A TAXONOMIC REVISION OF THE WESTERN PALAEARCTIC SPECIES OF THE SUBGENERA *ZIMMERMANNIA* HERING AND *ECTOEDEMIA* BUSCK S.STR. (LEPIDOPTERA, NEPTICULIDAE), WITH NOTES ON THEIR PHYLOGENY

by

ERIK J. VAN NIEUKERKEN

Department of Animal Systematics and Zoogeography, Vrije Universiteit, Amsterdam, Netherlands

ABSTRACT

The subgenera *Zimmermannia* Hering and *Ectoedemia* s.str., together forming the genus *Ectoedemia* Busck sensu Wilkinson & Newton (1981) are described and redefined, and the Western Palaearctic species are revised. In total 50 species are recognised, including the new species *hispanica, monemvasiae, nuristanica* in *Zimmermannia* and *andalusiae, algeriensis, leucothorax, alnifoliae, contorta* and two unnamed species in *Ectoedemia* s.str.

Fifteen new synonymies and ten new combinations are established and 42 lectotypes are designated. Primary types have been examined in many cases. Data on larvae and biology are included and keys to all species are provided.

The monophyly and the sister group relationships of both subgenera are demonstrated. The subgenus *Ectoedemia* can be divided into the *populella* group, *suberis* group, *subbimaculella* group and *occultella* group, being monophyletic entities, and the possibly paraphyletic *angulifasciella* group. Two alternative hypotheses of the phylogeny within *Ectoedemia* s.str. are presented.

Decisions on species discrimination have in many cases been corroborated by study of allozymes.

CONTENTS

INTRODUCTION

The present revision deals with the 50 Western Palaearctic species of *Ectoedemia* Busck, 1907, here assigned to the subgenera *Zimmermannia* Hering and *Ectoedemia* s.str. These two form the genus *Ectoedemia* in the sense of Wilkinson & Scoble (1979) and Wilkinson & Newton (1981). The concept of *Ectoedemia* was recently enlarged by Scoble (1983) to contain the subgenera *Fomoria* Beirne and *Laqueus* Scoble, and one more subgenus will be included in a forthcoming generic revision of Holarctic Nepticulidae (Van Nieukerken, in preparation). An up-to-date survey of the Western Palaearctic species assigned to the subgenera of *Ectoedemia* not treated here, will be presented by Van Nieukerken (in press).

Throughout this work the name *Ectoedemia* alone is reserved for the combination of the two

subgenera treated here, *Ectoedemia* s.str. is the typical subgenus and *Ectoedemia* s.l. is the enlarged genus in the concept of Van Nieukerken (in press).

For a taxonomic history of the genus and description of the Nearctic species refer to Wilkinson & Scoble (1979) and Wilkinson & Newton (1981). The three South-African species have been described by Scoble (1978, 1979).

A complete revision of the known *Ectoedemia* species in the Western Palaearctic region has not been carried out previously. The last author reviewing all European species was Meess (1910) who assigned most species to *Nepticula* Heyden (= *Stigmella* Schrank). Of the 138 species in his work only 19 belong to *Ectoedemia* in the present sense, of which 15 are here recognised as good species, hence the number of species has since been more than tripled.

In Europe Petersen (1930) figured the male genitalia of some nepticulid species for the first time, but retained them in the large genus *Nepticula*. Beirne (1945), who divided the Nepticulidae into several genera on the basis of the male genitalia of the British species, erected the genus *Dechtiria* for the leafmining species here assigned to *Ectoedemia* s.str.

Hering (1940) erected *Zimmermannia* as a genus for the barkminers, but most European authors placed them in *Ectoedemia*, following Busck, as did Klimesch (1953) in his revision of the four known European species.

Svensson (1966) was the first to discover the similarity between *Ectoedemia* and *Dechtiria* and hence synonymised both. This was followed by Borkowski (1972) and Emmet (1976) in their local fauna works. These authors recognised *Dechtiria* and *Zimmermannia* as separate subgenera, but Wilkinson & Newton (1981) treated them as synonyms of *Ectoedemia*. *Zimmermannia* is here re-established as subgenus for reasons to be discussed.

Apart from the four species treated by Klimesch (1953), no part of the genus has been completely revised and published in Europe previously.

Most species described since Meess (1910) were assigned originally to *Nepticula* or *Stigmella*, but several have in recent years been recombined with *Ectoedemia* or *Trifurcula* s.l., although frequently only in faunistic lists, without any comments. Most names given to European nepticulid species have been assigned to their correct genus in my checklist (Van Nieukerken, in press), but a few doubtful names still exist. Two are treated at the end of this paper.

For those species, likely to be included in *Ectoedemia*, primary types were studied as far as possible. A few old types were either not available during this study or could not be traced. In most cases however, there has been enough proof of their status. For some recently described species, no types have been studied, because detailed description and figures of genitalia made it unnecessary. A large wealth of material from several museums, private collections and our own collection has been studied and resulted in the discovery of eight undescribed species, and much new distribution data.

However, knowledge of *Ectoedemia* species in the Mediterranean region and Middle East is still poor and based on scanty data, as can be inferred from the distribution maps. For instance none of the autumn-feeding species of the *angulifasciella* group are recorded from Spain, probably because autumn-mines have not yet been collected.

For all species, including those recently described, complete (re)descriptions are provided. For most species the female genitalia are described here for the first time. These often appear to give better diagnostic characters than the male genitalia in this genus.

Because of limitations in time and space, I have refrained from giving detailed descriptions of larvae, although much material was available. However, it is hoped that a full treatment of the larvae can be made later.

Concise biological data have been provided, based on own observations, unless otherwise stated.

A discussion of the phylogeny of the genus, using cladistic methods, concludes this revision.

METHODS

Preparation of genitalia

Genitalia slides were prepared following Robinson (1976), but adapted slightly for the Nepticulidae. The abdomens were macerated in 10% KOH heated in a waterbath of 90 °C for 10—15 minutes. After preliminary rinsing and cleaning they were stored overnight in ethanol 70%. Cleaning appeared to be much easier after treatment with ethanol and there were no disadvantages. Cleaning and removal of scales was carried out with a snipe-feather primary or a pointed piece of stiff paper. For dissecting minute-pins were mounted in handles.

Male genitalia were usually stained red with haemaluin and females either with haemaluin or chlorazol black E.

Dissecting was usually done in glycerin to prevent floating. Male genitalia were removed from the abdomen, the aedeagus was taken out in some specimens of each species, by perforating the membranes holding it to the valvae and capsule; in *Ectoedemia* this is often difficult because of the tight connections to the aedeagal carinae. It is therefore advisable not to remove the aedeagus from all specimens, otherwise their in-situ connections can not be studied. Hooking out the vesica is possible in the larger species, but usually impracticable in smaller ones. Female genitalia were removed by separating segment 7 to 9 with the internal genitalia from the abdomen. Before mounting, genitalia were examined in glycerin in order to study their three-dimensional structure and to make figures in various aspects.

After dehydration the genitalia were embedded in euparal, and arranged in their desired position. The euparal was placed in a thin layer so that the parts could not move and the slide was then dried in an oven overnight. Thereafter a small drop of euparal was added and the coverslip positioned with, if necessary, euparal essence. This method prevents the parts from becoming displaced and disorientated. Care must however be taken not to damage protruding parts such as the gnathos or uncus with the coverslip. Male genitalia were mounted ventral side up, female genitalia either with ventral or dorsal side. In order to study the female postabdomen embedding with dorsal side up is most desirable.

In the above described method the genitalia are not squashed, which has a disadvantage in that focussing for photography is difficult, but this is outweighed by the disadvantage of distortion by squashing. It has unfortunately proved to be virtually impossible to unroll the male genitalia in the way practiced for Incurvarioidea (see Nielsen, 1980), because of the strongly sclerotised capsule, the tightly fused valvae, and the small size of the genitalia.

Figures

Drawings of genitalia were made with a Zeiss universal microscope and camera lucida attachment both from permanent slides and genitalia in glycerin. Dorsal aspects of valvae were drawn from ventrally mounted specimens, thus representing in fact a mirror image of the right valva as seen through the valva. From the transtilla only one half is figured. Setae are often represented in drawings by their sockets only because they are often broken in slides. In the figures of aedeagi in *Ectoedemia* s.str. the vesica is omitted.

The practice of illustrating complete genitalia in taxonomic papers on Lepidoptera is not followed, since such figures are usually too complicated to show the diagnostic features unambiguously. Therefore the most characteristic parts of the genitalia are separately figured and presented in a comparative way. However, to give an overall impression of the genitalia, photographs are also provided. These were prepared with a Zeiss universal photo-microscope, using bright-field contrast.

SEM micrographs were taken with an ISI 40 Scanning electron microscope, using a beam current of 10kV. Specimens were air-dried, mounted on stubs and gold-coated.

Adults were photographed with a Zeiss Tessovar camera, using black velvet as background, and concealed lighting, thus reducing reflections to a minimum. Photographs of mines in dried leaves were taken with a reproduction camera and transmitted light.

Measurements

Forewing length was measured only when flat from wing base to tip of fringe, using an ocular-micrometer in a Wild M5 stereomicroscope at a magnification of 25. Forewing length is preferred to the less accurate wingspan measurement, but for reasons of comparability with other authors the latter figure is added too.

Genitalia were measured using a Zeiss universal research microscope with ocular-micrometer, either with objective 6.3 × (bursa length and signa if very long) or 16 × (other measurements). Capsule length was measured along mid-line from tip of tegumen to anterior margin of ventral plate of vinculum, exactly in middle of anterior concavity, thus excluding lateral projections of vinculum. Valva length was measured from tip to anteriormost extension of ventral surface, thus excluding the transtilla. Aedeagus length was measured including carinal processes.

The bursa length could only be measured very roughly, approximately from point of entrance of ductus spermathecae to anterior tip. Measurements of signa are self-evident.

From all species measurement range is given first, followed by mean, standard deviation and sample-size in brackets.

Mean and standard deviations are only calculated for a sample-size of five and larger. An individual of extreme size falling far outside the normal range is given in brackets. Wing measurements of extremely small specimens, probably caused by food-shortage, are excluded. Not too much statistical significance should be given to these figures, because the samples were not selected statistically, and sometimes individuals only belong to one population.

Material

A considerable part of the adult material was reared in our laboratory, and will be mainly transferred to the collection of ZMA, however some specimens will be distributed to other museums. In addition material of many collections, listed below, has been examined. The material is listed at the end of each description in alphabetical order of localities, arranged in an alphabetical list of countries. When a number of consecutive data in one country is based on material from one collection, the abbreviation of this collection is only given at the end of these data. Primary types, cited under the species headings are included in material examined again, when actually studied.

Locality names are spelled as far as possible according to The Times Atlas of the World (Comprehensive Edition, 1975), a deviating name on a label is given in brackets.

A particular problem form the locality-names on the labels of C. Chrétien, who often used abbreviations of small hamlets or local names, which can not even be traced on topographical maps. By courtesy of G. Luquet, who prepared a list of Départements visited by Chrétien in various years, it has been possible to locate some of these obscure places. «Antarv.» has not been traced, but the collecting dates suggest that this is near Digne. «Nesp.» is an abbreviation of Nespouls, but most likely not of the village of that name in Corrèze. From a combination with "Artén." (= montagne d'Arténac) and the collecting year on certain labels it is inferred to be probably near St. Pons (Hérault).

Countries are used with their present-day political boundaries, but for convenience East-Germany comprises here both the German Democratic Republic and Berlin.

Distribution maps are prepared on the base of material examined and reliable literature records. When a certain literature record was far beyond the known range, and its correctness could not otherwise be proved it has been excluded. Many additonal data were received by courtesy of R. Buvat, R. Johansson, O. Karsholt, J. Klimesch, J. Kyrki and S. E. Whitebread. A list of literature used in compiling the maps wil be given later.

The data on biology are for a considerable part based on own observations, supplemented by literature data. Unless otherwise stated, mines have been collected between 1978 and 1984 by me or my colleagues or students, chiefly C. J. M. Alders, J. J. Boomsma, G. Bryan, B. J. van Cronenburg, H. van Driel, S. B. J. Menken, J. W. Schoorl, and stored in our collection. Larvae have been examined living, and are partly also stored in alcohol in our collection.

Nomenclature of hostplants follows Tutin et al. (1964, 1968). Some abbreviations used are: a.l. = at light, e.l. = ex larva, S = sternite, T = tergite.

List of collections from which material has been studied

Institutions and Museums: BMNH, British Museum (Natural History), London, U.K.; ETHZ, Eidgenössische Technische Hochschule, Entomologisches Institut, Zürich, Switzerland; IPAK, Institute of the Polish Academy of Sciences, Krakow, Poland; IRSN, Institute Royal des Sciences naturelles, Bruxelles, Belgium; LNK, Landessammlungen für Naturkunde, Karlsruhe, West Germany; MCST, Museo Civico di Storia Naturale, Terrasini, Italy; MHUB, Museum für Naturkunde der Humboldt-Universität, Berlin, East Germany; MNHN, Muséum national d'Histoire naturelle, Paris, France; MRST, Museo Regionale di Scienze Naturali, Torino, Italy; NMW, Naturhistorisches Museum, Wien, Austria; RMNH, Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands; RMS, Riksmuseum Stockholm, Sweden; SMNS, Staatliches Museum für Naturkunde, Stuttgart, West Germany; TMAB, Természettudományi Múzeum, Állatára, Budapest, Hungary; UMZC, University Museum of Zoology, Cambridge, U.K.; USNM, United States Natural History Museum, Smithsonian Institution, Washington D.C., U.S.A.; ZIAS, Zoological Institute, Academy of Sciences, Leningrad, USSR; ZMA, Instituut voor Taxonomische Zoologie (Zoologisch Museum), Amsterdam, Netherlands; ZMC, Zoologisk Museum, Universitet, København, Denmark;

ZSM, Zoologische Staatssammlung, München, West Germany; ZSMK, idem, collection Klimesch, Linz, Austria.

Private collections: AFW, coll. Van Frankenhuyzen, Wageningen, Netherlands; coll. Buvat, Marseille, France; coll. Derra, Bamberg, West Germany; ETO, coll. Traugott-Olsen, Marbella, Spain; EvN, coll. Van Nieukerken, Leiden, Netherlands; coll. Gielis, Lexmond, Netherlands; coll. Huisman, Melissant, Netherlands; coll. Johansson, Växjö, Sweden; coll. Koster, Callantsoog, Netherlands; coll. Kuchlein, Wageningen, Netherlands; coll. Leraut, Paris, France; coll. Speidel, Karlsruhe, West Germany; coll. Wolschrijn, Apeldoorn, Netherlands.

MORPHOLOGY

The following discussion is mainly intended to review those characteristics which are important for understanding the phylogeny of *Ectoedemia* and those which are useful as diagnostic features. Exhaustive treatments of the adult morphology of *Ectoedemia* and the Nepticulidae are given by Scoble (1979 and 1983), and of the larval morphology by Gustafsson (1981a) and Van Nieukerken & Jansen (in preparation). Schönherr (1958) provides an excellent monograph of the species *E. liebwerdella*.

Head (fig. 15).

The piliform scales on frons and vertex are collectively treated as the frontal tuft, the colour of which is often diagnostic, although some local and geographical variation occurs in several species. In *Ectoedemia* the collar is invariably composed of piliform scales, in contrast to *Stigmella* where the scales are lamellar. Its colour is often different from the frontal tuft. The term collar, although descriptive, might be misleading, since these groups of scales, inserted posterior of the eyes, are not homologous with the collar of higher Ditrysia, which is a prothoracic structure.

The number of antennal segments has some diagnostic value, although it varies within a species and sex, males have always more segments than females of the same species. There is also a positive correlation between individual size and number of antennal segments. Scape and pedicel are usually paler than the flagel, except in *E. intimella*. For a detailed description of antennal morphology see Van Nieukerken & Dop (in preparation).

The mouthparts of the species treated do not show diagnostic features. The eyes show the typical lepidopteran corneal nipple array pattern (fig. 16) (Davis, 1978).

Thorax and wings.

The thorax itself does not present many characteristics, the colour of the scales on mesoscutum and tegulae is sometimes diagnostic, but in many species it is concolorous with the forewings.

The colour-pattern and colour of the forewings is one of the most remarkable diagnostic features, although it is only useful in undamaged specimens, and many closely related species have the same or a similar colour-pattern.

Most species of *Ectoedemia* s.str. have white wing markings, often in the form of a medial fascia, or opposite costal and dorsal spots. In addition basal and discal spots may occur. It is often difficult to distinguish between metallic and non-metallic fasciae and spots. Comparisons should therefore be made with species in which this state is known. Several species, especially in *Zimmermannia*, have the forewings uniformly ochreous irrorate with brown, fuscous or similar tinges. In all but a few species the cilia are light and separated from the darker part of the forewing by a line formed by the tips of the last row of lamellar scales, this line is termed here the cilia-line. The scaling of the forewing is invariably rough, the scales (figs. 25, 26) are of the normal advanced lepidopteran type (Kristensen, 1970; Davis, 1978).

The hindwing of the males frequently possesses diagnostic secondary sexual characters. A frenulum is always present, in additon several species mining *Quercus* have a row of costal bristles. Most other species however bear a brush of hair-scales instead, arising near the frenulum, which is believed to be homologous with the costal bristles. Following Scoble (1983) it is named here hair-pencil. In rest it is laid parallel to the main-axis of the hindwing, in a shallow groove, which is especially prominent in several *E. (Zimmermannia)* species (figs. 10—14, 21—24). The hair-pencil can be spread out, and probably plays an important role in courtship, as Schönherr (1958) has shown for *E. liebwerdella* (see his figs. 26 and 41). The hair-pencil is often surrounded by lamellar scales which are differently coloured from the rest of the hindwing, these scales are referred to as special or androconial scales (figs. 18—20). The fine structure differs from the normal wing scales. In some species they occupy almost the

complete dorsal surface of the hindwing, as in *terebinthivora* or *heringella* (figs. 53, 62). Colour of these scales and the hair-pencil is very diagnostic. In *E. (Zimmermannia)* and to a lesser extent in some other species, the shape of the hindwing is influenced by the presence of the hair-pencil: the costal margin is abruptedly emarginated and curved inwards beyond the pencil and there is often a prominent humeral lobe (figs. 8, 10—19).

In several species the males possess in addition to the hindwing characteristics, specialisations on the underside of the forewing, such as a patch of differently coloured, androconial scales (figs. 63, 86). Species with a hair-pencil often have a scaleless area on the forewing under surface, probably in rest contacting the hair-pencil.

Females always bear a row of costal bristles, and lack any additional sexual characters.

The venation of *Ectoedemia* (figs. 8, 9) is very uniform, with only slight non-diagnostic variation in length and tracheation of some veins. The venation is essentially similar to that in the taxa *Fomoria* Beirne and *Etainia* Beirne.

Abdomen.

The scaling of the abdomen is uniform, and although there is some interspecific variation, the colour has not been found to be diagnostic. The anterior part of sternite 2 (see Kristensen & Nielsen, 1980) has a triangular shape. The male bears a pair of anal tufts on tergite 8. The external shape of the female ovipositor is sometimes diagnostic, especially when it is pointed, such as in *E. turbidella* or *agrimoniae*.

Male genitalia (figs. 3, 4, 27, 28).

The male genitalia of the species under study show a remarkable uniformity when compared to other nepticulid genera, in several cases they do not even provide characters to distinguish between species.

It must be stressed here that slight differences which apear from the illustrations often depend on the way of mounting the slides. A slight deviation from the ventral view can change the shape of the vinculum for instance, and since most structures are hinged by membranes to each other, mutual changes in position occur easily. This is especially the case with the gnathos. It is therefore advisable to study the genitalia in fluid (glycerin) before mounting permanently, and squashing should be avoided.

The vinculum forms a complete strongly sclerotised ring and is invisibly fused with the tegumen; together they are termed the capsule. The ventral plate of the vinculum is always short, and slightly concave anteriorly; the ventral plate can be divided by the ring, formed by the attachment to segment 8, in an anterior part, which is situated within the abdomen, and a posterior part, covered with scales. The anterior part has in the past erroneously been referred to as the saccus (Beirne, 1945; Wilkinson & Newton, 1981).

The tegumen is posteriorly produced into a pseuduncus, which can be approximately triangular, rounded, truncate or pointed. It is covered with many tactile hairs and scales.

The uncus is absent, it has been believed (cf Beirne, 1945) that it is membranous, but the membranous structure which is present between gnathos and tegumen is in my opinion formed by the anal tube only.

The gnathos is strongly sclerotised, and essentially composed of two lateral arms and a more ventral central element, which projects posteriorly and is more or less tongue-shaped. The form of the central element is highly diagnostic, but it must be viewed at the correct angle. In several species of *Ectoedemia* s.str. the central element is in fact divided in two parts: a basal ventral part, fused to the lateral arms and distally ending with a serrate margin, and a more distal, tongue-shaped element which is inserted dorsal to the basal part and connected by less sclerotised tissue. In lateral view the division is clearly seen, but in ventral view this is less obvious. The lateral arms of the gnathos are hinged by membranes to the lateral arms of the vinculum.

The valva is roughly triangular in ventral view, with an often inwardly directed tip. It is essentially a hollow sac, which is open at the anterior end. On the ventral and outer (lateral) surface, the valva is covered with many setae and scales, whilst the inner and dorsal surfaces bear comparatively few setae, which however become more abundant towards the tip. Although it has been the practice in Nepticulidae to illustrate only the ventral surface of the valva, the dorsal surface offers more diagnostic detail and so is here illustrated as seen through ventrally mounted genitalia — thus viewing through the valva. Therefore it has not been necessary to spread or remove the valva. Ventrally the valvae are hinged to each other and the vinculum by membranes, dorsally they are tightly fused by the transtillae, which are considered to be a part of the valvae. In *Ectoedemia*

the transtillae always possess a well sclerotised horizontal bar and ventral arms. The length of the ventral arms varies within the species and therefore has a limited diagnostic value.

The aedeagus bears apically paired carinae, except in *E. spiraeae*. These have been incorrectly referred to as the juxta by Beirne (1945), see also Scoble (1983) for a discussion of aedeagal structures. Most *Ectoedemia* s.str. species have one pair of ventral carinae only, they are usually pointed and often divided in two or more processes. Additional spines occur in some species near the base of the carinae (fig. 28). Some species have a dorsolateral pair of carinae in addition, and most *E. (Zimmermannia)* species possess three pairs of carinae. The ventral carinae are hinged by a slightly sclerotised ventral process to the vinculum and by membranes to the valvae. Although the ventral process is always present, it has not been illustrated here in all species. Dorsal and lateral carinae are hinged by membranes to the valvae and transtilla. In *E. (Zimmermannia)* the large ventral carinae are tightly connected with the valvae, which have a fold on the inner surface in which the carinae fit. Probably for this reason the carinae in this group have sometimes been misinterpreted as parts of the valva. The membranes fusing the aedeagus to the rest of the genitalia tolerate only a small posterior movement of the aedeagus, hence in the everted position the carinae are folded back.

The aedeagus is often slightly asymmetric, such that it is longer at the right side, and often the two carinae of one pair differ slightly. An exceptional case is *klimeschi*, which has a highly asymmetrical aedeagus. The ejaculatory duct enters the aedeagus through an approximately circular opening on the ventral side, below the middle. Posterior to this opening a group of microsetae (setal pores) can be observed. The vesica is typically covered with numerous small spine-like cornuti, and only occasionally additional larger spines and other sclerotisations occur.

Female genitalia (figs. 6, 7, 30—34).

The female genitalia of Nepticulidae have been paid much less attention to than those of the male, since they were often thought of lesser diagnostic value. In fact in *Ectoedemia* they often provide better characteristics than the male genitalia. However, the weak sclerotisation and the greater individual variation — compared with males — make study and interpretation more difficult. Several structures, which have not been used before, are found in this study to have high diagnostic value.

The only earlier complete and correct interpretation of the terminal segments is that of Dugdale (1974), see also the comments in Van Nieukerken (1983). Segment 7 is the last complete and more or less unmodified segment, which ventrally reaches the tip of the abdomen. The tip of sternite 7 is covered with many setae, probably mostly tactile. Dorsally tergite 7 encircles segments 8 and 9. Segment 8 comprises a distinct tergite, which is often approximately rectangular, and the complex anterior apophyses. They are dorsally united by tergite 8 and posteriorly by a semi-circular or angular, sclerotised bar, which is interpreted as sternite 8. The latter is covered by a membrane bearing many minute spines (fig. 30) and forms usually the tip of the abdomen and "ovipositor".

It is not completely clear if the integument covering tergite 8 belongs to that segment or is formed by segment 7, the latter possibility is suggested by the fact that the border between tergites 7 and 8 is often not clear. For practical reasons, however, setae and scales which in dorsal view appear to occur on tergite 8 are described as belonging to that segment. The posterior part of tergites 7 and 8 bear several sensory structures. Principally there are two lateral patches of scales and setae on tergite 8, and often some setae on tergite 7 as well, which is further covered with scales. In several species the scales on 8 are reduced and the number and size of setae increased, often forming distinct patterns or rows. Especially in species mining bark and evergreen *Quercus* there are large groups of long setae on these segments (figs. 31—34), which probably function in localising suitable oviposition sites. It is not clear if these setae are all mechanoreceptors only, or if these are partly chemoreceptors as well. In *E. caradjai* and *E. monemvasiae* the long setae are pectinate (fig. 32), in other species examined they are smooth. Segment 9 comprises a distinct tergite, often partly covered by tergite 8, with two distinct patches of setae (anal papillae) and the posterior apophyses. These end in indistinctly sclerotised internal structures, which probably have a function in opening and closing the genital and anal openings. The region near tergite 9 is difficult to interpret since many membranous structures occur, it is therefore not clear if there is underneath the anal opening a structure which can be considered to be sternite 9.

The enlarged portion of the vagina is referred to as the vestibulum, this part has earlier been regarded as part of the ductus bursae (Scoble, 1983) and sometimes termed colliculum (Wilkinson & Scoble, 1979; Wilkinson & Newton, 1981). Here the term ductus bursae is reserved for the narrowed part anterior of the entrance of the ductus spermathecae.

The vestibulum bears in *E. (Zimmermannia)* some indistinct sclerotisations and in most *Ectoedemia* s.str. species a ring-shaped sclerite (fig. 419), which in analogy to the Eriocraniidae (Davis, 1978) is termed vaginal sclerite. In addition to this sclerite the vestibulum has dorsally an evaginated pouch which often bears many spicules (fig. 420). At the transition of the vestibulum and the ductus bursae there is often a patch of very closely packed pectinations, similar to those on the corpus bursae. The corpus bursae is typically covered with many of such pectinations, combs of small denticles, and a pair of reticulate signa. The cells of the signa are also covered by small denticles. Shape and size of the signa is often diagnostic, but there is considerable intraspecific variation. The ductus spermathecae comprises a strongly sclerotised internal canal, ending in a sclerotised vesicle, and a membranous external canal, both canals are spiraled. The number of convolutions of the spermathecal duct appears to be fairly constant within a species, and has therefore high diagnostic value. The most common condition is 2½—3 convolutions, but as many as 14 convolutions have been found. In counting the convolutions the vesicle must be excluded. A distinct spermathecal papilla is absent.

TAXONOMIC TREATMENT

Ectoedemia Busck, 1907 (subgenera **Zimmermannia** Hering and **Ectoedemia** s.str.)

Diagnosis.

The following combination of characters is diagnostic:

1. Collar comprising piliform scales.
2. Cilia-line usually distinct (except *occultella*-group).
3. Forewing with closed cel between R and M+Cu.
4. Hindwing with two-branched Rs+M.
5. Antenna with sensillum vesiculocladum reduced into an unbranched blisterlike structure (Van Nieukerken & Dop, in preparation).
6. In ♀ only 1 sensillum vesiculocladum per segment (Van Nieukerken & Dop, in preparation).
7. Uncus absent.

Stigmella species are easily separated by the collar with lamellar scales and the different venation and genitalia. *Acalyptris* (= *Niepeltia*) species can be separated by the almost straight R+M vein in the forewing, and the reduced closed cell, shifted towards the base. Externally *Acalyptris* species in Europe are not likely to be confused with *Ectoedemia* because they have different colour patterns. Only *A. minimella* (Rebel) resembles somewhat *E. gilvipennella* or *E. nigrosparsella*, but it is more yellow and has a yellow hair-pencil. *Trifurcula* species can always be recognised by the three branched condition of the Rs+M in the hindwing. In addition males can always be recognized by the three pairs of anal tufts and the "velvet patch" on the underside of the hindwing. For *Parafomoria* see Van Nieukerken (1983). European *Ectoedemia (Etainia)* species have two fasciae, and the males possess a long dorsal apodeme on the valvae (see Scoble, 1983). *Bohemannia* species can be separated by the absence of a closed cell in forewing and the presence of an uncus. *Ectoedemia (Fomoria)* and *E. (Laqueus)* are externally not separable from the subgenera treated here. They both possess an uncus, and have generally a different form of genitalia (Scoble, 1983). In addition *E. (Laqueus)* has an anal loop in the forewing.

Taxonomy.

Two subgenera are recognised here, viz. *Zimmermannia* Hering and *Ectoedemia* s.str. This division is re-established here, because both groups are characterised by many more apomorphies than they share, they have very different biologies, and species can easily be recognised as belonging to one of the subgenera. *Ectoedemia* s.str. can also be subdivided further, but then much fewer characters are available and monophyly is not easily demonstrated. These groups are merely treated as species-groups without formal taxonomic status. See further section on phylogeny.

CHECKLIST OF SPECIES TREATED

Ectoedemia Busck

Subgenus *Zimmermannia* Hering

1. *atrifrontella* (Stainton)
2. *liebwerdella* Zimmermann
3. *longicaudella* Klimesch
   peiuii (Nemeş) syn. n.

4. *hispanica* sp. n.
5. *monemvasiae* sp. n.
6 *amani* Svensson
7. *nuristanica* sp. n.
8. *liguricella* Klimesch

Subgenus *Ectoedemia* Busck
Dechtiria Beirne

populella group
9. *intimella* (Zeller)
10. *hannoverella* (Glitz)
11. *turbidella* (Zeller)
populialbae (Hering)
12. *klimeschi* (Skala)
niculescui (Nemeş) syn. n.
13. *argyropeza* (Zeller)
simplicella (Heinemann) syn. n.

preisseckeri group
14. *preisseckeri* (Klimesch)

suberis group
15. *caradjai* (Groschke)
16. spec. (specimen 1843)
17. *suberis* (Stainton) comb. n.
viridella (Mendes) syn. n.
18. *andalusiae* sp. n.
19. *aegilopidella* (Klimesch) comb. n.

subbimaculella group
20. *quinquella* (Bedell)
21. *algeriensis* sp. n.
22. *gilvipennella* (Klimesch) comb. n.
23. *leucothorax* sp. n.
24. *haraldi* (Soffner)
25. *ilicis* (Mendes) comb. n.
26. *heringella* (Mariani) comb. n.
27. *alnifoliae* sp. n.
28. *nigrosparsella* (Klimesch)
albifasciella complex (29—32)
29. *albifasciella* (Heinemann)
30. *cerris* (Zimmermann)
montissancti (Skala) syn. n.
31. *pubescivora* (Weber) comb. n.
32. *contorta* sp. n.
subbimaculella complex (33—36)
33. *subbimaculella* (Haworth)
nigrociliella (Stephens) syn. n.
34. *heringi* (Toll)
quercifoliae (Toll)
sativella (Klimesch) syn. n.
zimmermanni (Hering) syn. n.
35. *liechtensteini* (Zimmermann)
36. *phyllotomella* (Klimesch) comb. n.
37. spec. (specimen 1375)

terebinthivora group
38. *terebinthivora* (Klimesch) comb. n.

"*angulifasciella* group"
39. *erythrogenella* (Joannis)
40. *spiraeae* Gregor & Povolný
41. *agrimoniae* (Frey)
42. *hexapetalae* (Szőcs) comb. n.
angulifasciella complex (43—46)
43. *angulifasciella* (Stainton)
schleichiella (Frey) syn. n.
utensis (Weber) syn. n.
minorella (Zimmermann) syn. n.
? *brunniella* (Sauber)
44. *atricollis* (Stainton)
aterrima (Wocke)
staphyleae (Zimmermann) syn. n.
45. *arcuatella* (Herrich-Schäffer)
46. *rubivora* (Wocke)
47. *spinosella* (Joannis)
48. *mahalebella* (Klimesch)

occultella group
49. *occultella* (Linnaeus)
strigilella (Thunberg)
? *mucidella* (Hübner)
mediofasciella (Haworth) syn. n.
argentipedella (Zeller)
50. *minimella* (Zetterstedt) comb. n.
mediofasciella auct. nec Haworth
woolhopiella (Stainton) syn. n.
viridicola (Weber) syn. n.

KEYS TO THE WESTERN PALAEARCTIC SPECIES OF *ECTOEDEMIA* SUBGENERA *ZIMMERMANNIA* AND *ECTOEDEMIA* S.STR.

Based mainly on external characters[1])

1. Forewings without distinct colour-pattern, irrorate or unicolorous, with at most inconspicuous group of white scales at tornus . . 2
— Forewings with distinct white spot(s) or fascia 12
2. Frontal tuft dark fuscous brown to black 3
— Frontal tuft yellowish or orange, sometimes mixed with fuscous 8
3. Thorax dorsally white with darker tips on

[1]) Two species mentioned in the text, but still undescribed have been excluded.

mesoscutum and tegulae. ♂ with white hair-pencil ..... 1. *atrifrontella*
— Thorax dorsally brown with at most white tips on mesoscutum and tegulae..... 4
4. ♂ hindwing without hair-pencil or costal emargination. ♀ with large patch of long tactile hairs on T7, extending almost to anterior margin. Occurring in Afghanistan ... . 7. *nuristanica*
— ♂ hindwing with hair-pencil and usually costal emargination. If ♀ with patch of long hairs, then only in posterior half of T7. Species occur in Europe or Anatolia 5
5. Hair-pencil in ♂ short, about 1/4 hindwing length; without distinct costal emargination in hindwing. ♀ unknown ..... 4. *hispanica*
— Hair-pencil longer, at least 1/3 of hindwing length. Costal emargination conspicuous (figs. 10—14) 6
6. Forewing with small tornal and costal white spots beyond middle, less conspicuous in ♂. Hair-pencil in ♂ white. Forewing scales almost uniformly dark .... 2. *liebwerdella*
— Forewing with at most a tornal spot beyond middle. ♂ hair-pencil fuscous or yellowish brown. Scales darker at tips 7
7. ♂ hair-pencil surrounded by brown scales. ♀ with large patch of approximately 100 very long tactile hairs on T7 and 8 (visible without dissection). Only known from Greece and Anatolia ..... 5. *monemvasiae*
— ♂ hair-pencil surrounded by white scales. ♀ with group of 20—30 long hairs, much shorter than in *monemvasiae*. Throughout Europe and Anatolia ..... 3. *longicaudella*
8. Large species, forewing length 3.0—4.5 mm. Cilia-line indistinct. Aedeagus with 2 or 3 pairs of carinae. ♀ genitalia without vaginal sclerite 9
— Smaller species, forewing length 1.9—2.9 mm (rarely 3.0 mm). Cilia-line distinct. Aedeagus with one pair of carinae only. ♀ genitalia with vaginal sclerite 10
9. Ground colour dark brown, irrorate with white. ♂ antennae with 36—41, ♀ with 36—37 segments. ♂ hindwing with hair-pencil and costal emargination .... 6. *amani*
— Ground colour lighter, more yellowish brown, irrorate with white. ♂ antennae with 43—48, ♀ with 39—44 segments.♂ hindwing without hair-pencil or costal emargination ..... 8. *liguricella*
10. Ground colour white, with scattered brown scales. ♂ with dark fuscous to black hair-pencil..... 22. *gilvipennella*
— Ground colour brown to yellowish brown, mixed with yellowish white scales. ♂ without hair-pencil, but with costal bristles (♂ of *alnifoliae* unknown) 11
11. Scape white, without brown scales. Forewing with many yellow scales between brown ones. ♀ ductus spermathecae with 13—14 convolutions. Larva feeds on deciduous *Quercus* in Europe . 28. *nigrosparsella*
— Scape white with some brown scales. Forewing mainly brown with few white scales. ♀ ductus spermathecae with 3 convolutions. Larva on *Quercus alnifolia* in Cyprus ..... 27. *alnifoliae* (♂ unknown)
12. Forewing with dorsal (tornal) spot only, but occasionally a few white scales along costa 13
— Forewing with at least two light spots or fascia 17
13. Dorsal spot postmedial in position 14
— Dorsal spot medial in position 15
14. Scape white, with brown scales .... *E. (Fomoria)* or *Trifurcula* spp.
— Scape unicolorous white ..... see 2
15. Scales of forewing not significantly lighter at bases. Flagellum yellowish orange, similar to scape and pedicel. ♂ with hair-pencil, ♀ with pointed ovipositor .... 9. *intimella*
— Scales of forewing distinctly lighter at base. Flagellum darker than scape and pedicel. ♂ with costal bristles, ♀ with blunt ovipositor 16
16. Forewing with dorsal spot only. ♂ hindwing or forewing without androconial scales ..... 25. *ilicis*
— Forewing usually with some white scales along costa, opposite dorsal spot, but not forming distinct spot. ♂ hindwing upperside and forewing underside with elongate patch of brown androconial scales .... 26. *heringella*
17. Forewing with dorsal and costal distinctly postmedial in position..... ..... see 6, 2. *liebwerdella*
— Forewing with costal and dorsal spot medial or more basal, or fascia present 18
18. Moth almost completely jet-black or greyish black, including cilia; cilia-line absent. Medial fascia present. Larva feeds on Betulaceae..... 19
— Moth not completely black, usually with a fuscous or brownish tinge, cilia silvery white beyond distinct cilia-line. Larva feeds on other foodplants..... 20
19. ♂ underside of forewing with small patch

of narrow white scales (difficult to see, fig. 86). Hair-pencil white. ♀ frontal tuft yellow or yellowish orange. Aedeagus without long cornuti (fig. 405) ..... 49. *occultella*

— ♂ underside of forewing without small patch of narrow white scales, hair-pencil grey. ♀ frontal tuft black, occasionally mixed with some fuscous and/or yellow scales. Aedeagus with group of about 20 long cornuti (fig. 406) ..... 50. *minimella*

20. Forewing with white spots in addition to costal and dorsal spots or fascia 21

— Forewing with either fascia or costal and dorsal spot only 27

21. Forewing with discal spot beyond middle. Frontal tuft fuscous black 22

— Forewing without discal spot in second half. Frontal tuft usually with at least some yellow scales, but occasionally dark 23

22. Thorax completely white. Forewing with basal spot (sometimes small). ♀ with group of long hairs on tergites 7 and 8. Feeds on evergreen *Quercus* ..... 21. *algeriensis*

— Thorax fuscous black, with at most a white distal half. Forewing without basal spot, but sometimes with some white scales. ♀ with only few long hairs on T7 and 8. Feeds on deciduous *Quercus* ..... 20. *quinquella*

23. Forewings with many white scales scattered in basal half, sometimes becoming a discal spot or even confluent with other spots . 24

— Forewings with only a basal spot or basal-dorsal streak, scattered white scales absent or practically so 25

24. Frontal tuft yellowish orange to light ferruginous, never with fuscous scales. ♀ with blunt ovipositor. ♂ genitalia: valva without pointed tip (fig. 241), aedeagus fig. 361 .... 10. *hannoverella*

— Frontal tuft light yellowish or yellowish fuscous to dark fuscous, never orange (light-headed ♂ can not always be identified with certainty on externals). ♀ with pointed ovipositor (visible without dissection). ♂ genitalia: valva with pointed tip (fig. 242), aedeagus fig. 362 .. 11. *turbidella*

25. Costal spot distinctly more proximal than dorsal spot, not forming a fascia. Basal spot clearly separate from dorsal. ♂ with costal bristles. ♀ without patch of long tactile hairs on T7 and 8 .... 33—36. *subbimaculella*-complex

— Costal spot opposite dorsal, usually forming a fascia. Basal spot extending along dorsal margin, often confluent with fascia. ♂ with hair-pencil or costal bristles. ♀ with patch of many long tactile hairs on T7 and 8 26

26. Thorax white. Frontal tuft intensively orange. ♂ with costal bristles. ♀ terminalia complex, with thickened anterior apophyses (fig. 444) ..... 23. *leucothorax*

— Thorax fuscous black. Frontal tuft yellowish, or mixed with fuscous. ♂ with hair-pencil. Anterior apophyses not especially thickened (fig. 436) ..... 15. *caradjai*

27. Fascia or spots shining metallic silver (feed all on Rosaceae) 38

— Fascia or spots dull white or yellowish white (various foodplants, including Rosaceae) 28

28. Costal and tornal spot opposite, often forming fascia. ♂ hindwing without costal bristles, in some species with hair-pencil 30

— Dorsal spot distinctly beyond costal spot, usually not forming a fascia. ♂ hindwing with costal bristles, hair-pencil absent .. 29

29. Thorax usually uniform dark. Forewing ground colour almost uniformly blackish brown, scales only slightly lighter at bases. ♂ aedeagus with two pairs of carinae, valva fig. 244. ♀ bursa with pectinations. Larva on *Ulmus* ..... 14. *preisseckeri*

— Thorax usually with white tips of mesoscutum and tegulae. Forewing ground colour fuscous blackish, slightly speckled because of lighter scale bases. ♂ aedeagus with one pair of carinae, valva figs. 261—264. ♀ bursa without pectinations. Larva on deciduous *Quercus* 29—32. *albifasciella*-complex

— Thorax with or without white tips. Forewing ground colour brown, more irrorate than preceding species, scales, especially at forewing tip only dark at their tips. ♂ aedeagus with one pair of carinae, valva fig. 255. ♀ bursa without pectinations. Larva on evergreen *Quercus* ..... 24. *haraldi*

30. Basal half of forewing with scattered white scales ..... see 24

— Basal half of forewing never with white scales, outside the spots 31

31. Large species, forewing length 2.6—3.2 mm. Antennae in ♂ with 49—60 segments, in ♀ with 34—39. ♂ with hair-pencil, never with brown lamellar androconial scales . 32

— Smaller species, forewing length 1.7—2.5 mm. Antennae in ♂ with 30—40, in ♀ with 23—35 segments. ♂ with or without hair-pencil, with or without brown androconial scales 35

32. Costal and dorsal spot forming distinct fascia. ♂ with white or brown hair-pencil. ♀ with broad oval signa of same length. Mediterranean species, feed on evergreen *Quercus* 33
— Costal and dorsal spot clearly separate. ♂ with yellow hair-pencil. ♀ with elongate signa of different length. European species, feed on *Populus* 34
33. ♂ hair-pencil white. Capsule length 260—300 µm. ♀ with dense patch of very long tactile hairs on T7 and 8 (fig. 437) ..... 17. *suberis*
— ♂ hair-pencil ochreous-brown. Capsule length 220—260 µm. ♀ without long tactile hairs on T7 and 8 (fig. 438) .. 18. *andalusiae*
34. ♂, or ♀ with 34—38 antennal segments. On *P. alba* ..... 12. *klimeschi*
— ♀ only, parthenogenetic, with 26—32 antennal segments. On *P. tremula* ..... 13. *argyropeza*
35. ♂ with patch of brown androconial scales on upperside of hindwing and underside of forewing. Forewings ochreous brown, or greyish brown with yellowish tinge, comparatively light. Fascia ill-defined. Mediterranean species 36
— ♂ without brown androconial scales. Forewings definitely dark, fuscous black. Fascia distinct. Species from central and southeastern Europe 37
36. Frontal tuft yellow, orange or fuscous. ♂ without hair-pencil. ♀ genitalia with elongate signa (fig. 202) ..... 38. *terebinthivora*
— Frontal tuft yellowish white. ♂ with yellowish white hair-pencil. ♀ genitalia with small oval signa (fig. 176) . 19. *aegilopidella*
37. Very small species, forewing length 1.7—2.1 mm. ♂ without hair-pencil. Aedeagus with spinose dorsal process and ventral carinae. ♀ genitalia with vaginal sclerite. Feeds on *Filipendula vulgaris* ..... 42. *hexapetalae*
— Larger, forewing length 2.2—2.5 mm. ♂ with yellowish white hair-pencil. Aedeagus without carinate processes. ♀ genitalia without vaginal sclerite. Feeds on *Spiraea media* ..... 40. *spiraeae*
38. Frontal tuft very dark, blackish fuscous. ♂ hindwing with white hair-pencil ..... 46. *rubivora*
— Frontal tuft varying from yellowish orange or pale ochreous to fuscous, but never black. ♂ hindwing with or without hair-pencil 39
39. Forewing with costal and dorsal spot usually separate, dorsal spot distinctly beyond costal spot. Frontal tuft ferruginous, with sometimes fuscous scales on crown; collar yellowish white. ♂ hindwing without hair-pencil ..... 39. *erythrogenella*
— Forewing with costal and dorsal spot often united to form constricted fascia. Dorsal part of fascia not distinctly beyond costal part. ♂ hair-pencil present or absent 40
40. ♂ 41
— ♀ 45
41. Hindwing with fuscous hair-pencil, surrounded by patch of brown scales. Small species, forewing length 1.4—2.1 mm ..... 47. *spinosella*
— Hindwing with white hair-pencil 42
— Hindwing without hair-pencil 44
42. Collar yellowish orange to ferruginous, approximately same colour as frontal tuft. Valvae with inner margin distinctly sinuate ..... 43. *angulifasciella*
— Collar brown to black, darker than frontal tuft. Valvae with inner margin approximately straight 43
43. Frontal tuft ferruginous yellow, often mixed with fuscous. Smaller species, forewing length 1.8—2.3 mm. Feeds on *Fragaria* and *Potentilla* ..... 46. *arcuatella*
— Frontal tuft orange to ferruginous. Slightly larger, forewing length 2.2—2.7 mm. Feeds on Rosaceous trees and *Staphylea* ..... 44. *atricollis*
44. Frontal tuft yellowish to ferruginous, or even fuscous. Collar greyish brown. Scape often with brown scales. Forewing length 2.3—3.0 mm. Tegumen pointed. Feeds on *Agrimonia* ..... 41. *agrimoniae*
— Frontal tuft and collar yellowish orange to ferruginous. Scape uniform white. Forewing length 1.9—2.4 mm. Tegumen rounded. Feeds on *Prunus* spp... 48. *mahalebella*
45. Collar and frontal tuft concolorous, yellowish orange to ferruginous 46
— Collar distinctly different in colour from frontal tuft: greyish brown to fuscous black. Frontal tuft yellowish orange to fuscous 47
46. Larger species, forewing length 2.0—2.9 mm. Signa elongate (figs. 211, 212) ..... 43. *angulifasciella*
— Smaller species, forewing length 1.9—2.4 mm. Signa oval (fig. 219, 220) ..... 48. *mahalebella*
47. Scape usually with some brown scales, es-

pecially along distal margin. Collar greyish brown. Ovipositor slightly pointed ..... 41. *agrimoniae*

— Scape uniform white. Collar fuscous to black. Ovipositor blunt 48

48. Small or medium sized species, forewing length 1.4—2.4 mm. Signa length 200—370 µm 49

— Larger species, forewing length 2.3—2.8 mm. Signa distinctly longer, 380—490 µm. Feeds on Rosaceous trees and *Staphylea* ..... 44. *atricollis*

49. Small species, forewing length 1.4—2.1 mm. Signa with smooth, uniformly curved outline, longest 250—370 µm, shortest 230—330 µm, 2.4—3.5 × as long as wide. Feeds on *Prunus* spp. ..... 47. *spinosella*

— Medium sized species, forewing length 1.7—2.4 mm. Signa with irregular outline, longest 230—310 µm, shortest 205—280 µm, 3.1—4.1 × as long as wide. Feeds on *Fragaria* or *Potentilla* ..... 45. *arcuatella*

Based mainly on male genitalia[1])

1. Aedeagus with three pairs (two in *liguricella*) of carinae, with ventral pair usually very prominent and longer than other carinae; dorsal carinae sometimes composed of several spines (palmate). Valva: tip straight or only very slightly curved inwards; often an inner (mesal) lobe present; large genitalia, capsule 320—430 µm, aedeagus 370—500 µm. (350 in *nuristanica*); valva longer than 270 µm. Subgenus *Zimmermannia* 2

— Aedeagus with one or two pairs of carinae, or carinae absent, ventral pair not more pronounced and larger than dorsolateral pair. Valva tip usually curved inwards, inner lobe absent. Genitalia usually smaller, capsule 150—320 µm (—390 in *occultella*); aedeagus 205—410 µm; valva shorter than 270 µm (except *leucothorax* and *occultella*, to 320 µm). Subgenus *Ectoedemia* 9

2. Aedeagus with two pairs of carinae, the ventral pointed and widely separate. Aedeagus with two distal spinose lobes (figs. 356—358). Valva (fig. 238) with inner lobe. Tegumen with tongue shaped process (fig. 336) ..... 8. *liguricella*

— Aedeagus with three pairs of carinae, the ventral not widely separate, aedeagus without spinose lobes. Tegumen without tongue-shaped process 3

3. Capsule very wide (± 370 µm), almost as wide as long. Valva broad (fig. 236). Aedeagus almost half as wide as long, dorsal carinae comprising row of 4—5 teeth 6. *amani*

— Capsule narrower, less than 360 µm wide. Valva narrower, aedeagus less than half as wide as long. Dorsal carinae simple, bifid or palmate 4

4. Ventral carinae prominent, long and pointed, larger than dorsal and lateral pairs. Hindwing with hair-pencil 5

— Ventral carinae about same size as dorsal and lateral, with bifurcate tip. Valva narrowed before tip (fig. 237). Hindwing without hair-pencil ..... 7. *nuristanica*

5. Valva with prominent inner lobe, approximately in middle 6

— Valva without inner lobe, or with very slight lobe, not projecting beyond inner margin 7

6. Gnathos with narrow pointed central element. Aedeagus with palmate dorsal carinae and stout triangular cornutus ..... 5. *monemvasiae*

— Gnathos with broad triangular central element. Aedeagus with single or bifurcate dorsal carinae, without stout cornutus ..... 4. *hispanica*

7. Aedeagus clearly constricted in middle. Dorsal and lateral carinae connected by distinct rim 8

— Aedeagus not constricted in middle. Dorsal and lateral carinae not connected by rim ..... 3. *longicaudella*

8. Outer margin of ventral carinae distinctly serrate. Tip of valva rounded. Ventral arm of transtillae very short ..... 1. *atrifrontella*

— Outer margin of ventral carinae smooth or with a few spines. Tip of valva always slightly hooked. Ventral arm of transtilla usually longer ..... 2. *liebwerdella*

9. Aedeagus with ventral and dorso-lateral carinae 10

— Aedeagus with ventral carinae only, sometimes divided, or none at all 14

10. Dorso-lateral carinae stout, curved in lateral view, larger than ventral pair, often bifurcate. Ventral carinae connected by basal plate 11

— Dorso-lateral carinae same size as ventral carinae or smaller, not particularly stout. Ventral carinae not similarly connected . 12

11. Valva ending in abruptly narrowed tip. Ae-

[1]) Males of *E. alnifoliae* are unknown.

deagus not markedly asymmetrical (fig. 362) ..... 11. *turbidella*
— Valva gradually narrowing towards tip. Aedeagus markedly asymmetrical (figs. 363, 400, 401) ..... 12. *klimeschi*
12. Ventral carinae curved, often overlapping (fig. 364). Gnathos triangular, pointed .... 14. *preisseckeri*
— Ventral carinae straight, distinctly separate. Gnathos with rounded central element .. 13
13. Valva with broad blunt tip, widest beyond middle. Gnathos with spines on central element ..... 10. *hannoverella*
— Valva with pointed tip, widest at basis. Gnathos broad, without spines 9. *intimella*
14. Tegumen cuspidate, long pointed. Carinae divided each in at least 4 similar spines (figs. 394, 397, 398) 15
— Tegumen triangular, rounded or blunt. Carinae single, or with some additional, usually smaller, spines 17
15. Small species, aedeagus 180—230 µm. Carinae distinctly below tip of aedeagus, with pointed tips. Ventral process with some spines. Gnathos triangular . 41. *agrimoniae*
— Large species, aedeagus at least 280 µm long. Carinae with blunt tips reaching tip of aedeagus. Ventral process smooth. Gnathos blunt 16
16. Aedeagus with small triangular cornuti only (fig. 405). Gnathos with very wide, blunt, central element (fig. 327). Comparatively large, aedeagus 305—350 µm . 49. *occultella*
— Aedeagus with a row of about 20 long elongate cornuti at right side (fig. 406). Gnathos with narrow, truncate, central element (fig. 328). Smaller species, aedeagus 280—310 µm ..... 50. *minimella*
17. Aedeagus without any carinae. Tegumen protruding, triangular (fig. 127). Gnathos with central element reduced (fig. 318). Valva fig. 271 ..... 40. *spiraeae*
— Aedeagus with ventral carinae. If tegumen protruding, than blunt or rounded. Gnathos usually with distinct central element 18
18. Aedeagus dorsally with medial spinose process (fig. 403, 404). Small species, capsule 195—240 µm, as wide as long, and aedeagus relatively long, 260—290 µm .... 42. *hexapetalae*
— Aedeagus without dorsal spinose process 19
19. Capsule 150—170 µm long, wider than long. Tegumen bulbous (fig. 410). Gnathos with central element in form of transverse bar (fig. 298) ..... 19. *aegilopidella*
— Capsule longer than 190 µm. Tegumen not bulbous. Gnathos with central element not in form of transverse bar 20
20. Carinae with many small additional spines at base (figs. 28, 390—393). Tegumen prominent, longer than wide, cut off (fig. 413). Valva with inner margin straight or slightly sinuous 21
— Carinae without or with few additional spines. Tegumen triangular, rounded or wider than long 22
21. Valva with inner margin sinuous, forming a slight bulge beyond middle (fig. 273). Capsule length 210—260 µm, aedeagus 215—275 µm ..... 43. *angulifasciella*
— Valva with inner margin straight below apex (figs. 274—276) .....
44. *atricollis* (capsule 270—290 µm, aegedagus 260—290 µm, head orange)
46. *rubivora* (capsule 255—285 µm, aedeagus 235—265 µm, head black)
45. *arcuatella* (capsule 250—255 µm, aedeagus 230—245 µm, head orange)
22. Valva with many setae on dorsal and inner surface, the prominent sockets result in a distinctly serrate inner margin (figs. 260—266). Gnathos undivided, without serrate margins. (Hindwing with costal bristles) 23
— Valva with comparatively few setae on inner and dorsal surface, usually restricted to posterior half; rarely a few prominent sockets along inner margin, never distinctly serrate. Gnathos divided or undivided, with or without serrate margins. (Hindwing with or without hair-pencil or costal bristles) 24
23. Gnathos with central element truncate (figs. 307—312). Aedeagus with carinae simple ... 29—32. *albifasciella*-complex (forewing with white spots)
28. *nigrosparsella* (forewing irrorate)
— Gnathos with central element rounded (figs. 313—315). Aedeagus with carinae usually with a few additional spines .... 33-36. *subbimaculella*-complex
24. Tegumen wider than long, truncate (fig. 412). Gnathos with very short central element. Valva fig. 268 .... 38. *terebinthivora*
— Tegumen longer than wide, or not protruding at all. Gnathos with conspicuous central element 25
25. Valva with inner margin almost straight up to the distinctly separate apex. Small species, capsule length 190—225 µm 26

— Valva with inner margin markedly concave, especially in distal half, with gradual transition into apex. Small or large species .. 27
26. Gnathos with smooth triangular central element. Valva with apex almost posteriorly pointing (fig. 269) ..... 39. *erythrogenella*
— Gnathos divided, basal part with more or less serrate margin. Valva with inwards curved apex (figs. 277, 278) ..... 47. *spinosella* (with hair-pencil) .... 48. *mahalebella* (without hair-pencil)
27. Gnathos with smooth, undivided triangular or tongue-shaped central element. Aedeagus distinctly longer than capsule, carinae simple 28
— Gnathos with divided central element, basal part with serrate margins, distal part spatulate. Aedeagus about as long as capsule, shorter or slightly longer. Carinae usually with additional spines 31
28. Valva with inner margin basally convex, apically concave, with sharp delimitation. Aedeagus very long, 310—395 µm..... 29
— Valva with inner margin basally hardly convex, without sharp delimitation between basal part and concave distal part. Aedeagus shorter, 275—290 µm (305 in specimen 1843) 30
29. Tegumen produced in broadly triangular pseuduncus with rounded tip. Capsule longer than 260 µm ..... 17. *suberis*
— Tegumen broad, truncate, not produced into pseuduncus. Capsule 225—235 µm..... 18. *andalusiae*
30. Tegumen produced into distinct rounded pseuduncus. Aedeagus 275—290 µm..... 15. *caradjai*
— Tegumen truncate, not produced into pseuduncus. Aedeagus 305 µm..... 16. specimen 1843
31. Valva with very prominent bulging outer margin (fig. 255)..... 24. *haraldi*
— Valva with outer margin uniformly convex 32
32. Valva dorsal surface with back-folded lobe (fig. 253). Hindwing with prominent black hair-pencil ..... 22. *gilvipennella*
— Valva without dorsal lobe. Hindwing with lighter hair-pencil or without..... 33
33. Valva extremely long and narrow (fig. 254), longer than 270 µm. Aedeagus distinctly shorter than capsule..... 23. *leucothorax*
— Valva not extremely long and narrow, shorter than 260, usually shorter than 220 µm. Aedeagus as long as capsule or longer 34
34. Hindwing with costal bristles. Forewing with dorsal spot only..... 35
— Hindwing with hair-pencil. Forewing with at least three spots 36
35. Hindwing upperside and forewing underside with brown androconial scales ..... 26. *heringella*
— Androconial scales absent..... 25. *ilicis*
36. Tip of valva pointed. Hair-pencil yellowish ..... 20. *quinquella*
— Tip of valva truncate. Hair-pencil white .... 21. cf *algeriensis*

Based mainly on female genitalia[1])

1. Corpus bursae longer than 880 µm, usually longer than 1000 µm. Vestibulum with inconspicuous sclerotisations or spines, without vaginal sclerite. Margin of signa wider than individual cells. Subgenus *Zimmermannia* 2
— Corpus bursae usually shorter than 880 µm, but occasionally up to 935 µm, and then always with vaginal sclerite. Margin of signa narrower than individual cells. Subgenus *Ectoedemia* 6
2. Ductus spermathecae with 12½—13 convolutions.Vestibulum with two groups of spines ..... 6. *amani*
— Ductus spermathecae with 4½—5¼ convolutions..... 3
— Ductus spermathecae with 2½—3¾ convolutions..... 5
3. T7 with large patch of long tactile hairs, extending almost to anterior margin (fig. 426) ..... 7. *nuristanica*
— T7 with long hairs only at posterior margin 4
4. T7 and 8 with dense bunch of many long hairs (fig 424). Longest signum longer than 500 µm. Eastern mediterranean species ..... 5. *monemvasiae*
— T7 and 8 with some long setae in a row, not forming a dense bunch (figs. 427, 428). Longest signum shorter than 500 µm. Western mediterranean species ..... 8. *liguricella*
5. Ductus spermathecae with 3½—3¾ convolutions..... 3. *longicaudella*
— Ductus spermathecae with 2½—3 convolutions..... 1. *atrifrontella* or ..... 2. *liebwerdella*

[1]) Females of *E. hispanica* are unknown.

