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Gracillariidae feeding on *Ostrya carpinifolia*

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Summary

Altogether 5 species of Gracillariidae are reported feeding on *Ostrya carpinifolia* Scopoli (Corylaceae). *Phyllonorycter aemula* sp. n. is described in this review from Italy (provinces South Tyrol, Trento, Verona, Udine, Trieste) ; it is restricted to *Ostrya* L. exclusively. *Phyllonorycter coryli* (Nicelli), *P. esperella* (Goeze), *P. tenerella* (Joannis) (Lithocolletiinae) and *Parornix carpinella* (Frey) (Gracillariinae) are oligophagous and feed on various Corylaceae. External characters and genitalia of all species are described and figured.

Zusammenfassung

Insgesamt 5 Gracillariidae-Arten ernähren sich oligophag oder monophag an *Ostrya carpinifolia* Scopoli (Corylaceae). *Phyllonorycter aemula* sp. n., eine hier neu beschriebene Art mit bekannten Vorkommen in Italien (Provinzen Südtirol, Trient, Verona, Udine, Triest), ist exklusiv an *Ostrya* L. gebunden. *Phyllonorycter coryli* (Nicelli), *P. esperella* (Goeze), *P. tenerella* (Joannis) (Lithocolletiinae) sowie *Parornix carpinella* (Frey) (Gracillariinae) ernähren sich oligophag an verschiedenen Corylaceae. Sämtliche Arten werden nach habituellen sowie genitalmorphologischen Kriterien beschrieben und abgebildet.

Résumé

5 espèces de Gracillariidae au total se nourissent en oligophage ou en monophage sur *Ostrya carpinifolia* Scopoli (Corylaceae). *Phyllonorycter aemula* sp. n., décrite ici et existant en Italie (dans les provinces du Sud-Tirol, de Trente, de Vérone, d'Udine et de Trieste), est strictement limité à *Ostrya* L. *Phyllonorycter coryli* (Nicelli), *P. esperella* (Goeze), *P. tenerella* (Joannis) (Lithocolletiinae) et *Parornix carpinella* (Frey) (Gracillariinae) sont oligophages et se nourissent de plusieurs Corylaceae. Les caractères externes et les genitalia de toutes les espèces sont décrits et figurés.

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Introduction

In autumn 1994 P. T. and P. H. independently dissected specimens of a species of *Phyllonorycter* from various Northern Italian localities which could not be identified according to standard identification literature (e.g. Bradley, Jacobs & Tremewan, 1969 ; Emmet, Watkinson & Wilson, 1985 ; Kuznetsov, 1989 ; Szöcs, 1977). Extensive correspondence with G. D. showed that the species was undescribed, although already represented in collections. From this material and from succeeding breeding results it became obvious that the host plant of the new species is *Ostrya carpinifolia* Scopoli (Corylaceae), but bred specimens were hitherto misidentified with other species of Corylaceae-feeding *Phyllonorycter*, namely *P. esperella*. The authors therefore intended to review the entire Gracillariid moth fauna on *Ostrya carpinifolia*, including the genera *Phyllonorycter* with four species and *Parornix* with one species.

The species

Phyllonorycter coryli (Nicelli, 1851)

Lithocolletis coryli Nicelli, 1851, *Stettin. ent. Ztg.* 12 : 36.
Lithocolletis danica Caradja, 1920, *Dt. ent. Z. Iris* 34 : 158.

Description of male and female (Fig. 1). Wingspan : 6.5-9.0 mm. Head with tuft yellow-ochre, white posteriorly ; face shiny white, labial palpus white, brownish on outer side. Antenna pale yellow, without any annulation ; pecten and scape white, latter fuscous above. Thorax orange, with three longitudinal stripes ; lateral and ventral surface whitish. All legs whitish ; foreleg with femur and tibia fuscous on outer side, latter with a fuscous band apically ; fore, mid and hind tarsi with two blackish spots or bands. Forewing orange with a golden reflection ; basal streak narrow, occupying little more than 1/3 of wing length, not dark-edged ; four costal and three dorsal whitish strigulae, dark-edged inwardly ; first costal edged on both sides, long and oblique, extending slightly along costa towards base ; second triangular and other two arc-shaped ; first dorsal very long and oblique, nearly meeting first costal and forming an acute angle ; second dorsal triangular and third small but distinct ; a small, white streak placed near base along dorsum ; an apical streak prolonged at junction of third pair of strigulae ; a fine black fringe line from fourth costal to second dorsal ; cilia light brown, in some specimens darker at tips from fourth costal to apex forming a very faint apical line. Hindwing pale grey, with cilia pale fuscous.

