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The morphology of the geometrid moths of the Levant and neighbouring countries

Part I : Orthostixinae and Geometrinae

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Summary

This is the first of a series of articles on the Geometrid moths occurring in the Levant and neighbouring countries (Middle East). Morphological descriptions of 53 taxa at species or subspecies level are accompanied by illustrations of venation (for all genera) and of male and female genitalia (for all taxa). Differential diagnoses of genera and discussions on possible relationships are added. In a general revision of the systematic arrangement more than 100 genera are attributed to 19 Old World tribes or subfamilies. The validity of subfamily rank for Orthostixinae Meyrick, 1892 (Oenochrominae auct. nec Guenée, 1857) is confirmed, including seven genera, and its differential features given. One new tribe is established : Microloxiini tribus n. with the type genus *Microloxia* Warren, 1893. Three new genera and one new subgenus are established : *Microbaena* gen. n. with type species *Phorodesma pulchra* Staudinger, 1897 ; *Proteuchloris* gen. n. with type species [*Geometra* (*Phorodesma*)] *neriaria* Herrich-Schäffer, 1852 ; *Acidromodes* gen. n. with type species *Acidaliastis nilotica* Wiltshire, 1985 ; *Victorinella* subgen. n. of *Victoria* Warren, 1897, with type species *Victoria sematoperas* Prout, 1916. Three new species and three new subspecies are described : *Thetidia persica* sp. n. from N. Iran, *Victoria wiltshirei* sp. n. from the Sudan, *Hemidromodes unicolorata* sp. n. from Kenya, *Pseudoterpna coronillaria halperini* ssp. n. from Israel, *Microbaena pulchra minor* ssp. n. from the Sudan and *Eucrostes indigenata lanjeronica* ssp. n. from Spain.

Further changes concern the following taxa : Archaeobalbini Viidalepp, 1981, emendation of Archeobalbini. Terpnini Inoue, 1961, homonym to Terpnini Kuznetsov, 1904 (= synonym to Geometrini Duponchel, [1845]). Terpnini sensu Inoue "synonym" (but unavailable) to Pseudoterpnini Warren, 1893. Neohipparchini Inoue, 1961, syn. n. to Geometrini Guenée, 1844. Ochrognesiini Inoue, 1961 syn. n. to Nemoriini Gumppenberg, 1887. Nemoriini Ferguson, 1969, homonym to Nemoriini Gumppenberg, 1887. *Apetovia* Krulikovsky, 1918, syn. n. to *Heliothea* Boisduval, 1840. *Aglossochloris* Prout, 1912, downgraded from genus to subgenus (of *Thetidia* Boisduval, 1840). *Antonechloris*

Raineri, 1994, downgraded from genus to subgenus (of *Thetidia* Boisduval, 1840). *Hissarica* Viidalepp, 1988, downgraded from genus to subgenus (of *Xenochlorodes* Warren, 1897). *Phaiogramma* Gumppenberg, 1887, stat. n., removed from synonymy of *Chlorissa* Stephens, 1831, and raised to generic rank. *Pseudoterpna coronillaria cinerascens* (Zeller, 1847), stat. n. raised from synonymy to subspecies (Italy). *Hemistola siciliana* Prout, 1935, stat. n. raised from subspecies (of *Hemistola chrysoprasaria* (Esper, 1795)) to species (Sicily). *Euchloris dissimilis* Warren & Rothschild, 1905, syn. n. to *Acidaliastis micra* Hampson, 1896. Three species are transferred from *Chlorissa* to *Diplodesma* Warren, 1896 : *Diplodesma approximans* (Warren, 1897), comb. n., *Diplodesma subrufibasis* (Prout, 1930), comb. n., *Diplodesma eborilitoris* (Fletcher, 1958), comb. n., nec (Prout, 1930 : unavailable). Provisionally six species are included in *Phaiogramma* (transferred from *Chlorissa*) : *Phaiogramma faustinata* (Millière, 1868), comb. n. (type species), *Phaiogramma stibolepida* (Butler, 1879), comb. n., *Phaiogramma discessa* (Walker, 1861), comb. n., *Phaiogramma patialensis* (Rose & Devinder, 1985), comb. n., *Phaiogramma pulmentaria* (Guenée, 1857), comb. n., and *Phaiogramma polemia* (Prout, 1920), comb. n.. Lectotypes are designated for *Orthostixis cribraria amanensis* Wehrli, 1932, and *Holoterpna pruinosata* (Staudinger, 1898).

Zusammenfassung

Gegenstand der vorliegenden Veröffentlichung sind die Geometriden (Orthostixinae und Geometrinae) der Levante einschließlich der umliegenden Länder (Naher Osten). Die Morphologie wird für 53 Taxa der Artgruppe (Arten und Unterarten) beschrieben. Für alle behandelten Genera wird die Flügeläderung, für alle behandelten Taxa sowohl der männliche als auch der weibliche Genitalapparat abgebildet. Desweiteren werden für Triben und Gattungen Differentialdiagnosen erstellt sowie mögliche Verwandtschaftsbeziehungen diskutiert. Die Systematik der behandelten Geometriden-Unterfamilien wird einer generellen Überprüfung unterzogen, mehr als 100 Gattungen werden den 19 erwähnten Triben bzw. Unterfamilien der „Alten Welt" zugeordnet. Für Orthostixinae Meyrick, 1892 (Oenochrominae auct. nec Guenée, 1857) wird der Rang einer Unterfamilie bestätigt, in die Konzeption der Differentialmerkmale werden 7 Gattungen einbezogen. Eine neue Tribus wird aufgestellt : Microloxiini tribus n. mit der Typus-Gattung *Microloxia* Warren, 1893. Drei neue Gattungen und eine neue Untergattung werden beschrieben : *Microbaena* gen. n. mit der Typusart *Phorodesma pulchra* Staudinger, 1897 ; *Proteuchloris* gen. n. mit der Typusart [*Geometra* (*Phorodesma*)] *neriaria* Herrich-Schäffer, 1852 ; *Acidromodes* gen. n. mit der Typusart *Acidaliastis nilotica* Wiltshire, 1985 ; Victorinella subgen. n. von *Victoria* Warren, 1897, mit der Typusart *Victoria sematoperas* Prout, 1916. Drei neue Arten und drei neue Unterarten werden beschrieben : *Thetidia persica* sp. n. aus dem Iran, *Victoria wiltshirei* sp. n. aus dem Sudan, *Hemidromodes unicolorata* sp. n. aus Kenia, *Pseudoterpna coronillaria halperini* ssp. n. aus Israel, *Microbaena pulchra minor* ssp. n. aus dem Sudan, und *Eucrostes indigenata lanjeronica* ssp. n. aus Spanien.

Weitere taxonomische Änderungen : Archaeobalbini Viidalepp, 1981, Emendation von Archeobalbini. Terpnini Inoue, 1961, jüngeres Homonym von Terpnini Kuznetsov, 1904 (=synonym zu Geometrini Duponchel, [1845]), und „synonym" (aber unverfügbar) zu Pseudoterpnini Warren, 1893. Neohipparchini Inoue, 1961, syn. n. von Geometrini Guenée, 1844. Ochrognesiini Inoue, 1961, syn. n. von Nemoriini Gumppenberg, 1887. Nemoriini Ferguson, 1969, homonym zu Nemoriini Gumppenberg, 1887. *Apetovia* Krulikovsky, 1918, syn. n. von *Heliothea* Boisduval, 1840. *Aglossochloris* Prout, 1912, herabgestuft von Gattungs- zu Untergattungs-Rang (von *Thetidia* Boisduval, 1840). *Antonechloris* Raineri, 1994, herabgestuft von Gattungs- zu Untergattungsrang (von *Thetidia* Boisduval, 1840). *Hissarica* Viidalepp, 1988, herabgestuft von Gattungs- zu Untergattungs-Rang (von *Xenochlorodes* Warren, 1897). *Phaiogramma* Gumppenberg, 1887, stat. n., aus der Synonymie von *Chlorissa* Stephens, 1831, in den Gattungsrang erhoben. *Pseudoterpna coronillaria cinerascens* (Zeller, 1847), stat. n., aus der Synonymie in den Rang einer Unterart erhoben (Italien). *Hemistola siciliana* Prout, 1935, stat. n., vom Unterarts-Rang (von *Hemistola chrysoprasaria* (Esper, 1795)) in den Rang einer Art erhoben (Sizilien). *Euchloris dissimilis* Warren & Rothschild, 1905, syn. n. von *Acidaliastis micra* Hampson, 1896. Drei Arten (ehemals Gattung *Chlorissa* Stephens, 1831) werden mit neuen Gattungen kombiniert : *Diplodesma approximans* (Warren, 1897), comb. n., *Diplodesma subrufibasis* (Prout, 1930), comb. n., *Diplodesma eborilitoris* (Fletcher, 1958), comb. n., nec Prout, 1930 (nicht verfügbar). Nach dem derzeitigen Stand umfaßt die Gattung *Phaiogramma* sechs Arten (übertragen aus *Chlorissa*) : *Phaiogramma faustinata* (Millière, 1868), comb. n. (Typusart), *Phaiogramma stibolepida* (Butler, 1879), comb. n., *Phaiogramma discessa* (Walker, 1861), comb. n., *Phaiogramma patialensis* (Rose & Devinder, 1985), comb. n., *Phaiogramma pulmentaria* (Guenée, 1857), comb. n., und *Phaiogramma polemia* (Prout, 1920), comb. n.. Festlegung von Lectotypen erfolgte bei *Orthostixis cribraria amanensis* Wehrli, 1932, und *Holoterpna pruinosata* (Staudinger, 1898).

Introduction

This is the first paper in the first of three series of publications by the author on the Geometridae of the Middle East. The three series are :

1) Morphology of the species and subspecies occurring in the Levantine basin and neighbouring countries, with figures of male and female genitalia of all taxa, of venation of all genera, description of external structure of the imago and discussion of relationships at subspecies, species, genus and tribe level.

2) Systematic list of these species with some important synonyms, citation of original descriptions, locus typicus and a short survey of the geographical distribution within the study area.

3) Faunistic data, phenology and ecology of the species occurring in the state of Israel (administration frontiers of 1990).

Only the morphology of adult stages will be considered in this paper. The study area includes S. Turkey south of the summits of the Taurus Mountains between Göksu and the River Tigris, Cyprus, Syria, Lebanon, Iraq, Kuwait, N. Saudi Arabia (north of a line from Medina to Kuwait), Israel, Jordan, Egypt (the reasons for adopting these boundaries are given in the second series of publications).

In the sections on "differential features" only some of the more important features are described. Characters mentioned in the description of tribes are not repeated where they are also valid for genus or species. In some cases the key differential diagnostic characters of tribes do not clearly reflect the phylogenetic relationships, which need further studies to be elucidated. Diagnoses are valid for the study area, but the author tried to check the validity for taxa from other regions all over the world (mainly "Old World" regions). Similarly Old World tribes not represented in the study area are taken into consideration, which should assist the construction of a better classification of the family Geometridae.

The systematic arrangement of the subfamily Geometrinae at tribal level largely follows the results of the extensive studies published by Inoue (1961) and Viidalepp (1981). The author however tried to re-examine the whole arrangement of tribes and genera on the basis of the results of the present morphological studies. Type species of more than 100 genera of Orthostixinae and Geometrinae have been examined and these genera attributed to the various tribes. Many tropical genera cannot be included in the tribes mentioned here. They need further studies with the aim of establishing new taxa at family group (tribal level).

The following structural details are given for all species and subspecies (♂♀) : venation, frenulum, frons, vertex, tongue, palpus, antenna, hindtibia/tarsus, genitalia (incl. sternite 8 and tergite 8). Additional features are included if they show diagnostic characters. The terminology of the genitalia largely follows that of Ferguson (1985), Pitkin (1993) and Scoble (1994). Terminology of venation according to Pitkin (1993 : Fig. 68).

Terms and abbreviations used in the descriptions of venation and external structure : "*separate*" = separate origin from cell of two veins ;

"*connate*" = veins arising from cell (upper or lower angle) at the same point ; "*palpus*" = labial palpus. Measurements of antennal branches or cilia refer to the longest, and comparison is made with the thickness of the filament at the point where this branch or cilium arises (usually at 1/3 to 1/2 length of flagellum)

Further abbreviations

ZSM	Zoologische Staatssammlung München
BMNH	The Natural History Museum, London
TAU	Tel Aviv University collection
NMW	Naturhistorisches Museum, Wien
ZFMK	Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn

SYSTEMATIC PART

Subfamilia **ARCHIEARINAE Fletcher, 1953**

Differential features : Venation : M2 of hindwing rudimentary. "Larva with 16 Legs" (Prout, 1915 : 1). Accessory tympanum reduced (Compare Cook & Scoble, 1992 : 229).

Remarks : Not represented in the study area.

Subfamilia **ORTHOSTIXINAE Meyrick, 1892**

Differential features : Venation : Forewing with accessory cell (double in *Myinodes* and *Eumegethes*) ; R1 and R2 fused or free, both arising below cell apex ; R3-R5 and M1 widely separate in all examined genera ; Sc + R1 and Rs of hindwing approximate, but not touching (slightly touching in *Myinodes* and *Eumegethes*), in some *Orthostixis* spp. with cross vein (R1) near wing base ; M2 tubular in all wings. Frenulum stout and long in ♂, replaced by tuft of stiff hair-scales in female. Frons usually strongly convex. ♂ antenna filiform, ciliate (in the study area). Ansa of tympanal organ broad at base, tapering to the end in all species examined (compare Cook & Scoble 1992 : 227). ♂ genitalia : Costa of valva strongly sclerotised. Surface of valva often wrinkled. ♀ genitalia : Surface of posterior part of corpus bursae strongly wrinkled, anterior part membranous and with smooth surface ; tergite 8 laterally tapering.

Type species of the following additional genera have been examined : *Gypsochroa* Hübner, [1825], *Derambila* Walker, [1863], *Naxa* Walker, 1856, *Ozola* Walker, 1861.

Remarks : Validity of subfamily rank for "Orthostixinae" was postulated by Bleszinski (1960 : 22) and Kovacs (1987 : 190), but without presenting a clear concept. The seven genera mentioned here are very probably monophyletic and would perhaps be better placed between Larentiinae and Ennominae. The African and Indoaustralian genera *Derambila* and *Ozola* seem to link (in external appearance, venation and genitalia) the three groups *Myinodes/Eumegethes, Orthostixis/Naxa* and *Gypsochroa*. Male genitalia of *Gypsochroa* reveal relationships with *Myinodes/Eumegethes* ; the venation of *Gypsochroa* is almost identical to that of *Derambila*. Nevertheless *Gypsochroa* has until recently been treated by many authors as a genus of Larentiinae near *Chesias* Treitschke, 1825 (e.g. Leraut, 1980 : 143). The genitalia resemble those of the latter genus only superficially. Ansa of tympanum is as described above for Orthostixinae. Compare also the remarks to the genus *Orthostixis*.

MYINODES Meyrick, 1892

Differential features : Venation see Fig. 1 : Forewing : R1 and R2 arising separately from cell, forming with Sc two accessory cells ; crossvein R1 between cell and Sc weak. Hindwing : Rs + M1 distinctly stalked. ♂ genitalia : Uncus tapering, without basal lobes ("socii") ; costa of valva strongly sclerotised ; ventral part of valva medially with stout inwardly directed projection ; surface of valva slightly wrinkled in the apical part. See also Hausmann (1994b). ♀ genitalia : Apophyses anteriores more than 3/4 length of apophyses posteriores !

Remarks : ♂ Genitalia in the group *Myinodes/Eumegethes* are quite uniform, furthermore indicating relationships to the genera *Ozola* and *Gypsochroa* (see above). ♀ genitalia of both *Myinodes/Eumegethes* have comparatively short ductus bursae, signum bursae lacking.

Myinodes shohami Hausmann, 1994

For data on the morphology and differential features with regard to the other species of the genus see Hausmann (1994b). Holotype re-examined. Venation : Fig. 1.

Genitalia ♂ : see Fig. 30 (N. Israel).

Genitalia ♀ : see Fig. 95 (N. Israel).

EUMEGETHES Staudinger, 1898

Differential features : Venation see Fig. 2 : Forewing like that of *Myinodes*. Hindwing : Rs + M1 not stalked. Cilia of antenna longer than in *Myinodes*. ♂ genitalia : Quite similar to genitalia of the genus *Myinodes*. However the surface of the valva is strongly wrinkled as in the species of the tribes Calothysanini and Cyclophorini (Sterrhinae). ♂ genitalia : Uncus tapering, basal lobes absent. Juxta with two posterior processes. Aedeagus with stout single cornutus. ♀ genitalia : Apophyses anteriores about half length of apophyses posteriores. Shows only minor differences from the genitalia of *Myinodes*, perhaps also related to *Derambila*.

Eumegethes tenuis Staudinger, 1898

External features : Venation see Fig. 2 and generic description. Tongue developed (about 2.5 mm). Palpus with dark brown scales, comparatively long (about 0.8 mm = twice the diameter of the eye). Frons whitish, strongly convex, tapering to one central projection. Vertex whitish. Antenna of ♂ ciliate with two rows of long cilia (longest 2-2.5 times width of flagellum), of ♀ ciliate, cilia as long as width of flagellum. Hindtibia of both sexes with two pairs of long spurs. Relative length hindtibia/hindtarsus 3.0/2.2 mm.

Genitalia ♂ : see Fig. 31 (C. Algeria) and generic description.

Genitalia ♀ : see Fig. 96 (C. Algeria) and generic description.

Remarks : No Egyptian material available. *Eumegethes picta* (Turati, 1934), described from E. Libya, provisionally has to be considered a form of *E. tenuis* (Rungs, 1981 : 223). More detailed studies are required to resolve this question.

ORTHOSTIXIS Hübner, [1823]

Differential features : Venation see Fig. 3 : Forewing : The first crossvein between Sc and cell must be identified as "R2" because Sc usually turns off to costa (sometimes distinctly) before joining this crossvein ; connection of Sc and this R2-crossvein must be interpreted as diverging R1 from Sc ; R1-crossvein from cell to Sc (as present in *Myinodes*/*Eumegethes*) lost. Hindwing : both Rs/M1 and M3/CuA1 separate. Frons comparatively flat, only in the ventral part strongly convex. Hindtibia with two short spurs in both sexes. ♂ genitalia : Uncus broad, not tapering towards end ; small basal lobes

beside uncus ("socii") present ; costa of valva strongly sclerotised, spinulose ; juxta with long posterior projection ; aedeagus without stout cornuti. ♀ genitalia : Apophyses anteriores 1/3-1/2 length of apophyses posteriores ; ductus bursae fairly long.

Remarks : The relationship between the genera *Orthostixis* and *Naxa* is very close, as their ♂ and ♀ genitalia reveal (e.g. posterior projection of juxta, long ductus bursae, shape of signum etc.). In ♂ genitalia "socii" are present in both *Ozola* and *Orthostixis* (probably synapomorphic character). Female genitalia are also somewhat similar.

Orthostixis cribraria cribraria (Hübner, [1799])

External features : Venation (Fig. 3) characterised by a short crossvein (R1) between Sc and Rs in the hindwing. Tongue developed and long (5 mm). Palpus somewhat weak, with outstanding scales, length in male 1.1-1.5 times diameter of eye ; female 1.5-1.7 times diameter of eye, tip pale brown. Frons and vertex whitish. Antenna of ♂ dentate, length of cilia 3/4 width of flagellum ; antenna of ♀ slightly dentate, length of cilia 1/3 width of flagellum ; in both sexes with light brown scales on the upper side. Hindtibia in both sexes with one pair of short spurs. There is little structural variation within the area of distribution ; specimens from Italy have somewhat smaller palpus.

Genitalia ♂ : see Fig. 32 (Hungary). No differences between specimens examined from Hungary, Italy, N. and C. Turkey.

Genitalia ♀ : see Fig. 97 (N. Turkey). Little difference between specimens examined from Sicily and N. Turkey : In Sicily the ductus bursae is broader near the corpus bursae and less sclerotised. Anthrum narrower. Signum bursae is more slender and more pointed in Turkish specimens.

Remarks : The distribution of the nominate subspecies probably does not reach the study area. Further studies are required with material from the "contact-zone" with the following taxon around the Taurus mountains.

Orthostixis cribraria amanensis Wehrli, 1932

External features : See characters of the nominate subspecies. Wings of both types of *amanensis* rather short. At the ZSM there are small specimens (infrasubspecific forms) from N. Greece and Bulgaria. Wehrli (1932 : 3) gives a more basal position of the postmedian line ; however

this character is variable in the populations of S. Turkey and Lebanon. The main differential features of the subspecies lie in the male genitalia.

Genitalia ♂ : see Fig. 33 (Paralectotype from the Amanus mountains). The spinulose field at the apex of the valva is more extended distally than its equivalent in the nominate subspecies. No difference observed between the specimens examined from the Taurus and the Amanus mountains. Lebanese specimens have a still more extended spinulose field.

Genitalia ♀ : unknown.

Remarks : Lectotype (♂, Syria, Taurus, Marasch, VII.1931, leg. Pfeiffer, coll. ZFMK) and Para-Lectotype (♂, [Amanus], coll. ZFMK) designated and examined.

***Orthostixis cinerea* Rebel, 1916**

External features : Venation as in *O. cribraria* (compare Fig. 3). Length of tongue 5.5 (♀) to 6.5 (♂) mm! Length of palpus as in *O. cribraria*, scales not strongly adherent as in *O. calcularia*, tip (3/4 of last segment) dark brown. Antenna of male dentate, length of cilia 3/4 width of flagellum ; antenna of female slightly dentate, length of cilia 1/2 width of flagellum, with dark brown scales on the upper side. Hindtibia in both sexes with one pair of short spurs.

Genitalia ♂ : see Fig. 35 (Cyprus).

Genitalia ♀ : see Fig. 99 (Cyprus). Ductus bursae long. Signum bursae triangular.

Remarks : Holotype (♂, coll. NHMW) examined. External and genitalic structure reveal a closer relationship to *O. cribraria* than to *O. calcularia*.

***Orthostixis calcularia* Lederer, 1853**

External features : Venation similar to that of *O. cribraria* (compare Fig. 3), but Sc + R1 and Rs of hindwing not connected by crossvein R1 at base. Length of tongue 1.0 (♀) - 1.5 (♂) mm only! Length of palpus as in *O. cribraria*, but stouter, scales adherent, tip dark brown. Frons and vertex white. Antenna of male dentate, cilia as long as width of flagellum ; antenna of female slightly dentate, length of cilia 1/3 width of flagellum, with dark brown scales on the upperside in both sexes. Hindtibia (♂, ♀) with one pair of short spurs. No structural variation within the area of distribution.

Genitalia ♂ : see Fig. 34 (C. Turkey).

Genitalia ♀ : see Fig. 98 (C. Turkey). Apophyses broad. Ductus bursae short. Signum bursae small.

Subfamilia **ALSOPHILINAE Herbulot, 1962**

Differential features : Venation : Forewing : R3-R5 distinctly stalked ; R3-R5 and M1 typically, but not always, separate ; M2 developed, tubular. Hindwing : Sc + R1 and Rs anastomosing for a long distance as in the Larentiinae (except some East Asiatic species) ; Rs and M1 typically shortly stalked (with a very few exceptions). Female brachypterous.

Remarks : Not represented in the study area. The exceptions in venation render the validity of subfamily rank doubtful. *Alsophila* is placed in "Oenochrominae" in Inoue (1977).

"Subfamilia **HELIOTHEINAE" Exposito, 1979**

Differential features (compare Exposito, 1979) : Venation : M2 tubular in all wings. Hindwing : Sc + R1 and Rs not anastomosing ; M2 arising from cell very near M1. Ansa of tympanal organ broad at its base, tapering towards end, not dilated in the central part. Genitalia ♂ : not unlike genitalia of many Geometrinae species : uncus tapered ; socius present in *Heliothea*, reduced in *Petovia* ; shape of aedeagus rather similar to the typical shape in many Geometrinae species.

Type species of the following genera examined : *Heliothea* Boisduval, 1840 (West Mediterranean), *Apetovia* Krulikovsky, 1918 (Central Asiatic) and *Petovia* Walker, 1854 (Ethiopian).

Remarks : Not represented in the study area. Validity of subfamily rank very doubtful. The possibility of inclusion in the subfamily Geometrinae as a separate tribe (as done in Vives Moreno, 1994 : 371) should be considered. With regard to the tympanal structure I hesitate to change the status formally ; the above described feature is common in "Oenochrominae" (s.l.) and Orthostixinae and quite unusual in Geometrinae (compare Cook & Scoble, 1992). The three above mentioned taxa of genus group apparently monophyletic. ♂ genitalia of *Heliothea* and *Apetovia* extremely similar to each other. Therefore the latter is downgraded to synonymy : *Apetovia* Krulikovsky, 1918, syn. n. to *Heliothea* Boisduval, 1840.

