

***Elachista saarelai* sp. n. (Lepidoptera, Elachistidae: Elachistinae), a new species from southern Finland**

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Elachista (Elachista) saarelai sp. n. is described on the basis of specimens reared from larvae in southern Finland. The new species belongs to the *Elachista tetragonella* group, and is a close relative of *E. trapeziella* Stainton, *E. ornithopodella* Frey, *E. occidentalis* Frey and *E. kebneella* Traugott-Olsen & Schmidt Nielsen. It differs from all these species by details in morphology and life history. The new species inhabits sheltered habitats. *Carex digitata* and probably also and *C. pediformis* are recorded as its host plants. Diagnostic characters and illustrations are provided for the close relatives of *E. saarelai* sp. n.

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1. Introduction

The gelechioid genus *Elachista* is one of the largest genera in Lepidoptera, with more than 600 described and about 200 discovered, yet unnamed species (Kaila & Ståhls 2006). The taxonomy of this cosmopolitan genus is premature everywhere in the World, Europe forming no exception as compared to other Lepidoptera. Recent revisions of species groups or complexes have constantly included descriptions of new species and revealed misconceptions of the identities of type specimens of previously recognised species (cf. e.g. Kaila *et al.* 2001, Kaila & Junnilainen 2002, Kaila & Varalda 2004, Kaila 2005, 2007, 2009). Even though the northern Europe is likely the best known area in the world regarding the elachistine fauna, thanks to the guide of Traugott-Olsen & Schmidt Nielsen (1977), new species are still discovered (e.g. Kaila & Kerppola 1992, Aarvik &

Berggren 2003, Kaila *et al.* 2008) even there. The reason is the cryptic mode of life of many species, as is the case of the species group treated in this paper.

In this paper, we provide description for one recently discovered species. It is presently only known by specimens found as larvae. It belongs to the *Elachista tetragonella* group *sensu* Kaila (1996), and is a close relative of *Elachista trapeziella* Stainton, *E. ornithopodella* Frey, *E. occidentalis* Frey and *E. kebneella* Traugott-Olsen & Schmidt Nielsen. The species was discovered by Esko Saarela in southern Finland. Due to the unusual life history, he doubted whether the emerged adults could belong to any of the known species in the *Elachista tetragonella* group in spite of its external resemblance to *E. trapeziella*. Having recently revised the relevant type specimens of Palaearctic species, and revised the Nearctic species (Kaila 1996) the author LK con-

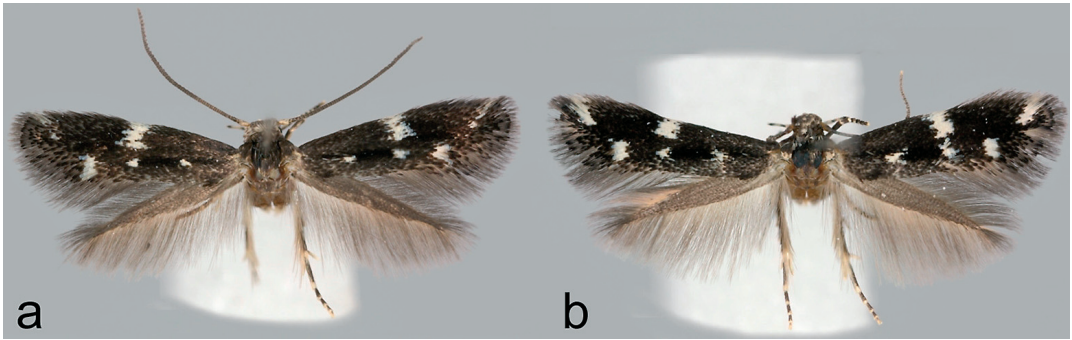


Fig. 1. External appearance of *Elachista saarelai* sp. n. – a. holotype ♂, – b. paratype ♀.