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Figs. 1-5. Adults : 1 — *Phyllonorycter coryli* ♀, Austria, Oberösterreich, Steyr, 285 m, ex l. 24.IV.1964 (*Corylus avellana*), leg. Deschka ; 2 — *Phyllonorycter aemula* sp. n. ♀ paratype, Italy, Trieste, 300 m, ex l. 3-9.IV.1976 (*Ostrya carpinifolia*), leg. Deschka ; 3 — *Phyllonorycter esperella* ♂, Austria, Oberösterreich, Steyr, 340 m, ex l. 29.I.-23.II.1965 (*Carpinus betulus*), leg. Deschka ; 4 — *Phyllonorycter tenerella* ♀, Austria, Oberösterreich, Steyr, ex l. 26.III.-2.IV.1965 (*Carpinus betulus*), leg. Deschka ; 5 — *Parornix carpinella*♂ , Germany, Württemberg, Großbottwar, Kälbling, ex p. 29.III.1956 (*Carpinus betulus*), leg. Süssner.

Male genitalia (Fig. 6). Symmetrical. Tegumen slender and pointed, about 1/4 as long as aedeagus ; tuba analis without spinules ventrally. Vinculum short, rounded, without produced saccus. Valva wide, subrectangular, a long seta originating from produced top of sacculus and reaching cucullus. Aedeagus about twice length of valva, straight and slender, with an ovate apical barb. Flap of eighth sternite about 2/3 as long as valva, pointed apically.

Female genitalia (Figs. 10-11). Apophysis posterioris longer than anterioris. Eighth segment not scaled, only weakly sclerotized, about 1/4 as long as seventh, sinuous in lateral view ; tergal area of the seventh segment weakly membranous and reduced. Antrum long, occupying about distal third of ductus bursae ; corpus bursae globose with a sclerotized, circular plate, with a pair of cone-shaped teeth in the centre.

Host plants. *Corylus avellana* L., *Ostrya carpinifolia* Scopoli (Corylaceae).

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Biology. Larva mines on the upperside of a leaf with formation, in the sap-feeding phase, of an almost circular whitish blotch. In the tissue-feeding phase the presence of silk contracts the upper surface of the mine with formation of many tiny creases and causing a strong folding of the leaf. If the mine is at the margin it resembles the fold made in later instars by *Parornix carpinella*. In the overwintering generation pupation takes place in a silk chamber at one end of the mine, generally on an uneaten part of parenchyma, the frass heaped at the opposite end. There are two generations, with adults flying from April to May and then in July - early August.

Distribution. Widely distributed all over Europe, from the British Isles to Caucasus and from Scandinavia to Italy ; not recorded from Spain and Greece.

Remarks. The identity of *Phyllonorycter coryli* is undisputed, due to the perfect description of the type-series, which was bred from *Corylus* exclusively, as well as the type-locality (surroundings of Szezin, Poland), an area where *Ostrya* is missing (Nicelli, 1851). *L. danica* was described after 4 Swedish specimens bred on *Corylus* (Caradja, 1920). Therefore conspecificity with *P. aemula* sp. n. can be excluded.

Phyllonorycter aemula sp. n.

Holotype ♂, Italy, Verona, M. Lessini, Montecchio 500 m, mn 28.X.1994 *Ostrya carpinifolia*, ex l. 5.III.1995, leg. Triberti (coll. Tiroler Landesmuseum Ferdinandeum, Innsbruck).

