

Two new species in the *Ectoedemia (Fomoria) weaveri*-group from Asia (Lepidoptera: Nepticulidae)

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Nieukerken, E.J. van. Two new species in the *Ectoedemia (Fomoria) weaveri*-group from Asia (Lepidoptera: Nepticulidae).

Zool. Med. Leiden 82 (15), 1.i.2008: 113-130, figs 1-28.— ISSN 0024-0672.

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Key words: China; Nepal; Turkey; Vietnam; *Hypericum*; new record; new food plant, new combination.

Two new species are described in the monophyletic *Ectoedemia (Fomoria) weaveri* group: *E. (F.) festivita-tis* **spec. nov.** from mountains in Nepal, China (Yunnan) and northern Vietnam, feeding on shrubby *Hypericum* species, and *E. (F.) degeeri* **spec. nov.** from Turkey, food plant unknown. The species group is briefly reviewed and a checklist with information on distribution and food plants is provided; the *weaveri* group comprises 14 species. *E. ruwenzoriensis* (Bradley, 1965) **comb. nov.** is added to the group. *E. hypericella* (Kuroko, 1982) and *E. permira* (Puplesis, 1984) are recorded for the first time from China and *Hypericum* is confirmed as food plant for the latter. The reported occurrence of the Canarian endemic *E. variicapitella* (Chrétien, 1908) outside the Canary Islands is based on an error.

Introduction

Within the Nepticulidae, the subgenus *Fomoria* Beirne, 1945, in the genus *Ectoedemia* Busck, 1907, is still the only (sub)generic entity for which no convincing apomorphies have been found (Hoare, 2000; van Nieukerken, 1986). This subgenus is particularly diverse in southern Africa, especially when one includes the group earlier placed in the subgenus *Laqueus* Scoble, 1983 (name pre-occupied). The obviously monophyletic *Laqueus*, occurring in southern Africa and the Mediterranean region, has been included in *Fomoria* by recent authors (Diškus & Puplesis, 2003; van Nieukerken, 2004; van Nieukerken et al., 2004). In total ca. 80 species are currently placed in *Ectoedemia (Fomoria)*.

Within *Fomoria*, the *weaveri* group is one of the clearly monophyletic entities (Hoare, 2000; van Nieukerken, 1986), widespread in the Holarctic region, and apart from two species, feeds on *Hypericum* species (Hypericaceae, formerly Clusiaceae or Guttiferae). Up to now, two diversity centres have been identified: the area around the Aegean Sea (Greece, Turkey), with five described species (Laštůvka & Laštůvka, 2000) and Eastern Asia, with three named and at least two unnamed species (Diškus & Puplesis, 2003; unpublished data). It is possible that more species will be identified from the Nearctic region with more focussed sampling.

During fieldwork in East Asian mountain areas between 1981 and 2003, one new species of *E. (Fomoria)* was encountered on shrubby species of *Hypericum*, and another unknown species was found among unidentified material, collected at light in Turkey. Both are here described.

Linnaeus and Nepticulidae

The 250th anniversary of binominal nomenclature, as applied first by Linnaeus, is the immediate cause to publish this paper, and the species are dedicated to this celebration. Linnaeus himself only named one species that we currently regard as belonging to the Nepticulidae: *Ectoedemia occultella* (Linnaeus, 1767), originally described as *Phalaena* (*Tinea*) *occultella*. Linnaeus had obviously no clue that this small moth, flying in the early morning on the windows in his estate Hammarby [*Habitat in meo Hammarby, hora matutina in fenestris lecta saepius*], was the cause of its characteristic leafmines on birch (*Betula*). In fact, since no type material is left, the identity has been established only recently by association with its habits in Sweden (Robinson & Nielsen, 1983).

At the time of Linnaeus' description, only the larva of one leafmining Nepticulidae was described, namely *Stigmella anomalella* (Goeze, 1783) on *Rosa*, by DeGeer (1752) [as "*Chenille mineuse jaune, qui mine les feuilles du Rosier en galerie*"]. Only later, DeGeer (1771) described the reared adult. Since he did not use binominal nomenclature in this work, it was only validly named later: *Phalaena anomalella* Goeze, 1783. Two more 18th century names were given to this species (the type species of *Stigmella* Schrank, 1802): *Phalaena grisearosae* Retzius, 1783 (also based on DeGeer's description) and *Tinea penicilla* Thunberg, 1794 (see Karsholt & Nielsen, 1986 for species named by Thunberg). Apart from another name by Thunberg, that is also a junior synonym, *Tinea strigilella* Thunberg, 1794 (= *Ectoedemia occultella*), only two more species of Nepticulidae were named in that century: *Tinea aurella* Fabricius, 1775 and *Tinea hybnerella* Hübner, 1796, now both in *Stigmella*.

Whereas Linnaeus is to be commemorated for initiating consistent use of the binominal nomenclature, it is important to recognize that his work was influenced by that of several contemporaries. His insect classification was often adapted from that of de Réaumur and his follower DeGeer, who was acknowledged for that fact by Linnaeus (Winsor, 1976). In order to commemorate the important role of DeGeer as early insect taxonomist and particularly for being the first to describe the typical Nepticulidae life history, I am dedicating one of the new species to him. The name of the other species commemorates the 250th anniversary of binominal nomenclature ("*festivitatis*").

Material and methods

Material.— Collections: EIHU – Entomological Institute, Hokkaido University, Sapporo, Japan; NHMB – Museum of Natural History, Humboldt University, Berlin, Germany; RMNH – National Museum of Natural History Naturalis, Leiden, The Netherlands; ZIAB – Zoological Institute, Academia Sinica, Beijing, China; ZMUC – Zoological Museum, University of Copenhagen, Denmark.

Methods.— Larvae and pupae of *E. festivitatis* were collected in leafmines on *Hypericum*. They were placed with moss in plastic bags or small containers and transported to the laboratory either in Amsterdam or Leiden. When collected in late autumn, they were given a cold treatment in a refrigerator for a few weeks and then reared at room temperature in closed containers. For most samples vouchers of the food plants were kept as herbarium specimens. These were (re-)identified by Dr Norman Robson (Natural History Museum, London) in November 2007.

Genitalia preparations were embedded in Euparal, following the methods described by van Nieukerken et al. (1990). Because of the tight fusion between aedeagal carina and valvae and vinculum, the aedeagus was usually not dissected out.

Photographs of moths, leafmines and genitalia slides were taken with a Zeiss Axio-Cam digital camera attached to respectively a Zeiss Stemi SV11 stereo-microscope or a Zeiss Axioskop H, using Carl Zeiss AxioVision software.

Measurements of genitalia were obtained from digital images, using AxioVision, 20 × objective for male genitalia and 10 × or 20 × for females. Capsule length was measured from vinculum to middle of pseuduncus; valva length from tip of posterior process to ventral edge, excluding the sublateral process; aedeagus length was measured along the sclerotized tube, to the tip of ventral process/carina, excluding any protruding vesica parts. Bursa length was measured from cloaca to anterior tip. Forewing length was measured from tip of cilia to attachment on thorax, usually at magnification of 20 ×. Antennal segment counts include scape and pedicel. All measurements based on sample size of at least five specimens are accompanied by mean, standard deviation and sample size in brackets.

Distribution maps were prepared with DMAP 7.0 (Morton, 2000).

Morphological terms follow van Nieukerken et al. (1990). Food plant names were checked with IPNI (2004).