Fig. 2. External appearance of *Elachista trapeziella* Stainton. – a. ♂ (Finland: PS: Kuopio, e. l. 1983 from *Luzula pilosa* J. Tabell leg. (MZH), – b. ♀ (Finland: EH: Tampere, e. l. 2008 from *Luzula pilosa* L. Sippola leg. & Coll).

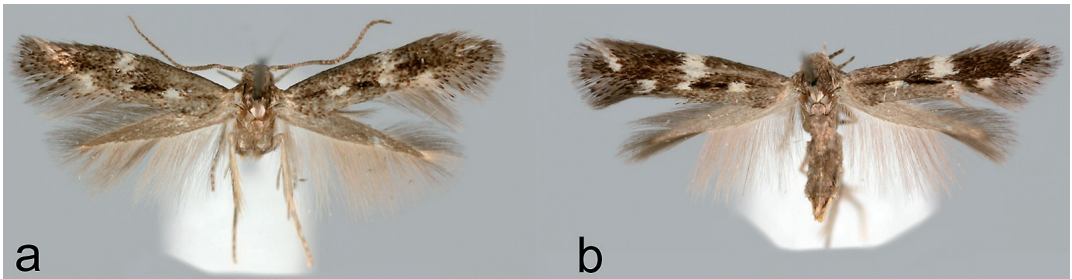


Fig. 3. External appearance of *Elachista kebneella* Traugott-Olsen & Schmidt Nielsen. – a. ♂ (Finland: LI: Inari 12.VII.1974 L. Sippola leg. & Coll.), – b. ♀ (Finland: LI: Inari 17.VII.1995 E. M. & L. Laasonen leg. (MZH).



Fig. 4. External appearance of *Elachista ornithopodella* Frey. – a. ♂ (Finland: ES: Kangasniemi e. l. 2007 from *Carex digitata* L. Sippola leg. & Coll.), – b. ♀ (Finland: ES: Kangasniemi e. l. 2007 from *Carex digitata* L. Sippola leg. & Coll.).

cluded that the specimen belongs to an undescribed species. Later on, the author LS has together with E. Saarela been able to elaborate the biology of the species, and genital dissections of both male and female show constant differences as compared to the other known species. No revision of this complex of species seems necessary in foreseeable future. Therefore we deem it better to describe and diagnose the new species separately.

The terminology follows Traugott-Olsen & Schmidt Nielsen (1977), Kaila (1996, 1999a & b) and Kristensen (2003).

Abbreviations:

- MZH Zoological Museum, Finnish Museum of Natural History, University of Helsinki, Finland
 MZLU Museum of Zoology, Lund University, Sweden
 ZMUC Natural History Museum of Denmark, Copenhagen

2. Taxonomy

Elachista saarelai sp. n.

Figs. 1, 5, 11, 16–19

Material. Holotype ♂: Fennia [Finland] EH: Tampere Herv[anta], e.l. 2007, ex *Carex pediformis* L. Sippola leg., genital slide L. Kaila 5092, coll. MZH. Paratypes (16 ♂, 6 ♀, coll. MZH, MZLU, ZMUC and private collections of E. Saarela and L. Sippola): Finland EH: Tampere, Hervanta 681:33 1 ♂ e. l. 2005 ex ?*C. pediformis* E. Saarela leg., genital slide L. Kaila 4646; EH: Tampere, Hervanta e.l. 2007 1 ♂ (genital slide L. Kaila 5091), 2008 3 ♂ 1 ♀ (genital slide L. Kaila 5093), 2009 1 ♂, 2010 9 ♂ 5 ♀, all ex *Carex digitata* and ?*C. pediformis*, L. Sippola leg.

