Brief Report

The larval mine of *Stigmella lappovimella* (Svensson, 1976) on *Salix lapponum* (L.) (Lepidoptera, Nepticulidae)

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The larval mine of *Stigmella lappovimella* in leaves of *Salix lapponum* of different host leaf thickness is described and differences between the mine and the mines of *Stigmella salicis* on *Salix caprea* and *Stigmella zelleriella* on *Salix repens* are noted. The best diagnostic characters differentiating the mine of *S. lappovimella* from the two others was the almost unbroken frass line in the first half and the limited frass particle dispersion in the second half of the mine. Wing length was also measured and a small but statistically significant difference was observed between *S. lappovimella* and *S. zelleriella.*

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1. Introduction

Plant species of the family Salicaceae constitute in Fennoscandia the host for six species of the family Nepticulidae. Four of these, *Stigmella benanderella* (Wolff, 1955), *S. obliquella* (Heinemann, 1862), *S. zelleriella* (Snellen, 1875) and *Ectoedemia intimella* (Zeller, 1848) mine in leaves of *Salix repens* (L.), *S. arenaria* (L.), *S. phylicifolia* (L.) and some other smooth-leaved willows. *S. intimella* also accepts other *Salix* species. One of these, the *S. salicis* (Stainton, 1854) also mines on rough-leaved *Salix* species and the last one, *S. lappovimella* (Svensson, 1976) mines in the leaves of the hair-leaved *S. lapponum* (Svensson 1993). The mines themselves of *S. lappovimella* and *S. zelleriella* have been considered to be impossible or very difficult to identify (Gustafsson 1985, Johansson *et al.* 1990).

Van Nieukerken (1983) synonymised *Stigmella lappovimella* with *S. zelleriella* and the two taxa were then treated together as *S. zelleriella* in the work of Nepticulidae and Opostegidae in northwestern Europe (Johansson *et al.* 1990). However, even earlier Svensson (1985), Svensson *et al.* (1987) and Bruun (1989) have considered the synonymisation of *S. lappovimella* unjustified. The rank of *S. lappovimella* as a valid species was then, some years later, further supported by studies on everted female bursa (Bruun 1992). These studies included specimens of the two taxa from several sites in northern Finland and Sweden. The investigations of the genitalia have later been completed to cover also separated and flat-prepared male valva showing that morphological differences also exist between the male genitalia of the two taxa (Bruun, unpubl.). We describe in this paper the mine of *S. lappovimella* on leaves of *Salix lapponum*.

2. Material and Methods

Leaves with mining larva of *S. lappovimella* were collected from late August to the first half of September from *Salix lapponum* and *S. zelleriella* from *S. repens* in northern Finland in the surroundings of the town of Oulu (721:41, 720:42). From *S. lapponum* leaves with mining larvae were

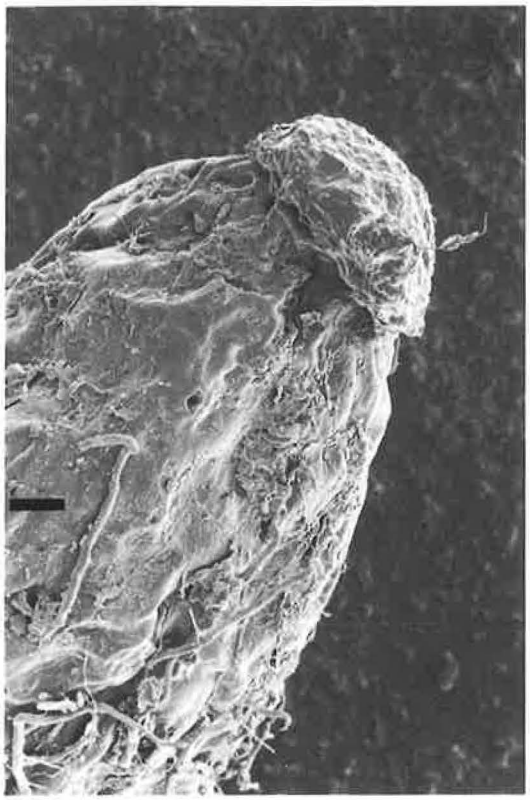


Fig. 1. The egg-case of *Stigmella lappovimella* deposited on the tip of a leaf of *Salix lapponum*. A skeleton of intersecting threads forms the surface of the egg-case. The leaf was collected for rearing of mining larvae 26.VIII.1980 and has passed the winter. Finland Ob: Oulu, 720:44. Scale 26.5 µm. The collector of the leaves, in Fig. 1 and Figs. 9–11 J. Kyrki, in Fig. 2 I. Svensson and in Figs. 3–8 J. Itämies.

also collected from several other sites in northern and northernmost Finland (see Bruun 1989). Dried *S. lapponum* leaves were also included in the study for comparison with vacant mines from northern Sweden (I. Svensson coll.). After rearing of the mining larvae, the leaves with the vacant mines (about a hundred leaves) were flat dried and, before study and photography, wetted with lactophenol to increase their transparence. For leaf thickness measurements, see Bruun 1989.