Systematic part

The *Ectoedemia* (*Fomoria*) *weaveri*-group

Diagnosis.— Adults: collar consisting of hair-scales. Wings usually dark with pale fascia or spots, occasionally with metallic scaling. Hindwing with costal bristles in both sexes. In few species androconial scaling present on hindwings, i.e. *E. variicapitella*. Male abdomen with rather indistinct tufts of hair scales on tergite 8. Venation essentially similar to other subgenera of *Ectoedemia*, but anal loop absent (see van Nieukerken, 1986) and Cu not present as separate vein. Although there are no external characters that distinguish this group in total from other *Ectoedemia* species; in many cases the absence of secondary sexual characters and the rather pointed abdomen in the male can suggest a specimen's placement here.

The male genitalia are characterised by well developed pseuduncus, uncus and gnathos, all with medial process. Two characters are supposed to be apomorphies for the group (Hoare, 2000): the lateral arms of the gnathos are straight, more or less horizontal and the lateral arms of the vinculum are strongly expanded medially and meet anterior to gnathos. The valvae are widely separate at their bases, and very often bear a sharp spine dorsally (absent in *septembrella* and *weaveri*, but an indication of it present in the latter); this spine is another possible apomorphy. The aedeagus (= phallus) usually has two or three pairs of curved carinal processes; tightly fused with membranes to the valves; transtilla and posterior projection of anterior plate of vinculum; the vesica bears typically a number of very blunt small cornuti and a variable number of large spinelike cornuti near the phallosome; the latter are often easily confused with carinae.

The female genitalia have the paired reticulate signa as in most species of the tribe Trifurculini. The bursa is usually covered internally with many pectinations and the

vestibulum has a number of characteristic sclerotizations. The ductus spermathecae includes a small number of convolutions.

Immature stages.— The final instar larvae of *E. septembrella* and *weaveri* have been described by Gustafsson & van Nieuwerkerken (1990): the relatively small head capsule and presence of dorsal calli on the thoracic and abdominal segments are diagnostic.

Biology.— Food plants. Most species make leafmines on *Hypericum* (Hypericaceae), two feed on Ericaceae and Rutaceae. Whereas the widespread *E. septembrella* feeds on a wide range of *Hypericum*-species, including exotic shrubby species, the other species seem to be more specialised. In a locality in central Greece, where three species occur syntopically, they show niche segregation by feeding each on different species of *Hypericum* (Laštůvka & Laštůvka, 2000).

The mines are characteristically a very long and narrow gallery, suddenly enlarged in the final instar into a large blotch, that becomes later inflated. The larva then prepares an exit slit and spins a cocoon, which it attaches via a silken tunnel to the exit slit. The only species without this habit are *E. pteliaeella* and *E. variicapitella* and these are also the only species with a green rather than yellow larva. According to Braun (1925), not all specimens of *E. hypericella* pupate in the mine, but this finding needs confirmation.

Checklist

Food plant and distribution data are according to original descriptions and the following sources: Klimesch (1977), Wilkinson (1979), Laštůvka & Laštůvka (2000) and Diškus & Puplesis (2003).

Ectoedemia Busck, 1907

subgenus *Fomorina* Beirne, 1945

type species *Nepticula weaveri* Stainton, 1855 (by original designation)

weaveri-group

E. degeeri **spec. nov.** – Turkey

E. deschikai (Klimesch, 1978a) (*Trifurcula*) – Greece

Hypericum crispum L., *H. hircinum* L., *H.* sp.

E. empetrifolii Laštůvka & Laštůvka, 2000 – Greece

Hypericum empetrifolium Willd.

E. eriki Laštůvka & Laštůvka, 2000 – Greece

Hypericum olympicum L., *H. perfoliatum* L.

E. festivitatis **spec. nov.** – Nepal, China, Vietnam

Hypericum beanii N. Robson, *H. henryi* H. Lévl. & Vaniot subsp. *hancockii* N. Robson;

H. hookerianum Wight & Arn., *H. uralum* Buch.-Ham. ex D. Don, ?*H. pseudopetiolum*

R. Keller subsp. *yunnanense* (Franchet) N. Robson.

E. hypericella (Braun, 1925) (*Nepticula*) – USA

Hypericum prolificum L.

E. hypericifolia (Kuroko, 1982) (*Fomorina*) – Japan, Russia, China¹

Hypericum attenuatum Choisy¹, *H. ascyron* subsp. *gebleri* (Ledeb.) N. Robson, *H. erectum* Thunb.

- E. luisae* (Klimesch, 1978b) (*Fomoria*) – Turkey
Hypericum calycinum L.
- E. permira* (Puplesis, 1984) (*Fomoria*) – Russia, China^{2,3}
Hypericum attenuatum Choisy³
- E. pteliaeella* (Chambers, 1880) (*Nepticula*) – USA
Ptelea trifoliata L. (Rutaceae)
- E. ruwenzoriensis* (Bradley, 1965) **comb. nov.** – Uganda⁴
- E. septembrella* (Stainton, 1849) (*Nepticula*) – West Palearctic
Hypericum, many species
- E. weaveri* (Stainton, 1855) (*Nepticula*) – Palearctic
Vaccinium vitis-idaea L. (Ericaceae)
- E. variicapitella* (Chrétien, 1908) (*Nepticula*) – Canary Islands⁵
Hypericum canariense L.

Notes

- ¹ *E. hypericifolia* was collected in China, Heilongjiang in 1984 and reared from *H. attenuatum* (unpublished data). Details will be published elsewhere.
- ² *E. permira* was tentatively recorded from Japan by Oku (2003), but upon checking (in 2007), the specimen appeared to be misidentified.
- ³ *E. permira* was collected in China, Heilongjiang in 1984 and reared from *H. attenuatum* (unpublished data). Previously the food plant of *permira* was unknown. Details will be published elsewhere.
- ⁴ *Stigmella ruwenzoriensis* was described from a montane zone (Ericaceous belt) of the Ruwenzori mountains in Uganda (above 3300 m) (Evans & Fletcher, 1958). The detailed description and original illustrations of the genitalia show the above-cited gnathos and vinculum characters and a large dorsal spine on the valva, which indicate the present new combination and its place in this group. Its relation to European *Fomoria* was, in fact, suggested in the original description. It is not clear why Diškus & Puplesis (2003) placed this species in the genus *Acalyptris* Meyrick, 1921. It is possible that *E. ruwenzoriensis* also feeds on *Hypericum*, because tree-forming *Hypericum* species occur commonly in the higher montane zones, such as the Ericaceous belt or *Hagenia-Hypericum* zone (Livingstone, 1967).
- ⁵ *E. variicapitella* was described from Gran Canaria, Tafira. Many authors cite the occurrence in North Africa (Morocco, Mauritania) in addition to the Canaries. This is an error, accidentally introduced by Hering (1927) and repeated by various authors, possibly because the toponym Tafira also occurs in Morocco. The moth is undoubtedly a Canarian endemic.