Paratypes : *Italy* : ♂, ♀, Verona, Lago di Garda, Brenzone 80 m, mn *Ostrya carpinifolia*, ex l. 15-29.VII.1965, leg. Deschka (coll. Deschka, Steyr) ; ♂, Verona, Lago di Garda, Costermano, 29.V.1978, leg. Triberti ; ♀, Verona, M. Baldo 800 m, SS. Benigno e Caro, 25.V.1974, leg. Triberti ; 2 ♀, Verona, M. Baldo, Albisano 500 m, 4.VIII.1978, leg. Triberti ; ♀, Verona, M. Lessini, Monte 500 m, 1.VI.1974, leg. Triberti ; 10 ♂, 4 ♀, Verona, M. Lessini, Montecchio 500 m, mn 15.X-3.XI.1994 *Ostrya carpinifolia*, ex l. 7.-20.III.1995, leg. Triberti ; 4 ♂, 5 ♀, Verona, M. Lessini, Montecchio loc. Gaspari 400 m, 4.V.1988, leg. Triberti ; 3 ♀, Verona, M. Lessini, Quinzano 300 m, mn 8.VI.1988 *Ostrya carpinifolia*, ex l. 20.VI.1988, leg. Triberti ; ♂, as above, mn 1.VIII.1984 *Ostrya carpinifolia*, ex l. 22.VIII.1984, leg. Triberti ; ♂, Verona, Avesa, 15.IV.1981, leg. Triberti ; ♀, Verona, M. Lessini, Trezzolano 400 m, 13.VII.1978, leg. Triberti ; ♂, ♀, Verona, M. Lessini, Ponte di Veia 600 m, mn 9.X.1994 *Ostrya carpinifolia*, ex l. 20.III.1995, leg. Triberti ; ♀, Verona, M. Lessini, Corso loc. Schioppi 700 m, mn 7.XI.1994 *Ostrya carpinifolia*, ex l. 8.III.1995, leg. Triberti ; ♀, Verona, M. Lessini, Velo 950 m, 15.VI.1974, leg. Triberti ; 2 ♂, ♀, Trento, Pomarolo (Savignano) 700 m, mn 25.X.1994

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Ostrya carpinifolia, ex l. 14.III.1995, leg. Triberti (all coll. Triberti, Verona) ; 4 ♂, 4 ♀, ditto, ex l. 10-16.II.1995, leg. Deschka (coll. Deschka, Steyr) ; 2 ♂, 3 ♀, ditto, ex l. 27.I.-19.II.1995, leg. Huemer ; 2 ♂, Südtirol, Montiggl, Kl. Priol 600 m, 1.IX.1993 (trap nr. 63) [only genitalia slides] ; ♀, ditto, mn 26.X.1994 *Ostrya carpinifolia*, ex l. 24.I.1995, leg. Huemer (coll. Tiroler Landesmuseum Ferdinandeum, Innsbruck) ; ♂, ♀, Friuli, Lago di Cavazzo 200 m, mn mid-VII.1968 *Ostrya carpinifolia*, ex l. 29.VII.-1.VIII.1968, leg. Deschka ; 3 ♂, 3 ♀, Trieste 300 m, mn 1-2.XI.1975 *Ostrya carpinifolia*, ex l. 3-9.IV.1976, leg. Deschka ; ♂, ♀, Trieste, Istria, Opicina 300 m, mn 30.X.-4.XI.1968 *Ostrya carpinifolia*, ex l. 6.III.1969, leg. Deschka (coll. Deschka, Steyr).

Description of male and female (Fig. 2). Wingspan : 6.3-8.0 mm. Head and face as *coryli*, labial palpus white. Antenna pale yellow, without distinct annulation, apical third greyish above, last three segments darker ; pecten and scape white, latter orange above. Thorax and legs as *coryli*, sometimes a third spot is present on first tarsal segment basally. Forewing orange with a golden reflection ; basal streak narrow, occupying about 1/3 of wing length, not dark-edged ; four costal and three dorsal whitish strigulae, narrowly margined with fuscous except first costal, that is very oblique, only slightly extending to base, other three strigulae arc-shaped ; a small, white streak placed near base along dorsum ; first dorsal oblique, not extending to base, second triangular and third very indistinct ; an apical streak darkish, paler basally, ending at apex of first dorsal strigula ; cilia and hind wing as *coryli*.

Male genitalia (Fig. 7). Symmetrical. Tegumen long and slender, pointed apically ; tuba analis without spinules ventrally. Vinculum short, rounded, without produced saccus. Valva arched upwardly in its costal margin, setae near apex being thickened like spine and a very strong seta on ventro-basal surface ; dorsum produced into a rounded lobe just before middle of valva with long setae at top and a cup-shaped structure, probably a sensorial organ. Aedeagus about 1.5 times as long as valva, straight and slender, with an ovate apical barb. Flap of eighth sternite about 2/3 as long as valva, truncated apically.

