A review of the *Stigmella sorbi* species-group with descriptions of two new species from Turkmenistan and Tadzhikistan (Lepidoptera: Nepticulidae)

Rimantas Puplesis & Arūnas Diškus

Abstract. The *Stigmella sorbi* species-group is reviewed, and two leaf-miner species on *Cerasus* and *Aflatunia* (*Stigmella cerasi* **sp. n.** & *S. aflatuniae* **sp. n.**) are described. The biology of *S. subsorbi* Puplesis is described for the first time. Illustrations of imagoes and genitalia of both sexes are provided.

Samenvatting. Overzicht van de *Stigmella sorbi* soortengroep met beschrijving van twee nieuwe soorten uit Turkmenistan en Tadzjikistan (Lepidoptera: Nepticulidae)
De *Stigmella sorbi* soortengroep wordt herzien en twee soorten bladmineerders worden beschreven: *S. cerasi* **sp. n.** op *Cerasus* (Turkmenistan) en *S. aflatuniae* **sp. n.** op *Aflatunia* (Tadzjikistan). De biologie van *S. subsorbi* Puplesis wordt voor het eerst beschreven. De imago's en genitalia van beide sexen worden afgebeeld.

Résumé. Révision du groupe d'espèces de *Stigmella sorbi* avec description de deux nouvelles espèces du Turkménistan et du Tadzhikistan (Lepidoptera: Nepticulidae)
Le groupe de *Stigmella sorbi* est étudié et deux nouvelles espèces de mineuses sont décrites: *S. cerasi* **sp. n.** sur *Cerasus* (Turkménistan) et *S. aflatuniae* **sp. n.** sur *Aflatunia* (Tadzhikistan). La biologie de *S. subsorbi* Puplesis est décrite pour la première fois. Les adultes et les génitalia des deux sexes sont illustrés.

Key words: Central Asia - Nepticulidae - new species.

Puplesis, R. & Diškus, A.: Department of Zoology, Vilnius Pedagogical University, str. Studentu 39, 2034 Vilnius, Lithuania.

Introduction

Johansson (1971) designated the *Stigmella sorbi* species-group for two European species: *Stigmella sorbi* (Stainton, 1861) and *S. plagicolella* (Stainton, 1854). At present the group comprises five species of which one, *Stigmella subsorbi* Puplesis, 1994, was described recently from Tadzhikistan by Puplesis (1994: 134). Two additional new species are described below.

Thus, the group is well represented in Europe (two species) and western Asia (three species), but is not known from other regions. The Nearctic *Stigmella slingerlandella* (Kearfott, 1908), which was redescribed by Wilkinson & Scoble (1979) shows many similarities with species of the *sorbi*-group. Unfortunately, it was not possible to re-examine the type specimen of this species (in U.S. National Museum of Natural History). However, the male genitalia, especially the short aedeagus and small cornuti, as well as the shape of the valva as figured by Wilkinson & Scoble (1979: 21), suggest to exclude *S. slingerlandella*, and to regard it as a sister-group to *S. sorbi*.

It would appear that the *sorbi*-group is of Palaearctic origin, but more exhaustive studies of subtropical or tropical faunas are needed to clarify the world distribution of this group.

The moths included in the group are of average size for Nepticulidae, with a wing span between 3.9 and 7.2 mm. They always have a distinct whitish or silvery glossy fascia on the fore-wing. However, the valva with two apical processes, the large bilobed vinculum and the long aedeagus with a large manica and numerous spine-like cornuti are most important for diagnosis of the species group. Species within the *sorbi*-group have pronounced genitalic differences by which they can readily be distinguished. Recognition of *S. subsorbi* Puplesis from *S. sorbi* (Stainton) is sometimes difficult by the relatively

slight genitalic differences in the males; however, these species can easily be identified by the female genitalia and the external features.

All species included in the *sorbi*-group are leaf-miners of trees or shrubs in the Rosaceae: *Sorbus*, *Prunus*, *Cerasus*, *Malus*, *Amelanchier*, *Cotoneaster* and the endemic centralasiatic genus *Aflatunia*. Mines can be easily separated from those of other nepticulids: the larvae produce a slender sinuous gallery which abruptly widens into a large oval blotch; the dark frass is scattered in the centre of the blotch.