Subfamilia **GEOMETRINAE Guenée in Duponchel, 1844 [1845]**

Differential features : Venation : Forewing : R1 and R2-R5 typically, but not always, arising separately from cell and R2-R5 stalked. Hindwing : Rs appressed or fused to Sc + R1 for short distance only (exceptions e.g. many Microloxiini genera and *Xenochlorodes*) ; M2 fully developed in both wings and arising from above middle of cell. Ansa of tympanal organ narrow at the base, widening in the middle and then tapering to the end in nearly all species occurring in the study area ; compare Cook & Scoble (1992 : 228). Antenna of male usually bipectinate (exceptions in the study area : *Aplasta, Chlorissa* and *Neromia*). Wing colour mainly green.

Tribus **PSEUDOTERPNINI Warren, 1893**
(Terpnini Inoue, 1961)

Differential features : Venation : Forewing : R1 arising from cell below cell apex ; M3 and CuA1 unstalked. Hindwing : Rs + M1 typically connate or very shortly stalked (exception : *Aplasta*). M3 and CuA1 unstalked, often separate. Frenulum of ♂ typically present (exception : *Holoterpna* and *Aplasta*). Hindtibia of both sexes typically with four spurs (exception : e.g. *Holoterpna*). ♀ antenna filiform, with very short cilia. Abdominal crests developed (exception : *Holoterpna* and *Aplasta*). Tympanum as described for subfamily. ♂ genitalia : "Uncus" deeply forked (main synapomorphic character) ; "socius" absent or rudimentary (e.g. *Pseudoterpna* or some *Dindica* species ; homology to the socius of other Geometrinae not confirmed) ; basal coremata of valva present ; costa of valva at base widely extended into inwardly directed sclerites ; sternite 8 and tergite 8 simple. ♀ genitalia : Apophyses anteriores comparatively short ; lamella antevaginalis usually band-shaped.

Type species of the following additional genera examined : *Dindica* Moore, 1888 ; *Metallolophia* Warren, 1895 ; *Pachyodes* Guenée, 1857 ; *Mimandria* Warren, 1895 ; *Agathia* Guenée, 1857 ; *Dooabia* Warren, 1894.

Remarks : The subdivision into the subtribes "Terpnina Inoue, 1961" and "Pseudoterpnina Herbulot, 1963" (Viidalepp, 1981 : 95) is excluded from consideration in this paper (Terpnina and Terpnini are invalid with regard to Kuznetsov's (1904) Terpnidae (= synonym to Geometrini), Pseudoterpnina has to be associated with "Warren, 1893" according to article 36 ICZN ; compare remarks in the systematical

part). Some features of *Holoterpna* and *Aplasta* are anomalous within Pseudoterpnini ; the systematical position of Aplasta is fairly isolated. According to genitalic morphology *Dooabia* is near *Agathia*. Bifurcation of uncus also occurs in *Mimandria* (*M. insularis* Swinhoe, 1904, examined), although Janse (1935 : 260) states "simple uncus".

PINGASA Moore, [1887]

Differential features : Venation (compare Fig. 4) : Forewing : Sc and R1 free, R2-R5 stalked, R2-R5 and M1 connate. Hindwing : Sc + R1 and Rs appressed for short distance only ; both Rs/M1 and M3/CuA1 usually unstalked, sometimes on very short common stalk ; A2 present, rudimentary. Frenulum in both male and female present. Third segment of palpus elongate, "naked" (Janse, 1935 : 255), i.e. slender, smooth, with short adherent scales. ♂ and ♀ hindtibia typically with four spurs. Wing pattern quite characteristic and rather uniform. Genitalia ♂ : dorsal part of anellus ("superjuxta"; compare Inoue, 1961 : 89) strongly sclerotised.

Pingasa lahayei multispurcata Prout, 1913

External features : Venation see Fig. 4 : In one male from Saudi Arabia however R2-5 and M1 very shortly stalked. Length of tongue 6-7 mm. Palpus (♂) 1.5 times diameter of eye, last segment with very short adherent scales, length of this segment ca. 0.4 mm ; total length in the female 2.5 times diameter of eye, length of last segment ca. 1.1 mm. Frons only slightly convex, black, lower 1/3 creamy white. Male antenna bipectinate, length of longest branches ranging from twice to 2.5 times width of flagellum at same point. Hindtibia (♂) with two pairs of spurs of unequal length. Only minor structural variation between the specimens examined from S. Iran, Saudi Arabia and Nigeria.

Genitalia ♂ : see Fig. 36 (Saudi Arabia). Only minor variation between the specimens examined from S. Iran, Saudi Arabia, Morocco and Nigeria.

Genitalia ♀ : see Fig. 100 (N. Nigeria).

Remarks : According to Wiltshire (1990 : 107) *Pingasa multispurcata* Prout, 1913, is probably a synonym of *P. lahayei* (Oberthür, 1887). However wing colour is somewhat more brownish in the Asiatic populations. Absence of records from Egypt and Sudan suggests disjunct distribution area.

PSEUDOTERPNA Hübner, [1823]

Differential features : Venation (compare Fig. 5) : In the forewing no accessory cell. R2-R5 and M1 shortly stalked. In the hindwing Sc + R1 and Rs appressed for about 1/3 length of cell ; Rs and M1 unstalked ; M3 and CuA1 unstalked ; A2 present, rudimentary. Frenulum present in male, absent in female (only some long hairs present). Hindtibia (♂♀) with two pairs of spurs of unequal length in all species. Tarsus somewhat shortened. Genitalia ♂ : Socius rudimentary, adherent to base of uncus ; "superjuxta" (compare *Pingasa*) absent ; harpe and gnathos spined.

Pseudoterpna coronillaria axillaria Guenée, 1857

External features : Venation : see generic description. Forewing : R2-R5 and M1 unstalked. Tongue developed, length ca. 5 mm. Length of palpus 1.5 times diameter of eye (upper side black) in both sexes. Frons slightly convex, black. Antenna of male bipectinate, longest branches three times width of flagellum ; antenna of female filiform, ciliate, longest cilia 1/3 width of flagellum. Width of male hindtibia 2-3 times width of tarsus. Length of hindtarsus 3/4 length of hindtibia. Some structural variation within the area of distribution of the species : In West Mediterranean populations including North Africa (= *P. c. coronillaria* and *P. c. algirica* Wehrli, 1930) width of male tibia about 2.5-4 times width of tarsus, tongue somewhat shorter (4-5 mm). Slight differences also in ratio tarsus/tibia : 1/2-2/3 in European subspecies.

Genitalia ♂ : see Fig. 37 (C. Lebanon). Gnathos without the prominent terminal spines present in the West Mediterranean populations. Shape of harpe somewhat variable, short and triangular in the specimens examined from the locus typicus. Distal cornutus long and slender as in the nominate subspecies, central cornutus comparatively slender, its teeth short.

Genitalia ♀ : see Fig. 101 (C. Lebanon). Shape of corpus bursae variable, but always more elongate than in the other subspecies. Rather similar to *P. rectistrigaria* (Fig. 104 ; see below). Apophyses posteriores slightly shorter than in European subspecies.

Remarks : *P. c. coronillaria* (Hübner, [1817]) ; as illustrated on pl. 93, figs. 479-482 in Hübner is bluish-grey coloured, postmedian line strongly marked (Spain, France, Corsica ; locus typicus one of these countries). North African populations (*P. c. algirica* Wehrli, 1930) are characterised by a brownish ground colour, dark marginal area and

forewing apex slightly pointed. The typical *P. c. axillaria* is small, brightly coloured, postmedian line very delicate, antemedian line almost wanting, forewing apex rounded. Culot (1919 : 7) mentions *P. c. axillaria* from "Syria" flying at the same locality together with specimens that resemble the nominate subspecies. To date the author has not been able to make similar observations.

***Pseudoterpna coronillaria halperini* ssp. n.**

Holotype : ♂, NE. Israel, Qibbuz Senir, 5 km S. Banyas, 300 m, 14.-16.IV.1987, leg. G. Müller, coll. TAU.

Paratypes : 1♀, NE. Israel, Banyas, 380 m, 22.IV.1988, leg. G. Müller, coll. ZSM ; 1♂, id., 12.IV.1988 ; 2♂ id., coll. TAU ; 2♂, NE. Israel, Shetula, 4 km NE Fassuta, 680 m, 10.IV.1987, leg. G. Müller, coll. ZSM ; 1♂, NE. Israel, Qibbuz Senir, 5 km S. Banyas, 300 m, 11.IV.1988, leg. G. Müller, coll. ZSM ; 1♀, id., 12.IV.1988.

External features : Venation see Fig. 5 : Forewing : R2-R5 and M1 in the typical populations near Mt. Hermon usually stalked, other Israeli and Jordanian populations slightly more variable in this character. Larger and with darker wing colour than in typical *P. c. axillaria* from Beirut. Postmedian and antemedian lines much more distinctly marked. Other external features as described for *P. c. axillaria* from Lebanon.

Genitalia ♂ : see Fig. 38 (NE. Israel). Similar to that of *P. c. axillaria*, but harpe longer ; valva longer and narrower. No structural difference in genitalia of specimens examined from N. Jordan, and also 1♂ from N. Lebanon (!).

Genitalia ♀ : see Fig. 102 (NE. Israel). Corpus bursae broader and more rounded than in *P. c. axillaria*, but at the anterior (oral) end more elongate than in the European subspecies. Apophyses posteriores shorter.

Remarks : Distribution areas of *P. c. axillaria* and *P. c. halperini* probably somewhat isolated from each other by the Bekaa Plain. According to the data published by Wiltshire (1939 : 43) with strikingly different phenology : "June-December" for *P. c. axillaria* ; end of March to beginning of May in *P. c. axillaria* from Israel. The populations from NW. Israel — although identical in their external appearance with typical *P. c. halperini* — are excluded from the type series, since they are slightly different in the male genitalia. An illustration of the imago of *P. c. halperini* will be given in a subsequent paper.

Both subspecies are probably well isolated from the nominate subspecies. Although *P. coronillaria* is said to occur in the Balkans, W. Turkey and Taurus, the author has never seen material from there (perhaps it only occurs as very local relict populations). The species is also absent from N. Italy (except Liguria).

C. Italian populations characterised by short, broad and dentate cornuti, short harpe with long spines, gnathos without the long spines present in the specimens from Spain and N. Africa (see Figs. 39, 103), and the bright grey wing colour. External appearance of the populations from Sicily and S. Italy is transitional to the North African populations, genitalically however they correspond to the specimens from C. Italy. Provisionally I refer these populations of C. Italy, S. Italy and Sicily to *Pseudoterpna coronillaria cinerascens* (Zeller, 1847), stat. n., comb. n. (perhaps beginning speciation). The venation of *P. c. cinerascens* is characterised by R2-R5 and M1 of forewing often being shortly stalked, but they are never stalked in the nominate subspecies (Spain, France, Corsica).

Pseudoterpna rectistrigaria Wiltshire, 1948

External features : Venation : Hindwing : Both Rs/M1 and M3/CuA1 separate ; Rs and CuA1 arising subapically below angle of cell. Tongue developed, length about 4 mm. Length of palpus (♀) about 1.5 times diameter of eye, only the upper side black. Frons convex, black. Antenna (♀) filiform, with very short cilia (1/4 width of flagellum). Relative length hindtibia/hindtarsus 3.7/3.0 mm (♀).

Genitalia ♂ : see Wiltshire (1948 : 80, Fig. B). Harpe very short, triangular.

Genitalia ♀ : see Fig. 104 (Cyprus). Quite similar to that of *P. c. axillaria*. Corpus bursae more slender. Apophyses posteriores slightly shorter than in European subspecies.

Remarks : Compare Hausmann (1994a).

Holoterpna Püngeler, 1900

Differential features : Venation see Fig. 6 : Forewing : R2-R5 distinctly stalked, R2-R5 and M1 connate (exceptionally very shortly stalked). Hindwing : Sc + R1 and Rs appressed for a short distance only ; Rs and M1 (as in *Aplasta*) shortly stalked, somewhat variable ; M3 and CuA1 not stalked, connate (or exceptionally separated by a short distance) ; A2 present, rudimentary. Frenulum in both ♂ and

♀ absent (as in *Aplasta*). Tongue lacking. ♂ antenna shortly bipectinate, ♀ antenna filiform. ♂ and ♀ hindtibia with only one pair of terminal spurs. Hindtarsus not shortened. ♂ genitalia : Uncus forked to 1/3-1/2 of its length only ; socius absent ; valva without spinulose harpe ; basal coremata of valva small. ♀ genitalia : Lamella antevaginalis in female genitalia only slightly sclerotised.

Remarks : Type species of the genus is *Holoterpna diagrapharia* Püngeler, 1900. The synonymisation of *Dyschloropsis* Warren, 1895, with *Holoterpna* in Vojnits (1976 : 170) is erroneous, as the genitalia of both type species evidently show! *Dyschloropsis* with the type species *Jodis impararia* Guenée, 1857, is a valid genus, which has to be placed in the Thalerini. The African species "*Holoterpna errata* Prout, 1922" must be transferred to another genus. Some features of *Holoterpna* are reminiscent of Hemistolini (frenulum, venation, papillae anales in ♀ genitalia).

Holoterpna pruinosata (Staudinger, 1898)

External features : See generic description. Palpus white, small, in both sexes ca. 1.3 times diameter of eye ; last segment very slender, with short adherent scales, somewhat resembling that of *Pingasa*, but not elongate. Frons rather flat, brown. Vertex white. Antenna of ♂ shortly bipectinate, length of longest branches 1.5 times width of flagellum ; antenna of female filiform, almost without cilia. Hindtibia of both sexes with two terminal spurs of nearly equal length. Length of tarsus somewhat exceeding length of tibia (distinguishing character from *Pseudoterpna*).

Genitalia ♂ : see Figs. 40, 41 (N. and C. Israel). Specimens from C. Israel with valva slightly more tapered and narrower than in the populations from N. Israel.

Genitalia ♀ : see Fig. 105 (N. Israel). Apophyses posteriores 3-4 times length of apophyses anteriores. Surface between papillae anales characteristically folded.

Remarks : Lectotype designated (♂, Israel, Jerusalem, 1895, leg. Paulus, coll. ZMB). Two specimens examined from Trieste (N. Italy) structurally without differences from the populations from N. Israel.

APLASTA Hübner, [1823]

Differential features : Venation see Fig. 7 : Forewing venation rather variable : Sc always fused with R1, length of fusion very

variable ; R1 exceptionally re-anastomosing with R2-R4 ; R3 exceptionally present ; R2-R5 and M1 connate or arising separately from cell. Hindwing : Sc + R1 and Rs appressed for about half length of cell, sometimes even more ; Rs and M1 always distinctly stalked ; M3 and CuA1 separate. Frenulum in both male and female absent. Tongue lacking, or sometimes rudimentary. Male antenna slightly dentate, ciliate (as e.g. in *Dooabia*), cilia only 1/5 width of flagellum. Antenna of ♀ almost identical to that of male, somewhat less dentate. ♂ genitalia : valvae asymmetric : spinulose harpe present on the right valva only ; basal coremata of valva small ; posterior edge of sternite 8 medially slightly notched ; tergite 8 simple. ♀ genitalia : lamella antevaginalis in female genitalia reduced.

***Aplasta ononaria* (Fuessly, 1783)**

External features : See Fig. 7 and generic description. Palpus brown, bushy-scaled ; length of palpus in ♂ 0.9-1.2 mm (1.6-1.8 times diameter of eye), in female 1.1-1.3 mm (2.0-2.2 times diameter of eye) ; last segment as described for *Holoterpna*. Frons rather flat, dark brown. Vertex with greyish scales. Hindtibia (♂♀) with two pairs of spurs of nearly equal length. Relative length hindtibia/hindtarsus 1 : 1 (1.7-2.5 mm). No constant differences in structure between the various populations within the area of distribution.

Genitalia ♂ : see Figs. 42-44 (N. Israel). Considerable infrapopulational variability in shape of valvae. No constant differences between specimens examined from Germany, France, Greece, Turkey, Cyprus and Israel.

Genitalia ♀ : see Fig. 106 (Israel). No significant and constant differences between specimens examined from Greece, Turkey and Israel.

Remarks : On the basis of more than 20 ♂ genitalia slides no constant correlation has been observed between structural details and flight season or habitus respectively ("f. *berytaria* Staudinger, 1901"; "f. *faecataria* Hübner, [1823]"). In Israel the smaller yellowish specimens tend to have narrower valva and smaller spines on the gnathos, but this is not a constant feature of all specimens examined. From some localities in Israel only dark coloured specimens are known, from other places only yellow ones (mainly surroundings of Mt. Hermon) ; however sympatric occurrence is often found. The above mentioned "habitus forms" (♂) are perhaps correlated with particular flight seasons (darker specimens emerging somewhat earlier ; compare Ellison & Wiltshire, 1939 : 43). This observation has to be verified with more ex-

tensive material and by rearing the various "entities" (see also Hausmann, 1994a).

Tribus **ARACIMINI Inoue, 1961**

Differential features : Venation similar to that of Pseudoterpnini : Rs and M1 of hindwing unstalked, M3 and CuA1 unstalked, often separate. Frenulum present in male. Palpus comparatively short in both sexes. Hindtibia with four spurs in both sexes. Female antenna filiform. Ansa of tympanal organ rather broad at its base, only slightly dilated in the central part, tapering to the end. Male genitalia characteristic with strongly sclerotised socius bearing large spinulose lobi at base. The simple uncus very short, almost wanting. Gnathos broken. Perhaps related to Geometrini.

Remarks : Type species of type genus (*Aracima muscosa* Butler, 1878) examined. Not represented in the study area.

Tribus **ARCHAEOBALBINI Viidalepp, 1981**

Differential features : See Viidalepp (1981).

Remarks : "Archaeobalbini" is an emended spelling of "Archeobalbini Viidalepp, 1981". Not represented in the study area. Some features, e.g. strongly sclerotised and elongate socius, indicate close relationships to Geometrini. Perhaps also related to Pseudoterpnini.

Tribus **GEOMETRINI Guenée in Duponchel, 1844 [1845]**

Differential features : Venation similar to that of Pseudoterpnini : Rs and M1 of hindwing separate (in *Paramaxates* on very short common stalk) ; M3 and CuA1 separate in both wings (exceptionally connate). Frenulum present in male, absent in female, (male frenulum absent in *Paramaxates*). As in most species of Pseudoterpnini last segment of palpus slender ("naked") and long, especially in the female. ♀ antenna filiform, with very short cilia. Hindtibia of both sexes with 4 spurs. Abdominal crests absent. Ansa of tympanal organ usually widened into hammer-headed plate at apex ; sometimes with big globular lacinia (e.g. *Chlororithra, Neohipparchus, Tanaorhinus*). Genitalia ♂ : Uncus more or less reduced (present e.g. in *Iotaphora, Ornithospila, Sphagnodela* and *Neohipparchus*) ; gnathos tapering, strongly sclerotised ; socius greatly elongate, slender, strongly sclerotised and widely spread (in *Ornithospila* membranous and somewhat shorter).

Type species of the following genera examined : *Geometra* Linnaeus, 1758, *Iotaphora* Warren, 1894, *Tanaorhinus* Butler, 1879, *Ornithospila* Warren, 1844 ; *Neohipparchus* Inoue, 1944, *Paramaxates* Warren, 1894 ; *Chlororithra* Butler, 1889 ; *Sphagnodela* Warren, 1893 ; in addition *Mixochlora* Warren, 1897, according to Inoue (1961 : 38).

Remarks : Not represented in the study area. The family group name "Geometridi" originally attributed to "Guenée in litt.". In Synchlorini Ferguson, 1969, the uncus is lacking and socii widely diverging as in the Geometrini, but Rs and M1 of hindwing distinctly stalked. Male hindtibia (Ferguson, 1985 : 81) with 4 spurs (exception : some *Cheteoscelis* spp.). According to Pitkin (1993 : 45) Synchlorini is perhaps synonymous with Nemoriini "Ferguson, 1969". Presence or absence of uncus is an unstable character in Geometrini (as defined here) ; therefore "Neohipparchini Inoue, 1961" should be better included in Geometrini (**syn. n.**). Both *Neohipparchus* and *Iotaphora* have a stout external spine on the aedeagus, which is probably homologous.

Tribus **COMIBAENINI Inoue, 1961**

Differential features : Venation very variable, in many cases even within populations of the same species. Hindwing : M3 and CuA1 typically unstalked (with a very few exceptions). ♂ antenna bipectinate with very long branches. Ansa of tympanal organ tapering to the free end. ♂ genitalia : Saccus forked, valva inserted in the central part of clasper ; uncus forked (exception : *Microbaena, Uliocnemis*) ; socius present ; gnathos weak or absent ; aedeagus long and slender (exception : *Microbaena, Uliocnemis*). ♀ genitalia : Apophyses anteriores rather long ; ostium bursae closely connected with surface of sternite 8 ; corpus bursae weakly sclerotised and small.

Type species of additional genus examined : *Uliocnemis* Warren, 1893.

Remarks : Unstalked M3 and CuA1 of hindwing is reminiscent of Pseudoterpnini and Geometrini and may indicate relationships. Genitalia characterise Comibaenini as a very homogenous and apparently monophyletic group. The uncus region has a similar aspect in the genera *Dichordophora* Prout, 1913 ("tribe Dichordophorini"; Nearctic) and *Oospila* Warren, 1897 (Neotropical), which however — according to Ferguson (1985 : 5) — are "presumably unrelated" genera (convergence).

***MICROBAENA* gen. n.**

Type species : *Phorodesma pulchra* Staudinger, 1897, by original (= present) designation.

Differential features : Venation see Fig. 8 : rather similar to *Comibaena*. Forewing : R2-R5 and M1 stalked. Frenulum present in male (plesiomorphy). Tongue absent. Hindtibia (♂) not dilated, with two terminal spurs of unequal length, without terminal projection (main distinguishing character separating *Microbaena* from all other *Comibaena* species). ♂ Genitalia : Uncus not forked (secondary apomorphic fusion ♂) ; gnathos weak, laterally strongly sclerotised ; costa of valva basally with long, inwardly directed projection, medially with two prominent and pointed spine-like processi ; aedeagus short, thick ; sternite 8 anteriorly and posteriorly concave, the posterior edge with two lateral incurved chitinous lobes ; tergite 8 with bilobed posterior border.

Remarks : The necessity of establishing a new genus was mentioned by Prout (1935 : 12). There are close relationships with *Uliocnemis*, which externally corresponds well to *Microbaena* (e.g. male hindtibia with 2 spurs, without terminal projection). The main differential feature lies in the male genitalia : *Uliocnemis* with both processi of uncus absent ; shape of valva simple as in *Thetidia* ; aedeagus similar to that of *Microbaena*. In the ♂ genitalia of the Indoaustralian species *Comibaena inductaria* (Guenée, 1857) and the African *Comibaena undulilinea* (Warren, 1905) the two projections of the uncus are closely approximate, fused at their base. Valva and aedeagus are quite similar in shape to those of *M. pulchra*. However the tongue is developed and the hindtibia as described for *Comibaena*.

***Microbaena pulchra* (Staudinger, 1897), comb. n.**

External features : See generic description. Length of palpus (♂) 1.3-1.5 mm (1.5-1.7 times diameter of eye), second segment bushy-scaled, third segment "naked" (i.e. with short adherent scales), short : in Holotype 0.35 mm. Frons in Holotype from Israel distinctly convex in the ventral half, with many dark brown scales. Vertex white. Antenna of male bipectinate, with longest branches ca. 0.9-1.0 mm (about 8 times width of flagellum), tapering, last quarter simple and ciliate. Relative length hindtibia/tarsus 2.2/1.8 mm in Holotype.

Genitalia ♂ : see Fig. 45 (C. Israel ; Holotype). Compare generic description. Little difference between specimens examined from Israel (*M. p. pulchra*), Sudan and Zaire (*M. p. minor* ; see below and Fig. 46) : The valva in the nominate subspecies is somewhat broader. More extensive material is needed to verify this observation.

Genitalia ♀ : unknown.

Remarks : Holotype (coll. ZMB) examined. Three NE. Sudanese males and one from Zaire are somewhat different :

***Microbaena pulchra minor* ssp. n.**

Holotype : ♂, Sudan sept. or., Kassala Prov., Erkowit, 1000-1300 m, 25.VI.1962, leg. Remane, coll. ZSM.