Female genitalia (Figs. 12-13). Apophysis posterioris longer than anterioris. Eighth segment not scaled, only weakly sclerotized, about 1/2 as long as preceding. Seventh segment with two rows of scales along ventro-lateral surface, sternite produced caudally forming an indented flap covering ostium bursae. Ductus bursae sclerotized in the apical fourth, corpus bursae globose with a sclerotized, circular plate, with a pair of cone-shaped signa in the centre.

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Figs. 6-9. Male genitalia : 6 — *Phyllonorycter coryli*, Belgium, Prov. de Namur, Yvoir, 200 m, ex l. 23.XI.1980 (*Corylus avellana*), leg. Coenen, gen. slide 2778 Deschka ; 7 — *Phyllonorycter aemula* sp. n., Italy, Lago di Garda, Brenzone, 80 m. ex l. 25-29. VII.1965 (*Ostrya carpinifolia*), leg. Deschka, gen.slide 2683 Deschka ; 8 — *Phyllonorycter esperella*, Sweden, SK Lund, e.p. 11-28.IV.1983, leg. Svensson, gen. slide 2777 Deschka ; 9 — *Phyllonorycter tenerella*, Austria, Oberösterreich, Steyr, 290-340 m, ex l. 9-17.II.1995 (*Carpinus betulus*), leg. Deschka, gen. slide 2784 Deschka.

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Pupal cremaster (Figs. 23-25). The cremasters of the three *Phyllonorycter* species *aemula* sp. n., *esperella* and *coryli* are very similar. They consist of two pairs : a pair of median and inwardly curved hooks and a pair of lateral, outwardly curved and stronger hooks. The cremaster of *aemula* sp. n. has the strongest appendages, esp. the median pair is well sclerotized, while *esperella* and *coryli* have weaker inner hooks. *P. aemula* sp. n. can also be separated by the lack of tiny dorsal setae of the cremaster.

Host plant. *Ostrya carpinifolia* Scopoli (Corylaceae).

Biology. The mine is formed on the upper surface and does not show any difference from that of *coryli*, except for a slightly more lengthened shape. The adults fly from April to early June and again from July to early August.

Distribution (Fig. 26). Up to the present the species is only known from the north of Verona, from Garda lake to Lessini Mountains and then along the Adige Valley as far as Bolzano and furthermore from Friuli and the area of Trieste. Concerning the geographic range of *Ostrya carpinifolia* Scopoli (Fig. 26) (Fenarolli & Gambi, 1976), it is likely that *aemula* sp. n. is more widely distributed but probably confused with *coryli* and *esperella*. However, a search for larvae at the northern limit of the range of *Ostrya* in Carinthia has failed. From this area as well as from Southern Italy (Potenza, Monte Vulture) *esperella* was bred from upperside *Ostrya* mines.

Remarks. *P. aemula* sp. n. is very similar to *coryli* and *esperella* in forewing pattern. However, it may be readily distinguished from both by the presence of a long apical streak, prolonged to the apex of the first dorsal strigula, and more shaded basally.

The main charcteristic features are found in the genitalia, particulary of the male, which cannot be mixed with other species of *Phyllonorycter*.

Following the division into 9 groups fixed by Kumata (1963), *P. aemula* sp. n. can be included into group 1 with the other *Phyllonorycter* described in the present paper. This group includes most of the Fagaceae-, Betulaceae- and Rosaceae-mining species. The closest relationships are found among the Corylaceae- and Fagaceae-mining species, esp. the miners on deciduous oaks.

Etymology. The specific name indicates that this species is an emulous of *coryli* and *esperella*.

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Phyllonorycter esperella (Goeze, 1783)

Tinea esperella Goeze, 1783, *Ent. Beitr.* 3 : 166.
Tinea quinnata Fourcroy, 1785, *Ent Paris* 2 : 331.
Lithocolletis carpinicolella Stainton, 1851, *Suppl. Cat. Br. Tineidae and Pterophoridae* 1851 : 13.

Description of male and female (Fig. 3). Wingspan : 7.5-9.0 mm. Head and face as *coryli*, labial palpus white, spotted with ochre-brownish on outer side. Antenna pale yellow annulated fuscous, this annulation absent on apical ten segments ; pecten and scape white. Thorax pale orange, with three longitudinal white stripes ; lateral and ventral surfaces white. All legs white ; foreleg with femur and tibia fuscous on outer side ; fore, mid and hind tarsi with two blackish spots or bands. Forewing pale orange ; basal streak narrow, occupying about 2/5 of wing length, not dark-edged ; four costal and three dorsal whitish strigulae, narrowly black-edged inwardly ; first costal narrow and strongly angled, extended almost to base of costa, other strigulae arc-shaped ; first dorsal long and sinuate, extended along dorsum towards base, second and third triangular ; apical streak, cilia and hind wing as *coryli*.