Methods

This study was based largely on the collections of Vilnius Pedagogical University (VPU), The Natural History Museum in London (BNHM), Zoological Institute of Russian Academy of Sciences in St. Petersburg (ZIRAS) and our own exhaustive field-collecting in south-eastern Europe, Caucasus and Central Asia during 1980–1993. The spelling of locality names follows the Times Atlas of the World (1968). A lectotype and paralectotypes are designated for *Stigmella sorbi* (Stainton 1861). The terminology of external features and genitalia follows that of Johansson et al. (1990) and Puplesis (1994). All genitalia structures were examined and figured in glycerin, i.e. before mounting in Euparal. Illustrations of imagoes were made by Mrs Birute Noreikiene (Vilnius), illustrations of all genitalic structures by the senior author R. Puplesis.

The *Stigmella sorbi*-group

1. *Stigmella sorbi* (Stainton, 1861) (Figs. 1–3).

Nepticula sorbi Stainton, 1861: 91.
Nepticula sorbiella Porritt, 1883: 171.
Nepticula sorbi var. *cotoneastrella* Weber, 1936: 670.
Nepticula plagicolella var. *malicola* Skala, 1939: 95.
Stigmella sorbi (Stainton); Emmet,1976: 226; Ivinskis et al., 1985: 62, 227; Johansson et al., 1990: 202–203; Puplesis, 1994: 133.

Type material examined. Lectotype ♂, England: Scarborough, ex l. on mountain ash, 1851, *leg.* T. Wilkinson. Paralectotypes: 6♂, 2♀, the same labels **(Lectotype & paralectotypes designated here)** (BNHM).

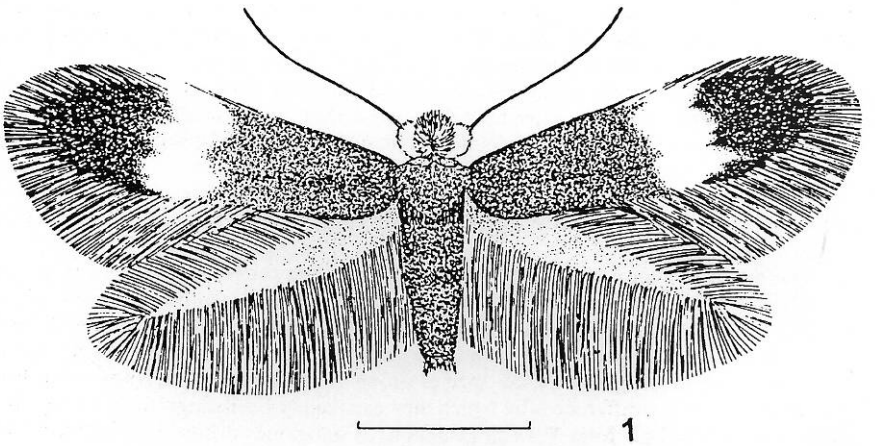
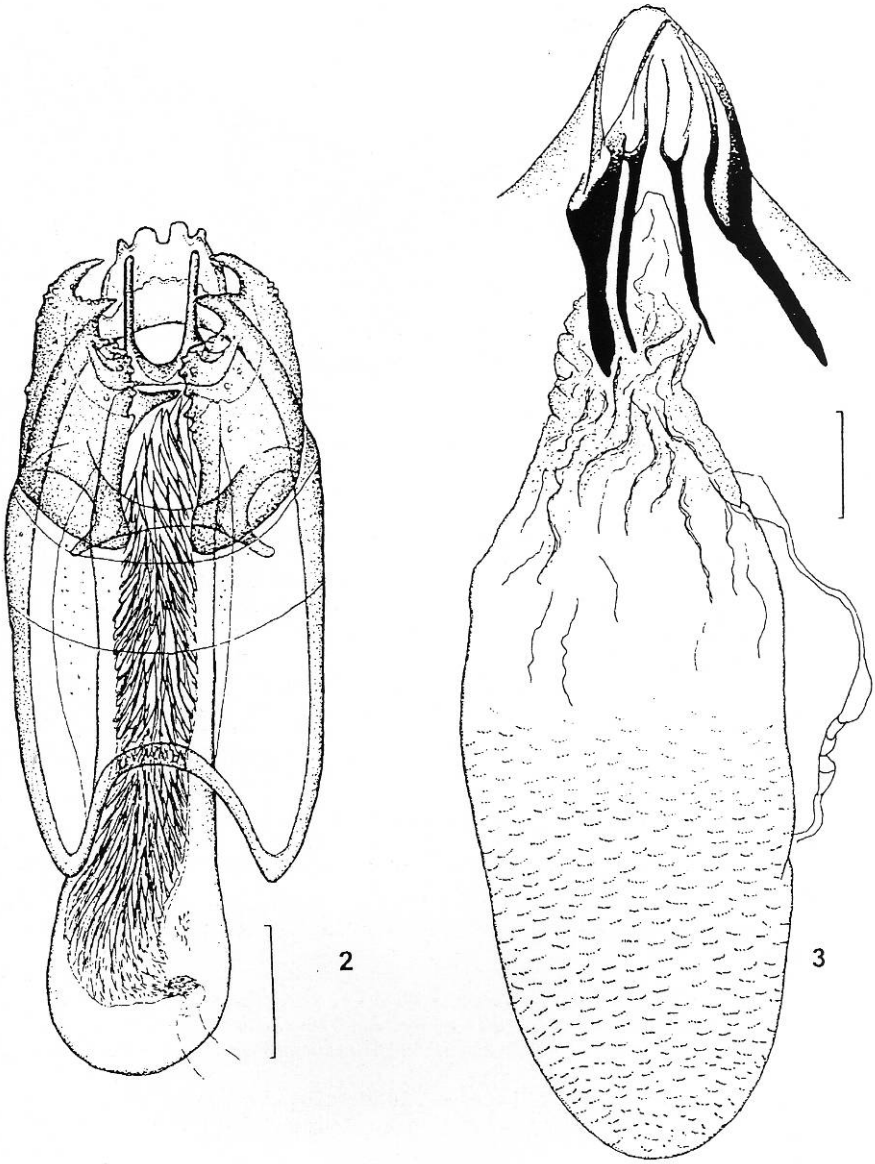