Paratypes : 2♂, id. ; 1♂, Belgisch Kongo [Zaire], Aequator Provinz, Liboko, V.1945, coll. ZSM.

Description (Fig. 146) : Colour and pattern of all wings as in the nominate subspecies. Forewing length 6.8-9.1 mm only (in Holotype of *M. p. pulchra* from Israel 10.6 mm). Third segment of palpus shorter (0.20 mm). Frons flat, very slightly convex in the ventral half, whitish with ochreous scales. Hindtarsus not shortened, length of both hindtibia and tarsus 1.5-2.0 mm.

Remarks : The populations from SW. Saudi Arabia and S. Oman may belong to the nominate subspecies (compare Wiltshire, 1985 : 10).

***COMIBAENA* Hübner, [1823]**

Differential features : Venation see Fig. 9 : Forewing : R2-R5 and M1 stalked. In some African species and the Indoaustralian *C. inductaria* M3 and CuA1 of hindwing distinctly stalked. Frenulum present in male (plesiomorphy ; exception : *C. undulilinea*), absent in female. Hindtibia with two proximal and two terminal spurs (plesiomorphy), pencil and one terminal projection (main differential feature shared by *Comibaena* and the following genus). ♂ Genitalia : Uncus forked ; aedeagus long, slender, straight ; sternite 8 and often tergite 8 with specific sclerotisations ; typical group with posterior edge of sternite 8 strongly sclerotised, crown-shaped.

Remarks : This is a rather heterogeneous group with many species ; perhaps some distinct subgenera should be separated from typical *Comibaena* : e.g. the African *C. leucospilata* Warren group and the *C. inductaria/undulilinea* group. The loss of the frenulum in *C. undulilinea* could have taken place analogously (convergence) to the phylogenetic line of *Proteuchloris/Thetidia*, as the very different genitalia imply. The western Palaearctic species *C. pseudoneriaria* Wehrli, 1926, and *C. serrulata* Fletcher, 1963, are closely related to *C. bajularia* (*Comibaena* s.str.).

***Comibaena bajularia* ([Denis & Schiffermüller], 1775)**

External features : Venation see Fig. 9. Tongue developed, length about 2.5 mm. Palpus 1.8-2.0 times diameter of eye, second segment bushy-scaled, third segment "naked". Frons flat. Male antenna long bipectinate to 4/5 of length of flagellum, longest branches 1.3-1.5 mm (about 10 times width of flagellum) ; female antenna filiform with short cilia, their length 1/3 width of flagellum. Terminal projection of hindtibia (♂) covering 1/3 to 1/2 of tarsus. Little structural variation within the area of distribution : Longest branches of male antenna in the Anatolian populations up to 1.7 mm.

Genitalia ♂ : see Figs. 47-48 (C. Turkey and N. Italy). No significant difference between specimens examined from S. Germany, N. Italy, N. and C. Turkey except slight variation in sternite 8, which in C. Turkish populations is more broadly sclerotised than in European and N. Turkish populations ; projections of uncus basally fused in N. Turkey. Genitalia very similar to those of *C. serrulata,* but uncus more deeply forked, costa of valva with one prominent basal spine. Sternite 8 in *C. serrulata* as figured for the C. Turkish populations.

Genitalia ♀ : see Fig. 107 (C. Turkey). No significant difference observed between specimens examined from S. Germany and C. Turkey. Without significant difference from *C. serrulata* and *C. pseudoneriaria.*

***Proteuchloris* gen. n.**

Type species : [*Geometra* (*Phorodesma*)] *neriaria* (Herrich-Schäffer, 1852), by original (= present) designation.

Differential features : Venation see Fig. 10 : Forewing : R2-R5 and M1 unstalked. Frenulum absent in male and female (synapomorphy of this and the following genus). Hindtibia with two proximal and two terminal spurs (plesiomorphy), furthermore with one terminal projection as in *Comibaena.* ♂ Genitalia : Uncus forked ; valva simple, very similar to that of *Thetidia* ; aedeagus long, slender, straight ; posterior and anterior edge of sternite 8 strongly sclerotised, notched medially on posterior edge ; tergite 8 rounded posteriorly.

Remarks : Loss of the frenulum in the *Comibaena inductaria/ undulilinea* group is presumably analogous (see above). Male genitalia, sternite 8 and tergite 8 of *Proteuchloris* exactly as in *Thetidia*, but the structure of the hindtibia does not allow inclusion in that genus. The Asiatic species *Thetidia albicostaria* (Bremer, 1864) is somewhat similar in habitus, but structurally better placed in *Thetidia.*

***Proteuchloris neriaria* (Herrich-Schäffer, 1852), comb. n.**

External features : Venation see Fig. 10. Tongue developed, length 2.0-2.3 mm. Palpus long, 2.2-2.8 times diameter of eye, second segment bushy-scaled, third segment "naked" somewhat longer (0.5-0.7mm) than in *C. bajularia*. Frons flat. Male antenna long bipectinate to 4/5 of length, longest branches about 1.5 mm (about 10 times width of flagellum) ; female antenna dentate with very short forked branches (length of cilia 1/4 width of flagellum). Projection of male hindtibia covering 1/3 to 1/2 of tarsus. There is no structural variation within the area of distribution.

Genitalia ♂ : see Fig. 49 (N. Israel). See generic description. There is no significant difference between the specimens examined from N. Greece, Turkey and N. Israel.

Genitalia ♀ : see Figs. 108-109 (N. Israel and Macedonia). There are slight differences between the specimens examined from N. Greece, Turkey and N. Israel in the shape of the posterior opening of the ostium bursae, which is wider in the populations from Israel.

***THETIDIA* Boisduval, 1840**

subgenus *ANTONECHLORIS* Raineri, 1994, stat. n.

Differential features : Venation see Figs. 11-12 ; unusually variable in all species of the genus. Forewing : R2-R5 and M1 usually unstalked. Frenulum absent in both sexes (often present, but weak in ♂ of *T. anomica* (Prout, 1935)). Tongue developed, but short and with tendency to reduction. Hindtibia of both ♂ and ♀ with four spurs ; proximal spurs of female with tendency to reduction in some species ; tibia without terminal projection (distinguishing generic character of *Thetidia* from *Comibaena* and *Proteuchloris*). ♂ Genitalia : Valva without processi or spines ; aedeagus curved and slender ; sternite 8 and tergite 8 as described for *Proteuchloris*, median excavations on sternite shallow or lacking.

In the type species *T. plusiaria* Boisduval, 1840, Sc and R1 are usually fused, but not always ; R2-R5 and M1 of forewing are distinctly stalked, whereas in the subgenera *Antonechloris* and *Aglossochloris* they are usually unstalked ; the stalk of R2-R5 and M1 is rather stout, perhaps indicating a secondary fusion. In some species of *Aglossochloris* R2-R5 and M1 are shortly stalked. Exceptionally these veins are also stalked

in *T. smaragdaria* ; therefore full generic separation of the "green *Thetidia*" (*Antonechloris*) species from *T. plusiaria* (corresponding to the significant difference in wing colour) is not adopted here. *Antonechloris* Raineri, 1994, is downgraded from genus to subgenus rank.

***Thetidia (Antonechloris) smaragdaria* (Fabricius, 1787)**

External features : Venation see Fig. 11 (Italy). Forewing : R1 arising quite separately from cell angle ; R2-R5 and M1 sometimes shortly stalked. Hindwing : Rs and M1 usually unstalked with tendency to be stalked, especially in the Spanish populations (where sometimes distinctly stalked) ; M3 and CuA1 usually connate, but quite variable. Length of tongue 1.2-1.6 mm. Length of ♂ palpus 1.5 times diameter of eye, in ♀ twice diameter of eye ; second segment of palpus long, bushy-scaled, third segment "naked" (smooth with adherent scales). Frons flat, green, lower part white. Vertex green. Antenna of male bipectinate to 3/4 of length of flagellum only ; longest branches 0.8-0.9 mm (about 8 times width of flagellum) ; antenna of female filiform or (exceptionally) slightly bipectinate with extremely short branches in basal half of flagellum (somewhat varying even within populations) ; length of cilia 1/3 width of flagellum. Hindtibia of both sexes with four spurs.

Genitalia ♂ : see Fig. 50 (C. Italy). Projections of uncus long, sometimes even longer than socius. Valva usually somewhat more slender than in *T. persica*. Posterior edge of sternite 8 slightly tapering. Only small differences observed between the specimens examined from C. Italy, Sicily, Bulgaria, N. Greece, and NW. Caucasus.

Genitalia ♀ : see Figs. 110-111 (C. Italy, NW. Caucasus). Vaginal plate posteriorly rounded. Chitinisation of ostium bursae narrow. Specimens examined from C. Italy, N. Greece and NW. Caucasus.

Remarks : Not represented in the study area (S. Turkish populations see *T. persica*), but discussed here with regard to possible confusion with the following and the preceding species. Main differential features between *T. smaragdaria, T. volgaria* and *T. persica* : Pectination of female antenna, stalk of Rs and M1 in hindwing, length of uncus projections in ♂ genitalia, shape of vaginal plate in ♀ genitalia. According to Viidalepp (1976 : 845) the two following taxa and *T. anomica* should be considered conspecific with *T. smaragdaria*. Since there are significant and constant differences not only in habitus, but also in structure, they are better considered as species unless interfertility is proved.

***Thetidia (Antonechloris) volgaria* (Guenée, 1857)**

External features : As described for *T. smaragdaria* with the following differences : Venation of forewing : R1 often arising very near cell apex. Hindwing : Rs and M1 shortly stalked or sometimes connate ; M3 and CuA1 separate. In the male antenna length of longest branches 0.6-0.8 mm (5-7 times width of flagellum) ; female antenna slightly bipectinate to 1/2 length of flagellum with very short branches.

Genitalia ♂ : see Fig. 51 (S. Russia). Length of projections of uncus variable, usually nearly as long as socius. Valva shorter than in *T. smaragdaria*, terminally broader.

Genitalia ♀ : see Figs. 112-113 (S. Russia, Armenia). Anterior edge of tergite 8 with two tapered projections. Vaginal plate posteriorly, anteriorly and laterally tapering. Chitinisation of ostium with deep caudal excavation.

Remarks : Not represented in the study area (S. Turkish populations see *T. persica*), but discussed here with regard to the possible confusion with the following and the preceding species. Main differential features from *T. smaragdaria* are wing colour (mainly underside), pectination of antenna, shape of vaginal plate in ♀ genitalia. Concerning the possible occurrence in Armenia see remarks to *T. persica*. The data of *T. volgaria* genitalia ("G 4762, N. Iran"), figured in Hausmann, 1991 (Fig. 9) are erroneously attributed ; the figure shows a female from S. Ural (Russia), prep. G 1523.

***Thetidia (Antonechloris) persica* sp. n.**

Holotype : ♀, N. Iran, Elburs mts. c.s., Tacht i Suleiman, Sardab Tal (Vandarbad), 2500-2700 m, 14.-18.VII.1937, leg. Pfeiffer & Forster, coll. ZSM.

Paratypes : 4♂, N. Iran, Elburs mts. c.s., Tacht i Suleiman, Sardab Tal (Vandarbad), 2500-2700 m, 14.-18.VII.1937, leg. Pfeiffer & Forster, coll. ZSM ; 2♂, N. Iran, Elburs mts. c.s., Tacht i Suleiman, Vandarban-Tal., 1900-2200 m, 1.-3.VII.1936, leg. Pfeiffer, coll. ZFMK ; 1♂, N. Iran, Elburs mts. c., Ort Demavend, Tar Tal, 2200-2500 m, 13.-17.VII.1936, leg. Pfeiffer, coll. ZFMK.

External features (Fig. 147) : Venation (Fig. 12) : Forewing : R1 arising quite separately from cell angle ; R2-R5 and M1 connate. Hindwing : Rs and M1 always stalked, common stalk sometimes very long ; in Anatolian populations usually on short common stalk ; M3

and CuA1 arising separately. Frenulum absent in both sexes. Tongue somewhat reduced, length 0.5-1.0 mm (often invisible between the palpi). Palpus longer than in the preceding species : ♂ about twice diameter of eye, ♀ 2.3-2.5 times diameter of eye. Frons and vertex as described for *T. smaragdaria*. Antenna of male bipectinate up to tip (!), longest branches about 0.80 mm (= about 7 times width of flagellum) ; antenna of female bipectinate to 2/3 or 3/4 length of flagellum, branches narrow, longest branches 0.3 mm (twice width of flagellum). Hindtibia of both sexes with four spurs. Structural features (also venation !) are constant for all specimens examined from N. Iran and E. Turkey (Hakkari, Van), with the exception of the somewhat shorter branches of antenna (0.65) and the short palpus (1.7 times diameter of eye) in the single male from Van. In Anatolian populations length of branches of female antenna usually about 0.10-0.15 mm (= width of flagellum). One male examined from S. Turkey (Zeitun) is structurally as described for *T. persica*, but forewing veins R2-5 and M1 slightly separate, palpus shorter (1.4 mm = 1.9 times diameter of eye), length of tongue about 1 mm, longest branches of antenna 0.75 mm (7 times width of flagellum).

Larger than *T. volgaria*, length of forewing 16.7-18.3 mm in the typical population from Elburz Mountains. Wing colour as in *T. smaragdaria*. Both antemedian and postmedian lines more strongly marked than in *T. smaragdaria*, but not as strongly as in *T. volgaria*. Postmedian line of forewing rather straight, slightly curved on the underside. Postmedian line of hindwing more prominent on the underside towards the margin than in *T. smaragdaria*.

Genitalia ♂ : see Figs. 52-53 (N. Iran, S. Turkey). Length of projections of uncus about half length of socius. Valva broad. Posterior edge of sternite 8 broad. Specimens examined from N. Iran, E., C. and S. Turkey, Armenia.

Genitalia ♀ : see Figs. 114-116 (N. Iran, C. and E. Turkey). Projections on anterior edge of tergite 8 usually rounded. Vaginal plate posteriorly rounded, laterally tapering. Chitinisation of ostium bursae very broad, narrower in C. Anatolian populations. Apophyses anteriores rather short in one female from C. Turkey (Fig. 114). Specimens examined from N. Iran, E. and C. Turkey, Armenia.

Remarks : Two males and two females from Armenia have been examined : one female with antenna typical of *T. persica*, also with genitalia similar to those of *T. persica*. The other one with very short antennal branches as in *T. volgaria/smaragdaria* and genitalia (Fig. 113)

corresponding with those of *T. volgaria*. From this it can be concluded that two species occur sympatrically in Armenia. In habitus the presumed "*T. volgaria*" is more similar to *T. smaragdaria*. Rs and M1 of hindwing in the Armenian pair of "*T. persica*" are only shortly stalked (♂) or unstalked (♀). More material and experimental research is required to establish whether hybridisation occurs in the contact zones of the various taxa. Anatolian populations are included in *T. persica* provisionally for reasons of genitalic similarity. The differences from the other above mentioned taxa lie in the ♀ antenna (see above), wing shape and colour (often deep green), pointed forewing apex, smaller than typical *T. persica*. These populations perhaps constitute a distinct (sub)species ; more material and experimental research are required.

***Thetidia (Antonechloris) silvia* Hausmann, 1991**

External features : Venation as figured for *T. persica*. Hindwing : Rs and M1 stalked, length of stalk 1/5-1/4 of distance between cell angle and termen ; M3 and CuA1 sometimes slightly separated only. Tongue rudimentary, length 0.5-0.7 mm. Length of palpus ♂ 1.6-1.8 times diameter of eye, ♀ twice diameter of eye. Frons flat, pale green, lower part white. Vertex whitish, with pale green scales. Antenna of male long bipectinate to 5/6-7/8 of length of flagellum, length of longest branches 0.80-0.95 mm (7-8 times width of flagellum) ; antenna of female shortly bipectinate, branches thicker than in *T. persica*, length 0.15-0.20 mm (1.5 times width of flagellum). Hindtibia of male with four short spurs, of female with two terminal spurs of unequal length.

Genitalia ♂ : see Fig. 54 (C. Jordan). Projections of uncus comparatively long and slender. Valva short and broad. Posterior edge of sternite 8 broad.

Genitalia ♀ : see Fig. 117 (C. Jordan). Vaginal plate almost round. Chitinisation of ostium bursae anteriorly rounded.

Remarks : Holotype (coll. SMNK) re-examined. There are significant and constant differences from congeneric species in wing pattern.

***Thetidia (Antonechloris) bilineata* Hausmann, 1991**

External features : Venation as figured for *T. persica*. Forewing : R2-R5 and M1 connate. Hindwing : Rs and M1 stalked, length of stalk 1/5 of distance between cell angle and termen. Tongue rudimentary, length 0.6 mm. Length of palpus (♀) twice diameter of eye. Frons

and vertex as described for *T. silvia*. Antenna of female shortly bipectinate, branches more slender than in *T. silvia*, longest branches 0.25 mm (twice width of flagellum). Hindtibia of female with two terminal spurs of unequal length ; proximal spurs present, but very rudimentary and almost invisible.

Genitalia ♂ : unknown.

Genitalia ♀ : see Fig. 118 (C. Jordan). Vaginal plate laterally tapering, anteriorly forked.

Remarks : Holotype (coll. SMNK) re-examined. There are significant differences from congeneric species in wing pattern.

subgenus *AGLOSSOCHLORIS* Prout, 1912, stat. n.

Differential features : Features as described for *Thetidia*, mainly distinguished by the absence of proximal spurs in the male hindtibia (only one terminal pair of short spurs present) ; however in some species rudimentary proximal spurs are visible ; female hindtibia with two terminal spurs which tend to be reduced. Tongue absent or rudimentary (the latter e.g. in some species from Afghanistan). Venation (compare Fig. 13) rather variable in all species. ♂ genitalia in the type species *T. fulminaria* (Lederer, 1870) very similar to the subgenera *Thetidia* and *Antonechloris*, in the other species projections of uncus long, narrow, widely separated from each other. ♀ genitalia : chitinous opening of ostium bursae situated on the anterior half of the vaginal plate.

Remarks : In all the generic features mentioned by Prout (1913 : 28) there tend to be transitional characters (to *Thetidia* and *Antonechloris*). Therefore I propose to reduce the status of *Aglossochloris* to subgeneric rank. In a similar way Viidalepp (1988 : 31, 181) considers *Aglossochloris* as invalid at generic rank. Nevertheless the possibility remains that in future larval morphology or other features will reveal valuable apomorphic characters.

***Thetidia (Aglossochloris) euryrithra* Prout, 1935**

External features : Venation (Fig. 13) similar to that of *T. bilineata*. Forewing : R2-R5 and M1 connate or sometimes stalked. Hindwing : Rs and M1 stalked, length of stalk 1/4-1/3 distance from cell angle to termen ; M3 and CuA1 very shortly stalked. Tongue absent. Structure of palpus as described for *T. smaragdaria*, third segment somewhat shorter ; length in male 1.5 times, in female twice diameter

of eye. Frons flat. Antenna of male bipectinate to 4/5 of length of flagellum ; longest branches about 0.8 mm (= about 7 times width of flagellum) ; antenna of female shortly bipectinate to 2/3 of length of flagellum ; longest branches 0.20-0.25 mm (= twice width of flagellum). Hindtibia of male with two spurs, of female sometimes with short (rudimentary) terminal spurs, sometimes without spurs.

Genitalia ♂ : see Fig. 55 (N. Jordan). Projections of uncus long, slender, well separated from each other.

Genitalia ♀ : see Fig. 119 (N. Jordan). Border of vaginal plate shallowly notched posteriorly ; vaginal plate laterally tapering and anteriorly forked. Chitinisation of ostium bursae narrow.

Tribus TIMANDROMORPHINI Inoue, 1961

Differential features : Venation : Forewing : M3 and CuA1 slightly separate. Hindwing : Rs and M1 unstalked. Frenulum in ♂ present, in ♀ lacking. Frons convex. Hindtibia of both sexes with four spurs. Abdominal crests absent. ♂ genitalia (main differential feature) : Uncus broad, with terminal excavation ; socius strongly sclerotised, broad at base, tapered at apex ; gnathos strongly sclerotised ; valva with spinulose harpe and cucullus ; sternite 8 round with two lateral projections (lobes).

Type species of type genus *Timandromorpha* Inoue, 1944, examined.

Remarks : Not represented in the study area. Perhaps related to Nemoriini.

Tribus **NEMORIINI Gumppenberg, 1887**
(Ochrognesiini Inoue, 1961, **syn. n.**)

Nemoriini Gumppenberg, 1887 (and not "Ferguson, 1969"), originally proposed as "Nemoriinae" with the (N. American) type genus *Nemoria* Hübner, [1818], available according to article 36 ICZN. Gumppenberg took into account not only the Palaearctic, but also the Nearctic fauna. Therefore the hypothesis, that Gumppenberg's concept of "*Nemoria*" concerns the Palaearctic *Chlorissa* species belonging to the Hemitheini (hypothetic homonymy "*Nemoria* Gumppenberg, 1887, nec Hübner, [1818]") has to be rejected and article 39 ICZN cannot be applied.

Differential features : Venation : Forewing : M3 and CuA1 separate or connate. Hindwing : M3 and CuA1 usually stalked (very rarely connate or separate) ; Rs and M1 stalked. Frenulum present

in ♂, absent in female. Third segment of ♀ palpus often smoothly scaled and distinctly elongate. Hindtibia of both sexes with four spurs (exceptionally with two hindtibial spurs in the Nearctic genus *Chlorosea* Packard, 1874). Abdominal crests absent. ♂ genitalia (main differential feature) : Uncus slender, fairly long, often forked terminally ; socius semi-membranous, short ; valva slender ; costa of valva strongly sclerotised, terminally slightly twisted inside ; basally often with processi ; posterior edge of sternite 8 with median excavation.

Type species of the following additional genera examined : *Ochrognesia* Warren, 1894, *Osteosema* Warren, 1894, *Chloromachia* Warren, 1899, *Lophomachia* Prout, 1912, *Anisozyga* Prout, 1911, *Chlorodontopera* Warren, 1893 (the latter genus with Rs and M1 of the hindwing unstalked). According to Ferguson (1985) and Pitkin (1993) *Chlorosea* Packard, 1874, *Nemoria*, Hübner, [1818], *Phrudocentra* Warren, 1895, *Dichorda* Warren, 1900, *Lissochlora* Warren, 1900, *Chavarriella* Pitkin, 1993, *Paromphacodes* Warren, 1897, *Rhodochlora* Warren, 1894, and probably many others from the Nearctic and Neoptropical regions belong here.

Remarks : Not represented in the study area. Genitalic and external morphology as stated and figured in Ferguson (1985) and Pitkin (1993) for the Nearctic and Neotropical Nemoriini reveal close relationships to the (above mentioned) Asiatic genera examined by the author. Therefore Ochrognesiini Inoue, 1961, must be placed in the synonymy of Nemoriini Gumppenberg, 1887.

Tribus **THALASSODINI Inoue, 1961**

Differential features : Cell of hindwing very short, discocellular vein oblique. Abdominal crests wanting.

Remarks : Several species of type genus *Thalassodes* Guenée, 1857 examined. Not represented in the study area. *Thalassodes* much resembles *Prasinocyma* (Hemistolini ♂), in external structure, except stalked M3 and CuA1 and oblique discocellulars of hindwing. However the genitalia are very different. It will be necessary to examine a lot of species to determine whether *Thalassodes* can be placed in Hemistolini or not.

Tribus **HEMISTOLINI Inoue, 1961**

Differential features : Venation : Forewing : R2-R5 and M1 typically stalked ; M3 and CuA1 usually arising at same point or slightly

separate (exception : *Xenochlorodes*). Hindwing : Sc + R1 and Rs fused or appressed at one point only (exception : *Xenochlorodes*) ; Rs and M1 stalked ; M3 and CuA1 usually connate with tendency to be shortly stalked. Frenulum often absent in both sexes, but present in male of *Gnophosema, Prasinocyma, Victoria, Gonochlora, Aporandria*. Palpus very slender and typically short in both sexes. ♂ antenna bipectinate. ♂ hindtibia not dilated, number of spurs varying. Abdominal crests weak (*Hemistola*) or absent. Ansa of tympanum medially broadened, distally tapering. ♂ genitalia with simple stout uncus, which is terminally forked in some species (perhaps indicating relationships to Nemoriini) ; socius semi-membranous and broad, often of medium length, but sometimes nearly as long as uncus or rudimentary (as in most *Prasinocyma* spp.) ; gnathos elongate, usually strongly sclerotised, indicating relationships to Comostolini/Jodiini ; saccus typically simple, but forked in *Xenochlorodes* ; tergite 8 simple, sternite 8 usually forked posteriorly (only slightly in Lophostola ; tapered in *Victoria*). ♀ genitalia : Papillae anales and surface between characteristically folded (compare Figs. 120-126).