Ectoedemia (*Fomoria*) *festivitatis* spec. nov.
 (figs 1-2, 4-17, 27)

Type material.— Holotype ♂: **Nepal**, Valley of Marsyandi: Dharapani, 2000 m, 28.30N–84.21E, 17.xi.1981, E.J. van Nieuwerkerken"; "[leafmines on] *Hypericum* cf. *uralum* Buch.-Ham., VU no 81744 KE, e. l. 22.ii.1982", "Host: *Hypericum uralum* Buch.-Ham. ex D.Don, det NKB Robson 2007"; "RMNH Lepidoptera, Genitalia slide E.J. van Nieuwerkerken 3812 ♂" "RMNH INS 23812 [with printed barcode]" (RMNH).— Paratypes: 23 ♂, 21 ♀.— **China (Yunnan)**: 2 ♂, 2 ♀ [1 ♂ and 1 ♀ slides only], Anning, 24.55N–102.29E, 1900 m, 20.x.1984, Mixed *Pinus yunnanensis*, *Keteleeria*, oak forest, leafmines on *H. beani*, e.l. 13.ii.1985, EvN no

35-19-1K, E.J. van Nieuwerkerken & J. van Driel, Genitalia slides A076 ♂, A130 ♂, A131 ♀ (ZIAB, RMNH); 1 ♂, Kunming, Qiongzhu Si (Bamboo temple), 25.08N-102.37E, 2100 m, 18.x.1984, Evergreen cupuliferous forest on northern slope, leafmines on *H. beanii*, e.l. 31.i.1985, EvN no 22-35-1 K, E.J. van Nieuwerkerken & J. van Driel (ZIAB, RMNH); 2 ♂, 1 ♀, 14 km SW Kunming, Xishan, 24.59N-102.37N, 2300 m, 5 & 22.x.1984, Open *Pinus*-oak forest and shrub, leafmines on *H. beanii*, e.l. 1.xii.1984, EvN no 23-4-1 K, E.J. van Nieuwerkerken & J. van Driel, Genitalia slides A077 ♀ (ZIAB, RMNH); 2 ♂, 1 ♀, W. of Yiliang, 24.53N-103.07E, 1900 m, 7.x.1984, Steep hills with degenerated *Pinus yunnanensis* forest, leafmines on *H. beanii*, e.l. 3.xi.1984, EvN no 25-2-1 K, E.J. van Nieuwerkerken & J. van Driel (ZIAB, RMNH).— **Nepal**: 4 ♂, 5 ♀, Bagmati, Kathmandu Valley, Balaju, 23.vii.1983, leafmines on *H. spec.*, e.l. 6-10.viii.1983, Npl-244, T. Kumata, Genitalia slides JT093 ♂, 3813 ♂, 3814 ♀ [RMNH INS 23813, 23814] (EIHU, RMNH); ♀, Valley of Marsyandi: between Thangja and Chame, 28.32N-84.15E, 2400 m, 8.xi.1981, leafmines on *H. uralum* Buch.-Ham. ex D. Don, e.l. 5-23.ii.1982, VU no 81726 KE, E.J. van Nieuwerkerken (RMNH); 2 ♂, 1 ♀, ditto, but 16.xi.1981, e.l. 9-18.ii.1982, VU no 81739 KE, E.J. van Nieuwerkerken (RMNH); 5 ♂, 8 ♀, Valley of Marsyandi: Dharapani, 28.30N-84.21E, 2000 m, 17.xi.1981, leafmines on *H. uralum* Buch.-Ham. ex D. Don, e.l. 12.i-9.iii.1982, VU no 81744 KE, E.J. van Nieuwerkerken, Genitalia slides VU 1341 ♂, EjvN 3815 ♀ [RMNH INS 21341+23815] (RMNH).— **Vietnam**: 1 ♂, 1 ♀, Lao Cai, Hoang Lien Song, Bán Khoang, 9 km NW Sapa, 48Q UK750773, 1400 m, 1.xi.2001, leafmines; secondary vegetation along road, leafmines on *H. hookerianum* Wight & Arn., e.l. 14-16.i.2002, EvN no 2001301-1K [♂ abdomen lost] E.J. van Nieuwerkerken & J.C. Koster, Genitalia slide 3816 ♀ [RMNH INS 23816] (RMNH); 2 ♂, 2 ♀, Lao Cai, Hoang Lien Song, pass N of Phan Xi Pang (Fansipan), 8 km WNW Sapa, 48Q UK736722, 1900 m, 30.x.2001, Secondary forest and grassland; on trail, leafmines on *H. hookerianum* Wight & Arn., e.l. 6-15.i.2002, EvN no 2001280K, E.J. van Nieuwerkerken & J.C. Koster, Genitalia slide 3811 ♂ [RMNH INS 23811] (RMNH); 1 ♂, 1 ♀, same locality and date, leafmines on *H. henryi* subsp. *hancockii* N. Robson, e.l. 6-11.i.2002, EvN no 2001281K (RMNH); 1 ♂, Hoang Lien Song, Tram Ton pass N of Phan Xi Pang (Fansipan), 8 km WNW Sapa, 1933 m, 48Q UK738726, 15.ix.2003, roadside shrub, leafmines on *H. hookerianum* Wight & Arn., e.l. 23.ix.2003, EvN no 2003056K, C. van den Berg & E.J. van Nieuwerkerken (RMNH).

Material excluded from type series.— **Nepal**: 1 adult (abdomen missing), Bagmati, Kathmandu Valley, Mulkharka, 18-20.ix.1983, leafmines on *H. spec.*, e.l. 17.x.1983, Npl-607, T. Kumata (EIHU).— **Vietnam**: 5 larvae (ethanol 96%), Lao Cai, Hoang Lien Song, pass N of Phan Xi Pang (Fansipan), 8 km WNW Sapa, 48Q UK736722, 1900-2000 m, 30.x.2001, Secondary forest and grassland; on trail, leafmines on *H. hookerianum* Wight & Arn., EvN no 2001280K, E.J. van Nieuwerkerken & J.C. Koster (RMNH) (3 used for destructive DNA extraction, RMNH-INS numbers 11551, 11553, 11568).— Leafmines only: **China (Yunnan)**: dead larvae, vacated mines, Anning, 20.x.1984, Mixed *Pinus yunnanensis*, *Keteleeria*, oak forest, leafmines on *H. petiolulatum* subsp. *yunnanense*, EvN no 35-18-1, E.J. van Nieuwerkerken & J. van Driel (RMNH); old mines, Shilin (Stone forest), Lunan county, 6-7.x.1984, Cultivated and seminatural vegetation between rocks, leafmines on *H. beanii*, EvN no. 24-9-1, E.J. van Nieuwerkerken & J. van Driel (RMNH).— **Vietnam**: mines, rearing failed, Lao Cai, Sapa, Ham Rong tourism area, 48Q UK813701, 1630 m, 13.ix.2003, rocky hill park with planted trees, sec. veg., leafmines on *H. hookerianum* Wight & Arn., EvN no 2003034, C. van den Berg & E.J. van Nieuwerkerken (RMNH).

