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Phyllonorycter robiniella (CLEMENS, 1859) in Europe (Lepidoptera, Gracillariidae)

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Summary

Phyllonorycter robiniella (CLEMENS, 1859), a North American species which mines the leaves of Black Locust (*Robinia pseudacacia* L.), is reported from Europe, where it was first found in 1983 near Basle, Switzerland. The species, including its biology, is described and compared with *Parectopa robiniella* CLEMENS, 1863, another North American species, which is rapidly extending its range in southern Europe.

Zusammenfassung

Phyllonorycter robiniella (CLEMENS, 1859), eine nordamerikanische Art welche in den Blättern der Falschen Akazie (*Robinia pseudacacia* L.) miniert, wird aus Europa gemeldet. Sie wurde erstmals im Raum Basel, Schweiz, 1983 gefunden. Die Art wird hier nochmals beschrieben und mit *Parectopa robiniella* CLEMENS, 1863, einer weiteren nordamerikanische Art, welche ihre Verbreitung in Süd-Europa rasch ausdehnt, verglichen.

Résumé

Phyllonorycter robiniella (CLEMENS, 1859), espèce d'Amérique du Nord qui mine les feuilles du Robinier Faux Acacia (*Robinia pseudacacia* L.) est maintenant signalée d'Europe, où elle a été trouvée pour la première fois en 1983 près de Bâle, en Suisse. Description et comparaison avec *Parectopa robiniella* CLEMENS, 1863, autre espèce d'Amérique du Nord qui se trouve en expansion rapide en Europe méridionale.

In 1970, C. VIDANO reported the occurrence of a North American Gracillariid moth, later identified as *Parectopa robiniella* CLEMENS, 1863, infesting Black Locust trees (*Robinia pseudacacia* L.) in northern Italy (VIDANO, 1970 ; VIDANO & MARLETTO, 1971a). Since then the species has been taken in S. France (MARTINEZ & CHAMBON, 1987 ; G. LANGOHR, pers. comm., 1988), S. Switzerland (VIDANO & MARLETTO, 1971b ; SAUTER, 1981, 1983), Hungary and Yugoslavia (MACELJSKI & IGRC, 1984 ; SEPRÖS, 1988).

In September 1983, soon after moving to Magden, I discovered blotch mines on *Robinia* in the village and in neighbouring Olsberg, from which moths soon emerged. Independently, in November 1983, a local naturalist, Dr. R. MASSINI, found similar mines 13 km away at Muttenz, near Basle which he sent to me for identification. This species did not appear to me to be a *Parectopa*, but a *Phyllonorycter*. Reference to the list of North American Lepidoptera (HODGES *et al.*, 1983) showed that there was a *Phyllonorycter robiniella* (CLEMENS, 1859). Dr. D. R. DAVIS at the Smithsonian Institute, Washington D.C., was able to positively identify it as this species when I sent him photographs of the adult and male genitalia. The following year, more mines were found in July and again in September, also in Riehen, Sissach and St Louis (France) all within 20 km of the original locality (WHITEBREAD, 1986 ; BLATTNER, BUSER & WHITEBREAD, 1989). I notified a number of European microlepidopterists, but no further localities for the species were reported. In 1988 and 1989, with the help of other Swiss microlepidopterists, I was able to study the distribution of *Ph. robiniella* in more detail. It now occurs north of Basle in both France and Germany, and south of the Jura mountains in Switzerland. During the preparation of this paper, I was informed by the European *Phyllonorycter* specialist, G. DESCHKA, Steyr, Austria, that the species had recently been found in the region of Milan, northern Italy.

Phyllonorycter robiniella (CLEMENS, 1859)

(*Lithocolletis Robiniella* CLEMENS, 1859. Proc. Acad. Nat. Sci. Philadelphia, Nov. 1859 : 319) (*)

DESCRIPTION OF ADULT (figs. 1, 7) : Wingspan 5.5-6.5 mm. Head tuft dark- or reddish-brown mixed white. Frons and palpi white. Antennae dark brown, narrowly white to 2/3 and to 1/4 above. Legs dark, ringed and marked white. Abdomen dark to light grey above, whitish beneath. Thorax dark grey to brown usually tinged ferruginous. Forewings shining orange-brown, paler towards costa, sometimes mixed pale grey ; small whitish basal dash surrounded by light grey ; dorsal 1/3 suffused fuscous. Four white costal strigulae, the first two strongly, the last two weakly edged fuscous inwardly