Diagnosis. *E. saarelai* sp. n. is externally close to several other species of the *Elachista tetragonella* group. In particular, it is similar to *E. trapeziella* Stainton and *E. kebneella* Traugott-Olsen & Schmidt Nielsen (Figs. 1–3). It may be distinguishable from *E. trapeziella* by the loca-

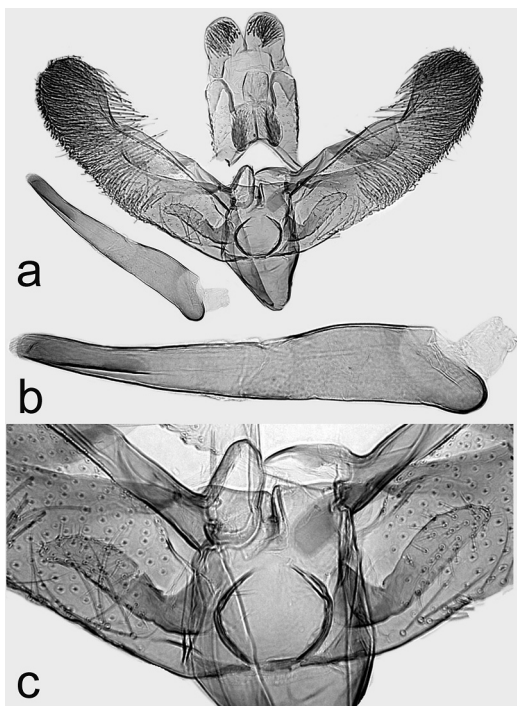


Fig. 5. Male genitalia of *Elachista saarelai* sp. n. Holotype, L. Kaila prep. 5092. – a. general image, – b. phallus enlarged, – c. juxta and digitate process enlarged.

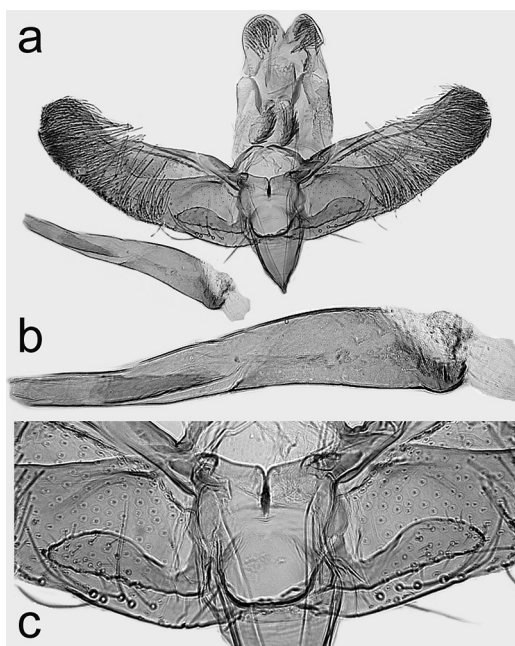


Fig. 6. Male genitalia of *Elachista saarelai* sp. n. Paratype, (L. Kaila prep. 4646 EH: Tampere). – a. general image, – b. phallus enlarged, – c. juxta and digitate process enlarged.

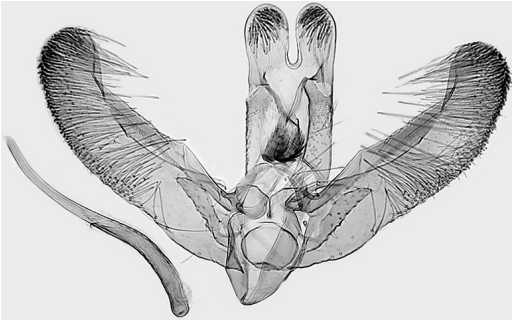


Fig. 7. Male genitalia of *Elachista occidentalis* Frey (L. Kaila prep. 3772, Finland U: Siuntio, e. l. 1992 from *Carex digitata* L. Kaila leg., in MZH).



Fig. 9. Male genitalia of *Elachista trapeziella* Stainton (L. Kaila prep. 5248, Finland U: Vantaa, e. l. 1990 from *Luzula pilosa* J. Junnilainen leg., in MZH).