6. Corpus bursae without pectinations, completely smooth outside signa. A group of densely packed pectinations present in vestibulum 7
— Corpus bursae mostly covered with small pectinations or spines. Densely packed pectinations in vestibulum may be either present or absent 14
7. Signa of about same length, approximately 2.6—3.4 × as long as wide. Anterior apophyses much widened (fig. 444). Large group of many long hairs along posterior margin of T7 ..... 23. *leucothorax*
— Signa distinctly dissimilar, more than 3.5 x as long as wide. Anterior apophyses not markedly widened 8
8. Ductus spermathecae with more than 3½ convolutions 9
— Ductus spermathecae with 2—3¼ convolutions 10
9. 3½—4 convolutions ..... 30. *cerris*
— 5—6 convolutions ..... 31. *pubescivora*
— 10½—12 (rarely 13½) convolutions ..... 32. *contorta*
— 13½—14 convolutions .. 28. *nigrosparsella*
10. T7 and 8 with in total more than 70 setae, including some very long (fig. 441). Anal papillae each with more than 24 setae ..... 21. *algeriensis*
— T7 and 8 with much fewer setae, usually not exceeding 25. Anal papillae with less than 24 setae 11
11. Abdominal tip narrow, T8 and 9 with distinctly converging margins (fig. 429). Spiculate pouch with small, single denticles, approximately equally spaced ... 9. *intimella*
— Abdominal tip wider, T8 and 9 not so distinctly converging. Spiculate pouch with small denticles, often in small groups, not equally spaced 12
12. T7 with distinct row of 6—14 setae along posterior margin 13
— T7 without such a row, at most few scattered short setae ..... 24. *haraldi*, 20. *quinquella* or 27. *alnifoliae*, compare externals and figures of female terminalia (figs. 445, 440, 449).
13. Sides of S8 almost parallel. Convolutions of ductus spermathecae very wide (fig. 416) ... . 29. *albifasciella*
— Sides of S8 diverging anteriorly. Convolutions of ductus spermathecae narrow (figs. 417, 418) ..... 22. *gilvipennella*, 25. *ilicis*, 26. *heringella* or 33—36. *subbimaculella*-complex, compare externals and figures of female terminalia.
14. T7 and 8 covered with many (more than 100) very long hairs, reaching abdominal tip. Ductus spermathecae with 3½—4½ convolutions 15
— T7 and 8 covered with few short setae only, at most 20. Ductus spermathecae either with 5½ or less than 3½ convolutions ... 16
15. Bursa almost globular. Long setae smooth. Ductus spermathecae with 4—4½ distinct convolutions. Abdominal tip fig. 437 .... 17. *suberis*
— Bursa elongate. Long setae pectinate. Ductus spermathecae with 3½—4 less distinct convolutions. Abdominal tip fig. 436 .... 15. *caradjai*
16. Ductus spermathecae with 5½ convolutions ..... 18. *andalusiae*
— Ductus spermathecae with 2—3½ convolutions 17
17. Vestibulum with patch of densely packed pectinations near entrance to ductus spermathecae. Vaginal sclerite present. Spiculate pouch conspicuous, usually with many distinct spines 18
— Vestibulum without patch of densely packed pectinations. Vaginal sclerite present or absent. Spiculate pouch inconspicuous or absent 23
18. Signa completely different in form and length, longest reaching into vestibulum, shortest 4.2—5.0 × as long as wide. Terminalia fig. 459 ..... 38. *terebinthivora*
— Signa similar in form, sometimes slightly different in length, not reaching into vestibulum 19
19. T7 with distinct row of 4—12 setae along posterior margin. Spines of spiculate pouch not all equally spaced, or very few only . 20
— T7 without distinct row of setae along posterior margin. Spines of spiculate pouch distinct, all equally spaced, not grouped ... 21
20. Signa 2.4—3.0 × as long as wide. Terminal segments narrow, fig. 435 .. 14. *preisseckeri*
— Signa 3.0—5.6 × as long as wide. Terminal segments wider, fig. 460 39. *erythrogenella*
21. T8 and 9 posteriorly narrowed, forming pointed ovipositor. Posterior apophyses widened at anterior tips (figs. 431, 432). .... 11. *turbidella*
— T8 and 9 not so much narrowed, ovipositor blunt. Posterior apophyses not distinctly widened 22

22. T8 about 2 × as wide as long (fig. 430). Anal papillae with 6—11 setae. Signa 390—480 µm. S8 without pronounced corners ... . 10. *hannoverella*
— T8 more than 2 × as wide as long (fig. 433). Anal papillae with 9—11 setae. Signa 373—416 µm. S8 with pronounced corners .... 12. *klimeschi*
— T8 more than 2 x as wide as long (fig. 434). Anal papillae with 5—9 setae. Signa 270—394 µm long. S8 without pronounced corners ..... 13. *argyropeza*
23. Anal papillae with 18—40 setae. Terminal segments wide (figs. 470, 471). Pectinations in bursa in two longitudinal bands, running halfway between the signa 49. *occultella* or ..... 50. *minimella*
— Anal papillae with 4—16 setae. Terminal segments not so wide. Pectinations in bursa more regularly distributed 24
24. Vestibulum completely smooth, without vaginal sclerite or spiculate pouch. T8 divided in middle..... 25
— Vestibulum with vaginal sclerite, although sometimes indistinct, and sometimes with inconspicuous spiculate pouch. T8 undivided 26
25. Signa dissimilar, 320—440 µm long. Anal papillae with 13—16 setae. Terminal segments fig. 461 ..... 40. *spiraeae*
— Signa similar, 180—300 µm long. Anal papillae with 7—12 setae. Terminal segments fig. 462 ..... 41. *agrimoniae*
26. Bursa very small, 310—350 µm. Signa short, 189—223 µm, oval, occupying large part of bursa ..... 19. *aegilopidella*
— Bursa larger, 570—715 µm. Signa short, 200—300 µm, oval, confined to posterior half of bursa ..... 48. *mahalebella*
— Bursa intermediate, 400—660 µm. Signa variable in length, elongate, throughout bursa ..... 42. *hexapetalae*, 47. *spinosella* and 43—46. *angulifasciella*-complex, compare externals, diagnoses, or genitalia figures.

Subgenus **Zimmermannia** Hering

Zimmermannia Hering, 1940: 266. Type-species: *Ectoedemia liebwerdella* Zimmermann, 1940, by original designation and monotypy.

Ectoedemia sensu Klimesch, 1953: 163 [European species].

Ectoedemia (Zimmermannia); Schönherr, 1958: 6; Borkowski, 1972: 699; Emmet, 1976: 188, 203.

Ectoedemia castaneae group sensu Wilkinson & Newton, 1981: 72.

Description.

Adult. Relatively large nepticulid moths, forewing length 2.8—4.5 mm, wingspan 6.4—9.8 mm (in Palaearctic species).

Head. Antennae long, more than half length of forewing, in male with 36—58 segments, in female with 36—49 segments. Scape and pedicel white, flagellum darker.

Wings. Uniform irrorate ochreous or yellowish-white, with darker scaling, often predominantly brown, without fascia, sometimes a small dorsal (tornal) and/or costal spot present. Cilialine not distinct. Hindwing in male without costal bristles, hair-pencil present in most species, surrounded by special scales. Humeral lobe often prominent, beyond which hindwing is suddenly emarginated (figs. 10—14).

Forewing venation (fig. 8). R and M + Cu forming closed cell, branches R_1, R_{2+3}, R_4, R_5, M and Cu present. A thickened, without anal loop. Cu and A often very long, seeming fused at tips.

Male genitalia. Vinculum ring-shaped, anterior extension not long, anteriorly convex. Tegumen slightly produced into a triangular or blunt pseuduncus. Uncus absent. Gnathos with prominent spatulate or triangular central element, margins smooth. Valva approximately triangular, tip not separate, usually not curved inwards; often with a mesal (inner) lobe. Aedeagus stout, with large ventral carinae, smaller dorso-lateral carinae and usually dorsal carinae. Ventral carinae fitting by membranes to fold in dorsal surface of valvae. Dorsal carinae palmate in some species. Vesica with numerous denticulate cornuti and usually one large cornutus or sclerotised plate posteriorly.

Female genitalia. On tergites 7 and 8, near anterior margin of T8 usually a group or row of very long setae, T8 with many shorter setae, without scales. Anal papillae with setae. Posterior apophyses often reaching beyond anterior apophyses. Vestibulum with indistinct paired sclerotisation, or with groups of spines, vaginal sclerite or spiculate pouch absent. Corpus bursae long, elongate, covered with pectinations, except in anterior part, arranged in concentric bands around long signa. Margin of signa wider than individual cells.

Larva. Long yellow larvae with strongly sclerotised head-capsule, feeding venter upwards.

See Schönherr (1958) and van Nieukerken & Jansen (in preparation). *E. liebwerdella* has six to eight larval instars (Schönherr, 1958).

Biology.

The larvae of the species where the life history is known, are bark-miners (or gall-makers in bark: *E. castaneae*) in Fagaceae (*Fagus, Quercus, Castanea*), and Ulmaceae (*E. amani* only). The mines are galleries. The larvae feed for one or two years and leave the mine in spring to pupate in the soil. Adults fly throughout the summer. The life-history became particularly well-known through the excellent work of Schönherr (1958) on *E. liebwerdella*, and the studies of Busck (1913, 1914a,b) on American species.

Distribution and composition.

Eight species are described here from the Western Palaearctic region as far east as Afghanistan, two species (*E. admiranda* and *E. sivickisi*) were described by Puplesis (1984b) from the Eastern Palaearctic region, and twelve species were recorded from North America by Wilkinson & Newton (1981) and Wilkinson (1981), and more unnamed Nearctic species are present in collections.

Remarks.

The species of this subgenus are remarkably uniform both in external features and genitalia, also when the Nearctic species are taken into consideration. Although the life history of only 3 Nearctic and 4 Palaearctic species is (partly) known, it seems very probable that all species are bark-miners, and the majority feeds on Fagaceae. Several of the species of which the life-history is unknown have also been collected in vegetation containing many Fagaceae (*Quercus*). There are mines also known which have not yet been associated with existing species. Schönherr (1958) for instance reported mines on *Carpinus*, and he and Klimesch (1953) on *Castanea*. I also found mines on *Castanea* and *Quercus ilex* in the south of France, and on *Q. coccifera* in Spain. Unfortunately rearing of *Zimmermannia* larvae proved very difficult, so it will probably be a long time before the life-histories of all species have been worked out.

1. Ectoedemia (Zimmermannia) atrifrontella (Stainton, 1851)

(figs. 8, 10, 33, 34, 35, 89, 143, 144, 231, 281, 329, 337, 338, 346, 421, 472, 514)

Trifurcula atrifrontella Stainton, 1851: 11. 2 Syntypes, England, G. Bedell (depository unknown) [not examined].

Zimmermannia heringiella Doets, 1947: 504—506, 5 figs. Lectotype ♂ (here designated), Netherlands: Hollandse Rading, 15.viii.1946, e.l. *Quercus*, J. Doets, Genitalia slide V. 679 on pin (RMNH) [examined, genitalia figured by Doets]. [Synonymised by Klimesch, 1953].

Trifurcula atrifrontella; Stainton, 1854: 306; Herrich-Schäffer, 1855: 360; Stainton, 1859: 438; Wocke, 1871: 335; 1874: 97; Heinemann & Wocke, 1877: 726; Meyrick, 1895: 727; Tutt, 1899: 358; Rebel, 1901: 221; Meess, 1910: 482; Meyrick, 1928: 864; Beirne, 1945: 207, 208; Gerasimov, 1952: 202; Karsholt & Nielsen, 1978: 3, 4, figs. 7, 8 (♂ genitalia).

Ectoedemia atrifrontella; Klimesch, 1953: 191—193, fig. 18 (revision, ♂ genitalia); 1961: 749; Lhomme, 1963: 1210; Szőcs, 1965: 49; Bradley et al., 1972: 3; Borkowski, 1975: 496; Emmet, 1976: 203, pl. 7 fig. 5, pl. 12 fig. 37.

Trifurcula (Ectoedemia) atrifrontella; Johansson, 1971: 245.

Diagnosis: the white thorax together with the black head separate *atrifrontella* from other *Zimmermannia* species, the snow-white hair-pencil in the male is a good additional character separating it from *longicaudella*. The narrow capsule, constricted aedeagus, serrate carinae and short ventral arms of transtilla are diagnostic characters of the male genitalia. The female genitalia differ from *longicaudella* by shorter posterior apophyses and lower number of convolutions in ductus spermathecae, but cannot be separated from *liebwerdella*.

Description.

Male (fig. 35). Forewing length 2.88—3.24 mm (3.05 ± 0.13, 12), wingspan 6.5—7.4 mm. Head: frontal tuft and collar dark brown to black. Antennae long, with 45—53 segments (48.3 ± 2.7, 7). Thorax yellowish white, except brown caudal tips of mesoscutum and tegulae. Forewings dark brown, irrorate with varying amount of white, tornal spot usually white; cilia silvery white beyond ill-defined cilia-line. Hindwing (fig. 10) with snow-white hair-pencil of approximately ¼ hindwing length, surrounded by white lamellar scales; humeral lobe prominent, costal margin distinctly emarginated beyond hair-pencil.

Female. Forewing length 3.2—3.84 mm (3.59 ± 0.23, 9); wingspan 7.2—8.5 mm. Antennal segments 37—49 (42.2 ± 3.2, 10).

Male genitalia (figs. 89, 329). Capsule length 390—411 µm (404.2 ± 8.7, 7), slender, width 274—304 µm. Vinculum with posterior part of ventral plate less than one third of ventral plate. Tegumen slightly cuspidate. Gnathos (fig. 281) with central element long and narrow, parallel-sided. Valva (fig. 231) slender, length 287—321 µm (297.6 ± 12.6, 7), approximately triangular, without any lobe along inner margin, tip rounded; transtilla with ventral arm extremely short. Aedeagus (figs. 337, 338, 346) 450—501 µm (471.4 ± 19.2, 7), constricted at level of opening for ductus ejaculatorius; ventral carinae long, approximately one third of total length aedeagus, with distinct serrate outer margins; lateral and dorsal carinae connected by prominent rim, stout and pointed, the dorsal longer. Vesica with distally a sclerotised plate with indistinct folds or ridges in addition to small cornuti.

Female genitalia (figs. 33, 34, 143, 144, 421). T8 with many long hairs, more than 50, a row of 10—20 thicker and very long setae along anterior margin of T8, scales absent; anterior margin of T8 slightly indented. Anal papillae with 8—13 setae. Posterior apophyses hardly reaching beyond anterior apophyses. Vestibulum with pair of indistinct sclerotisations. Corpus bursae 1080—1270 µm, covered with pectinations, partly in concentric bands around signa; signa elongate, similar, length 473—572 µm (510 ± 41, 14), 4.4—6.7 × as long as wide. Ductus spermathecae with 2½—3 convolutions, becoming wider distally.

Larva. Yellow, very elongate. Head-capsule brown. Ventral plates absent.

Biology.

Host plants: *Quercus robur* L., *Q. pubescens* Willd. and probably other *Quercus* species. In Spain the species was collected in cork-oak woods with some *Quercus faginea* Lam., of which the latter is the most likely foodplant here.

Mine (fig. 472). Contorted gallery in smooth bark of branches and thin trunks. The larva feeds mainly in the direction of the main axis.

Life history. Incompletely known, larvae start feeding probably in summer and overwinter at least once, but analogous to *liebwerdella* and *longicaudella* it could have a two year cycle. Full grown larvae collected late May and June pupate soon and emerge within a few weeks. Adults are frequently caught at light from early July until the middle of September. Rearing is difficult, and actually very few specimens have been reared.

Distribution (fig. 514).

Widely distributed in Europe from southern Finland to Spain, but not recorded from eastern Europe, except Hungary, nor from Belgium (Janmoulle's 1947 record actually refers to *longicaudella*), Ireland, Norway or Portugal. This is the only *Zimmermannia* species known from Great Britain. In central and southern Europe this species is often less common than *longicaudella*. Occurrence in Anatolia (one uncertain female) has to be confirmed.

Remarks.

Stainton described this species from two specimens from Bedell's collection. Unfortunately these specimens could not be found in BMNH, and the collection seems to have been dispersed after auctioning, so the types remain unknown. The identity of this species however seems to be beyond doubt, since there are two subsequent correctly identified specimens in Staintons collection, which represent this, the only British *Zimmermannia* species.

Records prior to 1953, and also several more recent ones, cannot be relied on since they refer at least partly to *E. longicaudella*.

The life-history of this species was discovered by Doets (1947), who at that time described it as the new species *Zimmermannia heringiella*. Previously *E. atrifrontella* was incorrectly believed to mine bark of *Sarothamnus*.

Material examined: 26 ♂, 18 ♀. — Austria: 5 ♂, Gumpoldskirchen, Glaslauterriegel, 10.viii.1958, 10.vii.1981, 26.viii.1983, and 1.ix.1983, F. Kasy; 1 ♂, Hundsheimer Berg, Porta Hungarica (near Hainburg), 2.vii.1977, F. Kasy (NMW). — France: 1 ♂, "Antarv". (? near Digne), 13.viii.1903, Chrétien; 1 ♂, Digne, viii.1903, Chrétien (MNHN); 2 ♂, Viens (Vaucluse) (near Apt), 6.viii.1974, 1.ix.1975, Buvat (coll. Buvat). — Germany, West: 2 ♀, Leine, Eime, 10.viii.1889, coll. J. Schlumberger. — Germany, East: 1 ♀, Altenburg, Krause (MNHN). — Great Britain: 1 ♀, Dartford Heath (Kent), 12.viii.1892, Tyerman; 1 ♂, Ham Street (Kent), 16.ix.1961, S. Wakeley (UMZC); 1 ♀, Lewisham (London), 13.viii.1851, beaten from oak, J. Stainton; 1 ♂, 1851, J. Grant, no further data (BMNH); 1 ♂, 1897, J. B. Hodgkinson, no further data; 2 ♂, no data, Whittle coll. (genitalia figured by Klimesch, 1953) (BMNH). — Hungary: 1 ♀, Nadap (near Velencei-tó), 6.ix.1951, Kovács (TMAB). —Netherlands: 3 ♂, 4 ♀, Hilversum, e.l. 10—17.viii.1948, e.l. 21.viii.1950, *Quercus*, Doets

(RMNH, 1 MHUB); 1 ♂, 3 ♀ (lecto- and paralectotypes of *heringiella* Doets), Hollandse Rading, e.l. 10—15.viii.1946, *Quercus*, Doets (RMNH, ZMA); 1 ♂, Leuvenum, Ullerberg, 1.ix.1926, a.l., P. Tutein Nolthenius; 1 ♀, Nijmegen, 7.ix.1921, Lycklama à Nijeholt (ZMA); 1 ♂, Overveen, 29.viii.1930, G. A. Bentinck (RMNH).— Spain: 2 ♂, Andalucia, road to Istan, 400 m, 28.vi.1972, E. Traugott-Olsen; 1 ♀, idem, 200 m, 8.vii.1972; 2 ♂, Andalucia, road to Casares, 500 m, 9.vii.1973, E. Traugott-Olsen (ETO). — Switzerland: 1 ♀, Erschmatt-Rotafen (Valais), 920 m, e.l. 7.vii.1983, mine *Quercus pubescens* 21.v.1983, S. E. Whitebread (coll. Whitebread).

Mines.— Netherlands: Hollandse Rading.

Identity uncertain: Turkey: 1 ♀, Anatolia, Kizilcahamam, 700 m, 31.vii-1.viii.1963, Arenberger (LNK) (specimen damaged).

Additional records. — Italy: Latina, Monti Aurunci, Castelforte, 22.vi.1969, R. Johansson (adults at light); Piemonte (coll. Jäckh) (R. Johansson, pers. comm.).

2. Ectoedemia (Zimmermannia) liebwerdella Zimmermann, 1940

(figs. 11, 36, 37 ,90, 145, 146, 232, 282, 330, 343, 348, 422, 473, 515)

Ectoedemia liebwerdella Zimmermann, 1940: 264, 265, 1 fig. Holotype ♀, Czechoslovakia: Dečín, (Tetschen) Liebwerd, 8.vi.1939, F. Zimmermann, Rindemine: *Fagus silvat.*, Genitalia slide on pin (MHUB) [examined].

Ectoedemia liebwerdella; Klimesch, 1953: 195; 1961: 749; Schönherr, 1958: 1—71, figs. (detailed description of all stages and biology); Lindner, 1959: 7—8 (Distribution in West-Germany); Szőcs, 1965: 49; Haase, 1968: 61 (Distribution in East-Germany); Borkowski, 1975: 496.

Zimmermannia liebwerdella; Hering, 1940: 266.

Ectoedemia (Zimmermannia) liebwerdella; Hering, 1957: 437; Dorfmann, 1960: 17.

Diagnosis: externally similar to *longicaudella*, but tornal and costal spots more distinct, expecially in female, and male with white hair-pencil. Differs from *atrifrontella* by brown thorax. Male genitalia extremely similar to *atrifrontella*, bud carinae hardly or not serrate, valva broader and ventral arms of transtilla longer. Female genitalia cannot be differentiated with certainty from *atrifrontella*.

Description.

Male (fig. 36). Forewing length 3.00—3.04 mm (3), wingspan 6.5—6.9 mm. Head: frontal tuft and collar dark brown to black. Antennae long, with 46—48 segments (2). Thorax dark brown to blackish fuscous. Forewings dark brown to blackish fuscous, almost uniform, sometimes slightly irrorate, tornal and to a lesser extent, costal spots white; cilia white beyond ill-defined cilia-line. Hindwing (fig. 11) with long white hair-pencil, of more than ⅓ hindwing length, surrounded by white lamellar scales. Humeral lobe and costal emargination more pronounced than in other species.

Female (fig. 37). Forewing length 3.60—3.64 mm (2), wingspan 7.8—8.4 mm. Antennal segments 40—41 (2). Costal and tornal spot more pronounced than in male.

Male genitalia (figs. 90, 330). Capsule length 377—429 µm (4), slightly wider than in *atrifrontella*: 291—343 µm. Tegumen slightly cuspidate. Gnathos (fig. 282) with central element long and narrow, parallel-sided. Valva (fig. 232) length 296—321 µm (4), approximately triangular, slender, but in comparison with *atrifrontella* wider, without any inner lobe, tip slightly hooked; transtillae with ventral arms intermediate in length between *atrifrontella* and *longicaudella*. Aedeagus (figs. 343, 348) 454—463 µm (4), constricted at level of opening for ductus ejaculatorius; ventral carinae long, approximately one third of total length aedeagus, with hardly serrate or smooth outer margins; lateral and dorsal carinae connected by prominent rim, stout and pointed, the dorsal longer. Vesica with distally a sclerotised plate with indistinct folds or ridges, in addition to small cornuti.

Female genitalia (figs. 145, 146, 422). T8 with many long hairs, a row of 16—20 thicker and very long setae along anterior margin of T8, scales absent; anterior margin slightly indented. Anal papillae with 6—10 setae. Posterior apophyses reaching slightly beyond anterior apophyses. Vestibulum with pair of indistinct sclerotisations. Corpus bursae ± 1100 µm, covered with pectinations, partly in concentric bands around signa; signa elongate, almost similar, length 390—495 µm (6), 3.6—4.0 × as long as wide. Ductus spermathecae with 2½—3 convolutions, becoming wider distally.

Larva. Yellow, very elongate. Head-capsule brown. Ventral plates absent. See also Schönherr (1958).

Biology.

Host plant: *Fagus sylvatica* L.

Mine (fig. 473). Contorted gallery in bark of trunks or thick branches. The larva feeds mainly in the direction of the main axis. Especially abundant on sunny side of trees.

Life history. See excellent treatment by Schönherr (1958), larvae feed during two sum-

mers and overwinter twice to pupate in May-July, thus having a two-year cycle (in East Germany), but specimens completing their cycle in one year do occur (Schönherr, l.c). Adults emerge from early July to August.

Distribution (fig. 515).

Adults are only known from reared material from DDR, the holotype and French and Italian specimens collected at light. Records of mines known from East and West Germany, Silesia in Poland, Austria, Hungary, Italy: Alps and Apennines, France: Alps and Pyrenees. In northernmost Germany and Denmark the species could not be found, despite intensive search (Lindner, 1959; Schönherr, 1958).

Material examined: 5 ♂, 3 ♀. — Czechoslovakia: 1 ♀ Holotype, see above.— France: 1 ♂, St. Barnabé, Col de Vence, 900 m (Alpes Marit.), 2—7.vii.1962, Arenberger (LNK). — Germany, East: 3 ♂, 2 ♀, Tharandt, e.l. 4—19.vii.1956, *Fagus sylvatica*, J. Schönherr (MHUB, 1 ZMC). — Italy: 1 ♂, Calabria-La Sila, prov. Cosenza, Longobucco, 1600 m, 3.viii.1982, at light, J. H. Kuchlein (coll. Kuchlein).

Mines. — France: l'Épine (Hautes Alpes); le Perthus (Pyr.Or.); le Sappey-en-Chartreuse (Isère).

Additional records. — Italy: Parco Nationale d'Abruzzo, 1700—1800 m, mines, R. Johansson (pers. comm.); Trento, Mte Maranza, 10.x.1983, mines, E. J. van Nieukerken.

3. Ectoedemia (Zimmermannia) longicaudella Klimesch, 1953
(figs. 12, 21, 27, 38, 91, 147, 148, 233, 283, 331, 339, 340, 347, 423, 516)

Ectoedemia longicaudella Klimesch, 1953; 193, 194, fig. 19. Lectotype ♂ (here designated), Hungary: Nagy Nyir, Kecskemét, 17—28.v.1937, J. Klimesch, Genitalia slide Kl. 438 (ZSMK) [not examined, genitalia figured by Klimesch].

Stigmella (Fomoria) peiuii Nemeş, 1972: 153—156, 1 fig. Holotype ♂, Rumania: Wald Gîrboavele, Bezirk Galaţi, 7.vii.1968, I. Nemeş, Genitalia slide 1299 (coll. Nemeş) [not examined]. **Syn. nov.**

Trifurcula atrifrontella sensu auctt. partim.

Ectoedemia longicaudella; Szőcs, 1965: 50; Borkowski, 1970: 549, figs. 19, 26 (♂ genitalia, externals); 1975: 496; van Nieukerken, 1982: 106, 107.

Trifurcula (Ectoedemia) longicaudella; Johansson, 1971: 245.

Ectoedemia (Zimmermannia) longicaudella; Borkowski, 1972: fig. 12 (venation).

Diagnosis: the brown thorax and yellowish brown hair-pencil separate this species from *atrifrontella*, the hair-pencil and the absence of a costal spot from *liebwerdella*. From both species it is distinguished by the unconstricted aedeagus, the shorter carinae, the wider capsule and longer ventral arms of transtilla in male, and by the long posterior apophyses and number of convolutions in spermathecal duct in female. See also *hispanica* and *monemvasiae*.

Description.

Male (fig. 38). Forewing length 2.68—3.64 mm (3.27 ± 0.20, 28), wingspan 7.0—8.0 mm. Head: frontal tuft and collar dark brown to black. Antennae long, with 41—50 segments (45.2 ± 2.5, 11). Thorax dark brown, often with white caudal tips of mesoscutum and tegulae. Forewings dark brown, irrorate with varying amount of white, tornal spot usually white; cilia silvery white beyond ill-defined cilia-line. Hindwing (fig. 12) with yellowish brown hair-pencil of approximately ⅓ hindwing length, surrounded by white lamellar scales; humeral lobe prominent, costal margin distinctly emarginated beyond hair-pencil

Female. Forewing length 3.32—3.92 mm (3.67 ± 0.19, 10), wingspan 7.2—8.6 mm. Antennal segments 40—42 (41.2 ± 0.8, 5).

Male genitalia (figs. 91, 331). Capsule length 364—424 µm (388 ± 19.4, 15), wider than in *atrifrontella*, width 308—356 µm. Vinculum with posterior part of ventral plate about half as long as ventral plate. Tegumen slightly cuspidate. Gnathos (fig. 283) with central element long and narrow, parallel-sided. Valva (fig. 233) length 279—321 µm (299.7 ± 13.5, 15), triangular, with indistinct rounded mesal lobe basally, not projecting beyond inner margin; transtilla with long ventral arm. Aedeagus (figs. 339, 340, 347) 343—403 µm (435.7 ± 19.1, 15), not constricted; ventral carinae long, but shorter than in *atrifrontella*, not serrate; lateral and dorsal carinae not connected by rim, stout and pointed; dorsal carinae often bi- or multifurcate, with up to four horns each. Vesica with egg-shaped sclerotised plate in addition to small cornuti.

Female genitalia (figs. 147, 148, 423). T8 with many long hairs, a row of more than 20 thicker and very long setae along anterior margin, scales absent; anterior margin of T8 almost straight, slightly indented. Anal papillae with 7—12 setae. Posterior apophyses reaching distinctly beyond anterior apophyses. Vestibulum with pair of indistinct sclerotisations. Corpus bursae 1050—1450 µm, covered with pectinations, partly in concentric bands around signa; signa elongate, similar, length 440—737 µm (562 ± 77

μm, 16), 4.0—5.2 × as long as wide. Ductus spermathecae with 3½—3¾ convolutions.

Larva not examined.

Biology.

Host plants: *Quercus robur* L. and probably other *Quercus* species. Mines on *Castanea* could also belong to this species. In fact only reared once by Schönherr (1958), but mistaken for *atrifrontella*.

Mine. Not described, but probably not different from that of *atrifrontella*.

Life history. Under the name *atrifrontella*, Schönherr (1958) reported a two year cycle for this species — this is analogous to *liebwerdella*. Adults are frequently collected at light in the months June and July, in Yugoslavia also in May, and occasionally in early August, thus not occurring as late as *atrifrontella*.

Distribution (fig. 516).

Widely distributed in central and southern Europe, but absent from Britain, and in Scandinavia only known from southern Sweden. Not yet recorded from Portugal, Switzerland, Czechoslovakia, Bulgaria and Greece, but occurring in Anatolia.

Remarks.

This species was described from a long series covering many localities. Klimesch did not specify a holotype, but the identity of this species is clearly understood from his description and figure. Although I did not study the syntypes, I select here the specimen of which the genitalia were figured by Klimesch, as lectotype, and therefore restrict the type locality to Nagy Nyir near Kecskemét, which also was listed as first locality in Klimesch's list.

Although I was not able to examine *Stigmella (Fomoria) peiuii* Nemeş, from the description and figure of male genitalia there is little doubt it is a synonym of *longicaudella*.

Material examined: 40 ♂, 13 ♀, 1 ex. — Austria: 2 ♂, Gumpoldskirchen, Glaslauterriegel, 4.vii.1976, 18.vii.1980, F. Kasy; 8 ♂, Hackelsberg N. of Neusiedlersee (near Jois), 23.vi.1975, 24.vi.1977 and 2.vii.1977, F. Kasy; 2 ♂, Hundsheimer Berg, Porta Hungarica (near Hainburg), 28.vi.1976, 2.vii.1977, F. Kasy (NMW). — Belgium: 1 ♀, Aye, 4.vii.1946, A. Richard; 2 ♀, Aye, 27.vii.1949, E. Janmoulle (IRSN). — France: 1 ♂, 1 ♀, "Antarv." (? near Digne), 18.vii.1903, Chrétien; 3 ♂, Célé (Lot), 24—26 [= decades?], C. Dumont; 2 ♂, 1 ♀, Digne, vii—viii.1903, Chrétien; 3 ♂, Nay, vi.1906, 9.vii.1912 and 16.vi.1917, Chrétien; 1 ♂, 2 ♀, Revent. (interpreted as Reventin-Vaugris), 12—27.vii.1902, Chrétien (MNHN); 2 ♂, 1 ♀, St. Barnabé, Col de Vence (Alpes Marit.), 900 m, 2—7.vii.1962, Arenberger (LNK); 1 ♂, Viens (Vaucluse) (near Apt), 10.viii.1974, R. Buvat (coll. Buvat). — Germany, East: 1 ♀, Tharandt, e.l. 9.vii.1956, *Quercus robur*, J. Schönherr (MHUB). — Hungary, 1 ♂, Budakeszi, Hársbokorh., 24.vii.1952, L. Gozmány (MHUB); 1 ♂, Cserkut near Pécs, 12—20.vi.1936, J. Klimesch (LNK); 1 ex., Hu Nyírség, Bátorliget, 14.vi.1949, Kaszab & Székessy (MHUB); 1 ♂, Kunadacs, 10.vi.1958, L. Kovács (TMAB). — Netherlands: 4 ♂, Nijmegen, 14.vii.1926, 21.vii.1929, and 11.vii.1932. Lycklama à Nyeholt (RMNH, ZMA). — Spain: 4 ♂, 3 ♀, San Ildelfonso (La Granja), 8.vii.1902, Chrétien (MNHN). — Sweden: 3 ♂, Högsby (Sm.), 17.vii.1976, R. Johansson (BMNH, EvN). — Turkey: 1 ♂, Anatolia, Kizilcahamam, 20.vi—8.vii.1970, Pinker (LNK). — Yugoslavia: 1 ♀, Macedonia, Matka, Treschka Schlucht, 19—29.v.1955, J. Klimesch (ZSMK).

Additional records. — Italy: Latina, Monti Aurunci, R. Johansson; Piemonte, Rocciamelone, 800 m, 8.vii.1961, at light, E. Jäckh (both R. Johansson, pers. comm.).

4. **Ectoedemia (Zimmermannia) hispanica** sp. n.

(figs. 39, 92, 234, 284, 332, 344, 345, 517)

Type material: Holotype ♂, Spain: Andalucia, Sierra de Marbella, El Mirandor, 700 m, 14.vii.1980, E. Traugott-Olsen, Genitalia slide VU 1931 (ZMC). Paratype ♂, Spain: Aragon, Rubielos de Mora, 4.vii.1967, Arenberger (LNK).

Diagnosis: male genitalia very characteristic with the pronounced lobe along inner margin of valva and broad and stout gnathos. Aedeagus similar to *longicaudella*. Externally characterised by inconspicuous costal emargination and short hair-pencil.

Description.

Male (fig. 39). Forewing length 2.88—3.08 mm, wingspan 6.2—6.8 mm. Head: frontal tuft fuscous to dark brown. Antennae long, with 50—56 segments. Colour of thorax not unequivocal to determine (worn specimens). Forewings brown, probably uniformly coloured. Hindwing with relatively short white hair-pencil, about ¼ of hindwing length, surrounded by some white lamellar scales; humeral lobe less pronounced than in previous species, costal emargination very inconspicuous.

Female unknown.

Male genitalia (figs. 92, 332). Capsule length 334—374 µm. Tegumen extended into rounded pseuduncus. Gnathos (fig. 284) with central element wide and truncate. Valva (fig. 234) length 270—279 µm, triangular, with prominent inner lobe in middle of valva; transtilla with long ventral arm. Aedeagus (figs. 344, 345) 377 µm, slightly constricted in middle; ventral carinae long, as in *longicaudella*, not serrate; lateral and dorsal carinae not connected by rim, stout and pointed; dorsal carinae sometimes bifurcate.

Larva unknown.

Biology.

Hostplant unknown. There are in the type-locality some large old *Castanea* trees and *Quercus suber*, but a search for barkmines in February 1984 was not succesful. Adults have been caught in July.

Distribution (fig. 517).

East and South Spain.

Remarks.

This species seems closely related to *E. longicaudella*, but the male genitalia and hair-pencil are different enough to justify describing a new species.

5. Ectoedemia (Zimmermannia) monemvasiae sp. n.

(figs. 13, 31, 32, 40, 93, 149, 150, 235, 285, 333, 349, 351, 352, 424, 538)

Type material: Holotype ♂, Greece (Hellas): Lakonia, 5 km s. Monemvasia, 28.vii.1979, G. Christensen, Genitalia slide VU 468 (ZMC). Paratypes: 5 ♂, 4 ♀. — Greece: 1 ♀, Lakonia, 5 km s. Monemvasia, 1.viii.1978, G. Christensen; 2 ♀, same data, but 28.vii.1979; 1 ♂, same data, but 8.viii.1979; 1 ♂, Lakonia, 7 km sw. Monemvasia, 4.viii.1979, G. Christensen; 1 ♀, same data, but 25.vii.1980; 1 ♂, same data, but 8.viii.1980 (ZMC, ZMA). — Turkey: 2 ♂, Anatolia, Kizilcahamam, 200 m, 31.vii—1.viii.1963, Arenberger (LNK).

Other material: Greece, 1 ♀ (abdomen and metathorax missing), Lakonia, 7 km sw Monemvasia, 10.vii.1980, G. Christensen (ZMC).

Diagnosis: male distinguished from the other *Zimmermannia* species treated here, by long brownish hair-pencil, surrounded by dark brown lamellar scales. Female by very dense bunch of long setae on abdominal tip dorsally. Male genitalia diagnosed by shape of vinculum, slender valvae with inner lobe, configuration of carinae and triangular cornutus and female genitalia by number of convolutions in ductus spermathecae and hairy T8 and T9.

Description.

Male. Forewing length 2.84—3.36 mm (3.05 ± 0.19, 5), wingspan 6.5—7.5 mm. Head: frontal tuft and collar fuscous. Antennae very long, with 49—58 segments (53.2 ± 3.7, 5). Thorax and forewings brown, irrorate with white, sometimes an inconspicuous tornal spot white; cilia white beyond ill-defined cilia-line. Hindwing (fig. 13) with long brown hair-pencil, almost half as long as hindwing, surrounded by field of dark brown lamellar scales; humeral lobe prominent, costal margin with distinct emargination beyond hair-pencil.

Female (fig. 40). Forewing length 2.6—3.0 mm (2.83 ± 0.15, 5), wingspan 6.5—7 mm. Antennal segments 42—44 (43.3 ± 1.0, 4).

Male genitalia (figs. 93, 333). Capsule length 386—429 µm (3). Vinculum with ventral plate short, slightly excavate. Tegumen produced into blunt pseuduncus. Gnathos (fig. 285) with central element long and narrow, tapering towards sharp point. Valva (fig. 235) length 303—343 µm (3), narrow triangular, with prominent inner lobe in middle of valva; transtilla with very long ventral arm. Aedeagus (figs. 349, 351, 352) 437—467 µm (3), slightly constricted near opening of ductus ejaculatorius; ventral carinae long and parallel, fused near tip; lateral carinae small, almost triangular; dorsal carinae palmate, comprising each 4—5 teeth. Vesica with stout pointed triangular cornutus in addition to numerous small cornuti.

Female genitalia (figs. 31, 149, 150, 424). Along anterior margin of T8 (? partly on T7) crescent shaped bundle of more than 50 very long setae, easily visible in undissected material, setae pectinate (fig. 32), on rest of T8 many short setae, scales absent. Anal papillae with more than 30 setae. Posterior apophyses reaching beyond anterior apophyses. Vestibulum wide, without distinct sclerotisations. Corpus bursae 1040—1080 µm, covered with pectinations, partly in concentric bands around signa; signa elongate, slightly dissimilar, shortest 484—506 µm, largest 583—616 µm. Ductus spermathecae with 4½—5 convolutions.

Larva unknown.

Biology.

Hostplant: unknown, possibly a barkminer on Fagaceae.

Life history. Adults have been taken in July and early August.

Distribution (fig. 538).
Greece: Peloponnesos and Turkey: Anatolia.

Remarks.
This is a very distinctive species, of which several specimens of both sexes were collected from the type locality. The remarkably hairy abdominal tip of the female and the pectinate setae, suggest that this species lays its eggs on a very rough surface, such as old rugose bark.

6. **Ectoedemia (Zimmermannia) amani** Svensson, 1966
(figs. 14, 41, 94, 151, 152, 236, 286, 334, 341, 342, 350, 425, 472, 474, 517)

Ectoedemia amani Svensson, 1966: 200, 201, fig. 34, pl. 4 fig. 3. Holotype ♂, Sweden: Sdm., Saltsjöbaden, 3.vii.1958, E. Aman, Genitalia slide 4107 (RMS) [examined].
Ectoedemia amani; Borkowski, 1975: 497, fig. 5 (♂ genitalia).
Trifurcula (Ectoedemia) amani; Johansson, 1971: 245.
Trifurcula amani; Larsen, 1981: 71, 72, figs. 1—4 (♂, ♀ genitalia, distribution).

Diagnosis: largest *Ectoedemia* from Europe, distinguished form preceding five species by orange head, absence of white spots on forewing and lower number of antennal segments. Differs from externally similar, but lighter, *liguricella*, by presence of hair-pencil in male and lower number of antennal segments, in both sexes. Male genitalia characteristic with short and wide aedeagus, configuration of carinae and broad triangular valvae. Female genitalia especially characterised by long spiraled ductus spermathecae, absence of long hairs on T8 and spines in vestibulum.

Description.
Male. Forewing length 3.2—3.92 mm (3.72 ± 0.15, 6), wingspan 7.8—8.8 mm. Head: frontal tuft and collar orange to ochreous. Antennae not very long, with 36—41 segments (3). Thorax and forewing uniformly brown irrorate with white, without white spots; cilia lighter but cilia-line very inconspicuous. Hindwing (fig. 14) with snowwhite hair-pencil, approximately ⅓ of hindwing length, with a row of white scales along costal margin, but no specialised scales along dorsal edge; humeral lobe prominent, costal emargination present beyond hair-pencil.

Female (fig. 41). Forewing length 3.84—4.52 mm (3), wingspan 8.8—9.8 mm. Antennal segments 36—37 (3).

Male genitalia (figs. 94, 334). Capsule length ± 420 µm (2), capsule very wide, 369—373 µm (2). Vinculum with very short ventral plate. Tegumen broadly rounded, not produced. Gnathos (fig. 286) with wide triangular central element. Valva (fig. 236) length 270—280 µm (2), triangular, comparatively wide, tip curved slightly inwards, dorsal surface with indistinct serrate lobe. Aedeagus (figs. 341, 342, 350) 369—420 µm (5), gradually widening from anterior end towards wide posterior end; ventral carinae broadly triangular, separated, inner margin serrate; lateral carinae indistinct, rounded; dorsal carinae comprising a row of 4—5 teeth; surface of aedeagus between ventral and lateral carinae with minute spines. Vesica with one broad triangular cornutus in addition to numerous small cornuti.

Female genitalia (figs. 151, 152, 425, 472). T8 with a row of 16—18 setae along anterior margin and 4—10 small setae on disc, scales absent. Anal papillae with 15—21 seatae. Posterior apophyses clearly reaching beyond anterior apophyses. Vestibulum with two groups of spines, one near opening of ductus spermathecae and one opposite (fig. 472). Corpus bursae 1430—1640 µm, covered with pectinations, partly in concentric bands around signa; signa similar, 527—594 µm (4) long, ± 4 × as long as wide. Ductus spermathecae with 12½—13 convolutions.

Larva. Yellow, very elongate. Head-capsule brown. Ventral plates absent.

Biology.
Host plant: *Ulmus* spp. The species has not been reared, but often caught on Elm on which barkmines were observed (Johansson, pers. comm., Larsen, 1981).

Mine (fig. 474). A long contorted gallery in smooth bark of rather thin branches, similar to that of *atrifrontella*.

Life history. Not studied, but probably similar to that of *liebwerdella*. Adults have been caught in June (southern Europe only) and July.

Distribution (fig. 517).
Recorded from southern Norway (see below, not on map), southern Sweden, Denmark: Bornholm and Falster, Austria: Vienna region, and Yugoslavia: Macedonia.

Remarks.

Although one of the largest nepticulid species, *E. amani* was only discovered in 1966 by Svensson in Sweden. Since then several specimens have been found in Sweden and Denmark (Larsen, 1981). Outside Scandinavia only the four specimens cited below are at present known, plus the larva and mines found near Bad Deutsch Altenburg. This species resembles *E. piperella* Wilkinson & Newton, 1981 from USA.

Material examined: 8 ♂, 4 ♀. — Austria: 1 ♂, Hundsheimer Berg, Porta Hungarica (near Hainburg), 23.vii.1977, F. Kasy; 1 ♂, Klosterneuburg, Kritzendorfer Au, 29.vi.1936, a.l., Preissecker (NMW). — Sweden: 1 ♂ Holotype, see above; 2 ♂, 2 ♀, Kullaberg (Sk.), 19.vii.1974, 11—12.vii.1975, R. Johansson (BMNH, EvN); 2 ♂, Stockholm, Skogskyrkogd, 4.vii.1973, B. Gustafsson; 1 ♂, Upland, Riksmuseet, 10.vii.1973, B. Gustafsson (RMS). — Yugoslavia: 1 ♀, Macedonia, Stari Dojran, 10—19.vi.1955, J. Klimesch (ZSMK); 1 ♀, Macedonia, Treschka Schlucht near Skopje, 1—8.vii, F. Kasy (NMW).

Larva and mines. — Austria: 1 final instar larva, mines, Bad Deutsch Altenburg, W. of Hainburg, Pfaffenberg, 23.x.1983, E. J. van Nieukerken (ZMA).

Additional record. — Norway; Ak., Baerum, Ostoya, 1 ♂, 2—9.vii.1983 (Johansson, in litt.).

7. Ectoedemia (Zimmermannia) nuristanica sp. n.

(figs. 42, 95, 153, 154, 237, 287, 335, 353—355, 426)

Type material: Holotype ♂, Afghanistan: Nuristan, 25 km N. Barikot, 1800 m, 12—17.vii.1963, Kasy & Vartian, Genitalia slide MV 5402 (NMW). Paratype ♀, same data (NMW).

Diagnosis: the only known dark-headed (Palaearctic) *Zimmermannia* without hair-pencil in male. Male genitalia characterised by pointed pseuduncus, narrow valvae and three pairs of almost similar carinae. Female characterised by very dense bundle of extremely long setae on tergite 7.

Description.

Male holotype (fig. 42). Forewing length 2.84 mm, wingspan 6.4 mm. Head: frontal tuft and collar dark brown. Antennae broken. Thorax and forewings brown irrorate with white, with an inconspicuous white dorsal spot. Hindwing without hair-pencil, costal bristles or specialised scales; humeral lobe more or less distinct.

Female paratype. Forewing length 3.08 mm, wingspan 7 mm. Antennae long, with 41 segments.

Male genitalia (figs. 95, 335). Capsule length 403 µm, width 261 µm. Tegumen produced into cuspidate pseuduncus. Gnathos (fig. 287) with long, slender central element (in figure not in proper ventral view). Valva (fig. 237) length 266 µm, narrow triangular, with indistinct inner lobe (mesal), distally suddenly narrowed into fingerlike tip. Aedeagus (figs. 353—355) 351 µm, hardly constricted; ventral carinae short, widely separate, bifurcate; lateral and dorsal carinae similar in size and shape, horn-shaped, closely placed. Vesica difficult to study in holotype, no special cornuti visible.

Female genitalia (figs. 153, 154, 426). T7 with horseshoe-shaped dense bundle of extremely long setae, reaching beyond abdominal tip. T8 with a row of about 20 long setae along anterior margin and with many shorter setae on disc. Anal papillae with 30—32 setae. Posterior apophyses hardly reaching beyond anterior apophyses. Vestibulum with indistinct sclerotisation. Corpus bursae 935 µm long, covered with pectinations, partly in concentric bands around signa; signa similar, 399 and 424 µm long, 4.5—4.65 × as long as wide. Ductus spermathecae with 4½ convolutions.

Larva unknown.

Biology.

Hostplant: unknown. The specimens were taken at light in mountains with extensive woods of *Quercus baloot* Griff., a relative of *Q. ilex* L. (Kasy, 1965), it is therefore possible that *nuristanica* is a barkminer of *Q. baloot*.

Life history. Adults taken in July.

Distribution.

Only known from East Afghanistan: Nuristan.

Remarks.

It is assumed that both sexes described here belong to the same species, since they are externally similar and have been collected together.

8. Ectoedemia (Zimmermannia) liguricella Klimesch, 1953

(figs. 43, 96, 155, 156, 238, 288, 336, 356—358, 427, 428, 539)

Ectoedemia liguricella Klimesch, 1953: 194, 195, figs. 20—22. Lectotype ♂ (here designated), Italy: Liguria, prov. Savona, Noli, v or ix.1951, J. Kli-

mesch, Genitalia slide Kl. 513 (ZSMK) [not examined, genitalia figured by Klimesch].
Ectoedemia liguricella; Szőcs, 1965: 49.

Diagnosis: differs from all treated *Zimmermannia* species, except *amani*, by light coloured head. Males can be separated from *amani* by absence of hair-pencil, and females by larger number of antennal segments. Diagnostic in male genitalia are the vinculum process, the short narrow gnathos, the shape of the valva and the configuration of the carinae. The female genitalia are characterised by the relatively few setae on T8 and the 4½—5½ convolutions of the ductus spermathecae. *E. liguricella* can be confused with *Trifurcula* species, see generic diagnosis.

Description.

Male (fig. 43). Forewing length 3.0—4.04 mm (3.58 ± 0.29, 12), wingspan 7.6—8.8 mm. Head: frontal tuft and collar yellow to yellow ochreous. Antennae long, with 43—48 segments (44.9 ± 1.7, 7). Thorax and forewings brown irrorate with yellowish-white (European specimens darker than Moroccan), with sometimes small indistinct white tornal spot; cilia-line hardly visible. Hindwing without hair-pencil, costal bristles or special scales. Humeral lobe distinct, rounded.

Female. Forewing length 3.44—4.0 mm (3.73 ± 0.24, 6), wingspan 7.6—9 mm. Antennal segments 39—44 (41.6 ± 2.9, 7).

Male genitalia (figs. 96, 336). Capsule length 321—377 µm (357 ± 20.4, 10). Vinculum with ventral plate narrow. Tegumen rounded, with an obvious anteriorly directed, tongue-shaped process. Gnathos (fig. 288) with narrow pointed central element, shorter than in related species. Valva (fig. 238) length 270—304 µm (284.8 ± 12.7, 9), narrow triangular, with distinct inner (mesal) lobe in middle; transtillae with short transverse bar. Aedeagus (figs. 356—358) 369—420 µm (398.1 ± 16.7, 10), slightly constricted; ventral carinae long, widely separate, pointing outwards; lateral carinae absent; dorsal carinae simple, pointed; aedeagus dorsally ending in two weakly sclerotised lobes covered with spines, less spines on left lobe. Vesica with small cornuti only.

Female genitalia (figs. 155, 156, 427, 428). T8 with a row of about 10—20 relatively long setae, along anterior margin, and with a row of 10—20 shorter setae more posteriorly, scales absent. Anal papillae with 15—27 setae. Posterior apophyses reaching beyond anterior apophyses. Vestibulum with indistinct internal sclerotisation. Corpus bursae 880—1100 µm, covered with pectinations, especially dense in ductus bursae, partly in concentric bands around signa; signa similar, 308—493 µm (395.9 ± 59.4, 8), 5.5—7.0 × as long as wide. Ductus spermathecae with 4½—5½ convolutions.

Larva unknown.

Biology.

Hostplant: unknown. It might be a barkminer of evergreen *Quercus*, since it has often been collected amongst those trees. In one of the localities near Marbella I noted a few barkmines on *Quercus coccifera*, which could belong to *E. liguricella*.

Life history. Adults taken from May to September.

Distribution (fig. 539).

A western mediterranean species, known from the Italian Riviera, France, Spain and Morocco. Occurs from sea-level to high elevations in the mountains (1600 m in Spain, 2600 m in Morocco).

Remarks.

I have not examined any types of *liguricella*, because the identity of this species is clear from Klimesch's (1953) figure of the male genitalia, and hence, the specimen represented by that figure is here selected as lectotype. For the first time the species is here recorded from areas outside the type-locality.

The female collected in the company of 6 males in Morocco has slightly different genitalia (fig. 428) from the Spanish specimens, and is therefore not included in the measurements of the female genitalia. It has 80 setae along the anterior margin of T8, 45 setae more posterior on T8 and anal papillae with 39 setae. The bursa is smaller, 715 µm, with signa of 283 and 317 µm. The total appearance of the specimen however, does not indicate that it is a different species, but more material is needed to see if this variation is constant.

Material examined: 39 ♂, 21 ♀. — France: 2 ♂, "Nesp." (? near St. Pons, dep. Hérault), 15.vi.1904, Chrétien; 1 ♂, Ile du Levant (Var), 19.vii.1941, H. Legrand (MNHN). — Morocco: 6 ♂, 1 ♀, Haut Atlas, Oukaim'den (near Toubqual), 2600 m, 9—11.vii.1975, F. Kasy (NMW). — Spain: 1 ♂, Albarracin, Noguera, 1600 m, 18—22.vii.1960, Vartian (NMW); 3 ♂, Andalucia, road to Benahavis,

8.vi.1983, E. Traugott-Olsen; 1 ♀, Andalucia, road to Casares, 500 m, 9.vii.1973, E. Traugott-Olsen; 2 ♂, 4 ♀, Andalucia (Marbella-region), road to Istan, 400 m, data: 17.vii.1971, 21.vii.1972, 4.vii.1973, 25.vi.1975, 15.vii.1982, E. Traugott-Olsen; 2 ♂, 6 ♀, Andalucia (Marbella-region), road to Ojen, 150 m, data: 5.v.1980, 12 and 25.vi.1981, 20 and 25.vi.1983, E. Traugott-Olsen; 1 ♀, Andalucia (Marbella-region), Refugio de Juanar, 700 m, 29.vii.1971, E. Traugott-Olsen, 2 ♂, 1 ♀, Andalucia, Sierra de Marbella, El Mirandor, 700 m, 21.vii.1982, E. Traugott-Olsen (ETO, ZMA, ZMC, EvN); 1 ♂, Andalucia (Granada), Sierra de Alfacar, 1200 m, 26.vi—8.vii.1962, W. Glaser (LNK); 1 ♀, idem, 1500 m, 23.vi.1968, K. Sattler & D. J. Carter (BMNH); 1 ♂, Aragon, Rubielos de Mora, 4.vii.1967, Arenberger; 2 ♂, 5 ♀, Cataluna, Port Bou, 11—18.vii.1967, Arenberger; 3 ♂, idem, 0—300 m, 9—24.vi.1964, M. & W. Glaser (LNK); 1 ♂, Huelva prov., Torre la Higuera, 12.v.1981, C. Gielis (coll. Gielis); 12 ♂, 1 ♀, idem, 22.iv—9.v.1983. J. B. Wolschrijn (coll. Wolschrijn, ZMA, EvN).

Subgenus **Ectoedemia** Busck

Ectoedemia Busck, 1907: 97. Type-species: *Ectoedemia populella* Busck, 1907: 98; by original designation and monotypy.

Dechtiria Beirne, 1945: 204. Type-species: *Tinea subbimaculella* Haworth, 1828: 583; by original designation. (Synonymised by Svensson, 1966: 200).

Ectoedemia (Dechtiria); Borkowski, 1972: 699; Emmet, 1976: 188, 191.

Ectoedemia (Ectoedemia); Borkowski, 1972: 699; Emmet, 1976: 188, 189; Scoble, 1983: 20.

Ectoedemia; Scoble, 1978: 82; 1979: 35—54; Wilkinson & Scoble, 1979: 73; Wilkinson & Newton, 1981: 32 partim.

Trifurcula (Ectoedemia); Johansson, 1971: 245.

Description.

Adult. Small to moderately large nepticulid moths, forewing length 1.7—3.7 mm (wingspan 3.2—8.4 mm).

Head. Antennae short or long; in male with 24—63 segments, in female with 21—43.

Wings. Colour pattern variable, often a white medial fascia or costal and dorsal spots present, sometimes basal or discal spot in addition, sometimes white markings absent. Cilia-line present except in *occultella*-group and *populella*. Hindwing in male either with costal bristles or hair-pencil, in some species both absent. Additional special scales occur in several species. Humeral lobe not very prominent, or absent.

Forewing venation (fig. 9). R and M + Cu forming closed cell, branches R_1, R_{2+3}, R_4, R_5, M and Cu present. A thickened, without anal loop. Cu and A in some species very long, seeming fused at tips.

Male genitalia. Vinculum ring shaped, anterior extension short, anteriorly convex. Tegumen produced into distinct pseuduncus, of variable form. Uncus absent. Gnathos with spatulate or triangular central element, sometimes divided into a distal spatulate part and basal part with serrate margins. Valva approximately triangular, or almost rectangular, with tip directed inwards or posteriorly, often clearly separate from rest of valva. No mesal (inner) lobes present. Aedeagus in all but one species with ventral carinae, often bi- or multifurcate, and in some species in addition with dorsolateral carinae. Vesica in all but one species with numerous small denticulate cornuti only.

Female genitalia. Tergite 7 with or without a row of long setae near anterior margin of tergite 8. Tergite 8 often with two patches of setae and scales, sometimes with setae only. Anal papillae with setae. Vestibulum in most species with ring-shaped vaginal sclerite and denticulate pouch. Corpus bursae with numerous pectinations, or pectinations concentrated posteriorly near vestibulum. Reticulate signa present, of variable form and often dissimilar. Margin of signa narrower than individual cells. Ductus spermathecae spiraled, with variable number of convolutions.

Larva. Yellow, white, green or grey, feeds venter upwards. Probably all species have four larval instars. Many species have 12 sclerotised ventral plates during second and third instar, being shed in the final instar, independently from moult. In some species similar dorsal plates occur in addition.

Biology.

Larva leaf-miner, or petiole-miner. Western Palaearctic species mine on Fagaceae, Rosaceae, Salicaceae and to a lesser extent on Betulaceae, Ulmaceae and Anacardiaceae. In addition species from other regions are recorded from Nyssaceae, Platanaceae, Juglandaceae, Aceraceae, Hippocastanaceae, Ericaceae, Caprifoliaceae and Burseraceae. Most European species are univoltine, feeding in late summer or autumn, but al least *terebinthivora* is bivoltine, and some others are suspected to be so. Larvae of many species are often gregarious. Larvae overwinter full-fed in cocoons in the soil, or in the mine in the case of *agrimoniae* and pupate in spring. Adults emerge in March—July. Some mediterranean species, on evergreen oaks, feed in the winter and aestivate in their cocoons, or emerge in spring.

Distribution and composition.

The distribution is mainly Holarctic: 42 species are reported here from the West Palaearctic, Wilkinson & Newton (1981) and Wilkinson (1981) reported 18 North American species, Puplesis (1984a and b) described 9 species from the eastern USSR and about 25 species occur in a collection of Japanese Nepticulidae. In addition three species are known from Southern Africa (Scoble, 1978; 1979).

The *Ectoedemia populella* group

This group comprises all the Salicaceae-feeding *Ectoedemia* species. Most make mines in the petiole and later in the lamina of *Populus* species, *intimella* makes a similar mine on *Salix* but starts in the midrib, not the petiole, and the Nearctic *populella* makes a petiole-gall. All feed late in the year and are often found in the green islands of fallen leaves. Adults are often found resting on trunks.

Male genitalia are characterised by the presence of two pairs of carinae, which are often large.

Female genitalia are characterised by the presence of a vaginal sclerite, a spiculate pouch with conspicuous and equally spaced spicules and a bursa, usually covered with pectinations (except *intimella*). The ductus spermathecae has 2½—3 convolutions and the signa are elongate and almost similar.

Males invariably possess a hair-pencil on the hindwing.

The group is Holarctic, and comprises also the Nearctic *E. populella* Busck and *E. canutus* Wilkinson & Scoble and the Eastern Palaearctic *E. wilkinsoni* Puplesis, 1984a.

Ectoedemia (Ectoedemia) populella Busck, 1907

(figs. 98, 240, 360)

Ectoedemia populella Busck, 1907: 98.

Ectoedemia populella; Borkowski, 1972: 697; Wilkinson & Scoble, 1979: 74—77, figs. 41, 42; Wilkinson & Newton, 1981: 41, figs. 4, 5.

E. populella does not occur in the Western Palaearctic Region, but is treated here because it is the type-species of *Ectoedemia*. A full description is given by Wilkinson & Scoble (1979). Some descriptive notes are given in order to compare it with the Western Palaearctic species.

Adult. Antennae very long, with approximately 63 segments in ♂ and 42—43 in ♀. Forewings including cilia uniform cupreous brown, no cilia-line, hindwing in ♂ with short inconspicuous brown hair-pencil.

Male genitalia (figs. 98, 240, 360). Capsule length ± 390 µm. Tegumen produced into rounded pseuduncus. Gnathos with smooth spatulate, slightly truncate central element. Valva (fig. 240) length ± 215 µm, broad, tip hardly demarcated, with many setae; inner margin slightly sinuous. Aedeagus (fig. 360) ± 380 µm, with long pointed ventral carinae and very similar dorsolateral carinae.

Female genitalia. Terminalia very wide. T7 without row of setae. T8 wide, with two patches of scales and 10 setae at least. Anal papillae with 7—11 setae. Vestibulum with vaginal sclerite, a spiculate pouch with many short, single denticles and a dense patch of pectinations near entrance of ductus spermathecae. Corpus bursae without pectinations; signa comparatively short, ± 270—320 µm, cells very spiny. Ductus spermathecae broken in single slide examined.

Remarks.

E. populella makes petiole-galls in several *Populus*-species. In some characters it is aberrant in comparison with European species such as absence of cilia-line, large number of antennal segments.

Material examined. — USA: 4 ♂, 2 ♀, syntypes, no. 3238, 12—24.v.1884, Poplar (USNM).

9. Ectoedemia (Ectoedemia) intimella (Zeller, 1848)

(figs. 9, 44, 97, 157, 158, 239, 289, 359, 429, 477, 520)

Nepticula intimella Zeller, 1848: 323. Holotype ♀. Poland: Głogów (Glogau), Zeller (depository unknown) [not examined].

Nepticula intimella; Stainton, 1849: 29; 1854: 299; Herrich-Schäffer, 1855: 356; Frey, 1857: 393, 394; Stainton, 1859: 432; Wocke, 1871: 339; 1874: 102; Nolcken, 1871: 792; Heinemann & Wocke, 1877: 764; Sorhagen, 1886: 309; Meyrick, 1895: 724, 725; Tutt, 1899: 341, 342; Rebel, 1901: 227; Meess, 1910: 480; Sorhagen, 1922: 54, pl. 3 fig. 61; Meyrick, 1928: 861; Petersen, 1930: 74, fig. 110 (♂ genitalia); Hering, 1943: 275, fig. 2 (♂ genitalia); Szőcs, 1965: 82.

Dechtiria intimella; Beirne, 1945: 205, fig. 67 (♂ genitalia); Emmet, 1971: 280, 281.