3. Results

3.1. Wing length

The length of the wing (incl. cilia) of the hatched *S. lappovimella* specimens varied from 2.3 to 2.6 mm ($x = 2.46$, $S.D. = 0.067$, $N = 20$); it was 12.6% ($S.D. = 3.42\%$) longer than the wing of the *S. zelleriella* specimens, 2.1–2.3 mm ($x = 2.19$, $S.D. = 0.085$, $N = 21$, Students t-test $p < 0.001$). The male wing length of *S. lappovimella*, 2.4–2.5 mm ($x = 2.44$, $S.D. = 0.042$, $N = 13$), was significantly shorter than the female wing length, 2.4–2.6 mm ($x = 2.51$, $S.D. = 0.077$, $N = 7$, $p = 0.008$). The wing length of *S. zelleriella* males (10 specimens) and females (11 specimens) showed no sexual dimorphism. The observed difference in wing length seems to support the view that these two represent separate species.

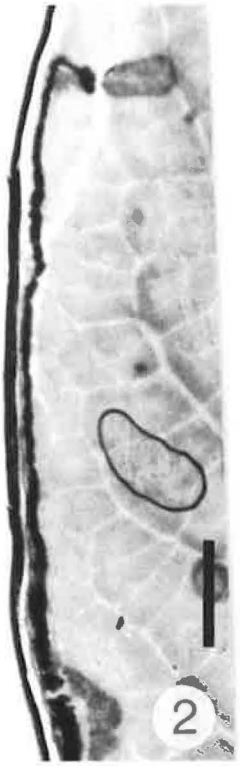
3.2. The mine of *Stigmella lappovimella* on *Salix lapponum*

The egg is laid on the underside of the leaf, seldom on the upper side or on the leaf tip (Fig. 1), often in vicinity of leaf margin, rib or nerve. In thin and medium–thick leaves the first half of the mine is a narrow gallery (Figs. 2 and 3), the second half a widened gallery. In thin leaves it often terminates in an elongated false blotch between nearby ribs or nerves (Fig. 4). The frass line in the first half is almost uninterrupted, the crossing of a thick nerve or skin shift can cause an interruption. The frass line width in different parts of the gallery can also vary. In the second, widened half (Figs. 5 and 6) the frass is deposited in a densely or loosely packed band, sometimes broken and showing irregularities and with limited frass particle dispersion. In thick leaves the mine forms an elongated blotch, often delimited by nearby ribs or nerves and with frass densely packed (Figs. 7 and 8). In thick leaves the first part of the mine is a contorted gallery often close to the blotch.

In the case of *Stigmella salicis*, which in rare cases also mines on *S. lapponum*, the mine can easily be recognized by the presence of frass line interruptions forming a large number of frass particle deposits of varying length and width. Unlike *S. lappovimella*, the mine of *S. zelleriella* on *S. repens* also shows similar regular interruptions and in addition, extended frass particle dispersion in the blotch (Figs. 9–11).

Note. An unidentified *Stigmella* sp., hatched from a mine on *S. lapponum* from north-eastern Finland, exhibited