Type species of the following genera examined : *Lophostola* Prout, 1912, *Prasinocyma* Warren, 1897, *Chlorocoma* Turner, 1910, *Antharmostes* Warren, 1899, *Lophorrhachia* Prout, 1916, provisionally also *Aporandria* Warren, 1894, *Gonochlora* Swinhoe, 1904, *Neurotoca* Warren, 1897, *Euproutia* Fletcher, 1979. Some additional possibly related genera are given under the generic description of *Victoria*.

Remarks : The group of genera included here is probably polyphyletic ; presumably monophyletic groups are *Hemistola/Lophostola/Prasinocyma/Chlorocoma* and *Victoria/Lophorrhachia/Antharmostes*. *Aporandria* in its external appearance resembles some genera of Geometrini (e.g. *Ornithospila*), however it is clearly different in the tympanum and venation and therefore better included here.

HEMISTOLA Warren, 1893

Differential features : Venation (compare Fig. 14) : Forewing : Sc often anastomosing with R1 ; R2-R5 and M1 typically stalked ; M3 and CuA1 usually connate or slightly separate. Hindwing : Rs and M1 stalked. M3 and CuA1 connate or slightly stalked (e.g. in type species). Frenulum absent in both sexes. Hindtibia of both sexes with four spurs. ♂ genitalia : see description of tribe. Anterior margin of valva medially notched as in many Jodiini. Base of valvula with one more or less sclerotised processus. Coremata at the base of the valva

developed in some species including the type species, but modified to stoutly sclerotised spines in many others. ♀ Genitalia : corpus bursae pear-shaped, rather strongly sclerotised ; lamella antevaginalis often divided into two spinulose fields (very similar in *Lophostola*).

Remarks : The genitalic morphology of the generic type species, *H. rubrimargo* Warren, 1893, shows it to be closely related to *H. chrysoprasaria* (see below), but basal coremata of valva are present (instead of a basal spine). The genitalic morphology of *Chlorocoma* and some Prasinocyma species is rather similar to that of *Hemistola*. The loss of the frenulum in *Hemistola* (as compared with these species) is evidently not sufficient as a separating feature at tribal level. Loss of the frenulum must have taken place several times independently in the phylogenesis of Geometrinae (compare Ferguson, 1985 : 4).

***Hemistola chrysoprasaria* (Esper, 1795)**

External features : Venation see Fig. 14 and descriptions of tribe and genus. Forewing : Sc and R1 anastomosing for a short distance or appressed ; R2-R5 and M1 stalked or (exceptionally) connate. Hindwing : M3 and CuA1 usually connate, but sometimes separated by a short distance or on short common stalk. Discocellular veins strongly curved. In the populations from S. Turkey (Taurus Mountains) R2-R5 and M1 of forewing connate or separate. Tongue developed, thick, its length usually about 2-3 mm, sometimes to 4 mm. Palpus very slender, length nearly diameter of eye or somewhat exceeding it (especially in ♀). Frons flat, reddish brown. Vertex white. Antenna of ♂ bipectinate nearly to tip, longest branches ca. 0.5 mm only (four times width of flagellum) ; antenna of ♀ shortly bipectinate nearly until tip, longest branches ca. 0.2 mm (somewhat exceeding width of flagellum). Little difference in the external structural features between the nominate subspecies and ssp. *occidentalis* Wehrli, 1929, ssp. *lissas* Prout, 1912, and the populations from Sicily (see remarks).

Genitalia ♂ : see Fig. 56 (S. Turkey). Little difference between specimens examined from N. and C. Italy, Macedonia and S. Turkey. In S. Turkey the membranous processus of valvula is narrower than in European populations. The ssp. (♂) *lissas* from C. Asia has basal processus of valva much smaller than in the nominate subspecies, in addition the membranous processus of the valvula and the fields of cornuti in the aedeagus are very small, and sternite 8 has two rounded elevations posteriorly ; it may be a distinct species.

Genitalia ♀ : see Fig. 120 (S. Turkey). Almost no differences between the specimens examined from C. Italy and S. Turkey. Lamella postvaginalis rounded in C. Italy, tapering to an angle of 90° in S. Turkey.

Remarks : In one specimen from C. Italy the venation is quite unusual (individual aberration) : M1 and M2 of forewing stalked, and Rs, M1 and M2 of hindwing stalked! Genitalia of the populations from Sicily show specific differences (*Hemistola siciliana* Prout, 1935, stat. n.), e.g. basal processus of valva not connected with anterior margin of valva by sclerotised ridge (connected in *H. chrysoprasaria*) ; socius and membranous processus of valvula narrower ; aedeagus without fields of cornuti ; sternite 8 with two tapering projections well separated from each other (see Fig. 57).

XENOCHLORODES Warren, 1897

Differential features : Venation see Fig. 15 (valid for *X. olympiaria* and *X. nubigena* (Wollaston, 1858)) : Forewing : both R1 and R2 fused with Sc, distally not reaching costa ; R2 exceptionally free ; R1 and (short) common stalk of R2-R5 and M1 connate, R1 sometimes arising from distal end of common stalk or between ; M1 very rarely unstalked ; M3 and CuA1 stalked. Hindwing : Sc + R1 and Rs fused over 2/3-3/4 length of cell ; Rs and M1 distinctly stalked ; M3 and CuA1 stalked. Discocellular veins strongly angled. Frenulum absent in both sexes. Tongue developed, length ca. 2 mm (lost in *Hissarica*). Palpus slender and short. Eyes quite distant from each other. Frons flat, reddish brown. Vertex white. Antenna bipectinate in both sexes, branches in ♀ very short. Hindtibia in both sexes not dilated, with two long terminal spurs of unequal length (in *Hissarica* short spurs of nearly equal length). Tergite 2 of male interiorly with two long processi, which are often club-shaped ; their function totally unknown. ♂ genitalia : uncus and gnathos strongly sclerotised, pincer-shaped ; gnathos strongly tapering ; socius membranous, but very weakly developed ; saccus forked (rounded in *Hissarica*) ; valva ventrally excavated, without spinulose processi ; basal coremata present ; aedeagus long and slender, with some external spines ; posterior edge of sternite 8 bilobed with narrow sinus. ♀ Genitalia rather simple : Lamella antevaginalis poorly sclerotised ; ductus bursae strongly sclerotised.

Remarks : The systematic position remains unclear. The venation is reminiscent of Comostolini. See remarks to *Hierochthonia*. The genus *Hissarica* Viidalepp, 1988, with type species *Hissarica postalbida* Viidalepp, 1988 (specimens examined from Afghanistan and Tadzhikistan),

is very near *Xenochlorodes* in venation and genitalia. The status of *Hissarica* must be downgraded to subgenus of *Xenochlorodes* (**stat. n.**). *Xenochlorodes (Hissarica) gilvescens* Wiltshire, 1966, is probably the right name and combination for the species called "*Hissarica postalbida*" in Viidalepp, 1988. Further studies are required to verify this hypothesis. The type of *Phorodesma graminaria* Kollar, 1850, has to be examined with regard to possible relationships with *X. (H.) postalbida*.

"*Xenochlorodes*" *albicostaria* Brandt, 1938, obviously belonging to another genus, can provisionally be maintained in *Xenochlorodes* (*Hissarica*) ; one "Paratypoid" examined.

***Xenochlorodes olympiaria cremonaria* (Staudinger, 1897)**

External features : For venation see generic description and Fig. 15 ; almost no variation between the populations from Spain, France, N. Africa, Italy, Greece, Turkey, Israel etc. (more than 50 specimens examined). Palpus reddish brown fading to ochreous, their length in ♂ 0.40-0.50 mm only (0.8-0.9 times diameter of eye), in ♀ 0.50-0.60 mm (= diameter of eye). Antenna of ♂ bipectinate nearly to tip, length of longest branches 0.50-0.60 mm (about five times width of flagellum) ; in ♀ very shortly bipectinate or almost filiform, "branches" not exceeding width of flagellum, length of cilia about 2/3 width of flagellum. Relative length tibia/tarsus in the hindleg (♂♀) 1.8/2.0 mm. Other features as described for the genus.

Genitalia ♂ : see Fig. 58 (N. Israel). Only very slight differences observed between the specimens examined from Israel, Lebanon and S. Turkey (*X. o. cremonaria*) and those from Spain, Algeria, Tunisia, S.Italy, Croatia, S.Greece, Crete, N.Turkey (*X. o. olympiaria*) : In *X. o. olympiaria* projections of sternite 8 posteriorly somewhat more rounded.

Genitalia ♀ : see Fig. 121 (N. Israel). No constant differences observed between the specimens examined from Israel, Lebanon, S. Greece, C. Italy and Morocco.

Remarks : *Xenochlorodes beryllaria* (Mann, 1853), syn. to *X. olympiaria* (Herrich-Schäffer, 1852) see Hausmann, 1997. The populations from S. Turkey, Lebanon and Israel differ from those of N. Turkey and Europe in their pale green (almost white) wing colour. All the deep green specimens from the Levant examined by the author proved to be *Hierochthonia* species. Two syntypes ("Original") of *cremonaria* examined.

GNOPHOSEMA Prout, 1912

Differential features : For generic description see revision of Ebert (1969). Venation (compare Fig. 16) : Forewing : R2 usually fused with R1. Hindwing : M3 and CuA1 on short common stalk or connate ; hindwing termen very slightly angled at both M1 and M3. Frenulum present in male, absent in female. Palpus in both sexes short and slender. Tongue absent. Antenna in both sexes bipectinate. Hindtibia in both sexes with two spurs, not dilated. ♂ genitalia : uncus and gnathos strongly sclerotised ; socius present ; ventral part of valva medially excavated ; basal processus of valva strongly developed in *G. isometra* (Warren, 1888), small or absent in *G. palumba* ; basal coremata absent ; posterior edge of sternite 8 with two flat projections. ♀ genitalia : Folds between papillae anales as in many other Hemistolini.

Remarks : Genitalic characters such as the long simple uncus, clearly show that *Gnophosema* is not a genus of "Pseudoterpnini" (as suggested in Ebert, 1969)! Certain relationships with *Hemistola* are indicated, particularly in the ♂ genitalia (structure of uncus, socius etc.). The external spines of the aedeagus and shape of the slender valva are reminiscent of those of *Xenochlorodes.*

Gnophosema palumba kurdistana Ebert, 1969

External features : see generic description and Ebert (1969 : 193ff.).

Genitalia ♂ : compare Fig. 59 (S. Iran ; G. *p. palumba* Brandt, 1938). Basal processus in subspecies from Kurdistan "totally reduced" longer in nominate subspecies. According to Ebert (loc. cit.) the chitinous ridge of the aedeagus has five teeth. Compare the figure of the right valva of *G. p. kurdistana* in Ebert (1969 : 183, Fig. 11).

Genitalia ♀ : compare Fig. 122 (S. Iran ; *G. p. palumba* Brandt, 1938). ♀ genitalia of *G. p. kurdistana* unknown.

VICTORIA Warren, 1897

subgenus *VICTORIA* Warren, 1897

Differential features : External morphology as described for *Victorinella* subgen. n. (see below), but palpus somewhat longer : slightly exceeding diameter of eye in ♂, nearly twice diameter of eye in ♀. Distinctly differing in ♂ genitalia from the following subgenus : Uncus long, terminally broadened and slightly forked in *V. fuscithorax* ; socius

broad and short ; spinulose harpe lacking, ventral projection of valva in *V. gordoni* probably not homologous to that of *Victorinella*, as indicated by lack of spines and different shape ; valva medially excavated on ventral margin (similar to equivalent in *Hemistola*) ; posterior edge of sternite 8 with two lobes (*V. albipicta, V. immunifica*) or two small projections, situated very near to each other (*V. fuscithorax*, *V. gordoni*, but rudimentary in the latter).

Species included : *Victoria albipicta* Warren, 1897 (type species), and *Victoria fuscithorax* Warren & Rothschild, 1905 ; provisionally also *Victoria immunifica* Prout, 1912, and *Victoria gordoni*, Prout, 1912.

Remarks : The structure of uncus, length of socius and shape of posterior edge of sternite 8 in *V. fuscithorax* correspond well to morphological characteristics of Nemoriini ; *Victoria* perhaps links both tribes. Venation almost identical with that of *Bustilloxia* (except stalked M1 of forewing) ; the concave hindwing termen between M1 and M3 and red frons are reminiscent of Thalerini. The number of spurs on the ♂ hindtibia is complete as in most species of the tribes Hemistolini/ Comostolini. The basal coremata of the valva are as e.g. in *Lophostola*. The systematic position has not been ascertained, but there may be further relationships to some African genera such as *Prosomphax* Warren, 1911, *Celidomphax* Prout, 1912, *Omphax* Guenée, 1857, and *Heterorachis* Warren, 1898. *Victoria immunifica* Prout, 1912, and *Victoria gordoni*, Prout, 1912, differ from both subgenera *Victoria* and *Victorinella* in their male genitalia with ventral part of valva basally membranous (modified coremata), tongue present etc. Perhaps they constitute a well defined third subgenus of *Victoria*.

subgenus *VICTORINELLA* subg. n.

Type species : *Victoria sematoperas* Prout, 1916, by original (= present) designation.

Differential features : See Hausmann (1993 : 53f.). Venation see Fig. 17 (*V. sematoperas*) : Venation of forewing quite simple : Sc free ; R1 free ; R2-R5 stalked ; R2-R5 and M1 connate ; M3 and CuA1 connate. Hindwing : Sc + R1 and Rs fused at one point ; Rs and M1 stalked ; M3 and CuA1 stalked. ♂ frenulum strongly developed, absent in ♀. Palpus comparatively short in both sexes. Tongue lacking. Antenna bipectinate in both sexes. Abdomen with dorsal crests. Hindtibia with four spurs in both sexes. ♂ genitalia : Uncus shorter than in *Victoria* s.str., tapering to end, not forked terminally ; length of socius nearly that of uncus ; spinulose harpe present ; posterior edge

of sternite 8 with one central spinulose projection (simple in *V. triplaga*). ♀ genitalia : Papillae anales transversally folded (similar to equivalent in *Hemistola*).

Further species examined : *V. sematoperas* Prout, 1916, *V. omanensis* (Wiltshire, 1980), *V. triplaga* Prout, 1915.

Remarks : *Victorinella* corresponds better in its genitalic morphology (♂) to some species of the African genus *Antharmostes* Warren, 1899 (e.g. A. interalbicans Warren, 1902) than to *Victoria* s.str.. However in *Antharmostes* the gnathos is weaker, tongue present, female antenna simple, hindtibia of male dilated and hind wing termen at M3 distinctly prominent (not or only slightly so at M1).

***Victoria (Victorinella) wiltshirei* sp. n.**

Victoria sematoperas Hausmann, 1993 : Spixiana 16 (1) : 59 (nec Prout, 1916 : Proc. Zool. Soc. London, 1916 : 142, pl. II, Fig. 26).

Holotype : ♂, NE. Sudan, Ed Damer, Hudeiba, 24.I.1962, leg. Remane, coll. ZSM.

External features : Holotype figured in Hausmann (1993 : Fig. 4 ; "Victoria sematoperas (?)"). Wing colour green. White cell spot of all wings larger than in *V. sematoperas*, encircled by a broad red-brown ring. Apical spot of forewing large, round (in *V. sematoperas* much smaller and more or less subdivided into 3 spots). Spots in the anal angle of both fore and hindwing larger than in *V. sematoperas*. Postmedian line present, but hardly visible (in *V. sematoperas* only one crossline very near the termen). Venation exactly as figured for *V. sematoperas* (Fig. 17). Length of palpus 2/3 diameter of eye, ochreous, second segment with outstanding scales, third segment extremely short. Length of longest branches of ♂ antenna 0.92 mm (8 times width of flagellum). Hindtibia (♂) apparently with two proximal spurs of unequal length and one terminal spur (both legs present and examined), but this may be an artifact. Distance between terminal and proximal spurs very small.

Genitalia ♂ see Fig. 60 (NE. Sudan) : Similar to that of *V. sematoperas* (compare Fig. 61). Harpe oval. Spines situated more medially than in *V. sematoperas*. Posterior edge of sternite 8 not tapering as in *V. sematoperas*, less sclerotised and with teeth less concentrated.

Genitalia ♀ : unknown, but presumably similar to genitalia of *V. sematoperas* (compare Fig. 123).

Remarks : The author was able to borrow a male from Herr Kuchler, München, of true *V. sematoperas* from Kaputir, W. Kenya, "near" the

locus typicus of the species (Mandere, NE. Kenya), which corresponds fairly well in external appearance to the original description and is genitalically identical with the holotype. Dedicated to Mr. E. P. Wiltshire, who sent me drawings of the genitalia of the ♂ holotype and ♀ paratype of *V. sematoperas*, and kindly helped also by his extensive scientific discussions on the genus *Victoria*.

***Victoria (Victorinella) plantei* Herbulot, 1976**

External features : This and the following species are characterised by smoothly scaled second segment of palpus (♂). Third segment of ♀ palpus somewhat elongate (♀ 0.3, ♂ 0.1 mm).

Genitalia ♂ see Fig. 62 (C. Israel), of ♀ see Fig. 124 (C. Israel).

Remarks : Holotype re-examined by M. Herbulot, Paris (personal communication). For data on the morphology and differential features from the other species of the genus see Hausmann (1993 : 53f.).

***Victoria (Victorinella) eremita* Hausmann, 1993**

Genitalia ♂ see Fig. 63 (S. Israel). New material collected in April confirms that the genitalia of specimens emerging in April are similar to those of *V. plantei*. Rearing experiments are necessary to resolve the problem of possible crossfertilisation between the various "seasonal units" of *V. eremita* (compare Hausmann, 1993) and *V. plantei*.

Genitalia ♀ see Fig. 125 (S. Israel).

Remarks : Holotype re-examined. Data on the morphology and differential features from the other species of the genus see Hausmann (1993 : 55f.).

***Victoria (Victorinella) fifensis* Wiltshire, 1994**

Genitalia ♂ see Fig. 64 (W. Saudi Arabia).

Remarks : Data on the morphology and differential features from the other species of the genus see Hausmann (1993 : 59 ; as "*Victoria* spec.") and Wiltshire (1994 : 115f.).

Tribus **RHOMBORISTINI Inoue, 1961**

Differential features : Venation : Forewing : M3 and CuA1 separate. Hindwing : venation corresponding well with that of Berta

(Jodiini) and *Comostola* (Comostolini) particularly in the extraordinary course of the discocellular vein. Frenulum present in ♂, absent in ♀. Tongue present. Palpus elongate, third segment of ♀ palpi very long. Antenna of ♂ and ♀ as described for Comostolini. Abdominal crests absent. Hindtibia with two spurs in ♂, with four in ♀.

Type species examined of *Rhomborista* subgenus *Spaniocentra.*

Remarks : Not represented in the study area. Closely related to both Comostolini and Jodiini. Some correspondences in ♂♀ genitalia.

Tribus **COMOSTOLINI Inoue, 1961**

Differential features : Venation : In *Comostola, Comostolopsis* and *Pyrrhorachis* R1-R5 and M1 of forewing stalked, in *Eucrostes* and *Mujiaoshakua* however M1 arising below cell apex ; M3 and CuA1 in both wings stalked ; Rs and M1 of hindwing stalked ; hindwing termen not or slightly prominent on M3. Frenulum absent in both sexes. Tongue generally present. Palpus very slender ; in female 3rd segment often elongate. Male antenna bipectinate, last 1/4-1/2 simple and ciliate. Female antenna filiform (very shortly bipectinate in *Eucrostes*). Hindtibia with four spurs in both sexes (two in *Eucrostes*), tarsus short. Ansa of tympanal organ very long and narrow. Abdominal crests wanting. ♂ genitalia : Uncus long, simple, or forked at apex ; gnathos present, tapering, often long ; basal coremata of valva absent (exception : *Pyrrhorachis*) ; base of valva with spinulose lobes ; aedeagus long and slender ; sternite 8 and tergite 8 usually simple. ♀ genitalia often with signum.

Type species of following additional genera examined : *Comostola* Meyrick, 1888, and *Comostolopsis* Warren, 1902 (perhaps should be included in *Comostola*, compare Inoue, 1961 : 101), *Pyrrhorachis* Warren, 1896. According to Inoue (1961 : 79) *Mujiaoshakua* Inoue, 1955 also belongs here.

Remarks : Some features are reminiscent of Hemistolini (e.g. ♂ genitalia). A rather close relationship to (and monophyly with) Jodiini is indicated by the structure of antenna, hindtarsus etc., see below. In *Syndromodes* ♂ genitalia are similar, e.g. uncus and tip of gnathos long and slender, basal coremata of valva absent etc., but relationship to Comostolini is not confirmed (male frenulum present ; see also Microloxiini). *Allochrostes* Prout, 1912, despite similar external appearance does not belong to Comostolini (perhaps near Microloxiini).

EUCROSTES Hübner, [1823]

Differential features : Venation see Fig. 18 : Forewing : Sc and R1 fused ; R1 arising from below cell apex ; R2-R5 and M1 usually separate ; M3 and CuA1 stalked. Hindwing : Sc + R1 and Rs touching (not fused) at one point ; Rs and M1 usually stalked ; M3 and CuA1 stalked ; discocellulars of all wings often weak between M2 and M3. Frenulum absent in both sexes. Frons flat. Palpus very slender, second and third segment elongate in ♀. Tongue present, but weak. ♂ antenna bipectinate with long branches, ♀ with very short branches or in some species flagellum filiform. Hindtibia in both sexes with two spurs, not dilated. ♂ genitalia : Uncus slender, terminally forked ; socius semi-membranous, long ; gnathos distinctly sclerotised, slender, tapering ; valva with chitinous crest instead of basal coremata ; aedeagus long, slender, without cornuti ; sternite and tergite 8 simple. ♀ genitalia : Apophyses posteriores 2.0-2.3 times length of apophyses anteriores (the latter 0.25 mm only) ; corpus bursae rather small and tender ; lamella antevaginalis sclerotised to a longitudinally folded ribbon ; ostium bursae funnel-shaped.

Further species examined : *Eucrostes disparata* Walker, 1861 (Nigeria, Tanzania).

Remarks : The male genitalia are strikingly similar to *Comostolopsis* ! The relationship is unquestionable, although forewing venation and some other features are quite different.

Eucrostes indigenata (de Villers, 1789)

External features : Venation (Fig. 18) see generic description : Forewing : R2-R5 and M1 separate or connate, exceptionally on very short common stalk ; M3 and CuA1 stalked ; forewing venation quite constant throughout the area of distribution. Hindwing : Rs and M1 in West Mediterranean populations shortly stalked or sometimes connate ; distinctly stalked in populations from Tunisia, Sicily, S. Italy and East Mediterranean with only a very few exceptions, transitional in C. Italy. Frons reddish brown or orange, vertex white with some yellowish or greenish scales. Length of weak tongue 1.2-2.0 mm. Palpus whitish ochreous, their length in ♂ 0.50-0.60 mm (= diameter of eye), in the Middle East populations somewhat exceeding diameter of eye ; in ♀ 0.70-0.80 mm (nearly 1.5 times diameter of eye), first segment bushy-scaled, third segment "naked" with adherent scales. Antenna of ♂ bipectinate over 2/3 of length of flagellum, length of longest branches

0.42-0.50 mm (4-5 times width of flagellum), in ♀ very shortly bipectinate (almost lamellate) over 1/2-2/3 of length of flagellum, length of longest branches 0.12-0.15, exceptionally 0.17 mm (slightly exceeding width of flagellum at same point). In hindleg of both sexes relative length tibia/tarsus 1.2-1.7/1.5-2.0 mm.

Genitalia ♂ : see Fig. 65 (N. Jordan) and generic description. No remarkable and constant difference between specimens examined from S. Spain, S. France, C. Italy, Sicily, Malta, Tunisia, Hungary, Crete, Lebanon, Syria, Israel and Jordan.

Genitalia ♀ : see Fig. 126 (Israel) and generic description. No remarkable and constant difference between specimens examined from S. Spain, C. Italy, Sicily, Tunisia, Turkey, Lebanon, Israel and Jordan.