Fig. 1: *Stigmella sorbi* (Stainton, 1861), male, Poland, M. F. Wocke coll. (ZIRAS). Reference bar 1 mm.



Figs 2–3: *Stigmella sorbi* (Stainton, 1861): 2 – male genitalia, Germany, M. F. Wocke coll. (ZIRAS); 3 – female genitalia, Germany (ZIRAS). Reference bar 0.1 mm.

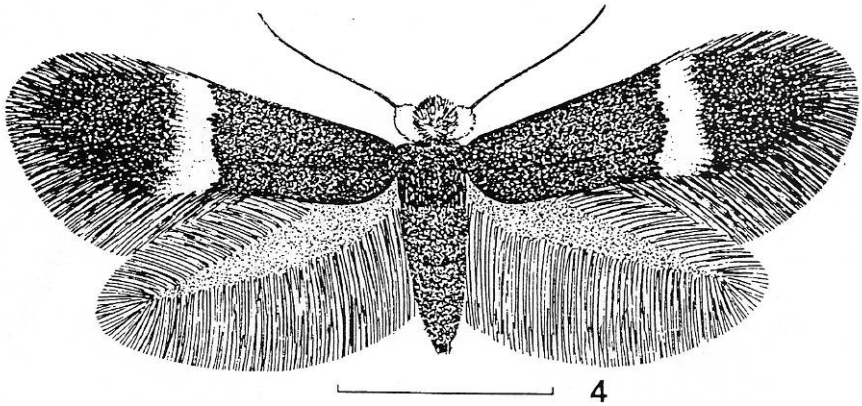


Fig. 4: *Stigmella plagicolella* (Stainton, 1854), female, Lithuania (VPU). Reference bar 1 mm.

Diagnosis. Distinguished from other species of the group by brownish dull grey basal area and usually diffused fascia of fore-wing. Bursa copulatrix, in contrast to *S. subsorbi* Puplesis, large and slightly elongate.

Description (figs 1–3) – see Johansson et al. 1990; Puplesis 1994.

Biology. Host-plant: *Sorbus* spp., *Cotoneaster* spp., *Amelanchier* spp., *Malus* spp. Larvae are found in June. Mine starts as a very slender gallery and later abruptly widens into a blotch, which sometimes envelops earlier track; frass densely packed in second half of gallery and scattered irregularly in centre of blotch. Cocoon yellowish brown to deep brown. Adults fly from late April to May.

Distribution. Throughout Europe, including Murmanskaya oblast' (Russia), Norway and Sweden, where it is quite common (R. Johansson, pers. comm.), to France, Italy and Greece in the South.

2. *Stigmella plagicolella* (Stainton, 1854) (figs 4–6).

