151-171.

Svensson, I., 1975. Anmärkningsvärda fynd av Microlepidoptera i Sverige 1974. – *Entomologisk Tidskrift* 96: 140-146.

Svensson, I., 1979. Anmärkningsvärda fynd av Microlepidoptera i Sverige 1978. – *Entomologisk Tidskrift* 100: 91-97.

Svensson, I., 1980. Anmärkningsvärda fynd av Microlepidoptera i Sverige 1979. – *Entomologisk Tidskrift* 101: 75-86.

Svensson, I., 1981. Anmärkningsvärda fynd av Microlepidoptera i Sverige 1980. – *Entomologisk Tidskrift* 102: 83-97.

Svensson, I., 1982. Anmärkningsvärda fynd av Microlepidoptera i Sverige 1981. – *Entomologisk Tidskrift* 103: 81-88.

Uffeln, K., 1930. Die sogenannten "Kleinschmetterlinge" (Microlepidopteren) Westfalens. – *Abhandlungen aus dem Westfälischen Provinzialmuseum für Naturkunde* 1: 1-98.

Uffeln, K., 1938. Die sogenannten "Kleinschmetterlinge" (Microlepidopteren) Westfalens. 1. Nachtrag nebst Ergänzungen. – *Abhandlungen aus dem Landesmuseum der Provinz Westfalen* 9: 1-32.

Vives Moreno, A., 1994. *Catalogo sistematico y sinonimico de los Lepidopteros de la Peninsula iberica y Baleares (Insecta: Lepidoptera)*: 1-775. Ministerio de Agricultura, Pesca y Alimentación, Madrid.

Accepted 29.x.1999.