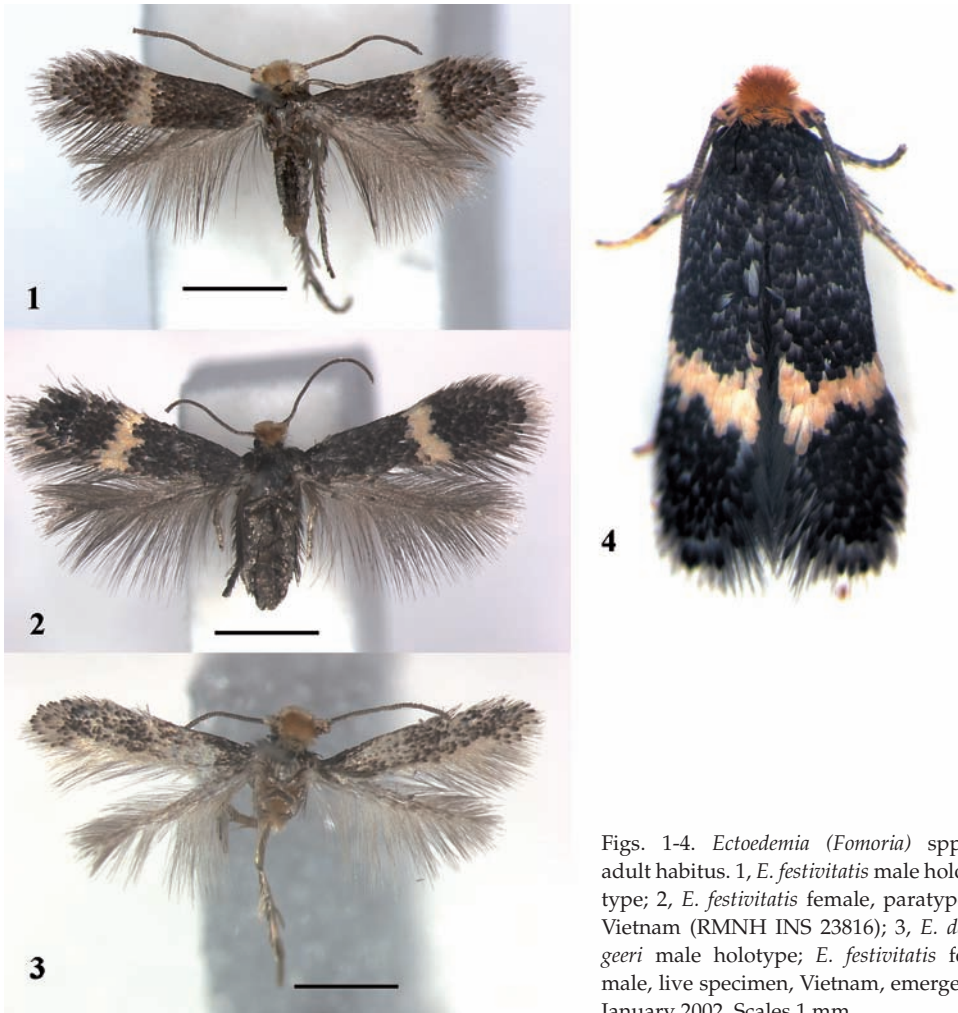
Diagnosis.— A typical fasciate nepticulid, relatively large, with collar composed of piliform scales, which can be confused with other fasciate *Ectoedemia* species, but *E. festivitatidis* lacks all special scaling or hair pencils that occur in many other species. Externally similar *Stigmella* species can usually be recognised by a collar of lamellar scales. Male genitalia characterised by inner medial process of valva and very long curved ventral carinae; female genitalia by several sclerotizations in vestibulum.

Male.— Forewing length 1.8-2.9 mm (2.4 ± 0.3 , 17), wingspan 4.0-6.1 mm. Head: frontal tuft orange to pale ochreous; scape cream with dark brown edge; collar consisting of piliform scales, same colour as frontal tuft; antenna greyish brown, 34-50 segments (44.4 ± 5.9 , 14), longer than two thirds length of forewing. Thorax and forewing

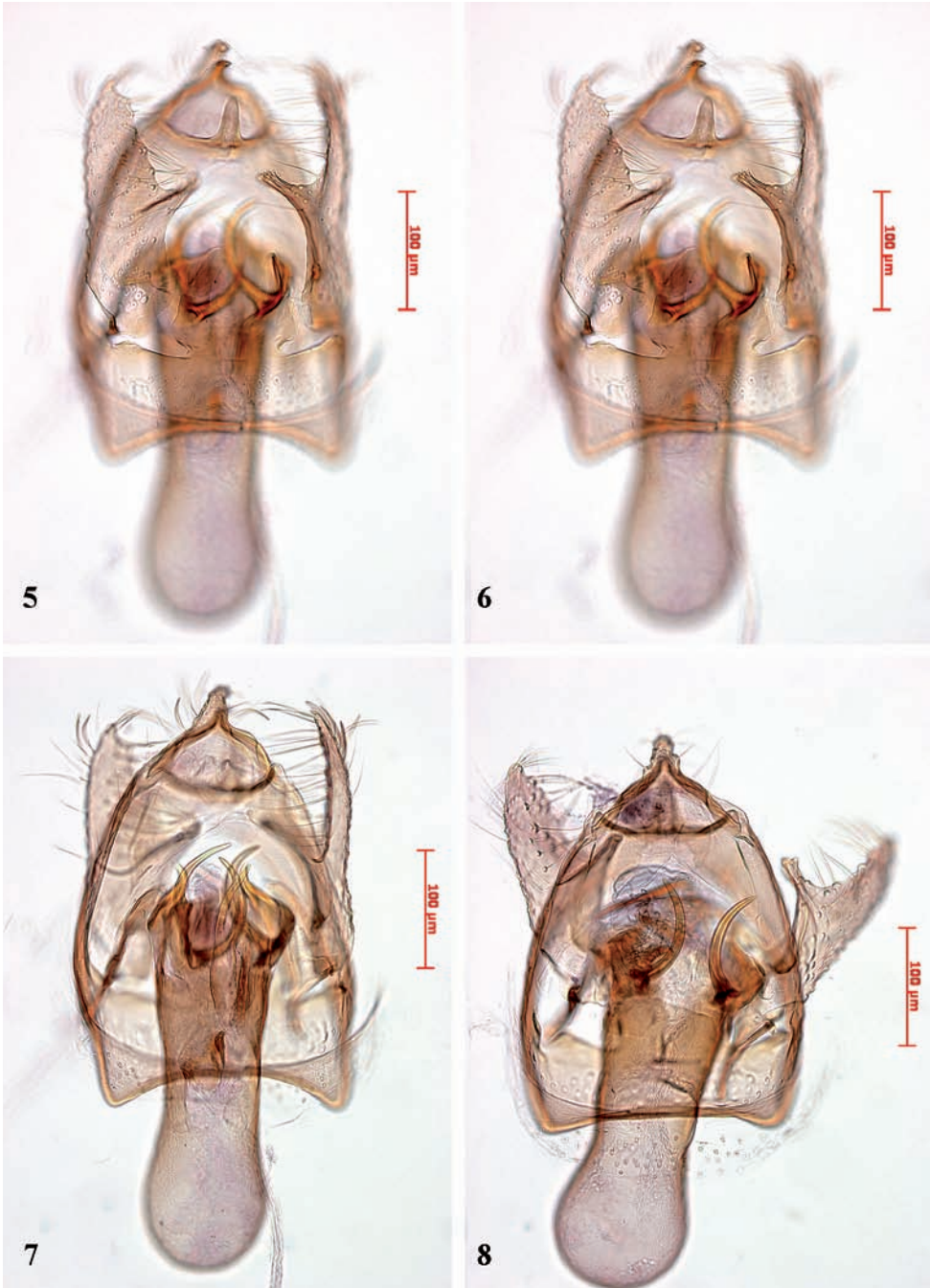
fuscous to black, with faint purple reflections; all scales darker at tips; postmedial fascia cream white, almost straight, slightly wider at dorsum, sometimes divided to almost obsolete; cilia line distinct; terminal cilia greyish white to grey. Hindwing and cilia greyish brown; no androconial scales; costal bristles present. Underside wings fuscous. Abdomen black, with very small grey anal tufts; abdominal tip tapering.

Female.— Forewing length 1.9-3.1 mm (2.5 ± 0.3 , 20), wingspan 4.1-6.6 mm. Antennae with 36-50 segments (43.1 ± 4.7 , 14). Abdominal tip very broad, truncate. Otherwise similar to male.