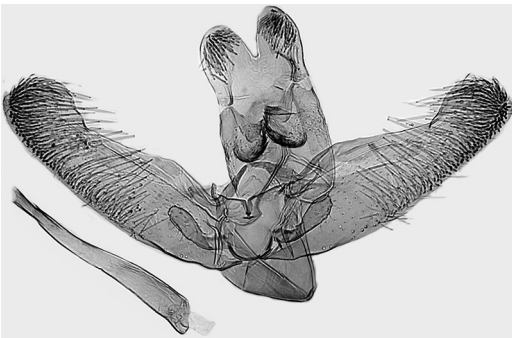


Fig. 8. Male genitalia of *Elachista ornithopodella* Frey (L. Kaila prep. 4660, Russia, Karelia, Sortavala, 1930 N. Kanerva leg., in MZH).

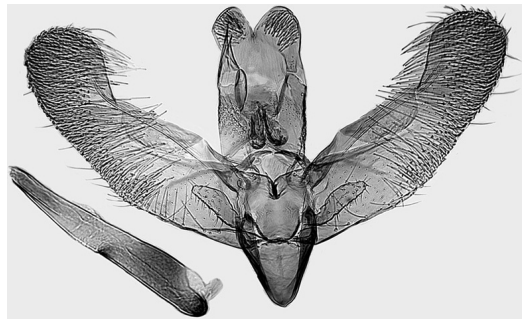


Fig. 10. Male genitalia of *Elachista kebneella* Traugott-Olsen & Schmidt Nielsen (L. Kaila prep. 4654, Russia, Kola Pns., 20 km S. Monchegorsk 24.VII.1996 Melnikov & Zverev leg., in MZH).

tion of the costal spot which is at the apex of the forewing in *E. trapeziella*, in costal margin near apex in *E. saarelai*; the dorsal margin of *E. trapeziella* is unicolorous black, suffused by grey in *E. saarelai*. The white fascia is divided into two markings in all specimens of *E. saarelai* available, but usually, though not always, undivided in *E. trapeziella*. *E. kebneella* is generally more greyish than *E. saarelai*. *E. ornithopodella* is externally easy to distinguish from the other species as having silvery sheen in its four white forewing markings (Fig. 4). The male genitalia of *E. saarelai* differ from the related species as follows: *Elachista occidentalis* Frey and its allies (detailed by Kaila & Varalda 2004) have longer uncus lobes and distinctly thinner phallus (Figs. 5–7). The juxta lobes are long, and the digitate process is short and blunt-tipped in *E. ornithopodella* (Fig. 8), long and distally obliquely tapered in *E. saarelai*. The juxta lobes are shorter, and the phal-

lus is distinctly longer and narrower in *E. trapeziella* than in *E. saarelai* (Fig. 9). The male genitalia of *E. saarelai* are closest to *E. kebneella* from which it nevertheless is easy to distinguish by the distinctly longer digitate process of *E. saarelai* as compared to *E. kebneella* (Fig. 10). The female genitalia of *E. saarelai* are readily separated from those of *E. trapeziella*, *E. ornithopodella* and *E. occidentalis* by the shape of the antrum which is wider than deep in all these species, as deep as wide in *E. saarelai* (Figs. 11–14). As such, it most resembles *E. kebneella*. The corpus bursae is rounded in *E. saarelai*, elongate, oval in *E. kebneella* (Fig. 15). The signum appears to be larger in *E. saarelai* than in *E. kebneella*, but this character may be unreliable in this species group (cf. Kaila & Varalda 2004).

Description. Wingspan. Male 6–8.5 mm, female 7.5–9 mm.