Remarks : The close relative *E. disparata* differs in (absolute) length of antennal branches (♂ : about 0.35-0.40 mm = four times width of flagellum), and in the hindwing where Rs and M1 are distinctly stalked as in East Mediterranean populations of *E. indigenata*. In the ♂ genitalia the valva is somewhat shorter. Perhaps only separable at subspecific rank. At the ZSM there are specimens of *E. indigenata* from S. Spain that differ from the nominate subspecies. These populations are probably isolated from the rest of the area of distribution, since the species is not recorded from Morocco and W. Algeria in the south ; in the north the Pyrenees could be another barrier :

***Eucrostes indigenata lanjeronica* ssp. n.**

Holotype : ♀, Hispania mer., Andalusia, Lanjeron, 11.VI.1895, leg. Korb, coll. ZSM.

Paratypes : 1♂, id. ; 1♂, id., "1894"; 1♀, Hispania mer., Las Alpujarras, Orgiva, 1000 m, 13.VII.1962, leg. Sattler, coll. ZSM ; 1♂, Hispania mer., Andalusia, Ronda, 26.VI.1926, leg. Wehrli, coll. ZFMK ; 1♂, id., 26.VII.1926. One further female from "Castilia" (C. Spain ; coll. ZSM) has a wrongly attached head (of a *Chlorissa* sp.), therefore is not included in the type series.

Description (Fig. 148) : Length of the antennal branches in ♀ : 0.22-0.27 mm (2.5 times width of flagellum) ; other external features and venation as described above for West Mediterranean populations. Yellowish postmedian line somewhat more distal than in *E. i. indigenata*. No distinguishing characters in genitalia (♂♀).

Remarks : Females of the nominate subspecies have been examined from SE. France, Majorca, Italy, Sicily, Malta, Tunisia, Hungary, Croatia, Bosnia, Macedonia, Greece, Crete, Bulgaria, Turkey, Lebanon, Israel, Jordan.

Tribus **JODIINI Inoue, 1961**

Differential features : Most features as described for Comostolini. However hindwing termen prominent at M3. Frenulum usually absent, but present in *Gelasma* (plesiomorphy ♂). Both ♂ and ♀ palpus elongate. Hindtarsus short. Abdominal crests wanting. ♂ genitalia : Valva slender, typically with ventral excavation ; basal coremata of valva absent in Jodis, but present in *Gelasma* and *Berta* (plesiomorphy ♂). Posterior edge of sternite 8 typically, but not always, strongly sclerotised with median notch.

Type species of the following genera examined : *Jodis* Hübner, [1823], *Gelasma* Warren, 1893 (*Gelasma* s.str., *Thalerura* Warren, 1894), *Berta* Walker, [1863].

Remarks : Not represented in the study area. *Gelasma* shows some presumably plesiomorphic features ; relationships with various other tribes (e.g. Hemitheini) are not excluded, perhaps a genus of great evolutionary age. *Gelasma* belongs to Hemitheini according to Viidalepp (1981 : 95).

Tribus **THALERINI Herbulot, 1963**
(Chlorochromini Duponchel, [1845], nom. invalid.)

Differential features : Venation : Forewing : R2-R5 and M1 usually stalked. Hindwing : Rs and M1 stalked ; M3 and CuA1 usually unstalked ; margin of hindwing strongly concave between M1 and M3. Frenulum absent in both sexes (present in male of *Culpinia* and *Bustilloxia*). Frons always red, orange or reddish brown. Palpus very slender. ♂♀ antenna usually bipectinate. Hindtibia with two terminal spurs in both sexes (female exceptionally with four spurs : *Culpinia*). ♂ genitalia : Uncus simple ; socius present, long, sclerotisation often comparatively strong ; gnathos weak or absent ; valva long and slender ; costa medially with strongly sclerotised processus ; a second processus at base of valva (exception : *Bustilloxia*) ; basal coremata of valva present ; sternite 8 and tergite 8 simple (exception : *Bustilloxia*). ♀ genitalia : Sclerotisations of lamella ante- and postvaginalis ring-shaped.

Type species of following additional genera examined : *Dyschloropsis* Warren, 1895 ; *Heteroculpinia* Hausmann, 1994, Dolosis Prout, 1912. *Bustilloxia* Exposito, 1979, has some features indicating relationships to Thalerini (compare Hausmann, 1994), but its systematic position is isolated (e.g. in ♂ genitalia transtilla differs strongly from that of typical Thalerini species).

Remarks : The tribes Hemistolini, Comostolini, Jodiini, Thalerini, Hemitheini and Microloxiini are linked by various (mostly exotic) genera, which show combinations of transitional features. E.g. in *Culpinia* the number of female hindtibial spurs and the presence of male frenulum correspond well with typical Hemitheini features, but genitalia, wing colour and hindwing margin reveal close relationships to Thalerini.

THALERA Hübner, [1823]

Differential features : Venation compare Fig. 19 and tribal description. Forewing : R1 often fused with R2 for a short distance ; R2-R5 and M1 stalked ; M3 and CuA1 distinctly separate. Hindwing : Sc + R1 and Rs fused over about 1/4 of length of cell (not fused in all other Thalerini genera) ; M3 and CuA1 unstalked as in *Dyschloropsis*. Tongue present (absent in *Dyschloropsis*). Fringes chequered. ♂ genitalia : saccus elongate. ♀ genitalia : Apophyses anteriores in type species comparatively long : 0.6 mm = 1/2 of length of apophyses posteriores (shorter in *Dyschloropsis* and *Heteroculpinia*) ; corpus bursae very long and slender.

Remarks : *T. laceratariа* Graeser, 1889, has somewhat different forewing venation : R1 fused with Sc ; R2-R5 and M1 connate.

Thalera fimbrialis magnata A. Fuchs, 1903

External features : Venation see Fig. 19, compare also tribal and generic description : Hindwing : CuA1 and M3 arising at same point or separated by a short distance only (exceptionally shortly stalked). Tongue developed, length 3.2-4 mm. Palpus (♂♀) slender, short (nearly = diameter of eye). Frons flat. Antenna of male bipectinate to tip, longest branches 0.8-0.9 mm (five times width of flagellum) ; antenna of female shortly bipectinate almost to tip, longest branches 0.3 mm (twice width of flagellum), in Greek populations about 0.4 mm. High constancy of external structural features throughout the area of distribution of both *T. f. fimbrialis* and *T. f. magnata*.

Genitalia ♂ : see Fig. 66 (C. Turkey). There are almost no remarkable and constant differences between the European and the Asiatic populations (specimens examined from Germany, S. Italy and Macedonia ; C. Turkey, N. Iran, C. Asia) : In the latter valva slightly narrower.

Genitalia ♀ : see Fig. 127 (N. Iran). No differences within the area of distribution.

Remarks :Perhaps *T. fimbrialis* var. *magnata* A. Fuchs, 1903, should be better considered as a synonym of *Thalera fimbrialis*. Specimens from the Asiatic populations are said to be larger than the nominate ones ; but this is a very slight difference with many transitions and exceptions.

CULPINIA Prout, 1912

Differential features : Venation see Fig. 20 : Forewing : R1 usually fused with Sc for short distance. Hindwing : Sc + R1 and Rs touching at one point, not fused ; M3 and CuA1 shortly stalked as in *Heteroculpinia*. Frenulum present in male, absent in female. Hindtibia of male with two, of female with four spurs. Fringes chequered (not in *Dyschloropsis* and *Heteroculpinia*). ♀ genitalia : Apophyses anteriores comparatively long (0.6 mm = half length of apophyses posteriores) ; corpus bursae comparatively short, rounded.

Remarks : The genus has many transitional features linking Thalerini with Hemitheini.

Culpinia prouti (Thierry-Mieg, 1913)

External features : Venation see Fig. 20 : Forewing : R1 often free ; R2-R5 and M1 shortly stalked (in type species *Culpinia diffusa* (Walker, 1861) usually connate) ; M3 and CuA1 of both wings on short common stalks. Tongue developed, length ca. 3.5-5 mm (absent in the type species and *Dyschloropsis*). Palpus slender, its length somewhat exceeding diameter of eye in male, nearly twice diameter of eye in female (♀ palpus not elongate in type species) ; first segment bushy-scaled. Frons flat, reddish brown. Antenna of male bipectinate nearly to tip, length of longest branches ca. 0.6 mm (four times width of flagellum) ; of female very shortly bipectinate, length of longest branches ca. 0.1 mm (nearly = width of flagellum). Proximal pair of spurs on female hindtibia rudimentary. No structural variation within the area of distribution.

Genitalia ♂ : see Fig. 67 (S. Turkey).

Genitalia ♀ : see Fig. 128 (C. Israel). No remarkable difference between the specimens examined from S. Turkey and C. Israel.

Remarks : The ♂ genitalia seem to show a closer relationship to *Thalera laceratariа* Graeser, 1889 and to the genus *Heteroculpinia*, than to the type species of the genus, *Culpinia diffusa*, but the male frenulum and structure of the ♀ hindtibia do not allow the species to be transferred.

Tribus **HEMITHEINI Bruand, 1846**

Differential features : Venation : Hindwing : Sc + R1 and Rs fused or appressed at one point ; Rs and M1 stalked ; M3 and CuA1 usually stalked. Frenulum present in male, absent in female ; according to Prout (1912 : 21) "♂ frenulum weak". Palpus of female often elongate. Male with one pair of metathoracic tibial spurs ; female with two pairs (e.g. most *Chlorissa* species, *Phaiogramma, Hethemia*) or one pair distally (some "*Chlorissa*" species, *Kuchleria, Pamphlebia, Neromia* and *Mesothea*). Both ♂ and ♀ antenna usually filiform, ciliate, but bipectinate in ♂ of *Kuchleria, Nipponogelasma, Chlorochlamys, Chloropteryx* and *Xerochlora*, in ♀ of *Kuchleria*. ♂ genitalia : Uncus simple, comparatively long ; gnathos weak or absent ; length of semi-membranous socius about that of uncus ; transtilla often narrow and U-shaped as in Thalerini, but sometimes extended ; valva with basal coremata ; aedeagus divided into a slender basal "stalk" and a broad distal half, very often with cornuti or sclerites ; sternite 8 in male sometimes with specific characters ; sternite 2 typically with lateral apophyses, which are strongly sclerotised, slender and tapered distally.

Type species of the following additional genera examined : *Hemithea* Duponchel, 1829, *Diplodesma* Warren, 1896, *Pamphlebia* Warren, 1897. According to Inoue (1961 : 57) and Viidalepp (1981 : 95) *Nipponogelasma* Inoue, 1946, and *Parachlorissa* Inoue, 1961 also belong here. According to Ferguson (1985 : 102f.) the N. American genera *Chlorochlamys* Hulst, 1896, *Chloropteryx* Hulst, 1896, *Xerochlora* Ferguson, 1969, *Hethemia* Ferguson, 1969, and *Mesothea* Warren, 1901, belong to Hemitheini.

Remarks : In the literature "Hemitheini" has often been treated as a polyphyletic "tribe" in which authors include those genera that cannot be placed in the other established tribes. Hemitheini (as defined here) is rather closely related to Thalerini. E.g. genitalic morphology of *Diplo-*

desma, Nipponogelasma, Hethemia and *Mesothea* reveal transitional features (mainly to *Culpinia*).

CHLORISSA Stephens, 1831

Differential features : see Dantart (1990). Venation see Fig. 21 : Forewing : Sc and R1 often fused, length of fusion variable, exceptionally R1 free ; R1 free from R2-R5. R2-R5 and M1 shortly stalked, exceptionally connate or only separated by a short distance ; M3 and CuA1 often stalked. Hindwing : M3 and CuA1 always distinctly stalked ; termen at M3 usually angled. Palpus of female long. Antenna of both male and female filiform without pectinations, ciliate. Hindtarsus of male reduced, except *Chlorissa gigantaria* (Staudinger, 1892) according to Viidalepp (1988, Fig. 1/4). ♂ genitalia with socius very narrow ; transtilla U-shaped, narrow ; processus of costa of valva prominent ; aedeagus with sclerites ; sternite 8 with one more or less prominent, strongly sclerotised median tooth. ♀ genitalia : Lamella antevaginalis a single plate ; ostium bursae posteriorly with two hairy lobes.

Further species examined : *C. pretiosaria* Staudinger, 1877, *C. gelida* Butler, 1889, *C. gigantaria* Staudinger, 1892, *C. talvei* Viidalepp, 1988, *C. arkitensis* Viidalepp, 1988, *C. rubripicta* (Warren, 1893) and *C. distinctaria* (Walker, 1866).

Remarks : The genera *Hemithea* and *Diplodesma* are closely related to *Chlorissa*. "*Chlorissa* should perhaps be sunk to subgeneric rank of *Hemithea*" (Prout, 1930 : 27). Some genitalic features of *Hemithea* (e.g. narrow socius, contents of aedeagus) lead to the opinion, that *Hemithea/Chlorissa* are more closely related to each other than to *Phaiogramma/Chlorissa*. Some other features, e.g. shape of valva and harpe, hindwing termen, structure of female genitalia confirm the generic distinction between *Chlorissa* and *Hemithea*. The palpus and antenna of the *C. pretiosaria* group are somewhat similar to those of *Phaiogramma*. In some African species R1-R5 of forewing stalked, with R1 fused to Sc. According to the generic diagnosis given by Prout (1934 : 117) they have to be transferred to *Diplodesma : Diplodesma approximans* (Warren, 1897), **comb. n.**, *Diplodesma subrufibasis* (Prout, 1930), **comb. n.**, *Diplodesma eborilitoris* (Fletcher, 1958), **comb. n.** nec (Prout, 1930 : unavailable) and probably many others.

Chlorissa viridata (Linnaeus, 1758)

External features : Venation see Fig. 21 : As described for the subgenus. Tongue developed, length 3-3.5 mm. Length of palpus of male somewhat exceeding diameter of eye, of female up to 1.5 times diameter of eye. Frons slightly convex. Antenna of male and female filiform, ciliate to tip of flagellum, length of longest cilia in male 0.09 mm (= width of flagellum), in female about 0.06 mm (2/3 width of flagellum). Relative length tibia/tarsus in the foreleg (♂♀) 1.3/2.3 mm ; in the hindleg 3.0/1.2 mm (♂) or 2.3/1.5 mm (♀). Male hindtibia slightly dilated. Little structural variation within the area of distribution : in the Central Asian subspecies *C. v. insigniata* (Staudinger, 1901) R2-R5 and M1 of forewing always separate ; in Transcaucasian and Georgian specimens (n=2 × 5 : both wings examined) R2-R5 and M1 of forewing connate, M3 and CuA1 separate, in the hindwing discocellular vein joining M3 + CuA1 very near CuA2.

Genitalia ♂ : see Figs. 68-69 (N. Italy, Transcaucasia). For distinguishing characters from *C. cloraria* see Dantart (1990). Terminal sclerotisation of vesica short, well separated from the patch of microcornuti by a hyaline area of the vesica. Specimens examined from S. Germany, N. Italy, Macedonia, Armenia, Transcaucasus, C. Asia. In Transcaucasian specimens shape of processus of costa of valva variable and transitional to *C. cloraria* as it is also in C. Asiatic *C. v. insigniata.*

Genitalia ♀ : see Fig. 129 (Transcaucasia). For distinguishing characters from *C. cloraria* see Dantart (1990). Specimens examined from S. Germany, N. Italy, Armenia, Transcaucasus, C. Asia.

Remarks : Not represented in the study area, but treated here as the species occurs in Transcaucasia, and because separation from the following species is difficult. The Transcaucasian populations however need taxonomic revision with more extensive material. Perhaps separation of the two taxa (*viridata*/*cloraria*) is not complete in some regions.

Chlorissa cloraria (Hübner, [1813])

External features : In venation, structure of tongue, palpus, frons, antenna and hindtibia as described for *C. viridata.* In the populations examined from C. Turkey R2-R5 and M1 of forewing distinctly stalked, M3 and CuA1 (forewing) shortly stalked. Last segment of palpus often darker. Apart from the venation little structural variation within the area of distribution.

Genitalia ♂ : see Figs. 70-71 (C. Greece, C. Turkey). For distinguishing characters from *C. viridata* see Dantart (1990). Terminal sclerotisation of vesica often long and tapering, touching the patch of microcornuti (with exceptions). Specimens examined from Austria, Corsica, C. Italy, N. and C. Greece and C. Turkey. For Spanish populations see Dantart (l.c.).

Genitalia ♀ : see Fig. 130 (C. Greece). For distinguishing characters from *C. viridata* see Dantart (1990). Specimens examined from Corsica, C. and S. Italy, N. and C. Greece. For Spanish populations see Dantart (l.c.). Determination may be impossible even after genitalic dissection.

Remarks : see remarks to *C. viridata.*

***Chlorissa asphaleia* Wiltshire, 1966**

External features : Venation as figured for *C. viridata*, but R1 of forewing free from both Sc and R2-R5 ; R2-R5 and M1 connate. Length of tongue 4-4.5 mm. Last segment of palpus of male very short ; length of palpus 1.7 times diameter of eye, in female somewhat longer (twice diameter of eye). Frons slightly convex. Antenna as described for *C. viridata*, but longest cilia in female about half width of flagellum. Relative length tibia/tarsus in the foreleg (♂♀) 1.3/3.0 mm ; in the hindleg 3.0/1.2 mm (♂) or 2.8/2.1 mm (♀).

Genitalia ♂ : see Fig. 72 (N. Turkey). The big rounded basal processus, costal projection on distal end of valva, and large basal coremata are unique within the genus. Reminiscent of Thalerini, e.g. genus *Thalera.*

Genitalia ♀ : see Fig. 131 (N. Turkey). Sclerites of lamella antevaginalis and surface between papillae anales reminiscent of Thalerini, e.g. genus *Thalera.*

Remarks : Not yet recorded in the study area.

***PHAIOGRAMMA* Gumppenberg, 1887, stat. n.**

Type species : *Nemoria faustinata* Millière, 1868, by subsequent monotypy.

Differential features : Venation (see Fig. 22) similar to that of *Chlorissa*, but hindwing termen somewhat more rounded, less angled at M3. Palpus of female extremely long. Antenna of male dentate ; cilia grouped in tufts ; ♀ antenna scarcely ciliate. ♂ hindtibia with two,

♀ with four spurs. ♂ hindtarsus short as in *Chlorissa* : relative length tibia/tarsus about 2.7/1.5 mm. ♂ genitalia with socius rather broad, especially subapically ; transtilla expanded ; processus of costa of valva absent or small ; aedeagus without chitinous plates, with patches of cornuti ; posterior edge of sternite 8 slightly concave. ♀ genitalia : Lamella antevaginalis divided into two sclerites ; surface somewhat wrinkled. Main differential characters from *Chlorissa* : shape of socius, aedeagus and sternite 8 (♂).

Additional species : The whole Afrotropical species complex surrounding *C. faustinata*/*C. stibolepida* (Butler, 1879) has to be included in *Phaiogramma*.

Remarks : Compare remarks to *Neromia* and *Neromia simplexa*. Until now *Phaiogramma* has been regarded as a synonym of *Chlorissa*.

***Phaiogramma pulmentaria* (Guenée, 1857), comb. n.**

External features : Venation (see Fig. 22) similar to that of *C. viridata*, but in the forewing R1 typically free (in a very few specimens however fused with Sc) ; R2-R5 and M1 usually connate, sometimes shortly stalked or separated from each other, in S. Spain, Morocco, Italy and Sicily always stalked, in Turkey usually stalked but sometimes connate ; M3 and CuA1 of forewing usually shortly stalked, but variable. Length of tongue 3.5-4 mm. Palpus of male long, length about 1.5-2 times diameter of eye ; of female very long : 2.0-2.6 times diameter of eye. Frons flat. Antenna of male dentate almost to tip, longest cilia about 0.15 mm (1.5-1.7 times width of flagellum) ; of female filiform, scarcely ciliate, longest cilia only 1/3 width of flagellum. Hindtibia (♂♀) as described for C. viridata. Apart from the venation no structural variation occurs within the area of distribution.

Genitalia ♂ : see Fig. 73 (N. Israel). No remarkable and constant differences between populations examined from S. Italy, S. Greece, Cyprus, S. Russia, Turkestan, Morocco, Israel, Jordan. For Spanish populations see Dantart (l.c.).

Genitalia ♀ : see Fig. 132 (N. Israel). No remarkable and constant differences between populations examined from S. Italy, S. Greece, Cyprus, Tunisia, Israel, Jordan. For Spanish populations see Dantart (l.c.).

Remarks : "*C. p. palaestinensis* Fuchs, 1903" is often regarded as valid at subspecific rank for the populations of the Middle East. Neither

genitalic morphology nor external appearance reveal any indication of isolation of populations and separation into distinct subspecies.

"*Chlorissa*" *solidaria* (Guenée, 1857)

Remarks : Recorded for S. Iraq in Wiltshire (1957 : 101) as "*Chlorissa solidaria* Guen.". This is a reference to Prout (1921 : 187), who mentions "*solidaria* Guen." from Fao, S. Iraq as a species "closely allied to *Chlorissa pulmentaria*": This, however, is obviously concerning *Symmacra solidaria* Gn., one of the few green species belonging to Sterrhinae : it is transferred to the genus *Symmacra* by Prout (1935 : 26).

***Phaiogramma faustinata* (Millière, 1868), comb. n.**

External features : Venation very similar to *C. pulmentaria* : Forewing : R1 typically free (in a very few specimens however fused with Sc) ; R2-R5 and M1 connate, exceptionally very shortly stalked or separate ; M3 and CuA1 usually connate, but variable. Hindwing : discocellular vein arising from M3 + CuA1 medially between CuA1 and CuA2. In C. African populations M3 and CuA1 of forewing sometimes distinctly stalked, discocellular vein of hindwing arising from M3 + CuA1 very near CuA2. Length of tongue 3-3.5 mm. Palpus of male long, length about 1.5 times diameter of eye ; of female very long : 2.3-2.8 times diameter of eye. Frons flat. Antenna (♂♀) as described for *P. pulmentaria*, flagellum of male antenna slightly dentate. Hindtibia (♂♀) as described for *C. viridata*, spurs of ♂ rather short, in ♀ the length of the longer terminal and longer proximal spur more than twice that of the shorter. Apart from the venation there is no structural variation within the area of distribution.

Genitalia ♂ : see Figs. 74-76 (N. and S. Israel ; Cyprus). No remarkable and constant differences observed between populations examined from Tunisia, Libya, Egypt, S. Greece, Cyprus and S. Oman. For Spanish populations see Dantart (l.c.). However in populations examined from Armenia, N. and C. Israel there are three patches of cornuti present instead of two, with only a very few exceptions (n = 35 ♂ slides). The only ♂ examined from S. Israel (Yotvata ; Fig. 75) has apparently two patches of cornuti, but this may be due to positioning on the slide. In Egypt there are regularly two patches.

Genitalia ♀ : see Fig. 133 (Israel). No remarkable and constant differences observed between the populations examined from Tunisia,

Egypt, S. Greece, Crete, Cyprus, C. Lebanon, Israel, N. Jordan, N. Oman, Sudan. For Spanish populations see Dantart (l.c.).

Remarks : The N. African "*Eucrostes*" *rhoisaria* (Chrétien, 1909) is a synonym (compare Hausmann, 1994a). In C. Africa male genitalia and venation (see above) seem to justify the separation of some subspecies (or species ♂). The whole complex should be revised separately.

***Phaiogramma discessa* (Walker, 1861), comb. n.**

External features : unknown.

Genitalia ♂ : see Fig. 77 (Bahrein) : According to Wiltshire (1990 : 110) differs from the next species in the aedeagus. Fig. 77 is redrawn from a sketch sent to the author by Mr. E. P. Wiltshire in a personal communication : central patch of external spines ("cornuti") replaced by a sclerotised ridge. However, conspecifity of this Bahrein specimen with typical *P. discessa* from India ("N.-Hindustan") awaits verification.

Genitalia ♀ : unknown.

Remarks : In 1985 Rose & Devinder described "*Chlorissa patialensis*" (*Phaiogramma patialensis* (Rose & Devinder, 1985), comb. n.) from NW. India. The genitalia figured in the original description are quite similar to those of *P. faustinata*. As far as can be judged from this illustration, the processus of the costa of the valva is lacking. As the locus typicus of *patialensis* and that of *discessa* are almost the same and no differential diagnosis has been made, the two names may be synonymous. If this is the case, the ♂ from Bahrein would belong to another species or it could be an extremely abnormal mutation of *P. faustinata*.

***Phaiogramma polemia* (Prout, 1920), comb. n.**

Genitalia ♂ : see Wiltshire (1967 : pl. VI, Fig. 4). Conspecifity not ascertained.

Remarks : For data on the morphology see Hausmann (1995 : 590). No authentic material available, photograph of holotype (♀ ; BMNH) examined.