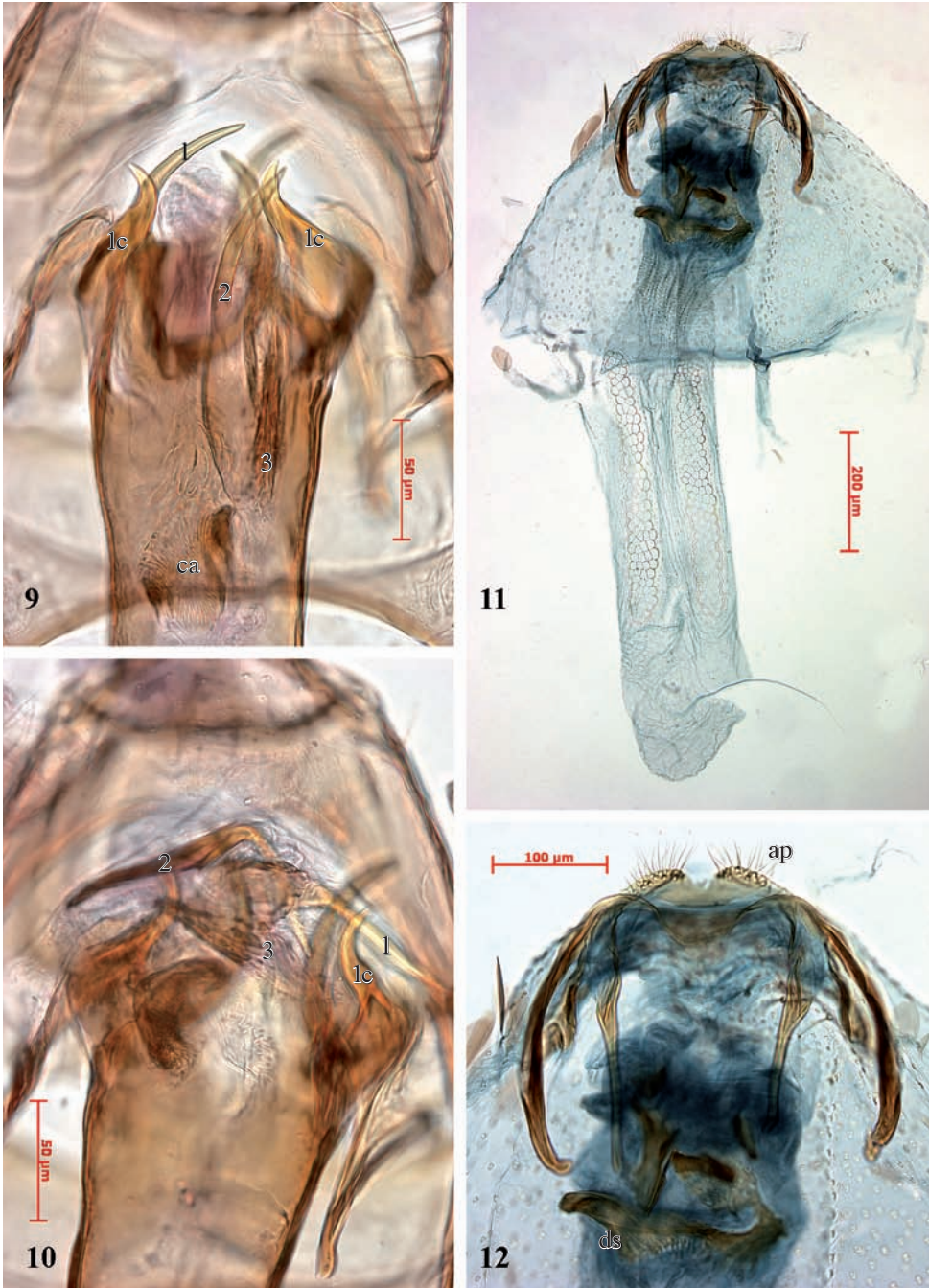
Male genitalia.— Vinculum with shallow anterior emargination; ventral plate posteriorly produced into a large bilobed juxta-like process, tightly fused to ventral carinae (best seen in fig. 8). Tegumen forming distinctly pointed pseuduncus, as long as uncus. Uncus with inverted Y-shaped medial process. Gnathos with relatively long narrow pointed central element. Valva narrow elongate to slightly triangular, medially with



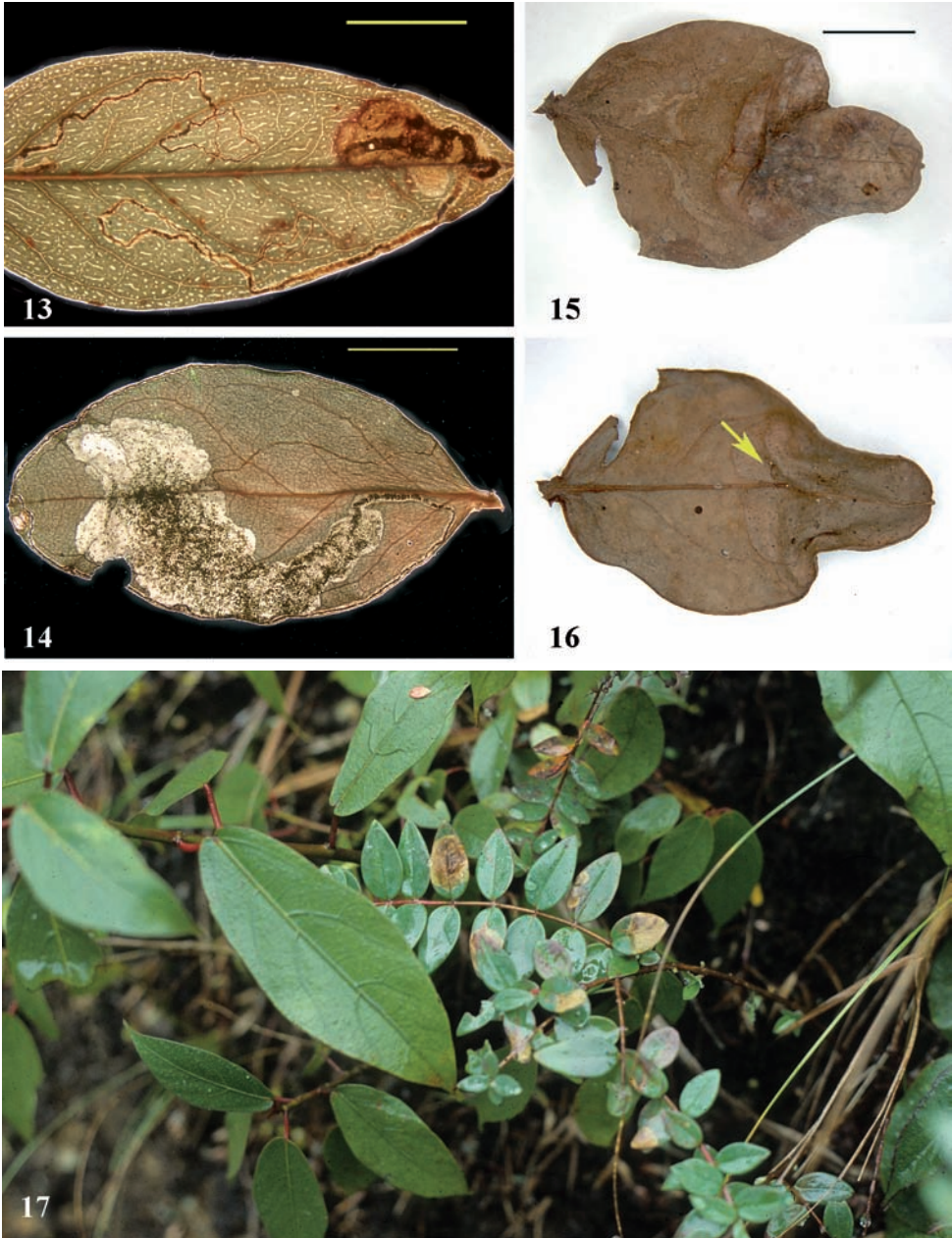
Figs. 1-4. *Ectoedemia* (*Fomoria*) spp., adult habitus. 1, *E. festivitatis* male holotype; 2, *E. festivitatis* female, paratype, Vietnam (RMNH INS 23816); 3, *E. degeeri* male holotype; *E. festivitatis* female, live specimen, Vietnam, emerged January 2002. Scales 1 mm.