Labial palpus ascending, length 1.2 times di-

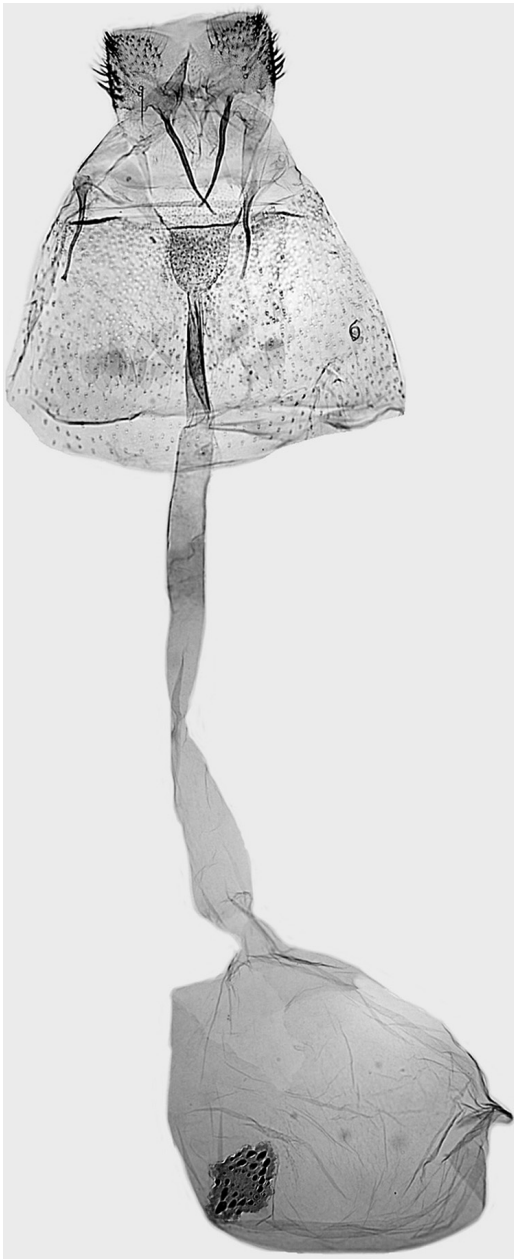


Fig. 11. Female genitalia of *Elachista saarelai* sp. n. Paratype, (L. Kaila prep. 5093 EH: Tampere, L. Sippola leg. & Coll.).