Stigmella intimella; Klimesch, 1951: 63, 64; Gerasimov, 1952: 244; Klimesch, 1961: 762; Lhomme, 1963: 1199; Borkowski, 1969: 112.

Stigmella (Dechtiria) intimella; Hering, 1957: 811, 928, fig. 588b (mine).

Trifurcula (Ectoedemia) intimella; Johansson, 1971: 245.
Ectoedemia intimella; Bradley et al., 1972: 3; Borkowski, 1975: 494; Emmet, 1976: 190, pl. 7 fig. 1, pl. 12 fig. 34; van Nieukerken, 1982: 107.
Trifurcula intimella; Karsholt & Nielsen, 1976: 18.

Diagnosis: easily separated from most *Ectoedemia* species by presence of a medial dorsal spot only on forewing. Distinguished from *ilicis* and *heringella* by more uniformly dark forewings, hair-pencil in male, and the flagellum being the same colour as the scape: it is the only treated *Ectoedemia*, with this character. Species of *Fomoria, Stigmella* or *Ectoedemia (Zimmermannia)* with dorsal spot only, have it in postmedial position.

Description.

Male. Forewing length 2.4—2.84 mm (2.58 ± 0.15, 16), wingspan 5.3—6.3 mm. Head: frontal tuft and collar intensively ferruginous to yellowish orange. Antenna with 39—45 segments (41.3 ± 2.0, 12), scape, pedicel and flagellum yellowish white, with an orange tinge. Thorax and forewings uniformly blackish fuscous, with a faint purplish gloss, scales almost uniformly dark; a yellowish white dorsal spot in middle of forewing, conspicuous. Hindwing with a very short ochreous hair-pencil, less than 1/5 of hindwing length.

Female (fig. 44). Forewing length 2.48—3.04 mm (2.75 ± 0.19, 7), wingspan 5.6—6.8 mm. Antenna with 27—30 segments (28 ± 1.1, 6). Ovipositor protruding, pointed.

Male genitalia (figs. 97, 239, 289, 359). Capsule length 287—304 μm (294.3 ± 8.0, 6). Tegumen produced into wide, triangular pseuduncus. Gnathos (fig. 289) with central element very wide, uniformly rounded. Valva (fig. 239) length 210—236 μm (217.1 ± 9.3, 6), basally broad, suddenly narrowed in middle with inner margin becoming strongly concave; tip pointed. Aedeagus (fig. 359) 317—364 μm (340.3 ± 18.3, 5), with pair of slender, pointed ventral carinae, sometimes bifid, and pair of pointed dorsolateral carinae with additional spines.

Female genitalia (figs. 157, 158, 429). T7 with a row of 6—8 setae along posterior margin. T8 narrowed posteriorly, with two lateral groups of 11—16 short and long setae. Anal papillae narrow, with 14—15 setae. Vestibulum with vaginal sclerite, a dorsal spiculate pouch with comparatively few (less than 40) spines, all single and equally spaced; patch of densely packed pectinations near opening of ductus spermathecae. Corpus bursae 505—605 μm, without pectinations; signa dissimilar, longest 304—347 μm (4), shortest 257—313 μm (4), 4.9—5.5 × as long as wide. Ductus spermathecae with 2½—3 convolutions.

Larva. Pale yellow. Sternites present on pro- and mesothorax and abdominal segment 10. Ventral plates absent.

Biology.

Hostplants. *Salix caprea* L., *S. cinerea* L., *S. pentandra* L., *S. fragilis* L., and *S. phylicifolia* L.

Mine (fig. 477). Egg on upperside, against midrib. Early mine in midrib, later becoming large elongate blotch at one side of midrib, with black frass deposited in two lateral lines, such that larva can pass in between to conceal itself in midrib. Only final instar larva mines in leafblade.

Life history. Univoltine. Larvae feed late in the season, from late September until November, often in green islands in fallen leaves. Adults in June and July.

Distribution (fig. 520).

Widely distributed in northern, western and central Europe, but not yet recorded from Norway and Ireland. In the south only known from northern Italy, North Yugoslavia and Rumania.

Remarks.

There is unfortunately no specimen in the Zeller collection in BMNH, which can be regarded as the holotype. Zeller's description is however very clear, since he amongst others noted the completely yellow antennae, which are very characteristic for *intimella*. Consequently the identity of this species has never been in doubt.

Material examined: 31 ♂, 23 ♀, 1 ex. — Austria: 1 ♂, Hirschdorf, Ob. Öst., e.l. 11.v. 1898, Hauder; 1 ♀, Klosterneuburg, Freiberg, e.l. 28.v.1941, *Salix caprea*, Preissecker (NMW). — Germany, East: 2 ♂, 1 ♀, Berlin, Finkenkrug, e.l. 27.ii—7.iii.1918, *Salix caprea*, Hering; 1 ♂, 1 ♀, Bredow near Nauen, e.l. 31.v—2.vi.1923, Hering (MHUB); 1 ♂, Görlitz, 24.vi.1884 (NMW); 1 ♂, Rachlau, Schütze (ZSM); 2 ♂, 3 ♀, Rachlau, 1902, *Salix caprea*, Schütze (MHUB). — Great Britain: 2 ♂, 1 ♀, 2 km SE Earls Colne: Chalkney Wood (Essex), e.l. 30.v—16.vi.1980, *Salix caprea*, Bryan, Emmet & van Nieukerken (ZMA). — Netherlands: 1 ♀, Amsterdamse Bos, e.l. 24.vi.1983, *Salix cinerea*, J. Brouwer; 1 ♂, 2 ♀, Ootmarsum: Ageler-

broek, e.l. 8—12.v.1982, *Salix cinerea*, Andeweg & van Nieukerken; 4 ♂, Rockanje: Voornes Duin, e.l. 17.vi—4.vii.1980, *Salix cinerea*, van Nieukerken; 3 ♂, Schinveld, 29.vi.1975, G. R. Langohr (ZMA); 1 ♀, Zwanewater, 5.vii.1982, Koster (coll. Koster). — Poland: 8 ♂, 5 ♀, 1 ex., Wrocław (Breslau), e.l. iii—iv.1875, *Salix fragilis*, Wocke (MHUB, NMW, RMNH, ZSM); 1 ♂, 1 ♀, Silesia (MHUB). — Switzerland: 1 ♀, St. Gallen, e.l. iv.1915, Müller-Rutz (ZSM). — Yugoslavia: 2 ♂, 3 ♀, Mt. Slavnik, 8 km S. Herpelje-Kozina (Slovenia), ± 900 m, e.l. 10—15.vi.1984, *Salix caprea*, J. J. Boomsma & E. J. van Nieukerken (ZMA).

Mines. On *Salix caprea*: Austria: Nassfeld Pass, SW Hermagor.— Belgium: Zolder. — Great Britain: SE Earls Colne. — Yugoslavia: Mt. Slavnik, S. Herpelje-Kozina. On *Salix cinerea*: Netherlands: Aalsmeer; Amsterdamse Bos; Ootmarsum; Rockanje.

10. Ectoedemia (Ectoedemia) hannoverella (Glitz, 1872)

(figs. 7, 24, 45, 99, 159, 160, 241, 290, 361, 399, 430, 475, 518)

Nepticula hannoverella Glitz, 1872: 25, 26. Lectotype ♂ (here designated), Germany: Hannover, Glitz, coll. Staudinger, Genitalia slide 1521 RJ (MHUB) [examined]

Nepticula hannoverella; Wocke, 1871: 340; 1874: 103; Heinemann & Wocke, 1877: 766; Rebel, 1901: 227; Meess, 1910: 480; Sorhagen, 1922: 58; Petersen, 1930: 76, fig. 116 (♂ genitalia); Hering, 1935: 7; Szőcs, 1965: 85.

Stigmella hannoverella; Klimesch, 1951: 64; Gerasimov, 1952: 241; Klimesch, 1961: 763; Lhomme, 1963: 102; Borkowski, 1969: 107.

Stigmella (Dechtiria) hannoverella; Hering, 1957: 811 (mine).

Trifurcula (Ectoedemia) hannoverella; Johansson, 1971: 245.

Ectoedemia hannoverella; Borkowski, 1972: fig. 7 (♂ genitalia); 1975: 495; van Nieukerken, 1982: 107, figs. 1, 5 (♂ genitalia, mine).

Diagnosis: externally easy to confuse with *turbidella*, but in female the blunt ovipositor of *hannoverella* separates it immediately from *turbidella*, which has a pointed ovipositor. Males with dark heads always belong to *turbidella*, but light-headed males can only be separated by the genitalia. These are very different in shape of valva, shape and size of carinate processes, and gnathos, which bears spines in *hannoverella*. From other *Ectoedemia* species *hannoverella* and *turbidella* can be separated by the presence of a white discal spot in basal part of forewing and many scattered white scales; males also possess a hair-pencil.

Description.

Male (fig. 45). Forewing length 2.4—3.16 mm (2.84 ± 0.21, 18), wingspan 5.2—6.8 mm. Head: frontal tuft yellowish orange to light ferruginous; collar slightly lighter. Antennae with 44—53 segments (48.8 ± 2.8, 10). Thorax fuscous black with some white scales along frontal margin; forewings fuscous black with a variable pattern of yellowish white spots; usually a medial costal and opposite dorsal spot, sometimes fused by some, more distally placed, scales; basal half with many scattered white scales, often forming a small discal spot halfway between wingbase and costal spot, and a basal spot along dorsal margin. Specimens with almost uniform dark forewings occur. Hindwing with a yellowish-white hair-pencil, about 1/5th of hindwing length.

Female. Forewing length 2.8—3.32 mm (3.05 ± 0.16, 14), wingspan 6.2—7.2 mm. Antennae with 29—33 segments (30.9 ± 1.6, 9).

Male genitalia (figs. 99, 241, 290, 361, 399). Capsule length 249—309 µm (282.9 ± 20.8, 6). Tegumen wide and rounded. Gnathos (fig. 290) with moderately long central element, ventrally with some rows of spines. Valva (fig. 241) length 201—236 µm (217.3 ± 11.8, 7), inner margin almost straight, except basally; outer margin strongly convex, widest part beyond middle; apex of valva not separated, hardly curved inwards, forming an almost right angle. Aedeagus (figs. 361, 299) 291—339 µm (309.8 ± 16.2, 7), with two pairs almost similar pointed carinae, hardly curved, without additional spines.

Female genitalia (figs. 159, 160, 430). T7 without row of setae. T8 broad, rectangular or trapezoid, with two lateral patches of scales and at least 12—17 setae. Anal papillae with 6—11 setae. Vestibulum strongly folded (heavily stained by chlorazol), with vaginal sclerite, dorsal spiculate pouch with ± 50 single and equally spaced spines, and a patch of densely packed pectinations near entrance of ductus spermathecae. Corpus bursae long and slender, 660—880 µm, covered with pectinations, partly in concentric bands around signa, absent in anterior part; signa almost similar, 390—480 µm (422.1 ± 26.4, 10), 3.4—3.7 × as long as wide. Ductus spermathecae with 2½—3 convolutions.

Larva. Pale yellow. All thoracic segments and abdominal segments 8—10 with light brown sternites. Ventral plates absent.

Biology.

Hostplants: *Populus nigra* L. and its hybrids (*P.* × *canadensis* Moench.)

Mine (fig. 475). Egg deposited on lateral side of petiole, about one centimeter from lamina. Mine first straight gallery in petiole, causing swelling; in final instar larva enters lamina, making elongate blotch, usually between first lateral vein and leaf margin, occasionally between midrib and first lateral vein; frass in two parallel lines, leaving passage for larva, which can withdraw itself in petiole.

Live history. Univoltine. Larvae start feeding early, probably already in July, but feed very slowly; blotches with final instar larvae can be found from late September to November, often in green islands of fallen leaves. Larvae feed usually in the dark. Adults in May and June.

Distribution (fig. 518).

Only known from a comparatively small area in central Europe, where it is widespread and often abundant. Absent from the British Isles and Scandinavia, but known from Denmark. Only two records from France, and not yet recorded south of the Po valley in Italy or south of the Danube in Yugoslavia. Buszko (in litt.) suggests that the species is expanding its area, on the basis of an increase of records in Poland.

Remarks.

Since types no longer exist in the Glitz collection in Hannover (Niedersächsisches Landesmuseum), a lectotype is selected from specimens in the Staudinger collection.

Material examined: 66 ♂, 56 ♀. — Austria: 2 ♂, 1 ♀, Klosterneuburg, Kritzendorfer Au, e.l. 11—15.v.1937, 24.iv.1938, Preissecker (NMW); 1 ♂, Wien, Mann, Zeller coll. (sub *turbidella*) (BMNH); 1 ♀, Wien, Prater, e.l. 10—12.vi.1984, E. J. van Nieukerken (ZMA). — Belgium: 1 ♀, Elewijt, 20.vi.1944, L. Legiest; 1 ♂, Laeken (Brussel), 9.v.1945, L. Legiest (IRSN); 2 ♂, 1 ♀, S. of Rouvreux (Liège), e.l. 26—27.v.1980, Bryan & van Nieukerken (ZMA). — France: 1 ♂, 1 ♀, Alpes Maritimes, Toét s.Var, 10.v.1980, C. Gielis (coll. Gielis). — Germany, West: 1 ♂, Baiern, 1858 (NMW); 1 ♂, 1 ♀, Grünnstadt, Pfalz, Eppelsheim (ZSM); 1 ♂, Hannover, Heinemann (RMNH); 1 ♀, Hannover, (NMW); 2 ♂, 1 ♀ (lecto- and paralectotypes), Hannover, Glitz, coll. Staudinger (MHUB); 2 ♂, 2 ♀, Regensburg, D. O. Hofmann (RMNH); 3 ♂, Regensburg, Frank (ZSM); 1 ♀, Regensburg, 28.v.1885 (NMW); 6 ♂, 3 ♀, Regensburg (MHUB). — Germany, East: 1 ♀, Bautzen, 2.iii.1907 (NMW); 4 ♂, 9 ♀, Berlin-Dahlem, e.l. 28.ii—10.iii.1958, Hering; 5 ♂, 8 ♀, Bredow near Nauen, e.l. 22.iii—16.iv.1924, 1.vii.1923, Hering (MHUB); 1 ♀, Erfurt, e.l. 1884 (RMNH). — Netherlands: 19 ♂, 15 ♀, from following localities: Amsterdamse Bos; Bunde; Geulle; De Lutte; Oostvoorne; Susteren; Winterswijk; Zwanewater (ZMA, coll. Koster). — Poland: 4 ♂, 1 ♀, Wrocław (Breslau), e.l. iii.1868, iii.1869, [Wocke] (MHUB, ZMA). — Switzerland: 1 ♂, Landquart, e.l. 26.iv.1916, Müller-Rutz (ZSM). — Yugoslavia: 2 ♀, 2 km W of Bezdan (Vojvodina), valley of Danube, e.l. 16—19.vi.1984, J. J. Boomsma & E. J. van Nieukerken (ZMA).

Mines. — Austria: Klosterneuburg; Mühlleiten (Grossenzersdorf). — France: Schirmeck. — Germany, West: Hillesheim. — Italy: Cimoláis. — Netherlands: Amsterdamse Bos; Bunde; Chaam; Denekamp; Hilversum; Hoogerheide; Oostvoorne; Ulvenhout; Winterswijk. — Yugoslavia: Bezdan.

11. Ectoedemia (Ectoedemia) turbidella (Zeller, 1848)

(figs. 46, 100, 161, 162, 184, 242, 291, 362, 431, 432, 476, 519)

Nepticula argyropeza var. *turbidella* Zeller, 1848: 321, 322. Syntypes, Poland: Głogów (Glogau), Zeller (depository unknown) [not examined].

[no genus] *argyropeza*; Herrich-Schäffer, [1853]: pl. 106 figs. 838, 839; [1854]: pl. 114 fig. 930 [misidentification].

Nepticula argyropezella Herrich-Schäffer, 1855: 357. (replacement name for *turbidella* Zeller).

Nepticula populi-albae Hering, 1935: 7. Lectotype ♀ (here designated), Germany: Berlin, Tiergarten, 22.ii.1933, M. Hering. *Populus alba*, N 4058, coll. Hypon., M. Hering, Genitalia slide on pin (MHUB) [examined].

Stigmella marionella Ford, 1950: 39, fig. Holotype ♂, England: Stanmore, Middlesex, v, L. T. Ford (BMNH) [not examined].

[*Nepticula argyropeza*; Frey, 1857: 398—400, partim, misidentification].

Nepticula turbidella; Wocke, 1871: 339; 1874: 103; Heinemann & Wocke, 1877: 766; Sorhagen, 1886: 310; Rebel, 1901: 227; Meess, 1910: 480; Petersen, 1930: 76, fig. 115 (♂ genitalia); Hering, 1935: 7: Szőcs, 1965: 85.

Stigmella turbidella; Klimesch, 1951: 64; Gerasimov, 1952: 265, 266; Klimesch, 1961: 762; Lhomme, 1963: 1202.

Stigmella (*Dechtiria*) *turbidella*; Hering, 1957: 811, fig. 488a (mine).

Dechtiria turbidella; Vári, 1950: 182, 184, figs. 9, 10 (♂, ♀ genitalia); Emmet, 1970a: 37—41, figs. (♂ genitalia, mine); 1971: 242, 243.

Trifurcula (*Ectoedemia*) *turbidella*; Johansson, 1971: 245.

Ectoedemia turbidella; Bradley et al., 1972: 3;

Borkowski, 1972: fig. 6 (♂ genitalia); Emmet, 1976: 189, pl. 12 fig. 36, pl. 7 fig. 2; van Nieukerken, 1982: fig. 2 (♂ genitalia).
Trifurcula turbidella; Karsholt & Nielsen, 1976: 18.
Stigmella populialbae; Gerasimov, 1952: 252.
Ectoedemia populialbae; Borkowski, 1975: 495.

Diagnosis: see diagnosis of *hannoverella* for the differences between it and *turbidella*. The male genitalia resemble those of *klimeschi*, but can be recognised by the shape of the valva, with tooth-shaped tip in *turbidella*, and the asymmetric aedeagus in *klimeschi*. The female genitalia are very characteristic with the pointed ovipositor, and the long and broad apophyses.

Description.

Male. Forewing length 2.8—3.68 mm (3.34 ± 0.21, 30), wingspan 6.2—8.4 mm. Head: frontal tuft light yellowish-orange or yellowish ochreous to dark fuscous; collar slightly lighter. Antenna with 46—59 segments (54.5 ± 3.1, 23). Thorax blackish fuscous, with scattered white scales and sometimes a white tip; forewings blackish fuscous with a variable pattern of yellowish white spots: usually a medial costal and opposite dorsal spot; basal half with many scattered white scales, often forming a small discal spot halfway between wingbase and costal spot, and a basal spot along dorsal margin, usually giving a lighter appearance than *hannoverella*. Hindwing with a yellowish hair-pencil of about one-fifth of hindwing length.

Female (fig. 46). Forewing length 2.76—3.48 mm (3.12 ± 0.20, 29), wingspan 6.0—7.8 mm. Head: frontal tuft yellowish orange, never fuscous. Antennae with 27—32 segments (29.3 ± 1.3, 21). Ovipositor very conspicuous, pointed.

Male genitalia (figs. 100, 242, 291, 362). Capsule length 270—347 μm (304.3 ± 23.0, 13). Tegumen produced into a widely rounded pseuduncus. Gnathos (fig. 291) with central element short triangular, smooth. Valva (fig. 242) length 193—227 μm (210 ± 9.5, 9), widest at base, gradually narrowing; tip inwards curved, tooth-shaped, clearly demarcated from valva. Aedeagus (fig. 362) 369—399 μm (377.6 ± 13.9, 10), very long and stout, with two pairs of prominent carinae: ventral pair at extreme posterior tip, basally connected, pointed, single or with two or more tips; dorsolateral pair more anteriorly placed, longer than ventral carinae, strongly curved, dorsally connected, often with additional spines at base, often asymmetrical.

Female genitalia (figs. 161, 162, 184, 431, 432). T7 without row of setae. T8 relatively narrow, tapering posteriorly, with two groups of 6—15 setae (to 20 in Iranian specimens), without or with very few scales. Anal papillae narrow, with 7—12 setae. Anterior apophyses widened in middle, especially in lateral view. Posterior apophyses widening towards anterior end. Vestibulum with vaginal sclerite, a dorsal spiculate pouch with many (about 100) single, equally spaced, spines; and a patch of densely packed pectinations near entrance of ductus bursae. Corpus bursae relatively small, 420—660 μm, covered with small pectinations, except in anterior part, partly in concentric bands around signa; signa slightly dissimilar in length (not in shape), longest 219—283 μm (263.6 ± 23.7, 6), shortest 184—266 μm (227.9 ± 29.6, 6), 3.3—4.4 × as long as wide (data for specimens from Iran resp.: long signum 240—334 μm; short 227—279, 2.7—3.4 × as long as wide). Ductus spermathecae with 2¼—3 convolutions.

Larva. Pale yellow. Sternite on prothorax only. Ventral plates absent. This is the only *Ectoedemia* s.str. species with dorsal as well as ventral calli.

Biology.

Hostplants: *Populus alba* L., *P. canescens* (Aiton.) Sm., only on the smaller leaves of older shoots of large trees, never on saplings. Material from Potsdam (leg. Hinneberg) is labelled with "Pop.nigr.", but this is probably incorrect.

Mine (figs. 476). Egg deposited on side of petiole, about 1½—2 cm from leaf base. Mine first straight gallery in petiole, causing swelling; final instar larva makes triangular blotch between first lateral vein and leaf margin, or less often between midrib and first lateral vein; frass deposited in two lateral lines, leaving passage for larva, which can withdraw itself in petiole.

Live history. Univoltine. Larvae start feeding probably in summer, mature larvae can be found in October and November, usually later than *hannoverella*, often in green islands in fallen leaves. The larva usually feeds in the night. Adults in May-June, or April in the South.

Distribution (fig. 519).

Widespread. In Scandinavia in southern Sweden and Denmark only, very local in the extreme east of England, locally abundant throughout central Europe. Some scattered records are known from southern Europe: Spain, Sicily. Also in North Iran (see remarks).

Remarks.

Zeller (1848) described *turbidella* as a variety of *argyropeza*, as follows: "?Var. c. major; strigula ex costa prope basim obliqua dorsoque basali albidis, ceterum ut. b. *Turbidella* Z. in lit.". Further (p. 322) he said that he believed it to possibly be a separate species. Unfortunately there is no specimen in the Zeller collection in BMNH that can be identified as a syntype of *turbidella*. His description can, however, only refer to *turbidella* or *hannoverella*. Borkowski (1975) referred to *turbidella* types, examined by Johansson. However, Johansson (verbal comm.) only saw one specimen (genitalia slide BMNH 20537) which actually is *argyropeza*, and was sent by Mann in Vienna to Zeller in 1856, too late to be a *turbidella* syntype. Hence, the synonymy of *turbidella* with *argyropeza* by Borskowski (l.c.) is unjustified. Ever since 1848, *turbidella* Zeller has been used for the species mining on *Populus alba*, with white scales in the basal half of the wing. This is not contradicted by the description, and thus its identity is firmly established. It is therefore not necessary to select a neotype here.

Unfortunately Herrich-Schäffer interchanged the names *turbidella* and *argyropeza*, although he knew exactly what Zeller meant by both names. Thus *turbidella* Herrich-Schäffer is a different species from *turbidella* Zeller, which was named by him first *argyropeza* Herrich-Schäffer (1853) and later *argyropezella*.

Nepticula populi-albae Hering was described on the basis of a different head colour only, but since this is a very variable character, even within one population, it does not justify a separate identity.

The fine series of *turbidella* collected by F. Kasy in Iran, consisting of only females, shows some slight differences from the European form in the genitalia. The most remarkable are that segments 8 and 9 are wider (fig. 432) and there is an oblique, hyaline bar in the vestibulum of all specimens examined (fig. 184). See also the measurements above. A sound taxonomic conclusion about these specimens cannot be made without examination of males from the same region, and preferably a study of the biology. The Iranian population is certainly not parthenogenetic — as in *argyropeza* — for spermatophores were found in several of the bursae examined.

Material examined: 175 ♂, 167 ♀. — Austria: 3 ♀, Hundsheimer Berg (near Hainburg), 15—16.v.1975, F. Kasy; 2 ♀, Klosterneuburg, Kuhau, 11.v.1915 and 14.iii.1938, Preissecker; 1 ♂, Klosterneuburg, Kritzendorfer Au, 16.iii.1938, Preissecker; 1 ♀, Linz, 2.v.1910, Knitsche (NMW); 1 ♂, 1 ♀, Linz, e.l. iii—iv.1936, Klimesch (NMW, ZMA); 1 ♀, Traun, e.l. 22—30.iii.1936, J. Klimesch (ZMA); 1 ♀, Wien, Prater, 24.iv.1904; 13 ♂, 14 ♀, Wien, Prater, e.l. 4.iv—21.vi.1984, E. J. van Nieukerken (ZMA); 1 ♂, 1 ♀, Wien, Aspern, e.l. 27.v.1934, Koschabek; 1 ♀, Lobau (Wien), 10.v.1908, Zerny (NMW). — Belgium: 3 ♀, Berg, 19.v.1945, L. Legiest; 2 ♂, Jette (Brussel), 28.iv.1945, L. Legiest; 1 ♂, Laeken (Brussel), 13.v.1944, L. Legiest (IRSN). — Denmark: 1 ♂, 1 ♀, Stigsnaes, 23.vi.1955, N. L. Wolff (MHUB). — Germany, West: 3 ♂, 1 ♀, Bavaria, A. Schmid (RMNH); 1 ♂, 3 ♀, Braunschweig, Heinemann (MHUB). — Germany, East: 2 ♂, 1 ♀ (lecto- and paralectotypes *populialbae*), Berlin, Tiergarten, e.l. 19—22.ii.1933, Hering; 14 ♂, 6 ♀, Berlin, Tiergarten, e.l. iii.1934, Hering; 16 ♂, 27 ♀, Berlin, Botanische Garten, 11—12.iii.1948 and 17—28.ii.1952, Hering (MHUB); 7 ♂, 9 ♀, Potsdam, 28.ii—10.iii.1895, *Pop. nigra* (sic!), Hinneberg (MHUB, ZMA, ZSM). — Great Britain: 2 ♂, 2 ♀, Loughton: Epping Forest, e.l. 10—12.v.1980, Bryan & van Nieukerken (ZMA). — Iran: 10 ♀, Keredj N., 27.iv.1970, Exp. Mus. Vind. (NMW). — Netherlands: 2 ♂, 1 ♀, Leiden, Leidse Hout, e.l. 22—23.iv.1981, E. J. van Nieukerken; 9 ♂, 4 ♀, Oostvoorne, Mildenburg, e.l. 10—20.v.1983, Boomsma & Alders (ZMA); 1 ♂, Oostvoorne, 3.v.1981, Huisman (coll. Huisman); 1 ♂, Oostmaerland, 12.v.1974, G. Langohr, 2♂, Overveen, 10.v.1927 and 3.vi.1942, Bentinck; 37 ♂, 17♀, Santpoort, 1944—1948, Vári, Helmers, Doets (RMNH, ZMA); 1 ♂, 2 ♀, Santpoort N., Duin- en Kruidberg, e.l. 19.v.1983, Boomsma & Alders; 2 ♂, 2 ♀, Schinveld, 16.v.1976, G. Langohr; 39 ♂, 23 ♀, Wijlre, 19.v.1974 and 22.v.1977, G. Langohr (ZMA). — Poland: 5 ♂, 3 ♀, Wrocław (Breslau), e.l. iii.1864 [Wocke] (MHUB, RMNH, ZMA); 1 ♀, Wrocław (Breslau), 19.v.1912 (NMW); 1 ♂, Silesia, Wocke (MHUB). — Spain: 2 ♂, Granada, 21—22.iv.1883, Staudinger (MHUB); 1 ♂, 19 ♀, Teruel, Valdetormo, 8.v.1978, C. Gielis (coll. Gielis). — Yugoslavia: 6 ♀, 2 km w. of Bezdan (Vojvodina), valley of Danube, e.l. 27.iv.—7.v.1984, J. J. Boomsma & E. J. van Nieukerken (ZMA).

Mines. — Austria: Mühlleiten (Grossenzersdorf); Wien, Prater. — France: Schirmeck. — Great Britain: Loughton, Epping Forest. — Netherlands: Santpoort. — Yugoslavia: Bezdan.

12. Ectoedemia (Ectoedemia) klimeschi (Skala, 1933)

(figs. 47, 101, 163, 164, 243, 292, 363, 400, 401, 433, 478, 541)

Nepticula klimeschi Skala, 1933: 31. Syntypes, Austria: Linz, Donauauen, *Populus alba*, mines 1931, e.l. 1932, J. Klimesch (ZSMK, MHUB) [examined].

Stigmella (*Fomoria*) *niculescui* Nemeş, 1970: 33—35, figs. 1, 2. Holotype ♂, Rumania: Itcani (Suceava),

16.iv.1966, l. Nemeş, Genitalia slide 1182 (coll. Nemeş) [not examined] **Syn. nov.**

[*Nepticula argyropeza*; Petersen, 1930: 78, fig. 122 (♂ genitalia) misidentification].

Stigmella klimeschi; Gerasimov, 1952: 244, 245; Klimesch, 1961: 763.

Nepticula klimeschi; Hering, 1935: 7; Szőcs, 1965: 85.

Stigmella (Dechtiria) klimeschi; Hering, 1957: 811 (mine).

Ectoedemia klimeschi; Borkowski, 1975: 495.

Diagnosis: females are externally almost inseparable from *E. argyropeza*, only the larger number of antennal segments (34—38 in *klimeschi*, 26—32 in *argyropeza*) being diagnostic. Female genitalia can be separated from *argyropeza* by the signa which are longer in *klimeschi*, at least always longer than the shortest signum of *argyropeza*. There is some resemblance to the species of *E. albifasciella*-complex, but the latter have the costal spot always nearer the wing base and lack the hair-pencil in the male. See key for differences with *suberis*.

Description.

Male (fig. 47). Forewing length 2.76-3.6 mm (3.09 ± 0.27, 12), wingspan 6.0—8.2 mm. Head: frontal tuft and collar yellowish orange. Antennae with 49—58 segments (52.8 ± 3.2, 13). Thorax and forewings blackish fuscous, slightly irrorate by lighter scale-bases; a medial dorsal and costal white spot, opposite, usually widely separate; dorsal spot sometimes extending along dorsal margin towards base. Hindwing with yellowish hair-pencil of 1/4—1/5 hindwing length.

Female. Forewing length 3.0—3.08 mm (3.05 ± 0.03, 5), wingspan 6.7—6.8 mm. Antennae with 34—38 segments (35.1 ± 1.3, 15).

Male genitalia (figs. 101, 243, 292, 363, 400, 401). Capsule length 292—321 µm (307.7 ± 11.9, 5). Tegumen produced into a widely rounded pseuduncus. Gnathos (fig. 292) with relatively long, triangular central element. Valva (fig. 243) length 214—236 µm (226.3 ± 8.2, 5), widest at base, gradually narrowing into triangular tip, not demarcated from valva. Aedeagus (figs. 363, 400, 401) 390—411 µm (405.4 ± 8.9, 5), very long and stout, markedly asymmetrical, posteriorly curved at right-hand side; with two pairs of prominent carinae: ventral pair at extreme posterior tip, basally connected, pointed, single; dorsolateral pair more anteriorly placed, longer than ventral carinae, strongly curved, dorsally connected, often with additional spine at base, which is larger in left process, asymmetrical.

Female genitalia (figs. 163, 164, 433). T7 without row of setae. T8 wide, trapezoid, with two lateral groups of scales and many setae (13—20 at least). Anal papillae with 9-11 setae. Vestibulum with vaginal sclerite, a dorsal spiculate pouch with many (more than 60) single, equally spaced, denticles; and a patch of densely packed pectinations near entrance of ductus spermathecae. Corpus bursae 660—715 µm, covered with small pectinations, partly in concentric bands around signa; signa almost similar, 373—416 µm (394.3 ± 12.5, 8), 3.5—4.4 × as long as wide. Ductus spermathecae with 2½—3 convolutions.

Larva. Pale yellow. Prothorax and segment 10 with sternites. Ventral plates absent.

Biology.

Hostplant: *Populus alba* L., on saplings and large lobed leaves of young branches on trees. When sympatric with *turbidella*, always on different leaves, but sometimes on the same branch.

Mine. (fig. 478). Egg on petiole, but almost impossible to find, between long hairs. Mine first straight gallery in petiole, causing it to swell. In final instar larva enters leaf, and makes blotch, usually not between veins, but incorporating vein or midrib in middle of mine; frass in two lateral lines, leaving passage for larva, which can withdraw itself in petiole. Sometimes the larva feeds so long in the petiole, that there is hardly a mine in the lamina. *E. klimeschi* does not cause such conspicuous green islands as the related species.

Life history. Univoltine. Larvae probably start feeding in summer, mature larvae can be found in October and November. Adults in June and July.

Distribution (fig. 541).

East and Southeast Europe, especially common in Danube bassin, from West Germany to Rumania. Also recorded from East Germany, Poland, Switzerland and northern Italy.

Remarks.

The types from Skala's collection are lost, but syntypes are still extant in other collections. I have examined syntypes from Berlin, but it would be more appropriate to select a lectotype from Klimesch's collection. Previously this spe-

cies has been confused with *argyropeza*, and probably most records of *argyropeza* males refer in fact to *klimeschi*.

Stigmella niculescui Nemeş is undoubtedly a synonym of *klimeschi*, the genitalia figure shows the characteristic valvae. The figure, however, is completely symmetrical, whilst the genitalia are asymmetrical.

This species was previously believed to occur only in the leaves of saplings, but in 1983 we were able to find it also on similarly shaped leaves on large trees. Sometimes they were even found on the same branches as *turbidella*, but always in the lobed leaves.

Material examined: 20 ♂, 19 ♀. — Austria: 1 ♀, Gramatneusiedl, Fürbachwiesen, 11.vi.1982, F. Kasy; 2 ♂, 1 ♀, Hundsheimer Berg (near Hainburg), 13.vi.1979 and 8.vii.1980, F. Kasy; 1 ♂, 1 ♀, Klosterneuburg, Kritzendorfer Au, e.l. 15—16.iv.1938, Preissecker; 1 ♂, Klosterneuburg, Kuhau, e.l. 19.iv.1937, Preissecker; 1 ♀, Klosterneuburg, Ziegelofen, e.l. 17.v.1937, Preissecker (NMW); 1 ♀, Klosterneuburg, Rollfähren, e.l. 19—21.v.1984, J. J. Boomsma & E. J. van Nieukerken (ZMA); 1 ♂, 1 ♀ (syntypes), Linz, Donauauen, e.l. 6.iv.1932, J. Klimesch (MHUB); 4 ♂, 2 ♀, Linz, Donauauen, e.l. 21.iv.—2.v.1934, J. Klimesch (MHUB, NMW); 1 ♂, Linz, 12.v.1974, J. Klimesch; 4 ♂, 1 ♀, Linz, Holzheim, e.l. 3.vi.1980, 30.iv—12.v.1981, J. Klimesch; 2 ♂, 3 ♀, Wien, Prater, e.l. 15.v—19.vi.1984, E. J. van Nieukerken (ZMA). — Germany, East: 2 ♂, Bautzen, e.l. 20—22.iv.1949, J. Klimesch (ZMA). — Hungary: 1 ♂, Magyaresisatre, e.l. 12.iv.1917; 1 ♂, Nagy Nyir near Kecskemét, 4.vi.1914 (NMW). — Yugoslavia: 7 ♀, 2 km W. of Bezdan (Vojvodina), valley of Danube, e.l. 5.v—12.vi.1984, J. J. Boomsma & E. J. van Nieukerken (ZMA).

Mines. — Austria: Klosterneuburg; Linz (leg. Klimesch); Wien, Prater. — Germany, West: München, Isarauen, 2.xi.1949, Groschke (BMNH). — Yugoslavia: Bezdan.

Additional record: Italy: Piemonte, Poggio d'Arasco, 9.vi.1977, Baldizzone (figure of ♂ genitalia by Klimesch examined).

13. Ectoedemia (Ectoedemia) argyropeza (Zeller, 1839)

(figs. 48, 165, 166, 434, 521)

Lyonetia argyropeza Zeller, 1839: 215. Lectotype ♀ (here designated) Poland: Silesia, Głogów (Gross Glogau), 183., Zeller, Walsingham coll. 1910—427; 101291, Genitalia slide BM 22611 (BMNH) [examined].

Nepticula apicella Stainton, 1854: 300. Lectotype ♀ (here designated), England: Beckenham, palings, 20.v.[18]51, Stainton, S 327/57, Genitalia slide 22610 (BMNH) [examined]. (Synonymised by Heinemann & Wocke, 1877).

[No genus] *turbidella* Herrich-Schäffer, [1853]: pl. 106 fig. 837 [nomenclatorially unavailable].

Nepticula turbidella Herrich-Schäffer, 1855: 357, nec Zeller. Syntypes, Austria: Wien (depository unknown) [not examined].

Nepticula argyropezella Doubleday, 1859: 36 (unjustified emendation).

Nepticula turbulentella Wocke, 1861: 129 (replacement name for *N. turbidella* Herrich-Schäffer nec Zeller).

Nepticula simplicella Heinemann, 1862: 319, 320. Lectotype ♀ (here designated), Germany: [Wolfenbüttel], Buchheister (specimen painted... by R. Johansson) (Niedersächsisches Landesmuseum, Hannover) [examined by R. Johansson]. **Syn. nov.**

Nepticula argyropeza ab. *morosella* Steudel & Hofmann, 1882: 244.

Nepticula argyropeza ab. *houzeaui* Dufrane, 1942: 11.

Lyonetia argyropeza; Tengström, 1848: 152.

Nepticula argyropeza; Zeller, 1848: 320, 321; Stainton, 1851: 11; 1854: 300; Frey, 1857: 398—400 [partim]; Stainton, 1859: 433 [partim, larva only]; 1862: 188—195, pl. 9 fig. 2 [partim, larva only]; Heinemann, 1871: 221; Nolcken, 1871: 795—797; Wocke, 1871: 339; 1874: 103; Heinemann & Wocke, 1877: 768; Sorhagen, 1886: 311; Tutt, 1899: 327—330; Rebel, 1901: 228; Meess, 1910: 481; Sorhagen, 1922: 57, pl. 4 fig. 66; Meyrick, 1928: 863; Hering, 1935: 7; Klimesch, 1936: 210; Szőcs, 1965: 84.

Nepticula apicella; Frey, 1857: 400, 401; Stainton, 1859: 433; Wocke, 1871: 339; Meyrick, 1895: 726.

[*Nepticula turbidella*; Frey, 1857: 401, 402. Misidentification].

Nepticula simplicella; Wocke, 1871: 340; Heinemann & Wocke, 1877: 770; Rebel, 1901: 228; Meess, 1910: 481.

Stigmella argyropeza; Klimesch, 1951: 64; Gerasimov, 1952: 227; Klimesch, 1961: 763; Lhomme, 1963: 1205; Borkowski, 1969: 107.

Stigmella (*Dechtiria*) *argyropeza*; Hering, 1957: 811 (mine).

Dechtiria argyropeza; Emmet, 1971: 243, 244.

Trifurcula (*Dechtiria*) *argyropeza*; Johansson, 1971: 245.

Ectoedemia argyropeza; Bradley et al., 1972: 3; Borkowski, 1975: 494; Emmet, 1976: 189, pl. 7 fig. 4, pl. 12 fig. 35.

Ectoedemia (*Ectoedemia*) *argyropeza*; Borkowski 1972: fig. 11 (venation).

Trifurcula argyropeza; Karsholt & Nielsen, 1976: 18.

Diagnosis: only females are known, which can easily be confused with *klimeschi*, see diagnosis for that species.

Description.

Female (fig. 48). Forewing length (2.08) 2.6—3.16 mm (3.16 ± 0.25, 39), wingspan (4.5) 5.0—

6.8 mm. Head: frontal tuft and collar yellowish orange. Antennae with 26—32 segments (29.0 ± 1.7, 23). Thorax and forewings blackish fuscous, slightly irrorate by lighter scale basis; a medial dorsal and costal white spot, opposite, usually widely separate; dorsal spot sometimes extending along dorsal margin towards base.

Female genitalia (figs. 165, 166, 434). T7 without row of setae. T8 wide, trapezoid, with two lateral groups of scales and many setae (8—12 at least). Anal papillae with 5-9 setae. Vestibulum with vaginal sclerite, a dorsal spiculate pouch with many (about 70) single, equally spaced denticles; and a patch of densely packed pectinations near entrance of ductus spermathecae. Corpus bursae 495—660 μm, covered with small pectinations, partly in concentric bands around signa; signa slightly dissimilar, longest 270—394 μm (325.4 ± 42.0, 14), shortest 240—351 μm (307.3 ± 35.4, 14), 3.4—4.3 × as long as wide. Ductus spermathecae with 2½—3 convolutions.

Larva. Pale yellow. Prothorax and segment 10 with sternites. Ventral plates absent.

Biology.

Hostplant: *Populus tremula* L.

Mine. Egg on side of petiole, about 1 cm from leaf base. Mine first straight gallery in petiole, causing it to swell, later blotch in lamina between midrib and first lateral vein; frass in two lateral lines, leaving passage for larva, which often hides in petiole; mine similar to *turbidella*.

Life history. Univoltine. Larva starts feeding early, from July, mature larvae can be found from early September to November, often in green islands in fallen leaves. The larva feeds usually in dark only. Time of completing larval cycle largely depends on age of leaf: when leaf falls in September the larva will be full-grown a long time before larvae in leaves still on the tree. This probably applies as well to the related species. Adults in May and June.

Distribution (fig. 521).

Widely distributed in Europe, and often very abundant. Not yet recorded from Ireland, Iberian Peninsula and south of Po valley, North Yugoslavia and Rumania.

Remarks.

Although a distinct species, *E. argyropeza* has been the subject of much nomenclatorial confusion. I have designated as lectotype the specimen in the Zeller collection, which had been labelled holotype by Durrant. Herrich-Schäffer (1853, 1855) was aware of the difference between *argyropeza* and *turbidella*, but interchanged these names deliberately and thus renamed *argyropeza* as *N. turbidella*. This incorrect use has, however, only been followed by Frey (1856, 1857). Stainton correctly described the biology of *argyropeza*, but mistook the adult of *albifasciella* for *argyropeza* (see under *albifasciella*). He therefore had to rename the real *argyropeza*, and gave it the name *apicella*.

R. Johansson examined the types of *N. simplicella* Heinemann and found they were just uniformly coloured examples of *argyropeza*. By courtesy of Mr. Johansson I designate here the lectotype that he selected but did not publish.

E. argyropeza is a parthenogenetic species, of which males are unknown. Reported males belong to either *albifasciella* or *klimeschi*. We have several times bred larvae from single females, which therefore corroborates their absolute parthenogenetic reproduction. Wilkinson & Scoble (1979) reported the species also from Canada and the USA, where it is parthenogenetic as well. Study of Canadian material showed that there is not much difference in morphology or allozyme pattern (Menken, in preparation) between them and the European populations. It is therefore likely that the North American populations are the offspring of recent introductions which may not warrant subspecific status.

Material examined: 169 ♀. — Austria: 1 ♀, Gumpoldskirchen, Glaslauterriegel, 17.v.1983, F. Kasy (NMW); 1 ♀, Linz, e.l. 17.iii.1932, J. Klimesch (MHUB); 1♀, Waldburg (near Freistadt)), e.l. 13.ii.1921, Knitschke; 3 ♀, Wien, Haschberg, e.l. 12—18.iii.1937, Preissecker; 1 ♀, Wien, Prater, 1867 (NMW); 2♀, no further data (RMNH). — France: 1 ♀, Malesherbes (Loiret), 8.v.1955, Buvat; 1 ♀, Puy Saint Vincent (Hautes Alpes), 6.vi.1965, Buvat (coll. Buvat). — Germany, West: 3 ♀, Braunschweig, Heinemann (MHUB); 1 ♀, Freiburg (MHUB); 1 ♀, Heidelberg, Ziegelhausen, 17.v.1976, W. Speidel (coll. Speidel). — Germany, East: 30 ♀, Berlin, e.l. v. Hering; 8 ♀, Nauen, e.l. 24.ii—2.iii.1924, Hering (MHUB); 9 ♀, Potsdam, e.l. 13—19.ii.1893, Hinneberg (MHUB, ZMA). — Great Britain: 6 ♀, Berley, Kent, 15.v.1947, S.N.A. Jacobs (ZMA); 3 ♀, (lecto- and paralectotypes of *apicella*), Beckenham, palings, 20—25.v.1851, Stainton (BMNH). — Italy: 2 ♀, Naturno (Bolzano), 2 km SE, N. slope, 800 m, e.l. 4.v.1984, J. J. Boomsma (ZMA). — Netherlands: 83 ♀ from following localities: Berg en Dal; Denekamp; 's-Graveland; Groote Peel; Hilversum; Overveen; Winterswijk; Zwanewater (RMNH, ZMA, coll. Koster). — Poland: 6 ♀, Wrocław (Breslau), e.l. 15—

16.v.1858, 1863, [Wocke] (MHUB); 1 ♀ (Lectotype, see above). — No data: 1 ♀, e.l. 24.ii.1866 (MHUB).

Mines. — Austria: Peggau. — France: Barr. — Germany, West: Birresborn; Blankenheim; Wiesbaum. — Germany, East: Berlin, leg. Hering (BMNH). —Great Britain: Earls Colne (Essex). — Hungary: Budapest. — Italy: Naturno. — Netherlands: many localities. — Yugoslavia: Fužine, SW of Delnice.

The *Ectoedemia preisseckeri* group

14. Ectoedemia (Ectoedemia) preisseckeri (Klimesch, 1941)
(figs. 49, 102, 167, 168, 244, 293, 364, 402, 435, 479, 540)

Nepticula preisseckeri Klimesch, 1941: 162—168, figs. 1—10, pl. 16. Lectotype ♂ (here designated) Austria: Klosterneuburg, Kritzendf. Au, e.l. 2.v.1939, Preissecker, Ulm., Genitalia slide MV 12214 (NMW) [examined].

Stigmella preisseckeri; Hering, 1957: 1092, fig. 698, 705b (mine); Klimesch, 1961: 760.

Ectoedemia (Dechtiria) preisseckeri; Klimesch, 1975c: 11, 3 figs. (♂ genitalia, mine).

Ectoedemia preisseckeri; Borkowski, 1975: 493.

Diagnosis: externally almost inseparable from *albifasciella*-complex, see key-characters. Male genitalia characterised by two pairs of similar, curved carinae and triangular gnathos. Female genitalia differ by combination of pectinate bursa and slightly dissimilar signa, which are much shorter than in *albifasciella*-complex.

Description.

Male (fig. 49). Forewing length 5.6—6.0 mm (2.63 ± 0.09, 6), wingspan 5.6—6.0 mm. Head: frontal tuft and collar yellowish orange to ferruginous. Antennae with 36—39 segments (37.2 ± 1.2, 6). Thorax and forewings blackish fuscous, thorax without white scales at tip of mesoscutum and tegulae; forewing with yellowish white, not shining spots: one dorsal in middle, and one costal before middle, sometimes united to form fascia. Hindwing without hair-pencil but with costal bristles.

Female. Forewing length 2.56—2.68 mm (2.62 ± 0.06, 5), wingspan 5.7—6.0 mm. Antennae with 27—31 segments (29 ± 1.6, 5).

Male genitalia (figs. 102, 244, 293, 364, 402). Capsule length 257—317 μm (4). Tegumen produced into broadly triangular pseuduncus. Gnathos (fig. 293) with central element triangular, pointed. Valva (fig. 244) length 214 μm (3), widest at base, inner margin serrate by prominent setal sockets, tip rounded; posterior margin with a notch, in ventral view suggesting a double tip. Aedeagus (fig. 364, 402) 330—334 μm (4), with a dorsal and dorsolateral pair of strong, curved carinae of same length, dorsal pair often overlapping; aedeagus slightly constricted.

Female genitalia (figs. 167, 168, 435). Abdominal tip narrow. T7 with a row of 6—12 setae along posterior margin. T8 approximately quadrate, with two groups of 1-4 setae, without scales. Anal papillae with 12—19 setae. Vestibulum with vaginal sclerite, a dorsal spiculate pouch with many spines, both single and in rows, and a dense patch of pectinations near entrance of ductus spermathecae. Ductus bursae densely covered with pectinations. Corpus bursae 550—790 μm, covered with small pectinations, except anterior part; signa ovoid, slightly dissimilar in length, longest 369—441 μm (3), shortest 330—394 μm (3), 2.4—3.0 × as long as wide. Ductus spermathecae with 2½—3½ convolutions.

Larva. Whitish, with distinct ganglia. Penultimate stages with 12 dark brown ventral plates, which are shed during final instar. See detailed description by Klimesch (1941).

Biology.

Hostplant: *Ulmus* spp.

Mine (fig. 479). Egg on either side of leaf, on a vein. Early mine narrow, much contorted gallery, with frass in widely separated pellets, then abruptly widening into elongate blotch, with blackish frass concentrated in basal half or at margins, often absorbing early gallery.

Life history. Univoltine. Larvae in September—Oktober. Adults probably in May-June (reared in April—June).

Distribution (fig. 540).

Only known from the Danube valley, near Vienna and Budapest, although not always near the river.

Material examined: 8♂, 5 ♀. — Austria: 2 ♂, Bad Deutsch Altenburg, Pfaffenberg, 3 km SW Hainburg, e.l. 21.vi.1984, E. J. van Nieukerken (ZMA); 1 ♂, 1 ♀ (paralectotypes), Klosterneuburg, e.l. 23.iv.1939, J. Klimesch; 2 ♂, 1 ♀ (lecto- and paralectotypes), Klosterneuburg, Kritzendf. Au, e.l. 1—3.v.1939, Ulm., Preissecker; 1 ♀, Klosterneuburg, Kuhau, e.l. 7.v.1939, Preissecker; 1 ♂, Wien, L.-Enzersdorf, e.l. 19.v.1918, Ulm, Preissecker (NMW). — Hungary: 2 ♂, 2 ♀, Budapest, Kamaraerdő, e.l. 19—20.v.1975, Ulmus camp., J. Szőcs (TMAB).

Mines. — Austria: Bad Deutsch Altenburg (Hainburg); Wien, Prater.

The *Ectoedemia suberis* group

The species of this group feed on *Quercus* species, and make blotch mines. Except *aegilopidella*, they form a relatively uniform group of fasciate moths, with conspicuous hair-pencil in male, and often a hairy abdominal tip in female.

Male genitalia have large curved valvae, one pair of single carinae, and a simple gnathos.

Female genitalia are characterised by weak development of vaginal sclerite and spiculate pouch, a globular bursa, covered with pectinations and wide, similar, oval signa.

The larvae are invariably green and have no ventral plates.

The European species all occur in the southern part and the group is probably also present in the Eastern Palaearctic area (*E. chasanella* Puplesis, 1984a).

15. Ectoedemia (Ectoedemia) caradjai (Groschke, 1944) (figs. 50, 103, 173, 245, 246, 294, 365, 407, 436, 483, 526)

Nepticula caradjai Hering, 1932: 16. [nomen nudum, description of mine only]; Toll, 1934b: 72 (record of mine).

Nepticula caradjai Groschke, 1944: 118, figs. 3, 4. ? Holotype ♀, [Italy: Sicilia, Taormina], 518 [e.l. 9.ix.1942, *Quercus pubescens*, F. Groschke] (SMNS) [examined].

Stigmella caradjai; Klimesch, 1951: 65, fig. 73; Gerasimov, 1952: 232; Hering, 1957: 876, figs. 530, 538, 544 (mine); Klimesch, 1961: 762.

Nepticula caradjai; Szőcs, 1965: 87.

Trifurcula (*Ectoedemia*) *caradjai*; Klimesch, 1978: 250, figs. 23, 24 (mine).

Ectoedemia caradjai; Szőcs, 1981: 211.

? *Trifurcula* (*Ectoedemia*) species; Klimesch, 1978, 250, 251, fig. 25 (mine).

Diagnosis: male recognised by combination of fascia, basal white streak on forewing and white hair-pencil, female by same wing-pattern and hairy abdominal tip. Sometimes basal streak inconspicuous, then similar to larger *suberis*, but in male of *caradjai* hair-pencil not surrounded by special scales. See also *leucothorax*. Male genitalia characterised by shape of valva. Female genitalia separated from *suberis* by shape of signa.

Description.

Male. Forewing length 1.88—2.4 mm (2.19 ± 0.15, 13), wingspan 4.2—5.3 mm. Head: frontal tuft yellowish to yellow mixed fuscous; collar yellowish. Antennae long, with 43—51 segments (48.3 ± 2.6, 11), scape with some brown scales. Thorax brown, with some white scales, especially at tip of mesoscutum and tegulae. Forewings fuscous, with a basal white streak along dorsum, sometimes joining fascia, sometimes inconspicuous, and a medial, almost straight fascia, sometimes broken. Hindwing with snowwhite hair-pencil of ¼ hindwing length, not surrounded by special scales.

Female (fig. 50). Forewing length 2.32—2.68 mm (4), wingspan 5.2—5.8 mm. Antennal segments 30—32 (4).

Male genitalia (figs. 103, 245, 246, 294, 365, 407). Capsule length 244—261 µm (251.1 ± 7.8, 5). Tegumen produced into small, but distinct, rounded pseuduncus (fig. 407). Gnathos (fig. 294) with narrow long central element, blunt at tip, with smooth margins. Valva (fig. 245) length 171—193 µm (187.7 ± 9.3, 5), inner margin basally almost straight, gradually becoming strongly concave towards pointed tip; outer margin uniformly convex. Aedeagus (fig. 365) 274—291 µm (282 ± 7.0, 5), carinae pointed, single, curved outwards.

Female genitalia (figs. 173, 436). T7 with a crescent-shaped patch of at least 100, very long setae, appearing pectinate at large magnifications (1000 ×). In addition T7 + 8 covered with about 50 shorter, more widely spaced setae, T8 without scales. Anal papillae wide, each with about 40 setae. Vestibulum with vaginal sclerite, and an indistinct dorsal spiculate plate, with few spines. Corpus bursae 495—570 µm, covered with pectinations, except in distal third; signa almost similar, 300—394 µm (6), 2.4—2.7 times as long as wide. Ductus spermathecae with 3½—4 inconspicuous convolutions.

Larva. Green. Ventral plates absent.

Biology.

Hostplants: *Quercus pubescens* Willd. s.l., from which it has been reared most often. Mines recorded from: *Q. frainetto* Ten., *Q. petraea* L. s.l.. About occurrence on *Q. infectoria* Olivier and *Q. coccifera* L. see remarks.

Mine (fig. 483). Egg on either surface, usually near or at margin. Early mine narrow contorted gallery up to 1.5 cm long, filled with frass, abruptly enlarging into roundish or elongated blotch with frass heaped near entrance, or in two lateral lines.

Life history. Univoltine. Larvae from July to September, adults from late May to early July, earlier records refer to reared material. Klimesch (1978) supposed that a second generation

occurred in Anatolia, since his July larvae gave rise to adults in August.

Distribution. (fig. 526).

In central and southern Europe, south and east of the Alps. Westernmost locality is in France. Not yet recorded, but to be expected from Czechoslovakia, Rumania and Bulgaria.

Remarks.

Most authors incorrectly attribute the name *caradjai* to Hering. Although he gave this name to the species, it is not available, since he described the mine only, after 1930 (Code, art. 13a, 16). Toll was the first who reared the adult, and some of his specimens are labelled as type, but he failed to describe the species. Thus, Groschke has to be regarded as the author, since he was the first who described *caradjai*. The collection of Groschke is in SMNS, but it is almost useless, since his specimens bear only labels with a number. According to W. Speidel (pers. comm.) no diaries or notebooks belonging to Groschke could be traced to find the meaning of these numbers. However, when I borrowed all the Nepticulidae from this collection, it was apparent that all specimens numbered from 514 tot 573 belong to species, which were collected in Taormina, Sicily, during the war. We know this from Groschke (1944) and from the Hering Herbarium (BMNH), where many nepticulid mines collected by Groschke are to be found. It is furthermore notable, that the first (514) and last (573) number are represented by species, which are typically mediterranean, i.e. *Nepticula euphorbiella* Stainton and *N. groschkei* Skala, therefore probably none of this series was collected elsewhere. There is one ♀ specimen in this collection, labelled 518, which corresponds completely with Groschke's description, and undoubtedly belongs to *caradjai*, but unfortunately lacks the abdomen. Groschke only mentioned one specimen in his description, so with some reluctance, it is accepted as the holotype of *caradjai*.

It is not yet clear if *caradjai* is one variable species, or forms a complex comparable with *subbimaculella*. Klimesch reared some very similar specimens from the semi-evergreen *Quercus infectoria* and the evergreen *Q. coccifera* (Klimesch, 1978). These specimens differ slightly since they are smaller, but do not show diagnostic differences. Their measurements are therefore excluded from the above mentioned data, but follow here:

1. from *Q. infectoria*. ♂: forewing length 1.84—2.04 mm (2), antennal segments 47—48. Capsule 206 µm, valva 171 µm (fig. 246), aedeagus 244 µm. ♀: forewing length 1.88—2.04 mm, antennal segments 31—32. Bursa 440 µm, signa 227—270 µm, 2.3—2.5 × as wide as long, less setae on T8 and anal papillae (about 20) (see fig. 174).
2. from *Q. coccifera*. ♀: forewing length 2.2 mm, antennal segments 33. Bursa 570 µm, signa 334—343 µm, 2.8 × as long as wide, 30 setae on anal papillae; ductus spermathecae with 3 convolutions (fig. 175).

More material is needed to check the constancy of these observations, and also especially to compare specimens reared from *Q. pubescens* on Rhodos.

Material examined: 17 ♂, 7 ♀. — Austria: 1 ♂, Gumpoldskirchen, Glaslauterriegel, 4.vii.1976, Kasy; 2 ♂, Hackelsberg, N. of Neusiedlersee, 23.vi.1975, 29.vi.1977, Kasy; 1 ♂, Wien, Leopoldsberg, e.l. 26.v.1943, *Q. pubescens*, Preissecker (NMW). — Hungary: 1 ♂, Csopak, e.l. 24.v.1971, J. Szőcs; 1 ♀, Nagykovacsi, Remetehegy, e.l. 19.vi.1963, J. Szőcs (TMAB). — Italy: 6 ♂, Monti Aurunci (Latina), 4 km NW Castelforte, 400 m, 22—23.vi + 1.vii.1969, R. Johansson (coll. Johansson); 1 ♂, Sitizano (Calabria), 450 m, 28.viii.1977, S. E. Whitebread (coll. Whitebread); 1 ♀, ? Holotype (see above). — Turkey: 1 ♂, Anatolia, Kizilcahamam, 700 m, 31.vii—1.viii.1963, Arenberger (LNK); USSR: 2 ♂, 4 ♀, Babínce, k. Krzywcza (Podolia), e.l. 5.iii.1938 + 21.iii—1.iv.1939, *Q. pubescens*, S. Toll (IPAK, MHUB); 2 ♂, Scianka Hlody, p. Borszczów (Podolia), e.l. 25—26.ii.1939, S. Toll (IPAK, MHUB). — Yugoslavia: 1 ♀. Treschkaschlucht, near Skopje, 21—30.vi.1959, F. Kasy (NMW).

Identity uncertain: 2 ♂, 4 ♀. — Greece: 2 ♂, 3 ♀, Rhodos, Treas, e.l. 20—30.iv.1978, *Quercus infectoria*, J. Klimesch; 1 ♀, Rhodos, Trianta, e.l. 4.v.1974, *Quercus coccifera*, J. Klimesch (ZSMK).

Mines. — On *Quercus frainetto*. — Greece: Oíti Oros (Fthiotis). On *Quercus petraea* s.l.. — Greece: W. Palaiokastron (Evritanía). On *Quercus pubescens*. — Austria: Gumpoldskirchen; Hainburg: Hundsheimer Berg. — France: Aix-en-Provence, leg. J. W. Schoorl; Viens (Vaucluse) (near Apt), leg. R. Buvat. — Greece: Evvoia, Dhirfis Oros; Oíti Oros (Fthiotis); Voutonási (Ioannína). — Italy: Abruzzi: Goia dei Marsi; Picinisco; Lazio: Veio; Sicilia, Taormina, leg Groschke (BMNH); USSR: Bendery (Tighina), leg. Hering (BMNH).

Identity uncertain: on *Quercus infectoria*. — Greece: Rhodos, leg. Klimesch.

16. **Ectoedemia** (**Ectoedemia**) species (specimen 1843) (figs. 104, 247, 295, 366)

Material: 1 ♂: Spain: Aragon, Rubielos de Mora, 4.vii.1967, Arenberger, Genitalia slide VU 1843 (LNK).