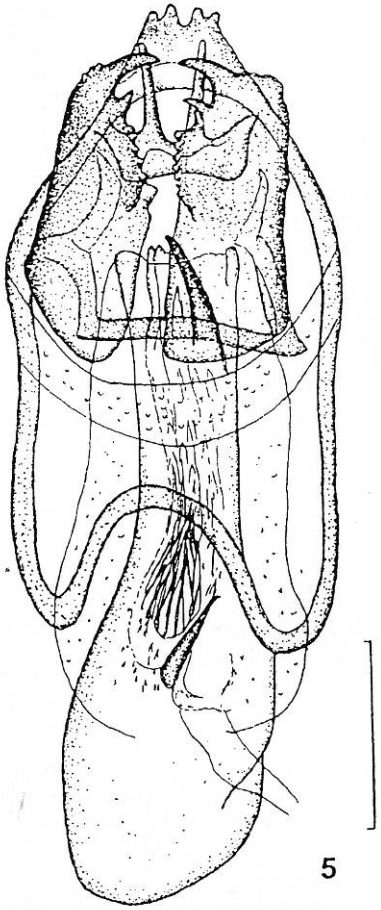
Nepticula plagicolella Stainton, 1854: 303.

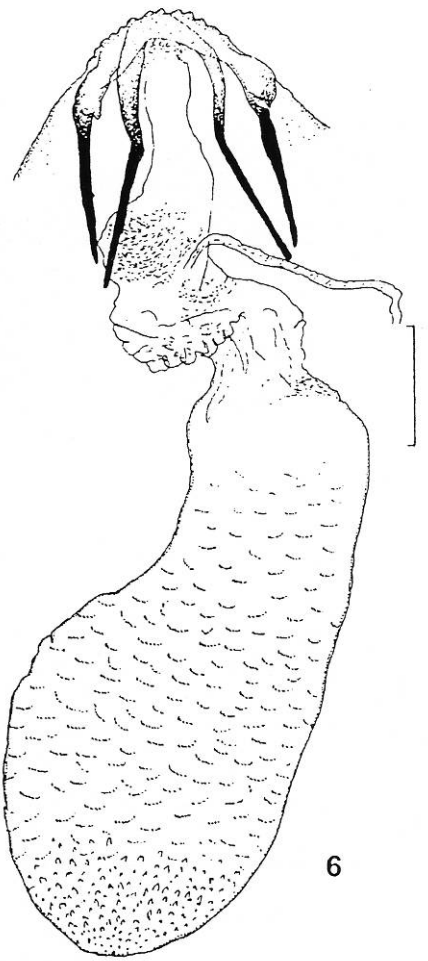
Stigmella plagicolella (Stainton); Emmet 1976: 226; Ivinskis et al. 1985: 60, 223; Johansson et al. 1990: 203–204; Puplesis 1994: 134–135.

Type material examined. Holotype ♀, England: Sloe, e. l. 21.VIII.1853, *leg.* Lewisham (BNHM).

Diagnosis. Distinguished from other species of the group (except *S. aflatuniae* **sp. n.**) by pale golden or shining silvery fascia on fore-wing. Distribution of cornuti in aedeagus (fig. 5), and pectination of vestibulum in female genitalia highly characteristic for the species.

Description (figs 4–6) – see Johansson et al. 1990; Puplesis 1994.





Figs 5–6: *Stigmella plagicolella* (Stainton, 1854): 5 – male genitalia, Poland, Wocke coll. (ZIRAS); 6 – female genitalia, Lithuania (VPU). Reference bar 0.1 mm.

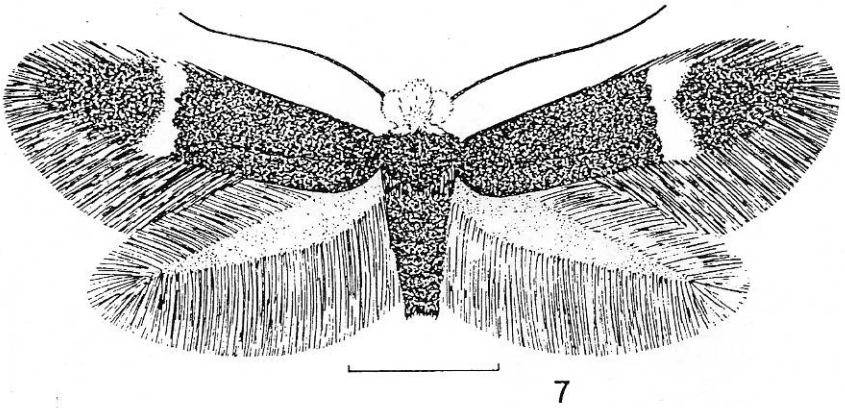


Fig. 7: *Stigmella subsorbi* Puplesis, 1994, male, paratype, Tadzhikistan (VPU). Reference bar 1 mm.