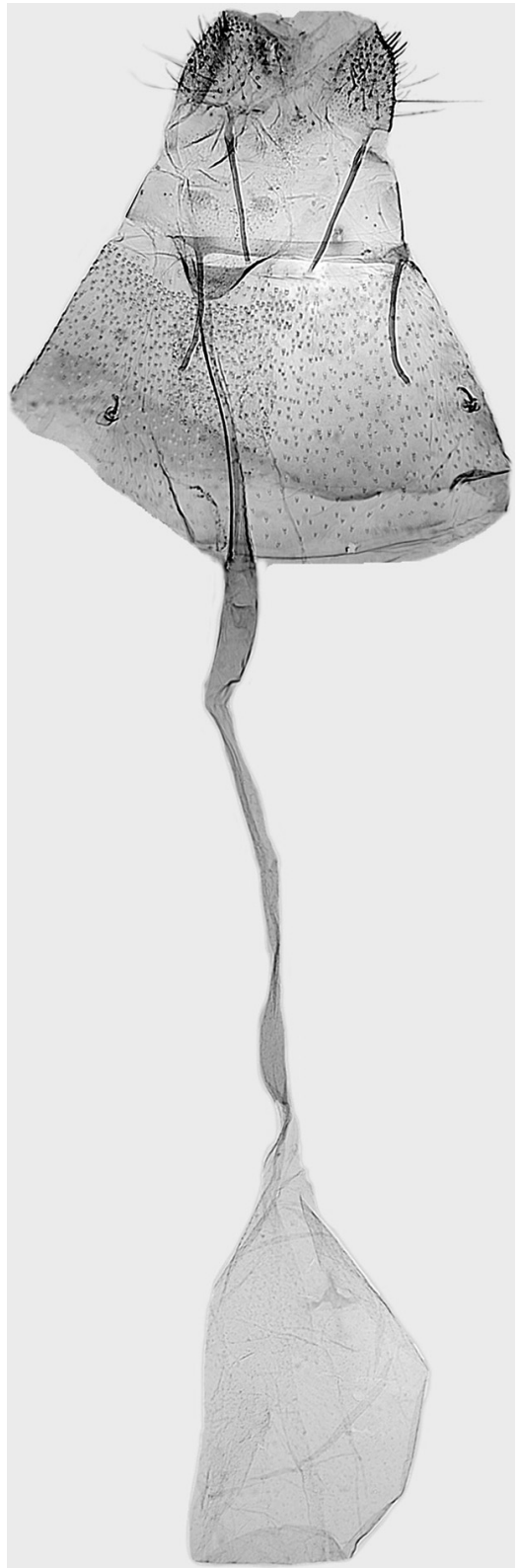


Fig. 12 (right). Female genitalia of *Elachista trapeziella* Stainton (L. Kaila prep. 3596, Finland U: Vantaa, e. l. 1992 L. Kaila leg., in MZH).



Fig. 13. Female genitalia of *Elachista ornithopodella* Frey (L. Kaila prep. 4661, Russia, Karelia, Sortavala, 1930 N. Kanerva leg., in MZH).

ameter of head; second segment above white, black below, third segment basally and distally black, medially white, head varying from creamy white to ochreous, scales of vertex basally pale

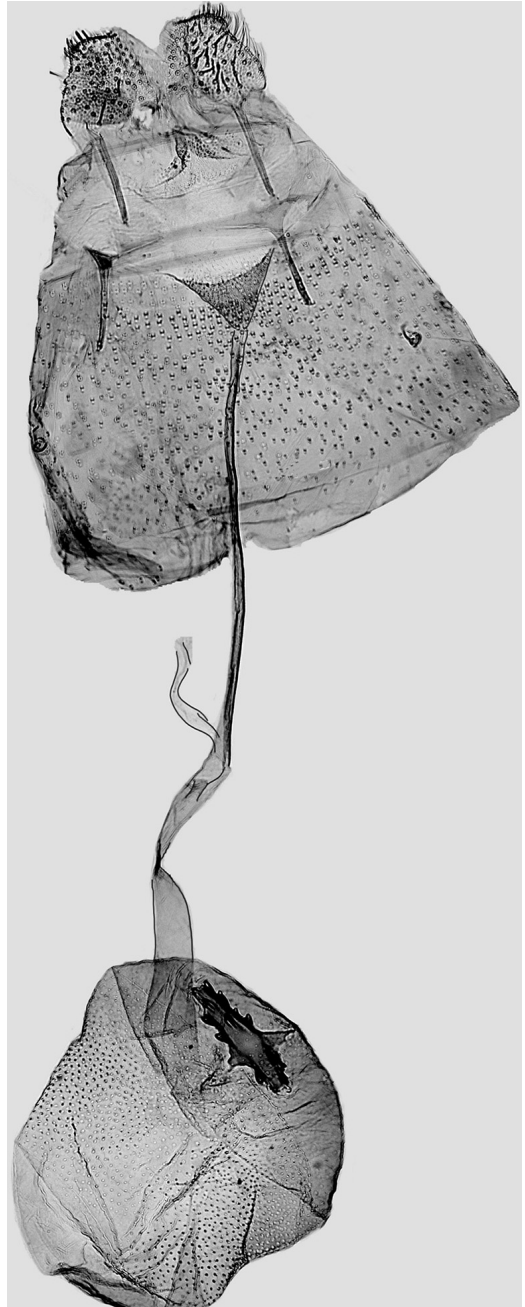


Fig. 14. Female genitalia of *Elachista occidentalis* Frey (L. Kaila prep. 3199, Finland U: Siuntio, e. l. 1992 from *Carex digitata* L. Kaila leg., in MZH).