This specimen clearly belongs in the group near *caradjai* and *suberis*, but is almost certainly specifically different. Due to the bad condition of the specimen, however, I refrain from naming it. It is most easily separated from the other species in the group by the ochreous brown hair-pencil, surrounded by brown lamellar scales. The genitalia are most similar to *caradjai*.

Description.

Male. Forewing length 2.44 mm, wingspan 5.4 mm. Antennal segments not countable. Worn specimen, wing pattern similar to *suberis*. Hindwing with ochreous brown hair-pencil, surrounded by brown lamellar special scales.

Male genitalia (figs. 104, 247, 295, 366). Capsule length 257 µm. Tegumen very broad, truncate. Gnathos with triangular central element (fig. 295). Valva (fig. 247) length 206 µm, inner margin concave, outer margin strongly convex, tip pointed. Aedeagus (fig. 366) 304 µm, carinae pointed, single.

17. Ectoedemia (Ectoedemia) suberis (Stainton, 1869) comb.n.
(figs. 51, 105, 169, 170, 248, 296, 367, 408, 437, 480, 542)

Nepticula suberis Stainton, 1869: 229. Lectotype ♂ (here designated), France: Cannes, e.l., found dead, iii.[18]68, *Q. suber*, green larva, Stainton, Genitalia slide BM 22577 (BMNH) [examined].

Nepticula viridella Mendes, 1910: 165, pl. 7, figs. 6, 9. Syntypes, Portugal, prov. Beira Baixa, San Fiel, Mendes (depository unknown) [not examined] **Syn. nov.**

Nepticula suberis; Wocke, 1871: 338; Rebel, 1901: 227; Meess, 1910: 479; Petersen, 1930; 71, fig. 101 (♂ genitalia).

Stigmella suberis; Gerasimov, 1952: 262; Hering, 1957: 868, fig. 539 (mine); Lhomme, 1963: 1196.

Stigmella (Stigmella) suberis; Leraut, 1980: 48.

Nepticula viridella; Hering, 1935: 373.

Stigmella viridella; Gerasimov, 1952: 260; Hering, 1957: 867 (mine).

Diagnosis: separated from *caradjai* by absence of white basal streak on forewing, and presence in male of white lamellar scales, surrounding hair-pencil. The hair-pencil in male, and the dense group of long setae on the female postabdomen also separate *suberis* from *haraldi* and other similar oak-mining species. In male genitalia the shape of the valva is very characteristic. See also diagnosis for *andalusiae*.

Description.

Male. Forewing length 2.72—3.08 mm (2.95 ± 0.09, 22), wingspan 6.5—6.8 mm. Head: frontal tuft yellowish orange to ferruginous; collar lighter. Antennae long with 49—60 short segments (54.9 ± 3.3, 17). Thorax and forewing brown, irrorate with white; a medial almost straight dull white fascia. Hindwing with white hair-pencil surrounded by white special lamellar scales.

Female (fig. 51). Forewing length 2.8—3.24 mm (3.05 ± 0.10, 23), wingspan 6.4—7.2 mm. Antennal segments 37—43 (39.1 ± 1.5, 18).

Male genitalia (figs. 105, 248, 296, 367, 408). Capsule length 261—296 µm (279.5 ± 11.5, 9). Tegumen produced into broadly triangular, rounded pseuduncus (fig. 408). Gnathos (fig. 296) with long triangular central element. Valva (fig. 248) length 201—227 µm (212.7 ± 9.1, 8), basally broad with inner margin convex, below middle suddenly narrowed and inner margin becoming concave towards tip. Aedeagus (fig. 367) 343—394 µm (375 ± 18.0, 8), much longer than capsule, carinae single, pointed, slightly curved outwards.

Female genitalia (figs. 169, 170, 437). T7 with a semicircular patch of 120—200 very long, smooth setae. T7 and 8 in addition with about 80—100 shorter setae, without scales. Anal papillae with 29—37 setae. Vestibulum with vaginal sclerite and a spiculate pouch with hardly visible spines, without pectinations. Corpus bursae almost globular, 550—660 µm; covered with minute pectinations; signa similar, 364—437 µm (417.4 ± 40.0, 10), 2.3—2.4 × as long as wide. Ductus spermathecae with 4—4½ distinct convolutions.

Larva. Dirty green, with conspicuous brown ganglia. Ventral plates absent.

Biology.

Hostplants: *Quercus suber* L., *Q. ilex* L., *Q. rotundifolia* Lam, *Q. coccifera* L. and possibly *Q. faginea* Lam.

Mine (fig. 480). Egg on leaf-upperside. Mine starts as contorted gallery filled with frass, later widening into large irregular blotch with the frass in basal half or in two lateral lines. Larva feeds only in upper parenchym layers.

Life history. Univoltine. Larva feeds in winter, mainly from January to March, occasionally early April. Larva or pupa aestivates in cocoon, adult flies from July to early October, but some specimens from Marbella were taken in June.

Distribution (fig. 542).

Western mediterranean species, known from Iberian peninsula, France, Corsica, Sardinia and North Africa. Not recorded from mainland Italy.

Remarks.

In contrast with *ilicis*, no types of *viridella* Mendes could be found in the De Joannis collection in Paris, but it does contain two specimens, labelled *viridella*, collected in Salamanca (Spain), probably by Mendes, who lived there after 1910 (Zerkowitz, 1946). These specimens are identical with *suberis*. Also Mendes' description does not give reason to believe that *viridella* should be regarded as a distinct species, it is therefore synonymised here.

Material examined: 33 ♂, 33 ♀. — France: 1 ♂, Lectotype (see above); 2 ♂, Cannes, Ragonot (RMNH); 2 ♂, 4 ♀, Alp. Mar., Cannes, Constant (IRSN, MNHN, RMNH); 1 ♀, Collobrières (Var), e.l. 3.ix.1981, *Quercus suber*, S. E. Whitebread (coll. Whitebread); 3 ♂, Corse, e.l. 29.viii + 6.ix.1906, *Q. ilex*, Chrétien (MNHN); 1 ♀, Golfe Juan, Alp. marit., Constant (IRSN); 1 ♂, 3 ♀, « Nesp. » (? near St. Pons, dep. Hérault), 2.viii.1904, Chrétien; 3 ♂, St. Pons, 4.viii.1904, Chrétien (MNHN). — Italy: 3 ♂, Sardegna, Mt. Istiddi, 1.ix.1978, G. Derra; 1 ♂, Sardegna, Bacu Trotu, Ortuabis, 800 m, 28.viii.1978, G. Derra (coll. Derra); 1 ♂, Sardegna, prov. Nuoro, Villanova-Strisaili 885 m, 7.vii.1983, J. Kuchlein (coll. Kuchlein). — Morocco: 1 ♂, Tanger, 2.v.1902, Walsingham (BMNH). — Spain: 1 ♂, Albarracin (Aragonia), e.l. ix.1933, *Quercus ilex*, Hering (MHUB); 1 ♂, 1 ♀, Alcuescar, Caceres, 1.x.1983, C. Gielis (Coll. Gielis; EvN); 3 ♂, Andalucia, prov. Malaga, road to Ojen, 150 m, 12.vi.1981, E. Traugott-Olsen (ETO); 1 ♂, 7 km N. Benahavis (Málaga), road to Ronda, 800 m, e.l. 21—22.viii.1984, *Quercus coccifera*, E. J. van Nieukerken (ZMA); 1 ♂, 1 ♀, La Vid (Burgos), 800 m, 23—28.ix.1965, H. G. Amsel; 1 ♂, Cataluna, Port Bou, 18—28.ix.1966, Arenberger (LNK); 1 ♀, 4 km NE Igualeja, Serrania de Ronda (Málaga), 1100 m, e.l. 21—22.viii.1984, *Quercus rotundifolia*, E. J. van Nieukerken; 1 ♂, 7 ♀, Marbella (Málaga), Casa y Campo, 100 m, e.l. 29.viii—29.x.1984, *Quercus coccifera*, E. J. van Nieukerken (ZMA); 1 ♂ 2 ♀, Las Murtas (near Elche), Murcia, 23.ix.1983, C. Gielis (coll. Gielis, EvN); 1 ♂, 1 ♀, Salamanca, e.l. 25.viii., *Q. ilex* [Mendes], coll. de Joannis (as *viridella*) (MNHN); 1 ♀, San Roque, Cadiz, 29.ix.1983, C. Gielis; 4 ♂, 10 ♀, Sierra Blanca, 6 km N. Marbella (Málaga), El Mirador, 800 m, e.l. 13—28.viii.1984, *Quercus suber* + *rotundifolia*, E. J. van Nieukerken (ZMA).

Mines. — On *Quercus suber*. — France: Collobrières, Var., leg. Whitebread; Plan d'Aups, Var., leg. Whitebread (coll. Whitebread). — Spain: prov. Málaga: Casares; Istan; Marbella; Serrania de Ronda; Sierra Blanca, N. Marbella. — Tunisia: Jebel Abiod; Aïn Draham. On *Quercus ilex*. — France: Corsica, Barbicaja, leg. Buhr (BMNH). On *Quercus rotundifolia*. — Algeria: Aurès Mts, near Arris; Aurès Mts, Dj. Chélia. — Spain: Sierra Almijara, N. Otivar; Sierra Blanca, N. Marbella; Serrania de Ronda. Identity uncertain: on *Quercus faginea*. — Spain: Istan.

18. **Ectoedemia (Ectoedemia) andalusiae** sp. n.

(figs. 52, 106, 171, 172, 249, 297, 368, 409, 438, 481, 526)

Type material: Holotype ♀: Spain (Málaga): Marbella, Casa y Campo, 100 m, 8.ii.1984, e.l. 17—18.v.1984, *Quercus coccifera*, VU no. 84043 KE, E. J. van Nieukerken, Genitalia Slide 1899 (ZMA). Paratypes, 4 ♂, 3 ♀. — Spain: 2 ♂, 1 ♀, Andalucia, prov. Málaga, Camino de (road to) Ojen, 150 m, 12.vi.1981, E. Traugott-Olsen (ZMA, ETO); 1 ♂, idem, 21.vi.1980; 1 ♀, Andalucia, prov. Málaga, Camino de (road to) Istan, 400 m, 4.vii.1973, E. Traugott-Olsen (ETO); 1 ♂, Marbella, Casa y Campo, ca 100 m, 18.ix.1982, E. Traugott-Olsen (ETO); 1 ♀, Pyr. Orient., Tolorin b. Martinet, 6.vii.1967, Arenberger (LNK). Mines examined: on *Q. coccifera* from type locality, mixed with *E. suberis* mines.

Diagnosis: ♀ separated from *suberis* by absence of long setae on abdominal tip; from *haraldi* by straighter fascia and genitalia. ♂ very similar to *suberis*, separated by ochreous-brown hair-pencil instead of white, and markedly shorter capsule with blunt and wide tegumen.

Description.

Male. Forewing length 2.44—2.72 mm (4): wingspan 5.4—6.2 mm. Head: frontal tuft and collar yellowish-orange. Antennae with 49-57 segments. Thorax and forewings brown, with medial, almost straight, constricted, dull-white fascia. Hindwing with ochreous-brown hair-pencil, surrounded by white lamellar scales as in *suberis*.

Female (fig. 52). Forewing length 2.4—3.04 mm (4), wingspan 5.5—6.9 mm. Antennae with 35—38 segments.

Male genitalia (figs. 106, 249, 297, 368, 409). Capsule length 223—261 µm (4). Vinculum anteriorly narrower than in *suberis*. Tegumen truncate, very broad, hardly produced into pseuduncus (fig. 409). Gnathos (fig. 297) with tiangular central element. Valva (fig. 249) length 193—210 µm (4), basally broad with inner margin convex, below middle suddenly narrowed

and inner margin becoming concave towards tip. Aedeagus (fig. 368) 309—351 µm (4), much longer than capsule, carinae single, pointed, slightly curved outwards.

Female genitalia (figs. 171, 172, 438). T7 without long setae. T8 with two lateral patches of scales and 4—7 setae. Anal papillae wide, with 18—24 setae. Vestibulum with vaginal sclerite and a spiculate pouch with very few, small spines, without pectinations. Corpus bursae almost globular, 495—640 µm; covered with minute pectinations; signa similar, 330—377 µm (348.2 ± 1.41, 8), 1.9—2.5 × as long as wide. Ductus spermathecae with 5½ convolutions.

Larva. As *suberis*.

Biology.

Hostplant: *Quercus coccifera* L., from which holotype was bred.

Mine (fig. 481). Not differentiated from the mine of *suberis*.

Life history. Adults taken in June, July and one male in September, larvae found in January.

Distribution (fig. 526).

Only known from Spain.

Remarks.

This species is closely related to *E. suberis*, but the female shows several diagnostic features, especially in the abdominal tip. The holotype was reared from a mixed sample of mines collected on *Quercus coccifera*, from which also *suberis* has been reared. The mines do not give any evidence of the presence of two species.

19. Ectoedemia (Ectoedemia) aegilopidella (Klimesch, 1978) comb. n.

(figs. 53, 54, 107, 176, 250, 298, 369, 410, 439, 482, 546)

Trifurcula (Ectoedemia) aegilopidella Klimesch, 1978: 269—271, figs. 65—69. Holotype ♂, Greece: Rhodos: Rodini, e.l. 17—30.iv.1973, Zucht nr. 1054, *Quercus macrolepis*, 22.ix.1972, J. Klimesch, Genitalia slide Kl. 4107 (ZSMK) [genitalia slide examined].

Diagnosis: very small species with a wingspan of less than 4.2 mm. Males with basal ⅔ of hindwing covered with brown special scales, as in *heringella* and *terebinthivora*, but separated from these two by presence of a hair-pencil in *aegilopidella*. Females very similar to *terebinthivora*, but *terebinthivora* has a more yellow fascia. Male genitalia very characteristic and diagnosed by small size, wide capsule, gnathos and tegumen. Female genitalia characterised by absence of group of many long setae and small and short signa.

Description.

Male (fig. 53). Forewing length 1.80—1.92 mm (2), wingspan 4.0—4.2 mm. Head: frontal tuft and collar yellowish white. Antennae with 35—37 segments (2). Thorax and forewings ochreous-brown, with a medial, often ill-defined, straight fascia, colour yellowish white. Underside of forewing with a group of brown androconial scales in distal half, and a group of short, yellowish-white lamellar scales near costal retinaculum. Hindwing with a yellowish-white hair-pencil of ¼ hindwing length; basal ⅔ covered with brown lamellar, special scales.

Female (fig. 54). Forewing length 1.58—1.80 mm (3), wingspan 3.8—4.1 mm. Antennae with 23—25 segments (3). Underside forewing and hindwing without special scales.

Male genitalia (figs. 107, 250, 298, 369, 410). Capsule very short, length 150—167 µm (3). Tegumen produced into ventral globular pseuduncus (fig. 410). Gnathos (fig. 298) with central element broad and truncate, in form of a transverse bar. Valva (fig. 250) length 133—150 µm, basally broad, below middle suddenly narrowed and inner margin becoming concave towards tip; outer margin uniformly convex. Aedeagus (fig. 369) 244—279 µm (3), more than 1.5 × as long as capsule, carinae single, pointed.

Female genitalia (figs. 176, 439). T7 without long setae. T8 small, with few scales laterally and with 8—14 setae. Anal papillae with 6—8 setae. Vestibulum with vaginal sclerite, slightly different from that in other species and a spiculate pouch with very few small spines, without pectinations. Corpus bursae small, 310—350 µm, covered with many pectinations, except distal part; signa similar, oval, 189—223 µm (209.3 ± 14.9, 6), 2.0—2.3 × as long as wide. Ductus spermathecae with 3—3½ convolutions.

Larva emerald green, head-capsule brown. No ventral plates (Klimesch, 1978).

Biology.

Hostplant: *Quercus macrolepis* Kotschy.

Mine (fig. 482). Egg on leaf upperside. Early mine contorted gallery, widening into irregular blotch or wide gallery, with dispersed central frass.

Life history. Probably univoltine. Larvae collected in September, adults emerged in April.

Distribution (fig. 546).
Only known from Rhodos.

Material examined: 3 ♂, 3 ♀ (holo- and paratypes), Greece, Rhodos, Rodini, e.l. 17—30.iv.1973, *Quercus macrolepis*, 22.ix.1972, J. Klimesch (ZSMK). Mines: 2 mines, same data (ZMA).

The *Ectoedemia subbimaculella* group

This is a uniform group of *Quercus* mining species, making gallery mines or gallery-blotch mines.

Adults of this group have various colour patterns, but never with metallic shining spots or fasciae. Males of most species possess costal bristles instead of a hair-pencil, except *quinquella*, cf. *algeriensis* and *gilvipennella*.

The group is best characterised by the female genitalia: vestibulum with a ring-shaped vaginal sclerite, a spiculate pouch with the spicules partly separate, partly in small rows of 2—3 in contrast to *populella*-group, and a patch of dense pectinations near entrance of ductus spermathecae. In contrast with all other *Ectoedemia* species except *intimella*, the corpus bursae is devoid of pectinations.The signa are long and elongate, dissimilar, the shortest being 3.5—7.5 times as long as wide, except in *leucothorax*.

Larvae are yellow, whitish or green, and many species possess black ventral plates during the penultimate instars.

The group is best developed in the mediterranean area, and also occurs in Japan.

20. Ectoedemia (Ectoedemia) quinquella (Bedell, 1848)

(figs. 55, 108, 177, 251, 299, 370, 411, 440, 485, 527)

Microsetia quinquella Bedell, 1848: 1986. Syntypes, England, West Wickham, 30.vi.1847, G. Bedell, (depository unknown), [not examined]

[no genus] *quinquella*; Herrich-Schäffer [1854]: pl. 114 fig. 928.

Nepticula quinquella; Stainton, 1849: 29; 1854: 301; Herrich-Schäffer, 1855: 355; Frey, 1857: 407, 408; Stainton, 1859: 433; Wocke, 1871: 339; Meyrick, 1877: 111, 112; 1895: 725; Tutt, 1899: 342, 343; Rebel, 1901: 227; Meess, 1910: 480; Meyrick, 1928: 862; Petersen, 1930: 76, fig. 114 (♂ genitalia).

Dechtiria quinquella; Beirne, 1945: 206, fig. 71 (♂ genitalia); Emmet, 1971: 248.

Stigmella quinquella; Gerasimov, 1952: 255; Lhomme, 1963: 1201.

Stigmella (Dechtiria) quinquella; Hering, 1957: 870, fig. 534 (mine).

Trifurcula (Ectoedemia) quinquella; Johansson, 1971: 245.

Ectoedemia quinquella; Bradley et al., 1972: 2; Emmet, 1976: 189, pl. 6, fig. 16, pl. 12, fig. 33.

Diagnosis: easily separated from all other *Ectoedemia* species, described here, except *algeriensis*, by characteristic pattern of three white spots on forewing: a costal, a dorsal and a discal spot. It can be separated from *algeriensis* by its dark thorax, and males from cf *algeriensis* by the darker hair-pencil and different form of valva and gnathos.

Description.

Male. Forewing length 1.84—2.28 mm (2.10 ± 0.17, 6), wingspan 4.2—5.0 mm. Head: frontal tuft almost completely black, with a few fuscous scales on frons; collar black. Antennae with 36—42 segments (39.8 ± 2.6, 4). Thorax black, posterior tips of mesoscutum and tegulae white. Forewings black with three white spots: a costal on ⅓ from wingbase, a dorsal, approximately in middle, and a discal on ⅔ from base, sometimes a few white scales near wingbase. Hindwing with yellowish hair-pencil of approximately ¼ hindwing length, surrounded by yellow lamellar scales.

Female (fig. 55). Forewing length 2.04—2.68 mm (2.37 ± 0.19, 8), wingspan 4.6—5.6 mm. Antennal segments 26—29 (28.1 ± 1.1, 7).

Male genitalia (figs. 108, 251, 299, 370, 411). Capsule length 227—266 μm (2). Tegumen (fig. 411) rounded, slightly indented at tip. Gnathos (fig. 299) with central element divided, distal part spatulate, basal part with serrate margin. Valva (fig. 251) length 171—257 μm (2), inner margin concave, except basally, tip narrow, dorsal surface with comparatively few setae. Aedeagus (fig. 370) length 171—257 μm (3), carinae pointed, single or bifurcate, sometimes with additional spines at base.

Female genitalia (figs. 177, 440). T8 with two lateral groups of scales and few setae, on T7 along anterior margin of T8 a few small setae, not arranged in distinct row. Anal papillae with 12—18 setae. Vestibulum with vaginal sclerite, a dorsal spiculate pouch, and a group of densely packed pectinations near entrance of ductus spermathecae. Corpus bursae 550—670 μm, without pectinations; signa dissimilar, longest 411—514 μm (4), shortest 356—454 μm, 4.0—4.7 × as long as wide (4). Ductus spermathecae with 2 indistinct convolutions.

Larva. Yellow, with dark brown head-capsule and conspicuous black ventral plates, which are shed during final instar. Thereafter ganglia visible.

Biology.

Hostplants: *Quercus robur* L. and *Q. petraea* L. s.l.

Mine (fig. 485). Egg on leaf underside, often against vein. Mine highly contorted gallery; early mine filled with narrow linear frass, later with irregular dispersed black frass, leaving wide clear margins. Often many mines occur in the same leaf.

Life history. Univoltine. Larvae occur late in the season, in England in late October and November, in Greece very young larvae have been found in mid September. The adults fly in the second half of June and early July.

Distribution (fig. 527).

Atlantic-mediterranean species, locally abundant in southern England, known from a small number of localities in Belgium, France, Italy and Greece. Record from Norway (Grönlien, 1937) probably incorrect.

Remarks.

Types of this species are unknown, and Bedell's collection does not seem to exist any more (see *atrifrontella*). From Bedell's description and figure the identity of this species is not in doubt.

Material examined: 6 ♂, 11♀. — Belgium: 1 ♀, Tervuren, 20.vi.1888, Crombrugghe; 1 ♀, Zolder, 27.vi.1938, E. Janmoulle (IRSN). — France: 1 ♀, Achères (Yvelines), 22.vi.1947, Le Marchand; 1 ♂, l'Étang la Ville (Yvelines), 21.vi.1942, Le Marchand (MNHN); 1 ♂, Vannes, e.l. 27.vi.1913, Joannis (IRSN). — Great Britain: 2 ♂, 1♀, 10 km NE Newmarket, Herringswell, 11.xi.1981, e.l. 8—10.vi.1982, A. M. Emmet, J. W. Schoorl; 1 ♀, Pods Wood, 2 km N. of Tiptree (Essex), 23.x.1979, e.l. 17.vi.1980, A. M. Emmet, G. Bryan & E. J. van Nieukerken; 2 ♂, 4 ♀, 3 km E. Rainham, Belhus Wood, 24.x.1979, e.l. vi.1980, G. Bryan, E. J. van Nieukerken (ZMA, partly on alcohol). — Greece: 1 ♀, Litochorion, 3—400 m, 14—22.vi.1957, J. Klimesch (ZSMK). — Country unknown: 1 ♀, Macedonia, Kr., coll. Staudinger (MHUB).

Mines. — On *Quercus robur*. — Great Britain: Herringswell; Tiptree; Rainham; Weeley. On *Quercus petraea* s.l.. — Greece: 4 km W. Palaiokastron, Evritanía.

Additional records (figs. of externals and ♂ genitalia by Klimesch, examined). — Italy: Liguria, Testico (near Alassio), 470 m, 5.vii.1969, Jäckh; Liguria, Conna, S. Sebastiano (near Pigna), 4.vii.1969, Jäckh.

21. **Ectoedemia (Ectoedemia) algeriensis** sp.n.

(figs. 56, 178, 441, 484, 527)

Type material: Holotype ♀: Algeria: Aurès, near Arris, 32 km SSE of Batna, 1700 m, 28.iv.1980, open *Q. ilex* veg., stat. 25, e.l. 13.vi.1980, *Quercus ilex*, VU no 80064 KE, Bryan, van Nieukerken & Oosterbroek, Genitalia slide 1125 (ZMA). Paratypes, 2 ♀, same data as holotype, e.l. 13—16.vi.1980 (BMNH, ZMA); Mines examined from type locality and from Algeria: Aurès, Dj. Chélia, 1600—1900 m.

Diagnosis: externally very similar to *quinquella*, but thorax entirely white and basal white spot present. Genitalia (♀) very characteristic by dense hairy abdominal tip.

Description.

Male. Unknown, but see below.

Female (fig. 56). Forewing length 2.28—2.56 mm (3), wingspan 5.0—5.6 mm. Head: frontal tuft and collar fuscous to black. Antennae with 27—33 segments (3). Thorax completely white. Forewings black, with four white spots: a small basal, a large costal before middle, a dorsal, approximately in middle and a discal at ⅔ from wingbase.

Female genitalia (figs. 178, 441). T8 (and T7?) with more than 70 long setae, partly in row along anterior margin, no scales. Anal papillae with 24—28 setae. Vestibulum with vaginal sclerite, a prominent dorsal spiculate pouch, and a group of densely packed pectinations near entrance of ductus spermathecae. Corpus bursae 605—660 µm without pectinations; signa dissimilar, longest 386—450 µm (2), shortest 355—420 µm, 3.5—3.9 × as long as wide (2). Ductus spermathecae with 2 indistinct convolutions.

Larva. Green, without ventral plates. Not examined in detail.

Biology.

Hostplant: *Quercus rotundifolia* Lam. (often regarded as form of *ilex*).

Mine (fig. 484). Egg on upper surface, often on or near vein. Gallery, much contorted with black frass leaving narrow clear margins. Mine similar to that of *ilicis*, *heringella* and *haraldi*, only separable by colour of larva.

Life history. Larvae taken in late April, adults emerged in June. Males of cf. *algeriensis* found in July.

Distribution (fig. 527).

Algeria: Aurès mountains, and probably Morocco (see remarks).

Remarks.

This species is described from three females reared from a small sample, from which unfortunately no males emerged. Although clearly related to *quinquella*, it is a distinct species, differing in genitalia and biology. The males described below probably belong to *algeriensis* because, although they resemble *quinquella*, they also differ in some ways. It is however not wise to include them in the type-series of *algeriensis*, since they are too worn. Also they have not been reared.

I have reared 1 ♀, (slide 1897) from *Quercus coccifera* from Spain (Málaga): 7 km N. Benahavis, road to Ronda, 800 m, 7.ii.1984, e.l. 17—18.iv.1984, which externally corresponds with *algeriensis*, and also in the internal genitalia. However, the terminal segments differ (fig. 442) from those of the type series, and I therefore can not identify this specimen with certainty until further material is available.

21A. **Ectoedemia** (**Ectoedemia**) cf. **algeriensis** sp.n. (male)
(figs. 109. 252, 300, 371)

Material: 2 ♂, Morocco: Moyenne Atlas, Azrou, 16.vii.1975, F. Kasy (NMW). Two worn males, which probably belong to *algeriensis*, see remarks on that species.

Diagnosis: wing pattern unknown, differs from *ilicis* and *heringella* by presence of hair-pencil, from *quinquella* by white hair-pencil, and from all by large number of antennal segments. Genitalia similar to *ilicis* and *heringella*, but central element of gnathos remarkably large.

Description.

Male. Forewing length 2.4 mm, wingspan ± 5.4 mm. Head: colour of frontal tuft unknown, all scales lost in the two specimens. Antennae long, with 53—54 segments. Thorax probably white. Colour-pattern of forewing not recognisable, but presence of discal spot likely, the distribution of the few scales left on the wings, suggest the likelyhood of a similar pattern as *algeriensis*. Hindwing with a white hair-pencil, surrounded by a patch of yellow scales.

Male genitalia (figs. 109, 252, 300, 371). Capsule 257 µm long. Tegumen rounded. Gnathos (fig. 300) with central element divided, distal part prominent, spatulate, basal part with serrate margin. Valva (fig. 252) length 206 µm, inner margin concave, tip wide and truncate, dorsal surface with few setae. Aedeagus (fig. 371) 274 µm, carinae pointed, bi- or trifurcate.

22. **Ectoedemia (Ectoedemia) gilvipennella** (Klimesch, 1946) comb. n.
(figs. 57, 58, 110, 179, 253, 301, 372, 443, 486, 543)

Stigmella gilvipennella Klimesch, 1946: 168, fig. 8. Lectotype ♂ (here designated), Italy: Liguria, Ferrania near Altare, e.l. 26.iv.—7.v.1945, *Quercus cerris*, ix.1944, Zucht No. 509, J. Klimesch, Genitalia slide Kl. 272 (ZSMK) [examined].

Stigmella (*Stigmella*) *gilvipennella*; Hering, 1957: 870.

Nepticula (*Stigmella*) *gilvipennella*; Szőcs, 1968: 228.

Diagnosis: the only predominantly white *Ectoedemia*, further characterised in the male by the prominent fuscous or black hair-pencil. The other uniformly coloured *Ectoedemia* species are darker and often larger. Without examining genitalia or venation, females could be mistaken for *Trifurcula* or *Acalyptris* species. Male genitalia very similar to those of *quinquella*, but separated by dorsal lobe of valva.

Description.

Male (figs. 57, 58). Forewing length 2.08—2.48 mm (2.32 ± 0.13, 12), wingspan 4.9—5.4 mm. Head: frontal tuft yellowish, mixed with fuscous, especially on vertex; collar yellowish white. Antennae with 28—34 segments (30.8 ± 1.5, 11). Thorax and forewings predominantly white, irrorate with dark brown tipped scales, no distinct colour-pattern. Hindwing with fuscous to black hair-pencil of ⅕ hindwing length, not surrounded by special scales.

Female. Forewing length 1.96—2.36 mm (2.21 ± 0.13, 13), wingspan 4.4—5.2 mm. Antennal segments (17)23—24 (23.4 ± 0.5, 10).

Male genitalia (figs. 110, 253, 301, 372). Capsule length 210—240 µm (219.4 ± 11.9, 5). Tegumen rounded. Gnathos (fig. 301) with central element divided, distal part spatulate, basal part with serrate margin. Valva (fig. 253) length 171—193 µm (177 ± 8.9, 5), inner margin concave, outer margin dorsally folded back, forming an inwardly projecting lobe, covering several setae, tip pointed. Aedeagus (fig. 372) 244—257 µm (248.6 ± 6.1, 4), carinae pointed, single.

Female genitalia (figs. 179, 443). T7 with a row of 8 long setae along anterior margin of T8; T8 with 8 setae, no scales. Anal papillae with 11—13 setae. Vestibulum with vaginal sclerite, a dorsal spiculate pouch, and a group of densely packed pectinations near entrance of ductus spermathecae. Corpus bursae 500 µm, without

pectinations; signa dissimilar, longest 347 µm (1), shortest 330 µm (1), 3.9 × as long as wide. Ductus spermathecae with 3 convolutions.

Larva. Bright emerald green, with light yellow head-capsule. Ganglia invisible, ventral plates absent.

Biology.

Hostplant: *Quercus cerris* L.

Mine (fig. 486). Egg on leaf upperside, often on or near vein. Early mine: narrow contorted gallery with broken brown frass, later becoming wide and more contorted gallery filled with brown dispersed frass.

Life history. Univoltine. Larvae from late October until late November. Adults reared from April to June.

Distribution (fig. 543).

Probably throughout the range of *Quercus cerris*, but yet only recorded from northwest Italy, Hungary, and here for the first time from Austria and Yugoslavia.

Material examined: 14 ♂, 13 ♀. — Austria: 6 ♂, 8 ♀, Hof am Leithagebirge, S. of Mannersdorf (Niederöst), 200 m, e.l. 30.iv—14.vi.1984, E. J. van Nieukerken; 2 ♂, 3 ♀, Loretto, 7 km N. Eisenstadt (Burgenland), 240 m, e.l. 30.iv.—8.v.1984, E. J. van Nieukerken (ZMA). — Hungary: 1 ♂, Törökbálint (W. of Budapest), 27.iv.1965, e.l., J. Szőcs; 3 ♂, 2 ♀, same data, e.l. 13—24.v.1974 (TMAB). — Italy: 2 ♂ (lecto- and paralectotype), Liguria, Ferrania near Altare, e.l. 26.iv.—7.v.1945, J. Klimesch (ZSMK).

Mines. — Austria: Hof am Leithagebirge; Loretto. — Hungary: Törökbálint. — Yugoslavia (Bosna): S. of Han Knežica, 11 km N. of Prijedor.

23. Ectoedemia (Ectoedemia) leucothorax sp. n.

(figs. 59, 111, 180, 181, 254, 302, 372, 444, 527)

Type material: Holotype ♂, Spain, Marbella (Málaga), 5.v.1981, C. Gielis, Genitalia slide VU 1892 (ZMA). Paratypes, 2 ♂, 3 ♀. — Spain: 1 ♀, Andalusia, Marbella, L. Monteros, 25 m, 12.vii.1972, E, Traugott-Olsen (ZMC); 1 ♂, Andalucia, Camino de (road to) Ojen, 150 m (Marbella), 25.vi.1983, E. Traugott-Olsen (ETO); 1 ♂, 2 ♀, Estepona, 10-21.vi.1979, Leo Kohonen (ZMUO, ZMA).

Diagnosis: easily recognised by white thorax, orange head and forewing with white streak along dorsal margin, running from base to fascia, and in male absence of hair-pencil. Externally most similar *caradjai* has a dark thorax and hair-pencil. Male genitalia characterised by very long, slender valvae and aedeagus shorter than capsule or valvae; female genitalia by widened anterior apophyses, shape of T8, hairy abdominal tip, similar signa and smooth bursa.

Description.

Male. Forewing length 2.28—2.44 mm (2), wingspan 5.2—6.0 mm. Head: frontal tuft and collar intensively orange. Antennae with 41—42 segments (2). Thorax and tegulae white, except brown outer edge of tegulae; forewings fuscous, with medial arched or interrupted white fascia, united by white streak along dorsal margin to wingbase, occupying 3—4 rows of scales; white pattern in rest position of moth forming anchor-shaped figure. Hindwing without hair-pencil, but with costal bristles.

Female (fig. 59). Forewing length 2.4—2.72 mm (3), wingspan 5.2—6.0 mm. Antennae with 31—32 segments (3).

Male genitalia (figs. 111, 254, 302, 372). Capsule length 304—330 µm (3). Tegumen produced into rounded, approximately triangular, pseuduncus. Gnathos (fig. 302), divided, with narrow spatulate distal part, basal part with serrate margin. Valva (fig. 254) length 279—321 µm, very long and narrow, inner margin completely concave, outer margin completely convex. Aedeagus (fig. 372) 244—279 µm (3), distinctly shorter than capsule or valva, with single pointed carinae, curved outwards.

Female genitalia (figs. 180, 181, 444). T7 with a semicircular patch with about 200 closely set long, smooth setae. T7 and 8 in addition with about 50 shorter setae and a few scales laterally; T8 with posteror margin truncate with prominent corners. Anal papillae broad, with 16 setae. Vestibulum with vaginal sclerite, a dorsal spiculate pouch with many small spicules and a group of densely packed pectinations near entrance of ductus spermathecae. Corpus bursae 620—660 µm, without pectinations; signa similar, 309—339 µm, 2.6—3.4 × as long as wide. Ductus spermathecae with 2 convolutions and a prominent vesicle.

Larva unknown.

Biology.

Hostplant unknown, but most likely evergreen *Quercus*, judging from its relationships and localities. In the Marbella localities *Quercus suber* or *Q. coccifera* grow. In February 1984 I was not able to collect there any other mines

than those similar to *E. suberis*, but it is possible that *leucothorax* feeds in another season.

Life history. Adults found from early May to early July, all collected at light.

Distribution (fig. 527).
Only known from the Costa del Sol in Spain.

Remarks.
This species shows some similarities with the *suberis* group, but the absence of pectinations in the bursa, the presence of a group of pectinations in the vestibulum, the form of the gnathos and the presence of costal bristles in the male indicate that it in fact belongs to the *subbimaculella* group. The presence of many long setae on the female abdominal tip probably is an adaptation to oviposition on rough surfaces of evergreen oak leaves, and hence a parallel development with *suberis* and *algeriensis*.

24. Ectoedemia (Ectoedemia) haraldi, (Soffner, 1942)

(figs. 60, 112, 182, 255, 303, 374, 445, 487, 545)

Nepticula haraldi Soffner, 1942: 56, figs. 1—12. Lectotype ♂ (here designated), France: Angoulème, e.l. v.1941, *Quercus ilex*, ii.1941, Zucht No. 382a, Soffner, Genitalia slide 4776 (MHUB) [examined].

Stigmella prinophyllella Le Marchand, 1946: 285. Holotype ♀ [in description as ♂], France: Villenave d'Ornon, Gironde, e.l. 23.v.1928, Le Marchand, Genitalia slide VU 0941 (MNHN) [examined]. (Synonymised by Le Marchand, 1948).

Stigmella haraldi; Hering, 1957: 867, fig. 553 (mine); Lhomme, 1963: 1196.

Ectoedemia (Dechtiria) haraldi; Klimesch, 1975a: 864, figs. 5, 6 (♂ genitalia).

Trifurcula (Ectoedemia) haraldi; Leraut, 1980: 49.

Nepticula ilicella Constant [nomen nudum]. (Synonymised by Klimesch, 1975a: 864.

Diagnosis: externally very similar to *albifasciella* complex and *preisseckeri*, but with generally lighter appearance. *E. ilicis* and *heringella* can be separated by the absence of a costal spot, and androconial scales in male *heringella*. *E. suberis* can be distinguished by the straighter fascia and by the presence of a hair-pencil in male and hairy abdomen tip in female. Females of *andalusiae* are very similar to *haraldi*, and can only be identified with certainty by genitalia. Male genitalia very characteristic by shape of valva with bulgy outer margin. Female genitalia characterised by wide T8 and wide, rounded S8.

Description.
Male. Forewing length 2.88—3.32 mm (3.07 ± 0.13, 8), wingspan 6.2—7.1 mm. Head: frontal tuft light yellow to yellowish orange; collar similar. Antennae with 35—42 segments (37.8 ± 2.4, 8). Thorax brown, sometimes mesoscutum with white tip. Forewings brown, with a white dorsal spot in middle, and a costal spot before middle, sometimes united to form a fascia. Hindwing without hair-pencil, but with costal bristles.

Female (fig. 60). Forewing length 2.56—2.88 mm (2.75 ± 0.13, 10), wingspan 5.8—6.5 mm. Antennal segments 27—31 (29.1 ± 1.5, 8). Female distinctly smaller than male.

Male genitalia (figs. 112, 255, 303, 374). Capsule length 266—300 µm (286.3 ± 14.7, 5). Tegumen rounded. Gnathos (fig. 303) with central element divided, distal part truncate, basal part with serrate margin. Valva (fig. 255) length 193—206 µm (201.4 ± 5.2, 5), outer margin bulging distally, inner margin basally straight or convex, from 1/3 distinctly concave, tip pronounced, pointed. Aedeagus (fig. 374) 274—283 µm (279.4 ± 3.6, 5), carinae varying from single to multifurcate.

Female genitalia (figs. 182, 445). T7 with only few short setae along anterior margin of T8, not in distinct rows. T8 with two lateral groups of scales and 3—5 setae each; posterior margin almost straight, lateral corners pronounced, rounded; S8 broadly rounded. Anal papillae with 14—23 setae. Vestibulum with vaginal sclerite, a dorsal spiculate pouch, and a group of densely packed pectinations near the entrance of ductus spermathecae. Corpus bursae 570—825 µm, without pectinations; signa dissimilar, longest 363—577 µm (460 ± 56, 11), shortest 308—495 µm (402 ± 48, 11), 4.0—5.4 × as long as wide. Ductus spermathecae with 2 indistinct convolutions.

Larva. Whitish, opaque, with distinct brown ganglia. Head-capsule and prothoracic plate dark brown. Ventral plates absent.

Biology.
Hostplants: *Quercus ilex* L., *Q. rotundifolia* Lam. and *Q. coccifera* L. Not yet recorded from *Q. suber* L., but probably also feeds on that species.

Mine (fig. 487). Egg on leaf upperside, not against vein. Early mine: slightly contorted narrow gallery, gradually widening, remaining linear throughout. Filled with thick black frass, hardly leaving clear margins. Not always separable from mines of *algeriensis*, *ilicis* or *heringella*.

Life history. Univoltine. Larvae collected in February and March, adults from April to June.

Distribution (fig. 545).

Widespread in southern France, occurring along Atlantic coast up to Angoulème, further recorded from Spain, Portugal, Italy and Greece.

Remarks.

Syntypes of *haraldi* are present in many collections. A lectotype is here designated from the Hering collection in Berlin, since it contains a large number of nepticulid types. The Soffner collection is not housed there.

Marchand incorrectly gave the holotype of *prinophylella* as male. He was the first to separate this species from *suberis*, with which it had been confused earlier.

Material examined: 18 ♂, 26 ♀. — France: 4 ♂, 4 ♀ (lecto- and paralectotypes of *haraldi*), Angoulème, e.l. v.1941, *Quercus ilex*, J. Soffner (MHUB, ZMA, ZMC); 1 ♀, Bize, v.1909, Chrétien; 2 ♂, 2 ♀, Alpes marit., Cannes, 13, 15 [decade], Constant (MNHN); 2 ♂, 1 ♀, Golfe Juan, Alpes maritimes, 8—15.vi.1894, Constant (BMNH); 1 ♂, "Nesp." (? near St. Pons, dep. Hérault), 15.vi.1904, Chrétien; 2 ♂, 2 ♀, Roquefort (B. du Rh.), between Cassis and Cuges les Pins, e.l. 14—24.iv.1984, *Quercus ilex*, R. Buvat (ZMA); 1 ♀, Viens (Vaucluse) (near Apt), e.l. 5.v.1971, *Quercus ilex*, R. Buvat (coll. Buvat); 3 ♂, 1 ♀ (holo- and paratypes of *prinophylella*), Villenave d'Ornon, Gironde, e.l. 23.v.—1.vi.1928, *Quercus ilex*, Le Marchand (MNHN). — Greece: 1 ♀, Lakonia, 7 km SW Monemvasia, 9.iv.1981, B. Skule (ZMC). — Italy: 3 ♀, Sistiana Mare, 0—60 m, e.l. 6—9.v.1970, *Quercus ilex*, G. Deschka (LNK). — Portugal: 2 ♀, San Fiel, e.l. 20.iv, *Quercus coccifera*, [Mendes], coll. Joannis; 3 ♂, 4 ♀, [prov. Beira Baixa, San Fiel] e.l. 23.iv, *Q. ilex*, [Mendes], coll. Joannis; 1 ♂, (misidentified paralectotype of *ilicis* Mendes) idem, e.l. 22.v. (MNHN). — Spain: 3 ♀, 7 km N. Benahavis (Málaga), road to Ronda, 800 m, e.l. 3—18.iv.1984, *Quercus coccifera*, E. J. van Nieukerken (ZMA).

Mines. — On *Quercus coccifera*. — Spain: 7 km N. Benahavis. On *Quercus ilex*. — France: Angoulème, leg. Soffner (BMNH); between Cassis and Cuges les Pins, leg. Buvat.

25. Ectoedemia (Ectoedemia) ilicis (Mendes, 1910) comb. n.

(figs. 61, 113, 183, 256, 257, 304, 375, 446, 488, 489, 543)

Nepticula ilicis Mendes, 1910: 164, pl. 7 figs. 7, 8. Lectotype ♂ (here designated), Portugal: [San Fiel, prov. Beira Baixa] e.l. 22.v., *Q. ilex*, [Mendes], Chenille à tête noire, Coll. L. & J. de Joannis, Genitalia slide VU 1358 (MNHN) [examined].

Stigmella ilicis; Gerasimov, 1952: 243; Hering, 1957: 869 (mine).

Diagnosis: *ilicis* and *heringella* are the only western Palaearctic oak-mining species with dorsal spot only. *Fomoria septembrella* (Stainton), *Stigmella catharticella* (Stainton) and *Zimmermannia* species also have dorsal spot only, but this is situated postmedially, whereas it is medial in *ilicis*. This is also the case in *E. intimella*, but this species can be separated by its unicolorous antennae, uniform dark scales on the forewings, and hair-pencil in the male. See *heringella* for differences with that species. The mines are easily confused with *haraldi*, but adults are easily separated by totally different valva in male and the distinct row of setae on T7 and form of T8 in female of *ilicis*.

Description.

Male (fig. 61). Forewing length 2.48—3.36 mm (2.87 ± 0.25, 13), wingspan 5.6—7.2 mm. Head: frontal tuft and collar yellowish orange. Antennae with 31—40 segments (37 ± 2.5, 13); scape white, with sometimes some brown scales. Thorax and forewings brown, with a dorsal spot only in medial position, sometimes slightly extending along dorsal margin towards base; sometimes a few scattered white scales present in addition. Hindwing without hair-pencil, but with costal bristles.

Female. Forewing length 2.36—2.88 mm (2.68 ± 0.16, 10), wingspan 5.1—6.5 mm. Antennal segments 28—31 (30.1 ± 1.0, 8).

Male genitalia (figs. 113, 256, 257, 304, 375). Capsule length 231—244 µm (240 ± 6.1, 5). Tegumen broad and rounded. Gnathos (fig. 304) with central element undivided, slightly truncate, lateral margins serrate. Valva (figs. 256, 257) length 176—193 µm (183.4 ± 7.0, 5), inner margin basally straight or convex, from 1/3 distinctly concave, inwards pointed tip prominent, truncate. Aedeagus (fig. 375) 253—274 µm (264 ± 9.9, 5), carinae split into two or more spines each.

Female genitalia (figs. 183, 446). T7 with a distinct row of 8-14 long setae along anterior margin of T8. T8 with two groups of about 3—6 setae, scales absent; T8 narrow with slightly sinuous posterior margin. Anal papillae with 8-14 setae. Vestibulum with vaginal sclerite, a dorsal spiculate pouch and a group of densely packed pectinations near the entrance of ductus spermathecae. Corpus bursae 660—825 µm,

without pectinations; signa dissimilar, longest 407—471 µm (432.9 ± 26.9, 5), shortest 369—416 µm (395.1 ± 19.3, 5), 3.9—5.1 × as long as wide. Ductus spermathecae with 2 indistinct convolutions.

Larva. Yellow with conspicuous brown ganglia. Head light brown. Ventral plates absent.

Biology.

Hostplants: *Quercus ilex* L., *Q. rotundifolia* Lam. and *Q. suber* L. Often sympatric with *haraldi* and *suberis*.

Mine (fig. 488, 489). Egg on leaf upperside, usually against vein. Early mine: much contorted gallery, starting very narrow. Frass black, dispersed, leaving narrow clear margins. Mine seems longer and more contorted than in *haraldi*, but difficult to separate.

Life history. Univoltine. Larvae found in January and February. Adults from March to the end of June.

Distribution (fig. 543).

Clearly west mediterranean.

Remarks.

As in the case of *Parafomoria ladaniphila* (Mendes) (Van Nieukerken, 1983: 469) type material of *ilicis* seems no longer to exist in Portugal, but Portuguese material in de Joannis collection (MNHN) can be regarded as syntype material if labelled as *ilicis*. I examined 3 ♂ and 1 ♀ mounted on the same block of pith and labelled "*ilicis* Mendes". One of these males belongs to *haraldi*, but the other specimens are this species. Since Mendes clearly refers in his description to the species with a dorsal spot only, one male of the two is selected lectotype, and the *haraldi* male is regarded as a misidentified paralectotype. Later I found more paralectotypes in the Hering collection in Berlin.

Material examined: 14 ♂, 12 ♀. — Algeria: 1 ♂, Batna, 1.v.1903, Walsingham (BMNH). — France: 1 ♀, Bize, 30.vi.1910, Chrétien; 1 ♂, 3 ♀, "Nesp." (? near St. Pons, dep. Hérault), 15.vi.1904, Chrétien (MNHN). — Portugal: 3 ♂, 2 ♀ (lecto- and paralectotypes), [San Fiel, prov. Beira Baixa], e.l. 22+ 26.v, *Quercus ilex*, [Mendes] (MNHN, MHUB). — Spain: 1 ♀, Sierra de Alfacar (near Granada), 24.iv.1880, Staudinger (MHUB); 1 ♂, Marbella, El Mirandor, 100 m, 17.v.1969, E. Traugott-Olsen (ETO); 2 ♀, Port Bou, e.l. 29—30.iii.1968, *Quercus ilex*, J. Klimesch (ZSMK); 7 ♂, 3 ♀, 4 km NE. Igualeja, Serrania de Ronda (Málaga), 1100 m, e.l. 19.iii—16.iv.1984, *Quercus rotundifolia*, E. J. van Nieukerken; 1 ♂, 1 ♀, Sierra Blanca, 6 km N. Marbella (Málaga), El Mirador, 800 m, e.l. 17—24.iv.1984, *Quercus rotundifolia* (♀) + *Q. suber* (♂), E. J. van Nieukerken (ZMA).

Mines. — On *Quercus rotundifolia*. — Portugal: San Fiel, leg. Mendes (BMNH). — Spain: Serrania de Ronda; Sierra Blanca. On *Quercus suber*: Spain: Sierra Blanca.

Additional record. — France: 1 ♂, 1 ♀, Marseille, e.l. 17.v.1971, 27.v.1972, *Quercus ilex*, R. Buvat (R. Johansson, pers. comm.).

26. Ectoedemia (Ectoedemia) heringella (Mariani, 1939) comb. n.

(figs. 62—64, 114, 115, 185, 186, 258, 259, 305, 306, 376, 377, 447, 448, 544)

Nepticula heringella Mariani, 1939: 5, 6, fig. 1a, pl. 1. Lectotype ♂ (here designated), Italy: Sicilia, Partinico, 1.v.1937 [*Quercus ilex*], Mariani (MCST) [examined].

Nepticula heringella f. *alliatae* Mariani, 1939: 7.

Stigmella heringella; Hering, 1957: 868, fig. 554 (mine).

Diagnosis: very similar to *ilicis*, but male easily separated (also from most other species) by patches of brown androconial scales on hindwing upperside and forewing underside. Female cannot always be separated with certainty from *ilicis*, but usually *heringella* has some white scales in the region of the costal spot and also has slightly longer signa.

Description.

Male (figs. 62, 63). Forewing length 2.08—2.68 mm (2.43 ± 0.13, 19), wingspan 4.4—6.0 mm. Head: frontal tuft yellowish white to orange, in specimens from Cyprus fuscous on vertex; collar yellowish white. Antennae with 35—42 segments (38.4 ± 1.8, 15); scape with some brown scales in posterior distal corner. Thorax and forewings brown with some scattered white scales; medial dorsal spot white, some white scales along costa, not forming a distinct costal spot; underside of forewings with basally an elongate patch of brown (androconial) scales. Hindwing without hair-pencil, but with costal bristles; in basal half with a patch of brown (androconial) scales on upperside.

Female (fig. 64). Forewing length 2.24—2.60 mm (2.44 ± 0.20, 14), wingspan 4.6—5.8 mm. Antennal segments 27—32 (29.9 ± 1.4, 16). Without patches of brown scales on underside forewing or upperside hindwing.

Male genitalia (figs. 114, 115, 258, 259, 305, 306, 376, 377). Capsule length 236—283 µm (252.9 ± 16.5, 9). Tegumen broad and rounded.

Gnathos (figs. 305, 306) with central element divided, distal part spatulate, basal part with serrate margin. Valva (figs. 258, 259) length 180—223 µm (209.0 ± 17.2, 9), inner margin almost straight or concave, tip prominent, slightly truncate. Aedeagus (figs. 376, 377) 257—300 µm (274.3 ± 16.5, 9) carinae single, bi- or trifurcate.

Female genitalia (figs. 185, 186, 447, 448). T7 with a distinct row of 8—12 long setae along anterior margin of T8. T8 with two groups of 2—4 setae (7 in Cyprus specimen), without scales, but some scales present in specimen from Corsica; T8 narrow, with slightly sinuous posterior margin. Anal papillae with 8—15 setae. Vestibulum with vaginal sclerite, a dorsal spiculate pouch and a group of densely packed pectinations near the entrance of ductus spermathecae. Corpus bursae 580—715 µm, without pectinations; signa dissimilar, longest 407—583 µm (484 ±73, 5), shortest 353—517 µm, (116 ± 73, 5), 4.0—4.7 × as long as wide. Ductus spermathecae with 2 indistinct convolutions.

Larva not examined.

Biology.

Hostplants: *Quercus ilex* L., *Q. alnifolia* Poech (on Cyprus).

Mine. Egg on leaf upperside, often near vein. Mine: much contorted gallery, amost filled with black frass. Not to be separated from mine of *ilicis*.

Life history. Univoltine. Larvae taken from November to April (Hering, 1957). Adults from late April to the end of June.

Distribution (fig. 544).

From Corsica eastwards to Cyprus. Seems to be the eastern vicariant of *E. ilicis*. Not yet recorded from Greece.

Remarks.

This species shows some variability. The specimens from Cyprus differ in darker headcolour and some genitalic details, but, since they also have the diagnostic features of *heringella*, I regard these as conspecific with *heringella*. The form *alliatae*, described by Mariani has no taxonomic value, it is probably described from worn specimens.

Material examined: 28 ♂, 26 ♀. — Cyprus: 1 ♂, 1 ♀, Arakapos (Troödos mountains), e.l. 25.iii.1980, *Quercus alnifolia*, B. Gustafsson (RMS). — France: 1 ♂, 1 ♀, Corsica: Corte, 14.vi.1899, Walsingham (BMNH). — Italy: 4 ♂, 3 ♀, Latina, Monti Aurunci, 5 km. N. Itri, 600 m, 24—30.vi.1969, R. Johansson (coll. Johansson); 2 ♀ (paralectotypes), Sicilia, Palermo, 8.vi.1928, Mariani; 1 ♂, 1 ♀, idem, e.l. 31.vi.1937, Mariani (MCST); 1 ♂, idem, e.l. 16.vi.1964, W. Glaser (LNK); 5 ♂, 6 ♀ (lecto- and paralectotypes), Sicilia, Partinico, 1—11.v.1937, Mariani (MCST, MHUB, ZMC). — Yugoslavia: 12 ♂, 18 ♀, Rijeka, Istria, 100 m, e.l. 6—20.v.1970, *Quercus ilex*, G. Deschka (LNK); 1 ♂, Split, Dalmatia, 19.v.1959, Novak (TMAB); 3 ♂, 4 ♀, Zadar, Dalmatia, 0—60 m, e.l. 13—24.v.1970, *Quercus ilex*, G. Deschka (LNK).

Mines. — On *Quercus alnifolia*. — Cyprus: Arakapos, leg. Gustafsson (RMS). On *Quercus ilex*. —Italy: Sicilia, Taormina, leg. Groschke (BMNH).

27. **Ectoedemia** (**Ectoedemia**) **alnifoliae** sp. n. (figs. 65, 187, 188, 449, 546)

Trifurcula (Ectoedemia) sp.; Gustafsson, 1981b: 468, fig. 9.

Type material: Holotype ♀, Cyprus: Troödos, 10.iii.1979, [e.l. 17.iv.1979], *Quercus alnifolia*, [B. Gustafsson], Genitalia slide RMS 6572 (RMS). Mine from which holotype emerged examined.

Diagnosis: externally similar to *nigrosparsella*, but light scales not intensively yellow, and scape with scattered brown scales. Female genitalia without long spiraled ductus spermathecae, with only 3 narrow convolutions.

Description.

Male unknown.

Female holotype (fig. 65). Forewing length 2.88 mm, wingspan 6.6 mm. Head: frontal tuft orange, darker on vertex, collar yellowish. Antennae broken, scape white with some brown scales. Thorax and forewings dark brown, irrorate with some yellowish-white scales, no colour pattern present.

Female genitalia (figs. 187, 188, 449). T7 without a row of setae. T8 with two lateral groups of scales and approximately 5 setae each. Anal papillae with 15—18 setae. Vestibulum with vaginal sclerite, a prominent dorsal spiculate pouch, and a group of densely packed pectinations near entrance of ductus spermathecae. Corpus bursae 690 µm, without pectinations; signa dissimilar, longest 540 µm, shorter 440 µm, 4.0 × as long as wide. Ductus spermathecae with 2 narrow convolutions.

Larva not examined.

Biology.

Hostplant: *Quercus alnifolia* Poech, an evergreen oak.

Mine. Egg on leaf underside. Mine starting as narrow gallery, suddenly enlarging into large blotch against leaf margin, frass not visible in single mine examined. See also Gustafsson (1981b: 469, fig. 9C).

Life history. Larva taken in March, adult emerged in April.

Distribution (fig. 546).

Troödos mountains on Cyprus.

Remarks.

Although only one female was available, this species is here described as new, since it shows sufficient diagnostic characters to separate it from other species, and the identity of males of this species can easily be determined by hostplant, mine-form and locality.

28. Ectoedemia (Ectoemedia) nigrosparsella (Klimesch, 1940)

(figs. 66, 116, 189, 190, 260, 307, 378, 450, 491, 546)

Nepticula nigrosparsella Klimesch, 1940a: 91, pl. 14, figs. 8, 9, pl. 15, figs. 10—12. Lectotype ♂ (here designated). Italy: Teriolis merid., Naturno, near Merano, e.l. iv.1939, J. Klimesch, Genitalia slide 449/39 Hering (MHUB) [examined].

Stigmella nigrosparsella; Klimesch, 1951: 64; Hering, 1957: 869, fig. 543 (mine); Klimesch, 1961: 763.

Ectoedemia nigrosparsella; Kasy, 1983: 5.

Diagnosis: characterised by brown irrorate with yellow forewings and absence of hair-pencil in male. Male genitalia not separable from *albifasciella* complex. Female genitalia characterised by long spiraled ductus spermathecae, with 13½—14 convolutions, whereas *contorta* usually has 10½—12 convolutions (except one specimen).

Description.

Male. Forewing length 2.0—2.68 mm (2.43 ± 0.19, 9), wingspan 4.3—6.0 mm. Head: frontal tuft ferruginous, sometimes mixed with fuscous; collar similar. Antennae with 28—37 segments (32.5 ± 3.2, 6). Thorax and forewings brown irrorate with light yellow scales, being a more pronounced yellow than in most other species; colour pattern absent, but light scales predominant at tornus. Hindwing without hair-pencil, but with costal bristles.

Female (fig. 66). Forewing length 2.72—2.88 mm (2.79 ± 0.07, 4), wingspan 6.0—6.4 mm. Antennal segments 25—27 (2.8 ± 1.0, 4).

Male genitalia (figs. 116, 260, 307, 378). Capsule length 283—309 µm, (3). Tegumen rounded. Gnathos (fig. 307) with central element truncate, as cut off. Valva (fig. 260) length 206—223 µm (4), inner margin strongly convex, except apically, serrate by prominent setal sockets, tip pointed; dorsal surface with many setae. Aedeagus (fig. 378) 279—287 µm (4), carinae pointed, single.

Female genitalia (figs. 189, 190, 450). T7 with a row of 8—12 setae along posterior margin; T8 with two lateral groups of scales and 2—4 setae each. Anal papillae with 14—17 setae. Vestibulum with vaginal sclerite, a dorsal spiculate pouch, and a group of densely packed pectinations near entrance of ductus spermathecae. Corpus bursae 740—825 µm, without pectinations; signa dissimilar, longest 485—695 µm (3), shortest 450—458 µm, 4.1—4.4 × as long as wide (3). Ductus spermathecae with very prominent spiralised inner canal, with 13½—14 convolutions.

Larva. Yellow, with greenish tinge in younger larvae, head-capsule brown. In penultimate instars with conspicuous brown ventral plates, which are shed during final instar; thereafter the ganglia become visible.

Biology.

Hostplants: *Quercus pubescens* Willd., occasionally on *Q. petraea* (Mattuschka) Liebl. (Klimesch, 1951).

Mine (fig. 491). Egg on leaf underside, occasionally on upperside. Early mine highly contorted, forming brown blot with irregularly accumulated brown frass; later gallery less contorted, with brown dispersed or coiled frass, leaving narrow clear margins. Mine confined to small area, often near leaf-margin.

Life history. Univoltine, larvae occurring from mid October to November. Adults collected at light mid June, reared in April and May (forced).

Distribution (fig. 546).

Known from a limited number of localities in Czechoslovakia, Hungary, Austria, Italy and France. Usually occurs in exposed southern slopes on calcareous soil — the typical habitat for *Q. pubescens*.

Material examined: 15 ♂, 13 ♀. — Austria: 2 ♂, Gumpoldskirchen, Glaslauterriegel, 10.vi.1983, F.

Kasy (NMW); 4 ♂, 5 ♀, ibid., e.l. 25.iv.—2.v.1984, *Quercus pubescens*, E. J. van Nieukerken (ZMA); 1 ♂, Hundsheimer Berg, Porta Hungarica (near Hainburg), 19.vi.1976, F. Kasy (NMW). — France: 2 ♀, Aubagne (Bouches du Rhône), e.l. 10—17.v.1977, *Quercus pubescens*, Buvat (coll. Buvat). — Hungary: 4 ♂, 2 ♀, Törökbálint (W. of Budapest), e.l. 10—18.iv.1974, 16.v.1976, *Q. pubescens*, J. Szőcs (TMAB). — Italy: 1 ♂, 1 ♀ (lecto- and paralectotype), Naturno near Merano, e.l. iv.1939, J. Klimesch (MHUB); 3 ♂, 3 ♀, Trento, Sardagna, 500 m, e.l. iv.1946, *Q. pubescens*, J. Klimesch (MHUB, ZMA).