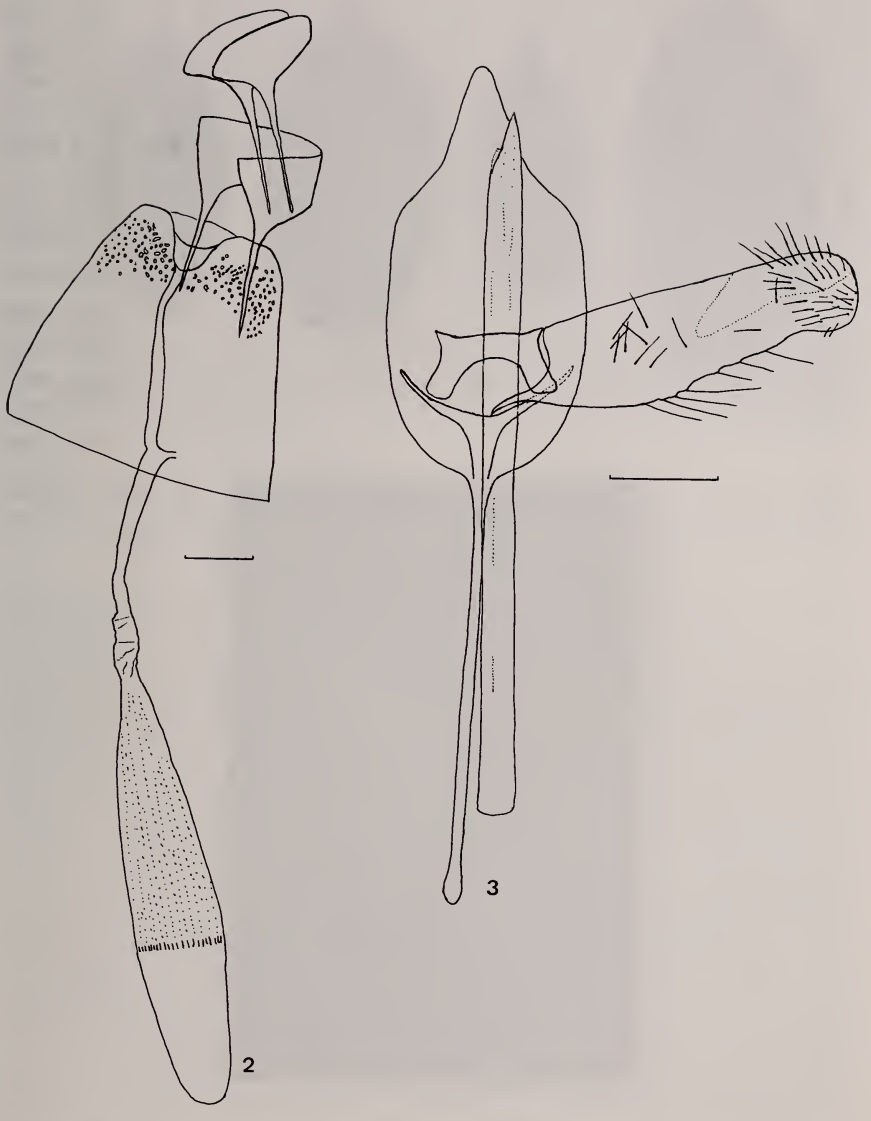
(*) In *The Entomologist's Weekly Intelligencer* of January 16th, 1858 (No. 68, pp. 125-126) STAINTON published an extract of a letter written to him by CLEMENS wherein the biology of *robiniella* is shortly described. Applying the Rules of Zoological Nomenclature strictly, this could be considered to be the first publication of this taxa. However, this was clearly not STAINTON's or CLEMENS' intention, therefore I quote here the much more detailed 1859 description which leaves no doubt as to the identity of the species. The letter in question did in fact contain a detailed description of *robiniella*, but was published in full only in 1872 (pp. 8-14 *in* B. CLEMENS, ed. H. T. STAINTON : *The Tineina of North America* pp. XV + 282).