grey, black-tipped. Scape pale grey, pedicel and flagellum dark grey, flagellum distally somewhat serrate. Scales of neck tuft, tegula and thorax grey, black-tipped. Fore- and mid leg dark grey

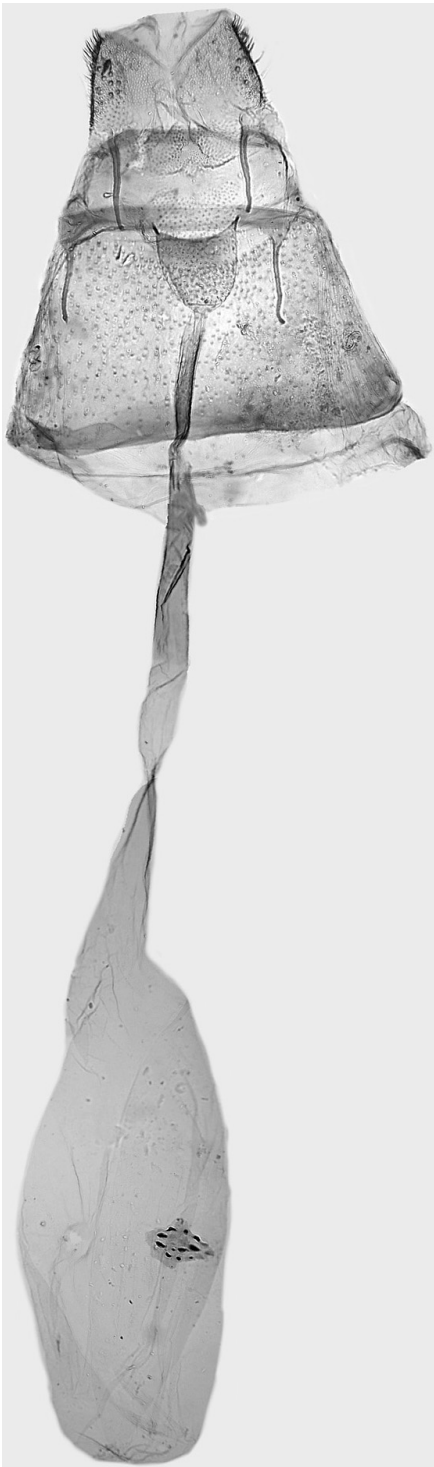


Fig. 15. Female genitalia of *Elachista kebneella* Traugott-Olsen & Schmidt Nielsen (L. Kaila prep. 5250, Finland, InL. Inari 9. VII. 1983 E. Laasonen leg., in MZH).



Fig. 16. Pupa of *Elachista saarelai* sp. n. – a. dorsal, – b. lateral, – c. ventral image.

with creamy white distal rings; hind tibia basally grey, medially black, distally creamy white, spurs creamy white, tarsal articles black with white distal rings. Abdomen dark grey, irregularly with paler grey scales, especially ventrally, apex of abdomen ventrally pale yellow. Forewing ground colour nearly black, weakly mottled by slightly paler grey bases of scales, except along fold which is black, along dorsal margin paler, mottled grey; with following white pattern: small rounded spot at fold at 1/4 wing length, fascia broken as two spots: quadrangular spot at middle of wing length from costa, and elongate streak at fold; near apex at costal margin narrow spot, extended to fringe. Fringe otherwise dark grey. Underside dark grey with concolorous fringe. Hindwing dark grey at both sides.

Male genitalia. Uncus lobes rounded, their ventral surface distolaterally densely covered with cylindrical scales arising from erect pinaculæ, mesially separated by narrow Y-shaped indentation. Basal arms of gnathos longer than uncus lobes, distally connected by membranous bridge. Spinose knob of gnathos divided to two oval lobes. Valva slightly bent towards costa, parallel-sided, about 3.5 longer than wide; basal fold of costa extended to 1/4 length of costa, distal



Fig. 17. First-year mine of *E. saarelai* sp. n. in the leaf of *Carex ?pediformis*.