Mines. — Austria: Gumpoldskirchen; Hainburg; Loretto; Wien, Leopoldsberg. — Italy: Naturno, leg. Klimesch; Trento, leg. Klimesch (BMNH).

The *Ectoedemia albifasciella* complex

This is a complex of four sibling species comparable with the *subbimaculella* complex, but differing in so far that the species are well separable on the female genitalia, the number of convolutions of the ductus spermathecae being a good and constant character in this complex: *albifasciella* with 2¼—2¾, *cerris* 3½—4, *pubescivora* 5—6 and *contorta* with 10½—12 (13½) convolutions. The externals and male genitalia do not provide any diagnostic characters. The species seem to have a different foodplant choice: *albifasciella* on *Quercus robur* and *Q. petraea*, *pubescivora* and *contorta* on *Q. pubescens* and *cerris* on *Q. cerris*, on which only one exception is known. Only *E. albifasciella* is described fully, the other species only as far as they differ.

29. Ectoedemia (Ectoedemia) albifasciella (Heinemann, 1871)
(figs. 6, 67, 117, 191, 192, 261, 308, 309, 379, 416, 451, 490, 522)

Nepticula albifasciella Heinemann, 1871: 222. 2 Syntypes, Germany, West: Braunschweig, e.l. *Quercus*, Heinemann (depository unknown) [not examined].

[*Nepticula argyropeza*; Stainton, 1854: 300 (partim, imago only); 1859: 433; 1862: 188—191, pl. 9, fig. 2 m (imago); Meyrick, 1895: 726, misidentification.]

Nepticula subapicella Stainton, 1886: 238. Lectotype ♂ (here designated), England: Beckenham, Palings, 17.vi.[18]51, S 7609, 57, Stainton, Genitalia slide BMNH 22609 (BMNH) [examined] (Synonymised by Emmet, 1974b: 274—276).

Nepticula albifasciella; Heinemann & Wocke, 1877: 769; Snellen 1882: 1002; Sorhagen, 1886: 312; Waters, 1928: 248—251 (redescription, biology); Petersen, 1930: 77; fig. 121bis (♂ genitalia); Klimesch, 1936: 210; Szőcs, 1965: 84.

Nepticula subbimaculella var. *albifasciella*; Rebel, 1901: 228; Meess, 1910: 481.

Dechtiria albifasciella; Beirne, 1945: 205, fig. 65 (♂ genitalia); Emmet, 1971: 246, 247.

Stigmella albifasciella; Klimesch, 1951: 66; Gerasimov, 1952: 224; Klimesch, 1961: 762; Lhomme, 1963: 1204; Borkowski, 1969: 110.

Stigmella (Dechtiria) albifasciella; Hering, 1957: 867 (mine).

Trifurcula (Ectoedemia) albifasciella; Johansson, 1971: 245.

Ectoedemia (Dechtiria) albifasciella; Borkowski, 1972: fig. 13 (venation).

Ectoedemia albifasciella; Bradley et al., 1972: 3; Borkowski, 1975: 491; Emmet, 1976: 199, pl. 6 fig. 10, pl. 12 fig. 30.

Trifurcula albifasciella; Karsholt & Nielsen, 1976: 18.

[*Dechtiria argyropeza*; Beirne, 1945: 205, fig. 66 (♂ genitalia) misidentification.]

Diagnosis: only separable from the other members of the complex in the female sex, by the lower number of convolutions in the ductus spermathecae. Externally also very similar to *preisseckeri* and *haraldi*, which can however easily be separated on genitalia (see there). Distinguished from *E. subbimaculella* complex by absence of basal spot, truncate gnathos and single carinae in male and wider convolutions of ductus spermathecae in female. Other species with white costal and dorsal spot (not metallic) have these spots opposite, or forming an almost straight fascia, and a hair-pencil in male. *E. erythrogenella* has a similar pattern, but metallic silver spots.

Description.

Male. Forewing length 2.32—2.96 mm (2.68 ± 0.17, 23), wingspan 5.2—6.4 mm. Head: frontal tuft and collar uniformly orange to ferruginous. Antennae with 34—41 segments (36.4 ± 1.9, 19). Thorax blackish fuscous, with a few white scales at tip of mesoscutum and tegulae. Forewings blackish fuscous, with a white dorsal spot in middle and a costal spot before middle, sometimes united to form a fascia. Hindwing without hair-pencil, but with costal bristles.

Female (fig. 67). Forewing length 2.32—2.92 mm (2.67 ± 0.18, 24), wingspan 5.2—6.5 mm. Antennal segments 25—28 (26.3 ± 1.0, 23).

Male genitalia (figs. 117, 261, 308, 309, 379). Capsule length 244—321 µm (292.1 ± 18.5, 13). Tegumen distinctly produced into almost triangular, rounded pseuduncus. Gnathos (fig. 308, 309) with central element parallel-sided, with blunt, truncate tip. Valva (fig. 261) length 180—

236 µm (220.1 ± 14.1, 14), apically distinctly narrowed into pointed tip; inner margin strongly convex, becoming concave near tip, serrate by prominent sockets of numerous setae on inner and dorsal surfaces. Aedeagus (fig. 379) 236—313 µm (275.8 ± 20.1, 14), carinae pointed, single.

Female genitalia (figs. 191, 192, 416, 451). T7 with a row of 6-12 setae along posterior margin; T8 with two lateral groups of scales and 2—6 setae each; S8 almost quadrate, with parallel sides. Anal papillae with 13—29 setae. Vestibulum with vaginal sclerite, a dorsal spiculate pouch, and a group of densely packed pectinations near entrance of ductus spermathecae. Corpus bursae 660—825 µm, without pectinations; signa dissimilar, longest 460—560 µm (519 ± 34.7, 10), shortest 395—530 (473 ± 39.0, 11), 4.9—7.5 × as long as wide. Ductus spermathecae with 2¼—2¾ convolutions, the convolutions being very wide and prominent (fig. 416).

Larva. Yellowish white with light brown head-capsule, inconspicuous ganglia. Penultimate instars with indistinct brown ventral plates.

Biology.

Host plants: *Quercus robur* L., and *Q. petraea* (Mattuschka) Liebl. Occurs on several other deciduous oaks in botanical gardens, and occasionally on *Castanea sativa*.

Mine (fig. 490). Egg on upperside beside vein, or midrib. Mine starting as narrow linear gallery, often along midrib and later following lateral vein outwards, abruptly changing into almost rectangular blotch; sometimes blotch takes form of wide, irregular gallery. Early mine with linear frass, in blotch frass in basal half.

Life history. Univoltine, larvae from end of August until October, usually much earlier than *heringi* and *subbimaculella*, but occasionally still feeding in green islands in late October; adults flying in May and June.

Distribution (fig. 522).

Widely distributed in Central and North Europe, apparently occurring farther northwards than *subbimaculella* and *heringi*. In Scandinavia as far north as the limit of *Quercus* in southern Finland and north of Stockholm in Sweden. Not yet recorded from Norway, but presumably occurring along the south coast. Common in Great-Britain as far north as the Scottish Highlands. The distribution in the south is hardly known, due to confusion with other species of the complex. *E. albifasciella* is there with certainty known from Austria, Hungary and central Greece (Pindhos mountains).

Remarks.

This species has been the subject of much confusion. Stainton (1854, 1859, 1862) misidentified it as *E. argyropeza* Zeller, and incorrectly equated the immature stages with those of the real *argyropeza*. The imago of *argyropeza* he described as *apicella* Stainton (see under *E. argyropeza*). By 1863 Stainton was aware of this incongruency, but did not settle the problem, since he thought that Fritsche was going to publish the solution (Stainton, 1886; Emmet, 1974b). Not until 1886 did he propose the name *subapicella* for the adults he had previously described as *argyropeza* Zeller, still without knowing the life-history. I have studied three specimens from the Stainton collection, labelled as *argyropeza* which he presumably used for his description of *argyropeza* and, hence, *subapicella*. From these specimens I selected a lectotype of *subapicella*.

Although Heinemann (1871) also noted Stainton's misinterpretation of *argyropeza*, he did not link it up with the new species which he reared from oak, and described as *albifasciella*. In the Niedersächsisches Landesmuseum Hannover, there is no material of this species left in the Heinemann collection (pers. comm. R. Johansson), neither in the Berlin or Leningrad museums. However, the clear description, with the note on the foodplant, and the type-locality (Braunschweig) make it most likely that the present interpretation of *albifasciella* is correct. Waters (1928) was the first to describe the biology of *albifasciella* in detail, and to separate it from *subbimaculella*. Since that time mines and larvae were still often confused with *heringi* (described in 1934), and in southern Europe with the other species of the complex.

I have only seen correct *albifasciella* females reared from *Quercus robur* and *Q. petraea*, all specimens reared from *Q. pubescens* appear to belong to either *E. pubescivora* or *contorta*. However, as this refers to comparatively few specimens, it cannot definitively been concluded that these species are completely host-specific.

Material examined: 128 ♂, 109 ♀, 23 ex. — Austria: 1 ♂, Klosterneuburg, Freiberg, 9.v.1932, Preis-

secker; 3 ♀, Klosterneuburg, Buchberg, e.l. 8—16.v.1942, *Q. robur*, Preissecker (NMW); 1 ♂, 1 ♀, 5 km W. Völkermarkt, Pörtschach (Kärnten), e.l. 27—30.iv.1984, *Quercus robur*, J. J. Boomsma & E. J. van Nieukerken (ZMA). — France: 1 ♂, Pontault, 18.v.1977, Leraut (coll. Leraut). — Germany, West: 1 ♂, Rohr (Württemberg), e.l. 18.iii.1934, Wörz (LNK); 1 ♂, Schwabisch Hall, 13.vi.1978, W. Speidel (coll. Speidel). — Germany, East: 2 ♂, Berlin, Finkenkrug, 15.v.1923, 22.v.1930, Hering; 1 ♂, 3 ♀, Nordhausen, 24—29.v.1898, Petry (MHUB). — Great Britain: 3 ♂ (lecto- and paralectotypes of *subapicella*), Beckenham, Palings, 17 + 22.vi.1851, Stainton (BMNH); 1 ♀, Saffron Walden, e.l. 25.v.1980, Bryan, Emmet & van Nieukerken; 1 ♀, Southampton, 15.vi.1935, Fassnidge (ZMA); 2 ♂, no locality, 8.v.1884, Stevens; 3 ♂, 5 ♀, no further data, Walsingham (BMNH). — Greece: 1 ♂, 2 ♀, Palaiokastron, Evritanía, 1200 m, e.l. 8—13.v.1981, *Quercus petraea* s.l. 21.ix.1980, Menken & van Nieukerken (ZMA). — Hungary: 1 ♀, Budapest, Petneházi-rét, e.l. 20.v.1979, *Q. petraea*, J. Szőcs; 1 ♂, 1 ♀, Mátra Hegység, Sástó, e.l. 12 + 14.v.1973, *Q. petraea, Q. robur*, J. Szőcs (TMAB). — Netherlands: 98 ♂, 78 ♀, 23 ex. from following localities: Aerdenhout, Arnhem, Bergen op Zoom, Breda, Bussum, Doetinchem, Driesum, Epen, Groesbeek, Den Haag, Helvoirt, Hilversum, Hoge Veluwe near Deelen, Hollandse Rading, Horst, Hulshorst, Leeuwarden, Leuvenum, Loenen (Gld.), De Lutte, Nunspeet, Oosterbeek, Overberg, Overveen, Rhenen, Rockanje, Rotterdam, Rijs, Santpoort, Tietjerk, Ubbergen, Vaals, Venlo, Wageningen, Wassenaar, Winterswijk, Zandvoort (RMNH, ZMA, AFW, coll. Huisman, coll. Kuchlein). — Poland: 3 ♂, Dąbie (Alt Damm), 11.iv.Krone (TMAB); 5 ♂, 10 ♀, Krosno Odr. (Crossen a. Oder), e.l. 18.v—10.vi.1930, *Quercus robur*, Hering; 2 ♂, Osiecznica (Güntersberg O.), near Krosno, 6.vi.1915, Hering (MHUB). — Switzerland: 1 ♀, Lussy (VD), LS 05A, e.l. 10.vi.1977, S. E. Whitebread (coll. Whitebread).

Mines. — On *Castanea sativa*. — Great Britain: Reading. On *Quercus petraea* and *robur*. — Austria: Hof am Leithagebirge; Hundsheimer Berg near Hainburg; Völkermarkt. — Belgium: Zolder. — France: Andlau. — Germany, West: Blankenheim; Wiesbaum. — Great Britain: Little Waltham; Reading; Redhill. — Greece: W. of Palaiokastron, Evritania. — Italy: Tolmezzo. — Netherlands: many localities.

Males of *albifasciella*-complex with uncertain identity. 5 ♂. — Spain: 1 ♂, San Ildelfonso (La Granja), 22.vi.1902, Chrétien (MNHN); 1 ♂, Sierra de Alfacar, 24.iv.1880, Staudinger (MHUB). — Turkey: 1 ♂, Asia minor, SW of Yalova, Sea of Marmara, 11.v.1969, Kasy (NMW). — USSR: 1 ♂, Krasnoarmeysk (Sarepta), 22.v.1859, Christoph (BMNH). — Yugoslavia: 1 ♂, Drenovo, near Kavadarci (Macedonia), 20—30.v.1957, Kasy (NMW).

30. **Ectoedemia (Ectoedemia) cerris** (Zimmermann, 1944) (figs. 68, 118, 193, 194, 262, 310, 380, 452, 492, 548)

Nepticula cerris Zimmermann, 1944: 121. Lectotype ♀ (here designated), Czechoslovakia: Moravia merid., Lednice (Eisgrub), F. Zimmermann, Genitalia slide VU 1333 (MHUB) [examined].

Nepticula sp.; Skala, 1942: 6, 7, figs. 1, 2 (description of species, later named *montissancti*).

Nepticula montissancti Skala, 1948: 121, 122. Holotype, Czechoslovakia: Mikulov (Nikolsburg), v. 1943, e.l., *Quercus cerris* (Skala) (lost) [not examined]. **Syn. nov.**

Stigmella (Dechtiria) cerris; Hering, 1957: 866, fig. 555 (mine).

Nepticula (Dechtiria) cerris; Szőcs, 1968: 227.

Ectoedemia cerris; Szőcs, 1978: 266; 1981: 210.

Diagnosis: separated from the other members of the complex by the ductus spermathecae of the female, with 3½—4 convolutions.

Description.

Male. Forewing length 2.24—2.28 mm (3), wingspan ± 5.0 mm. Antennae with 32-34 (3) segments. Similar to *albifasciella*, fascia generally broken.

Female (fig. 68). Forewing length 2.32—2.4 mm (5). Wingspan 5.2—5.3 mm. Antennae with 25—28 segments (4).

Male genitalia (figs. 118, 262, 310, 380). As *albifasciella*. Capsule 250—285 µm (2); valva 200—205 µm (2); aedeagus 245—250 µm (2).

Female genitalia (figs. 193, 194, 452). T7 with a row of 6 setae; T8 with 3—6 setae on each side. Anal papillae with 8—13 setae. Corpus bursae 790—860 µm; longest signum 462—560 (4), shortest 418—540 (4), 5.4—7 × as wide as long. Ductus spermathecae with 3½—4 convolutions.

Larva. Whitish, with dark head-capsule and conspicuous black ventral plates which are shed during final instar.

Biology.

Hostplant: *Quercus cerris* L.

Mine (fig. 492). Egg on upperside, on or near vein. Early mine narrow gallery, following vein or contorted, with broken linear frass; suddenly widening into large blotch, in which frass is accumulated near opening. Mine often away from the midrib.

Life history. Univoltine. Larvae have been found from late September to the end of October, but most plentiful in early October. The adults appeared in May.

Distribution (fig. 548).

Known from Hungary, Moravia, eastern Austria, Italy and Yugoslavia.

Remarks.

Skala (1948) described *montissancti* as a third species on *Quercus cerris*, separate from *cerris* and *liechtensteini*, but his description of mine and adult clearly indicate that he was describing *cerris* again, hence the synonymy. The holotype was according to Skala himself destroyed by psocids. *E. cerris* is in the autumn the earliest *Ectoedemia* species mining on *Q. cerris*. In the first week of October 1983 we found many feeding larvae in Austria, but no other *Ectoedemia* species, whereas in the last week of October, on the same localities almost only empty mines were found between many larvae of *liechtensteini* and *gilvipennella*.

Material examined: 7 ♂, 13 ♀. — Austria: 5 ♀, Hof am Leithagebirge, S. of Mannersdorf (Niederöst), e.l. 3—7.v.1984, J. J. Boomsma & E. J. van Nieukerken; 1 ♀, Wien, Kahlenberg, SE, 400 m, e.l. 3.v.1984, E. J. van Nieukerken (ZMA). — Czechoslovakia: ♀ lectotype, see above. — Hungary: 1 ♂, Budaörs, Csiki-hegyek, e.l. 14.v.1971, *Q. cerris*, J. Szőcs; 2 ♂, 4 ♀, Szár, *Q. cerris*, e.l. 1.v.1965, 20.iv.1966, 1.v.1966, 18—19.v.1968, J. Szőcs; 1 ♂, Törökbálint, e.l. 15.v.1965, J. Szőcs (TMAB). — Italy: 2 ♂, P. N. d'Abruzzo, Opi, Bivio, la Camosciara (L'Aquilla), e.l. 5—7.v.1984, S. B. J. Menken; 1 ♂, 2 ♀, between Tolfa-Allumiere (Roma), e.l. 9—16.v.1984, S. B. J. Menken (ZMA).

Mines. — Austria: Hof am Leithagebirge; Eisenstadt; Loretto, N. of Eisenstadt; Wien, Kahlenberg; — Hungary: Törökbálint. — Italy: Opi; Sabaudia; Tolfa; Veio. — Yugoslavia: S. of Han Knežica, N. of Prijedor.

31. Ectoedemia (Ectoedemia) pubescivora (Weber, 1937) comb. n.

(figs. 69, 119, 195, 196, 263, 311, 381, 453, 493, 547)

Nepticula pubescivora Weber, 1937b: 212, fig. 2. Lectotype ♀ (here designated), Switzerland: Somazzo, 12.x.1932, *Querc. cerris* (sic!), Weber, Genitalia slide ETH 1236 (ETHZ) [examined].

Stigmella pubescivora; Klimesch, 1948: 73, 74, figs. 52—54 (♂ genitalia); Klimesch, 1951: 65; Hering, 1957: 870, fig. 547 (mine).

Trifurcula (Ectoedemia) pubescivora; Kasy, 1978: 4.

Diagnosis: separated from the other members of the complex by the ductus spermathecae in the female, with 6 wide convolutions.

Description.

Male. Forewing length 2.24—2.56 mm (2.45 ± 0,13, 5), wingspan 5.0—5.8 mm. Antennae with 34—35 (3) segments. Further as *albifasciella*.

Female (fig. 69). Forewing length 2.4—2.76 mm (2.55 ± 0.11, 9), wingspan 5.2—6.0 mm. Antennae with 25—27 segments (25.7 ± 0.8, 7).

Male genitalia (figs. 119, 263, 311, 381). As *albifasciella*. Capsule 270—300 µm (3); valva 223—236 µm (3); aedeagus 253—274 µm (3).

Female genitalia (figs. 195, 196, 453). T7 with a row of 6—10 setae; T8 with 2—5 setae on each side. Anal papillae with 10—17 setae. Corpus bursae 680—935 µm; longest signum 430—650 µm (543 ± 46, 14), shortest 395—550 µm (485 ± 43, 14), 4.3—6 × as long as wide. Ductus spermathecae with 5—6 very wide convolutions.

Larva. As in *cerris*, with black ventral plates.

Biology.

Host plant: *Quercus pubescens* Willd. The specimens in the type-series are labelled *Q. cerris*, but Weber refers clearly to *pubescens* in his description.

Mine (fig. 493). Egg on either surface of leaf. Mine largely as in *albifasciella*, but both linear part and blotch part often more contorted, and blotch often more forming wide gallery.

Life history. Univoltine. Larvae of the type-series have been found in mid October, adults were reared or collected in late May or first half of June.

Distribution (fig. 547).

With certainty only known from the material examined. The records of mines on *Quercus pubescens* from France and Italy are probably correct. Other records are doubtful, and not included here.

Material examined: 9 ♂, 20 ♀. — France: 2 ♀, "Nesp." (? near St. Pons, dep. Hérault), 15.vi.1904, Chrétien (MNHN); 2 ♀, Viens (Vaucluse) (near Apt), e.l. 16—17.v.1979, *Quercus pubescens*, Buvat (coll. Buvat). — Italy: 3 ♂, 5 ♀, Sardegna, Belvi, environs, 700 m, 29.v—15.vi.1975, F. Hartig (MRST); 4 ♀, Sardegna, Gennargentu, Belvi, 800 m, 19.v.1976, G. Derra (coll. Derra): 4 ♂, 5 ♀, [Sicilia, Taormina], 572, Groschke (SMNS). — Switzerland: 2 ♂, 2 ♀ (lecto- and paralectotypes), Somazzo, Monte Generoso, mines 12.x.1932, Weber (ETHZ).

Mines. — France: Aix-en-Provence; Viens (Vaucluse), leg. Buvat. — Italy: Abruzzi: Alfredena; Goia dei Marsi; Sicilia, Taormina, leg. Groschke (BMNH). — Switzerland: Astano, leg. + coll. Whitebread; Somazzo, leg. Weber (ETHZ); idem, leg. + coll. Whitebread.

32. Ectoedemia (Ectoedemia) contorta sp. n.

(figs. 70, 120, 197, 198, 312, 382, 454, 547)

Ectoedemia spec.; Van Nieukerken in Kasy, 1983: 5.

Ectoedemia cf *albifasciella*; Van Nieukerken in Kasy, 1983: 5.

Type material: Holotype ♀, Hungary: Budaörs, Csiki-hegyek, *Quercus pubescens*, e.l. 6.v.1966, J. Szőcs, Genitalia slide VU 1388 (TMAB). Paratypes, 8 ♀. — Austria: 1 ♀, Hundsheimer Berg, Porta Hungarica (near Hainburg), 19.vi.1976, F. Kasy; 1 ♀, Leithagebirge, N. Burgenland, Zeilerberg S., 30.v.1964, Kasy & Vartian (NMW). — Hungary: 1 ♀, Csopak, 3.v.1971, *Q. pubescens*, J. Szőcs; 1 ♀, Északborsodi-karszt, Haragistya, e.l. 3.v.1965, *Q. pubescens*, J. Szőcs; 1 ♀, Mátra Hegység, Sástó, e.l. 16.v.1973, *Q. robur*, J. Szőcs; 3 ♀, Nagykovácsi, Kis Szénás (W. of Budapest), e.l. 14—15.v.1964, *Q. pubescens*, J. Szőcs (TMAB, ZMA).

Other material: 4 ♂, probably belonging to *contorta*. — Austria: 2 ♂, Hundsheimer Berg (near Hainburg), 17.vi + 8.vii.1980, F. Kasy (NMW). — Hungary: 1 ♂, Budaörs. Csiki-hegyek, e.l. 10.v.1966, *Q. pubescens*, J. Szőcs; 1 ♂, Nagykovácsi, Kis Szénás, e.l. 8.v.1964, *Q. pubescens*, J. Szőcs (TMAB).

Diagnosis: easily separated from other females in the species complex by the long spiraled ductus spermathecae, with 10½—13½ convolutions. *E. nigroparsella* has a similar ductus, but has a very different wing pattern.

Description.

Female (fig. 70). Forewing length: 1.84—2.56 (2.24 ± 0.21, 9), wingspan 4.6—5.4 mm. Antennae with 22—26 segments (24 ± 1.2, 9). Further as *albifasciella*.

Male. Forewing length 2.36—2.48 mm, wingspan 5.2—5.6 mm. Antennae with 32—35 segments.

Female genitalia (figs. 197, 198, 454). T7 with a row of 10—12 setae; T8 with 2—5 setae on each side. Anal papillae with 9—21 setae. Corpus bursae 715—925 µm; long signum 460—585 µm (520 ± 52.2, 8), short 430—550 µm (487 ± 54.1, 8). Ductus spermathecae with 10½—12 (in 1 specimen 13½) convolutions. Further as *albifasciella*.

Male genitalia (figs. 120, 264, 312, 382). Similar to *albifasciella*. Capsule length 257—278 µm. Valva 210—227 µm. Aedeagus 257—278 µm.

Larva not examined.

Biology.

Hostplants: *Quercus pubescens* Willd. One specimen reared from *Q. robur* L.

Mine unknown, but since all specimens reared were identified by Szőcs as *albifasciella*, it probably is very similar to the mine of *albifasciella*.

Life history. Univoltine. Adults reared or collected in May, June, and early July. Larvae collected in autumn, but exact data unknown.

Distribution (fig. 547).

At present only known from eastern Austria and Hungary.

Remarks.

This species was discovered amongst material identified as *albifasciella*. All specimens reared by Szőcs from *Quercus pubescens* appear to belong to *contorta*, and all but one reared from *Q. robur* and *Q. petraea* are the real *albifasciella*. Only one *contorta* has been reared from *Q. robur*. Also the Austrian localities have dense stands of *Q. pubescens*, so it seems likely that *E. contorta* is restricted to this oak, and an eastern vicariant of *E. pubescivora*.

As in the other species of this complex, only the females can be identified with certainty, therefore the males are excluded from the type-series, and the order of description is changed accordingly.

The *Ectoedemia subbimaculella* complex

The complex of species around *E. subbimaculella* is one of the most difficult species complexes in Nepticulidae, and not completely understood. Externally all these species are extremely similar, and show only slight differences in head-colour and size. The male genitalia do not provide constant diagnostic characters and the female genitalia only show minute differences to separate *subbimaculella* from other species. More than one species has been described because of differences in larval habit and foodplant choice. The larva of *E. subbimaculella* invariably slits its mine open during its last instar, and the larva of *E. phyllotomella* cuts out a circular disc at the end of its mine. The other species in this complex, without having such pecularities, have been described because they feed on different species of *Quercus*, or *Castanea*, viz. *heringi* and *quercifoliae* on *Q. robur*, and *Q. petraea*, *zimmermanni* on *Q. pubescens*, *liechtensteini* on *Q. cerris* and *sativella* on *Castanea sativa*. In my experience the larvae found on *Q. robur*, *Q. petraea*, *Q. pubescens* and *Castanea* do not show any difference, but larvae collected on *Q. cerris* are very

different in colour, agreeing with the description of *liechtensteini*. Similar larvae, however, have also been collected in low number on *Q. pubescens* and *Q. petraea*, together with the commoner type, so that food plant difference does not seem te be constant. By electrophoresis of allozymes there is indication of some isolation in the following species, but in contrast with other situations no diagnostic enzymes have been found: *subbimaculella*, "*heringi*" from *Q. robur* and *Q. pubescens* and *liechtensteini*" from *Q. cerris* and *Q. pubescens* (Menken, in preparation). On the ground that the larvae from *Castanea* and *Q. pubescens* do not show differences from those from *Q. robur, zimmermanni, sativella* and *quercifoliae* are considered provisionally to be synonymous with *heringi*. This hypothesis is open to further tests. Hereafter only *E. subbimaculella* is described fully, and the other species only in so far as they differ from it.

33. Ectoedemia (Ectoedemia) subbimaculella (Haworth, 1828)

(figs. 71, 121, 199, 200, 265, 313, 384, 417, 455, 494, 523)

Tinea subbimaculella Haworth, 1828: 583. Lectotype ♂ (here designated), [England], Haworth Coll.; Stainton Coll., Genitalia slide BM 22595 (BMNH) [examined].

Microsetia nigrociliella Stephens, 1829: 208 [nomen nudum].

Microsetia nigrociliella Stephens, 1834: 267. Lectotype ♂ (here designated), [England], Stephens coll., Genitalia slide BM 22599 (BMNH) [examined]. **Syn. nov.**

Nepticula cursoriella Zeller, 1848: 326. Holotype ♀, Germany: Frankfurt am Main, Heyden (depository unknown) [not examined].

Microsetia subbimaculella; Stephens, 1829: 208; 1834: 267.

Nepticula subbimaculella; Stainton, 1849: 29; 1854: 300; 1855: 258—271, pl. 7, fig. 3; Frey, 1856: 379; 1857: 397, 398; Stainton, 1849: 433; Wocke, 1871: 339; 1874: 102; Heinemann & Wocke, 1877: 767; Snellen, 1882: 1002—3; Sorhagen, 1886: 310, 311; Meyrick, 1895: 725, 726; Tutt, 1899: 352; Rebel, 1901: 228; Meess, 1910: 481; Sorhagen, 1922: 56, 57 (partim); Meyrick, 1928: 863; Waters, 1928: 248—251 (differences with *albifasciella*); Petersen, 1930: 77, fig. 121 (♂ genitalia); Szőcs, 1965: 86.

Stigmella subbimaculella; Klimesch, 1951: 65; Gerasimov, 1952: 262; Klimesch, 1961: 761; Lhomme, 1963: 1204; Borkowski, 1969: 111.

Dechtiria subbimaculella; Beirne, 1945: 205, fig. 64 (♂ genitalia); Emmet, 1971: 247, 248.

Stigmella (Dechtiria) subbimaculella; Hering, 1957: 866, fig. 533 (mine).

Trifurcula (Ectoedemia) subbimaculella; Johansson, 1971: 245.

Ectoedemia subbimaculella; Bradley et al., 1972: 3; Borkowski, 1975: 490; Emmet, 1976: 200, fig. 60a, b, pl. 7, fig. 3, pl. 12, fig. 32.

Trifurcula subbimaculella; Karsholt & Nielsen, 1976: 18.

[no genus] *cursoriella*; Herrich-Schäffer, [1853]: pl. 106, fig. 844.

Nepticula cursoriella; Herrich-Schäffer, 1855: 356.

Diagnosis: from most other *Ectoedemia* species distinguished by the white basal spot on the forewing and absence of hair-pencil in male. Very difficult to separate from other species in the complex, which have usually a darker head and are slightly smaller. The differences in the male genitalia are not diagnostic. The female can be separated by the wider convolutions in the ductus spermathecae. *E. subbimaculella* is most easily identified by the dark larval head and prothorax and the slit in the mine.

Description.

Male. Forewing length 2.24—2.8 mm (2.50 ± 0.15, 26), wingspan 4.8—6.1 mm. Head: frontal tuft yellowish orange, sometimes with fuscous scales on vertex; collar dark brown. Antennae with 31—36 segments (33.3 ± 1.3, 21). Thorax black, with some white scales at tips of mesoscutum and tegulae. Forewing blackish fuscous with a white basal spot along dorsal margin, a dorsal spot in middle and a costal spot before middle, sometimes uniting to form a fascia. Hindwing without hair-pencil, but with costal bristles.

Female (fig. 71). Forewing length 2.16—2.8 mm (2.52 ± 0.19, 25). Antennae with 24—29 segments (25.7 ± 1.1, 24).

Male genitalia (figs. 121, 265, 313, 384). Capsule length 231—304 μm (274.1 ± 19.2, 24). Tegumen produced into rounded pseuduncus. Gnathos (fig. 313) with central element gradually narrowing to rounded tip. Valva (fig. 265) length 193—244 μm (222.7 ± 13.8, 25), apically gradually narrowed into blunt tip; inner margin little convex to concave, serrate by prominent sockets of many setae on inner and dorsal surfaces. Aedeagus (fig. 384) 210—261 μm (243.5 ± 14.3, 23), carinae with variable number of spines.

Female genitalia (figs. 199, 200, 417, 455). T7 with a row of 6—10 setae along anterior margin of T8; T8 with two lateral groups of scales and 3—7 setae each; S8 with converging margins. Anal papillae with 9—16 setae. Vestibulum with

vaginal sclerite, a dorsal spiculate pouch, and a group of densely packed pectinations near entrance of ductus spermathecae. Corpus bursae 450—710 µm, without pectinations; signa dissimilar, longest 390—514 (459.0 ± 34.3, 11), shortest 339—467 µm (408.3 ± 38.4, 11), 4.4—5.6 × as long as wide. Ductus spermathecae with 2¼—2½ (rarely 3) convolutions, wider than in *heringi*, narrower than in *albifasciella* (fig. 417).

Larva. Translucent glossy white, with dark brown or black head-capsule and prothoracic plate. Ganglia more or less conspicuous. Ventral plates absent.

Biology.

Host plants: *Quercus robur* L., *Q. petraea* (Mattuschka) Liebl., *Q. pyrenaica* Willd. and *Q. pubescens* Willd., a few mines known from *Q. cerris* L. in Yugoslavia. Rarely on *Q. rubra* L. In botanical gardens on a wide variety of deciduous oaks.

Mine (fig. 494). Egg on upperside of leaf, beside vein. Mine: narrow linear gallery along vein, abruptly changing in blotch, usually in angle between midrib and lateral vein. The larva makes a slit in the under epidermis, through which water and frass fall out of the mine. In Austrian mines on *Q. pubescens* the slit was often in the upper epidermis or in both surfaces. When the egg is laid along a lateral vein, the larva usually feeds towards the midrib.

Life history. Univoltine, larvae from late September until November, adults flying in June and July.

Distribution (fig. 523).

Widely distributed in West and Central Europe, in Scandinavia only in southern Sweden and Denmark, most northern records being misidentifications (R. Johansson, pers. comm.); it is not recorded from Ireland and Scotland. In the south the distribution is insufficiently known, confirmed records are available from northern Italy, Sicily, Hungary, Yugoslavia and southwest USSR.

Remarks.

The lectotype is a male in good condition which was placed in the Stainton collection with a "Type" label. On examining the lectotype of *nigrociliella* Stephens, also from Stainton's collection, the synonymy was confirmed, which was already suggested by several authors (Stainton, 1855; Bradley et al., 1972). Types of *cursoriella* Zeller could not be found, but it is likely to be a synonym of *subbimaculella*, and has always been treated as such since Herrich-Schäffer (1855).

Until the beginning of this century, this was the only oak-mining species of this group recognised by most authors, even *albifasciella* was generally considered a variety. Waters (1928) was the first to recognise the differences in biology between *subbimaculella* and *albifasciella*. Therefore all older literature records are useless, unless a clear description of the characteristic mine with slit is given. More recent records of adults which have not been reared have to be checked since they are easily confused. Hering (1957) mentioned a probable new species from Sicily on *Q. pubescens*, with similar mines, but with larvae making cocoons in their mines. In BMNH there are such mines, but in all cocoons which are still in these mines, pupae of parasitic Hymenoptera can be observed. The phenomenon of parasitised larvae, spinning their cocoons inside the mine has been noted in several species, thus these are probably *subbimaculella* mines. This is further corroborated by *subbimaculella* adults in the Groschke collection, which probably come from Taormina (see also *caradjai*).

Material examined: 116 ♂, 122 ♀, 3 ex. — Austria: 11 ♂, 14 ♀, Hainburg: Hundsheimer Berg, 200—400 m, e.l. 8—21.vi.1984, *Quercus pubescens*, E. J. van Nieukerken (ZMA); 1 ♂, Hundsheimer Berg (near Hainburg), 28.vi.1976, F. Kasy; 1 ♂, Klosterneuburg, Buchberg, e.l. 14.v.1942, *Q. robur*, Preissecker (NMW); 6 ♂, 5 ♀, Loretto, 7 km N. Eisenstadt (Burgenland), 240 m, e.l. 30.iv—14.v.1984, *Quercus pubescens*, E. J. van Nieukerken; 1 ♂, Wien, Leopoldsberg, W. of Kahlenberg, 200—400 m, e.l. 2.v.1984, *Quercus pubescens*; E. J. van Nieukerken (ZMA). — France: 1 ♂, Pessac-Alouette (Gironde), 3.vi.1934, Le Marchand; 1 ♂, Mutrécy (Calvados), S. of Caen, 15.vi.1919, Le Marchand (MNHN); 1 ♀, Mulhouse, Bois de Nonnenbruch, 250 m, 12.vi.1977, S. E. Whitebread (coll. Whitebread); 2 ♂, 1 ♀, Ozoir la Ferrière, 30.v.1946, Le Marchand; 1 ♂, Vaucresson (Hauts de Seine), 17.vi.1946, Le Marchand (MNHN); 1 ♂, Pontault, 28.iv.1977, P. Leraut (coll. Leraut). — Germany, East: 7 ♂, 11 ♀, Berlin, Finkenkrug, e.l. 25—31.v.1930, *Q. robur*, Hering (MHUB); 2 ♀, Nordhausen, 27.v.1898, Krone (TMAB); 6 ♂, 6 ♀, Potsdam, e.l. 2—18.v.1900, Hinneberg (MHUB). — Great Britain: 2 ♂ (lectotypes *subbimaculella* and *nigrociliella*, see above); 3 ♂, 1 ♀, Southampton, 15.vi.1935, Fassnidge; 1 ♀, Weeley (Essex), Maldon Wood, e.l. 11.vi.1980, Bryan, Emmet & Van Nieukerken (ZMA). — Hungary: 1 ♀, Budapest, Hivós, e.l. 24.v.1956. J. Szőcs (TMAB). — Italy: 3 ♂, 1 ♀, [Sici-

lia, Taormina], 554, Groschke (SMNS). — Netherlands: 65 ♂, 73 ♀, from following localities: Aerdenhout, Amerongen, Arnhem, Bergen (N.H.), Berghem, Breda, Bussum, Doetinchem, Echt, Geulhem, Groesbeek, Den Haag, Helvoirt, Herkenbosch, Hilversum, Hollandse Rading, Horst, Hulshorst, De Lutte, Maarn, Naardermeer, Nunspeet, Olterterp, Oosterbeek, Overberg, Overveen, Rijs, Rotterdam, Santpoort, Ubbergen, Wageningen, Wassenaar, Winterswijk, Zandvoort, Zwanewater (RMNH, ZMA, AFW, coll. Huisman, coll. Koster, coll. Kuchlein). — Poland: 1 ♂, Dąbie (Alt Damm), e.l. 4.vi. Krone (TMAB). — Portugal: 3 ♂, 3 ♀, [San Fiel, Beira Baixal], 9.v, *Quercus toza* (= *Q. pyrenaica*), [Mendes], coll. De Joannis (MNNH). — Yugoslavia: 1 ♀, Bački Monoštor, 4 km S. Bezdan (Vojvodina), e.l. 5—7.v.1984, *Quercus petraea*, J. J. Boomsma & E. J. van Nieukerken; 1 ♂, Križišće, 10 km NNW Crikvenica (Hrvatska), e.l. 10.v.1984, *Quercus pubescens*, J. J. Boomsma & E. J. van Nieukerken (ZMA).

Mines. — On *Quercus cerris*. — Yugoslavia: NE Bihac. On *Quercus petraea*. — Hungary: Törökbálint. — Yugoslavia: NE Bihac; Bački Monoštor, near Bezdan. On *Quercus pubescens*. — Austria: Gumpoldskirchen; Hundsheimer Berg near Hainburg; Loretto; Wien, Leopoldsberg. — Italy: Picinisco; Sicilia, Taormina, leg. Groschke (BMNH).- Yugoslavia: NNW Crikvenica. On *Quercus robur*. — Austria: Hof am Leithagebirge. — Belgium: Zolder. — Great Britain: Danbury; Earls Colne; Rainham; Tiptree, Weeley. — Netherlands: many localities.

34. **Ectoedemia (Ectoedemia) heringi** (Toll, 1934)

(figs. 72, 122, 123, 203, 266, 314, 315, 385, 418, 456, 495, 524)

Nepticula heringi Toll, 1934a: 1, figs. 3, 4. Lectotype ♂ (here designated), Poland: Bydgoszcz, Rynkowo, e.l. 5.iii.1934, *Quercus penduculata*, Toll, Genitalia slide VU 1408 (IPK) [examined].

Nepticula quercifoliae Toll, 1934b: 71, 81, pl. 2. Lectotype ♀ (here designated), Poland, Bydgoszcz, Rynkowo, e.l. 18.iii.1935, *Quercus robur*, Toll, Genitalia slide VU 1409 (IPK) [examined] [synonymised by Borkowski, 1975].

Nepticula sativella Klimesch, 1936: 208, figs. 10—13. Lectotype ♀ (here designated), Italy: Teriolis merid., Naturno near Merano, e.l. 15—19.v.1935, *Castanea sativa*, J. Klimesch, Genitalia slide VU 1391 (ZSMK) [examined]. **Syn. nov.**

Nepticula zimmermanni Hering, 1942: 26, fig. Lectotype ♀ (here designated), Czechoslovakia, Libochowan (near Litomerice), Elbe, vi.1940, *Quercus lanuginosa*, F. Zimmermann, Genitalia slide VU 0896 (MHUB) [examined]. **Syn. nov.**

Nepticula heringi; Toll, 1934b: 71; Szőcs, 1965: 86.

Stigmella (Dechtiria) heringi; Hering, 1957: 867 (mine).

Stigmella heringi; Klimesch, 1961: 761; Borkowski, 1969: 110.

Ectoedemia heringi; Borkowski, 1975: 491; Emmet, 1979: 16.

Trifurcula (Ectoedemia) heringi; Kasy, 1978: 4; Leraut, 1980: 49.

Nepticula quercifoliae; Klimesch, 1936: 190; Szőcs, 1965: 87.

Stigmella (Dechtiria) quercifoliae; Hering, 1957: 867 (mine).

Stigmella quercifoliae; Klimesch, 1961: 761; Borkowski, 1969: 110.

Ectoedemia quercifoliae; Bradley et al., 1972: 3; Emmet, 1974a: 108, 147, 148; 1976: 200, fig. 60c, d, pl. 12 fig. 31, pl. 6 fig. 11; Leraut, 1977: 91.

Stigmella sativella; Klimesch, 1948: 74—76, fig. 55—57; Klimesch, 1951: 65.

Stigmella (Dechtiria) sativella; Hering, 1957: 256, fig. 165 (mine).

Stigmella zimmermanni; Klimesch, 1951: 65; 1961: 761.

Stigmella (Dechtiria) zimmermanni; Hering, 1957: 866, fig. 540 (mine).

Nepticula zimmermanni; Szőcs, 1965: 86.

Trifurcula (Ectoedemia) zimmermanni; Kasy, 1978: 4.

Ectoedemia zimmermanni; Szőcs, 1981: 210.

Diagnosis: distinguished from *E. subbimaculella* by the darker head and the ductus spermathecae in the female; the species is slightly smaller than *subbimaculella*. Adults not separable from *phyllotomella* or *liechtensteini*. In the mine there is no slit, which makes it very similar to the mine of *E. albifasciella*, however, *heringi* usually feeds towards the midrib.

Description.

Male (fig. 72). Forewing length 1.88—2.4 mm (2.18 ± 0.18, 14), wingspan 4.2—5.3 mm. Head: frontal tuft ferruginous, on vertex brown to black, a sharp delimitation of the light and dark area at the level of antennal insertion; collar similar to vertex. Antennae with 29—32 (—36) segments (31 ± 2.0, 13). Thorax and forewing as in *E. subbimaculella*, but basal spot often larger. Hindwing with costal bristles.

Female. Forewing length 1.88—2.44 mm (2.14 ± 0,18, 8). Antennae with 22—25 segments (23.4 ± 1.3, 7).

Male genitalia (figs. 121, 123, 266, 314, 315, 385). Capsule 230—270 µm (249,6 ± 14.6, 12). Tegumen broadly rounded, slightly less producing than in *subbimaculella*. Gnathos (figs. 314, 315) with rather short and broad, rounded central element. Valva (fig. 266) length 175—215 µm (195.4 ± 10.2, 12), tip blunt, broader than in *subbimaculella*, inner margin straight, or hardly convex in proximal third, concave apically. Ae-

deagus (fig. 385) 205—255 µm (228.6 ± 14.3, 12). Several specimens are not separable from *subbimaculella*.

Female genitalia (figs. 203, 418, 456). T7 with a row of 6—10 setae along posterior margin. T8 with two lateral groups of scales and 1—3 setae. Anal papillae with 9—15 setae. Corpus bursae 410—660 µm; longest signum 347—463 µm (395.5 ± 35.9, 11), shortest 309—420 µm (350.1 ± 33.6, 10), 4.4—5.8 × as long as wide. One specimen with much smaller signa: 257, 287 µm. Ductus spermathecae with 2—2¼ narrow convolutions (fig. 418).

Larva. Translucent yellowish white, or greenish white, with dark brown head-capsule. Ganglia usually conspicuous, but sometimes less so. Ventral plates absent. Separated from *albifasciella* by darker head.

Biology.

Host plants: *Quercus robur* L., *Q. petraea* (Mattuschka) Liebl., *Q. pubescens* Willd., *Q. faginea* Lam. and *Castanea sativa* Miller.

Mine (fig. 495). Egg on the upperside beside a vein, often the midrib. Mine starts as narrow linear gallery following vein, usually towards midrib, abruptly changing into a blotch, or false blotch, without slit, usually in angle between midrib and lateral vein. Sometimes the last part resembles more a wide gallery than a blotch.

Life history. Univoltine, larvae from late September until November, but in southern Spain also found in February, adults flying in May in the south and in June and July more in the north.

Distribution (fig. 524).

Due to confusion with *subbimaculella* and *albifasciella* insufficiently known. Apparently lacking in Scandinavia and the Netherlands, scarce in south east England, more common in central Europe.

Remarks.

This species seems to have the widest range of foodplant species within the *subbimaculella* group. Some of the synonyms listed here were described as separate species only on the basis of a different foodplant species. These forms, *E. zimmermanni* on *Q. pubescens* and *E. sativella* on *Castanea sativa*, of which lectotypes have been selected, differ neither morphologically, nor biologically and can therefore only be treated as one species. *E. heringi* and *quercifoliae* were both described in 1934, but which was published first is not clear, however, most likely *heringi* should take priority, since it is also mentioned in Toll (1934b), as an established species. In this paper Toll compares the larval characters and the mines of both species. *N. quercifoliae* was originally only described from mines and larvae which were collected in the autumn of 1934. From these, in fact the syntypes, he reared adults in 1935, which can therefore be regarded as type material. The ♂ in Toll's collection, bearing the label "type", is selected as lectotype.

Material examined: 72 ♂, 76 ♀: reared from *Quercus robur* or *petraea*: 33 ♂, 25 ♀. — Austria: 2 ♂, Klosterneuburg, Freiberg, e.l. 9.v.1932, 18.iv.1938, Preissecker; 1 ♀, Klosterneuburg, Buchberg, e.l. 25.v.1941, Preissecker (NMW). — France: 3 ♂, 1 ♀: Andlau (Bas-Rhin), Kastelberg, e.l. 9—19.vi.1979, *Q. petraea*, E. J. van Nieukerken (ZMA). — Hungary: 1 ♀, Szentpéterfölde, e.l. 25.v.1969, *Q. robur*, J. Szőcs (TMAB). — Poland: 3 ♂ (lecto- and paralectotypes of *heringi*), Bydgoszcz, Rynkowo, e.l. 28.ii—7.iii.1934, *Q. pedunculata*, Toll (ZMC, MHUB); 2 ♂, 1 ♀ (lecto- and paralectotypes of *quercifoliae*), same locality, e.l. 16—18.iii.1935, *Q. robur, petraea*, Toll (IPAK); 21 ♂, 21 ♀, idem, e.l. iii.1936, *Q. petraea*, Toll (IPAK, MHUB, MNHN). — Yugoslavia: 2 ♂, S. of Han Knežica, 11 km N. of Prijedor (Bosna), e.l. 25.iv—1.v.1984, *Quercus robur*, J. J. Boomsma & E. J. van Nieukerken (ZMA).

Reared from *Q. pubescens*: 23 ♂, 35 ♀. — Austria: 3 ♂, 7 ♀, Hainburg, Hundsheimer Berg, 200—400 m, e.l. 27.iv.—1.v.1984, E. J. van Nieukerken; 3 ♂, 8 ♀, Wien, Leopoldsberg, W. of Kahlenberg, 200—400 m, e.l. 6—12.vi.1984 (ZMA). — Czechoslovakia: 14 ♂, 16 ♀ (lecto- and paralectotypes of *zimmermanni*), Libochowan (near Litomerice), Elbe, e.l. vi.1940, Zimmermann (MHUB, ZMC). — Hungary: 1 ♂, 1 ♀, Pécs Mecsek, Misina, e.l. 27—29.iv.1966, J. Szőcs; 2 ♂, 3 ♀, Törökbálint (W. of Budapest), e.l. 12—17.v.1974, J. Szőcs (TMAB).

Reared from *Quercus faginea*: 1 ♀, Spain: 3 km NW. San Pedro de Alcantara (Málaga), 300 m, mine 6.ii.1984, e.l. 25—26.iv.1984, E. J. van Nieukerken (ZMA).

Reared from *Castanea sativa*: 2 ♂, 2 ♀. — Italy: 2 ♂, 1 ♀ (lecto- and paralectotypes of *sativella*), Naturno, near Merano, e.l. 15—24.v.1935, Klimesch (ZSMK); 1 ♀, Trento, e.l. v.1946, J. Klimesch (MNHN).

Reared from unknown *Quercus* or not reared, but likely to be *heringi*: 14 ♂, 13 ♀. — Austria: 3 ♂, 6 ♀, Hackelsberg, N. of Neusiedlersee, 1971—1977, F. Kasy; 1 ♀, Hundsheimer Berg (near Hainburg), 28.vi.1976, F. Kasy (NMW). — France: 2 ♂, no data, De Joannis (MNHN). — Germany, West; 1 ♂, 1 ♀, Stuttgart, Lindental, e.l. 27.iv—4.v.1947, Wörz; 1 ♂, 1 ♀, Stuttgart, Wildpark, e.l. 9.v.1938, Wörz (LNK); 1 ♀, Wolfenbuttel, [Heinemann], coll. Staudinger (MHUB). — Germany, East: 1 ♂, Altenburg, 1874,

Krause; 1 ♂, Dresden, Staudinger (MHUB). — Hungary: 1 ♂, Budapest, Zanoshegg, e.l. 15.v.1960, J. Szőcs; 1 ♂, Szigetszentmiklós, e.l. 23.v.1955, J. Szőcs (TMAB). — Poland: 3 ♂, 3 ♀, Wrocław (Breslau), e.l. iv.1869, Wocke (MHUB).

Identity uncertain: 1 ♂, 1 ♀. — Albania: 1 ♂, Kula Ljums, 7—14.vi.1918, Alban. Exped. — Yugoslavia: 1 ♀, Drenovo near Kavadarci, 20—30.v.1957, Kasy (NMW).

Mines. — On *Quercus faginea*. — Spain: Istan; NW of San Pedro de Alcantara. On *Quercus petraea*. — France: Andlau. — Hungary: Törökbálint. — Poland: Bydgoszcz, leg. Toll (BMNH). — Yugoslavia: 11 km NE Bihac; Slavonska Požega. On *Quercus pubescens*. — Austria: Gumpoldskirchen; Hundsheimer Berg; Loretto; Wien, Leopoldsberg. — Czechoslovakia: Libochowan, near Litomerice, leg. Zimmermann (BMNH). — Hungary: Budaörs. On *Quercus robur*. — Great Britain: S. of Weeley. — Poland: Bydgoszcz, leg. Toll (BMNH). — Yugoslavia: Han Knežica, N. of Prijedor.

35. **Ectoedemia (Ectoedemia) liechtensteini** (Zimmermann, 1944) (figs. 124, 204, 496, 525)

Nepticula liechtensteini Zimmermann, 1944: 119—121, fig. 8. Lectotype ♀ (here designated), Czechoslovakia: Moravia merid., Lednice (Eisgrub), F. Zimmermann, Genitalia slide 4775 (MHUB) [examined].

Stigmella (Dechtiria) liechtensteini; Hering, 1957: 866, fig. 558 (mine).

Ectoedemia liechtensteini; Szőcs, 1978: 266.

Diagnosis: adults cannot be separated from *heringi*. Larvae intensely amber-yellow, without visible ganglia in contrast with greenish white larvae of *heringi*, which usually have distinct ganglia. Specific status doubtful.

Description.

Male. Forewing length 2.12—2.16 (3), wingspan 4.8 mm. Antennae with 28—31 segments. Further as *heringi*.

Female. Forewing length 1.8—2.28 (3), wingspan 4.4—5.2 mm. Antennae with 22—24 segments.

Male genitalia (fig. 124). Similar to *heringi*. Capsule length 249 μm (2). Valva length 180—210 μm (2). Aedeagus 223—231 μm (3).

Female genitalia (fig. 204). T7 with a row of 6—8 setae. T8 with 3—5 setae at each side. Anal papillae with 10—12 setae. Corpus bursae 460—595 μm; longest signum 334—411 μm (2); shortest 291—356 μm (2), 4.5—4.9 × as long as wide. Ductus spermathecae with 2—2 ¼ inconspicuous convolutions.

Larva. Intensely, glossy amber yellow, with very light brown head-capsule and prothoracic plate. Not the slightest indication of ganglia. Ventral plates absent.

Biology.

Hostplants. *Quercus cerris* L. on which it can be very abundant. Very occasionally on *Q. petraea* (Mattuschka) Liebl. or *Q. pubescens* Willd. (see remarks).

Mine (fig. 496). Egg on leaf upperside. Mine completely similar to *heringi*, in the axil of the midrib and a lateral vein.

Life history. Univoltine. Larvae in October-November, usually much later than *E. cerris*, especially abundant in late October. Adults (reared) from April to June.

Distribution (fig. 525).

With certainty from Moravia, east Austria, Hungary and Yugoslavia.

Remarks.

The separate identity of this species is uncertain. Adults are similar to *heringi*, but the larvae are very different, and can easily be distinguished. Moreover, larvae of *liechtensteini* are usually found on *Q. cerris*, whereas sympatric *heringi* occurs on other oak species, but never on *cerris*. However, in autumn 1983 I also found one larva of the *liechtensteini* type on *Q. petraea*, in a locality with numerous *liechtensteini* on *Q. cerris*, and several larvae on *Q. pubescens* in Gumpoldskirchen. In the latter locality no *Q. cerris* grew, but on the *Q. pubescens* some "normal" *heringi* larvae were also noted. S. Menken (pers. comm.) could find no difference in their allozymes and allozyme differences with *heringi* were insignificant. It will be necessary to set up foodplant choice and hybridisation experiments in order to solve problems of isolation in this species complex.

The striking differences in the larva lead me to consider *liechtensteini* tentatively as a separate taxon, having no evidence to the contrary.

Material examined, 22 ♂, 22 ♀. — Austria: 7 ♂, 9 ♀, Hof am Leithagebirge, S. of Mannersdorf (Niederöst.), 200 m, e.l. 2.v, 10—18.vi.1984, *Quercus cerris*, E. J. van Nieukerken; 3 ♂, 3 ♀, Loretto, 7 km N. Eisenstadt (Burgenland), 240 m, e.l. 5—25.v.1984, *Quercus cerris*, E. J. van Nieukerken; 1 ♂, Wien, Kahlenberg SE., 400 m, e.l. 30.iv—1.v.1984, *Quercus cerris*, E. J. van Nieukerken (ZMA). — Czechoslovakia, 5 ♂, 3 ♀ (lecto- and paralectotypes), Moravia merid., Lednice (Eisgrub), Zimmermann (MHUB, ZMC). — Hungary: 2 ♂, 2 ♀, Törökbálint (W. of Bu-

dapest), e.l. 5, 11.v.1968, 14, 18.v.1974, *Q. cerris*, J. Szőcs (TMAB); 2 ♂, Törökbálint, Nagy-erdő, 5 km N. Érd, e.l. 25.iv—1.v.1984, *Quercus cerris*, J. J. Boomsma & E. J. van Nieukerken (ZMA). — Yugoslavia: 2 ♂, 4 ♀, Bački Monoštor, 4 km S. Bezdan (Vojvodina), e.l. 25.iv—4.v.1984, *Quercus cerris*, J. J. Boomsma & E. J. van Nieukerken (ZMA).

Mines. On *Quercus cerris*. — Austria: Eisenstadt; Hof am Leithagebirge; Loretto. — Czechoslovakia: Lednice (Eisgrub), leg. Zimmerman (BMNH). — Hungary: Törökbálint. — Yugoslavia: Han Knežica, N. of Prijedor; Bački Monoštor, S. of Bezdan. On *Quercus petraea*. — Hungary: Törökbálint (1 mine). On *Quercus pubescens*. — Austria: Gumpoldskirchen.

36. **Ectoedemia (Ectoedemia) phyllotomella** (Klimesch, 1946) comb. n.
(figs. 73, 125, 205, 267, 386, 457, 497, 525)

Stigmella phyllotomella Klimesch, 1946: 166, fig. 7, pl. 12. Lectotype ♂ (here designated), Italy: Liguria, Altare near Ferrania, e.l. 26.iv—7.v.1945, *Quercus cerris*, 2.xi.1944, Zucht 507, J. Klimesch, Genitalia slide Kl. 270 (ZSMK) [examined].
Stigmella phyllotomella; Hering, 1957: 855 (mine).

Diagnosis: adults not separable from *heringi*, although head slightly lighter. Female separated from *subbimaculella* by narrower convolutions of ductus spermathecae. Mines very characteristic by circular "cut-out".

Description.

Male (fig. 73). Forewing length 2.16—2.24 mm, wingspan 4.9—5.2 mm. Antennae with 30—34 segments. Head: frontal tuft yellowish orange, on vertex fuscous. Further as *subbimaculella*.

Female. Forewing length 2.04 mm, wingspan 4.6 mm. Antennae with 23 segments.

Male genitalia (figs. 125, 267, 386). Similar to *subbimaculella*. Capsule length 233—253 µm (3). Valva (fig. 267) length 193—210 µm (3). Aedeagus (fig. 386) 214—236 µm (2).

Female genitalia (figs. 205, 457). T7 with a row of 8 setae. T8 with 2—5 setae at each side. Anal papillae with 8—9 setae. Corpus bursae 515—530 µm; longest signum 386—390 µm, shortest 339—356 µm, 4.6—4.9 × as long as wide. Ductus spermathecae with 2 very inconspicuous convolutions.

Larva not examined.

Biology.

Hostplant: *Quercus cerris* L.

Mine (fig. 497). Egg on leaf upperside, against midrib. Early gallery narrow, following vein or midrib; later becoming highly contorted gallery with linear frass, often forming false blotch. The larva cuts out an oval case from the end of the mine, in which it pupates. The case does not fall immediately to the ground, but after some time, by weathering of the leaf.

Life history. Univoltine. Larvae collected in late October and early November, adults reared in April and May.

Distribution (fig. 525).

Only known from Italy: Liguria and Lucania.

Remarks.

The peculiar habit of the larva, and the foodplant, suggest that *phyllotomella* is a separate entity, isolated from the other species of the complex. Study of larvae and electrophoresis of allozymes might shed some light on the degree of genetic isolation from its relatives.

Material examined: 3 ♂, 2 ♀. — Italy: 2 ♂, 1 ♀ (lecto- and paralectotypes), Liguria, Altare near Ferrania, e.l. 26.iv—7.v.1945, J. Klimesch (ZSMK); 1 ♂, 1 ♀, Lucania, Mte Vulture, Laghi di Monticchio, 750 m, e.l. 2—7.iv.1966, F. Hartig (LNK).

Mines. — Italy: Ferrania, Ligur. Appenin, leg. Klimesch (BMNH) (2 mines only).

37. **Ectoedemia (Ectoedemia)** spec. (specimen 1375) (figs. 74, 206, 458)

Material: 1 ♀, Iran: 100 km W. Shiraz, 18.iv.1970, Exp. Mus. Vind., Genitalia slide VU 1375 (NMW).

Undoubtedly a new species, which I do not name here, because of limited material and lack of knowledge on biology. It is externally most similar to *gilvipennella*.

Description.

Male unknown.

Female (fig. 74). Forewing length 2.4 mm, wingspan 5.3 mm. Head: frontal tuft ochreous-white; collar white. Antenna with 23 segments. Thorax and forewings uniform light brown irrorate with yellowish white.

Female genitalia (figs. 206, 458). T7 with a distinct row of 14 setae along posterior margin. T8 with two groups of few (3—5) setae, no scales. Anal papillae with 17—18 setae. Vestibulum with vaginal sclerite, a spiculate pouch with many spines and a dense patch of pectinations near entrance of ductus spermathecae. Corpus bursae 595 µm, without pectinations; signa dissimilar, longest 437 µm, shortest 360 µm, 3.9 × as long as wide. Ductus spermathecae with 3 narrow convolutions.