Figs. 5-8. *Ectoedemia (Fomoria) festivitatis*, male genitalia. 5-7, Holotype, slide 3812, focused from ventral to respectively more dorsal; 8, paratype, slide 3811.



Figs. 9-12. *Ectoedemia* (*Fomoria*) *festivitatis*, genitalia, details. 9, Holotype, slide 3812; 10, male paratype, vesica partly everted, slide 3811, 11-12, female paratype, slide 3816. Coloured numbers 1-3 denote the three large cornuti, the third spinose; ap = anal papillae; ca = cathrema; lc = lateral (or dorsolateral) carina; s = sclerite with forward-directed spines.



Figs. 13-17. *Ectoedemia* (*Fomoria*) *festivitatis*, leafmines, 13-16 in dried leaves. 13, two incomplete mines on *Hypericum beanii*, dead larvae and exit hole of parasitic wasp visible, China, Yunnan, Kunming, Qiongzhu Si; 14, incomplete mine on *Hypericum uralum*, final instar larva taken out, Nepal, Valley of Marsyandi: between Thangja and Chame; 15, 16, upper- and underside of completed, inflated mine, exit visible on underside (arrow), on *Hypericum hookerianum*; Vietnam (Lao Cai), Sapa, Ham Rong tourism area; 17, *Hypericum hookerianum* with several mines, Vietnam, Lao Cai, Hoang Lien Song, pass N of Phan Xi Pang, roadside, 30.x.2001. Scales 5 mm.

pronounced inner process in ventral plane; apex blunt. Transtilla with long transverse bar and relatively long sublateral processes. Aedeagus stout, with ventral pair of long, outward-curved carinae and dorsolateral pair of short, outward-curved carinae; vesica with groups of small blunt cornuti and two large cornuti near phallotrema, one straight, and one long curved, slightly sinuous, easily confused with carinae; a third one, proximal to the largest, a cone covered with small spines; cathrema conspicuous.

Measurements: capsule length 287-369 μm (327.5 ± 26.9 , 7), valva length 204-228 μm (214.3 ± 10.7 , 6), aedeagus length 253-387 μm (321.2 ± 45.5 , 7), ratio aedeagus/capsule 0.8-1.1 (0.98 ± 0.09 , 7).

Female genitalia.— Abdominal tip: T8 broad and narrow, without any setae, posterior margin straight, with prominent rounded corners; T9: anal papillae each with *ca* 14-19 setae. Apophyses subequal in length, anterior apophyses curved. Bursa elongate, vestibulum with a number of strong sclerites (fig. 12), anteriormost a wide transverse bar, anteriorly covered with forward-directed spines (not seen in one specimen, 3814); bursa completely covered with pectinations, particularly strongly developed in folded ductus bursae, signa long and narrow 3-5 cells wide; ductus spermathecae with 2 shallow convolutions, ending in distinct vesicle.

Measurements: total length bursa 630-1160 μm ($n = 3$), length of signa resp. 290-445 and 260-455 μm long ($n = 3$).



Fig. 18. Habitat of *Ectoedemia* (*Fomorina*) *festivitat*is in Vietnam (Lao Cai): Hoang Lien Song, pass N of Phan Xi Pang, 30.x.2001: secondary shrub vegetation with *Hypericum hookerianum*, *Pteridium aquilinum*, grasses, 1900 m.

Biology.— Food plants. Shrubby species of *Hypericum*, reared from *H. beanii* N. Robson (Yunnan), *H. henryi* H. Lév. & Vaniot subsp. *hancockii* N. Robson (Vietnam); *H. hookerianum* Wight & Arn. (Vietnam) and *H. uralum* Buch.-Ham. ex D. Don (Nepal). These species have often been mixed in the literature and are difficult to distinguish, a recent treatment is Li & Robson (2007) in the Flora of China. Vacated mines on *H. petiolulatum* Hook.f. & Thomson ex Dyer subsp. *yunnanense* (Franchet) N. Robson in Yunnan, syntopic with mines on *H. beanii*, may also have been made by *E. festivitatis*. A distinct mine, probably belonging to this species, is shown on a photograph of *H. oblongifolium* Choisy, taken in India, Himachal Pradesh (Polunin & Stainton, 1984: plate 19, 210).

Voltinism: Larvae were collected in July and from September to early November and adults emerged under laboratory conditions in August, October and from January to March. *E. festivitatis* is bivoltine or has possibly more generations.

Egg deposited on under side of leaf, always near midrib. Leaf mine: starts as a very long, sinuous and very narrow gallery, often following leaf margin, with black to brown linear frass, abruptly widening into a blotch with scattered brown frass, usually concentrated in centre, adhering to upper epidermis. Later mine swollen and larva spinning cocoon inside a prepared silken tunnel, which leads to an exit slit, which the larva makes prior to spinning its cocoon.

Larva: greenish white with dark brown head capsule; feeding inside mine with venter upwards.

Habitat: secondary or degraded forest or shrub vegetation, in mountainous area (fig. 18).

Distribution.— Sino-Himalayan region: Nepal, China: Yunnan and North Vietnam (Fan Si Pan only). Probably more widespread, occurrence in India suggested by above cited photograph.