Male genitalia (Fig. 8). Symmetrical. Tegumen long and slender, pointed apically ; tuba analis without spinules on ventral surface. Vinculum short, rounded, without produced saccus. Valva slender, parallel-sided, slightly arched upwardly, setae near apex being thickened like spine ; a very strong seta originating from produced top of sacculus. Aedeagus a little longer than valva, straight and slender, with an ovate apical barb. Flap of eighth sternite about 2/3 as long as valva, rounded apically.

Female genitalia (Figs. 14-15). Apophysis anterioris about as long as posterioris. Eighth segment not scaled, very short. Ostium bursae wide, antrum sclerotized, occupying about 1/4 of ductus bursae ; corpus bursae globose with a sclerotized, circular plate, with a pair of cone-shaped signa, slightly serrate.

Host plants. *Carpinus betulus* L., *Ostrya carpinifolia* Scopoli (Corylaceae).

Biology. The species mines on the upperside of a leaf as *coryli* and also the pupation takes place in a similar way. Two generations are present, with adults flying from late April to May and in July - early August.

Distribution. To the north known up to Denmark and southern Sweden ; common and widely distributed in all central European

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Figs. 10-13. Female genitalia : 10 — *Phyllonorycter coryli*, Oberösterreich, Gersten, 303 m, ex l. 12.IV.1963 (*Corylus avellana*), leg. Deschka, gen. slide 1994 Deschka ; 11 — ditto, corpus bursae/signum enlarged) ; 12 — *Phyllonorycter aemula* sp. n., Trieste, Opicina, 300 m, ex l. 6.III.1969 (*Ostrya carpinifolia*), leg. Deschka, gen. slide 2684 Deschka ; 13 — dito, corpus bursae/signum enlarged ;

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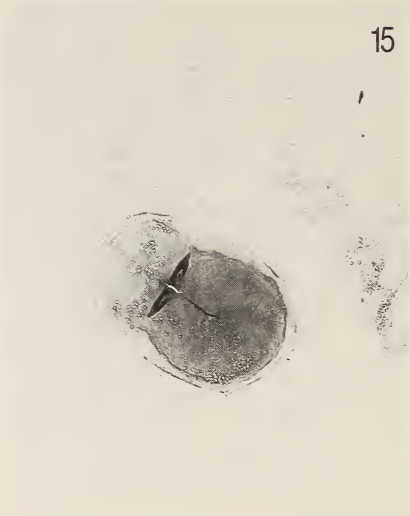

Figs. 14-17. Female genitalia : 14 — *Phyllonorycter esperella*, Austria, Oberösterreich, Steyr, 340 m, ex l. 29.I.-23.II.1965 (*Carpinus betulus*), leg. Deschka, gen. slide 1990 Deschka ; 15 — ditto, corpus bursae/signum enlarged ; 16 — *Phyllonorycter tenerella*, Austria, Oberösterreich, Steyr, 285 m, ex l. 4.III.1964 (*Carpinus betulus*), leg. Deschka ; 17 — ditto, corpus bursae/signum enlarged.

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countries, including southern England ; to the south not present in Spain, no records from Greece and Romania, known in Turkey up to Caucasus.

Remarks. The adult of this species is readily distinguishable from *aemula* sp. n. (see above), more difficultly from *coryli*. The only reliable characters seem to be the first costal strigula, prolonged on costa basally, and the basal streak which is slightly longer.

P. esperella and *P. quinnata* are objective synonyms since both names refer to the same description by Geoffroy (1762). The latter work is nomenclatorially invalid, using no latin names (Karsholt, in litt.). The description of this species is vague and no type-material could be traced. However, we accept the present species status of *P. esperella* in the interest of stability.

Phyllonorycter tenerella (Joannis, 1915)

Lithocolletis tenerella Joannis, 1915, *Annls. Soc. ent. Fr.* 84 : 121.
Lithocolletis tenella Zeller, 1847, *Linn. Ent.* 2 : 236, homonym.