The *Ectoedemia terebinthivora* group

38. Ectoedemia (Ectoedemia) terebinthivora (Klimesch, 1975) comb. n.
(figs. 75, 126, 201, 202, 268, 316, 383, 412, 459, 498, 540)

Trifurcula (Ectoedemia) terebinthivora Klimesch, 1975b: 19—23, figs. 27—33. Syntypes, 4 ♂, 8 ♀, Anatolia: Kanlidivane, along road Silifke-Mersin, larvae 31.v.1970, e.l. 24—30. vi.1970, Klimesch (ZSMK) [not examined].

Trifurcula (Ectoedemia) terebinthivora; Klimesch, 1978: 251, figs. 26—28 (mine, ♂, ♀ genitalia).

Diagnosis: externally characterised by small size, light brown ground-colour with yellowish tinge and in male by hindwing almost completely covered with brown androconial scales. *E. aegilopidella* has similar scales in male but has also a hair-pencil which is absent in *terebinthivora*.

Description.

Male. Forewing length 1.88—2.24 mm (2.08 ± 0.12, 8), wingspan 4.1—5.0 mm. Head: frontal tuft very variable, from completely yellowish to dark brown, variation not sex-linked; collar similar or slightly lighter. Antennae with 39—41 segments (40.3 ± 1,0, 7). Thorax and forewings brown, with an obvious yellow tinge; thorax sometimes apically lighter; forewing with a medial yellowish fascia, somewhat irregular, outer margin concave, sometimes fascia indistinct. Hindwing covered in basal two thirds with brown lamellar androconial scales, not extending in fringe; costal bristles or hair-pencil absent. Underside forewing with few similar brown scales near base.

Female (fig. 75). Forewing length 2.12—2.32 mm (2.23 ± 0.09, 8), wingspan 4.7—5.2 mm. Antennae with 33—35 segments (34.1 ± 0.7, 7).

Male genitalia (figs. 126, 268, 316, 383, 412). Capsule length 197—214 μm (4). Tegumen produced into broad, truncate pseuduncus (fig. 412). Gnathos (fig. 316) with very short, rounded central element. Valva (fig. 268) length 146—163 μm (4), inner margin almost straight, except basally, tip pointed. Aedeagus (fig. 383) 279—300 μm (4), much longer than capsule, with pair of single, pointed, dorsal carinae.

Female genitalia (figs. 201, 202, 459). T7 without row of setae. T8 with two lateral patches of scales and setae (6—7). Anal papillae with 8—10 setae. Anterior apophyses remarkably widened in middle. Vestibulum with vaginal sclerite and dorsal spiculate pouch with many pointed spines, and a dense patch of pectinations near entrance of ductus spermathecae. Corpus bursae 470—530 μm, covered with minute pectinations, except anteriormost part; signa dissimilar, longest 369—403 μm (4), shortest 309—334 μm (4), 4.2—5.0 × as long as wide. Ductus spermathecae with 2—2 ½ convolutions.

Larva. Yellowish white to whitish, in mine appearing greenish, first 4 ganglia distinct. Head-capsule brown. Penultimate stages with 12 ventral brown plates.

Biology.

Hostplant. *Pistacia terebinthus* L.

Mine (fig. 498). Egg always deposited on leaf underside, close to midrib or lateral vein. Early mine much contorted with thin brownish linear or dispersed frass; later widening into large irregular, elongate blotch with dispersed brown frass.

Life history. Probably bivoltine, or at least partly. Larvae in late May and June (Klimesch, 1975b) and in September. Adults reared in June and July (from May and June larvae) and May—June (from September larvae). Therefore Klimesch's assumption that the species is univoltine seems to be incorrect.

Distribution (fig. 540).

Greece, Ionian and Aegean Islands and Anatolia. Probably widespread in eastern Mediterranean. Record from Keffalinia from mines in old herbarium specimen of *Pistacia* in Rijksherbarium, Leiden, no. 897, 363—722.

Material examined: 12 ♂, 12 ♀. — Greece: 1 ♀, Athina (Atena), 16.vi.1980, Leo Kohonen (ZMUO); 11 ♂, 9 ♀, 3 km E. of Dhelfoi (Fokís), 700 m, e.l. 2.v—11.vi.1981, *Pistacia terebinthus*, 27.ix.1980, S. B. J. Menken, E. J. van Nieukerken (ZMA, BMNH, ZSMK); 1 ♂, 1 ♀, Kardhamili (Messinia), a.s.l., e.l. 14—16.vii.1984, E. J. van Nieukerken (ZMA). — Turkey: 1 ♀, Asia minor, Tekir Tepisi, Taurus, 13.viii.1965, Arenberger (LNK).

Mines. — Greece: Parnis Oros (Attika); Evvoia: SE Gouvés; Oíti Oros, SW Ipáti (Fthiótis); Dhelfoi (Fókis); Kardhamili (Messinia).

The *Ectoedemia angulifasciella* group

This is a rather heterogenous assemblage of Rosaceae mining species, comprising a tight group — *hexapetalae*, *angulifasciella* complex, *mahalebella* and *spinosella* — and some aberrant species which at present cannot be included in any other group.

The adults usually have a shining metallic fascia, and males have a hair-pencil, or this is secondarily lost.

Except in the first three species, the gnathos is divided, and the basal part has a serrate margin. The aedeagus has one pair of carinae, often with additional spines. The valva is comparatively uniform, with a more or less straight inner margin.

In female genitalia the vaginal sclerite is present in most species except *spiraeae* and *agrimoniae*, but the spiculate pouch is less distinct than in previous groups or even absent. The bursa is covered with pectinations.

The larvae make gallery-blotch mines, and only the species in the *angulifasciella* complex have ventral plates in the penultimate stages.

Species belonging to this group occur also in Japan and probably in North America (*E. rubifoliella* (Clemens)).

39. Ectoedemia (Ectoedemia) erythrogenella (de Joannis, 1908)

(figs. 76, 128, 129, 207, 269, 317, 387, 460, 499, 528)

Nepticula erythrogenella J. de Joannis, 1908a: 327, 328. Lectotype ♂ (here designated), France: Vannes, L. de Joannis, Genitalia slide VU 946 (MNHN) [examined].

[*Nepticula rubivora*; Walsingham, 1891: 152, misidentification]

Nepticula erythrogenella; J. de Joannis, 1908b: 823, figs. 1, 2, pl. 15 fig. 12 (mine, adult, larva); Klimesch, 1940b: 190.

Stigmella erythrogenella; Gerasimov, 1952: 238; Hering, 1957: 908 (mine); Lhomme, 1963: 1192.

Ectoedemia (Dechtiria) erythrogenella; Emmet, 1974c: 129, 130, fig. (mine).

Ectoedemia erythrogenella; Emmet, 1976: 195, fig. 59, pl. 9 fig. 16.

Trifurcula (Dechtiria) erythrogenella; Gustafsson, 1981b: 466—468, fig. 8 (♂, ♀ genitalia, larva, mine).

Stigmella erythrogenella ab. *juncta* Dufrane, 1949: 9.

Diagnosis: separated from all other Rosaceae feeding *Ectoedemia* by costal spot (or costal part of fascia) placed distinctly before middle of forewing; in addition separated from *angulifasciella* complex by absence of hair-pencil in male. Externally similar to *albifasciella*-complex and *preisseckeri*, but separated by shining silver spots on forewing and absence of costal bristles in male. Male genitalia characterised by shape of valva, with almost posteriorly directed tip, and undivided, smooth gnathos.

Description.

Male (fig. 76). Forewing length 1.76—2.28 mm (2.05 ± 0.19, 13), wingspan 4.1—5.0 mm. Head: frontal tuft ferruginous, or orange, sometimes becoming fuscous towards crown; collar yellowish white, lighter than frontal tuft. Antenna with 33—41 segments (36.1 ± 2.3, 10). Thorax and forewings blackish, with shining silvery white spots, one slightly before middle on costa, one in middle on dorsum, with sometimes a small spot in between, less commonly united to form a fascia (ab. *juncta*). Hindwing without hair-pencil or costal bristles.

Female. Forewing length 1.88—2.52 mm (2.23 ± 0.22, 12), wingspan 4.1—5.6 mm. Antennae with 25—30 segments (27.5 ± 1.4, 8).

Male genitalia (figs. 128, 129, 269, 317, 387). Capsule length 189—223 µm (206.6 ± 13.7, 5). Tegumen distinctly produced into slightly truncate pseuduncus. Gnathos (fig. 317) with broadly spatulate, undivided, smooth central element. Valva (fig. 269) length 150—180 µm (158.6 ± 13.2, 5), gradually narrowing into pointed tip, which points almost posteriorly; inner margin approximately straight. Aedeagus (fig. 387) 223—253 µm (238.2 ± 14.1, 5), with pointed, single carinae.

Female genitalia (figs. 207, 460). T7 with a distinct row of 4—10 long setae along posterior margin. T8 trapezoid, with two lateral patches of scales and 3—5 setae. Anal papillae with 6—11 setae. Vestibulum with vaginal sclerite, a spiculate pouch (sometimes indistinct) and a dense patch of pectinations near entrance of ductus spermathecae. Corpus bursae 440—690 µm, covered with pectinations, except anterior part, especially closely set near vestibulum; signa similar, 300—369 µm (326.8 ± 24.9, 12), 3.9—5.6 × as long as wide. Ductus spermathecae with 2 ½—3 convolutions.

Larva. Dirty grey, but more yellowish in early stages; ganglia conspicuous. Head capsule dark brown. Ventral plates absent.

Biology.

Hostplant. *Rubus fruticosus* L. sensu lato, especially on evergreen *Rubus ulmifolius* Schott.

Mine (fig. 499). Egg on upperside against midrib or vein. Early mine narrow gallery, following vein, often turning back, completely filled with blackish frass; finally widening into elongate blotch, with dispersed black frass in basal part, or at sides. Leaves often stained red around mine.

Life history. Univoltine, with a very long period of larval feeding. In the northern part of its range larvae from September until November, but in the south larvae can be found all over the winter until March, April and occasionally later. Some data: mid-October, Trieste, many early instar larvae, full-fed after two or three weeks; early February, south Spain, many early instar, fewer late instar larvae, completing their larval cycle in two to four weeks; late March, Sicily, few larvae left; late April, Aures mountains in Algeria, few larvae left, but still giving rise to adults; July, southern France, very few larvae, no adults reared. It is not clear if the July larvae belonged to the old generation or were just very early larvae of the new generation, but since no young larvae were present it is most likely that they belonged to the past generation and were late because of parasitism. Adults emerged in May—July, whether from autumn or early spring larvae.

Distribution (fig. 528).

Essentially a mediterranean species, which is abundant and widely distributed throughout the mediterranean region, both along coast and inland, although it has still to be recorded from many places. Distributed along French Atlantic coast as far as the south coast of England, where it can only be found within a short distance of the sea (Emmet, 1976), as a consequence of its supposed vulnerability to frost. The species has been recorded from Switzerland, where it might occur in Tessin, but it certainly does not occur in Austria as erroneously indicated by Emmet (1976) (Klimesch, in litt.).

Material examined: 21 ♂, 23 ♀. — Algeria: 1 ♀, Aurès, Dj. Chélia, northern slopes, 1500 m, e.l. 5.vi.1980, *Rubus ulmifolius*, 29.iv, E. van Nieukerken, G. Bryan, P. Oosterbroek (ZMA). — Cyprus: 3 ♂, 3 ♀, Limassol, Yermassoyia, 24 + 28.iii.1980, *Rubus*, B. Gustafsson (RMS). — France: 2 ♂, 4 ♀, Cannes, e.l. 27.v—12.vi.1889, *Rubus fruticosus*, iii. Walsingham (BMNH); 5 ♂, 6 ♀ (lecto- and paralectotypes), Vannes, ronce, 24.vi, 1.vii, Joannis (MNHN, MHUB); 1 ♂, 3 ♀, Vannes, e.l. 28.vi—29.vii.1910, mine 8.x.1909, Joannis, coll. Dufrane (IRSN). — Great Britain: 3 ♂, 1 ♀, Portland, Church Ope Cave, e.l. 10—17.vi.1982, *Rubus fruticosus*, 28.ix.1981, Bryan & Menken (ZMA). — Italy: 1 ♂, Sicilia (Caltanisetta), W. of Manzarino, e.l. 2—4.v.1981, *Rubus ulmifolius*, 25.iii.1981, E. J. van Nieukerken (ZMA). — Spain: 1 ♂, 2 ♀, 7 km NW San Pedro de Alcantara (Málaga), 350 m, e.l. 21.iv, 15.v, 3—4.vii.1984, *Rubus ulmifolius*, E. J. van Nieukerken; 4 ♂, Sierra Blanca, 6 km N. Marbella (Málaga), El Mirador, 800 m, e.l. 12.iv—18.vi.1984, *Rubus ulmifolius*, E. J. van Nieukerken (ZMA). — Yugoslavia: 1 ♂, 3 ♀, 7 km SE Piran, Čedle (Slovenia), 300 m, e.l. 22.iv—14.v.1984, *Rubus ulmifolius*, J. J. Boomsma, E. J. van Nieukerken (ZMA).

Mines. — Algeria: Aurès, Arris, 32 km SSE Batna; Aurès, Dj. Chélia; La Calle (El Kala); E. of Morris. — Corsica: Pisciatella; Porticcio (near Ajaccio). — Cyprus: Limassol, Yermassoyia (RMS). — France: Banyuls; Port Vendres; Douelle (Lot), Le Carriol (BMNH); Bretagne (Côtes du Nord) (BMNH). — Great Britain: Harwich; Newhaven (Sussex), Emmet; Portland; St. Osyth. — Greece: Kardamyli (Messinia). — Italy: Frascati (BMNH); Roma Fiumicino; Sasso di Bordighera (BMNH); Trieste; Sicilia, Mazzarino; Sicilia, Montallegro; Sicilia, Taormina (BMNH). — Spain: Marbella; San Pedro de Alcantara; Tunisia: Aïn Draham; Hammam Lif; Tabarka. — Yugoslavia: Piran; Rovinj (BMNH).

40. Ectoedemia (Ectoedemia) spiraeae Gregor & Povolný, 1983

(figs. 77, 127, 204, 271, 318, 388, 416, 500, 549)

Ectoedemia spiraeae Gregor & Povolný, 1983: 174—177, figs. 4—7, 9. Holotype ♂, Czechoslovakia: Cigánka Hill near Muráň, 930 m, 26.ix.1981, e.l. iii.1982, *Spiraea media*, Gregor & Povolný (Department of Entomology, Moravian Museum, Brno) [not examined].

Stigmella sp.; Povolný & Gregor, 1952: 237, figs. c, d (mine).

Stigmella spireae (sic!) Gregor & Povolný, 1955: 124, 127 (nomen nudum, no description); Hering, 1957: 1021 (mine).

Nepticula spireae; Szőcs, 1968: 229.

Diagnosis: externally characterised by light head and collar, almost straight non-metallic fascia and in male yellowish-white hair-pencil and white tuft on underside forewing. Male genitalia characterised by aedeagus without carinae and valvae with serrate inner margin and inconspicuous tip. Female genitalia characterised by absence of both vaginal sclerite and spiculate pouch, and by dissimilar signa.

Description.

Male. Forewing length 2.42—2.52 mm (4), wingspan 5.0—5.6 mm. Head: frontal tuft and collar yellowish-orange. Antennae with 34—36 segments (4). Thorax and forewings blackish, with medial, almost straight, non-shining fascia, often interrupted. Underside of forewing with a tuft of white hair-scales arising near costal retinaculum and a large scaleless area. Hindwing with a yellowish-white hair-pencil.

Female (fig. 77). Forewing length 2.2—2.32 mm (2.25 ± 0.04, 7), wingspan 4.8—5.4 mm.

Antennae with 26—27 segments (26.8 ± 0.5, 5). Without characteristics on underside forewing.

Male genitalia (figs. 127, 271, 318, 388). Capsule length 266—287 µm (2). Tegumen produced into prominent triangular pseuduncus. Gnathos (fig. 318) with central element very short and inconspicuous, with wide truncate tip. Valva (fig. 271) length 206—214 µm (2), inner margin approximately straight, but serrate by prominent setal sockets; tip an inconspicuous, pointed, inwards directed process. Aedeagus (fig. 388) 244—266 µm (2), without carinae, a simple tube.

Female genitalia (figs. 204, 416). T7 with 6—8 short setae in an indistinct row along posterior margin. T8 appearing as a double sclerite: with two lateral patches of scales and 6—7 long setae. Anal papillae with 13—16 setae. Vestibulum smooth, without sclerite or spiculate pouch. Corpus bursae 650—660 µm, sparsely covered with small spines or pectinations; signa clearly dissimilar, longest 394—441 µm (3), shortest 321—343 µm (3), 3.8—3.9 × as long as wide. Ductus spermathecae with 2½—3 convolutions.

Larva not examined.

Biology.

Hostplant: *Spiraea media* Franz Schmidt.

Mine (fig. 500). Egg on leaf-underside against midrib, often in axil between midrib and lateral vein. Early mine linear, straight, following a vein, or occasionally leaf margin, filled with brown, dispersed frass; later abruptly widening into wide, irregular blotch, with blackish dispersed frass.

Life history. Probably univoltine. Larvae found in September—October. Adults reared in February—March (probably indoors) and May—June (Szőcs, 1968).

Distribution (fig. 549).

Only known from Slovakia and Matra mountains in Hungary.

Remarks.

This species was discovered by Povolný & Gregor (1952), who described the mine as *Stigmella* sp. Later they named it *Stigmella spireae* Gregor & Povolný, 1955, but still based this name on mines only. This name therefore remains a nomen nudum (Code, art. 13a, 16). Later, Gregor & Povolný (1983) redescribed it under the name *Ectoedemia spiraeae* and designated a neotype. However, since the 1955 name is not available, the last description is to be regarded as the original species designation and the neotype as holotype.

In a collection of Japanese Nepticulidae, at present under study, there is a species reared from *Spiraea japonica* L. and *S. salicifolia* L., which is almost unseparable from *spiraeae* but has a brown hair-pencil instead of a yellowish-white one.

Material examined: 5 ♂, 5 ♀. — Czechoslovakia: 1 ♂, 1 ♀, (paratypes) Slovakia centr. Muráň, Huta: Cigánka, 26.ix.1981 on *Spiraea media*, Gregor & Povolný; 1 ♂, 1 ♀, (paratypes), Slovakia or., Slovenský Raj, Čingov, 27.ix.1981 on *Spiraea media*, Gregor & Povolný (ZMA, EvN). — Hungary: 3 ♂, 3 ♀, Mátra Hegyseg, Sástó, e.l. 13—19.v.1973, *Spiraea media*, J. Szőcs (TMAB, ZMA).

Mines. — Czechoslovakia: Erzgebirge, Sitno near Banska Stiavnica, Gregor & Povolný (BMNH); Slovakia or., Slov. Raj., Čingov, Gregor & Povolný (ZMA). — Hungary: Mátra-Gebirge, Sástó (BMNH).

41. Ectoedemia (Ectoedemia) agrimoniae (Frey, 1858)

figs. 78, 131, 132, 209, 270, 319, 394, 462, 501, 529)

Nepticula agrimoniae Frey, 1858: 44, 45. Lectotype ♂ (here designated), Germany: Regensburg, Hofmann, Frey coll., Genitalia slide 22676 (BMNH) [examined].

Nepticula agrimoniella Herrich-Schäffer, 1860: 60. Syntypes, Germany: Regensburg (Hofmann, Angerer) (depository unknown) [not examined].

Nepticula agrimoniella; Herrich-Schäffer, [1861]: fig. 169; Heinemann, 1862: 312, 313; Wocke, 1871: 338; 1874: 101; Heinemann & Wocke, 1877: 757, 758; Meyrick, 1895: 722; Sorhagen, 1922: 49, pl. 3 fig. 49; Meyrick, 1928: 859.

Nepticula agrimoniae; Ballett Fletcher, 1882: 211; Tutt, 1899: 313—315; Rebel, 1901: 226; Meess, 1910: 479, pl. 91 fig. 68; Petersen, 1930: 68, fig. 92 (♂ genitalia).

Dechtiria agrimoniae; Beirne, 1945: 205, fig. 61 (♂ genitalia).

Stigmella agrimoniae; Gerasimov, 1952: 224; Klimesch, 1961: 759; Lhomme, 1963: 1192; Borkowski, 1970: 544, figs. 8, 23 (mine, externals).

Stigmella (Dechtiria) agrimoniae; Hering, 1957: 41, fig. 19a (mine).

Trifurcula (Ectoedemia) agrimoniae; Johansson, 1971: 245.

Ectoedemia agrimoniae; Bradley et al., 1972: 2; Borkowski, 1975: 491; Emmet, 1976: 191, pl. 6 fig. 1, pl. 12 fig. 22.

Nepticula agrimomella (sic!); Rössler, 1881: 337 [misspelling].

Diagnosis: externally similar to species of *an-*

gulifasciella complex, but separated by absence of hair-pencil in male, slightly pointed ovipositor in female and brown edged scape. Separated from smaller *E. hexapetalae*, *mahalebella* and *spiraeae* by dark collar and edged scape. Both male and female genitalia highly characteristic.

Description.

Male (fig. 78). Forewing length (1.84) 2.28—2.96 mm (2.58 ± 0.21, 15), wingspan (4) 5.2—6.4 mm. Head: frontal tuft yellowish to ferruginous brown, sometimes completely brown; collar greyish brown, different from frontal tuft. Antennae with 35—41 segments (38.3 ± 1.7); scape white, but caudal edge with some brown scales. Thorax and forewings fuscous black with a yellowish silver medial fascia, constricted in middle. Hindwing without hair-pencil or costal bristles.

Female. Forewing length 2.0—2.48 mm (2.24 ± 0.15, 20), wingspan 4—5.6 mm. Antennae with 31—36 segments (33.2 ± 1.3, 15). Thorax and forewings darker than in male, fascia more shining silver.

Male genitalia (figs. 131, 132, 270, 319, 394). Capsule length 214—240 μm (225.7 ± 8.4, 6). Tegumen produced into pointed, cuspidate pseuduncus. Gnathos (fig. 319) with triangular, pointed central element, with smooth margins. Valva (fig. 270) length 163—189 μm (174.3 ± 10.7, 6), widest at base, distinctly constricted below pointed and inwards curved tip. Aedeagus (fig. 394) 184—227 μm (204.3 ± 16.6, 6), dorsal carinae inserted clearly below apex, each divided into 4—5 pointed teeth; ventral projection with some small spines.

Female genitalia (figs. 209, 462). T7 with 6—8 small setae along posterior margin. T8 in form of a narrow curved band, almost split in middle, with a group of scales and 4—7 setae on either side. Anal papillae narrow, with 7—11 setae. Vestibulum without vaginal sclerite, or spiculate pouch. Corpus bursae 440—640 μm, completely covered with pectinations; signa similar, cells particularly spiny, length 180—300 μm (237.9 ± 35.0, 14), 2.3—3.6 × as long as wide. Ductus spermathecae with 3—3½ convolutions.

Larva. Greenish yellow, with conspicuous brown ganglia, head-capsule brown. Without ventral plates.

Biology.

Hostplants. *Agrimonia eupatoria* L. and *Aremonia agrimonoides* (L.) DC. (Greece only).

Mine (fig. 501). Egg on leaf-underside. Early mine narrow tortuous gallery, sometimes following vein, with broken linear frass, occasionally partly contorted; later widening into a wide irregular gallery, or elongate blotch with dispersed frass. Cocoon made in mine.

Life history. Univoltine, larvae from the end of August until October, pupae inside the mine. Adults from May to July.

Distribution (fig. 529).

Widespread in Central Europe, the Balkans and France, local in South England and southeast Sweden. Not recorded from Denmark, the Netherlands, Belgium, Iberian Peninsula or Italy.

Material examined: 49 ♂, 67 ♀, 91 ex.. — Austria: 4 ♂, 11 ♀, Hainburg: Hundsheimer Berg, 200—400 m, e.l. 15—28.v.1984, *Agrimonia eupatoria*, J. J. Boomsma & E. J. van Nieukerken (ZMA). — Czechoslovakia: 1 ♀, Praha (Prag), Pock. (NMW). — Germany, West: 1 ♀, Baiern, 1858 (NMW); 1 ♂, 1 ♀, Frankfurt am Main, coll. Staudinger (MHUB); 1 ♂, 1 ♀, Hafen, e.l. iv.1928, *Agrim. eupat.*, A. Wörz (LNK); 2 ♂, München, coll. Staudinger; 1 ♂, 2 ♀, Regensburg, coll. Staudinger (MHUB); 1 ♂, 1 ♀, (lecto- and paralectotype of *agrimoniae*), Regensburg, Hofmann (BMNH); 2 ♂, 1 ♀, Wolfenbuttel, [Heinemann] (MHUB). — Germany, without further data: 1 ♀, Jos. Mann; 1 ♂, 1 ♀, ex coll. v. Heinemann (RMNH); 1 ♀, 1869, Lederer (NMW). — Germany, East: 1 ♂, 1 ♀, Berlin-Finkenkrug, e.l. 15—21.iii.1930, Hering; 1 ♀, Berlin Frohnau, e.l. 10.v.1924, Hering; 91 ex., Berlin, MAJ, *Agrimonia*, Hering; 5 ♂, 6 ♀, Berlin Rudersdf., e.l. 22.iii—10.iv.1928, Hering; 7 ♂, 7 ♀, Chorin (Mark), e.l. 1—30.iv.1921, Hering (MHUB); 6 ♂, 6 ♀, Potsdam, e.l. 16—22.iii.1894, Hinneberg (MHUB, NMW, ZMA); 1 ♀, [Potsdam] e.l. 16.ii.1892, *Agrimon.* (ZMA). — Great Britain: 3 ♀, Box Hill, e.l. 25.vi.1936, 11.vi.1938, 6.vi.1939, S. Jacobs (ZMA); 2 ♂, 1 ♀, W. of Hadleigh (Essex), South Benfleet, e.l. 29.vi—7.vii.1982, G. Bryan & S. B. J. Menken (ZMA); 1 ♂, 1 ♀, no further data, Tyerman, ex coll. BMNH (ZMA). — Greece: 4 ♂, 2 ♀, Evvoia: Dhírfis Oros, S. slopes 700—900 m, e.l. 2—18.v.1981, *Aremonia agrimonoides*, S. B. J. Menken & E. J. van Nieukerken; 1 ♂, 3 ♀, Frangísta (Evritanía), valley, 600 m, e.l. 16.v—3.vi, 1981, *Aremonia* and *Agrimonia*, S. B. J. Menken & E. J. van Nieukerken; 2 ♂, 6 ♀, Katsiká (Ioánnina) near Limni Ioánninon, 480 m, e.l. 7—15.v.1981, *Agrimonia eupatoria*, S. B. J. Menken & E. J. van Nieukerken; 2 ♂, 1 ♀, Métsovon (Ioánnina), 950—1000 m, e.l. 14—22.v.1981, *Agrimonia eupatoria*, S. B. J. Menken & E. J. van Nieukerken (ZMA); 1 ♂, 2 ♀, Vardhoúsia O., (Fthiótis), Dafni, 7 km SE Mármara, 1100 m, e.l. 5—14.v.1981, *Agrimonia eupatoria*, S. B. J. Menken & E. J. van Nieukerken. — Switzerland: 1 ♂, no further data, 1869 (NMW). — USSR: 3 ♂, 4 ♀,

Bendery (Tighina), Bessarabia, e.l. 10.iv—20.v.1931, *Agrimonia eupatoria*, Hering (MHUB).

Mines. — On *Agrimonia eupatoria*. — Austria: Hundsheimer Berg near Hainburg. — Germany: Berlin-Frohnau, Hering (BMNH). — Great Britain: Hadleigh; Dorking, Box Hill (Surrey). — Greece: SE Mármara, Vardhoúsia Ori (Fthtiótis). — USSR: Bendery (Tighina), Hering (BMNH). — Yugoslavia: Otočac. On *Aremonia agrimonoides*. — Greece: Evvoia, Dhírfis Oros; SE Mármara, Vardhoúsia Ori (Fthiótis); Frangísta (Evritanía); Fournás (Evritanía).

42. Ectoedemia (Ectoedemia) hexapetalae (Szőcs, 1957) comb. n.
(figs. 79, 130, 210, 272, 320, 389, 403, 404, 463, 502, 549)

Nepticula utensis Weber var. biol. *hexapetalae* Szőcs, 1957: 322, 323. Holotype ♂, Hungary: Budapest, Sashegy, 24.vii.1956 e.l., Szőcs, Genitalia slide 944 Gozmány (TMAB) [examined].
Nepticula hexapetalae; Szőcs, 1965: 79; 1968: 228.
Trifurcula hexapetalae; Kasy, 1980: 47.

Diagnosis: this species differs externally from most species of the *angulifasciella* group by its small size, light collar, straight non-metallic fascia, and absence of hair-pencil in male. It can possibly be confused with *E. mahalebella*, in which case the genitalia should be examined. Male genitalia are immediately recognised by the width and the dorsal spinose process of the aedeagus. Female genitalia are easy to separate from *mahalebella* by shape and position of signa.

Description.

Male. Forewing length 1.96—2.12 mm (2.05 ± 0.07, 6), wingspan 4.4—4.7 mm. Head: frontal tuft yellowish orange to orange brown; collar slightly lighter. Antennae with 30—33 segments (32 ± 1.2, 5). Thorax and forewings brownish black with a medial, almost straight fascia, dull white, not shining. Hindwing without hair-pencil or costal bristles.

Female (fig. 79). Forewing length 1.68—2.04 mm (1.89 ± 0.13, 8), wingspan 3.7—4.6 mm. Antennae with 24—26 segments (24.9 ± 0.8, 8).

Male genitalia (figs. 130, 272, 320, 389, 403, 404). Capsule length 197—240 µm (3), wider than long. Tegumen distinctly produced into a rounded pseuduncus. Gnathos (fig. 320) divided into short distal element, and basal part with serrate margin. Valva (fig. 272) length 167—184 µm (3), relatively broad, inner margin almost straight, but slightly concave below pointed tip. Aedeagus (figs. 389, 403, 404) 261—287 µm (3), distinctly longer than capsule, relatively broad; with pair of single or bifid carinae and a single dorsal projection with many spines.

Female genitalia (figs. 210, 463). T7 with 4—6 scattered setae along posterior margin. T8 with two lateral patches of scales and 3—5 setae. Anal papillae with 7—18 setae. Vestibulum with incomplete vaginal sclerite with an indistinct ventral projection, without spiculate pouch. Corpus bursae 460—630 µm, completely covered by pectinations, especially dense near vestibulum; signa similar, with only slight differences in length, 197—326 µm (254.7 ± 47.5, 7), 2.6—3.1 × as long as wide. Ductus spermathecae with 2—3 convolutions.

Larva. Pale green, according to Szőcs (1957).

Biology.

Hostplant. *Filipendula vulgaris* Moench (= *hexapetala* Gilibert).

Mine (fig. 502). Egg on leaf-underside. Mine narrow gallery, often following leaf-margin; early mine filled with brown dispersed frass, later black dispersed frass leaving clear margins.

Life history. Probably bivoltine. Larvae most abundant in June and July, again in lower numbers in August and October (Szőcs, 1968). Adults from summer larvae emerged within a month, from autumn larvae in May (only 1 specimen examined). The only specimen taken at light flew in May.

Distribution (fig. 549).

Still only known from the region near Budapest and the Fischawiesen near Gramatneusiedl in the Vienna region. The population of the latter locality appears to be threatened, because these meadows are yearly completely mowed (pers. comm. Kasy), without leaving any old leaves for the autumn generation.

Remarks.

Originally described as variety of *utensis* (= *angulifasciella*) only, but *E. hexapetalae* appears to be a very distinctive species. Together with *terebinthivora* these are the only European *Ectoedemia* species which are known to be bivoltine.

Material examined: 6 ♂, 9 ♀. — Austria: 1 ♀, Gramatneusiedl, Fürbachwiesen (= Fischawiesen), e.l. 28.vii.1972, F. Kasy; 3 ♀, idem, e.l. 19—20.vii.1979; 1 ♂, idem, 30.v.1979, at light (NMW). — Hungary: 2 ♂, 2 ♀, Budaörs, e.l. 15.vii.1962, 3.vii.1964, 6—8.vii.1968, J. Szőcs; 1 ♂, 1 ♀, Budaörs, Törökugrató, e.l. 29.vi.1968, 21.v.1979, J. Szőcs; 1 ♂, 1 ♀, (Holo- and paratype), Budapest, Sasshegy, e.l. 24—26.vii.1956, J. Szőcs (TMAB).

Mines. — Austria: Gramatneusiedl, Fischawiesen, leg. Kasy. — Hungary: Budapest, Sasshegy, leg. Szőcs (BMNH).

The *Ectoedemia angulifasciella* complex

This is a complex of four very similar species, mining on Rosaceae. The status of the four taxa has recently been discussed by Wilkinson et al. (1983), where it was shown that the four taxa form two pairs of sibling species. In that paper the forms *schleichiella* and *staphyleae* were not treated, but it is shown here that these are synonyms of *E. angulifasciella* and *atricollis* respectively.

As in the other complexes treated here, the first species (*angulifasciella*) is described fully, and the other species only as far as they differ from it.

43. Ectoedemia (Ectoedemia) angulifasciella (Stainton, 1849)

(figs. 80, 133, 211, 212, 273, 321, 390, 464, 503, 532)

Nepticula angulifasciella Stainton, 1849: 29. Syntypes, England, Stainton (depository unknown) [not examined].

Nepticula schleichiella Frey, 1870: 286. Lectotype ♀ (here designated), Switzerland: Zürich, Frey, Genitalia slide 22567 (BMNH) [examined]. **Syn. nov.**

Nepticula utensis Weber, 1937a: 669, fig. 2. Lectotype ♂ (here designated), Switzerland: Zürich, Ute, 28.ix.1935, *Sanguis. offic.*, Z. 2368, Weber, Genitalia slide ETH 1240 (ETHZ) [examined]. **Syn. nov.**

Nepticula minorella Zimmermann, 1944: 118, 119, figs. 5, 7. Lectotype ♂ (here designated), Austria: Gumpoldskirchen near Wien, e.l. 26.vii.1943, *Poterium min.*, F. Zimmermann (labelled paratypus). Genitalia slide No. 763/1943 M. Hering (on pin) (MHUB) [examined]. **Syn. nov.**

? *Nepticula brunniella* Sauber, 1904, Syntype mines, Germany, West: Hamburg, Sorhagen (depository unknown) [not examined].

Nepticula angulifasciella; Stainton, 1854: 304; Herrich-Schäffer, 1855: 350; Stainton, 1855: 88—97, pl. 1 fig. 3; Frey, 1857: 417, 418; Stainton, 1859: 435; Heinemann, 1862: 314, 315; Wocke, 1871: 338; 1874: 101; Heinemann & Wocke, 1877: 758, 759; Sorhagen, 1886: 308; Meyrick, 1895: 859; Tutt, 1899: 308—310; Rebel, 1901: 226; Meess, 1910: 479; Meyrick, 1928: 859; Petersen, 1930: 69, fig. 94 (♂ genitalia); Szőcs, 1965: 78.

Dechtiria angulifasciella; Beirne, 1945: 205 (partim, not fig. 68); Vári, 1951: 196, 197, figs. 13, 17 (♂ genitalia, identity).

Stigmella angulifasciella; Klimesch, 1951: 62; Gerasimov, 1952: 225; Klimesch, 1961: 759; Lhomme, 1963: 1193; Borkowski, 1969: 112.

Stigmella (Dechtiria) angulifasciella; Hering, 1957: 902 (mine).

Trifurcula (Ectoedemia) angulifasciella; Johansson, 1971: 245.

Ectoedemia angulifasciella; Bradley et al., 1972: 2; Emmet, 1973: 178—180 (differences with *atricollis*); 1976: 192, pl. 6 fig. 2, pl. 12 fig. 24; Wilkinson et al., 1983: 211—224, figs. 1, 2, 9 (specific status).

Ectoedemia angulifasciella (partim); Borkowski, 1975: 492.

Trifurcula angulifasciella (partim); Karsholt & Nielsen, 1976: 18.

Nepticula schleichiella; Wocke, 1871: 338; Heinemann & Wocke, 1877: 759, 760; Rebel, 1901: 226; Meess, 1910: 479.

Stigmella schleichiella; Gerasimov, 1952: 259; Hering, 1957: 937 (mine).

Stigmella utensis; Klimesch, 1948: 72, 73, figs. 50, 51 (♂ genitalia).

Stigmella minorella; Klimesch, 1961: 739.

? *Nepticula brunniella*; Sorhagen, 1922: 59, fig. 70.

Diagnosis: male characterised by the combination of a yellowish-orange collar, an oblique metallic fascia and a white hair-pencil. *E. spiraeae* is very similar, but has almost no metallic fascia and is usually smaller. Male genitalia characterised by the shape of the valva, with sinuous inner margin. Female separated from *agrimoniae*, *atricollis* and *arcuatella* by light collar, *E. mahalabella* is very similar, but usually smaller and with very different signa.

Description.

Male (fig. 80). Forewing length (excluding specimens reared from *Filipendula*) 2.2—2.8 mm (2.56 ± 0,18, 21), wingspan 5.2—6.6 mm. Including *Filipendula* specimens: forewing length 1.92—2.8 (2.47 ± 0.25, 25), wingspan 4.4—6.6 mm. Head: frontal tuft and collar pale ochreous to ferruginous, usually lighter than in *atricollis*; collar often slightly lighter. Antennae with 29—35 segments (32.2 ± 1.6, 18). Thorax and forewings fuscous black, with a medial, oblique, shining metallic silver fascia, rarely interrupted in middle. Underside of forewing with small scaleless area. Hindwing with white hair-pencil and a few dark scales along costa.

Female. Forewing length (excluding specimens reared from *Filipendula*) 2.04—2.68 mm (2.52 ± 0,18, 12), wingspan 4.7—6.1 mm. Including *Filipendula* specimens: forewing length 1.92—2.68 (2.40 ± 0.26, 16), wingspan 4.5—6.1 mm. Antennae with 25—29 segments (27.1 ± 1.0, 13).

Male genitalia (figs. 133, 273, 321, 390). Capsule length 210—257 µm (241.0 ± 16.6, 9). Te-

gumen distinctly produced into truncate pseuduncus. Gnathos (fig. 321) with central element divided, distal part spatulate, basal part with serrate margin. Valva (fig. 273) length 159—193 µm (175.3 ± 11.6, 11), inner margin sinuous, forming a slight, but distinct rounded bulge in distal half, so that inner margin forms a right angle with pointed tip. Aedeagus (fig. 390) 214—274 µm (250.1 ± 18.3, 11), slightly constricted beyond middle, carinae single or bifid, not sharply pointed, with many small spines at base.

Female genitalia (figs. 211, 212, 464). T7 without setae in a row. T8 with two lateral patches with many scales and about 4—8 setae; anal papillae with 5—9 setae. Vestibulum with a vaginal sclerite and a "spiculate" pouch without spines. Corpus bursae 400—570 µm, almost completely covered with pectinations; signa dissimilar, longest 249—381 µm (326.1 ± 38.0, 10), shortest 227—356 µm (289.5 ± 37.1, 9), 3.3—4.6 × as long as wide. Ductus spermathecae with 2½—3 convolutions.

Larva. Greenish white, with distinct ganglia. Head-capsule and prothoracic plate dark brown. In 2nd and 3rd instar with chain of dark brown ventral plates.

Biology.

Hostplants: *Rosa* spp., including evergreen *Rosa sempervirens* L., occasionally on *Sanguisorba minor* Scop., *S. officinalis* L. and *Filipendula vulgaris* Moench (in Hungary only).

Mine (fig. 503). Egg on leaf-underside. Early mine highly contorted gallery filled with brown, contorted frass; later widening into large irregular blotch or wide gallery with irregular dispersed black frass.

Life history. Univoltine. Larvae from end of August to early November. S. E. Whitebread (in litt.) found some larvae in July in Switzerland. Adults flying from the middle of June to the end of July. May records probably refer all to indoor rearing.

Distribution (fig. 532).

Widespread in Europe, from southern Scandinavia to Greece. Not yet recorded from Ireland, Iberian Peninsula and central Balkan.

Remarks.

In the Stainton collection there are only *angulifasciella* specimens collected after 1849, thus without syntype status. The type specimens were not reared, but were later recognised by Stainton as being the same species as the rose miner. The identity of this species has been discussed by Wilkinson et al. (1983), with exception of the *Sanguisorba* form. Three authors described the *Sanguisorba* form: Frey as *schleichiella*, Weber as *utensis* (from the same locality as Frey!) and Zimmermann as *minorella*. The lectotypes of these taxa are morphologically identical with *angulifasciella*, and also the biology, except the foodplant, is similar. Electrophoresis of one larva collected in the Pyrenees on *Sanguisorba minor* showed that this form is also genetically identical with *angulifasciella* (Menken, in preparation). The conclusion is that *angulifasciella* is an oligophagous species, which most commonly feeds on *Rosa*. Szőcs also collected the species in numbers on *Filipendula vulgaris* in Hungary. These specimens are much smaller than normal *angulifasciella* probably due to the size of the leaves. The measurements of the adults have thus been given both excluding and including these specimens.

N. brunniella Sauber has been described on the basis of some mines collected by Sorhagen in Hamburg. Judging from Sorhagen's (1922) description and figure they could also belong to *angulifasciella*.

Material examined: 38 ♂, 28 ♀, 42 ex. — Austria: 3 ♂, (lecto- and paralectotypes of *minorella*), Gumpoldskirchen near Wien, e.l. 14.vi—26.vii.1943, *Poterium min.*, Zimmermann (MHUB); 1 ♂, Gumpoldskirchen, Glaslauterriegel, 28.vii.1972, F. Kasy; 2 ♂, Hundsheimer Berg (near Hainburg), 17.vii.1977, 15.vii.1980, F. Kasy; 1 ♀, Linz, 2.v.1910, Knitsche (NMW). — France: 1 ♂, 1 ♀, Chaville, e.l. 31.v., Joannis (MNHN). — Germany, West: 1 ♂, Bayers, 1858 (NMW); 2 ♂, 1.5 km NW Birresborn (Rhl.-Pf.), Vulkanberg, 460 m, e.l. 24—27.vi.1983, *Rosa*, Alders & Van Nieukerken (ZMA); 2 ♀, Braunschweig, Heinemann, coll. Staudinger (MHUB); 2 ♂, 1 ♀, Stuttgart, 30.vi.1883; 19.vii.1886 (MHUB, NMW); 1 ♂, no data, ex coll. Heinemann, coll. Snellen (RMNH). — Germany, East: 1 ♂, 1 ♀, Friedland, 1, 9.v.1885, Stange; 5 ♂, 3 ♀, Rachlau, e.l. 1897, *Rosa canina*, Schütze; 2 ♀, Sachsenberg, Nordhausen, e.l. 29.vi.1899, *Rosa*, Petry (MHUB). — Hungary: 5 ♂, 4 ♀, Szár, e.l. 17—24.vi.1968, *Filipendula vulgaris*, J. Szőcs (TMAB). — Netherlands: 3 ♂, Nunspeet, e.l. 14—22.vii.1946, *Rosa*, L. Vári; 8 ♂, 5 ♀, Ootmarsum, Achter de Voort, e.l. 10—14.vii.1981, *Rosa*, 15.x.1980, Andeweg & Van Nieukerken; 3 ♀, Winterswijk, quarry, e.l. 26.vii.1979, 12—13.vii.1982, Van Nieukerken (ZMA). — Poland: 42 ex., Krosno Odr. (Crossen a. Oder), e.l. 10—26.vi.1930, *Rosa canina*, Hering; 3 ♂, 3 ♀, idem, e.l. 15—23.v.1932; 1 ♂, Silesia, Wocke (MHUB); 1 ♂, Silesia, 1872, Staudinger (NMW); 2 ♂, 4 ♀, Wrocław (Breslau), e.l.

iv.1872, *Rosa* (Wocke) (MHUB). — Switzerland: 2 ♀ (lecto- and paralectotype of *schleichiella*), Zürich, Frey (BMNH); 1 ♂ (lectotype of *utensis*, see above); 2 ♂, 1 ♀, Zürich, Uto, mine 29.ix.1936, *Sanguisorba officinalis*, Weber (ETHZ). — Yugoslavia: 3 ♂, 2 ♀, Selce, 4 km SE Crikvenica (Hrvatska), a.s.l., e.l. 24.v—18.vi.1984, J. J. Boomsma & E. J. van Nieukerken (ZMA). — No data: 1 ♂, *Rosa* (ZMA); 2 ♀, e.l. 6.vi.1884, v. 1903, *Rosa* (NMW).

Mines. — On *Rosa* spp. — Austria: Gumpoldskirchen. — France: Andlau; Arvieu; Barr; Corse, Porticcio; Modane. — Germany, West: Alendorf; Birresborn; Hillesheim; Klotten. — Great Britain: Saffron Walden; Takeley; Tintern. — Greece: Fournás, Evritanía; Oíti Oros, Fókis + Fthiótis; Olympia; Parnos Oros, Attika. — Italy: Picinisco; Trento. — Netherlands: Cadier en Keer; Epen; Kunrade; De Lutte; Ootmarsum; Winterswijk; Wijlre. On *Sanguisorba minor*. — France: Porté-Puymorens. — Germany, West: Alendorf.

44. Ectoedemia (Ectoedemia) atricollis (Stainton, 1857)

(figs. 15—17, 28, 81, 134, 213, 214, 274, 323, 391, 465, 504, 505, 533)

Nepticula atricollis Stainton, 1857: 112. Lectotype ♀ (here designated), England, ex Boyd Coll. B.M., 1813—391, ♀ 5788, *Nepticula atricollis* Stn. Type, Genitalia slide 22617 (BMNH) [examined].

Nepticula atricolella Doubleday, 1859: 36 (unjustified emendation).

Nepticula aterrima Wocke, 1865: 270. Lectotype ♂ (here designated), Poland: Freiburg, Silesia, e.l. iv.1862, *Crataegus*, Wocke, Genitalia slide VU 2325 (ZIAS) [examined].

Nepticula malivora Toll, 1934b: 70, 83, pl. 2 fig. 1. Nomen nudum (no description or diagnosis, mine only).

Nepticula atricollis var. *aterrimoides* Skala, 1940: 143. Nomen nudum (no description or diagnosis).

Nepticula staphyleae Zimmermann, 1944: 117, 118, figs. 4, 6. Lectotype ♂ (here designated), Austria: Gumpoldskirchen near Wien, e.l. 12.vi.1943, *Staphylea pinnata*, F. Zimmermann, Genitalia slide VU 1488 (MHUB) [examined]. **Syn. nov.**

Nepticula atricollis var. *prunivora* Skala 1941: 1977. Nomen nudum (no description or diagnosis, mine only).

Nepticula atricollis; Stainton, 1859: 435; 1862: 228—235, pl. 11 fig. 1; Heinemann, 1862: 313, 314; Nolcken, 1871: 782; Wocke, 1871: 338; 1874: 101; Heinemann & Wocke, 1877: 758; Meyrick, 1895: 722; Tutt, 1899: 304—306; Rebel, 1901: 226; Meess, 1910: 479; Meyrick, 1928: 859; Petersen, 1930: 69, fig. 93 (♂ genitalia); Klimesch, 1936: 208; Zimmerman, 1944: fig. 6 a—c (♂ genitalia); Szőcs, 1965: 79.

Dechtiria atricollis; Vári, 1951: 197 (comparison with *angulifasciella*); Emmet, 1971: 171, 240, 241.

Stigmella atricollis; Gerasimov, 1952: 228, Klimesch, 1961: 759; Lhomme, 1963: 1193; Borkowski, 1969: 104.

Stigmella (Dechtiria) atricollis; Hering, 1957: 349, 664, 690, 835, 854, 1010; figs. 229b, 408a.

Trifurcula (Ectoedemia) atricollis; Johansson, 1971: 245.

Ectoedemia atricollis; Bradley et al., 1972: 2; Emmet, 1973: 178—180 (differences with *angulifasciella*); Emmet, 1976: 193, pl. 6 figs. 4, 5, pl. 12 fig. 25; Wilkinson et al., 1983: 211—224, figs. 3, 4, 10 (specific status).

Dechtiria angulifasciella (partim); Beirne, 1945: 205, fig. 68 (♂ genitalia).

Ectoedemia angulifasciella (partim); Borkowski, 1975: 492.

Trifurcula angulifasciella (partim); Karsholt & Nielsen, 1976: 18.

Nepticula aterrima; Wocke, 1871: 338, 1874: 102; Heinemann & Wocke, 1877: 763; Rebel, 1901: 227; Meess, 1910: 480.

Stigmella aterrima; Gerasimov, 1952: 228; Lhomme, 1963: 1198.

Nepticula malivora; Toll, 1936: 411.

Nepticula staphyleae; Szőcs, 1965: 79.

Stigmella staphyleae; Hering, 1957: 1027 (mine); Klimesch, 1961: 759.

Ectoedemia staphyleae; Borkowski, 1975: 493.

Diagnosis: separated from *angulifasciella*, *mahalebella* and *spiraeae* by dark collar, from *agrimoniae* by hair-pencil in male and blunt ovipositor in female (pointed in *agrimoniae*), from *rubivora* by head colour and from *spinosella* by size, and dark coloured hair-pencil in male *spinosella*. *E. arcuatella* can hardly be distinguished from *atricollis*, except by smaller size, much shorter signa and shorter aedeagus of *arcuatella*.

Description.

Male. Forewing length 2.16—2.56 mm (2.39 ± 0.12, 20), wingspan 4.8—6.0 mm. Head: frontal tuft orange to ferruginous (rarely black); collar dark fuscous to black. Antennae with 29—39 segments (33.3 ± 2.4, 16). Hindwing with white hair-pencil, surrounded by some dark brown scales, especially along costa. Further as *angulifasciella*.

Female (fig. 81). Forewing length 2.28—2.80 mm (2.56 ± 0.14, 14), wingspan 5.2—6.2 mm. Antennae with 26—30 segments (27.7 ± 1.2, 12).

Male genitalia (figs. 134, 274, 323, 391). Capsule length 270—287 µm (278.6 ± 6.9, 11). Gnathos fig. 322. Valva (fig. 274) length 176—206 µm (189.4 ± 8.5, 11), inner margin almost straight, forming an obtuse angle with pointed

tip. Aedeagus (fig. 391) 261—287 µm (273.1 ± 8.8, 11), hardly constricted. Further as *angulifasciella*.

Female genitalia (figs. 213, 214, 465). T8 with 3—4 setae at both sides. Anal papillae with 6—9 setae. Spiculate pouch with few almost invisible spines. Corpus bursae 495—660 µm; longest signum (360) 411—489 µm (435.5 ± 32.3, 12), shortest (356) 377—446 µm (405 ± 24.4, 12), 3.8—5.0 × as long as wide. Ductus spermathecae with 3—$3^1/_2$ convolutions.

Larva. Greenish white, with distinct ganglia. Head-capsule and prothoracic plate black. In 2nd and 3rd instar with chain of black ventral plates.

Biology.

Hostplants. Oligophagous on Rosaceous trees: most abundant on *Crataegus* spp., common on *Malus sylvestris* Miller, *Pyrus communis* L. and *Prunus avium* L., occasionally on *Prunus mahaleb* L. and *P. cerasifera* Ehrh. Records on *Prunus spinosa* L. probably all refer to *E. spinosella*. In east Central Europe also common on *Staphylea pinnata* L. (Staphyleaceae).

Mine (figs. 504, 505). Egg on leaf-underside. Early mine linear, following leaf-margin, or slightly contorted, filled with brown frass; later widening into large blotch with scattered black frass.

Life history. Univoltine. Larvae from late August until late October, commonest in September. Adults slightly earlier than *angulifasciella*, from early June until late July. May records probably refer to indoor rearing.

Distribution (fig. 533).

Widespread in Europe, from Central Sweden to Central Italy. Not yet found in a large part of the mediterranean region and Ireland.

Remarks.

Beirne (1945) and Borkowski (1975) synonymised this species with *angulifasciella*, but Wilkinson et al. (1983) showed that both species are separate, genetically isolated entities.

N. aterrima Wocke is just a dark aberration of *atricollis*. The nomina nuda *malivora* Toll and *aterrimoides* Skala are based on mines of *atricollis*.

N. staphyleae Zimmermann is morphologically identical to *atricollis*, the adult, larva, and mine being completely similar. The hostplant of *staphyleae* is however unrelated to the Rosaceae. By analysis of allozymes (Menken, in preparation) the larvae collected from *Staphylea* in the autumn of 1983 are shown to be genetically identical to those of sympatric *atricollis* from *Crataegus*. Therefore *staphyleae* is here synonymised with *atricollis*.

Material examined: 64 ♂, 59 ♀, 1 ex.. — Austria: 3 ♂, 1 ♀ (lecto- and paralectotypes of *staphyleae*), Gumpoldskirchen near Wien, e.l. 12.vi—21.vii.1943, *Staphylea pinata*, Zimmermann (MHUB); 1 ♂, 1 ♀, 1 km N. Gumpoldskirchen, Richardshof, e.l. 5.vi.1984, *Staphylea pinnata*, J. J. Boomsma & E. J. van Nieukerken (ZMA); 1 ♀, Klosterneuburg, Buchberg, e.l. 24.v.1937, Preissecker; 1 ♀, Linz, 9.ii.1911, Knitsche; 1 ♂, Wien, Haschbg., e.l. 22.v.1937, Preissecker (NMW). — Czechoslovakia: 1 ♂, 1 ♀, Dečin (Tetschen, Elbe), e.l. 11, 23.vi.1943, *Crataegus*, Hering (MHUB). — France, 2 ♂, 3 ♀, Clamart (Hauts de Seine), e.l. 4.vi, Aubépine (*Crataegus*), De Joannis (MNHN). — Germany, West: 3 ♂, 2 ♀, Freiburg, e.l. iv.1965, Pyr. mal., 1 ♀, Hannover, Glitz; 2 ♀, Wolfenbuttel, [Heinemann] (MHUB). — Germany, East: 10 ♂, 9 ♀, Berlin-Finkenkrug, e.l. 31.v—10.vi.1930, *Pyrus malus*, Hering; 2 ♂, 4 ♀, Bredow b. Nauen, e.l. 25.iii—2.iv.1925, *Malus silvestris*, Hering; 2 ♂, 2 ♀, Rüdingsdorf, Nordhausen, e.l. 21.v—7.vi.1921, 1.vi.1925, *Crataegus*, Petry; 2 ♂, 4 ♀, Rachlau, e.l. i.1888, 1897, *Pyrus malus*, Schütze (MHUB). — Great Britain: 1 ♀ (lectotype, see above). — Hungary: 2 ♂, Budapest, e.l. 16.vi.1953, *Staphylea*, J. Szőcs; 1 ♀, Budapest, Csittepéta, e.l. 30.v.1978, *Staphylea pinnata*, J. Szőcs; 1 ♀, Normafa, e.l. 14.v.1978, *Staphylea pinnata*, J. Szőcs; 1 ♀, Budapest, Zugliget, e.l. 23.vi.1957, *Staphylea pinnata*, J. Szőcs (TMAB). — Italy: 1 ♀, Formello (Roma), Valle delle mad. d. Sorbo, e.l. 5.vi.1984, *Crataegus monogyna*, S. B. J. Menken (ZMA). — Netherlands: 32 ♂, 20 ♀, from following localities; Ankeveense Plassen, Castricum, Loosdrecht, Nederhorst den Berg, St. Pietersberg, Weesp, Winterswijk and own breeding, reared from *Crataegus*, *Malus* or *Pyrus* (RMNH, ZMA). — Poland: 1 ♂ (lectotype of *aterrima*, see above); 2 ♂, 1 ♀, Silesia, Wocke, Staudinger (MHUB, ZMA). — Switzerland: 1 ♂, 1 ♀, 1869, 1870 (NMW).

Mines. On *Crataegus*. — Austria: Hundsheimer Berg near Hainburg; Orth am Donau. — Germany, West: Bad Honnef; Birresborn; Gerolstein. — Great Britain: Chepstow; Churchill; New Forest; Takeley. — Netherlands: many localities. — Italy: Formello; Opi. On *Malus*. — Austria: Orth am Donau. — Great Britain: Stapleford Abbots. — Italy: Picinisco. — Netherlands: Denekamp; Hilversum; Leiden; Nederhorst ten Berg; Rockanje; Wassenaar; Winterswijk. On *Mespilus germanica*. — Netherlands: Winterswijk. On *Prunus avium*. — Austria: Hof am Leithagebirge. — Germany, West: Bad Honnef. — Netherlands: Oud Valkenburg; Rijckholt; Sibbe; St. Geertruid; Winterswijk. On *Prunus cerasifera*. — Rumania: Cocoş, Niculiţel, Tulcea, 1.ix.1973, leg. Drağhia. On *Prunus mahaleb*. — Germany, West: Klotten. *Pyrus*. — Italy: Opi. — Netherlands: Hilver-

sum; Leiden; Wassenaar; Winterswijk. — Yugoslavia: Slavonska Požega. On *Staphylea pinnata*. — Austria: Gumpoldskirchen; Hundsheimer Berg near Hainburg. — Yugoslavia: N. Bihac.

45. Ectoedemia (Ectoedemia) arcuatella (Herrich-Schäffer, 1855)

(figs. 82, 136, 215, 275, 323, 392, 466, 506, 534)

Nepticula arcuatella Herrich-Schäffer, 1855: 354. Lectotype ♂ (here designated) identical with lectotype of *N. arcuata* Frey, see below.

Nepticula arcuata Frey, 1856: 384, 385. Lectotype ♂ (here designated), Switzerland: Zürich, Frey, Genitalia slide 22678 (BMNH) [examined].

Nepticula arcuosella Doubleday, 1859: 36 (unjustified emendation).

Nepticula arcuata; Frey, 1857: 415—417; Stainton, 1858: 97; 1859: 434, 435; 1862: 196—203, pl. 9 fig. 3 (biology); Nolcken, 1871: 784—786.

Nepticula arcuatella; Heinemann, 1862: 315, 316; Wocke, 1871: 338; 1874: 101; Heinemann & Wocke, 1877: 759; Meyrick, 1895: 723; Tutt, 1899: 306—308; Rebel, 1901: 226; Meess, 1910: 479; Meyrick, 1928: 860; Petersen, 1930: 70, fig. 96 (♂ genitalia); Klimesch, 1936: 208; Szőcs, 1965: 78.

Dechtiria arcuatella; Beirne, 1945: 206, fig. 70 (♂ genitalia).

Stigmella arcuatella; Klimesch, 1951: Gerasimov, 1952: 226; Klimesch, 1961: 759; Lhomme, 1963: 1194; Borkowski, 1969: 105, figs. 13, 14.

Stigmella (Dechtiria) arcuatella; Hering, 1957: 42, 454, 821, fig. 503c (mine).

Trifurcula (Ectoedemia) arcuatella; Johansson, 1971: 245.

Ectoedemia arcuatella; Bradley et al., 1972: 2; Emmet, 1973: 180, 278 (differences with *rubivora*); Borkowski, 1975: 492; Emmet, 1976: 194, pl. 6 fig. 3, pl. 12 fig. 26; van Nieukerken, 1982: 108; Wilkinson et al., 1983: 211—224, figs. 5, 6, 11 (specific status).

Trifurcula arcuatella (partim); Karsholt & Nielsen, 1976: 18.

Diagnosis: when not reared almost inseparable from *E. atricollis*, see diagnosis for that species. Females difficult to separate from *spinosella*.

Description.

Male (fig. 82). Forewing length 1.80—2.24 mm (2.11 ± 0.17, 8), wingspan 4.0—4.9 mm. Head: frontal tuft yellow to ferruginous, mixed with fuscous scales, getting darker towards collar; collar fuscous to black. Antennae with 28—32 segments (29.9 ± 1.5, 8). Hindwing with a white hair-pencil. Further as *angulifasciella*.

Female. Forewing length 1.64—2.32 mm (2.05 ± 0.26, 10), wingspan 3.6—5.2 mm. Antennae with 24—28 segments (26.2 ± 1.4, 9).

Male genitalia (figs. 136, 275, 323, 392). Capsule length 249—253 µm (3). Gnathos fig. 323. Valva (fig. 275) length 180—189 µm (4), inner margin almost straight, forming an obtuse angle with pointed tip. Aedeagus (fig. 392) 231—244 µm (4), hardly constricted.

Female genitalia (figs. 215, 466). T8 with about 5 setae at each side. Anal papillae with 5—9 setae. Spiculate pouch with very few minute spines. Corpus bursae 420—500 µm; longest signum 227—313 µm (4), shortest 206—283 µm (4), 3.1—4.1 × as long as wide. Ductus spermathecae with $2^1/_2$ convolutions.

Larva. Pale yellow, ganglia not very distinct. Head-capsule and prothoracic plate light brown. Penultimate instars with chain of brown ventral plates, which are shed in final instar.

Biology.

Hostplants. *Fragaria vesca* L., *F. moschata* Duchesne, *Potentilla erecta* (L.) Räuschel, *P. sterilis* (L.) Garcke.