Fig. 1. *Phyllonorycter robiniella* (CLEMENS). Olsberg, AG, Switzerland, 435 m, ex larva 3.10.1983.

and pale grey outwardly. Three whitish dorsal strigulae, sometimes indistinct. A fuscous streak between the dorsal first and second. An indistinct pale grey basal streak. Apical spot black. Black fringe line from 4th costal to tornus. Cilia pale greyish-brown, with a paler subapical patch. Hindwings pale grey, cilia tinged brownish. Not sexually dimorphic.

GENITALIA : Very different from European species of *Phyllonorycter*, symmetrical. Female (fig. 2) : Ductus- and corpus bursae very long, the latter with a ring of short sclerotized rods. Male (fig. 3) : Saccus and aedeagus long and straight, saccus slightly longer than the valve, aedeagus almost twice the valve length ; eighth sternite not developed.

BIOLOGY : In Basle, double brooded. Eggs are laid, usually away from a vein, on the underside of leaves of *Robinia pseudacacia* in May/June and again in July/August. In America, also on *Robinia neomexicana* GRAY and *R. hispida* L. (DESCHKA, in litt., 1989). As many as three eggs may be laid on each side of the midrib. Initially, the larva forms a gallery 1-2 mm long filled with more or less linear brown frass, separating the lower epidermis of the leaf from the parenchyma. This mine is very soon enlarged into a blotch, although the frass usually remains visible, being attached to the lower epidermis. The larva then



Figs. 2, 3. *Phyllonorycter robiniella* (CLEMENS), sketches of the genitalia. 2. Female ; 3. Male (left valve not drawn). Scale bar 0.1 mm.

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Figs. 4, 5. *Phyllonorycter robiniella* (CLEMENS). 4. Mines at different stages of development, viewed from the underside. Olsberg, AG, Switzerland, 435 m, 15.7.1984. 5. Normal underside mine viewed from above (left) and upperside mine (right), Waldenburg, BL, Switzerland, 550 m, 15.10.1989.

spins a silken web within the mine causing it to blister in the typical *Phyllonorycter* manner (figs. 4, 5 left). The larva feeds on the mesophyll cells of the parenchyma, but depositing frass on the parenchyma in the centre of the mine. The full-grown larva is *c.* 4.5 mm long, greenish-white, head brown. Pupation takes place in a flimsy, but usually quite dense white flattish oval cocoon within the silken web. When more than one egg is laid on the same side of the midrib, the larval mines merge to form a single larger one. Very exceptionally, the mine is formed on the upperside (fig. 5 right). The *c.* 3 mm long pupa is greenish-white with darker wing cases and head. It vacates the cocoon completely before pushing through the lower epidermis. Adults emerge in July/August and in September/October, presumably overwintering. The autumn generation appears to be more abundant.

PARASITES : Larvae are parasitised by at least three species of common non-host specific Hymenoptera Parasitica : *Colastes braconius* HALIDAY (Braconidae), *Tetrastichus ecus* (WALKER), *Chrysocharis nephereus* (WALKER) (Eulophidae), all bred in 1984. Cocoons of a further, as yet unidentified, species were taken in 1989.

DISTRIBUTION : In Europe, found so far in N. Switzerland, E. France and S. W. Germany within 85 km of Basle, up to 600 m.a.s.l. (fig. 6). In autumn