Description of male and female (Fig. 4).Wingspan : 6.0-8.5 mm. Head with tuft white, sometimes with a few brown scales anteriorly ; face and labial palpus shiny white ; sometimes latter with a few brown scales. Antenna whitish, more or less annulated with pale brown, pecten and scape white, sometimes spotted with brownish. Thorax white to yellow ochre, lateral and ventral surface white. All legs whitish ; foreleg almost completely fuscous on outer side in darker specimens ; mid and hind tarsi with two or three blackish spots or bands. Ground-colour of forewing ranging from white to yellow ochre basally, distally always yellow ochre ; basal streak distinguishable only in darker specimens, occupying about 2/3 of wing length, not dark-edged ; four costal and three dorsal whitish strigulae, dark brownish edged inwardly ; first costal very oblique, the second less, other two strigulae at right angle to costa ; first dorsal stopping well before end of first costal, second triangular, third dorsal indistinct ; apical streak slightly elongate, often to the second pair of strigulae ; fringe line as *coryli*, cilia whitish ; hindwing pale greyish fuscous.

Male genitalia (Fig. 9). Asymmetrical. Tegumen long and slender, pointed apically ; tuba analis with spinules on lateral surface. Vinculum short, subtriangular, with a produced saccus. Valvae straight and narrow, slightly longer than flap of eighth sternite ; left valva slightly wider than right one, both covered ventro-distally with short and strong spines, one of them, subapically, longer. Two asymmetrical processes

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are present, longer on left side than on right, from which filaments originate. Aedeagus slender, with apical barb, slightly longer than valva.

Female genitalia (Figs. 16-17). Apophysis posterioris longer than anterioris. Eighth segment not scaled, about 1/5 as long as seventh. Ostium wide, antrum partially sclerotized and subrectangular, almost as long as the seventh segment ; corpus bursae globose with a sclerotized, circular plate, which has a pair of cone-shaped signa in the centre.

Host plants. *Carpinus betulus* L., *Ostrya carpinifolia* Scopoli (Corylaceae).

Biology. Larva mines the lower surface of the leaf, between two veins. The mine is long and narrow, with a strong central fold, those collected on *Ostrya* are always shorter, with irregular outline. The pupal site is placed at one end of the mine, frass stacked in the central portion and alongside the cocoon. Two generations, adults flying from late April to first of June and then in July-August.

Distribution. Widely distributed in central and eastern Europe up to Denmark, Sweden and Baltic Republics ; in the Mediterranean area only known from Italy.

Remarks. *Lithocolletis tenella* Zeller, 1847, is a junior secondary homonym of *Lithocolletis tenella* Duponchel, 1843 (currently *Phyllonorycter harrisella* (Linnaeus, 1761)) and was therefore renamed as *Lithocolletis tenerella* (Joannis, 1915) (Emmet, Watkinson & Wilson, 1985). The identity of this species is undisputed though Zeller (1847) recorded his type-specimens flying around oaks. However, *Carpinus* occurs in the area of the type-localities (Vienna and Reichstadt) as well and in the absence of syntypes in Zeller's collection we accept the general interpretation of this species.

Parornix carpinella (Frey, 1863)

Ornix carpinella Frey, 1863, *Linn. Ent.* 15 : 19.

Description of male and female (Fig. 5). Wingspan : 8.5-10.5 mm. Head pale ochre, tuft with mixed brownish scales, white posteriorly ; labial palpus white with subapical fuscous band on third segment. Antenna ochreous annulated fuscous ; pecten and scape spotted with fuscous. Thorax pale ochre, tegulae brownish. All legs ochreous, strongly irrorated with fuscous scales ; fore and mid tarsus white, each segment annulated with dark brown apically. Forewing pale ochre, costa mixed fuscous with indistinct strigulation ; dorsal area less strongly mixed fuscous, with dark brown ante- and postmedian spots,

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preceded from few whitish scales ; an ochreous white spot in disc at 3/4 and an apical dark dot. All these spots are often hardly visible or absent. Cilia with three dark brown lines separated from whitish scales. Hindwing pale grey, with cilia whitish.

Male genitalia (Fig. 20). Tegumen short, rounded apically ; tuba analis moderate in length, with a pair of setaceous areas at base ; a short, subtriangular and well defined subscaphium is present. Valva slightly bent at basal 1/4, with sacculus slender, about 2/3 as long as aedeagus, apically hook-shaped. Aedeagus curved, pistol-shaped ; ductus ejaculatorius sclerotized anteriorly for a length equal to aedeagus.