***NEROMIA* Staudinger, 1898**

Differential features : Venation see Fig. 23 : similar to that of *Chlorissa* and *Phaiogramma*. Forewing : R1 free ; R2-R5 and M1

stalked, sometimes distinctly ; M3 and CuA1 shortly stalked or connate. Hindwing termen rounded as in *Phaiogramma*. Palpus comparatively short and slender in both sexes (in *N. simplexa* ♀ palpus elongate). Antenna of ♂ ciliate with cilia grouped in tufts ; antenna of ♀ scarcely ciliate. Hindtibia of female with two spurs. Hindtarsus of male long in *N. pulvereisparsa* (in *N. simplexa* shortened). ♂ genitalia somewhat resembling that of *Hemithea* (e.g. postition of harpe in *N. pulvereisparsa*), but socius broader ; uncus slightly split terminally (but not in *N. simplexa*) ; basal coremata of valva present ; transtilla expanded. ♀ genitalia more or less of the *Phaiogramma* type : lamella antevaginalis divided and posterior (caudal) part of corpus bursae wrinkled, somewhat resembling female genitalia of the Microloxiini genus *Thelycera*.

Remarks : The female hindtibia of some African "*Chlorissa*" species has two spurs (Prout, 1930 : 27). These species should be re-examined and incorporated in a revision of the generic differences between *Chlorissa, Phaiogramma, Hemithea, Diplodesma* and *Neromia*. Since *N. simplexa* shows transitional features to *Phaiogramma*, it should be considered whether downgrading of *Neromia* to a subgenus of *Phaiogramma* may be necessary. *Phaiogramma* and *Neromia* are more closely related than *Phaiogramma* and *Chlorissa*.

Within the Hemitheini the combination of two spurs on female hindtibia, short female palpus (these features being the main differential characters according to Prout 1913 : 26), dorsoventrally split uncus and harpe arising from ventral part of valva are quite unusual and may indicate certain relationships to Microloxiini. However the filiform antenna of ♂♀, long socius (♂ genitalia), and presence of basal coremata of valva are quite unusual for Microloxiini.

Neromia pulvereisparsa pulvereisparsa (Hampson, 1896)

External features : Venation see Fig. 23 and generic description. Length of tongue 2-3 mm. Length of palpus in ♂ somewhat exceeding diameter of eye, in ♀ somewhat longer : 1.2-1.4 times diameter of eye. Frons flat, dark brown. Vertex greyish. Antenna of male filiform, slightly notched between segments, with two rows of tufts of cilia, longest cilia (0.20 mm) about twice width of flagellum ; antenna of female filiform, ciliate, longest cilia somewhat exceeding width of flagellum. Relative length tibia/tarsus in foreleg (♂♀) about 1.1/2.3 mm ; in hindleg of both male and female about 1.8-2.0/1.7-1.8 mm. Male and female hindtibia with two long spurs of unequal length.

Genitalia ♂ : see Fig. 78 (N. Oman). No remarkable differences observed between specimens examined from N. Oman and S. Iran.

Genitalia ♀ : see Fig. 134 (N. Oman). No remarkable differences observed between specimens examined from N. Oman and S. Iran.

Remarks : The descriptions given above concern material from N. Oman and S. Iran (no topotypic material examined). The external appearance of one S. Oman specimen (nearer to locus typicus) figured in Wiltshire (1990 : Fig. 61) is identical to the specimens examined (see remarks to *N. p. jodisata*).

***Neromia pulvereisparsa jodisata* Staudinger, 1898**

External features : Little structural difference from the nominate subspecies as described above : Tongue slightly shorter, length ca. 1.7-2.5 mm. Scales of frons ochreous, paler than in nominate subspecies, as is the colouring of the whole insect, even the vertex is paler.

Genitalia ♂ : see Fig. 79 (C. Israel). No remarkable and constant structural differences from the nominate subspecies. Specimens examined from Israel and Jordan. The male genitalia of an Egyptian specimen figured by Wiltshire (1949 : Fig. 83) obviously match well those of Palestinian populations.

Genitalia ♀ : see Fig. 135 (C. Israel). No remarkable and constant structural differences from the nominate subspecies. Specimens examined from Israel and Jordan.

Remarks : Differs from the nominate subspecies mainly in the much brighter wing colour. As the species is widely distributed in the Arabian peninsula, perhaps there is no real isolation between the typical populations of *jodisata* and *pulvereisparsa*, in which case the name *jodisata* would sink in synonymy.

***Neromia simplexa* Brandt, 1938**

External features : Venation (compare Fig. 23) as described in generic diagnosis. Forewing : R2-R5 and M1 on short common stalk ; M3 and CuA1 connate (constant in three specimens examined). Length of tongue 2.5-3.0 mm. Palpus brown, length in ♂ 0.80 mm (1.2 times diameter of eye), in ♀ 0.90-0.95 mm (1.7-1.8 times diameter of eye). Frons flat or slightly convex, brown. Vertex whitish. Antenna of ♂ filiform, ciliate to tip, longest cilia 0.25-0.30 mm (about three times width of flagellum) ; antenna of ♀ scarcely ciliate, length of cilia about

half width of flagellum. Relative length tibia/tarsus in foreleg (♂♀) 0.9/1.8 mm. Tarsus shortened in hindleg (♂♀) : relative length tibia/tarsus 1.7-1.8/1.2-1.3 ; hindtibia of both sexes with two spurs of unequal length.

Genitalia ♂ : see Fig. 80 (N. Oman). Socius subapically very broad. Central part of valva strongly sclerotised with two stout projections. Aedeagus with two patches of very small cornuti. The genitalia figured here correspond to sketches of specimens from C. Iraq (Baghdad), which Mr. E. P. Wiltshire sent to the author in a personal communication.

Genitalia ♀ : see Fig. 136 (N. Oman).

Remarks : *N. simplexa* shows transitional features between *Neromia* and *Phaiogramma* (especially *P. faustinata*) in length of ♀ palpus, length of hindtarsus, shape of harpe (♂ genitalia), breadth of socius, position of cornuti in aedeagus (♂ genitalia) and lamella antevaginalis (♀ genitalia). Perhaps it would be better transferred there.

KUCHLERIA Hausmann, 1995

Differential features : For generic differential analysis see Hausmann (1995). Venation see Fig. 24. Sternite 2 without lateral apophyses (differential feature from most other Hemitheini genera).

Kuchleria gisisi Hausmann, 1995

Genitalia ♂ see Fig. 81 (C. Israel), of ♀ see Fig. 137 (C. Israel).

Remarks : For data on the morphology and distinguishing characters from the other species of the genus see Hausmann (1995 : 589).

Tribus **MICROLOXIINI tribus n.**

Type genus : *Microloxia* Warren, 1893, by original (= present) designation.

Differential features : Venation : see Figs. 25-29 and Hausmann (1995) : Hindwing : Termen rounded ; Rs and M1 usually very distinctly stalked ; very long fusion of Sc + R1 and Rs in some genera. Frenulum sometimes present in male (tending to be weakly developed), but often absent ; absent in female. Palpus short and slender in both sexes. Frons flat. Tongue short or absent, rarely well developed. Antenna in both sexes bipectinate (except *Thelycera*). Hindtibia of female with two spurs

only. Abdominal crests absent. ♂ genitalia : Distal end of uncus often split dorsoventrally ; socius present, but often broad and shortened ; gnathos typically weak or absent ; valva without basal coremata (except *Thelycera*) ; harpe arising from ventral part of valva.

Genera included here after examination of their type species : *Microloxia* Warren, 1893, *Mixocera* Warren, 1901, *Thelycera* Prout, 1912, *Acidaliastis* Hampson, 1896, *Acidromodes* gen. n., *Tropicollesis* Prout, 1930, *Hemidromodes* Prout, 1912, *Allochrostes* Prout, 1912, *Paraprasina* Warren, 1897, and perhaps also *Syndromodes* Warren, 1897 (despite complete number of spurs and filiform antenna ; see Comostolini). *Hierochthonia* Prout, 1912 placed here only provisionally.

Remarks : For possible relationships with *Neromia* see above. The presence of basal coremata on the valva in *Thelycera* is perhaps to be interpreted as a plesiomorphic feature. Reduction (as e.g. in *Thelycera*) and elongation of branches of antenna are presumably processes taking place with (comparatively) high frequency in the phylogenesis of the Geometrinae. The frenulum must surely have been lost many times independently not only in the Microloxiini, but also in other tribes of Geometrinae.

MICROLOXIA Warren, 1893

Differential features : For generic description see Hausmann, 1995. Venation see Fig. 25.

Microloxia herbaria (Hübner, [1813])

Genitalia ♂ see Fig. 83 (C. Turkey), ♀ see Fig. 138 (SE. Turkey).

Remarks : For description of morphology see Hausmann (1995 : 573).

Microloxia ruficornis Warren, 1897

Genitalia ♂ see Fig. 84 (S. Israel), ♀ see Fig. 139 (S. Israel).

Remarks : For description of morphology see Hausmann (1995 : 576).

ACIDALIASTIS Hampson, 1896

Differential features : Venation see Fig. 26 : Forewing : R1 fused with Sc, not reaching costa as in *Microloxia* ; R2-R5 distinctly stalked ; R3 lacking, exceptionally present in wing apex ; origins of R2, R4

and R5 on the stalk very near to each other, sometimes connate ; R2, R4 and R5 widely diverging ; R2-R5 and M1 unstalked ; M3 and CuA1 unstalked, points of origin from cell often well separated. Hindwing : Sc + R1 and Rs fused over 3/4 length of cell, sometimes even 4/5, in Israel and Jordan up to 7/8 ; Rs and M1 on extremely long common stalk, distally widely diverging ; M3 and CuA1 unstalked, sometimes separate, sometimes on very short common stalk. Frenulum lacking in both sexes. Frons flat. Palpus short in both sexes. Tongue lacking. Antenna bipectinate in both sexes. Hindtibia with two spurs in both sexes, not dilated in male. ♂ genitalia : Uncus broad ; gnathos lacking ; socius shortened ; valva ventrally with long, stout, outwardly directed and curved spine (harpe) ; aedeagus without cornuti ; sternite 8 simple, its anterior margin strongly convex. ♀ genitalia very simple with small and weakly sclerotised corpus bursae. Apophyses very short, broad, triangular.

Remarks : Studies of the differential features of the genus *Acidaliastis* necessitate the description of a new genus (see below). *Acidaliastis curvilinea* (Prout, 1912) according to Janse (1935 : 403) has two spurs on the male hindtibia, not four as stated in Prout (1930 : 48). Genitalia (e.g. shape of valva) quite similar to *A. micra*. The generic placement of *Acidaliastis prophanes* Prout, 1922, is confirmed by genitalic morphology.

***Acidaliastis micra* Hampson, 1896**

Euchloris dissimilis Warren & Rothschild, 1905 : Novitates Zool. 12 : 26, pl. 4, Fig. 27, **syn. n.**

External features : Venation see Fig. 26 and generic description. Palpus white, length in both sexes ca. 0.45 mm (= diameter of eye). Frons white or brigthly ochreous. Antenna bipectinate nearly to tip in both sexes, longest branches in male 0.30-0.38 mm (6-8 times width of flagellum), in female about 0.20 mm (three times width of flagellum), branches broad, arising quite distantly from each other. Relative length hindtibia/tarsus in ♂ about 1.0/0.8 mm, in ♀ about 1.4/1.1 mm.

Genitalia ♂ : see Fig. 85 (S. Israel). See also generic description. Infrapopulational variability rather small. No structural difference within the area of distribution, neither between the whitish and the brownish forms.

Genitalia ♀ : see Fig. 140 (S. Israel). See also generic description. No structural difference within the area of distribution, not even between the whitish and the brownish forms.

Remarks : Locus typicus of *A. micra* is Aden. According to Prout (1930 : 48) characterised by small size, straight postmedian line and black cell spots. From Sudan, the locus typicus of "*Euchloris*" *dissimilis* Warren & Rothschild, 1905, and from Israel large numbers of specimens (several hundreds from each country) were examined by the author : Brownish coloured specimens occur only occasionally, cell spot often rather small, specimens often very small (compare distinguishing characters mentioned by Prout, l.c.). As there are no constant differences in structure or habitus within the area mentioned above, the taxon *dissimilis* has to sink into synonymy.

ACIDROMODES gen. n.

Type species : *Acidaliastis nilotica* Wiltshire, 1985, by original (= present) designation.

Differential features : Venation see Fig. 27 : Forewing : R1 fused with Sc for a short distance only, not reaching costa, as in *Microloxia* and *Acidaliastis* ; R2-R5 and M1 shortly stalked, all veins present ; R2-R5 not widely diverging as in *Acidaliastis* ; M3 and CuA1 separate. Hindwing : Sc + R1 and Rs fused over somewhat more than 1/2 length of cell only (in *Acidromodes saharae* 3/4) ; Rs and M1 distinctly stalked, but shorter than in *Acidaliastis* (in *Acidromodes saharae* distally diverging as in Acidaliastis) ; M3 and CuA1 on a short common stalk, in *Acidromodes saharae* distinctly stalked. Frenulum absent in both sexes (present in ♂ of *Tropicollesis*). Tongue absent. Male palpus quite long, length about 0.75 mm (1.2 times diameter of eye). Antenna bipectinate to tip, longest branches about 0.65 mm (5-6 times width of flagellum). Hindtibia of male strongly dilated, with four spurs. Hindtarsus short, relative length tibia/tarsus about 2.0/1.1 mm. ♂ genitalia (see Fig. 82) : Uncus simple, narrow ; socius broad, nearly reaching length of uncus ; gnathos present, but weak ; harpe arising from ventral part of valva, somewhat resembling that of *Hemidromodes robusta* (see below) ; aedeagus with one short stout cornutus ; the long stout processi of sternite 8 are unique. ♀ genitalia unknown.

Examined material : Holo- and Paratype of *Acidromodes nilotica* (Wiltshire, 1985) from Sudan, also one male of *Acidromodes saharae* (Wiltshire, 1985) from Burkina Faso (Upper Volta).

Remarks : Not represented in the study area. According to Prout (1930 : 48) the male hindtibia of the African species "*Acidaliastis*" *subbrunnescens* Prout, 1916, and "*Acidaliastis*" *bicurvifera* Prout, 1916, have four spurs ; therefore they probably should be included in this

new genus. This genus has a combination of various particular features evidently showing close relationships to *Hemidromodes* and *Tropicollesis* : male hindtibia dilated, with four spurs ; fusion of Sc + R1 and Rs ; stout cornutus ; shape of harpe etc.

HEMIDROMODES Prout, 1916

Differential features : Venation see Fig. 28 : Forewing : Sc and R1 free, without fusions ; R2-R5 and M1 shortly stalked, exceptionally connate ; M3 and CuA1 connate, sometimes very shortly stalked or separate. Hindwing : Sc + R1 and Rs fused for a long distance ; Rs and M1 distinctly stalked ; stalk of M3 and CuA1 somewhat shorter, sometimes connate. Venation of hindwing according to Prout (1935 : 16) similar to that of *Hierochthonia* and that of *Syndromodes* (Prout, 1930). Frenulum present in male, but often somewhat weak, absent in female. Frons flat. Palpus whitish, in ♂ very short and slender, in ♀ slender, but somewhat elongate. Tongue lacking. Antenna short (ca. 2-3 mm), bipectinate in both sexes, branches of ♂ long, of ♀ short. Hindtibia of ♂ greatly dilated, with four spurs, proximal pair of spurs long, the terminal ones very short. ♀ hindtibia very slender, only terminal pair of spurs present. ♂ genitalia : uncus simple, stout ; socius broad, somewhat shorter than uncus ; gnathos more strongly sclerotised than in other Microloxiini genera ; juxta and transtilla expressed as two extended sclerites ; the stout basal processus of valva is unique ; harpe arising from ventral part of valva ; aedeagus with strongly sclerotised cornutus (cornuti) ; sternite and tergite 8 simple. ♀ genitalia : Lamella antevaginalis strongly sclerotised ; corpus bursae with a constriction separating a stiff, longitudinally ribbed, posterior part from a smaller smooth anterior part.

Remarks : Its nearest ally in Africa is perhaps the genus *Tropicollesis*. There may also be some relationships to "Lophochoristini" of North America. One further new species from C. Africa will be described in a separate article.

Hemidromodes robusta robusta (Prout, 1913)

External features : Venation see Fig. 28 (Sudan) : Variability as described in generic diagnosis. Length of palpus in ♂ 0.30-0.45 mm (0.5-0.7 times diameter of eye), in ♀ 0.70-0.80 mm (about 1.2 times diameter of eye). Frons pale brown or ochreous, becoming brighter towards ventral part. Antenna (♂♀) bipectinate nearly to tip ; length

of longest branches in ♂ 0.40-0.50 mm (about 6 times width of flagellum), in ♀ about 0.20 mm. Terminal pair of spurs in ♂ hindtibia extremely short. Relative length tibia/tarsus 1.7/1.2 mm ; ♀ exceptionally with very short rudiments of proximal spurs.

Genitalia ♂ : see Fig. 86 (NE. Sudan). Little infrapopulational variability within the long series from Sudan at the ZSM. Length of cornutus somewhat variable. In two slides (BMNH ; ♂ from Assuan, S. Egypt) harpe more irregularly shaped.

Genitalia ♀ : see Fig. 141 (NE. Sudan). Corpus bursae strongly tapering anteriorly. Ostium bursae with deep notch posteriorly.

Remarks : The species name used in many publications is "*affinis*" while "*robusta*" has often (erroneously) been used as the species name for the eastern eremic species *H. sabulifera*. The populations of S. and C. Egypt probably belong to the nominate subspecies, but further material is necessary to resolve this question.

***Hemidromodes robusta affinis* (Rothschild, 1915)**

External features : No material available.

Genitalia ♂ : unknown.

Genitalia ♀ : unknown.

Remarks : Subspecies rank is contested by Herbulot (1965 : 27), who sinks it into the synonymy of *H. robusta*. Since the author also includes triforma as a subspecies of *H. robusta*, the validity of the differential features used is doubtful. Synonymy however is not excluded. According to Speidel & Hässler (1989 :51) two species occur in the Sahara. The record of H. robusta "sensu Wiltshire" (= *H. sabulifera triforma*) however has to be regarded as erroneous. The genitalia of "*H. subbrunnescens* Prout, 1915" (Speidel & Hässler, l.c.) are figured under the name "*Acidaliastis subbrunnescens* Prout, 1916" in Wiltshire (1985, pl. 19, Fig. 4). Wiltshire's figure is strikingly similar to the genitalia of *Acidaliastis micra* (see above).

***Hemidromodes robusta galala* Wiltshire, 1949**

External features : No material available.

Genitalia ♂ : see Wiltshire (1949 : Fig. 84) ; in the illustrated genitalia slide (WA. 102) aedeagus with cornutus accidentally lost. Apparently not different from Sudanese populations. According to Wiltshire (1949 :

402) green "*affinis*" from Assuan (S. Egypt) "with identical genitalia"; those genitalia examined by the author (see above under *H. r. robusta*).

Genitalia ♀ : unknown.

Remarks : On account of the apparently constant red wing colour this is maintained provisionally as a subspecific taxon. One male from Marigat, Kenya is somewhat different.

***Hemidromodes unicolorata* sp. n.**

Holotype : ♂, Kenya, Marigat, 21.VIII.1973, leg. Politzar, coll. Sommerer. Genitalic morphology of one specimen from "Abessinia" (Prp. Geom. 8125) in the BMNH corresponds well.

Description : Deep green like *H. robusta*, crosslines on upperside of wings almost invisible. Length of forewing 7.7 mm. External structure without differences from *H. robusta*. ♂ genitalia (Fig. 87) : basal processus of valva much longer than in *H. robusta* ; harpe tapering distally ; cornutus of aedeagus broader ; posterior edge of sternite 8 strongly convex. More detailed description and figures of the adult will be given in a subsequent paper.

***Hemidromodes sabulifera sabulifera* Prout, 1922**

External features : For venation see generic description and compare Fig. 28 : Hindwing : Sc + R1 and Rs fused over 1/3-1/2 of length of cell ; M3 and CuA1 shortly stalked. Palpus in ♂ short (0.5 mm = 0.7 times diameter of eye), in ♀ comparatively long (0.9-1.0 mm = 1.2-1.4 times diameter of eye). Frons pale brown, brighter towards ventral part. Antenna as described for *H. robusta*, longest branches of ♂ antenna somewhat longer (0.5-0.6 mm). Terminal pair of spurs in ♂ hindtibia short, but usually distinctly visible, occasionally absent. ♀ hindtibia without rudiments of proximal spurs. Relative length tibia/tarsus in hindleg about 1.6/1.0 mm.

Genitalia ♂ : see Fig. 88 (E. Iran). Basal processus of valva longer than in *H. robusta*, Juxta more rounded, Harpe more strongly sclerotised, strongly tapering dorsally, Cornutus longer. As yet no specimen found with second cornutus present (compare *H. s. hessa*). No remarkable and constant difference between specimens examined from E. Iran and N. Oman.

Genitalia ♀ : see Fig. 142 (E. Iran). Ostium bursae posteriorly only a little concave in E. Iranian specimen, however rather deeply notched in one ♀ from N. Oman.

Remarks : Holotype (♀) re-examined in the BMNH (Prp. Geom. 4062). It is strikingly different from the following subspecies in the white ground colour and the comparatively straight (and dotted) postmedian lines on all wings. N. Oman specimens not distinguishable in external appearance from material from E. Iran. According to Wiltshire (1990 : 111) the distribution of nominate subspecies includes NW. India, S. Iran, C. and E. Saudi Arabia, but in C. Arabia there are transitions to *H. s. hessa* ; real isolation between the populations is doubtful ; eventually the taxa may have to be synonymised.

Hemidromodes sabulifera hessa Prout, 1935

External features : For venation see generic description and compare Fig. 28 : Hindwing : fusion of Sc + R1 and Rs over about 1/3-1/4 of length of cell ; Rs and M1 on a very long stalk ; M3 and CuA1 rather distinctly stalked ; these features expressed with high constancy. External features as described for *H. sabulifera*, but palpus of ♀ slightly shorter than equivalent in nominate subspecies (1.1-1.3 times diameter of eye). Relative length tibia/tarsus about 1.9/1.2 mm. Terminal spurs in ♂ hindtibia always present and distinctly visible.

Genitalia ♂ : see Figs. 89-91 (C. and S. Israel). High infrapopulational variability in the shape of harpe and cornutus. Even some variation in the number of cornuti : out of 75 dissected ♂♂ of *H. s. hessa* (from Israel) 11 ♂♂ had two cornuti present (this feature commoner in S. than in C. Israel). Little difference between the genitalia of specimens examined from Israel/Jordan and genitalia of the nominate subspecies : Harpe often with one or two small additional lateral teeth, mainly in specimens from the northern part of the area of distribution.

Genitalia ♀ : see Fig. 143 (S. Israel) : Resemble those of *H. s. sabulifera*, but as in the N. Oman specimen the ostium bursae has a deep notch posteriorly.

Remarks : Dissected Paratype (♂) of *H. s. hessa* re-examined in the BMNH (Prp. Geom. 8117). Differs from the nominate subspecies in the brownish, not dotted ante- and postmedian lines, which are strongly undulate ; wings often sandy coloured.

***Hemidromodes sabulifera triforma* Wiltshire, 1949**

External features : As described for *H. s. hessa.*

Genitalia ♂ : see Fig. 92 (W. Saudi Arabia). Specimens examined from Saudi Arabia and Yemen. No difference from ♂ genitalia of *H. s. hessa.*

Genitalia ♀ : unknown.

Remarks : Holotype of "*H. robusta triforma*" re-examined in the BMNH (Prp. Wilts. 827). Populations of *H. s. hessa* and *H. s. triforma* are not clearly separated from each other : there are no differences in genitalic morphology, but in external appearance there are transitional features in S. Israel and S. Jordan. The latter name may have to be considered a synonym of *H. s. hessa.*

***HIEROCHTHONIA* Prout, 1912**

Differential features : Venation see Fig. 29 : Forewing : Sc and R1 anastomosing ; length of fusion variable, often touching at one point only ; length of fusion between R1 and R2 variable too ; R3 lost (total fusion with R4) ; R2-R5 and M1 distinctly stalked ; M3 and CuA1 connate or exceptionally stalked. Hindwing : long fusion of Sc + R1 and Rs (2/3 to 3/4 of length of cell) ; Rs and M1 on very long common stalk ; M3 and CuA1 distinctly stalked, length of stalk variable, in one specimen M3 and CuA1 connate. Frenulum present in ♂, absent in ♀. Frons flat, reddish brown. Vertex white. Tongue lacking. Palpus very small and slender. Antenna of both sexes bipectinate, branches long in ♂, short in ♀. Hindtibia of both sexes not dilated, with two terminal spurs. ♂ genitalia : uncus short, slightly split dorsoventrally ; socius present, but often hardly visible, being inside fold over uncus ; gnathos rather strongly sclerotised ; basal coremata absent ; aedeagus with one stout cornutus. ♀ genitalia : lamella ante- and postvaginalis characteristically sclerotised ; posterior (caudal) half of corpus bursae stiff, longitudinally ribbed, divided by a constriction from membranous anterior half which has small, horizontally positioned signum bursae.