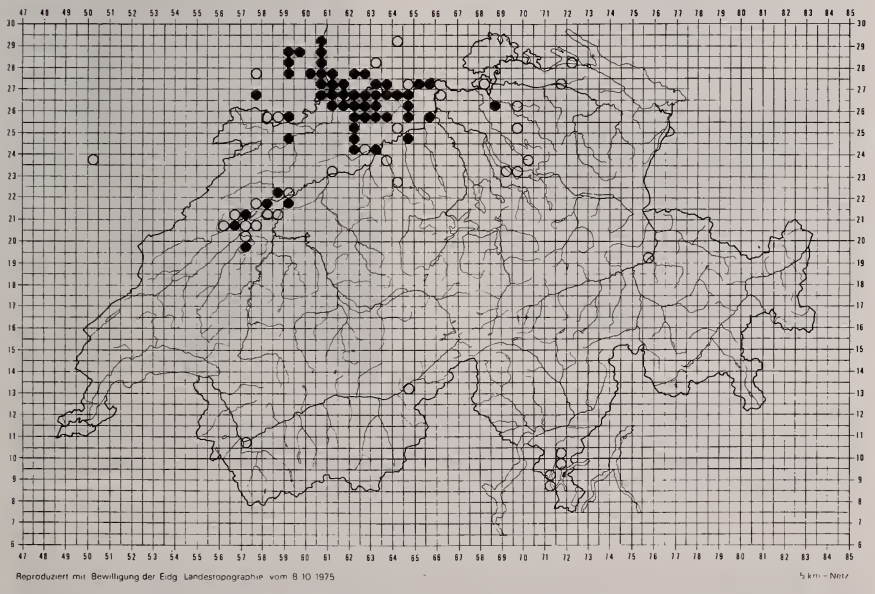

Fig. 6. 5 km grid map of Switzerland : distribution of *Phyllonorycter robiniella* (CLEMENS). Filled circles : mines found 1983-1989 ; Open circles : mines could not be found where the foodplant occurs, autumn 1988-1989 (Ticino : 1986).

1988, it was found for the first time in northern Italy where it is apparently already quite widespread (BOLCHI, SERINI & TREMATERRA, 1989). In America, the species is apparently found throughout the natural range of *Robinia pseudacacia.*

Discussion

Mines and adults of *Phyllonorycter robiniella* cannot be confused with those of *Parectopa robiniella* (figs. 7, 8). The larva of *Parectopa* initially mines the underside of the leaf, before forming a digitate blotch mine on the upperside. The larva vacates the mine for pupation. Two further species of *Phyllonorycter* also occur on *R. pseudacacia* in America and could also find their way to Europe some day: *gemmea* (FREY & BOLL, 1873) and *ostensackenella* (FITCH, 1859).

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Figs. 7, 8. 7. *Phyllonorycter robiniella* (CLEMENS), Olsberg, AG, Switzerland, 435 m, ex larva 2.10.1984 (above). *Parectopa robiniella* CLEMENS, Morcote, TI, Switzerland, 275 m, ex larva May 1987 (below). 8. *Parectopa robiniella* CLEMENS. Mines viewed from above, Losone, TI, Switzerland, 230 m, 26.9.1986, leg. L. REZBANYAI-RESER.

It is impossible to be sure how the two *robiniella* species came to Europe. VIDANO & MARLETTO (1971a) pointed out that the *Parectopa* was first found close to Milan International Airport. Basle also has an international airport, although there have been no direct flights from America until very recently.

However, Basle has a very large volume of container traffic, by air, road, rail and water. I consider it most likely that the *Phyllonorycter* arrived by container, possibly as overwintering adults. It may extend its range further both within and outside Europe by this means. In the light of the moth's recent discovery in northern Italy the question arises as to whether the population at Basle originated from Italy or vice-versa, or whether they originated independently. Considering the attention given to the *Parectopa* in that part of Italy (*Robinia* is economically important due to the acacia honey produced there), it is unlikely that the *Phyllonorycter* could have occurred for very long without it being detected. It is possible therefore that the Basle population preceded that of Italy. Due to the more favourable climatic and topographical situation in northern Italy, the species would become widespread more rapidly than in Basle. In Italy, where the *Parectopa* and *Phyllonorycter* occur together, it is the *Phyllonorycter* that is more abundant (Bolchi Serini & Trematerra, 1989). Whether this is due to competition for the same ecological niche or due to the effect of the host-specific parasite (*Closterocerus cinctipennis* Ashmead), that has been introduced to control the *Parectopa* is not clear.

The species was already common around Basle in 1983, but appears to have been rather slow in extending its range. This is certainly partly due to the natural barrier formed by the surrounding Jura, Black Forest and Vosges mountains, which are too high for the species to occur, and where the host tree is also very rarely planted. It has extended up the Rhine towards Schaffhausen, but it has apparently not yet reached Zürich. In the other direction, the northernmost locality that I know is Ottmarsheim, near Mulhouse. I have no report of it from Freiburg/D, and I have personally failed to find it at Rust, just north of Freiburg. However, conditions should be ideal for it further north in Alsace and it will certainly reach Strasbourg before long, if it has not already done so. Surprisingly, it was found this year at several places around the Lake of Biel, on the south side of the Jura. These populations are almost certainly of more recent occurrence as they have not reached the abundance of the populations at Basle. Of 29 localities visited where *Robinia* occurs, the *Phyllonorycter* could only be found at 8 and in most cases only sparingly. In contrast, at Basle, the species is present on virtually every tree and bush.