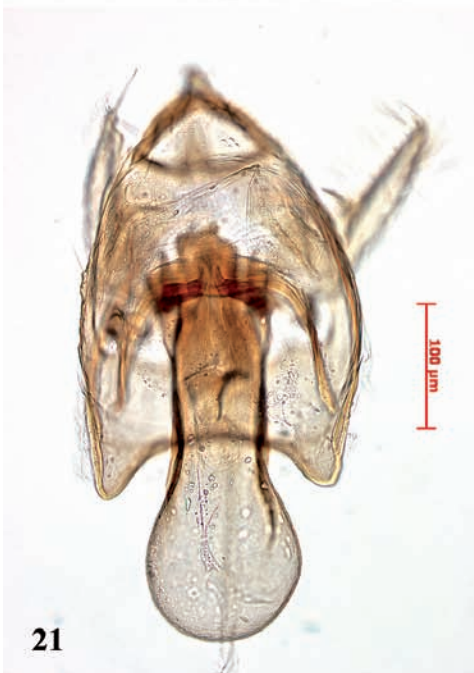
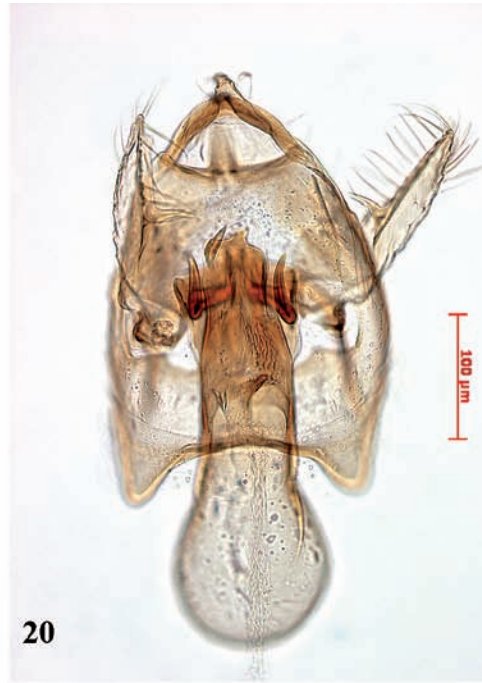
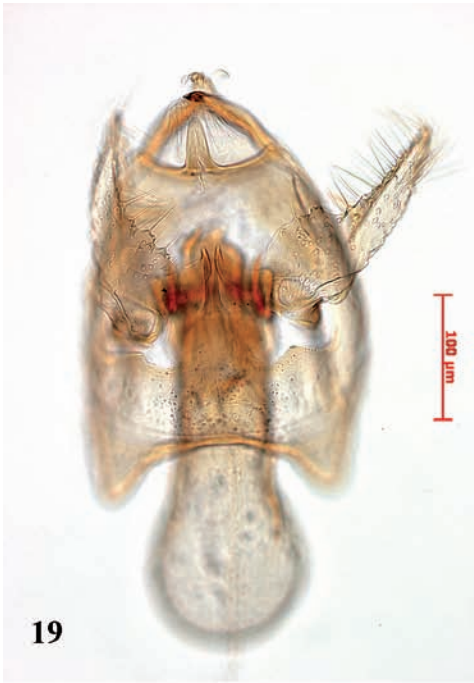
Remarks.— There is considerable variation in size. Males and females have approximately a similar number of antennal segments, which is quite unusual for Nepticulidae: usually males have significantly more segments. However, the ratio antennal segments / forewing length is on average slightly larger in males (18.8 ± 2.1 , $n = 12$, in females 16.9 ± 2.1 , $n = 13$). Also the valval shape shows some variation - the inner margin is sometimes triangularly tapering towards the middle process; in others the process is sharply demarcated from the inner margin.

The *Hypericum beanii* specimens from China were previously misidentified as *H. patulum*, this name can still be found on our labels, but labels with new identification of food plants are added. Also Vietnamese plants were initially misidentified, but these names have not been used on the labels or have been corrected.

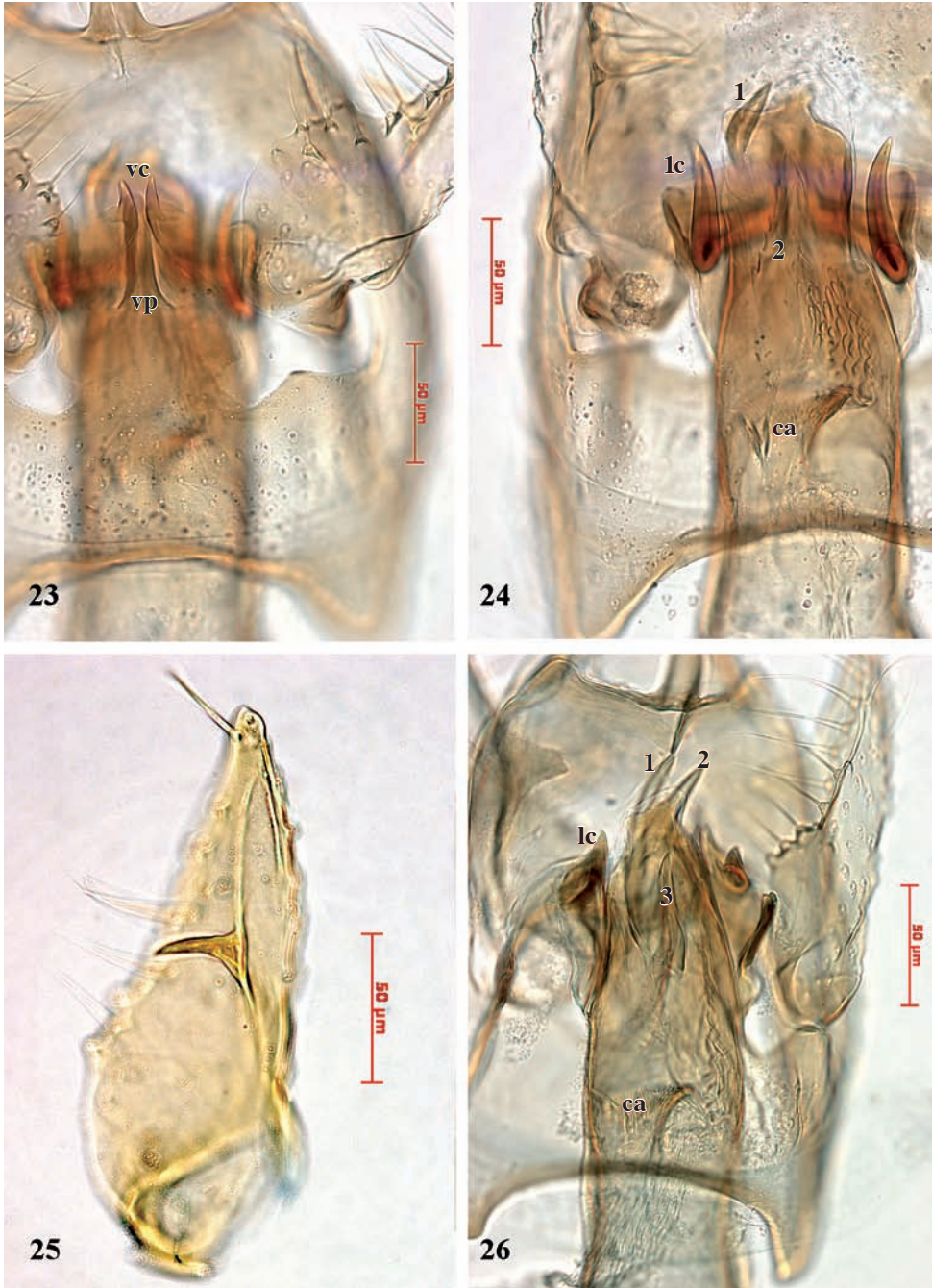
Etymology.— Dedicated to the 250th anniversary of the start of zoological literature on 1 January 1758. *Festivitatis*: a noun in genitive case, from *festivitas*, Latin for feast, celebration.

Ectoedemia (*Fomoria*) *degeeri* spec. nov.
(figs 19-21, 23-25, 28)

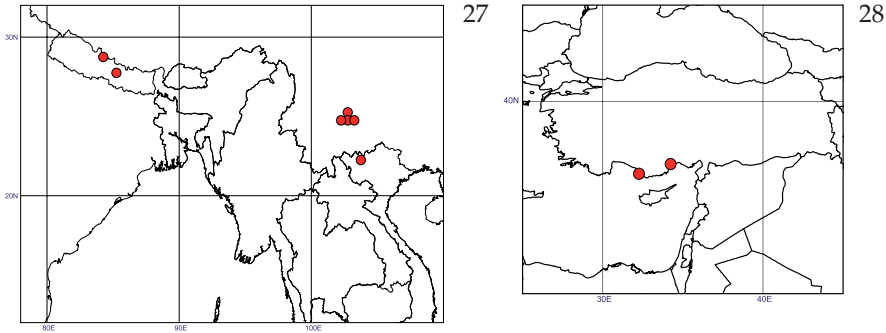
Type material.— Holotype ♂, "Turkey, [prov. Antalya]: Alanya, Mahmutlar [36.29.34N–32.05.57E], 100 m, 14.vi.2005, LF [at light], leg. W. Mey"; "Genitalia slide EvN 3692 ♂"; "DNA extracted from abdomen, Knölke protocol, E.J. van Nieuwerkerken 2006"; "RMNH INS 23692" [with printed barcode, number for extraction](NHMB).— Paratypes: 2 ♂, Turkey, Mersin, 5 km NW Erdemli [36.38N–34.21E], 200 m, 16.vii.1986, M. Fibiger, Genitalia slide EvN 3257 ♂ (ZMUC, RMNH).