Biology. Host-plant: *Prunus* spp., occasionally on *Cerasus* sp. (introduced). Larvae are found in June–July and September–October. Mine as in *S. sorbi* (Stainton), but frass in gallery forming a narrow central line. Cocoon from pale ochreous to brown or dark brown. Eggs on underside of leaf. Adults fly in June and August.

Distribution. Throughout Europe (including Norway, Sweden and Baltic countries, where it is exceedingly plentiful (as in England) to France, Italy and the Caucasus in the South.

3. *Stigmella subsorbi* Puplesis, 1994 (figs 7–9).

Stigmella subsorbi Puplesis, 1994: 134.

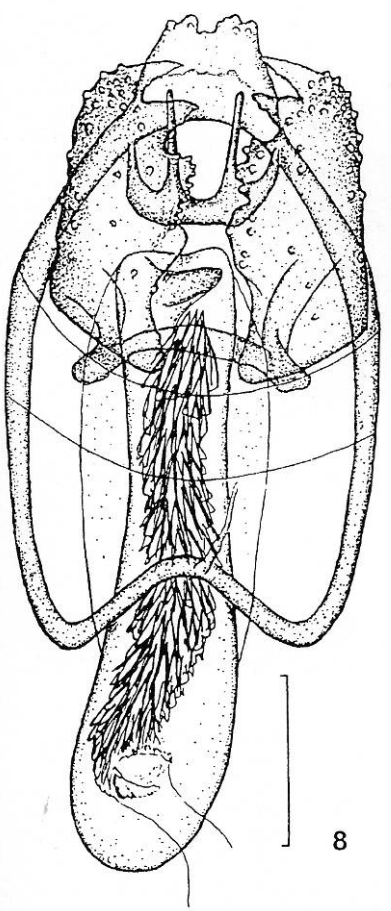
Type material examined. Holotype ♂, Tadzhikistan: 30 km N Dushanbe (Kondara), 20.VIII.1986, *leg.* R. Puplesis (VPU). Paratypes: 28♂, 8♀, the same locality as holotype, VI–IX.1986–1990 (VPU).

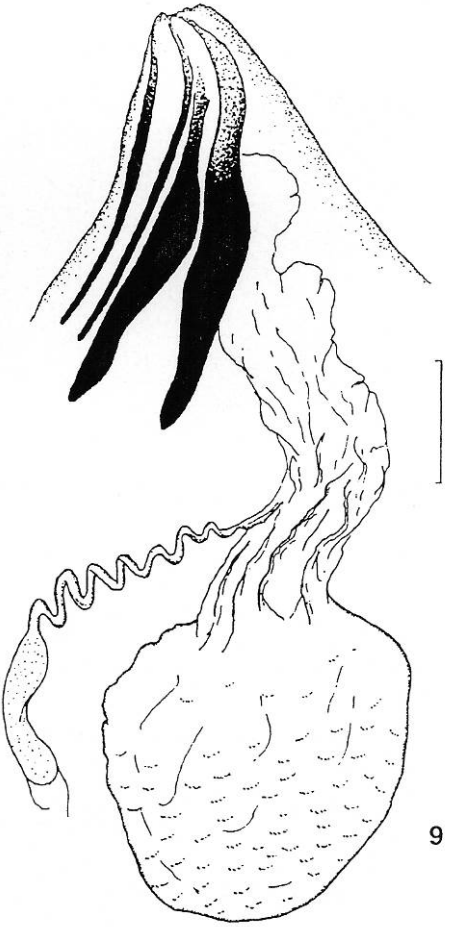
Diagnosis. Closely resembling *S. sorbi* (Stainton), but differs by dark brown basal area of fore-wing and distinct fascia, more bulged inner margin of valva and distinctly rounded bursa copulatrix.

Description (figs 7–9) – see Puplesis 1994.

Biology. Host-plants: *Cotoneaster hissaricus* Pojark., *C. insignis* Pojark. Egg on underside of leaf. Larvae are found in June-August, or even later in autumn. Mine starts as a very slender gallery with narrow central line of frass (clear margins are distinct); further mine abruptly widening into a blotch, sometimes engulfing the earlier gallery part of the mine. Frass scattered irregularly in the blotch, but usually concentrated in centre. Coloration of frass usually black, sometimes blackish brown. Exit hole in upperside. Cocoon greenish grey or brownish grey. Adults fly from May to September.

Distribution. Mountains of Tadzhikistan (Central Asia).





Figs 8–9: *Stigmella subsorbi* Puplesis, 1994: 8 – male genitalia, paratype, Tadzhikistan (VPU); 9 – female genitalia, paratype, Tadzhikistan (VPU). Reference bar 0.1 mm.