This is despite the fact that since 1983 Basle has had at least two successive very hard winters with temperatures down to - 20°C. For comparison, during this period nearly all the *Pyrocantha* bushes were frozen, only surviving, together with *Phyllonorycter leucographella* Zeller, 1850, in very sheltered situations. This brings us to the problem of the overwintering stage. I have not been able to discover any stage during the winter. The adult moth

would have to wait at least 7 months before it could lay eggs on the leaves. It should not therefore be excluded that a winter generation of larvae feeds in shoots or flower buds.

In the list of HODGES, et al. (1983) this species is marked 'mispl.', meaning that its generic placement is incorrect or uncertain. It certainly differs in many respects from the type species of the genus (*P. rajella* LINNAEUS, 1758). Superficially the genitalia resemble more those of the tineid genus *Monopis* than a *Phyllonorycter*! However, the biology is more typical of the genus. Only a full revision of the world Lithocolletinae using modern techniques would determine the correct placement of the species.

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References

BLATTNER, S., BUSER, H. & WHITEBREAD, S. E., 1989. Schmetterlinge (Lepidoptera), pp. 290-297 *in* IMBECK, P. (Ed.), *Natur Aktuell.*, 343 pp., 361 text figs., 17 supplementary maps and figs. Kanton Basel-Landschaft, Liestal, Switzerland.

BOLCHI SERINI, G. & TREMATERRA, P., 1989. Comparsa del neartico *Phyllonorycter robiniellus* (CLEMENS) (Lepidoptera Gracillariidae) in Italia. *Boll. Zool. agr. Bachic.* Ser. II, 21 (in press).

HODGES, R. W., et al., 1983. Check List of the Lepidoptera of America North of Mexico. 284 pp., Classey, Faringdon, UK and Wedge Foundation, Washington, D.C.

MACELJSKI, M. & IGRC, J., 1984. Bagremov miner *Parectopa robiniella* CLEMENS (Lepidoptera, Gracillariidae) u Jugoslaviji. *Zastita Bilja* 35 (4) : 323-331.

MARTINEZ, M. & CHAMBON, J.-P., 1987. Note sur la présence en France de *Parectopa robiniella* (CLEMENS) la mineuse américaine des feuilles de Robinier (Lepidoptera, Gracillariidae). *Nouv. Revue Ent.* (N.S.) 4 (3) : 323-328.

SAUTER, W., 1981. Interessante Neufunde von Microlepidopteren aus der Schweiz und Süddeutschland. *Nota lepid.* 4 (3) : 103-106.

SAUTER, W., 1983. Die Schmetterlinge der Schweiz. 8. Nachtrag : Microlepidopteren. *Mitt. schweiz. ent. Ges.* 56 : 107-124.

SEPRÖS, I., 1988. Ujabb adatok az akáclevél-hólyagosmoly *Parectopa robiniella* CLEMENS (Lepidoptera, Gracillariidae) magyarországi elterjedéséhez. *Növényvédelem* 24 (5) : 218.

VIDANO, C., 1970. Foglioline di *Robinia pseudoacacia* con mine di un Microlepidottero nuovo per l'Italia. *L'apicoltore moderno* 61 (10) : I-II.

VIDANO, C. & MARLETTO, F., 1971a. L'americana *Parectopa robiniella* CLEMENS (Lepidoptera Gracillariidae) nemico della *Robinia* in Europa. *L'apicoltore moderno* 62 (7) : 143-153.

VIDANO, C. & MARLETTO, F., 1971b. *Parectopa robiniella* un insecte nuisible pour *Robinia pseudoacacia* en Europe. *XIII Congr. Int. Apic.*, Moscow 1971 : 559-561.

WHITEBREAD, S. E., 1986. Nachtfalter und Kleinschmetterlinge. pp. 116-121 *in* M. BLATTNER, M. RITTER & K. C. EWALD (Eds). *Basler Natur-Atlas* I. 163 pp., numerous text figs and maps. Basler Naturschutz, Basle.

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