Fig. 18 Second-year mines of *E. saarelai* sp. n. in the leaves of *Carex digitata*.

fold, distal fold broad, rounded, extended to $2/3$ length of valva where cucullus is slightly twisted on top of costa forming indistinct hump; saccus straight or somewhat bent, without spine distally, cucullus rounded. Digitate process almost $1/3$ length of valva, S-shaped, distally obliquely tapered. Median plate of juxta oval, concave without lateral or posterior extensions. Mesial margin of juxta lobes straight, joining distal margin at a right angle; distal margin straight, without scales or setae. Vinculum variable, V- or U-shaped, without median ridge. Phallus $4/5$ length of valva, broad, nearly straight, gradually tapered towards rounded apex; insertion of ductus ejaculatorius dorsodistally directed; caecum blunt, as long as width of basal opening of phallus; distal opening extended to distal $2/3$ of phallus; vesica elongate plate-like sclerotisation whose length is $1/4$ length of phallus.

Female genitalia. Papillae anales short, rounded, with both usual-type thin setae and short and coarse setae. Apophyses straight, apophyses posteriores 1.5 times as long as apophyses anteriores. Ostium bursae at posterior margin of sternum 7, width half the distance between apophyses anteriores. Antrum as deep as wide, laterally convex. Colliculum 1.5 times as long as antrum, separated from it by short membranous region; ductus bursae otherwise membranous, tubular, length seven times as long as apophyses posteriores, inserted in corpus bursae with distinct limit. Corpus bursae with large, broad, entirely dentate signum, without internal spines.

Pupa (Fig. 16). Pupa amber-coloured, relatively short; head and thorax with tubercles, thorax and abdomen with dorsal and lateral ridges; abdomen with brown dorsolateral line. A10 dorsally with prominent, rounded lobe.



Fig. 19. Full-grown larva of *E. saarelai* sp. n.

Distribution. Until now known from the province EH in southern Finland. It is probable that the actual range is wider.

Life history. The habitat is shady, old conifer forest with thick moss layer. The host plants of *E. saarelai* are *Carex digitata* L. and likely also *C. pediformis* C. A. Mey (Cyperaceae); the identification of the latter host plant species has proved difficult and therefore the records from this plant are pending verification. The development of the larva takes two years. The larva starts mining during October in a leaf developed during the same year. The mine starts from the middle of the length of the leaf and is directed upwards. During the autumn the mine is 5–8 cm long, weakly visible, with a line of frass (Fig. 17). The larva hibernates within this mine for the first time. It continues mining during the spring in the same leaf. By the end of June the mine occupies the whole width of the leaf, and is turned downwards after reaching the tip of the leaf. Then the narrow initial mine is visible as pale. In the broad later stage of the mine there are two separate packages of frass visible. During mid-summer the larva does not feed continuously, but is hiding within the mine and is difficult to observe. It mines until August–September, and the mine is finally 12–18 cm long and resembles a lot other withered leaves of the host plant (Fig. 18). The larva hibernates within the mine for the second time. There can be 2–3 larvae in the same tuft of the host plant. If reared in room temperature, the larva will exit the mine within two weeks after the hibernation, and turns reddish brown before pupation (Fig. 19). The shields of sternum and tergum 2 are indistinct in living larva, but well visible in preparation. The larva pupates on the leaf, and is attached to the surface with a silken girdle and a pair of spur groups under segment 9. The adult emerges within 2–4 weeks after pupation.

Derivation of name. The species is dedicated to Esko Saarela, a skilled but all too modest

microlepidopterist who first discovered this species. The name *saarelai* is a nomen in apposition.

Acknowledgements. Without the original discovery of this species by Esko Saarela this paper would not have appeared. LS is deeply indebted for him for company in the field, the time spanning over several decades. Pekka Malinen is thanked for the adult images and Virginius Sruoga for valuable comments on the manuscript.

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