Mine (fig. 506). Egg on leaf-underside. Early mine highly contorted gallery with brown, coiled frass; later widening into large irregular blotch with scattered brown frass.

Life history. Univoltine. Larvae from late August to middle of October. Adults emerge from end of May to July.

Distribution (fig. 534).

Widespread in Europe, but scarcer than the other three species of the complex. Only one record each from the Netherlands and France. Not yet recorded from Norway, Iberian Peninsula, Belgium or Ireland.

Remarks.

Frey discovered this species, named it *arcuata* and described it in 1856. However, Herrich-Schäffer, who renamed it *arcuatella* and attributed the species to Frey, described it one year ahead, and therefore is attributed with the authorship. Since Herrich-Schäffer clearly refers to the Frey material, it can be regarded as type material for both *arcuatella* and *arcuata*. The synonymy of *rubivora* with this species, as suggested by Borkowski (1975) has been refuted by Wilkinson et al. (1983).

Material examined: 29 ♂, 27 ♀. — Austria: 8 ♂, 6 ♀, 5 km. W. Völkermarkt: Pörtschach (Kärnten), 500 m, e.l. 19.v—5.vi.1984, *Fragaria vesca*, J. J. Boomsma & E. J. van Nieukerken (ZMA); 1 ♂, 1♀, Wien,

Haschbg., e.l. 13, 20.v.1937, Preissecker (NMW). — Denmark: 2 ♀, Bornholm, Gudhjem, e.l. 31.v—4.vi.1921, *Fragaria*, C. S. Larsen (ZMC). — Germany, West: 1 ♀, Braunschweig, Heinemann (RMNH); 2 ♂, Freiburg, iii.1882, Fragaria; 1 ♂, Wolfenbuttel, [Heinemann] (MHUB); 2 ♀, Pfalz, Eppelsheim (MHUB, NMW); 1 ♀, no data, 1870, Heinemann (MHUB); 1 ♂, locality illegible, *Frag. vesc.*, Heinemann (RMNH); 1 ♀, no data, 1878, Staudinger (NMW). — Germany, East: 1 ♂, Friedland, 11.iv.1889, Stange (NMW); 1 ♀, Kyffhausen, 12.vi.1912 (NMW); 2 ♀, Rachlau, Schütze (MHUB). — Greece: 1 ♂, Frangísta (Evritanía), valley, 600 m, st. 29, e.l. 13—15.vi.1981, *Fragaria vesca*, Menken & Van Nieukerken; 1 ♂, 1 ♀, 3 km SE Neráïdha (Evritanía), 1200 m, st. 37, e.l. 3—4.vi.1981, *Fragaria vesca*, Menken & Van Nieukerken (ZMA). — Netherlands: 1 ♂, 2 ♀, Woods W. of Wijlre, e.l. 3—9.vii.1982, E. J. van Nieukerken (ZMA). — Poland: 1 ♀, Wrocław (Breslau), e.l. iv.1864, *Fragaria* (MHUB). — Switzerland: 1 ♂, 1 ♀ (lecto- and paralectotype), Zürich, Frey (BMNH). — USSR: 4 ♂, 2 ♀, Bendery (Tighina), Bessarabia, e.l. 16—18.v.1931, *Fragaria vesca*, Hering (MHUB). — Yugoslavia: 1 ♀, 2 km W. Otočac (Hrvatska), 450—500 m, e.l. 26—28.v.1984, *Fragaria vesca*, J. J. Boomsma & E. J. van Nieukerken (ZMA).

Mines. — On *Fragaria vesca*. — Austria: Hof am Leithagebirge; Völkermarkt. — Great Britain: Churchill; Grays; Saffron Walden; Tintern. — Greece: Fournás, Evritanía; Frangísta, Evritanía; Neráïdha, Evritanía. — Italy: Tolmezzo. — Netherlands: Wijlre. — Yugoslavia: Han Knežica, N. of Prijedor; Otočac; Mt. Slavnik, S. of Herpelje-Kozina. On *Potentilla erecta*. — Italy: Tramonti di Sopra.

46. Ectoedemia (Ectoedemia) rubivora (Wocke, 1860)

(figs. 83, 135, 216, 276, 324, 393, 413, 467, 507, 535)

Nepticula rubivora Wocke, 1860, 132. Syntypes, Poland: Wrocław (Breslau), e.l. iv.18.. (ante 1860), Wocke (depository unknown) [not examined].

Nepticula rubivora; Heinemann, 1862: 315; Nolcken, 1871: 783; Wocke, 1871: 338; 1874: 101; Heinemann & Wocke, 1877: 783; Meyrick, 1895: 722, 723; Tutt, 1899: 310—313; Rebel, 1901: 226; Meess, 1910: 479; Sorhagen, 1922: 49, 50, pl. 3 fig. 52; Meyrick, 1928: 860; Petersen, 1930: 69, fig. 95 (♂ genitalia); Klimesch, 1936: 208; Szőcs, 1965: 76.

Dechtiria rubivora; Beirne, 1945: 205, fig. 69 (♂ genitalia).

Stigmella rubivora; Klimesch, 1951: 62; Gerasimov, 1952: 257; Klimesch, 1961; 759; Lhomme, 1963: 1194; Borkowski, 1969: 112.

Stigmella (Dechtiria) rubivora; Hering, 1957: 908, fig. 579a.

Trifurcula (Ectoedemia) rubivora; Johansson, 1971: 245.

Ectoedemia rubivora; Bradley et al., 1972: 2; Emmet, 1973: 180, 278 (differences with *arcuatella*); 1976: 195, pl. 6 fig. 7, pl. 12 fig. 27; Wilkinson et al., 1983: 211—224, figs. 7, 8, 12 (specific status).

Ectoedemia arcuatella rubivora; Borkowski, 1975: 492.

Trifurcula arcuatella (partim); Karsholt & Nielsen, 1976: 18.

Diagnosis: separated from the other Rosaceae mining *Ectoedemia* species by the black head in both sexes. In genitalia almost inseparable from *arcuatella*, although signa seem to have fewer cells.

Description.

Male (fig. 83). Forewing length 2.0—2.56 mm (2.28 ± 0.12, 25), wingspan 4.6—5.7 mm. Head: frontal tuft and collar black, sometimes with some fuscous scales. Antennae with 30—37 segments (33.2 ± 1.7, 19). Hindwing with white hair-pencil. Further as *angulifasciella*.

Female. Forewing length 2.08—2.69 (2.43 ± 0.18, 28), wingspan 4.6—6.0 mm. Antennae with 25—31 segments (27.9 ± 1.6, 24).

Male genitalia (figs. 135, 276, 324, 393, 413). Capsule length 257—283 µm (269.1 ± 9.8, 5). Gnathos fig. 324. Valva (fig. 276) length 176—206 µm (196.3 ± 11.9, 5), inner margin almost straight, forming an obtuse angle with pointed tip. Aedeagus (fig. 393) 236—266 µm (248.6 ± 12.5, 5), hardly constricted. Further as *angulifasciella*.

Female genitalia (figs. 216, 467). T8 with few setae at both sides. Anal papillae with 4—6 setae. Spiculate pouch with some almost invisible spines. Corpus bursae 410—460 µm; longest signum 227—274 µm (245.5 ± 17.1, 7), shortest 201—257 µm (226.5 ± 22.6, 7), 2.9—3.7 × as long as wide. Ductus spermathecae with 2½ convolutions.

Larva. Pale yellow, or yellowish white with green tinge, ganglia conspicuous. Head-capsule and prothoracic plate brown. Penultimate instars with chain of dark brown ventral plates and smaller, similar dorsal plates, which are shed in final instar.

Biology.

Hostplants. *Rubus fruticosus* L. (sensu lato), *R. caesius* L., *R. saxatilis* L., *R. chamaemorus* L. and *R. arcticus* L. (Kyrki & Tabell, 1984). Not found on *R. idaeus* L.

Mine (fig. 507). Egg on leaf-underside. Early mine highly contorted gallery filled with brown

frass; later widening into large irregular blotch with scattered black frass. Often staining surrounding tissue purple.

Life history. Univoltine. Larvae from late August until late October. Adults fly in June and July.

Distribution (fig. 535).

Widespread in Europe, from Lapland southwards to Central Italy. In the mediterranean region usually in river valleys and mountains only.

Remarks.

According to R. Puplesis (in litt.) no type material of this species is present in Wocke's collection in Leningrad, but from Wocke's very clear description and from subsequent Wocke material there can be no doubt about the identity of his species. Wilkinson et al. (1983) discussed the separate identity of *rubivora* and *arcuatella*.

Material examined: 62 ♂, 74 ♀. — Austria: 1 ♂, Linz, Au, 23.v.1923, Knitsche (NMW). — Denmark: 2 ♀, Faaborg (Fynen), Alliskus, e.l. 7—15.vi.1926, *Rubus*; 1 ♂, 4 ♀, Faaborg (Fynen), Sändarsjöen, e.l. 6—10.vi.1920, 17.vi.1922, 12—15.vi.1926, *Rubus* (ZMC). — Germany, West: 1 ♂, 2 ♀, Braunschweig, Heinemann (MHUB); 1 ♂, Hannover, Lederer (NMW); 1 ♂, Wolfenbuttel, [Heinemann] (MHUB). — Germany, East: 1 ♂, 5 ♀, Berlin-Finkenkrug, e.l. 6—12.vi.1930, *Rubus caesius*, Hering; 2 ♂, 2 ♀, Friedland, e.l. 4—10.iv.1888, *Rubus caesius*, Stange (MHUB); 2 ♂, idem, iv.1900 (NMW). — Great Britain: 1 ♂, 1 ♀, Saffron Walden (Essex), 3 km NE, e.l. 24.vi—4.vii.1980, Bryan, Emmet & Van Nieukerken (ZMA). — Italy: 2 ♂, 1 ♀, 4 km WSW Tolmezzo (Udine), Villa Verzegnis, 550 m, e.l. 16—18.vi.1984, J. J. Boomsma & E. J. van Nieukerken (ZMA). — Netherlands: 43 ♂, 41 ♀ from following localities: Blaricum, Gronsveld, Hulshorst, Kortenhoef, Lunteren, Nunspeet, Simpelveld, Winterswijk (RMNH, ZMA). — Poland: 1 ♂, Silesia, Staudinger (RMNH); 1 ♀, Wroclaw (Breslau), e.l. iv.1869, *Rubus caesius* (RMNH); 1 ♂, 5 ♀, Wroclaw (Breslau), v.1862, [Wocke], *Rubus caesius* (MHUB). — Switzerland: 2 ♀, Glarus, e.l. 20.v., 7.vi.1875, *Rubus petraeus* (= *saxatilis*) (MHUB); 2 ♂, Zürich, coll. Lederer (MHUB); 1 ♀, no data, 1868 (NMW). — USSR: 1 ♂, Estonia, Nomme, Moor, *Rub. cham.*, Petersen (MHUB). — Yugoslavia: 2 ♀, Mt. Slavnik, 5 km S. Herpelje-Kozina (Slovenia), 800 m, e.l. 26.v—7.vi.1984, J. J. Boomsma & E. J. van Nieukerken; 2 ♀, Sovinjak, 9 km NE Motovun (Hrvatska), Mirna valley, e.l. 8—15.vi.1984, J. J. Boomsma & E. J. van Nieukerken (ZMA). — No Data: 1 ♂, e.l. vi, *Rubus caes.* (RMNH).

Mines. — Austria: Wien, Lobau. — Belgium: Zolder. — Germany, West: Gerolstein; Oberstadtfeld. — Great Britain: Cheddar Gorge; Grays; Hadleigh; Saffron Walden. — Italy: Tramonti di Sopra; Trento; Tolmezzo. — Netherlands: many localities. — Yugoslavia: NE Bihac; S. of Novska; Mt. Slavnik, S. of Herpelje-Kozina; Sovinjak, NE Motovun.

47. Ectoedemia (Ectoedemia) spinosella
(de Joannis, 1908)
(figs. 18—20, 84, 137, 138, 217, 218, 277, 325, 395, 468, 508, 509, 536)

Nepticula spinosella J. de Joannis, 1908a: 328. Lectotype ♀ (here designated), France: Vannes, 18.vi., prunetier, L. de Joannis, Genitalia slide VU 947 (MNHN) [examined].

Nepticula spinosella; J. de Joannis, 1908b: 825, 826, fig. 3, pl. 15 fig. 13 (larva, mine, adult); Klimesch, 1936: 206; 1941: 163, 164, pl. 16 fig. 5 (♂ genitalia); Szőcs, 1965: 78.

Stigmella spinosella; Klimesch, 1951: 62; Gerasimov, 1952: 260; Hering, 1957: 835, fig. 518 (mine); Klimesch, 1961: 759; Lhomme, 1963: 1194; Emmet, 1970b: 121, 122, fig. 1.

Dechtiria spinosella; Emmet, 1971: 244.

Trifurcula (Ectoedemia) spinosella; Johansson, 1971: 245.

Ectoedemia spinosella; Bradley et al., 1972: 2; Emmet, 1974a: 79, 80; Borkowski, 1975: 493; Emmet, 1976: 192, pl. 6 fig. 8, pl. 12 fig. 23; van Nieukerken, 1982: 108, fig. 8 (mine).

Diagnosis: *E. spinosella* is externally similar to the *angulifasciella* complex, but is smaller, has a fuscous collar and the male has a brown hair-pencil surrounded by some brown lamellar scales. The female can be separated from *atricollis* by shorter signa with smoother, more uniformly curved outline. See for separation from *mahalebella* under that species.

Description.

Male (fig. 84). Forewing length 1.44—2.20 mm (1.87 ± 0.15, 29), wingspan 3.2—4.9 mm. Head: frontal tuft orange to orange fuscous, sometimes completely fuscous; collar fuscous. Antenna with 24—30 segments (26.8 ± 1.7, 18). Thorax and forewings blackish fuscous with medial silvery fascia, slightly concave at inner margin. Hindwing with brown hair-pencil, surrounded by a small patch of brown, lamellar scales. Underside of forewing with a tuft of long grey or white hairscales, arising near costal retinaculum.

Female. Forewing length 1.52—2.24 mm (1.85 ± 0.16, 34), wingspan 3.4—5.0. Antennae with 21—26 segments (22.5 ± 1.1, 29). Hind-

wing without brown patch, forewing without tuft.

Male genitalia (figs. 137, 138, 277, 325, 395). Capsule length 193—219 µm (207.9 ± 8.9, 8). Tegumen produced into broad and truncate pseuduncus. Gnathos (fig. 325) divided, with short, rounded distal element, and basal part with serrate margin. Valva (fig. 277) length 133—150 µm (142.5 ± 5.5, 8), inner margin slightly sinuous to almost straight, tip pointed. Aedeagus (fig. 395) 231—253 µm (242.1 ± 7.6, 8), with single, or bifid, pointed carinae.

Female genitalia (figs. 217, 218, 468). T7 without a row of setae. T8 with two lateral patches of scales and several setae (at least 4). Anal papillae with 6—11 setae. Vestibulum with incomplete vaginal sclerite, a spiculate pouch with indistinct spines. Corpus bursae 440—550 µm, completely covered with small pectinations or minute spines; signa slightly dissimilar, ovoid, with smooth, uniformly curved outline, longest 249—373 µm (312.4 ± 44.6, 9) shortest 227—330 µm (283.3± 35.4, 9), 2.4—3.5 × as long as wide. Ductus spermathecae with 2—2½ convolutions.

Larva. Greenish white, with distinct brown ganglia. Head light brown. Ventral plates absent.

Biology.

Hostplants. *Prunus* spp., in central and northern Europe only on *P. spinosa* L., in the south also recorded from *P. domestica* L., *P. cerasifera* Ehrh., *P. fruticosa* Pallas (to be confirmed), *P. dulcis* (Miller) (Greece).

Mine (figs. 508, 509). Egg on leaf underside, close to mid-rib, or less often lateral vein; occasionally on leaf-margin. Early mine much contorted narrow gallery, filled with reddish frass, later becoming elongate blotch with dispersed black frass, often very compact.

Life history. Univoltine. Larvae from end of July to October, most abundant in September, but in southern Greece some mines were vacated already by mid June. Adults in June and July (occasionally May).

Distribution (fig. 536).

Widespread in central Europe, but more localised northwards, occurring mainly on sun-exposed hills, or near coast (in England). Probably widespread in mediterranean area, but not yet recorded from Iberian Peninsula, the mediterranean islands, and most of the Balkan. Borkowski (1975) did not mention *E. spinosella* from Poland, but the specimens cited below, collected by Hering, indicate its presence in Poland. Recently Buszko (in litt.) found it also in Poland.

Remarks.

Before De Joannis discovered this species in France, it had been mistaken several times for *E. atricollis*. Named as such, specimens which were collected by Eppelsheim in Pfalz can be found in many collections. To my knowledge *E. atricollis* has never been found on *Prunus spinosa*.

Greek specimens reared from *Prunus dulcis* (on which it is locally almost a pest) differ slightly in head-colour and female signa (usually shorter), but electrophoretically they appeared to be indistinguishable from normal *spinosella* (Menken, in preparation).

Material examined: 52 ♂, 59 ♀. — Austria: 1 ♂, Dürnstein, e.l. 2.vi. 1936, J. Klimesch; 1 ♀, Klosterneuburg, Freiberg, e.l. 15.vi.1941, Preissecker; 2 ♂, 1 ♀, Mödling, e.l. 7—25.v.1938, Preissecker; 1 ♂, Neu-Aigen, Schmidawiesen, e.l. 18.v.1937, Preissecker (NMW). — France: 3 ♂, 4 ♀ (lecto- and paralectotypes), Vannes, 18.vi, 2.vii, prunetier (= *Prunus spinosa*), Joannis (MNHN). — Germany, West: 2 ♀, Grünstadt, Pfalz, Eppelsheim (MHUB, NMW); 3 ♀, Pfalz, e.l. 1893, 1894, *Prunus spinosa*, Eppelsheim (MHUB, NMW); 3 ♂, no data (probably Pfalz, Eppelsheim) (ZMA); 1 ♂, 2 ♀, Lemberg-Zuffh., Württemberg, e.l. 5—10.v.1939, *Prunus spinosa*, A. Wörz (LNK, coll. Johansson). — Great Britain: 1 ♀, Puddle Dock (Essex), e.l. 4.vi.1982, *Prunus spinosa*, A. M. Emmet (ZMA). — Greece: 31 ♂, 25 ♀, Arákhova (Voiotía), 950 m, e.l. 2.v.—8.vii.1981, *Prunus dulcis*, 27—29.ix.1980, S. B. J. Menken, E. J. van Nieukerken (ZMA, ZSMK). — Hungary: 1 ♂, Badacsony, e.l. 10.vi.1969, *Prunus spinosa*, J. Szőcs; 1 ♂, 3 ♀, Törökbálint (W. of Budapest), e.l. 20.vi—16.vii.1955, *Prunus spinosa*, J. Szőcs (TMAB). — Netherlands: 3 ♂, 5 ♀, Gulpen, e.l. 7—16.vi.1980, *Prunus spinosa*, E. J. van Nieukerken; 1 ♂, 1 ♀, 2 km NE Wijlre, Vrakelberg, e.l. 11—13.vi. 1980, *Prunus spinosa*, E. J. van Nieukerken; 3 ♂, 9 ♀, Woods W. of Wijlre e.l. 22.vi—6.vii.1982, *Prunus spinosa*, Alders, Van Nieukerken (ZMA). — Poland: 1 ♂, 2 ♀, Krosna Odr. (Crossen a. Oder), e.l. 7—12.vi.1930, *Prunus spinosa*, Hering (MHUB).

Mines. — On *Prunus spinosa*. — Austria: Gumpoldskirchen. — France: Villefranche-de-Conflent. — Germany, West: Kassel, 1.x.1946 (BMNH); Klotten. — Netherlands: Gulpen; Wijlre. — Poland: Bellinchen/Oder, W. of Chojna, 6.ix.1939, Hering; Krosna Odr. (Crossen/Oder), ix.1929, Hering (BMNH). — Yugoslavia: Savudrija (Istria). On *Prunus dulcis*. — Greece: Arakhova; Dhelfoi; Kardhamili.

48. Ectoedemia (Ectoedemia) mahalebella (Klimesch, 1936)
(figs. 85, 140, 141, 219, 278, 326, 396, 469, 510, 537)

Nepticula mahalebella Klimesch, 1936: 207, 208, figs. 8, 9. Syntypes, Italy: Naturno, Vintschgau, e.l. 5—21.v. 1935, *Prunus mahaleb*, J. Klimesch (ZSMK) [not examined].
Nepticula mahalebella; Klimesch, 1940b: 190; Szőcs, 1965: 79.
Stigmella mahalebella; Lhomme, 1945: 155; Klimesch, 1948: 72, figs. 47—49 (♂ genitalia); 1951: 62; 1961: 759; Lhomme, 1963: 1195.
Nepticula (Dechtiria) mahalebella; Klimesch, 1950: 28, figs. 13—15 (mine, ♂ genitalia, foodplant races).
Stigmella (Dechtiria) mahalebella; Hering, 1957: 836 (mine).
Ectoedemia mahalebella; Szőcs, 1978: 266.

Diagnosis: easily separated from related *spinosella* by light collar, which is concolorous with frontal tuft (darker in *spinosella*), and absence of hair-pencil and special scales on hindwing of male, and by position and shape of signa in female genitalia. Similar, but larger, *angulifasciella* separated by presence of hair-pencil and different shape of valva in male and signa in female. See also diagnosis of *hexapetalae*.

Description.

Male (fig. 85). Forewing length 1.92—2.40 mm (2.14 ± 0.17, 7), wingspan 4.3—5.3 mm. Head: frontal tuft yellowish orange to ferruginous; collar concolorous with or lighter than frontal tuft. Antennae with 26—32 segments (28.7 ± 1.9, 7). Thorax and forewings blackish fuscous with medial silvery fascia, inner margin slightly concave. Hindwing without hair-pencil or costal bristles. Underside forewing with a tuft of long grey hair-scales, arising near costal retinaculum.

Female. Forewing length 2.0—2.36 mm (2.15 ± 0.10, 14), wingspan 4.4—5.2 mm. Antennae with 23—27 segments (24.5 ± 1.2, 11).

Male genitalia (figs. 140, 141, 278, 326, 396). Capsule length 201—214 µm (4). Tegumen produced into broad and truncate pseuduncus. Gnathos (fig. 326) divided into short, rounded distal part, and basal part with serrate margin. Valva (fig. 278) length 129—150 µm (4), inner margin straight, tip pointed; valva widest at base, constricted below tip. Aedeagus (fig. 396) 231—274 µm (260.6 ± 17.0, 5), with single or bifid, pointed carinae.

Female genitalia (figs. 219, 220, 469). T7 without a row of setae. T8 with two lateral patches of scales and 6—8 setae. Anal papillae with 5—11 setae. Vestibulum with complete vaginal sclerite, a spiculate pouch with indistinct spines. Corpus bursae long, 570—715 µm, proximally covered with pectinations, distally with small spines; signa ovoid, almost similar, confined to proximal (posterior) half of corpus bursae, length 201—304 µm (238.9 ± 26.3, 19), 1.8—2.4 × as long as wide. Ductus spermathecae with 2½—3 convolutions.

Larva. Greenish white, with distinct brown ganglia. Head light brown. Ventral plates absent.

Biology.

Hostplants. *Prunus mahaleb* L., on which most common, *P. cocomilia* Ten. (Greece), *P. tenella* Batsch (Hungary), *P. fruticosa* Pallas, *P. avium* L. and *P. cerasus* L. (Klimesch, 1950 and own data).

Mine (fig. 510). Egg deposited on leaf-underside, usually at or near margin, in French and Yugoslavian samples 99% at margin, but in Italian and Greek samples up to 50% close to midrib or lateral vein. It is not yet clear if these mines belong all to *mahalebella*. Early gallery narrow, following leaf margin, or much contorted, filled with reddish frass; later abruptly changing into small roundish blotch, with blackish frass accumulated in centre.

Life history. Univoltine. Larvae from late July until mid-October. Adults in May and June (rearing data).

Distribution (fig. 537).

A southern European species, south and east of the Alps, including hot alpine valleys. Recorded from Rumania as *E. spinosella* (Drağhia, 1967).

Remarks.

The types have not been examined, but from Klimesch's (1936) description, the identity of this species is clear.

In central Europe *E. mahalebella* and *spinosella* are clearly separated by their host-plants, but in the south, they could have overlapping hostplant ranges. More data are needed to confirm this.

Material examined: 12 ♂, 19 ♀. — Austria: 2 ♀, Bad Deutsch Altenburg, Pfaffenberg, e.l. 4 + 23.vi.1934, Weichsel (= *P. mahaleb*), Preissecker (NMW). — France: 1 ♂, 1 ♀, St. Thibaud-de-Couz

(Savoie), 500—700 m, e.l. 11—19.vi.1980, *Prunus mahaleb*, E. J. van Nieukerken (ZMA). — Greece: 1 ♀, Parnassós Oros, NW Arákhova (Voiotía), plateau, 1150 m, e.l. 9—11.v.1981, *Prunus cocomilia*, S. B. J. Menken & E. J. van Nieukerken; 2 ♂ 5 ♀, Mt. Timfristós (Evrítania) above Karpenission, 1200—1400 m, e.l. 21.v—25.vi.1981, *Prunus cocomilia* and *P. mahaleb*, S. B. J. Menken & E. J. van Nieukerken (ZMA). — Hungary: 3 ♀, Budaörs, e.l. 3—7.vi.1971, *Prunus mahaleb*, J. Szőcs; 3 ♂, Budaörs, Csiki-hegyek, e.l. 20—27.vi.1962, *Prunus mahaleb*, J. Szőcs; 1 ♀, Budaörs, Úthegy, e.l. 14.vi.1973, *Prunus tenella*, J. Szőcs (TMAB). — Italy: 1 ♂, 1 ♀, Trento, Goccladoro, e.l. iv.1946, *Prunus mahaleb*, J. Klimesch (ZMA). — Yugoslavia: 5 ♂, 5 ♀, Selce, 4 km SE Crikvenica (Hrvatska), a.s.l., mines 15.x.1983, e.l. 30.iv—3.v.1984, *Prunus mahaleb*, J. J. Boomsma & E. J. van Nieukerken (ZMA).

Mines. — On *Prunus avium*. — Italy: Guilliana near Savona, 17.ix.1944, J. Klimesch (BMNH); Frascati, 17.xii.1941, Groschke (BMNH). On *Prunus cocomilia*. — Greece: Oíti Oros, SW Ipáti (Fthiótis); Oíti Oros, NE Strómi (Fokís); Mt. Timfristós above Karpenísion; Parnassós Oros, NW Arákhova (Voiotía). On *P. fruticosa*. — Austria: Hundsheimer Berg near Hainburg. On *P. mahaleb* — Austria: Hainburger Berge (BMNH). — France: St. Thibaud-de-Couz (Savoie); Modane (Savoie); Villefranche-de-Conflent (Pyr. Or.). — Greece: Mt. Timfristós above Karpenísion; Kastráki (Tríkala). — Italy: Avezzano (Lazio); Brenzone, x.1943, Groschke (BMNH); Susa, Piemonte, 20.viii.1960, 1.ix.1964, Jäckh (BMNH). — Yugoslavia: Crikvenica (Croatia); Novi Vinodolski (Croatia).

The *Ectoedemia occultella* group

This group comprises two closely related species, mining in Betulaceae. They differ from all other described *Ectoedemia* s.str. species by the absence of a cilia-line and the concolorous black cilia. See further the descriptions.

The larvae are yellow and possess ventral plates. This group occurs also in North America (*E. lindquisti* (Freeman)) and in Japan.

49. Ectoedemia (Ectoedemia) occultella (Linnaeus, 1767)

(figs. 4, 5, 86, 87, 139, 221, 279, 397, 405, 470, 511, 512, 530)

Phalaena (Tinea) occultella Linnaeus, 1767: 899. Syntypes, Sweden: Hammerby, Linnaeus (depository unknown, probably lost) [not examined].

Tinea strigilella Thunberg, 1794: 87. Lectotype ♀ (designated by Robinson & Nielsen, 1983), Sweden: [Uppsala], Gedner, Genitalia slide RJ 751A (Zoological Institute, Uppsala) [not examined] [Synonymised by Robinson & Nielsen, 1983].

? *Tinea mucidella* Hübner, [1814—1817]: pl. 65 fig. 435. Syntypes, [Europe] (depository unknown [not examined].

Tinea mediofasciella Haworth, 1828: 584. Lectotype ♂ (here designated), [England: London], ex Haworth coll., Stainton coll., Genitalia slide 22608 (BMNH) [examined]. **Syn. nov.**

Lyonetia argentipedella Zeller, 1839: 215. Lectotype ♀ (here designated) [Poland: Głogów (Glogau)], 28.v.[18]35, Zeller, Walsingham coll. 1910—427, 101267, Genitalia slide 22600 (BMNH) [examined]. [Synonymised by Robinson & Nielsen, 1983].

Lyonetia argentipedella; Tengström, 1848: 152.

Nepticula argentipedella; Heyden, 1843: 208; Zeller, 1848: 316, 317; Stainton, 1849: 29; 1854: 303; Herrich-Schäffer, 1855: 353; Frey, 1856: 386, 387; 1857: 421, 422; Stainton, 1859: 435; 1862: 212—219, pl. 10 fig. 2; Heinemann, 1871: 218; Nolcken, 1871: 780; Wocke, 1871: 338; 1874: 101; Heinemann & Wocke, 1877: 754, 755; Snellen, 1882: 996, 997; Sorhagen 1886: 307; Meyrick, 1895: 721; Tutt, 1899: 289—291; Rebel, 1901: 225; Meess, 1910: 478, pl. 91 fig. 66; Sorhagen, 1922: 48, pl. 2 fig. 46; Meyrick, 1928: 858; Petersen, 1930: 66, fig. 82 (♂ genitalia); Szőcs, 1965: 64.

[no genus] *argentipedella*; Herrich-Schäffer, [1853]: pl. 105, fig. 834.

Dechtiria argentipedella; Beirne, 1945: 205, fig. 62 (♂ genitalia).

Stigmella argentipedella; Klimesch, 1951: 61; Gerasimov, 1952: 226; Klimesch, 1961: 758; Lhomme, 1963: 1188.

Stigmella (Dechtiria) argentipedella; Hering, 1957: 179, fig. 124 (mine).

Nepticula (Dechtiria) argentipedella; Szőcs, 1968: 226 (biology).

Trifurcula (Ectoedemia) argentipedella; Johansson, 1971: 245.

Ectoedemia argentipedella; Bradley et al., 1972: 2; Borkowski, 1975: 493; Emmet, 1976: 197, pl. 6 fig. 9, pl. 12 fig. 28; van Frankenhuyzen & de Vries, 1979: 129—135, figs. (biology).

Trifurcula argentipedella; Karsholt & Nielsen, 1976: 18.

Microsetia mediofasciella; Stephens, 1829: 208; 1834: 268.

? *Elachista mucidella*; Treitschke, 1833: 179.

Ectoedemia occultella; Robinson & Nielsen, 1983: 221, 222.

Diagnosis: easily distinguished from other *Ectoedemia* spp. (except *minimella*), by completely jet-black colour of thorax and forewings, (except fascia), including cilia, and absence of cilia-line. Separated from *Stigmella* species by medial fascia (usually postmedial in *Stigmella*) and collar, consisting of hair-scales, instead of lamellar scales as in *Stigmella*. Separated from very similar *minimella* by presence of group of

white scales on underside of forewing in male, and by light coloured head in female. See also *minimella*.

Description.

Male (fig. 86). Forewing length 2.36—3.44 mm (2.85 ± 0.33, 23), wingspan 5.1—7.5 mm. Head: frontal tuft black, often mixed with some fuscous or ochreous scales; collar black. Antennae with 31—42 segments (35.6 ± 2.9, 19). Thorax and forewings completely jet-black, less coarsely scaled than in other *Ectoedemia* species, with a rather broad, almost straight dull white fascia, sometimes slightly constricted in middle. Hindwing with a relatively long white hair-pencil. Underside forewing with a small elongate patch along costa with narrow white scales, often difficult to see.

Female (fig. 87). Forewing length 2.56—3.84 mm (3.28 ± 0.39, 20), wingspan 5.7—8.4 mm. Head: frontal tuft yellowish to yellowish orange, sometimes mixed fuscous; collar yellow. Antennae with 27—32 segments (29.4 ± 1.6). Patch of white scales on underside forewing absent.

Male genitalia (figs. 139, 279, 397, 405). Capsule length 313—390 µm (353.6 ± 27.4, 10), very large comparing with other *Ectoedemia* (s.s.) species. Tegumen produced into long tapering, pointed pseuduncus. Gnathos (fig. 327) with relatively broad, blunt central element. Valva (fig. 279) length 236—279 µm (245 ± 8.3, 6), outer margin strongly convex, inner margin slightly concave, almost straight; tip pointed, pointing posteriorly. Aedeagus (figs. 397, 405) 304—351 µm (326.8 ± 17.5, 12), carinae each divided into several blunt ending digitate processes, number variable; vesica with many small, triangular cornuti only.

Female genitalia (figs. 221, 470). T7 without row of setae. T8 with two groups of scales and 3—5 setae. Anal papillae confluent, in total with 18 to 40 setae. Vestibulum with vaginal sclerite, and a dorsal spiculate pouch with very few minute spines only. Corpus bursae 495—580 µm, with pectinations closely set in two lateral bands, at some distance from signa; signa dissimilar, one reaching vestibulum, longest 214—334 µm (275.3 ± 34.1, 9), shortest 180—266 µm (221.0 ± 27.9, 9), 2.2—3.3 × as long as wide. Ductus spermathecae with 2½—3 convolutions.

Larva. Pale yellowish white, ganglia not very conspicuous. Head light brown. Penultimate stages with 12 black ventral plates.

Biology.

Hostplants. *Betula* spp. Occurring on al native *Betula* spp. in Europe and many species in botanical gardens (Buhr, 1935, Van Frankenhuyzen & De Vries, 1979). In northern Finland it has been found mining both on *Salix pentandra* L. and *Betula*, but no adults have yet been reared from *Salix* (J. Kyrki, pers. comm.).

Mine (figs. 511, 512). Egg on leaf underside, rarely on upperside. Mine large blotch, often almost circular, with black circular blotch in middle, caused by staining of both epidermis layers; frass black, irregular, but usually accumulated under and near blotch. Mine does not start as gallery, young mines consist of black blotch only, through which larva cannot be seen.

Life history. Univoltine. Larvae feed slowly during long period, from the end of June to early November. Complete mines with mature larvae can occasionally be found from late July to August, but are most common in September and October. Adults fly in May and June. See detailed description by Van Frankenhuyzen & De Vries (1979).

Distribution (fig. 530).

One of the commonest and most widespread *Ectoedemia* species in Europe, occurs in almost all places where birch grows. In southern Europe probably in mountains only, and recorded from Etna, Sicily.

Remarks.

This species has long been known as *E. argentipedella* (Zeller), but Robinson & Nielsen (1983) showed that this is a junior synonym of *occultella* Linnaeus.

The type series of *Tinea mediofasciella* Haworth comprises five specimens, representing several species, including *Bucculatrix*, *Stigmella*, and one *Ectoedemia*. *E. mediofasciella* was previously incorrectly synonymised with *woolhopiella* Stainton (= *minimella*), probably on the basis of the single *Ectoedemia* specimen, selected here as lectotype. Examination of the genitalia, which had not earlier been dissected, however, showed it to be *occultella*.

The identity of *Tinea mucidella* Hübner is still unknown, this synonymy has been suggested by Zeller (1839) in his description of *argentipedella*.

E. lindquisti (Freeman, 1962), described also by Wilkinson & Scoble (1979) and Wilkinson & Newton (1981) is extremely similar to *occultella* in the adult and larval stage and in its life history

(Lindquist, 1962). The only difference seems to be the absence of a patch of white scales on the underside of the forewing of the males. The allozyme differences are also small (Menken, in preparation), so it is probable that *lindquisti* and *occultella* are vicariant forms, and hence different subspecies.

Material examined: 102 ♂, 88 ♀, 141 ex. — Austria: 1 ♀, no further data (RMNH). — France: 3 ♂, 1 ♀, Pralognan (Savoie), 1450 m, e.l. 21—23.v.1980, E. J. van Nieukerken (ZMA). — Germany, West: 1 ♂, 1 ♀, Alendorf, 8 km S. of Blankenheim (N.-Westf.), e.l. 10—18.v.1983, Alders & Van Nieukerken (ZMA); 1 ♀, Stuttgart (MHUB). — Germany, East: 1 ♀, Berlin, Bot. Garten, 12.v.1947, Hering; 2 ♂, 1 ♀, Berlin Finkenkrug, 1918—1932, Hering; 1 ♀, Berlin Frohnau, 18.ii.1920, Hering; 3 ♂, 6 ♀, Potsdam, 13.iv.1886, 15—20v.1898, Hinneberg; 1 ex., Rachlau, 1884, Schütze (MHUB). — Great Britain: 1 ♂, 5 ♀, Bromley (London), 7—11.v.1939, S. Jacobs (ZMA); 1 ♂ (lectotype of *mediofasciella*, see above). — Netherlands: 82 ♂, 61 ♀, 140 ex. from following localities: Arnhem; Epen; Geulhem; 's-Gravenhage; Hilversum; Hoge Veluwe; Kerkrade; Kortenhoef; Kortenhoefse Plassen; Kosberg; Loosduinen; Meijnweg; Neerbosch; Nunspeet; Rockanje; Schin op Geul; Schinveld; Slenaken; Wageningen; Wijlre; Winterswijk; Zwanewater (RMNH, ZMA, AFW, coll. Huisman, coll. Kuchlein). — Poland: 1 ♀ (lectotype of *argentipedella*, see above); 2 ♀, Obernigk, ii.1869; 1 ♂, 2 ♀, Wrocław (Breslau), ii.1869, Wocke (MHUB). — Switzerland: 1 ♂, 2 ♀, Zürich (MHUB). — No Locality Data: 5 ♂, 2 ♀ (ZMA, RMNH, MHUB).

Material of *lindquisti* examined. — Canada: 6 ♂, 3 ♀, Ontario: Awenda Prov. Park, Penetang, Simcoe Co., mines 24.viii.1981, *Betula papyrifera*, Evans, e.l. 2—8.vi.1982 (ZMA); USA: 2 ♂, 1 ♀, Maine, Bethel, 29.vi.1946, A. F. Braun (USNM).

Mines. — Austria: Gramatneusiedl; Hermagor; Mühlleiten; Lavamünd. — Belgium: Bolderberg, Zolder. — France: Le Hohwald; Pralognan. — Germany, West: Alendorf; Oberstadtfeld. — Great Britain: Brentwood; Grays; New Forest. — Hungary: Budapest. — Italy: Naturno; Tolmezzo; Trento. — Netherlands: many localities. — Yugoslavia: Fužine, SW Delnice.

50. Ectoedemia (Ectoedemia) minimella (Zetterstedt, 1839) comb. n.
(figs. 88, 142, 222, 280, 328, 398, 406, 414, 415, 513, 531)

Elachista minimella Zetterstedt, 1839: 1011. Lectotype ♀ (here designated), Norway: Nordland, Björkvik, 14.vii, Zetterstedt, Genitalia slide RJ (Zoological Institute, Lund, Sweden) [examined by R. Johansson].

Nepticula woolhopiella Stainton, 1887: 262. Lectotype ♀ (here designated), Great Britain: Tarrington, 29.vi.1887, e.l. birch, Wood, Genitalia slide 11362 (BMNH) [examined]. **Syn. nov.**

Nepticula viridicola Weber, 1937: 211, 212, fig. 1. Lectotype ♂ (here designated), Switzerland: Simplon, 1970 m, mines 19.ix.1936, *Alnus virid.*, Z. 2606, Weber, Genitalia slide ETH 1241 (ETHZ) [examined]. **Syn. nov.**

Nepticula argentipedella [partim]; Meyrick, 1895: 721.

Nepticula woolhopiella; Tutt, 1899: 292, 293; Rebel, 1901: 225; Meess, 1910: 478; Meyrick, 1928: 858; Petersen, 1930: 67.

Dechtiria woolhopiella; Beirne, 1945: 205, fig. 63 (♂ genitalia).

Stigmella woolhopiella; Gerasimov, 1952: 270; Klimesch, 1961: 758; Borkowski, 1969: 100.

Stigmella (Dechtiria) woolhopiella; Hering, 1957: 181, fig. 118b (mine).

Trifurcula (Ectoedemia) woolhopiella; Johansson, 1971: 245.

Ectoedemia woolhopiella; Borkowski, 1975: 493.

Stigmella viridicola; Klimesch, 1948: 70, figs. 43, 44 (♂ genitalia); 1951: 61; Hering, 1957: 66, fig. 37a (mine); Klimesch, 1961: 758.

Ectoedemia woolhopiella viridicola; Borkowski, 1975: 494.

[*Ectoedemia mediofasciella*; Bradley et al., 1972: 2; Emmet, 1973: 282, 283; 1976: 197, pl. 6 fig. 12; pl. 12 fig. 29; Van Nieukerken, 1982: 107, 108, fig. 7 (mine). misidentification].

[*Trifurcula mediofasciella*; Karsholt & Nielsen, 1976: 18. misidentification].

Diagnosis: extremely similar to *occultella*, for external differences see under that species. Male genitalia can be separated by smaller size, presence of large elongate cornuti and shape of gnathos. Female genitalia extremely difficult to separate, but *minimella* has usually shorter and wider signa, although there is some overlap.

Description.

Male (fig. 88). Forewing length 2.32—2.72 mm (2.54 ± 0.11, 14), wingspan 5.1—6.1 mm. Head: frontal tuft black; collar black. Antennae with 35—42 segments (37.5 ± 2.2, 14). Thorax and forewings completely jet-black, less coarsely scaled than in other *Ectoedemia* species, with a rather broad, almost straight, dull white fascia, sometimes slightly constricted in middle. Hindwing with a greyish hair-pencil, slightly shorter than *occultella*. Underside of forewing without white scale patch.

Female. Forewing length 2.28—3.04 mm (2.71 ± 0.24, 16), wingspan 5.1—6.6 mm. Head: frontal tuft black, or mixed with yellow and fuscous scales, sometimes completely yellow on frons, but always black on vertex; collar

black. Antennae with 23—29 segments (26.3 ± 1.9, 14).

Male genitalia (figs. 142, 280, 328, 398, 406, 414, 415). Capsule length 296—321 µm (307.9 ± 11.6, 6). Tegumen (figs. 414, 415) produced into long tapering, pointed pseuduncus. Gnathos (fig. 328) with narrow, truncate central element. Valva (fig. 280) length 214—227 µm (221.0 ± 4.2, 7), outer margin strongly convex, inner margin slightly concave, almost straight; tip pointed, pointing posteriorly. Aedeagus (figs. 398, 406) 283—309 µm (297.1 ± 10.0, 6), carinae each divided into several blunt ending processes, number variable; vesica with about 20—22 long, needle shaped cornuti at right side, and many smaller cornuti in remaining part of vesica.

Female genitalia (figs. 222, 471). T7 without row of setae. T8 with two groups of scales and about 4 setae. Anal papillae confluent, with 23—32 setae in total. Vestibulum with vaginal sclerite, and dorsal spiculate pouch with very few minute spines only. Corpus bursae 440—550 µm, with pectinations in two lateral bands, at some distance from signa; signa dissimilar, longest 176—279 µm (240 ± 37.4, 7), shortest 167—231 µm (199.6 ± 24.9, 7), 2.0—2.4 × as long as wide. Ductus spermathecae with 2½—3 convolutions.

Larva. Pale yellow to yellowish white, with distinct brown ganglia. Head light brown. Penultimate instars with 12 black ventral plates.

Biology.

Hostplants. *Betula* spp., usually on *B. pubescens* Ehrh., or in Scandinavia *B. nana* L., less common on *B. pendula* Roth. In the Alps common on *Alnus viridis* (Chaix) DC. in Lam. & DC., which it seems to prefer even in the presense of *Betula*. In the west of Great Britain also recorded from *Corylus avellana* L.

Mine (fig. 513). Egg deposited on leaf-underside. Early mine much contorted gallery, with dispersed frass, staining leaf brown; later abruptly enlarges into elongate blotch, which often fills the space between two veins; dispersed black frass.

Life history. Univoltine. Larvae found from July to September, occasionally October in south, but most abundant in August and early September. Adults fly in May and June.

Distribution (fig. 531).

Common and widespread in Scandinavia and locally in the Alps, but elsewhere very local and always less common than *occultella*. Not yet recorded from Belgium, Spain (to be expected in Pyrenees) or Yugoslavia (Alps).

Remarks.

This species has been known since 1972 (Bradley et al.) under the name *E. mediofasciella*, but this was apparently based on a misinterpretation of the type, which in fact belongs to *occultella*.

The first available name appears now to be *minimella* Zetterstedt, a name of which the identity was hitherto unknown. The two specimens mentioned by Zetterstedt (1839) are both in Lund, and were examined by R. Johansson, who kindly communicated us his observations. The specimen labelled "*minimella* ♀" is identical with *woolhopiella*, and selected as lectotype. The other specimen, described as variety, is a female of *E.* (*Fomoria*) *weaveri* (Stainton).

There seem to be no grounds for regarding *viridicola* as a subspecies (Borkowski, 1975), since it is not geographically or morphologically separate, and shows no differences in allozyme pattern (Menken, in preparation). The fact that it often feeds only on *Alnus*, even in the presence of *Betula* might be explained by the oviposition preference of females, which they cannot follow in other parts of its range where *Alnus viridis* is absent. It would be interesting to study *minimella* populations — if present — in northern Siberia or Corsica, where other subspecies of *A. viridis* occur.

The character given by Beirne (1945) to separate *minimella* from *occultella* is incorrect and probably based on an artifact. It is questionable if the genitalia, depicted by him, belong to *minimella*, since he did not figure the characteristic cornuti.

Material examined: 17 ♂, 22 ♀. — Austria: 2 ♀, Gr. Glockner, Guttal, 2000 m, e.l. iv.1944, *Alnus viridis*, J. Klimesch (ZMA). — France: 1 ♂, 1 ♀, Pralognan (Savoie), 1450 m, e.l. 17—19.v.1980, *Alnus viridis*, E. J. van Nieukerken (ZMA). — Great Britain: 1 ♀ (lectotype, see above). — Italy: 1 ♀, Riva di Tures (Rain in Taufers), Knuttental, 1800 m, 14.vi.1976, G. Derra (coll. Derra). — Netherlands: 2 ♀, Lochem, Ampsensche Veld, e.l. 16—18.iv.1983, *Betula pubescens*, E. J. van Nieukerken; 1 ♀, Rockanje: Voornes Duin, e.l. 20—21.v.1980, *Betula pubescens*, E. J. van Nieukerken (ZMA). — Norway: 1 ♂, 1 ♀, Alta (Alten), 1.vii, Staudinger (MHUB); 4 ♂, 3 ♀, Grøvudalen, 900 m, 62.27 N, 8.54 E, e.l. 5—22.v.1981, *Betula pubescens*, E. J. van Nieukerken; 1 ♂, 1 ♀, 2 km E. Oppdal, 650 m, e.l. 7—8.v.1981, *Betula pubescens*, E. J. van Nieukerken; 6 ♂, 6 ♀, 11 km W. Rennebu, 600

m, e.l. 30.iv—12.v.1981, *Betula pubescens*, E. J. van Nieukerken (ZMA). — Switzerland: 1 ♂, 1 ♀ (lecto- and paralectotype of *viridicola*), Simplon, 1970 m, mine 19.ix.1936, *Alnus virid.*, Weber (ETHZ); No locality data: 3 ♂, 2 ♀, bred in captivity (from Norwegian material), e.l. 8—21.v.1982, *Betula* (ZMA).

Mines. — On *Alnus viridis*. — Austria: Lavamund. — France: Pralognan. — Italy: Trento. — Switzerland: near Genève. On *Betula nana*. — Norway: Grøvudalen. On *Betula pendula*. — Germany, West: Oberstadtfeld. On *Betula pubescens*. — France: Pralognan. — Netherlands: Dalfsen; Griendtsveen; Den Ham; Lochem; Mariënberg; Oostvoorne; Ootmarsum; Rockanje; Vilsteren; Vorden. — Norway: Grøvdal; Grøvudalen; Hoem; Oppdal; Rennebu.

NAMES OF DOUBTFUL STATUS, PROBABLY BELONGING TO *ECTOEDEMIA*

Nepticula bistrimaculella Heyden, 1861: 40.

According to Dr. H. Schröder (in litt.) there is no type-material of this species left in the Heyden collection in Frankfurt. From the description it seems to belong to the *subbimaculella* complex and to feed on *Betula*. Most likely this refers to an unusual case of xenophagy of either *heringi* or *subbimaculella*.

Nepticula gilvella Rössler, 1866: 395; 1881: 338.

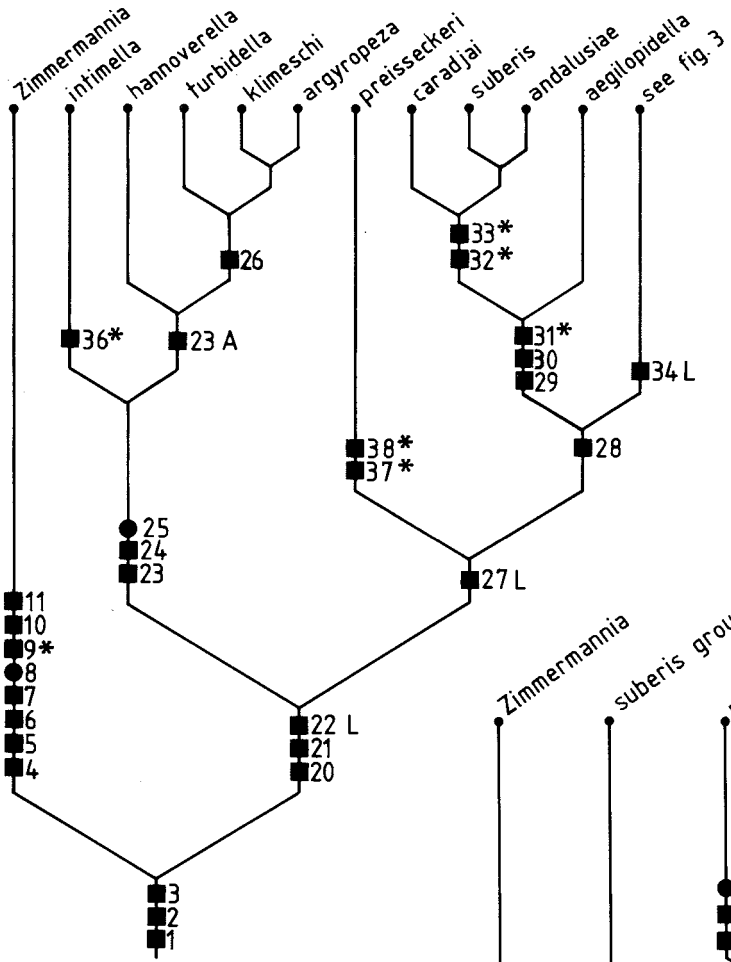
No material of this species is present in the Rössler collection in Wiesbaden (Dr. M. Geisthardt, in litt.) nor in Strasbourg (Dr. J. Matter, in litt.). The description is vague, so the identity of this species remains obscure. It could belong to one of the *Quercus* feeding *Ectoedemia* species.

CATALOGUE OF HOSTPLANTS OF WESTERN PALAEARCTIC *ECTOEDEMIA*

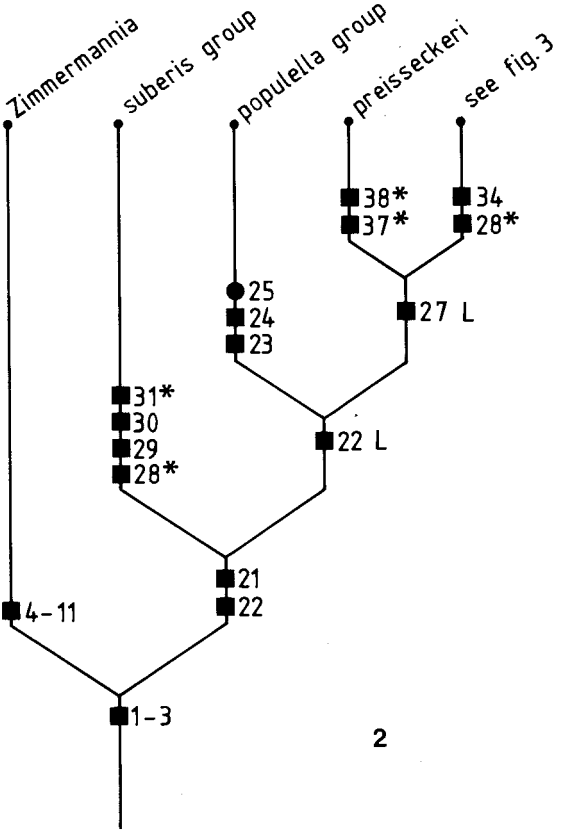
(Occasional occurrence on unusual hostplants in brackets)

SALICACEAE	
Salix fragilis L.	*E. intimella*
Salix caprea L.	*E. intimella*
Salix cinerea L.	*E. intimella*
Salix pentandra L.	*E. intimella*, (*occultella*)
Salix phylicifolia L.	*E. intimella*
Populus alba L.	*E. klimeschi*, *turbidella*
Populus canescens (Aiton) Sm.	*E. turbidella*
Populus tremula L.	*E. argyropeza*
Populus nigra L.	*E. hannoverella*, (*turbidella*?)
Populus × *canadensis* Moench.	*E. hannoverella*
BETULACEAE (incl. Corylaceae)	
Betula pendula Roth.	*E. occultella*, *minimella*
Betula pubescens Ehrh.	*E. occultella*, *minimella*
Betula nana L.	*E. occultella*, *minimella*
Alnus viridis (Chaix) DC. in Lam. & DC.	*E. minimella*
Corylus avellana L.	(*E. minimella*)
Carpinus betulus L.	*E.* (*Zimmermannia*) spec.
FAGACEAE	
Fagus sylvatica L.	*E. liebwerdella*
Castanea sativa Miller	*E.* (*Zimmermannia*) spec., *E. albifasciella*, *heringi*
Quercus coccifera L.	*E.* cf. *algeriensis*, *haraldi*, *suberis*, *andalusiae*, cf. *caradjai*
Quercus ilex L. and *rotundifolia* Lam.	*E.* (*Zimmermannia*) spec., *E. algeriensis*, *ilicis*, *heringella*, *haraldi*, *suberis*
Quercus suber L.	*E. haraldi*, *ilicis*, *suberis*
Quercus macrolepis Kotschy	*E. aegilopidella*
Quercus alnifolia Poech	*E. heringella*, *alnifoliae*
Quercus infectoria Olivier	*E.* cf. *caradjai*
Quercus cerris L.	? *E. caradjai*, *gilvipennella*, *cerris*, (*subbimaculella*), *liechtensteini*, *phyllotomella*

Quercus petraea L. s.l.	*E. caradjai, quinquella, nigrosparsella, albifasciella, subbimaculella, heringi*
Quercus robur L.	*E. atrifrontella, longicaudella, quinquella, albifasciella, (contorta), subbimaculella, heringi*
Quercus frainetto Ten.	*E. caradjai, E. albifasciella* complex
Quercus pyrenaica Willd.	*E. subbimaculella*
Quercus pubescens Willd. s.l.	*E. atrifrontella, caradjai, nigrosparsella, pubescivora, contorta, subbimaculella, heringi, (? liechtensteini)*
Quercus faginea Lam.	*? E. atrifrontella, E.* cf. *suberis, heringi*
Quercus ehrenbergi Kotschy	*E. caradjai*
ULMACEAE	
Ulmus spp.	*E. amani, preisseckeri*
ROSACEAE	
Spiraea media Franz Schmidt	*E. spiraeae*
Filipendula vulgaris Moench	*E. hexapetalae, angulifasciella*
Agrimonia eupatoria L.	*E. agrimoniae, (? rubivora, ? arcuatella)*
Aremonia agrimonioides (L.)DC.	*E. agrimoniae*
Rubus chamaemorus L.	*E. rubivora*
Rubus arcticus L.	*E. rubivora*
Rubus saxatilis L.	*E. rubivora*
Rubus caesius L.	*E. rubivora*
Rubus fruticosus L. aggr.	*E. rubivora, erythrogenella*
Rubus ulmifolius Schott	*E. erythrogenella*
Rosa spp.	*E. angulifasciella*
Sanguisorba officinalis L.	*E. angulifasciella*
Sanguisorba minor Scop.	*E. angulifasciella*
Potentilla erecta (L.) Räuschel	*E. arcuatella*
Potentilla sterilis (L.) Garcke	*E. arcuatella*
Fragaria vesca L.	*E. arcuatella*
Fragaria moschata Duchesne	*E. arcuatella*
Pyrus communis L.	*E. atricollis*
Malus sylvestris Miller	*E. atricollis*
? Sorbus sp.	*E. atricollis*
Mespilus germanica L.	*E. atricollis*
Crataegus laevigata (Poiret) DC.	*E. atricollis*
Crataegus monogyna Jacq.	*E. atricollis*
Prunus dulcis (Miller)	*E. spinosella*
Prunus tenella Batsch	*E. mahalebella*
Prunus cerasifera Ehrh.	*E. spinosella ?, (atricollis)*
Prunus spinosa L.	*E. spinosella*
Prunus domestica L.	*E. spinosella, (? mahalebella, ? atricollis)*
Prunus fruticosa Pallas	*E. mahalebella*
Prunus cocomilia Ten.	*E. mahalebella*
Prunus avium L.	*E. atricollis, mahalebella*
Prunus cerasus	*E. mahalebella*
Prunus mahaleb	*E. mahalebella, (atricollis)*
ANACARDIACEAE	
Pistacia terebinthus L.	*E. terebinthivora*
STAPHYLEACEAE	
Staphylea pinnata L.	*E. atricollis*


Zimmermannia
intimella
hannoverella
turbidella
klimeschi
argyropeza
preisseckeri
caradjai
suberis
andalusiae
aegilopidella
see fig. 3
26
33*
32*
36*
23 A
31*
30
29
34 L
38*
37*
28
25
24
23
27 L
11
10
9*
8
7
6
5
4
22 L
21
20
3
2
1

1


Zimmermannia
suberis group
populella group
preisseckeri
see fig. 3
38*
37*
34
28*
25
24
23
27 L
31*
30
29
28*
22 L
21
22
4-11
1-3

2

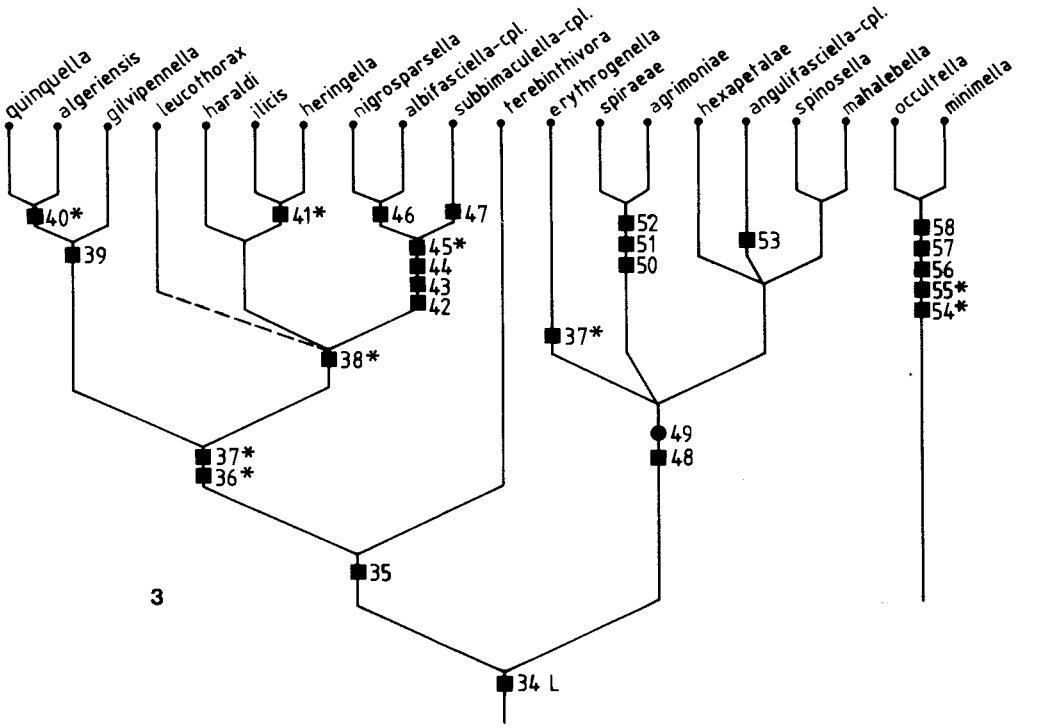
PHYLOGENY

I have attempted to reconstruct the phylogeny of *Ectoedemia*, using the cladistic approach as outlined by Hennig (1966) and refined amongst others by Wiley (1981).