Remarks : The systematic position is unclear. Venation, structure of harpe in ♂ genitalia and other features probably indicate relationships to Microloxiini. Transverse subdivision of corpus bursae in ♀ genitalia as in *Hemidromodes.* Some other features, but especially the habitus reminiscent of *Xenochlorodes.* Possibly forms a link between Micro-

loxiini and *Xenochlorodes* (actually placed in Hemistolini). The African genus *Rhodesia* Warren, 1905, corresponds in many features (e.g. ♂♀ antenna, frenulum, ♂♀ genitalia) ; however the structure of palpus and hindtibia is rather different.

Hierochthonia pulverata (Warren, 1901)

External features : For venation see generic description (Fig. 29). Palpus ochreous with some reddish-brown scales, length 0.45-0.50 mm (3/4 diameter of eye) in both sexes. Length of longest antennal branches in ♂ about 0.55 mm (4-5 times width of flagellum), in ♀ about 0.25 mm (twice width of flagellum). Relative length tibia/tarsus in the hindleg of both sexes about 1.8/2.0 mm. Further features see generic description.

Genitalia ♂ : see Fig. 93 (C. Lebanon). Valva basally much broader han in the following species. Harpe strongly sclerotised, somewhat tapering, placed in central part of valva. Cornutus crest-shaped. Posterior edge of sternite 8 convex. Only little structural variation within the area of distribution (specimens examined from N. and C. Lebanon).

Genitalia ♀ : see Fig. 144 (C. Lebanon). Resembling very much those of following species. Lamella postvaginalis almost rectangular. Length of signum bursae somewhat variable. There is little structural variation within the area of distribution (specimens examined from S. Turkey, N. and C. Lebanon).

Remarks : *H. pulverata* and the following species are probably allopatric vicariants. To date no sympatric occurrence is known. Although very closely related to each other, striking differences in ♂ genitalia do not allow them to be considered conspecific.

Hierochthonia semitaria (Püngeler, 1901)

External features : Venation and other external features without any remarkable and constant difference from *H. pulverata*. See description above. One Jordanian male has antennal branches slightly shorter (about 0.45 mm).

Genitalia ♂ : see Fig. 94 (C. Israel). Valva more slender than in the preceding species. Harpe less tapering, with one small subapical tooth ; harpe placed on ventral edge of valva. Cornutus crest-shaped with central teeth much elongate. Posterior edge of sternite 8 concave. There

is little structural variation within the area of distribution (specimens examined from N. and C. Israel, C. Jordan).

Genitalia ♀ : see Fig. 145 (C. Israel). Very similar to genitalia of preceding species. Lamella postvaginalis posteriorly tapering, almost triangular. Length of signum bursae somewhat variable. Only little structural variation within the area of distribution (specimens examined from N. and C. Israel, N. and C. Jordan).

Remarks : Compare preceding species. Both original types examined (♂♀) ; male labelled as "type" (= holotype), female as "cotype" (= paratype).

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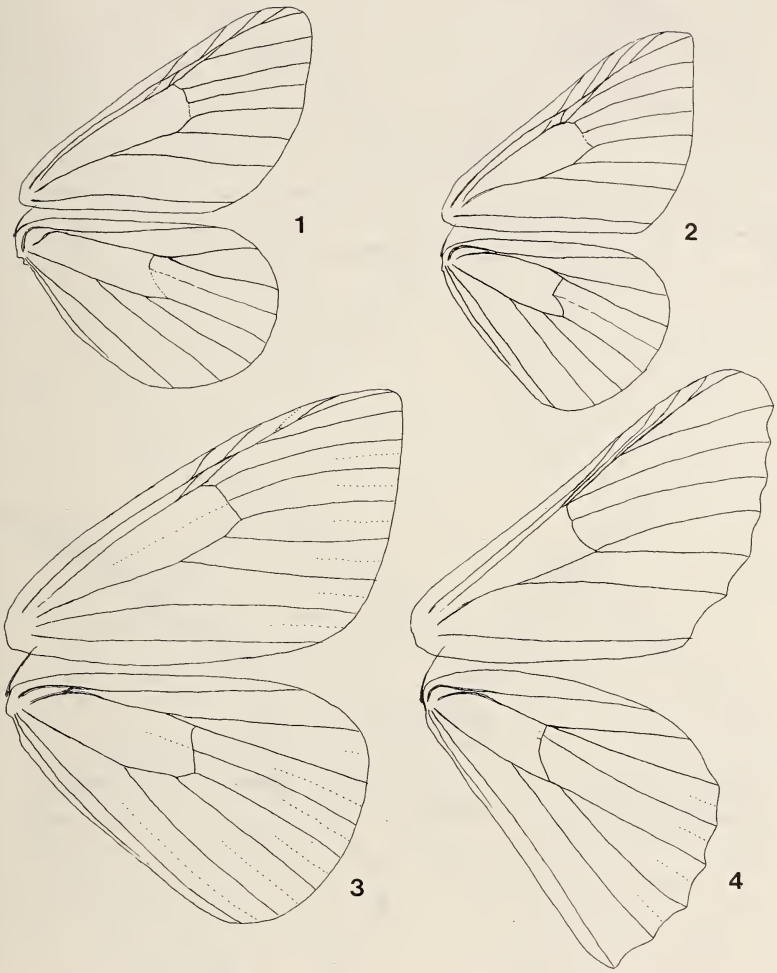
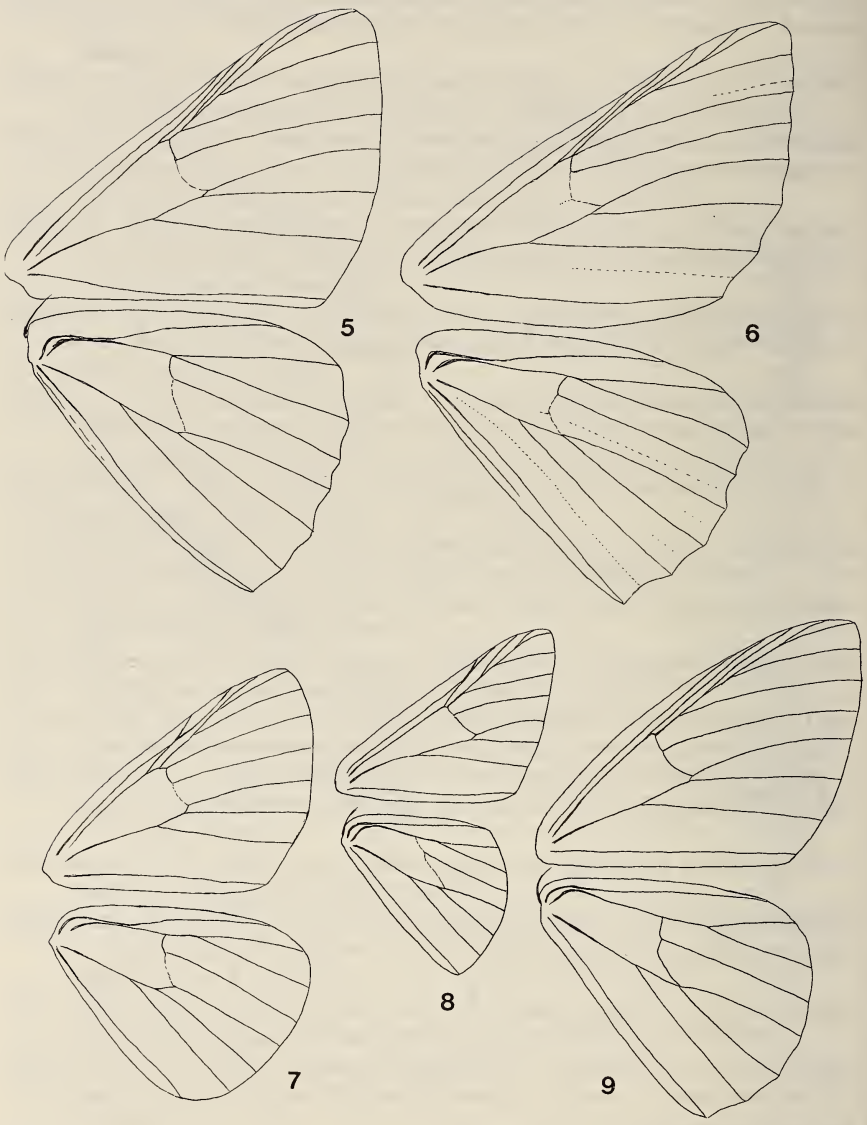
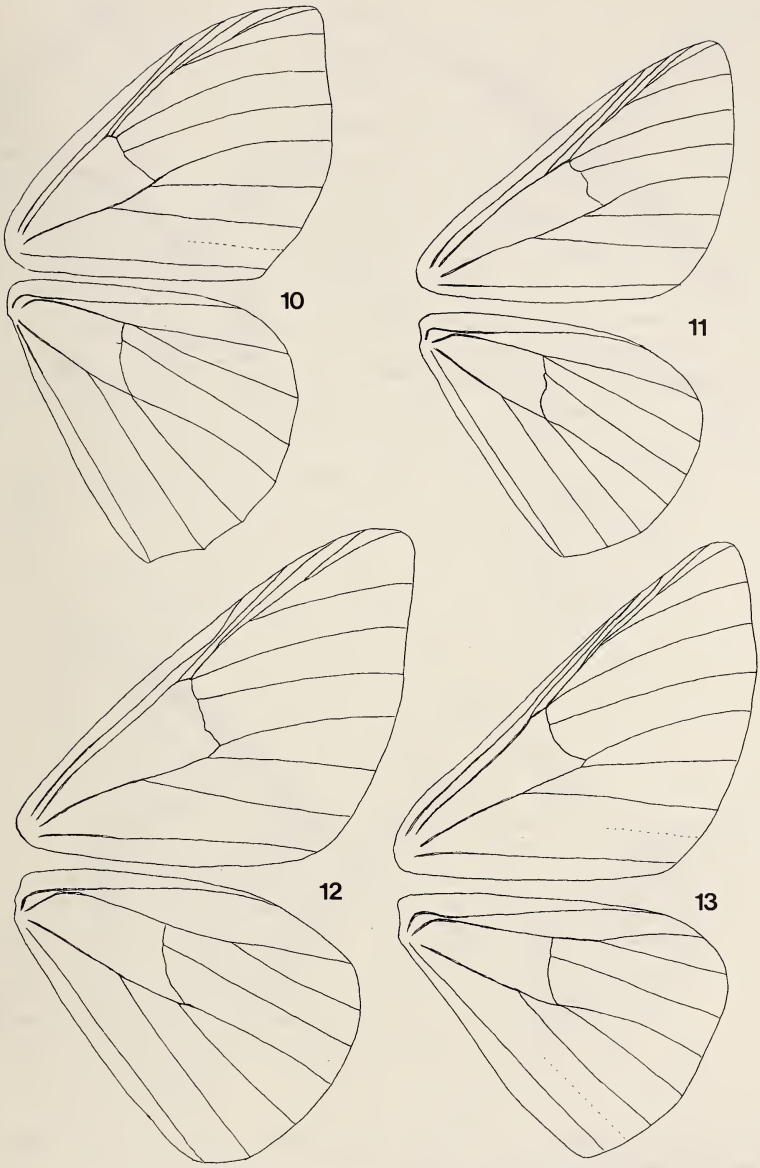


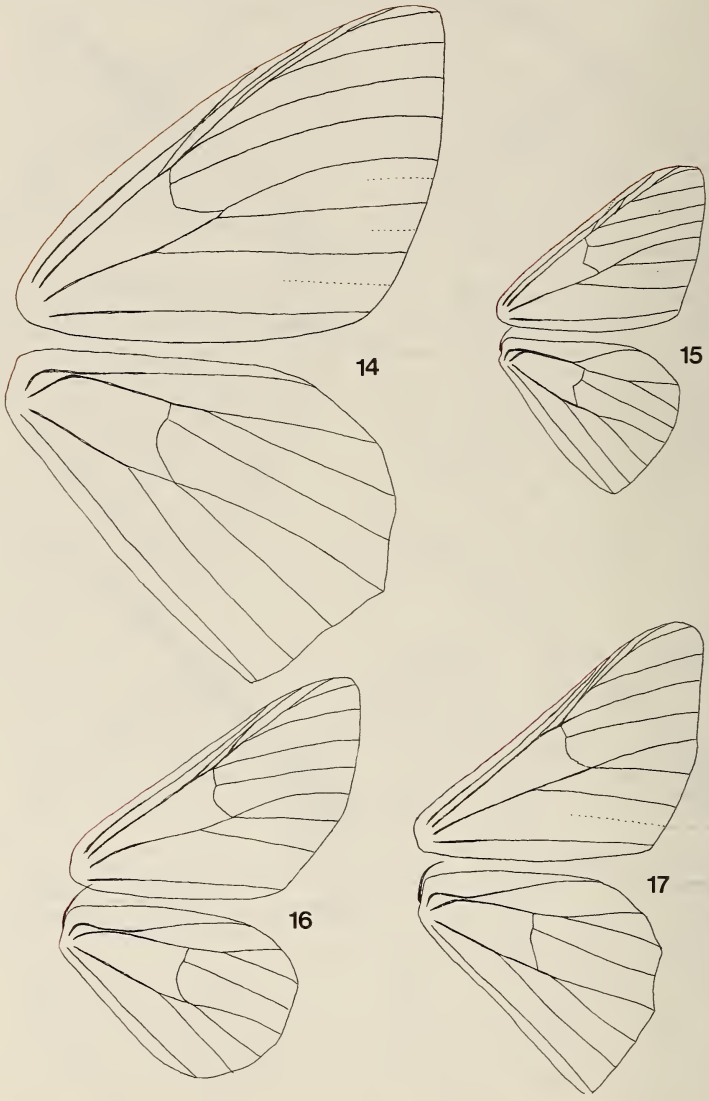
Figs 1-4. Venation (♂)
1) *Myinodes shohami* Hausmann, 1994
2) *Eumegethes tenuis* Staudinger, 1898
3) *Orthostixis cribraria* (Hübner, [1799])
4) *Pingasa lahayei* (Oberthür, 1887)



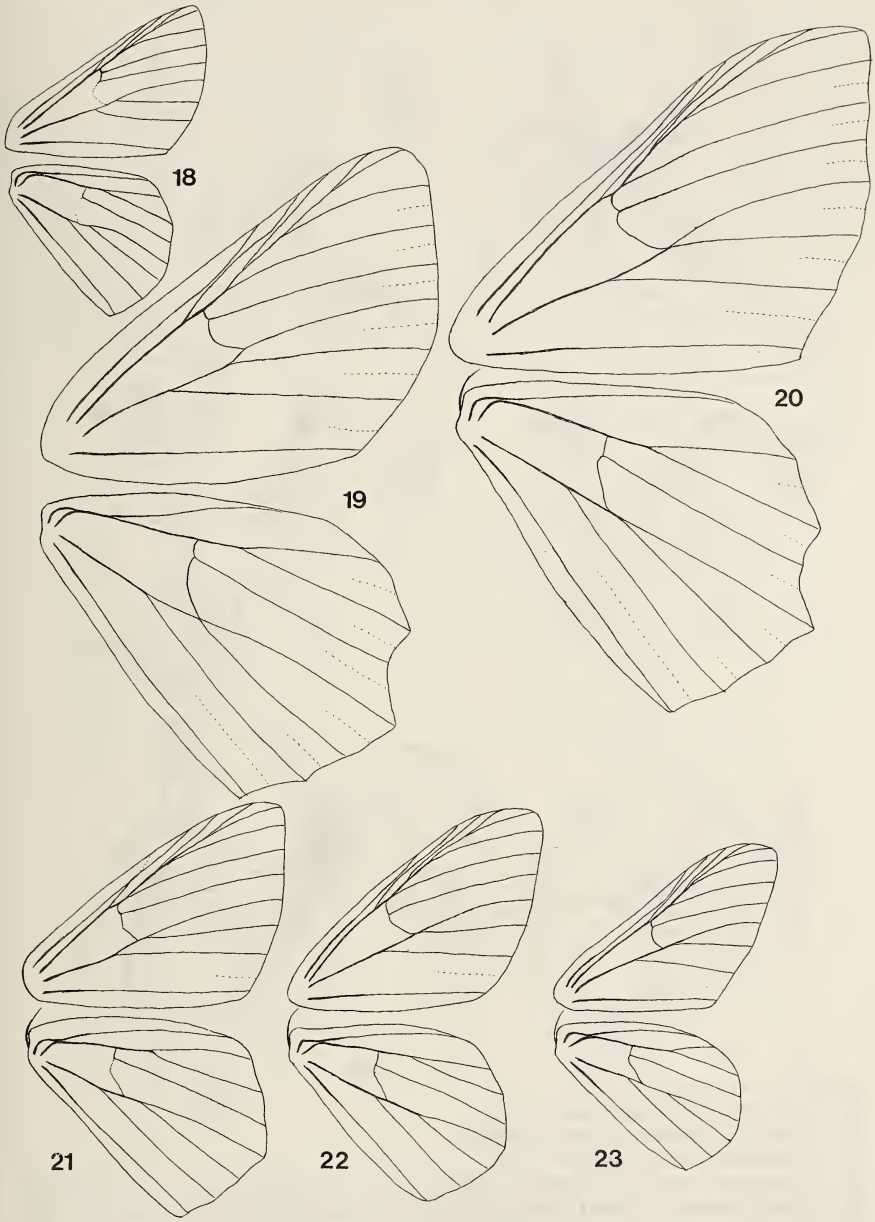
Figs 5-9. Venation (♂)
5) *Pseudoterpna coronillaria halperini* ssp. n.
6) *Holoterpna pruinosata* (Staudinger, 1898)
7) *Aplasta ononaria* (Fuessly, 1783)
8) *Microbaena pulchra minor* ssp. n.
9) *Comibaena bajularia* ([Denis & Schiffermüller], 1775)



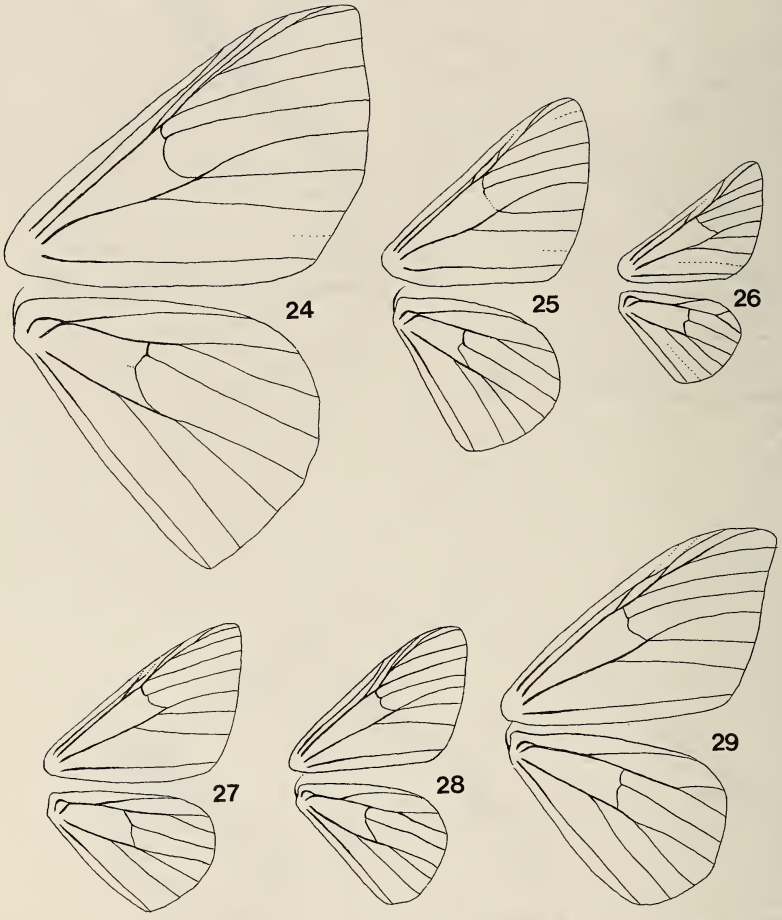
Figs 10-13. Venation (♂)
10) *Proteuchloris neriaria* (Herrich-Schäffer, 1852)
11) *Thetidia (Antonechloris) smaragdaria* (Fabricius, 1787)
12) *Thetidia (Antonechloris) persica* sp. n.
13) *Thetidia (Aglossochloris) euryrithra* Prout, 1935



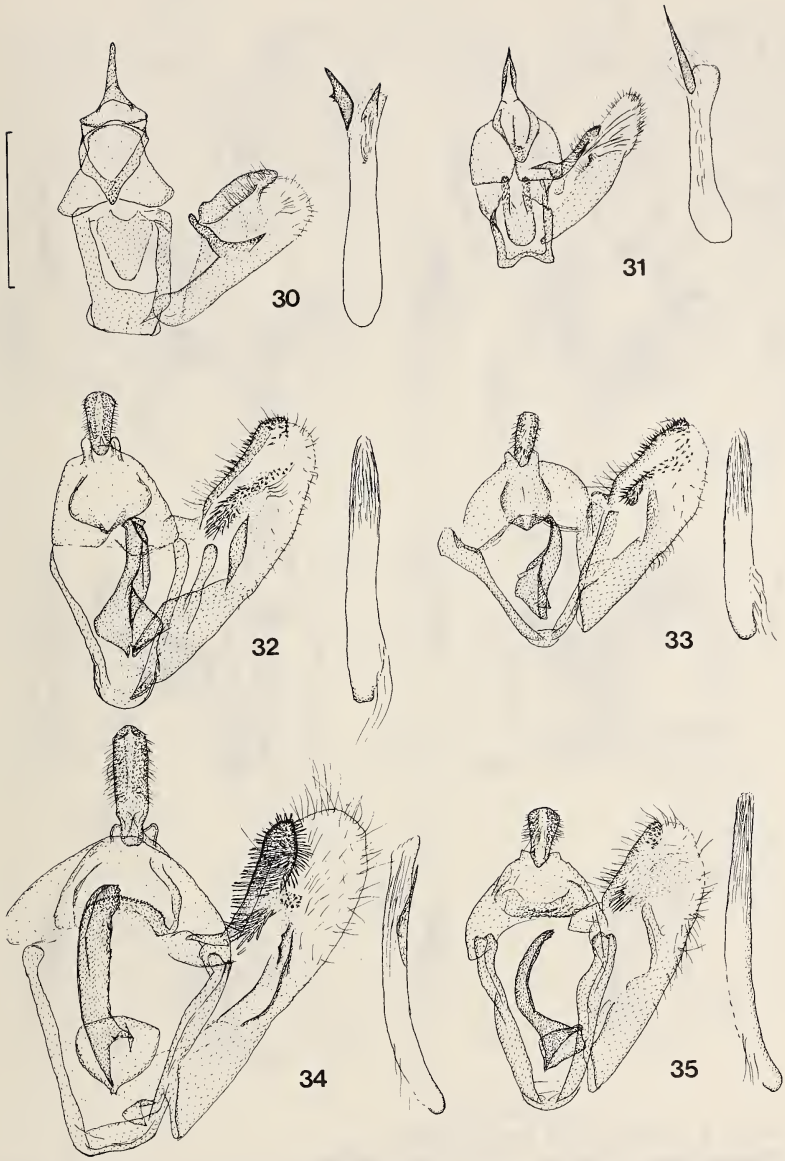
Figs 14-17. Venation (♂)
14) *Hemistola chrysoprasaria* (Esper, 1795)
15) *Xenochlorodes olympiaria cremonaria* Staudinger, 1897
16) *Gnophosema palumba* Brandt, 1938
17) *Victoria sematoperas* Prout, 1916