Figs. 2–6. Mines of *Stigmella lappovimella* on *Salix lapponum*. — 2–3: The first half of the mine in medium–thick leaf (0.20–0.25 mm). 2: The gallery follows the leaf margin. The leaf collected in Sweden, Härj., Tännäs, 19.VIII.1984. 3: The gallery follows the mid rib of the leaf, the frass line uninterrupted. — 4–6: The second half of the mine. 4: In thin leaf (0.17 mm) the gallery widened asymmetrically to a false blotch, the frass particles deposited in a loosely packed band. 5–6: In medium–thick leaf the gallery widened between ribs or nerves, the band of frass particles almost unbroken. In 3–7 the leaves collected in Finland Ob: Oulu, 720:44, 19.IX.1989. Scale for 2–11 is 1 mm).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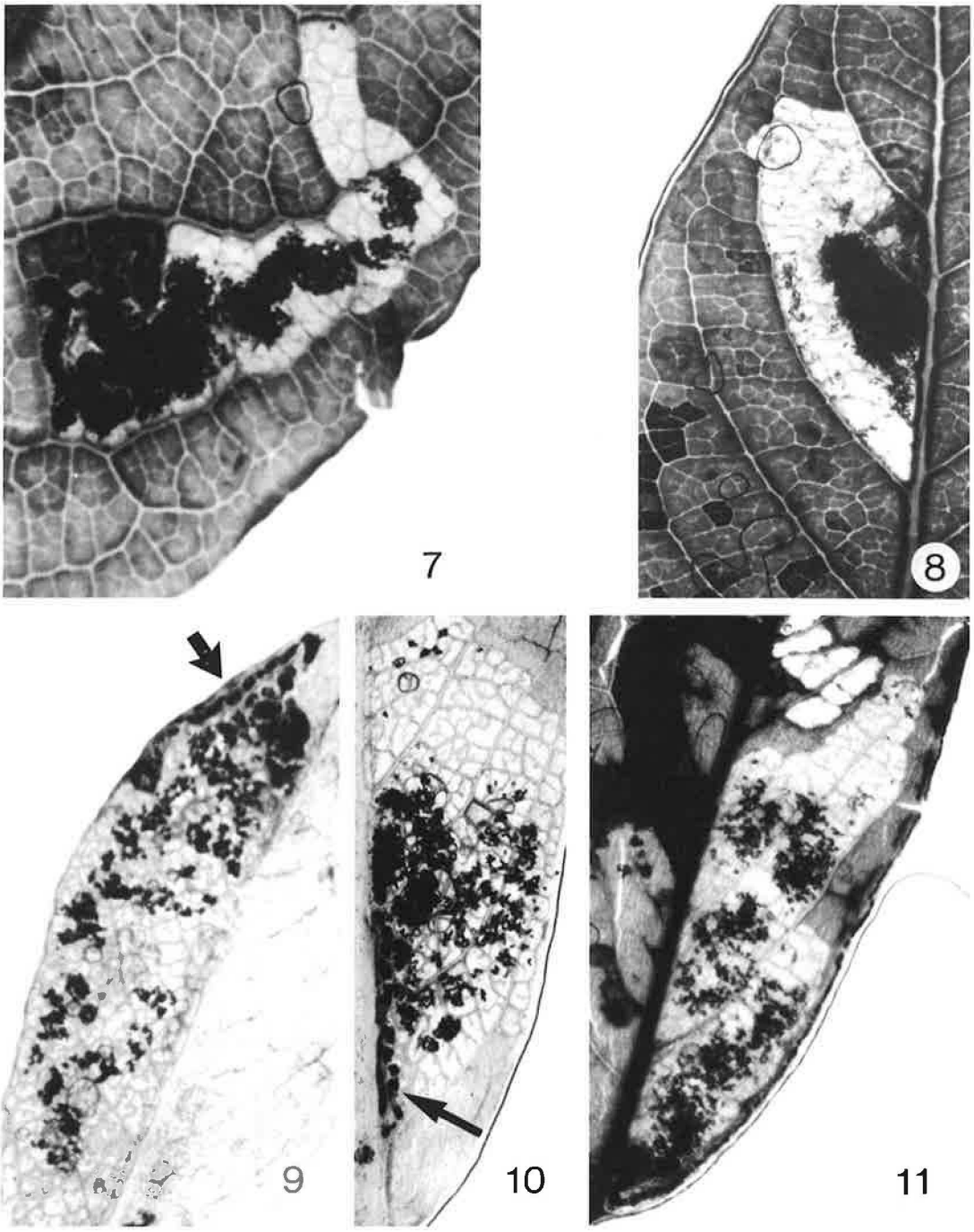

Figs. 7–11. Mines of *Stigmella lappovimella* on *Salix lapponum* (Figs. 7–8) and *Stigmella zelleriella* on *Salix repens* (Figs. 9–11). — 7: In medium–thick leaf (0.26 mm) the mine forms a short widened gallery, the first part contorted close to the mine. — 8: In thick leaf (0.30 mm) the mine forms a small blotch between leaf ribs, the frass particles almost all deposited in an elongated spot. Finland Li: Ivalo, 760:54, 27.VIII.1992. — 9–11: The mines in the leaves (0.14–0.20 mm) start as a short gallery, the frass line broken into a large number of pieces (indicated with arrows). The second part of the mine forms a blotch, the frass particles are irregularly scattered. Finland Ob: Oulunsalo, 7212:416, 6.IX.1976.

fore wing with a pale fascia and female bursa pectination looking like that of *S. vimineticola* (Frey, 1856).

4. Conclusion

Stigmella lappovimella belongs to the group of larval mining species which shows a distinct difference in the mine appearance as a function of leaf thickness (Bruun 1988b, 1989). Mines in thin–thick leaves show gradual changes in appearance, from gallery mines to blotches (see also Johansson *et al.* 1990).

The mine of *S. lappovimella* differs from that of *S. zelleriella*; in the first the frass line is almost uninterrupted in the first half and as a rule there is limited frass particle dispersion in the second half of the mine. In *S. zelleriella* a large number of frass particle deposits and an extended frass particle dispersion in the second half of the mine are to be found. This supports the separation of the two taxa. The significant wing size difference observed in the present material also seems to support this conclusion.

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