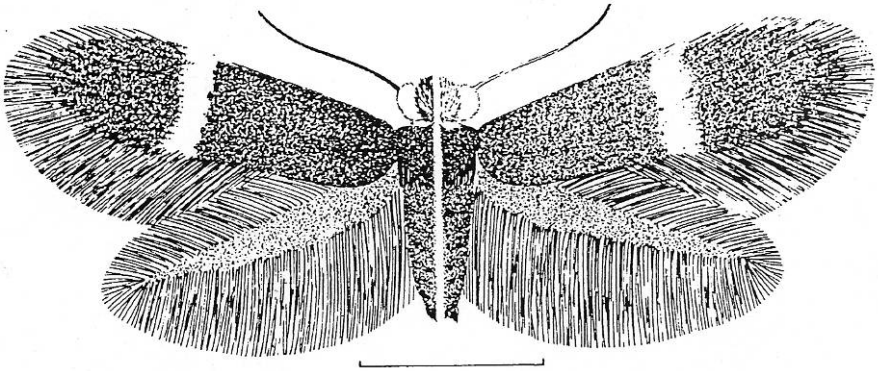


Fig. 10: *Stigmella cerasi* sp. n.: female (left side), paratype, Turkmenistan (VPU), male (right side), holotype, Turkmenistan (VPU). Reference bar 1 mm.

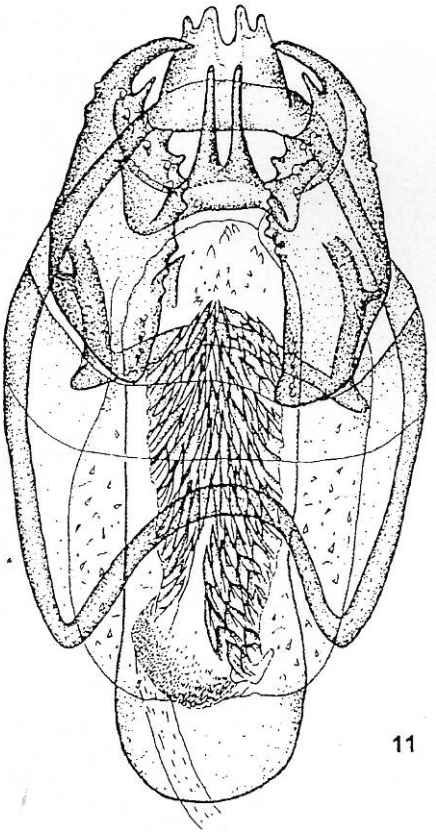
4. *Stigmella cerasi* Puplesis & Diškus sp. n. (figs 10–12).

Type material. Holotype ♂, Turkmenistan: Western Kopet-Dagh Mts., 40 km E Kara Kala (=Garrygala), larva on *Cerasus microcarpa*, 10.VI.1993, N 4272, *leg.* R. Puplesis & A. Diškus (VPU). Paratypes: 1♂, 1♀, the same label; 2♂, 1♀, the same locality, at light, 30.VI–02.VII.1993, *leg.* R. Puplesis & A. Diškus (VPU).

Diagnosis. Externally easily distinguishable from *S. plagicolella* (Stainton) and *S. aflatuniae* **sp. n.** by its whitish creamy (not silver) fascia and from *S. sorbi* by the dark basal part of fore-wing. In male genitalia, differs from *S. sorbi* and *S. subsorbi* by presence of spine-like distal process (not large); from *S. plagicolella* by large and distinct band of cornuti, wide aedeagus, shape of valva at apex (fig. 11); differs from *S. aflatuniae* **sp. n.** by smaller cornuti in aedeagus and distinctly spined & larger manica.

Description. Male (fig. 10, right side). Fore-wing length 1.8–2.1 mm. Head: frontal tuft from yellowish orange to ferruginous; eye-caps and collar creamy; antenna brownish. Thorax and fore-wing fuscous brown with some purplish reflection at apex; area beyond fascia with slight coarse scaling. Fascia varies in width, whitish cream (without distinct silvery lustre). Cilia and hind-wing rather dark, brownish grey. Abdomen blackish, but anal tufts on underside creamy.

Female (fig. 10, left side). Fore-wing length 1.9–2.2 mm. Generally darker than male, frontal tuft ferruginous, antenna brown, fascia sometimes broken in the middle. Otherwise like male.