Many difficulties arose with the assessment of the polarity of character states, especially within the subgenus *Ectoedemia*, since at first sight there seemed to be no correlation at all between the character distributions. This means that there is a considerable amount of either homoplasy, secondary reduction, reversal or cases of underlying synapomorphies (Saether, 1979), which require many ad hoc statements to explain apparently conflicting evidence. It must be stressed that many of such characters are relatively simple morphological structures, which therefore might have a simple genetic basis. If so, reversals and parallelisms could appear quite often in the course of evolution. Therefore it is not always feasible to use parsimony, where only the number of "ad hoc" statements counts, not their quality. The most parsimonious cladogram should only been chosen after some qualification or weighing of the "ad hoc" statements. For instance reduction of a simple structure is a much more likely event than the parallel development of a complex structure.

Another weak point in the phylogeny presented and discussed below, is that several monophyletic groups are defined by one character only. Moreover these characters are frequently suspected to be homoplasies, but similarity both in morphology and biology often coincides with the groups defined in the cladogram, and although part of this similarity might be based on plesiomorphies, it is also very likely that apomorphies, which can at present not be defined easily, play an important role in this similarity. An extension of this analysis with Nearctic and eastern Palaearctic species, and larvae could resolve some of the existing uncertainties.

The following analysis has been carried out by hand and as a consequence of the high pro-



Figs. 1—3. Cladograms representing proposed phylogeny within *Ectoedemia*. Black squares denote apomorphies; black dots characters with uncertain status. Character numbers explained in text; in-group parallelisms marked with an asterisk, frequent secondary loss denoted by L.
Figs. 1 and 2 give two alternative phylogenies for the basic branching in the genus, fig. 3 details the right branch of figs. 1 and 2.

portion of conflicting evidence, can only be regarded as a very rough preliminary analysis, open to further tests. The supposed apomorphies found with the outgroup-rule are given for pairs and groups of species. Autapomorphies for single species are not given here. Cladograms representing the proposed phylogenies are presented in figs. 1—3.

Sistergroup and monophyly of *Ectoedemia*

The sistergroup of *Ectoedemia* s.str. and *E.* (*Zimmermannia*) should be sought for amongst the taxa *Fomoria* Beirne, *Laqueus* Scoble or *Etainia* Beirne (van Nieukerken, in preparation). For neither of them convincing arguments have been found, so for the following outgroup comparisons all these taxa together have been taken into consideration. The following apomorphies support the monophyly of the two subgenera treated here and therefore corroborate the earlier suggestion of monophyly based on character 1 only (Scoble, 1983).

1. Loss of uncus. — The classical character (Beirne, 1945; Scoble, 1983). The uncus is also absent in Holarctic species of *Etainia*, but since it is present in some South African *Etainia* species, it has probably been lost independently. An uncus is present in almost all other Nepticulidae.
2. Sensillum vesiculocladum blisterlike, not branched (van Nieukerken & Dop, in preparation). — A more or less similar situation in some species of *Fomoria* is tentatively regarded as a parallelism.
3. Female with single sensillum vesiculocladum per flagellar segment (van Nieukerken & Dop, in preparation). — A unique character, checked for many species, representing all species groups.

Subgenus *Zimmermannia*

The Palaearctic and Nearctic species share a number of uniquely derived characters which demonstrate the monophyly of this subgenus, and therefore justify its re-establishment.

4. Larvae barkmining. — The basic feeding pattern in Nepticulidae larvae is leaf-mining. Although some other species make mines in bark of branches or shoots, only *Zimmermannia* larvae make mines in the bark of thick branches or trunks of trees, especially Fagaceae. This character led Hering (1940) to erect the genus *Zimmermannia*, but later authors doubted the validity of this character to define a taxon (i.e. Wilkinson & Newton, 1981). In my opinion it is a sound autapomorphy for the subgenus.
5. Larval life lengthened, with 6—8 instars. — As a rule Nepticulidae larvae have four or five larval instars, with probably four as the most generalised condition (van Nieukerken & Jansen, in preparation). However, this apomorphy is subject to some reservation as it is only known with certainty for *atrifrontella*, *liebwerdella* and *longicaudella*.
6. Colour pattern of forewings largely lost, colour uniform or irrorate. — The presence of light dots or fasciae is assumed to be the generalised condition in Nepticulidae.
7. Male hindwing with pronounced costal emargination. — The costal emargination, unknown outside *Zimmermannia*, is associated with the relatively long hair-pencil. In some species with reduced or without hair-pencil, the emargination is absent. A hair-pencil is considered to belong to the ground-plan of *Ectoedemia* and is also present in several non-European species of *Etainia*, *Laqueus* and *Fomoria*. Therefore the reduction of the hair-pencil and hence of the emargination are thought to be secondary (character 18).
8. Large size of ventral carinae and corresponding dorsal fold of valva. — A peculiar feature, which is clearly seen in undissected genitalia.
9. Female with many long tactile setae on tergites 7 and 8. — This character needs investigation in Nearctic species. It is probably secondary reduced in *amani* and *liguricella* (character 19).
10. Bursa copulatrix extremely long and narrow.
11. Margin of signa wider than individual cells.

The available characters are insufficient to present a cladogram of the western Palaearctic species of *Zimmermannia*, however some supposed apomorphies for groups of species are given below and listed in table 1.

12. Aedeagus constricted.
13. Dorsal and dorsolateral carinae connected by rim.

Characters 12 and 13 show the sister-relationship between *atrifrontella* and *liebwerdella*.

14. Vesica with folded sclerotised plate. — This character is shared by the first three

Table 1. Data-matrix of some important characters in *Ectoedemia* (*Zimmermannia*) species. Species given with their number and first three letters of epitheton, characters and numbers refer to text. — 1 = character present (supposed apomorphy), 0 = character absent (either by plesiomorphy or secondary reduction), ? = status unknown.

Spec.	atr	lie	lon	his	mon	ama	nur	lig
Char.	1	2	3	4	5	6	7	8
12	1	1	0	0	0	0	0	0
13	1	1	0	0	0	0	0	0
14	1	1	1	?	0	0	0	0
15	0	0	1	1	1	1	1	1
16	0	0	1	?	1	1	1	1
17	0	0	0	0	1	1	0	0
18	0	0	0	0	0	0	1	1
19	0	0	0	0	0	1	0	1

species and therefore in conflict with the following characters.

15. Valva with inner (mesal) lobe. — This lobe is only slightly developed in *longicaudella* and *nuristanica*.
16. Ductus spermathecae with more than 3½ convolutions. — The basic number is 2 to 3 convolutions, increase of this number occurred independently in various other groups.

Characters 15 and 16 indicate a monophyly of the species 3 to 8, but they are both only slightly developed in *longicaudella*, which together with character 14 make its position uncertain. The valval lobe is also only slightly developed in *nuristanica*, but it is present in many Nearctic species, and it is therefore not at all unlikely that the lobe belongs to the ground-plan of *Zimmermannia* and has been lost in a few species.

17. Vesica with stout sclerotised cornutus. — Present in *amani*, *monemvasiae* and also in several Nearctic species, in which the cornutus bears also many secondary spines. It is not clear if this character is a homologue of the sclerotised plate (character 14) and hence part of the same transformation series. In that case either 14 or 17 is invalid as autopomorphy.
18. Loss of hair-pencil (and costal emargination) in ♂. — See character 7.
19. Loss of long setae on abdominal tip in ♀. — See character 9.

Subgenus *Ectoedemia* s.str.

The following characters of the female genitalia are assumed to be apomorphic for the subgenus:

20. Vestibulum with circular vaginal sclerite. — Vaginal sclerites are present in several other nepticulids and according to Scoble (1983) belong to the ground plan of Trifurculini, but they usually have a different shape from the type here, which is unique for *Ectoedemia* s.str. It is only absent in *spiraeae* and *agrimoniae*.
21. Vestibulum with spiculate pouch. — Probably correlated with 20, this is another unique character for the subgenus, which is absent in the same two species and *hexapetalae*, and less distinct or without spicules in some other species.
22. Vestibulum with patch of densely packed pectinations. — Shared by all species of the *populella* group, *subbimaculella* group, *preisseckeri*, *terebinthivora* and *erythrogenella*. It is either another synapomorphy for the subgenus (fig. 1) or of a large part (fig. 2), but in both cases secondarily lost in many species.

The subgenus also exhibits high uniformity in several other characters. For instance in the shape of the valva, the aedeagus and genital capsule; the general shape of the female genitalia and several biological characters. Yet it appears to be impossible to ascribe any of these similarities to straightforward apomorphies, indeed some of them are rather plesiomorphic. Some other features, which easily identify a species as belonging to *Ectoedemia* s.str. cannot be regarded as belonging to the groundplan because they are absent in too many species, to explain them all as secondary losses. However, present evidence justifies the acceptance of *Ectoedemia* s.str. as a monophyletic entity.

Subdivision of the subgenus into species groups is desirable, for coping with the large number of species. The aim has been to make monophyletic groups, but on the basis of the species treated here, it is difficult, and the subdivision only tentative. The groups used here are recognised by a combination of similarities in both morphological and biological characters. For some species which were hard to place, the biology provided the decisive factors, so that all groups recognised here feed on one hostplant family. Most of these groups are likely to be monophyletic, but at least one is suspected to be paraphyletic. With the characters given, I have presented two alternative phylogenies in figs. 1—3, but both still require many ad hoc

statements. The characters used are discussed below and partly presented in the data-matrix in table 2. Characters are treated in the order in which they appear in the cladograms figs. 1 and 3, which I regard at present as the best alternatives. The sequence of species in the main body of the text also follows these cladograms.

The *populella* group forms one of the best defined groups in *Ectoedemia*, with a high overall similarity and the following supposed apomorphies:

23. Petiole or midrib miners. — Just as in the case of *Zimmermannia*, this feeding pattern is so unique and different from leafmining, that it can be safely regarded as an apomorphy for the *populella* group. Within this group the petiole-mining is probably more derived than the midrib mine of *intimella* in *Salix*, which could be the first step in the evolution from a "normal" leafmine into a petiole mine. Hence, the petiole-mine in *Populus* is regarded here as a further step in the transformation series and as such used with number 23A in fig. 1. A mine on *Ostrya*, strikingly similar to that of *intimella*, has been figured by Clemens (1872: figure on p. 27), but remains undescribed.
24. Hostplant: Salicaceae. — The character "hostplant" is difficult to interprete, but certainly useful in some cases. It is possible that oak (*Quercus*) is the ancestral hostplant for *Ectoedemia* s.str. because it is also the main hostplant for the sister-group, *Zimmermannia*. This explains the fact why two rather different groups mine in *Quercus*; they have retained their plesiomorphic hostplant. Salicaceae certainly seems to be a good apomorphy. In other leaf mining taxa, species feeding on Salicaceae are closely related (*Stigmella*, *Phyllocnystis*).
25. Denticles on spiculate pouch single, equally spaced. — This character is diagnostic for the *populella* group, but it is impossible to decide if it is derived or ancestral.

On grounds discussed above *intimella* is regarded as the sister-species of the remaining *Populus* feeding species. The following character seems to be an apomorphy for *turbidella* and *klimeschi*.

26. Aedeagal carinae very well developed and large. — The total configuration of aedeagus, and in fact the male genitalia as a whole is very similar in these two species. This character is of course inappropriate for the parthenogenetic *argyropeza*. On the basis of high similarity this species can be regarded as closely related to *klimeschi*, which might be the sexually reproducing ancestor of *argyropeza*.

For the remaining species groups the following character is tentatively regarded as the only apomorphy:

27. Second and third larval instar with 12 ventral plates. — A unique character present in many species of *Ectoedemia* s.str., but again often absent from closely related species. It does not occur in the *populella* group and *suberis* group. It is supposed to be an apomorphy for the subgenus without the *populella* group in fig. 1 or for the subgenus without the *suberis* group in fig. 2. It is either lost in the species in which it is absent, or it is an underlying apomorphy.

E. preisseckeri has some affinities with the *albifasciella* complex but since it lacks apomorphies 28, 35 and 36 is placed here in a group of its own, as a sister-group of the remaining species. It is probably closely related to the Nearctic *E. ulmella* (Braun).

All other species belong to one monophyletic entity on the basis of the following apomorphy:

28. Aedeagus with only one pair of carinae. — Within *Ectoedemia* s.l. the presence of several (2—4) pairs of carinae is widespread in the other subgenera, and therefore the plesiomorphic condition on grounds of outgroup argument. In cladogram fig. 1 the reduction to one pair is regarded as an apomorphy for the remaining groups. The very similar configuration of the carinae in all species favours this solution, but a reduction on several occasions cannot be excluded and leads for instance to the cladogram in fig. 2. In *spiraeae* the dorsal carinae are also lost.

The species of the *suberis* group share the following apomorphies:

29. Aedeagus very long in relation to capsule.
30. Signa oval. — The plesiomorphic condition of the signa seems to be narrow elongate.
31. Larva green. — Most nepticulid larvae are yellow or more transparent white. Bright green larvae occur scattered throughout the family, especially in *Stigmella*, but in *Ectoedemia*, apart from all species in the *suberis* group only *algeriensis* and *gilvipennella* have green larvae.

Within the *suberis* group, *aegilopidella* takes an isolated position, but the remaining species

Table 2. Data-matrix of some important phylogenetic characters in *Ectoedemia* (s.str.) species. Species given with their number and abbreviation, character numbers refer to text. — 1 = character present (supposed apomorphy), 0 = character absent (either by plesiomorphy or secondary reduction), — = character not relevant, ? = character state unknown, H = Hostplant family or genus, A = Anacardiaceae, B = Betulaceae, R = Rosaceae, Q = Quercus, S = Salicaceae, U = Ulmaceae.

Spec.	int	han	tur	kli	arg	pre	car	sp.	sub	and	aeg	qui	alg	gil	leu	har	ili	her	aln	nig	alb	cer	pub	con	sub	her	lie	phy	sp.	ter	ery	spi	agr	hex	ang	atr	arc	rub	spi	mah	occ	min
Char.	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
22	1	1	1	1	1	1	0	?	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
23	1	1	1	1	1	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0
25	1	1	1	1	1	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	1	0	?	0	0	0	1	0	0	?	0	0	0	?	1	1	1	1	?	0	0	0	0	?	1	0	0	0	?	1	1	1	1	0	0	1	1
28	0	0	0	0	—	0	1	1	1	1	1	1	1	1	1	1	1	1	?	1	1	1	1	1	1	1	1	1	?	1	1	1	1	1	1	1	1	1	1	1	1	1
30	0	0	0	0	0	1/0	1	?	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1/0
31	0	0	0	0	0	0	1	?	1	1	1	0	1	1	?	0	0	0	?	0	0	0	0	?	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	1	?	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	1	?	1	1	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	—	0	0	0	0	0	0	1	1	1	1	1	1	1	?	0	0	0	0	0	0	0	0	0	?	0	0	0	0	1	1	1	1	1	1	1	0	0
35	0	0	0	0	0	0	0	?	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0
36	1	0	0	0	0	0	0	?	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	1	0	?	0	0	0	1	0	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	—	1	0	0	0	0	0	0	0	0	1	1	1	1	?	1	1	1	1	1	1	1	1	1	?	0	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	—	0	0	0	0	0	0	0	0	0	0	0	0	0	?	1	1	1	1	1	1	1	1	1	?	0	0	1	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	1	1	1	?	1	1	1	1	?	0	0	0	0	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	1	1	1	1	0	0
H	S	S	S	S	S	U	Q	?	Q	Q	Q	Q	Q	Q	?	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	?	A	R	R	R	R	R	R	R	R	R	R	B	B

form a tight group with the following apomorphies:

32. T7 and 8 with many long tactile setae. — This apomorphy occurs in various distantly related species, feeding on evergreen *Quercus*. It could be an apomorphy for this part of the *suberis* group, and secondarily lost in *andalusiae*.
33. Ductus spermathecae with more than 3½ convolutions. — Although the increase of the number of convolutions occurred several times in Nepticulidae, it is supposed that it is an apomorphy for this part of the *suberis* group.

The remaining species of *Ectoedemia* s.str. most likely form a monophyletic unit, at least based on character 34. In fig. 2 character 28 is also an apomorphy but as a parallelism with the *suberis* group. The phylogeny within this part of the genus is still far from resolved, the characters showing a very complicated pattern, but a tentative phylogeny is given in fig. 3.

34. Gnathos with central element divided into distal spatulate and basal serrate part. — The single, smooth central element is the generalised condition in Nepticulidae (Scoble, 1983). The "divided" gnathos only occurs in the *subbimaculella* group, excluding the two species complexes and *nigrosparsella*, and in the *angulifasciella* group, excluding the first three species. Since the structure is so uniform, it is most unlikely that it originated twice independently, therefore its absence in part of these groups must be explained by reversal or its presence by underlying synapomorphy. Alternatively this character is only an apomorphy for species 20—26 and 42—48 together, in which case the hypotheses of monophyly of the *subbimaculella* group and *angulifasciella* group both must be refuted, but on parsimonious grounds I prefer the present solution.

E. terebinthivora and the *subbimaculella* group are here regarded as sister-groups on the basis of the following:

35. Signa distinctly dissimilar in shape. — Here the dorsal signum is much longer than the ventral, it reaches almost into the vestibulum, and the shape of the posterior part is different from the other signum. A slightly similar situation occurs in *spiraeae*.

The *subbimaculella* group is considered a monophyletic entity on the basis of the next two characters:

36. Corpus bursae without pectinations. — Pectinations on the bursa belong to the ground-plan of Nepticulidae, their loss is therefore an apomorphy. The only other *Ectoedemia* species with this character, probably as a parallelism, is *intimella*.
37. T7 with a distinct row of setae along anterior margin of T8. — This row occurs in most species of the *subbimaculella* group but also in *preisseckeri* and *erythrogenella*. Probably it has secondarily evolved into a group of long setae similar to character 32 in the species *algeriensis* and *leucothorax*.

A large part of this group shares the following character:

38. Costal bristles present in male. — The interpretation of this character is open to doubt. In itself the presence of costal bristles belongs to the groundplan of Nepticulidae. Costal bristles and the male hair-pencil are homologous structures; they always occur more or less in the same position, and hair-pencil and costal bristles are mutually exclusive. The presence of a hair-pencil is regarded as part of the groundplan of *Ectoedemia* s.str., and in this case the presence of costal bristles can best be explained as a reversal and therefore an apomorphy within the subgenus. The alternative explanation that these species retained the plesiomorphic condition implies the parallel development of a hair-pencil in many cases, in which case it could be based on an underlying apomorphy. The evidence here is not sufficient to eliminate this explanation entirely, but the presence of this character in a group of species, which also shares other attributes favours the reversal interpretation at present.

The remaining three species, *quinquella*, *algeriensis* and *gilvipennella*, possess a hair-pencil, in this interpretation the plesiomorphic condition of 38. They are tentatively placed as the sister-group of the other species of the *subbimaculella* group with the following possible apomorphy:

39. Forewing with a pale discal spot in second half. — A distinct feature of *quinquella* and *algeriensis*. *E. gilvipennella* has a completely pale forewing with some scattered dark scales, which can be explained as an enlargement of the white spots and hence as a further step in the transformation series 39, but this remains a weak character which needs corroboration.

E. quinquella and *algeriensis* clearly form a pair of sister species, based on the following apomorphy and corroborated by their high similarity:

40. Male hindwing with patch of special scales near hair-pencil.

E. leucothorax cannot be placed with certainty in the cladogram. The next three species, *haraldi*, *ilicis* and *heringella* are considered to form a monophyletic group, merely based on similarities. Especially mine form and life history are very similar. *E. ilicis* and *E. heringella* are most likely sister-species with the following apomorphy:

41. Loss of costal spot in forewing.

E. nigrosparsella, the *albifasciella* complex and the *subbimaculella* complex form a well defined monophyletic entity based on the following characters:

42. Valva with many setae on inner (mesal) surface.
43. Gnathos smooth and undivided. — A reversal of character 34.
44. Mine type. — The *albifasciella* and *subbimaculella* complexes have a unique mine type: a narrow gallery, usually following a vein, abruptly enlarging into a square or triangular blotch, often in vein axil. Only *nigrosparsella* has a different type but is on other grounds regarded as a relative of the *albifasciella* complex.
45. Hostplant deciduous *Quercus*. — This might be correlated with character 44. Evergreen species form the majority of the Fagaceae and deciduous forms occur exclusively in temperate regions. From this fact it seems likely that ancestral oak-mining Nepticulidae lived on evergreen oaks. However, this point needs further research, especially in the extensive evergreen cupuliferous forests in east and southeast Asia.

The *albifasciella* complex and *nigrosparsella* are characterised by:

46. Convolutions of ductus spermathecae widened. — Except in *albifasciella* the number of convolutions is also increased. On the grounds of the number of convolutions *nigrosparsella* seems close to *contorta*, but otherwise it is quite different from the complex.

The *subbimaculella* complex can be characterised by:

47. Forewing with basal spot.

The *angulifasciella* group is a rather loose aggregrate of species sharing the hostplant (Rosaceae, character 48), which can hardly be regarded as a sound synapomorphy, considering the wide variety of unrelated Nepticulidae and many other Microlepidoptera feeding on this plant family. The following morphological character might be the only true synapomorphy for this group:

49. Forewing with metallic coloured fascia. — This is not or hardly developed in *spiraeae* and *hexapetalae*, and remains a weak character. It is not unlikely that this group is in fact paraphyletic in terms of either the *subbimaculella* or *occultella* group or both. Especially *E. erythrogenella* is different from other species in the group, and shares character 37 with the *subbimaculella* group, and moreover resembles *albifasciella* externally.

E. spiraeae and *agrimoniae* form a pair on the following grounds:

50. Vaginal sclerite lost.
51. Spiculate pouch lost.
52. T8 in female divided.

The remaining species of this group possibly form a monophyletic entity based on their similarity, but I failed to find a distinct apomorphy. The branching within this group is presented as an unresolved trichotomy between *hexapetalae*, the *angulifasciella* complex and the pair *spinosella* and *mahalebella*. For the *angulifasciella* complex the following character is an apomorphy:

53. Carinae with many basal spines.

The *occultella* group is a sound monophyletic entity on the following apomorphies:

54. Cilia-line lost.
55. Tegumen cuspidate.
56. Carinae divided into blunt ending processes.
57. Pectinations on bursa arranged in bands.
58. Hostplant Betulaceae.

However, the affinities of this group are not clear. It must be placed somewhere between the *suberis* and *angulifasciella* groups since it shares characters 27 and 28 with those groups, but any indication about its sister-group relationship is lacking, hence its tentative placement at the end.

BIOGEOGRAPHY

Discussion of the biogeography is limited to a few remarks owing to the scanty knowledge of the distribution. The subgenera discussed here are both widely distributed in the Holarctic region, probably with the highest number of

(mostly unknown) species in the Eastern Palaearctic, as indicated by some preliminary work on that fauna. In the Southern Hemisphere only *Ectoedemia* s. str. is known with three species from South Africa (Scoble, 1978, 1979), a very low number in relation to the total number of species (Scoble, 1983). In a large collection of Australian Nepticulidae the genus was not present (Scoble, 1983), neither was it in New Zealand (Donner and Wilkinson, pers. comm.). Unfortunately little is known from the Oriental and Neotropical regions, so that the conclusion that the group is predominantly Holarctic is not yet justified. In fact, the high number of Fagaceae feeding species might lead to the assumption that these subgenera are well represented in the Fagaceous forests of the Oriental region.

Many of the widespread European species probably have a distribution which goes much further east, but hardly any data are available from the Soviet Union. Many species are restricted to the mediterranean region and some of these (*quinquella*, *erythrogenella*) have an atlantic-mediterranean distribution type.

The species pairs *heringella-ilicis* and *contorta-pubescivora* are examples of vicariant species pairs with an eastern and western mediterranean element. These species are closely related and feed on the same hostplant, so that they most likely originated from populations isolated during the glaciation in west or east mediterranean refugia.

ACKNOWLEDGEMENTS

I would like to thank the following people for the loan of material and for information: Mrs. P. Arduino (Roma), Prof. Dr. R. Buvat (Marseille), Dr. A. Casale (Torino), Dr. D. R. Davis (Washington, D.C.), Mr. G. Derra (Bamberg), Dr. W. Dierl (München), Dr. J. P. Duffels (Amsterdam), Dr. W. Foster (Cambridge), Mr. A. van Frankenhuyzen (Wageningen), Dr. M. Geisthardt (Wiesbaden), Dr. Ph. Georges (Brussel), Mr. C. Gielis (Lexmond), Dr. L. Gozmány (Budapest), Dr. F. Gregor (Brno), Mr. B. Gustafsson (Stockholm), Dr. H. Hanigk (Lobbach), Prof. Dr. H. J. Hannemann (Berlin), Mr. W. Hogenes (Amsterdam), Mr. K. J. Huisman (Melissant), Mr. R. Johansson (Växjö), Dr. R. de Jong (Leiden), Mr. O. Karsholt (København), Dr. F. Kasy (Wien), Dr. J. Klimesch (Linz), Mr. J. Koster (Callantsoog), Dr. N. P. Kristensen (København), Mr. J. Kuchlein (Wageningen), Mr. J. Kyrki (Oulu), Mr. P. Leraut (Paris), Dr. G. Luquet (Paris), Dr. J. Matter (Strasbourg), Dr. E. S. Nielsen (Canberra), Prof. Dr. D. Povolný (Brno), Dr. R. Puplesis (Leningrad), Prof. Dr. J. Razowski (Krakow), Dr. U. Roesler (Karlsruhe), Dr. K. Sattler (London), Prof. Dr. W. Sauter (Zürich), Dr. H. Schröder (Frankfurt), Mr. W. Speidel (Karlsruhe), Dr. P. D. Syme (Salt Ste. Marie), Dr. E. Traugott-Olsen (Marbella), Mr. K. Tuck (London), Dr. P. Viette (Paris), Dr. S. E. Whitebread (Magden) and Mr. J. Wolschrijn (Apeldoorn). Of these I would especially acknowledge the help of R. Johansson, for the wealth of unpublished data he allowed me to use in this work. For their hospitality and help during collecting trips I am indebted to Col. and Mrs. A. M. Emmet (Saffron-Walden), Mrs. A. Hallin and Mr. E. Traugott-Olsen (Marbella) and Dr. F. Kasy (Wien). I would like to thank my colleagues of the Vrije Universiteit — Dr. Koos Boomsma, Dr. Georgina Bryan and Dr. Steph Menken — for their advice and cooperation during the course of my studies and in joint collecting-trips, and Steph Menken also for all his data on allozyme studies of *Ectoedemia*. I am indebted for advice and critical remarks to Prof. Dr. C. Wilkinson, who also initiated this study. Similarly Dr. R. de Jong is acknowledged. Technical assistance by Mr. Kees Alders, Mr. Bart Jan van Cronenburg, Mrs. Daisy Kloos and Mr. Adri Rol, especially in preparation of genitalia and rearing work is much appreciated. I wish to acknowledge Messrs T. Feijen, P. W. A. van Huijstee and B. H. van Nifterik for assisting with photographic work, Mrs. Silvia Richter and Désirée Hoonhout for typing the manuscript, and Mr. L. Sanna for preparing figs. 1—3. For collecting trips to Greece and Central Europe grants were received from the Netherlands Organisation for the Advancement of Pure Research (ZWO) and the Uyttenboogaart-Eliasen foundation.

REFERENCES

Ballet Fletcher, W. H., 1882. *Nepticula agrimoniae* Heyden, a species new to Britain. — Entomologist's mon. Mag. 18: 211.

Bedell, G., 1848. Description of *Microsetia quinquella*, a new species of moth of the family Tineidae. — Zoologist 6: 1986.

Beirne, B. P., 1945. The male genitalia of the British Stigmellidae (Nepticulidae) (Lep.). — Proc. R. Ir. Acad. (B) 50: 191—218.

Borkowski, A., 1969. Studien an Stigmelliden (Lepidoptera). Teil I. Zur Verbreitung, Biologie und Ökologie der Stigmelliden in den polnischen Sudeten. — Polskie Pismo ent. 34: 95—122.

Borkowski, A., 1970. Studien an Stigmelliden (Lepidoptera). Teil III. Beitrag zur Kenntnis der Stigmellidenfauna Polens. — Polskie Pismo ent. 40: 541—555.

Borkowski, A., 1972. Studien an Nepticuliden (Lepidoptera). Teil IV. Bemerkungen zur Nomenklatur und Systematik der Familie Nepticulidae. — Polskie Pismo ent. 42: 689—709.

Borkowski, A., 1975. Studien an Nepticuliden (Lepidoptera) Teil VI. Die Verbreitung der Nepticuliden in Polen. — Polskie Pismo ent. 45: 487—535.

Bradley, J. D., D. S. Fletcher & P. E. S. Whalley, 1972. Kloet and Hincks. A checklist of British Insects. Second Edition (Revised) part 2: Lepidoptera. — Handbooks Ident. Br. Ins. 11(2): i—viii, 1—153.

Buhr, H., 1935. Mecklenburgische Minen. III. Lepidopteren-Minen. — Stett. ent. Ztg. 96: 131—159.

Busck, A., 1907. New american Tineina. — Proc. ent. Soc. Wash. 8: 86—99.

Busck, A., 1913. Two microlepidoptera injurious to Chestnut. — Proc. ent. Soc. Wash. 15: 102—104.

Busck, A., 1914a. The chestnut bastminer. — Insecutor Inscit. menstr. 2: 3, 4.

Busck, A., 1914b. Descriptions of new Microlepidoptera of forest trees. — Proc. ent. Soc. Wash. 16: 143—150, pls. 7, 8.

Clemens, B., 1872. In: Stainton, H. T. (ed.). The Tineina of North America. — John van Voorst, London.

Davis, D. R., 1978. A revision of the North American moths of the superfamily Eriocranioidea with the proposal of a new family, Acanthopteroctetidae (Lepidoptera). — Smithson. Contr. Zool. 251: 1—131.

Doets, C., 1947. *Zimmermannia heringiella* nov. spec. Nepticulidae (Lepidoptera). — Tijdschr. Ent. 88: 504—506.

Dorfmann, H., 1960. Über das Vorkommen von Rindenminen in Berlin (Lepid.) — Mitt. Dt. ent. Ges., E. V., 19: 17—19.

Doubleday, H., 1859. The zoologist synonymic list of British butterflies and moths, 2nd ed. — Edward Newman, London.

Drağhia, I., 1967. Insectes mineurs. — Trav. Mus. Hist. nat. "Grigore Antipa", 7: 241—254.

Dufrane, A., 1942. Microlépidoptères de la faune Belge (1re note). — Bull. Mus. r. Hist. nat. Belg. 18(5): 10—12.

Dufrane, A., 1949. Microlépidoptères de la faune Belge, (6e note). — Bull. Inst. r. Sci. nat. Belg. 25(13): 1—11.

Dugdale, J. S., 1974. Female genital configuration in the classification of Lepidoptera. — New Zealand J. Zool. 1: 127—146.

Emmet, A. M., 1970a. *Dechtiria turbidella* at Wicken Fen (Lep., Nepticulidae). — Entomologist's Rec. J. Var. 82: 37—41.

Emmet, A. M., 1970b. *Stigmella spinosella* Joannis (Lep. Nepticulidae); a species new to Britain. — Entomologist's Rec. J. Var. 82: 121—123.

Emmet, A. M., 1971. Notes on some of the British Nepticulidae. — Entomologist's Rec. J. Var. 83: 75—83, 136—142, 163—171, 240—248, 278—282, 300—304.

Emmet, A. M., 1973. Notes on some of the British Nepticulidae. II. — Entomologist's Rec. J. Var. 85: 77—80, 176—180, 278—283.

Emmet, A. M., 1974a. Notes on some of the British Nepticulidae. II. — Entomologist's Rec. J. Var. 86: 75—80, 103—108, 147—153.

Emmet, A. M., 1974b. *Ectoedemia subapicella* (Stainton, 1886) (Lep., Nepticulidae) a synonym of *Ectoedemia albifasciella* (Heinemann, 1871). — Entomologist's Gaz. 25: 274—276.

Emmet, A. M., 1947c. *Ectoedemia* (*Dechtiria*) *erythrogenella* (de Joannis, 1907) (Lep.: Nepticulidae). A species new to Britain. — Entomologist's Rec. J. Var. 86: 129—130, pl. 9.

Emmet, A. M., 1976. Nepticulidae. — In: J. Heath (ed.). The moths and butterflies of Great Britain and Ireland 1: 171—267, pls. 1—7, 11, 12.

Emmet, A. M., 1979. Nepticulidae. — In: A. M. Emmet (ed.), A field guide to the smaller British Lepidoptera: 14—112. The British Entomological and Natural History Society, London.

Ford, L. T., 1950. A new Stigmellid. — Entomologist's Gaz. 1: 39, 40.

Frankenhuyzen, A. van & D. de Vries, 1979. Waarnemingen aan *Ectoedemia argentipedella* (Zeller), een mineermot op berk (Lep., Nepticulidae). — Ent. Ber., Amst. 39: 129—135.

Freeman, T. N., 1962. A new species of *Nepticula* v. Heyd. on Birch (Lepidoptera: Nepticulidae). — Can. Ent. 94: 522, 523.

Frey, H., 1856. Die Tineen und Pterophoren der Schweiz: i—xii, 1—430. — Meyer & Zeller, Zürich.

Frey, H., 1857. Revision der Nepticuliden. — Linn. ent. 11: 351—446.

Frey, H., 1858. *Nepticula agrimoniae*. — Ent. Wkly Intell. 4: 43, 44.

Frey, H., 1870. Ein Beitrag zur Kenntniss der Microlepidopteren. — Mitt. Schweiz. ent. Ges. 3: 244—296.

Gerasimov, A. M., 1952. Nasekomye češuekrylye 1, 2. Gusenicy. — Fauna SSSR, N.S. 56: 1—338.

Glitz, C. T., 1872. Neue Microlepidopteren. — Stett. ent. Ztg 33: 23—26.

Gregor, F. & D. Povolný, 1955. Nové a významné nálezy lepidopter z Československa. (Neue und interessante Lepidopteren aus der Csr). — Čas. morav. Mus. Brně 40: 114—129.

Gregor, F. & D. Povolný, 1983. Description of *Ectoedemia spiraeae* (Gregor & Povolný, 1955) and designation of type specimens of *Lithocolletis desertella* Gregor & Povolný, 1949. — Čas. morav. Mus. Brně, 68: 173—180.

Grönlien, N., 1937. Tillegg til Norges Lepidopterfauna. — Norsk ent. Tidsskr. 5: 29—31.

Groschke, F., 1944.Neues über Minierer aus dem Mittelmeergebiet. — Mitt. Münchn. ent. Ges. 34: 115—124.

Gustafsson, B., 1981a. Characters of systematic importance in european Nepticulidae larvae (Lepidoptera). — Ent. scand. 12: 109—116.

Gustafsson, B., 1981b. New leaf-mining moths of the family Nepticulidae from Cyprus, Greece (Lepidoptera). — Ent. scand. 12: 453—496.

Haase, J. 1968. Zum Vorkommen von Rindenminen an Holzpflanzen in der DDR. — Ent. Ber., Berlin 1968: 61—68.

Haworth, A. H., 1828. Lepidoptera Brittanica. 4: 513—609. — J. Murray, London.

Heinemann, H. von, 1862. Einige Bemerkungen über die Arten der Gattung *Nepticula*. — Wien. ent. Monatschr. 6: 237—268, 301—320.

Heinemann, H. von, 1871. Nachtrag zu den Bemerkungen über die Arten der Gattung *Nepticula*. — Berl. ent. Z. 15: 209—223.

Heinemann, H. von & M. F. Wocke, 1877. Die Schmetterlinge Deutschlands und der Schweiz. Zweite Abtheilung. Kleinschmetterlinge. Band 2. Die Motten und Federmotten. Heft 2: 389—825, 1—102, V—VI. — C. A. Schwetke und Sohn, Braunschweig.

Hennig, W., 1966. Phylogenetic systematics. — University of Illinois Press, Urbana.

Hering, M., 1932. Die Minenfauna von Tighina (Bender) in Bessarabien. (2. Beitrag zur Kenntnis der Minenfauna von Gross-Rumänien). — Bull. Sci. Acad. Roum. 15: 1—22.

Hering, M., 1935. Minenstudien 15. — Z. PflKrankh. PflPath. PflSchutz 45: 1—15.

Hering, M., 1940. *Zimmermannia liebwerdella* (Zimmermann). Ein Nachwort. — Mitt. zool. Mus. Berlin 24: 266.

Hering, M., 1942. Eine neue *Nepticula* der *subbimaculella*-Gruppe, *Nepticula zimmermanni* spec. nov. von *Quercus pubescens* Willd. — Mitt. Dt. ent. Ges. 11: 26—29.

Hering, M., 1943. Untersuchungen über die Weiden-Nepticuliden I. — Z. Wien. ent. Ges. 28: 273—278.

Hering, M., 1957. Bestimmungstabellen der Blattminen von Europa, 3 vols, 1185 pp., 725 figs. — Junk, 's-Gravenhage.

Herrich-Schäffer, G. A. W., 1853—1855. Systematische Bearbeitung der Schmetterlinge von Europa, zugleich als Text, Revision und Supplement zu Jakob Hübner's Sammlung europäischer Schmetterlinge, 5, Die Schaben und Federmotten: 1—394, 124 + 7 + 1 pls. — G. J. Manz. Regensburg.

Herrich-Schäffer, G. A. W., 1860. Revision der Europäischen Schmetterlingfauna. — KorrespBl. Sammler Ins. 1: 59—61.

Herrich-Schäffer, G. A. W., [1861]. Neue Schmetterlinge aus Europa und den angrenzenden Ländern: 25—32, pls. 19—26.

Heyden, C. von, 1843. (no titel). — Amtlicher Bericht der Versammlung der Naturforscher zu Mainz: 208.

Heyden, C. von, 1861. Fragmente aus meinen entomologischen Tagebüchern. — Stett. ent. Ztg 22: 31—42.

Hübner, J., [1814—1817]. Sammlung europäischer Schmetterlinge, 8. Tineae: pl. 65.

Janmoulle, E., 1947. Espèces nouvelles pour la Faune belge (suite). — Lambillionea 47: 2.

Joannis, J. de, 1908a. Deux espèces nouvelles de *Nepticula* (Lep.). — Bull. Soc. ent. Fr. 1907: 326—329.

Joannis, J. de, 1908b. Contribution a l'étude des Lépidoptères du Morbihan. — Annls Soc. ent. Fr. 77: 688—838.

Johansson, R., 1971. Notes on the Nepticulidae (Lepidoptera) I. A revision of the *Nepticula ruficapitella* group. — Ent. scand. 2: 241—262.

Karsholt, O. & E. S. Nielsen, 1976. Systematisk fortegnelse over Danmarks sommerfugle. — Scandinavian Science Press Ltd., Klampenborg.

Karsholt, O. & E. S. Nielsen, 1978. Nogle for den danske fauna nye småsommerfugle, med en oversigt over *Coleophora milvipennis*-gruppen (Lepidoptera). — Ent. Meddr 46: 1—16.

Kasy, F., 1965. Österreichische entomologische Expeditionen nach Persien und Afghanistan. — Ann. naturhist. Mus. Wien. 68: 653—666.

Kasy, F., 1978. Die Schmetterlingsfauna des Naturschutzgebiete Hackelsberg, Nordburgenland. — Z. ArbGem. öst. ent. 30: 1—44.

Kasy, F., 1980. Lepidopterologisch-faunistisch bemerkenswerte Neufunde aus Niederösterreich, IX. (7 für Österreich neue Kleinschmetterlingsarten). — Z. ArbGem. öst. Ent. 32: 47—48.

Kasy, F., 1983. Die Schmetterlinge des WWF-Naturreservates "Hundsheimer Berge" in Niederösterreich. — Z. ArbGem. öst. Ent., 34, Suppl: 1—48.

Klimesch, J., 1936. Ein kleines Beitrag zur Kenntnis der Nepticulidenfauna (Lep.) des Vintschgaues (Prov. Bozen). — Stett. ent. Ztg 97: 194—211.

Klimesch, J., 1940a. Beschreibung einiger neuer *Nepticula*-Arten (Lep., Nepticulidae). — Z. wien EntVer. 25: 79—81, 89—94, pls. 14, 15.

Klimesch, J., 1940b. Über eine Nepticuliden-Ausbeute von Triest sowie Beschreibung der mine von *Leucospilapteryx cupediella* H.S. (Lep. Nepticulidae et Gracilariidae). — Z. wien. EntVer. 25: 176—179, 188—193, pl. 21.

Klimesch, J., 1941. *Nepticula Preisseckeri* spec. nov. (Lep., Nepticulidae). — Z. wien. EntVer. 26: 162—168.

Klimesch, J., 1946. Neue *Stigmella*-Arten (Lep., Stigmellidae). — Z. wien. ent. Ges. 31: 160—172.

Klimesch J., 1948. Zur Frage der verwantschaftliche Beziehungen einiger *Stigmella*-Arten auf Grund des Baues des männl. Kopulationsapparates. (Lep., Stigmellidae). — Z. wien. ent. Ges. 33: 49—82.

Klimesch, J., 1950. Über einige Nahrungsrassen von

Nepticula-Arten (Lep., Nepticulidae). — Ent. NachrBl., Wien 2: 25—28, 49—51, 72—74, 89, 90.

Klimesch, J., 1951. Contributo alla fauna Lepidotterologica del Trentino. — Studi trent. Sci. nat. 27: 11—68.

Klimesch, J., 1953. Die europäischen *Trifurcula*- und *Ectoedemia*-Arten (Lep., Nepticulidae). — Z. wien. ent. Ges. 38: 160—170, 191—196.

Klimesch, J., 1961. Ordnung Lepidoptera. I. Teil: Pyralidina, Tortricina, Tineina, Eriocraniina und Micropterygina. — In: H. Franz, Die Nordost-Alpen im Spiegel ihrer Landtierwelt, 2: 481—789. Universitätsverlag Wagner, Innsbruck.

Klimesch, J., 1975a. Ergebnisse von Untersuchungen einiger Nepticuliden-Typen der Sammlung des Muséum national d'Histoire naturelle, Paris (Lep., Nepticulidae). — Bull. Mus. natn Hist. nat., Paris 3e ser., no. 314, Zool. 221: 861—866.

Klimesch, J., 1975b. Über neue mediterrane und kanarische Nepticuliden. — Mitt. münch. ent. Ges. 65: 1—28.

Klimesch, J. 1975c. Die an Ulmen lebenden europäischen Nepticuliden-Arten (Lepidoptera: Nepticulidae). — Opusc. Zool. 135: 1—15.

Klimesch, J., 1978. Betrag zur Kenntnis der Nepticulidenfauna von Anatolien und der Insel Rhodos (Lepidoptera, Nepticulidae). — Tijdschr. ent. 121: 239—278.

Kristensen, N. P., 1970. Morphological observations on the wing scales in some primitive Lepidoptera (Insecta). — J. Ultrastruct. Res. 30: 402—410.

Kristensen, N. P. & E. S. Nielsen, 1980. The ventral diaphragm of primitive (non-ditrysian) Lepidoptera. A morphological and phylogenetic study. — Z. Zool. Syst. EvolFors. 18: 123—146.

Kyrki, J. & J. Tabell, 1984. Lisayksia Suomen luonnontieteellisten maakuntien pikkuperhoslajistoon (Lepidoptera: Micropterigidae — Pterophoridae). — Notul. ent. 64: 134—144.

Larsen, K., 1981. To for den danske fauna nye småsommerfugle: *Trifurcula amani* (Svensson, 1966) og *Phyllonorycter platani* (Staudinger, 1870) (Lepidoptera). — Ent. Meddr 49: 71—75.

Leraut, P., 1977. Quatre Lépidoptères a ajouter à la faune de France (Gracillariidae, Nepticulidae). — Bull. Soc. Lépidoptéristes fr. 1(2): 91—92.

Leraut, P., 1980. Liste systématique et synonymique des Lépidoptères de France, Belgique et Corse. — Supplément à Alexanor et au Bull. Soc. ent. Fr.: 1—334.

Lhomme, L., 1945. Deux espèces nouvelles pour la faune française *Phlyctaenodes ustrinalis* Schris. (Pyraustinae) et *Stigmella* (*Nepticula*) *mahalebella* Klim. (Stigmellina). — Revue fr. Lépidopt. 10: 155, 156.

Lhomme, L., [1963]. Catalogue des Lépidoptères de France et de Belgique 2.(2), Microlépidoptères: 1164—1210.

Lindner, E., 1959. Über das Vorkomen von *Ectoedemia liebwerdella* Zimm. in Westdeutschland (Lepidoptera, Nepticulidae). — Mitt. Dt. ent. Ges., e.v., 18: 7, 8.

Lindquist, O. H., 1962. A biological study of a new leaf miner on Birch, *Nepticula lindquisti* Freeman (Lepidoptera: Nepticulidae), in Ontario. — Can. Ent. 94: 524—530.

Linnaeus, C., 1767. Systema naturae. Tomus I. Edition decima tertia, ad Editionem duodecimam reformatam Holmiensem. — Vindobonae, Typis Ioannis Thomae nob. de Trattnern.

Marchand, S. le, 1946. *Stigmella prinophyllella* n. sp. Microlépidoptères, Stigmellidae). — Revue fr. Lépidopt. 10: 280—289.

Marchand, S. le, 1948. *Stigmella* (*Nepticula*) *prinophyllella* Le Md. est synonyme de *Nepticula haraldi* Soffner. — Revue fr. Lépidopt. 11: 298, 299.

Mariani, M., 1939. Un nuovo genere e due nuove specie di Lepidotteri di Sicilia. — G. Sci. nat. econ. Palermo, 40(17): 1—7, 1 pl.

Meess, A., 1910. Superfam. Tineides aculeatae. — In: A. Spuler (ed.), Die Schmetterlinge Europas, 2: 464—482; 3: pl. 91. Schweizerbart'sche Verlagbuchhandlung, Stuttgart.

Mendes, C. 1910. Lithocolletes et Nepticulae novae ex Lusitania. — Broteria 9: 163—166, pl. 7.

Menken, S. B. J., in preparation. Biochemical systematics and phylogeny in the leafminer genus *Ectoedemia* Busck (Lepidoptera: Nepticulidae).

Meyrick, E., 1877. Larva of *Nepticula quinquella*. — Entomologist's mon. Mag. 14: 111, 112.

Meyrick, E., 1895. A handbook of British Lepidoptera. — London, Macmillan & Co.

Meyrick, E., 1928. A revised handbook of British Lepidoptera. — Watkins & Doncaster, London.

Nemeş, I., 1970. *Stigmella* (*Fomoria*) *niculescui* nova species (Lep. Stigmellidae). — Bull. Soc. ent. Mulhouse 1970: 33—35.

Nemeş, I., 1972. *Stigmella* (*Fomoria*) *peiuii* nova species (Lepidoptera, Stigmellidae). — Studii Comun. Muz. Stiint. nat. Bacau. 5: 153—156.

Nielsen, E. S. 1980. A cladistic analysis of the Holarctic genera of adelid moths (Lepidoptera: Incurvaroidea). — Ent. scand. 11: 161—178.

Nieukerken, E. J. van, 1982. New and rare Nepticulidae in the Netherlands (Lepidoptera). — Ent. Ber., Amst. 42: 104—112.

Nieukerken, E. J., van, 1983. The Cistaceae-feeding Nepticulidae (Lepidoptera) of the western Palaearctic region. — Syst. Ent. 8: 453—478.

Nieukerken, E. J. van, in preparation. Revision and phylogeny of holarctic genera of Nepticulidae (Lepidoptera).

Nieukerken, E. J. van, in press. A provisional phylogenetic check-list of the western palaearctic Nepticulidae, with data on hostplants (Lepidoptera). — Ent. scand. 17.

Nieukerken, E. J. van & H. Dop, in preperation. Antennal sensory structures in Nepticulidae (Lepidoptera) and phylogenetic implications.

Nieukerken, E. J. van & R. Jansen, in preparation. Morphology and systematics of larvae of palaearctic Nepticulidae (Lepidoptera).

Nolcken, J. H. W. Baron, 1871. Lepidopterologische Fauna von Estland, Livland und Kurland. Zweite Abtheilung, Microlepidoptera, 2. Heft: I—VIII, 1—849, errata.

Petersen, W., 1930. Die Blattminierer-Gattungen *Lithocolletis* und *Nepticula* (Lep.). Teil II: *Nepticula* Z. — Stett. ent. Ztg 91: 1—82, 3 pls.

Povolný, D. & F.Gregor, 1952. Pátý příspěvek k fauně Motýlů čsr. — Čas. čsl. Spol. ent. 49: 237—239.

Puplesis, R. K. (Pupljasis), 1984a. Novye vidy Molejmaljutok (Lepidoptera, Nepticulidae) iz južnogo Primor'ja. — Ent. Obozr. 63: 111—125.

Puplesis, R. K., 1984b. K sisteme molej-maljutok (Lepidoptera, Nepticulidae) palearktičeskoj fauny. — Ent. Obozr. 63: 582—597.

Rebel, H., 1901. — In: Staudinger, O. & H. Rebel, Catalog der Lepidopteren des Palaearctischen Faunengebietes. Berlin, Friedländer & Sohn.

Robinson, G. S., 1976. The preparation of slides of Lepidoptera genitalia with special reference to the Microlepidoptera. — Entomologist's Gaz., 27: 127—132.

Robinson, G. S. & E. S. Nielsen, 1983. The Microlepidoptera described by Linnaeus and Clerck. — Syst. Ent., 8: 191-242.

Rössler, A., 1866. Verzeichniss der Schmetterlinge des Herzogthums Nassau. — Jb. nassau. Ver. Naturk. 19 + 20: 99—442.

Rössler, A., 1881. Die Schuppenflügler (Lepidopteren) des Kgl. Regierungsbezirks Wiesbaden und ihre Entwicklungsgeschichte. — Jb. nassau. Ver. Naturk. 33 + 34: 1—392.

Saether, D. A., 1979. Underlying synapomorphies and anagenetic analysis. — Zool. Scr. 8: 305—312.

Sauber, A., 1904. Die Kleinschmetterlinge Hamburgs und der Umgegend. — Verh. Ver. naturw. Unterh. Hamb. 12: 1—60.

Schönherr, J., 1958. Biologie und Morphologie von *Ectoedemia liebwerdella* Zimmerm., unter Berücksichtigung der übrigen rindenminierenden Nepticuliden (Lep.). — Dt. ent. Z. (N.F.) 5: 1—71.

Scoble, M. J., 1978. Nepticulidae (Lepidoptera) of southern Africa: the genus *Ectoedemia* Busck. — J. ent. Soc. sth. Afr. 41: 81—86.

Scoble, M. J., 1979. A new species of *Ectoedemia* Busck from Botswana with observations on its imaginal skeletal anatomy (Lepidoptera: Nepticulidae). — Ann. Transv. Mus. 32: 35—54.

Scoble, M. J., 1983. A revised cladistic classification of the Nepticulidae (Lepidoptera) with descriptions of new taxa mainly from South Africa. — Transv. Mus. Monograph. 2: i—xi, 1—105.

Skala, H., 1933. Neue Neptikel. — Z. öst. EntVer. 18: 30—32.

Skala, H., 1940. In der Welser Heide beobachtete Falter. — Z. wien. EntVer. 25: 143, 144, 159, 160, 179, 180, 186—188, 211.

Skala, H., 1941. Neues über Miner. — Z. wien. EntVer. 26: 55—57, 77—80, 123—125, pls. ii—iv.

Skala, H., 1942. Falter von Haid und anderes. — Z. wien. EntVer. 27: 5—7.

Skala, H., 1948. Zur Familie der Miner (Nepticulidae). — Z. wien. EntVer. 32: 121, 122.

Snellen, P. C. T., 1882. De vlinders van Nederland. Microlepidoptera, systematisch beschreven, 2 vols. — E. J. Brill, Leiden.

Soffner, 1942. Eine neue *Nepticula* Art. — Mitt. Dt. ent. Ges. 11: 56—61.

Sorhagen, L., 1886. Die Kleinschmetterlinge der Mark Brandenburg und einiger angrenzenden Landschaften. Mit besonderer Berücksichtigung der Berliner Arten. — R. Friedländer & Sohn, Berlin.

Sorhagen, L., 1922. Beiträge zur Biologie Europäischer *Nepticula*-Arten. — Arch. Naturgesch., 88A: 9—60, 4 pls.

Stainton, H. T., 1849. An attempt at a systematic catalogue of the British Tineidae & Pterophoridae. — John van Voorst, London.

Stainton, H. T., 1851. A supplementary catalogue of the British Tineidae & Pterophoridae. — John van Voorst, London.

Stainton, H. T., 1854. Insecta Brittanica. Lepidoptera: Tineina. — Lovell Reeve, London.

Stainton, H. T., 1855. The natural history of the Tineina, 1. — John van Voorst, London.

Stainton, H. T., 1857. Lepidoptera. New British species in 1856. — Entomologist's Annu. 1857: 97—112.

Stainton, H. T., 1858. Lepidoptera. New British species in 1857. — Entomologist's Annu. 1858: 85—98.

Stainton, H. T., 1859. Manual of British Butterflies and Moths, 2. — Cooke & Son, London.

Stainton, H. T., 1862. The Natural History of the Tineina, 7. — John van Voorst, London.

Stainton, H. T., 1869. Tineina observed at Cannes and Mentone in February and March 1867. — In: H. T. Stainton (ed.). The Tineina of Southern Europe: 216—232. John van Voorst, London.

Stainton, H. T. 1886. *Nepticula argyropeza* and *apicella*. — Entomologist's mon. Mag. 26: 237, 238.

Stainton, H. T., 1887. A new species of *Nepticula* bred from birch, from Herefordshire (*N. Woolhopiella*). — Entomologist's mon. Mag. 24: 62.

Stephens, J. F., 1829. A systematic catalogue of British Insects, part 2. — London, Baldwin and Cradock.

Stephens, J. F., 1834. Illustrations of British Entomology, Haustellata IV: 1—433, pls. 33—41. — London, Baldwin and Cradock.

Steudel, W. & E. Hofmann, 1882. Verzeichniss württembergischer Kleinschmetterlinge. — Jh. Ver. vaterl. Naturk. Württ. 38: 143—262.

Svensson, I., 1966. New and confused species of Microlepidoptera. — Opusc. ent. 31: 183—202.

Szőcs, J., 1957. New *Nepticula* species from Hungary. — Annls hist.-nat. Mus. natn hung. (nov. Ser.) 8: 321—323.

Szőcs, J., 1965. Microlepidoptera I, Nepticulidae. — Fauna Hung. 76: 48—104.
Szőcs, J., 1968. Some unknown data concerning miners (Lepidoptera). — Acta zool. hung. 14: 225—231.
Szőcs, J., 1978. Adatok a Pilis-hegység aknázómoly faunájához. (Data to the mining moths fauna from the Pilis Mts.) — Folia ent. hung, s.n., 31: 265—271.
Szőcs, J., 1981. Angaben über die minierenden Motten aus Budapest und Umgebung. — Folia ent. hung., 42: 209—220.
Tengström, J. M. J., 1848. Bidrag till Finlands Fjäril-Fauna. — Notis. Sällsk. Faun. Fl. fenn. Förh. 1: 69—164.
Thunberg, C. P., 1794. D. D. Dissertatio entomologica sistens Insecta Suecica, 7: 83—98. — Upsaliae, Litteris Joh. Fred. Edman.
Toll, S., 1934a. *Nepticula heringi* Sp. nova. — Annls zool., Warsz. 11: 1—3.
Toll, S., 1934b. Jeszcze o krajowych gatunkach rozaju *Nepticula* Zell. (Noch über die heimischen Arten der Gattung *Nepticula* Zell.). — Polskie Pismo ent. 13: 61—84.
Toll, S., 1936. Untersuchung der Genitalien bei *Pyrausta purpuralis* L. und *P. ostrinalis* Hb., nebst Beschreibung 11 neuer Microlepidopteren-Arten. — Annls. zool. Warsz. 11: 403—413, pls. 47—49.
Treitschke, F., 1833. Die Schmetterlinge von Europa, 9 (2): 1—294. — Fleischer, Leipzig.
Tutin, T. G., V. H. Heywood, N. A. Burges, D. H. Valentine, S. M. Walters & D. A. Webb (eds), 1964. Flora Europaea, 1. Lycopodiaceae to Platanaceae. — University Press, Cambridge.
Tutin, T. G., V. H. Heywood, N. A. Burges, D. H. Valentine, S. M. Walters & D. A. Webb (eds), 1968. Flora Europaea, 2. Rosaceae to Umbelliferae. — University Press, Cambridge.
Tutt, J. W., 1899. Natural History of the British Lepidoptera. A textbook for Students and Collectors, 1. — London-Berlin.
Vári, L., 1950. Nederlandse Lepidoptera. (5e Faunistische Mededeling). — Ent. Ber., Amst. 13: 180—184.
Vári, L., 1951. Nederlandse Lepidoptera (5e Faunistische Mededeling) (slot). — Ent. Ber., Amst. 13: 193—198.
Walsingham, L., 1891. Micro-Lepidoptera collected near Cannes, 1890. — Entomologist's mon. Mag. 27: 137—152.
Waters, E. G. R., 1928. *Nepticula albifasciella* Hein. : its early stages and its occurence in Britain. — Entomologist's mon. Mag. 64: 248—251.
Weber, P., 1937a. Über Mikrolepidopteren. — Beschreibung neuer Arten und Formen aus der Schweiz, sowie Angaben über weniger bekannte Arten. — Mitt. Schweiz. ent. Ges. 16: 666—672.
Weber, P., 1937b. Zwei neue Arten der Mikrolepidopterengattung *Nepticula* und ein Beitrag zur Kenntnis von *Nepticula stelviana* Wck. — Mitt. Schweiz. ent. Ges. 17: 211—215.
Wiley, E. O., 1981. Phylogenetics. — Wiley & Sons, New York.
Wilkinson, C., 1981. A supplement to the genus *Ectoedemia* Busck (Nepticulidae: Lepidoptera) in North America, dealing with some difficult species and also some new ones. — Tijdschr. Ent. 124: 93—110.
Wilkinson, C., G. Bryan, S. B. J. Menken & E. J. van Nieukerken, 1983. A clarification of the status of four taxa in the *Ectoedemia angulifasciella* group (Nepticulidae: Lepidoptera). — Neth. J. Zool. 33: 211—224.
Wilkinson, C. & P. J. Newton, 1981. The microlepidopteran genus *Ectoedemia* Busck (Nepticulidae) in North America. — Tijdschr. Ent. 124: 27—92.
Wilkinson, C. & M. J. Scoble, 1979. The Nepticulidae (Lepidoptera) of Canada. — Mem. ent. Soc. Can. 107: 1—118.
Wocke, M. F., 1860. Mittheilungen über einige für die schlesische Fauna neue Arten. — Jber. schles. Ges. vaterl. Kult. 38: 132, 133.
Wocke, M. F., 1861. Microlepidoptera. — In: O. Staudinger & M. Wocke. Catalogue des Lépidoptères d'Europe et des pays limithrophes: 85—130. — Dresden.
Wocke, M. F., 1865. Zwei neue Nepticulen. — Stett. ent. Ztg 26: 269, 270.
Wocke, M. F., 1871. Catalog der Lepidopteren des europaeischen Faunengebiets, 2. Microlepidoptera.
Wocke, M. F., 1874. Verzeichniss der Falter Schlesiens, 2. Microlepidoptera. — Z. Ent., N. F. 4: 1—107.
Zeller, P. C., 1839. Versuch einer naturgemässen Eintheilung der Schaben. — Isis, Jena 1839: 167—220.
Zeller, P. C., 1848. Die Gattungen der mit Augendeckeln versehenen blatminirenden Schaben. — Linn. ent. 3: 248—344.
Zerkowitz, A., 1946. The Lepidoptera of Portugal. — J. N.Y. ent. Soc. 54: 51—87, 115—165, 211—261.
Zetterstedt, J. W., 1839. Insecta Lapponica descripta, 1010—1011. — Lipsiae.
Zimmermann, F., 1940. Eine neue Nepticulide aus Deutschland (Lep.), *Ectoedemia liebwerdella* spec. nov. (Lep.). — Mitt. zool. Mus. Berlin 24: 264, 265.
Zimmermann, F., 1944. Zur Kenntnis der Verbreitung der Nepticuliden in den Reichsgauen Wien und Niederdonau (Lepidopt.). — Z. wien. ent. Ges. 29: 3—6, 60—64, 78—91, 107—122.

Index to (sub)genera and species treated

Reference to the first page of the treatment of each species is given only. Synonyms are given in italics, unavailable names provided with a double dagger (‡) and misidentifications are cited in square brackets.