Figs. 19-21. *Ectoedemia (Fomoria) degeeri*, holotype, male genitalia, slide 3692, focussed from ventral to respectively more dorsal; fig. 22, *E. deschkai*, slide 2912, Greece: Chios, Limnia, 5.ix.1996, R. Sutter (RMNH INS 22912).



Figs. 23-26. *Ectoedemia* (*Fomorina*) sp., details of male genitalia. 23-24, *E. degeeri*, holotype, 23 showing ventral process, 24, cornuti; 25, paratype, slide 3257, innerside valva with spinelike process; 26, *E. deschkai*, slide 2912, data see fig. 22. Coloured numbers 1-3 denote the three large cornuti, 2 in *degeeri* with serrated edge; ca = cathrema; lc = lateral (or dorsolateral) carina; vc = ventral carina; vp = ventral process.



Figs. 27-28. *Ectoedemia* (*Fomoria*) sp., distribution. 27, *E. festivitatis* in Southeast Asia; 28, *E. degeeri* in Turkey.

Diagnosis.— Rather nondescript nepticulid moth, with narrow tornal spot, and without any androconial scales. Can be externally confused with some *Ectoedemia* (s. str.) species. Most similar to *E. (Fomoria) deschkai* (figs 22, 26), with rather similar male genitalia: *E. degeeri* differs in possessing three pairs of carinae compared to two in *deschkai*, and *E. degeeri* has two large cornuti, one of which has a serrated edge; *E. deschkai* has three large cornuti, none with serrated edge. The valval spine is elongate spinelike in *E. degeeri* and triangular in *deschkai* (fig. 26).

Male.— Forewing length 1.8-2.4 mm (3), wingspan 4.1-5.2 mm. Head: frontal tuft orange; scape cream with scattered brown scales; collar yellow; antenna greyish brown, 39-43 segments (2). Thorax and forewing irrorate blackish brown with white, most scales with dark tips; an indistinct narrow tornal spot cream white; cilia line distinct; terminal cilia greyish white to grey; underside almost black. Hindwing and cilia grey; no androconial scales; costal bristles present. Abdomen grey, with very small grey anal tufts, abdominal tip tapering.

Female.— Unknown.

Male genitalia.— Vinculum with distinct anterior emargination; ventral plate posteriorly produced into narrow tongue-shaped juxta-like process or ventral process, tightly fused to ventral carinae. Tegumen forming distinctly pointed pseuduncus, as long as uncus. Uncus with inverted Y-shaped medial process. Gnathos with rather short central element, broadly shouldered laterally. Valva more or less triangular, with short spinelike process originating on dorsal surface, pointing inward. Transtilla with long transverse bar and long sublateral processes. Aedeagus long and narrow, with three pairs of carinae: a ventral pair slightly outward-curved, approaching in middle, a rather long dorsolateral pair, and a dorsal pair approaching in middle, all connected by sclerotized rim; vesica with groups of small blunt cornuti and one long curved cornutus near phallotrema and another rather large serrated cornutus, serrated margin at left side in ventral view.

Measurements: capsule length 292-293 μm (2), valva length 191-195 μm (2), aedeagus length 321-330 μm (2), ratio aedeagus/capsule 1.1.

Etymology.— *Degeeri*, a noun in genitive case, dedicated to Carl DeGeer, one of the first entomologists, known for his series "*Mémoires pour servir a l'histoire des insectes*", who influenced Linnaeus' insect classification and was first describer of nepticulid leaf-mines (DeGeer, 1752).

Discussion

The two new species fill a knowledge gap that existed between Greece / European Russia and Eastern Russia (Primorye). *Ectoedemia degeeri* extends the known range of this species group somewhat eastwards. More species of the *weaveri*-group may be expected in Turkey, which has been poorly sampled, yet has a very rich flora of *Hypericum* with 69 recorded species (Robson, 1968). It is to be expected that this group also occurs in the poorly investigated area between Turkey and Nepal, and that more species occur in China, where 64 species of *Hypericum* (Li & Robson, 2007) are known. The placement of *E. ruwenzoriensis* in this group, based on the genitalia apomorphies (1, 2 and 5, see below), confirms the presence of the *weaveri*-group in the East African mountains. The Canarian *E. variicapitella*, which is rather different from the other Palearctic species in the group, may also have an Afrotropical origin: the placement of the valval spine resembles that in *ruwenzoriensis*. No species have yet been found in the Neotropical region, although it is very well possible that members of the *weaveri*-group occur there as well, since several species of *Hypericum* grow there.

The phylogeny of the subgenus and the *weaveri*-group have been discussed by Hoare (2000), who suggested the following apomorphies:

1. lateral arms of gnathos straight, more or less horizontal;
2. lateral arms of vinculum strongly expanded medially and meeting anterior to gnathos;
3. host plant *Hypericum*;
4. pupation inside mine;
5. valva with sharp dorsal spine.

The new species share these characters, but *E. festivitat* possesses a different dorsal spine in that the spine unites with a process of the ventral valval surface. Considering its dorsal position (fig. 7), I believe it is very likely homologous. The hostplant character does not apply to the species *E. weaveri* and *E. pteliaeella*, but considering the close resemblance of both with a *Hypericum* feeding species (resp. *E. septembrella* and *E. hypericella*), a secondary hostshift is the most plausible explanation. For character 4 the same could apply, but since *H. variicapitella* is aberrant in several features, it is also possible that it is sister to all other species and thus the pupation character (4) could have evolved after that split.

Hoare (2000) also mentioned a possible member of this group from Australia. Because we have been able to rear this species, and a substantial adult and larval material is now available for study, the hope is to assess the taxonomic placement of this Australian nepticulid in a future paper.

Acknowledgements

I would like to thank all who accompanied me on the field trips to Asia: Kees van den Berg (Naturalis), Hans van Driel (formerly Free University, Amsterdam), Sjaak Koster (Naturalis) and our local counterparts in China: professor Liu You Qiao (Zoological Institute, Academia Sinica, Beijing) and in Vietnam: professor May Phu Quy (Institute of Ecology and Biological Resources, Hanoi), the many local interpreters, guides and porters, without whom this study would have been impossible. For the loan of speci-

mens I am indebted to Ole Karsholt (ZMUC), Tosio Kumata (EIHU), Wolfram Mey (NHMB) and Toshio Oku (Morioka, Japan). I am grateful to Dr Norman Robson (Natural History Museum London), for identifying the food plant vouchers on short notice. Kees van den Berg (Naturalis) and Kees Alders (formerly Free University, Amsterdam) assisted with rearing, mounting and labelling the material. Don Davis (Washington DC) and David Wagner (Storrs) are acknowledged for critical comments on an earlier version of this paper.

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Received: 12.xi.2007

Accepted: 22.xi.2007

Edited: J. van Tol