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Figs 11-12: *Stigmella cerasi* **sp. n.**: 11 – male genitalia, holotype, Turkmenistan (VPU); 12 – female genitalia, paratype, Turkmenistan (VPU). Reference bar 0.1 mm.

Male genitalia (fig. 11). Valva rather broad, more or less rectangular, with two distal processes: one long and arcuate, other small spine-like and pointed. Transtilla with weakly demarcated sublateral processes. Uncus with large, medial notch and distinct paramedial notches. Gnathos with long, close-set, almost parallel horns. Vinculum large, with deep distal emargination. Aedeagus long (approximately as long as genital capsule or slightly shorter) with a large number of spines of varying sizes and shapes and a triangular sclerotization at tip. Manica distinctly covered with varied spines.

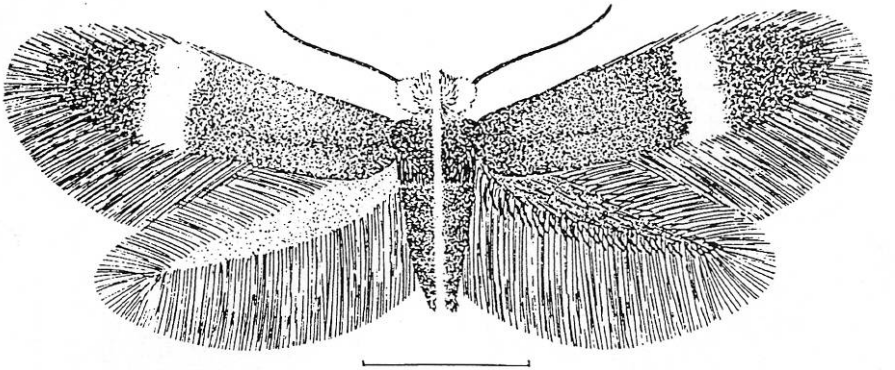

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Fig. 13: *Stigmella aflatuniae* sp. n.: Female (left side), paratype, Tadzhikistan (VPU), male (right side), holotype, Tadzhikistan (VPU). Reference bar 1 mm.

Female genitalia (fig.12). Apophyses long, more or less equal in length. Accessory sac very small, indistinct. Corpus bursae short, tending to be rounded, without distinct pectination. Ductus spermathecae weakly sclerotized, very slender, as long as corpus bursae.

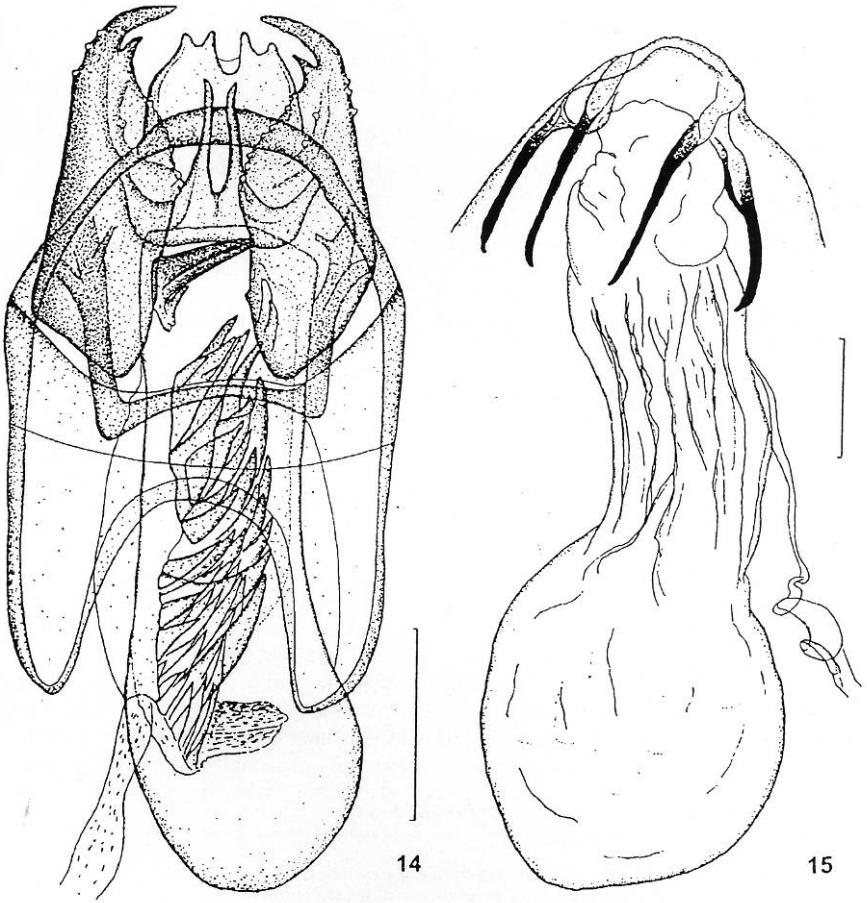
Biology. Host-plant: *Cerasus microcarpa* (C. A. Mey) Boiss. Egg on underside of leaf. Larvae are found in May–July, and August (probably in autumn also). Mine starts as very slender, slightly sinuous gallery with usually thin, occasionally more or less wide line of blackish frass; further mine abruptly widening into a large oval blotch, where blackish brown or black frass is scattered in the centre or occasionally irregularly (if mine in very shaded place). Exit hole in upperside. Cocoon pale brownish. Adults have been collected in June-August, but probably fly from May till September.