Female genitalia (Figs. 18-19). Apophysis posterioris as long as anterioris. Eighth segment very short with a simple sterigma. Ductus bursae long, narrow, membranous, scobinate on whole length except antrum ; corpus bursae ellipsoid, entirely scobinate with two small, round signa.

Host plants. *Ostrya carpinifolia* Scopoli, *Carpinus betulus* L. (Corylaceae).

Biology. Larva starts feeding with a gallery in the lower face, then absorbed by a blotch mine. This is very variable : it can be narrow as *tenerella* (but shorter), rounded, subrectangular. After leaving its mine, the larva folds the edge of a leaf downwards and feeds within. Each larva usually makes two such folds. Pupation takes place in a white cocoon under the edge of an upwards folded leaf. Two generations are present and e.g. in Lessini Mountains it is possible to find larvae from June to October.

Distribution. Widely distributed in central and eastern Europe up to Sweden ; to the south not present in Spain.

Ecological remarks

Gracillariidae feeding on *Ostrya carpinifolia* Scopoli show a remarkable variety of mining habits. Two subfamilies are represented : Gracillariinae, with the genus *Parornix* Spuler and Lithocolletiinae with the genus *Phyllonorycter* Hübner. The principal character separating these two groups is the different way to conclude the tissue-feeding stage. The former has a phase in which the larva continues to mine and a second in which it feeds externally in folded leaves (Fig. 22). The latter has larvae mining for the whole tissue-feeding phase and pupating within the original mine (Fig. 21). Different mining habits may also be found within the species of *Phyllonorycter*. The mine of *P. tenerella* is built on the lower surface of a leaf, long and narrow between two veins,

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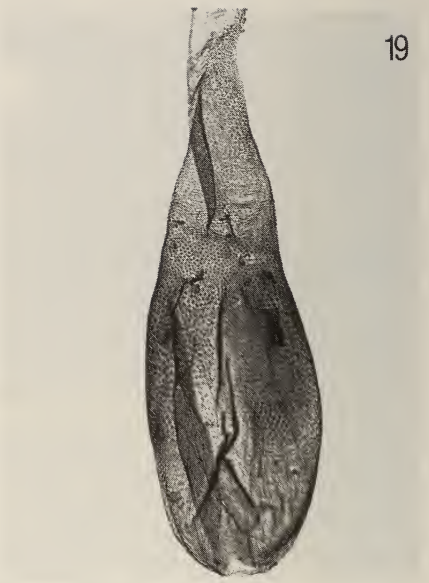

Figs. 18-20. Female/male genitalia : 18-19 — *Parornix carpinella*, female ; 20 — *Parornix carpinella*, male, Italy, Prov. Trento, Pomarolo, Savignano, 700 m, ex l. 10-16.II.1995 (*Ostrya carpinifolia*), leg. Deschka, gen. slide 2711 Deschka.

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Figs. 21-22. Leaf-mines on *Ostrya carpinifolia* : 21 — *Phyllonorycter* sp., Italy, Prov. Trento, Pomarolo, Savignano, 700 m, X.1994 ; 22 — *Parornix carpinella*, Italy, Prov. Trento, Pomarolo, Savignano, 700 m, X.1994.

whereas larvae of the remaining species cause upperside mines, initially making a blotch mine between two veins and extending it sidewards (Fig. 21). These blotch mines are very similar and also the miners (*P. coryli*, *P. aemula* sp. n., *P. esperella*) are closely related.

Because of this poor differentiation at level of mining habits, the collecting localities of the upperside miners were examined, to find out possible ecological specializations. In particular Lessini Mountains were considered because the localities were more numerous and covering different environments. It is important to remember that these data may not be adequate for discussing ecological problems because they were not gathered according to a plan designed for this purpose. However, as they seem to show a "tendency" of these species to occupy specific environments, it was preferred to report these behaviours, even if further research will be necessary to explain them reliably.