Distribution. Western Turkmenistan and probably Iran.

5. *Stigmella aflatuniae* Puplesis & Diškus sp. n. (figs. 13–15).

Type material. Holotype: ♂, E. Tadzhikistan: ca 170 km E Dushanbe, env. Tavil Dare (=Tovil Dara), larva on *Aflatunia ulmifolia* 13.VII.1991, ex p. 30.VII.1991, *leg.* R. Puplesis & A. Diškus (VPU). Paratypes: 2♂, 2♀, same data, ex p. 30.VII–2.VIII.1991, *leg.* R. Puplesis & A. Diškus (VPU).

Diagnosis. Easily distinguished from all species of the group, except *S. plagicolella* (Stt.), by silvery lustre of fascia of fore-wing; additionally, males differ from all species of the group by presence of dark brown androconia on hind-wing. In male genitalia *S. aflatuniae* most resembles *S. cerasi* sp. n., but is easily recognisable by considerably larger cornuti on vesica (including at apex of aedeagus) and small manica, which is weakly spined. From similar *S. plagicolella*, differs by wider aedeagus, greater number & shape of cornuti, as well as shape of valva.



Figs 14–15: *Stigmella aflatuniae* **sp. n.**: 14 – male genitalia, holotype, Tadzhikistan (VPU); 15 – female genitalia, paratype, Tadzhikistan (VPU). Reference bar 0.1 mm.

Description. Male (fig. 13, right side). Fore-wing length 2.0–2.5 mm. Head: frontal tuft pale orange; eye-caps and collar creamy or greyish creamy; antenna greyish to brown. Thorax and fore-wing very dark golden bronze to fuscous brown, glossy with purplish reflection; fascia distinct, shining silver. Cilia brown. Hind-wing covered by dark brown androconial scales; some of them extend over cilia, but they are rather short. Abdomen fuscous, anal tufts brownish creamy, on underside valval lobes distinctly paler, almost creamy.

Female (fig. 13, left side). Similar to male, but hind-wing without androconia, remains brown (not dark brown).

Male genitalia (fig. 14). Valva with two distal processes: one large, arcuate and other small, spine-like. Occasionally smaller process varies in shape and looks wider than in holotype. Transtilla without sublateral processes or with weakly developed ones. Uncus

large with deep medial notch and distinct paramedial notches. Gnathos with long and slender close-set horns; they even converge at tips. Vinculum large, with deep distal emargination. Aedeagus large, as long as genital capsule, with one large cornutus near tip and many large spine-like cornuti. Manica rather small, with weakly developed sclerotization.

Female genitalia (fig. 15). Both pairs of apophyses long. Accessory sac hardly distinct. Proximal part of corpus bursae narrowed and folded, distal part tends to be oval, without distinct pectination. Ductus spermathecae slightly shorter than corpus bursae and weakly sclerotized.

Biology. Host-plant: *Aflatunia ulmifolia* (Franch.) Vass. (closely related to *Prunus* and *Amygdalus*). Eggs are laid on the leaf underside. Larvae are found in July (probably in autumn also). Mine starts as a slender, sinuous gallery with rather wide central line of brown or blackish frass (clear margins of gallery usually remain); further mine abruptly widening into a large oval blotch, blackish frass is scattered in the centre of the blotch (in sunny places) or irregularly (in strongly shaded places). Mines (empty or with larvae) usually easily distinguishable on a tree, because mine blotch looks distinctly whitish. Exit hole in upperside. Cocoon pale brownish or pale greyish brown. Adults fly in July–August.

Distribution. North-western approach of the Pamir mountains: Darvaza (=Darvazkiy) ridge (Tadzhikistan). The species likely can also be found in western China.

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