The Lessini Mountains are a calcareous chain degrading slowly towards Po plain, representing a part of the southern border of the Alps. The

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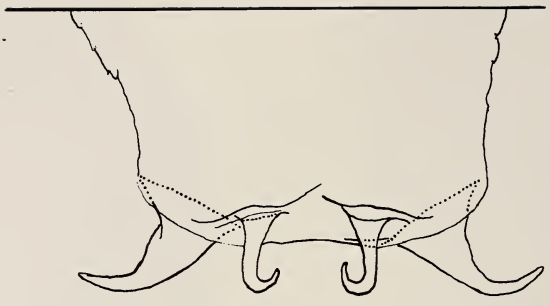

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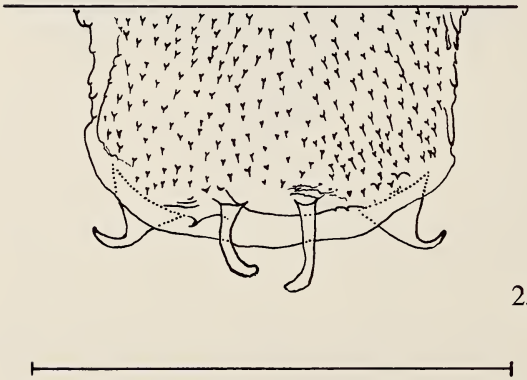

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Figs. 23-25. Pupal cremaster : 23 — *Phyllonorycter aemula* sp. n., holotype ; 24 — *Phyllonorycter esperella* ; 25 — *Phyllonorycter coryli* (reference bar 300 µm).

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lower part (below 1000 m) is formed by sunny and dry slopes with bushy vegetation characterized by *Fraxinus ornus* L., *Corylus avellana* L., *Cotinus coggyria* Scopoli, *Amelanchier ovalis* Med., *Quercus pubescens* Willd. and *Ostrya carpinifolia* Scopoli. These slopes are crossed by deep valleys, rather fresh and wet. Here the presence of *Ostrya* Scopoli is rather discontinuous, often mixed with *Carpinus betulus* L. In fact it is a thermophil and xerophilous element, with a distribution (Fig. 26) from Southern France to the Caucasus and Asia Minor.

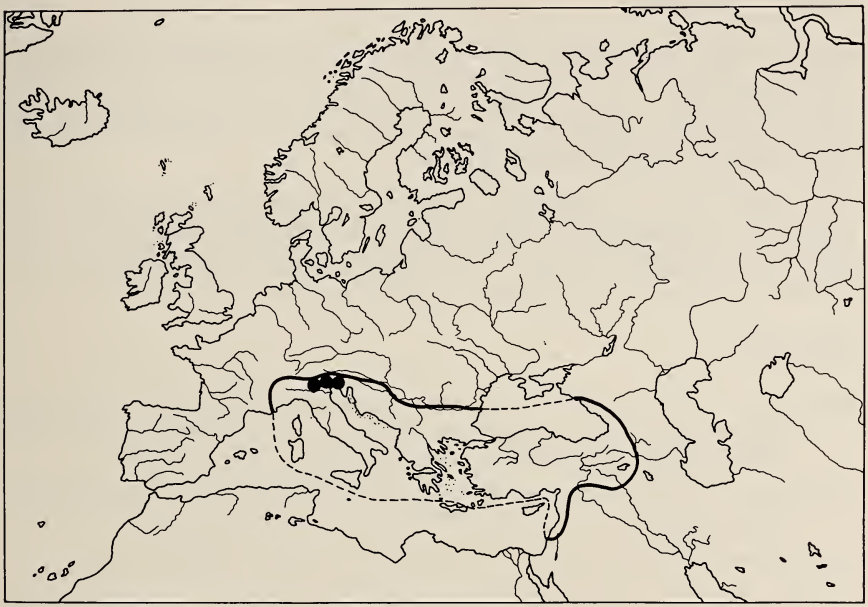

Fig. 26. Distribution map of *Ostrya carpinifolia* with records of *Phyllonorycter aemula* sp. n.

In the dry area 34 adults were obtained from *Ostrya* Scopoli, 32 belonging to *P. aemula* sp. n. and 2 to *coryli*. In the valleys, 50 adults emerged, 36 belonging to *coryli*, 11 to *tenerella* and 3 to *P. aemula* sp. n. These data show that *P. aemula* sp. n. may be restricted almost exclusively to thermophilous areas as it seems not to follow the host-plant when it occurs in fresher woods. On the contrary *Ostrya* Scopoli may be selected by *coryli* (and also *tenerella*) in these environments.

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There is clearly some mechanism of host specificity, probably constrained by chemical stimuli, to which is due the limitation of these species to Corylaceae. However, also environmental factors, such as temperature and humidity, seem to play an important role for host selection, independently from a positive feeding response.

Parornix carpinella shows a considerable ecological valence and it was found everywhere where searched for, both on *Ostrya* Scopoli and *Carpinus* L.

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