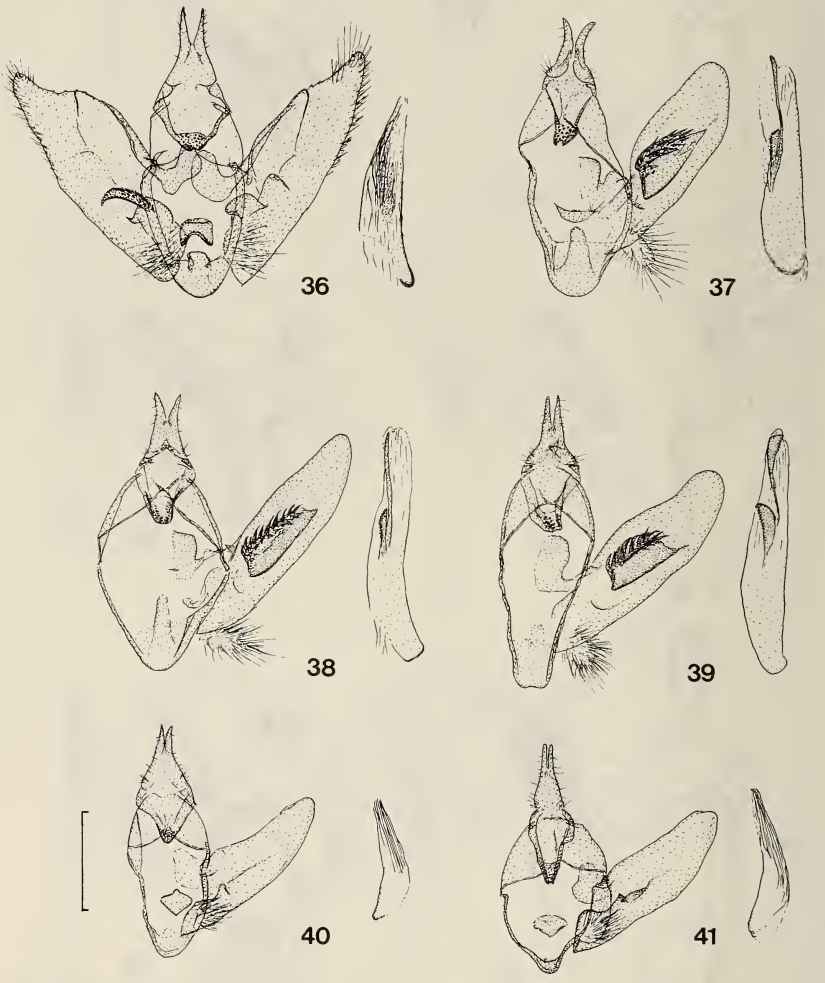
Figs 18-23. Venation (♂)
18) *Eucrostes indigenata* (de Villers, 1789)
19) *Thalera fimbrialis magnata* A. Fuchs, 1903
20) *Culpinia prouti* (Thierry-Mieg, 1913)
21) *Chlorissa viridata* (Linnaeus, 1758)
22) *Phaiogramma pulmentaria* (Guenée, 1857)
23) *Neromia pulvereisparsa* (Hampson, 1896)



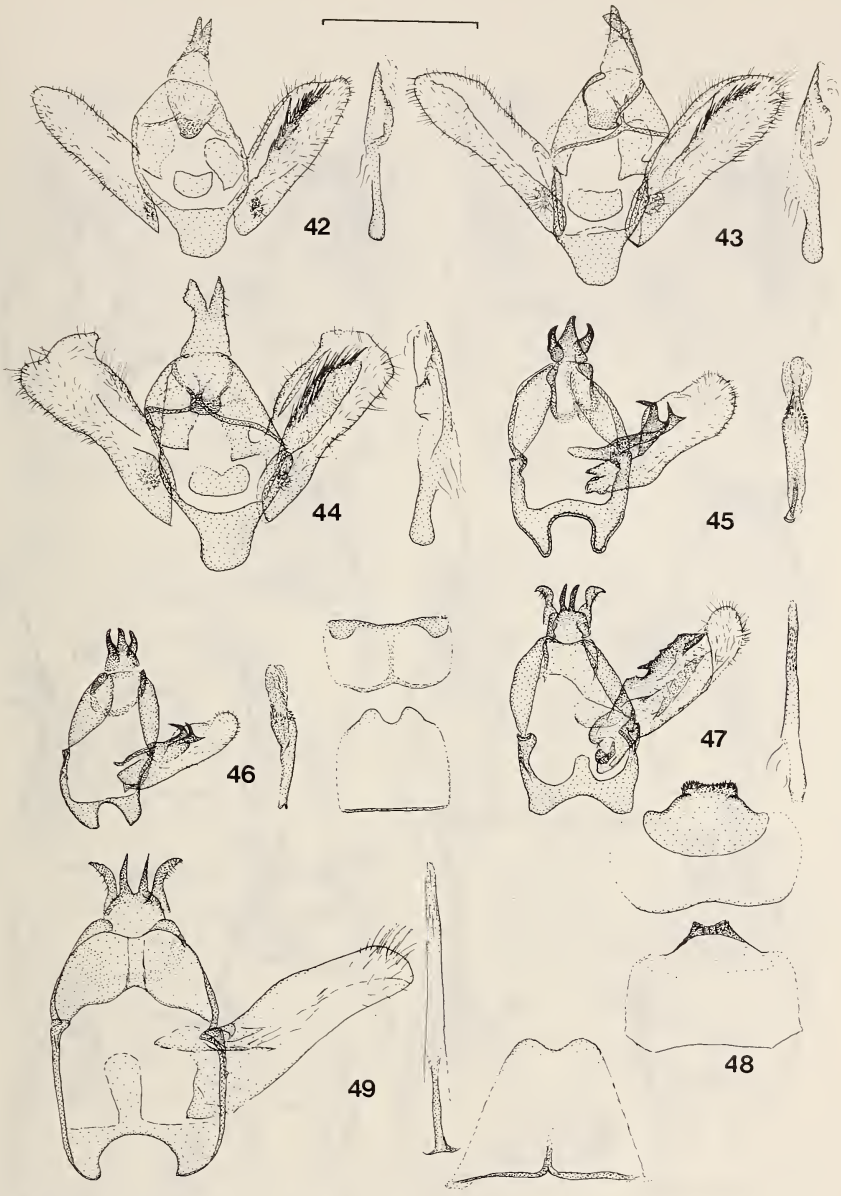
Figs 24-29. Venation (♂)
24) *Kuchleria gisisi* Hausmann, 1995
25) *Microloxia herbaria* (Hübner, [1813])
26) *Acidaliastis micra* Hampson, 1896
27) *Acidromodes nilotica* (Wiltshire, 1985)
28) *Hemidromodes robusta* (Prout, 1913)
29) *Hierochthonia semitaria* (Püngeler, 1901)



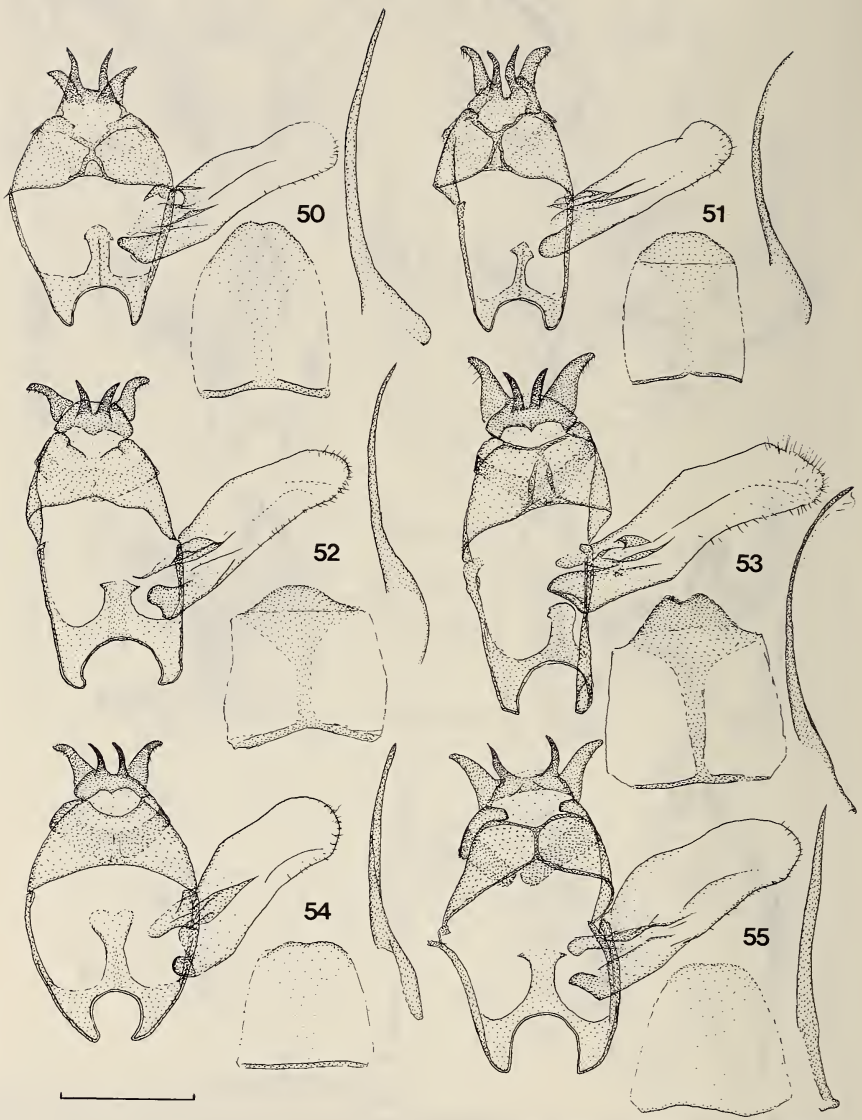
Figs 30-35. ♂ Genitalia (scale bar = 1 mm)
30) *Myinodes shohami* Hausmann, 1994 (N. Israel ; Paratype)
31) *Eumegethes tenuis* Staudinger, 1898 (C. Algeria)
32) *Orthostixis cribraria cribraria* (Hübner, [1799]) (Hungary)
33) *Orthostixis cribraria amanensis* Wehrli, 1932 (S. Turkey ; Paralectotype)
34) *Orthostixis calcularia* Lederer, 1853 (C. Turkey)
35) *Orthostixis cinerea* Rebel, 1916 (Cyprus ; Holotype)



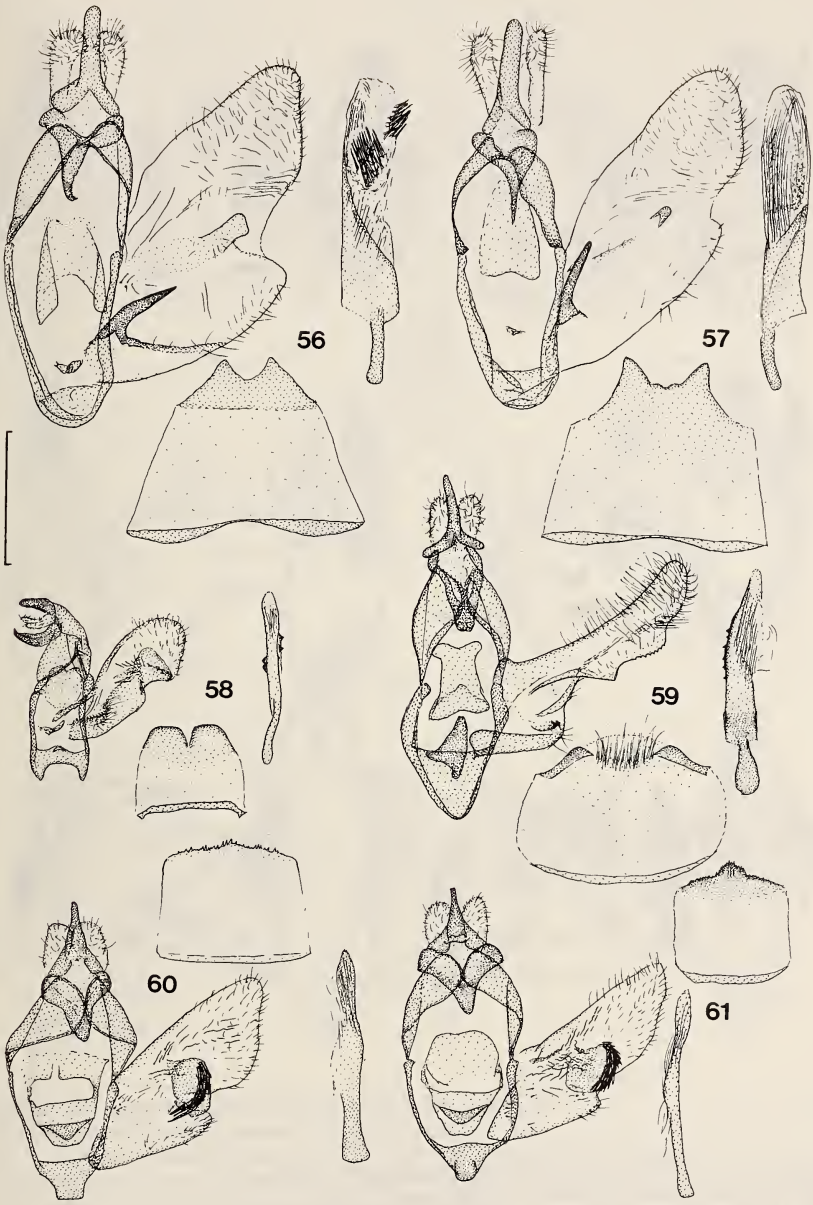
Figs 36-41. ♂ Genitalia (scale bar = 1 mm)
36) *Pingasa lahayei* (Oberthür, 1887) (Saudi Arabia)
37) *Pseudoterpna coronillaria axillaria* Guenée, 1857 (C. Lebanon)
38) *Pseudoterpna coronillaria halperini* ssp. n. (NE. Israel ; Paratype)
39) *Pseudoterpna coronillaria cinearascens* (Zeller, 1847) (C. Italy)
40) *Holoterpna pruinosata* (Staudinger, 1898) (C. Israel)
41) *Holoterpna pruinosata* (Staudinger, 1898) (N. Israel)



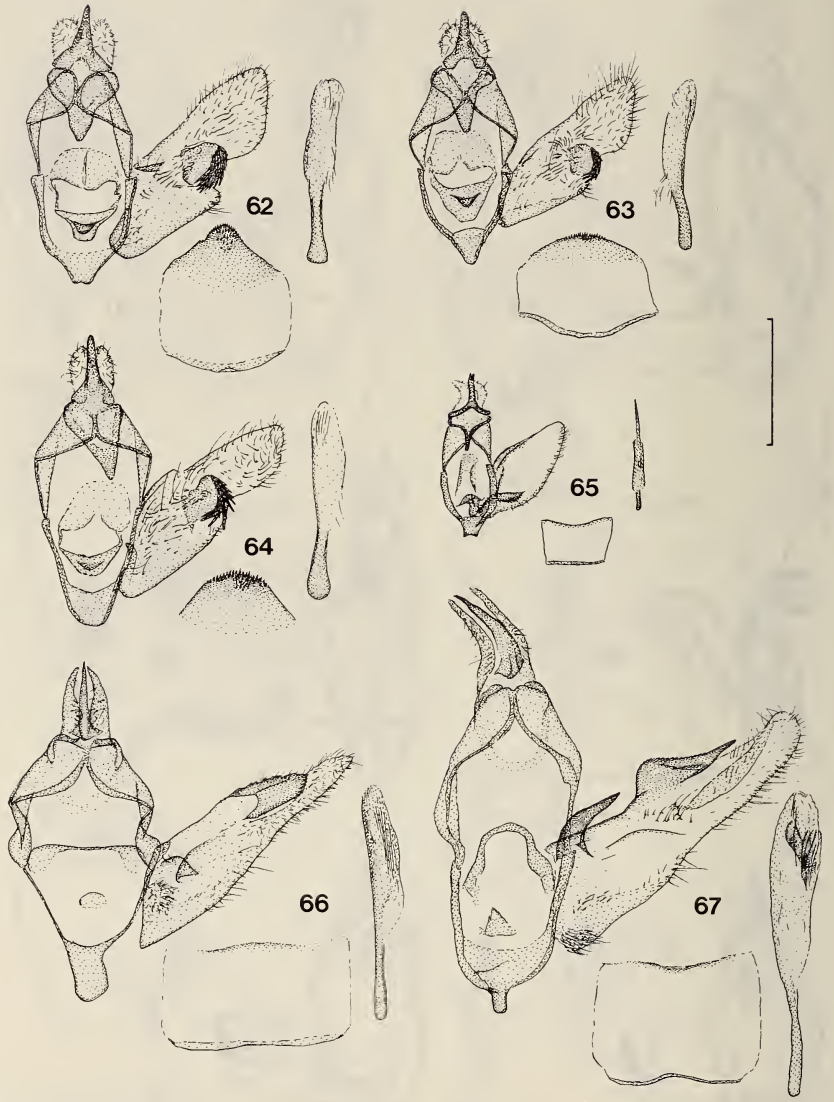
Figs 42-49. ♂ Genitalia (scale bar = 1 mm)
42) *Aplasta ononaria* (Fuessly, 1783) (N. Israel ; f. *faecataria* Hübner)
43) *Aplasta ononaria* (Fuessly, 1783), with sternite 8 (N. Israel ; f. *berytaria* Staudinger)
44) *Aplasta ononaria* (Fuessly, 1783), genital aberration (N. Israel ; f. *berytaria* Staudinger)
45) *Microbaena pulchra* (Staudinger, 1897) (C. Israel ; Holotype)
46) *Microbaena pulchra minor* ssp. n., with sternite 8 (above) and tergite 8 (below) (NE. Sudan ; Holotype)
47) *Comibaena bajularia* ([Denis & Schiffermüller], 1775), with sternite 8 (C. Turkey)
48) *Comibaena bajularia* ([Denis & Schiffermüller], 1775), sternite 8 only (N. Italy)
49) *Proteuchloris neriaria* (Herrich-Schäffer, 1852) (N. Israel)



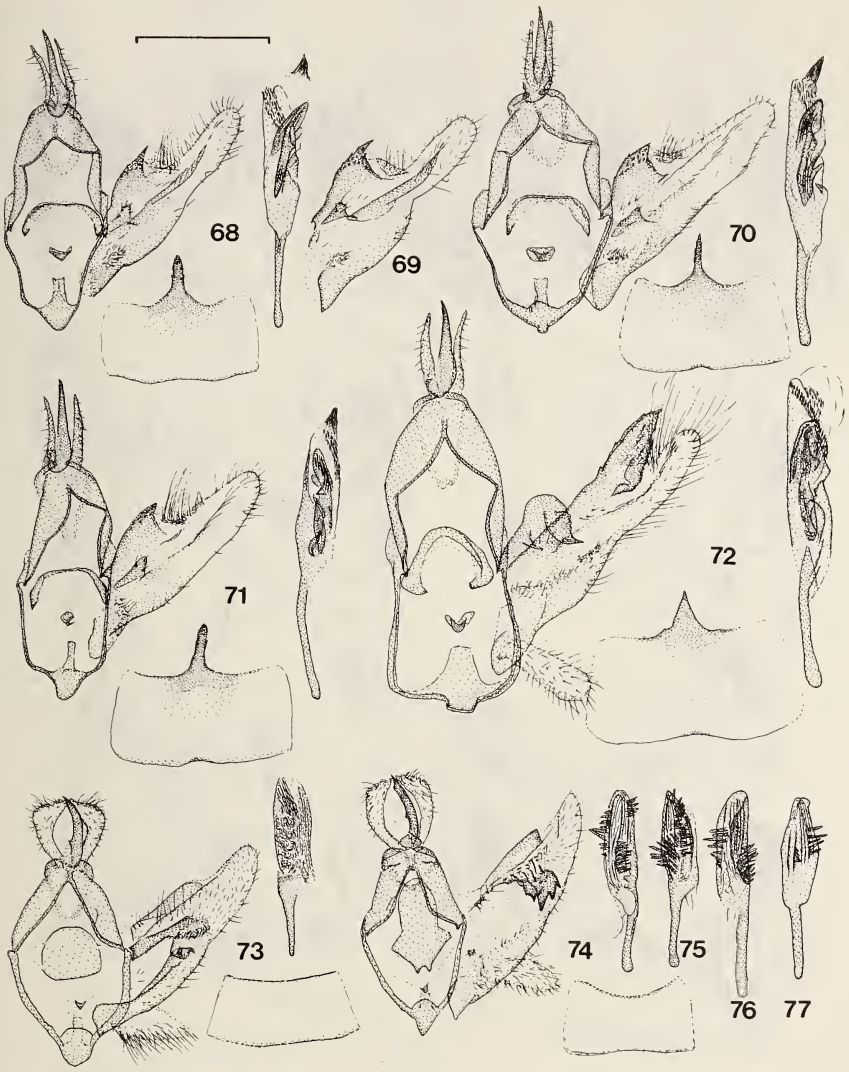
Figs 50-55. ♂ Genitalia with sternite 8 (scale bar = 1 mm)
50) *Thetidia (Antonechloris) smaragdaria* (Fabricius, 1787) (C. Italy)
51) *Thetidia (Antonechloris) volgaria* (Guenée, 1857) (S. Russia)
52) *Thetidia (Antonechloris) persica* sp. n. (N. Iran ; Paratype)
53) *Thetidia (Antonechloris) persica* sp. n. (S. Turkey)
54) *Thetidia (Antonechloris) silvia* Hausmann, 1991 (C. Jordan ; Paratype)
55) *Thetidia (Aglossochloris) euryrithra* Prout, 1935 (N. Jordan)



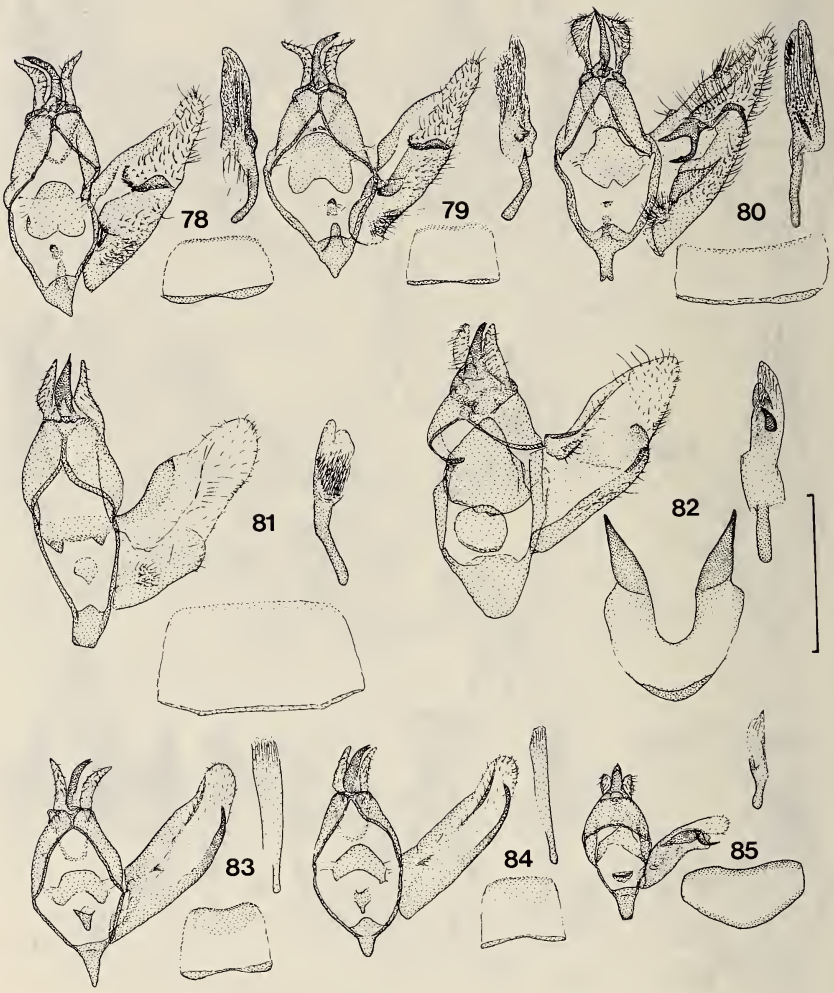
Figs 56-61. ♂ Genitalia with sternite 8 (scale bar = 1 mm)
56) *Hemistola chrysoprasaria* (Esper, 1795) (S. Turkey)
57) *Hemistola siciliana* Prout, 1935 (Sicily)
58) *Xenochlorodes olympiaria cremonaria* (Staudinger, 1897) (N. Israel)
59) *Gnophosema palumba* Brandt, 1938 (S. Iran)
60) *Victoria wiltshirei* sp. n. (NE. Sudan ; Holotype)
61) *Victoria sematoperas* Prout, 1916 (Kenya)



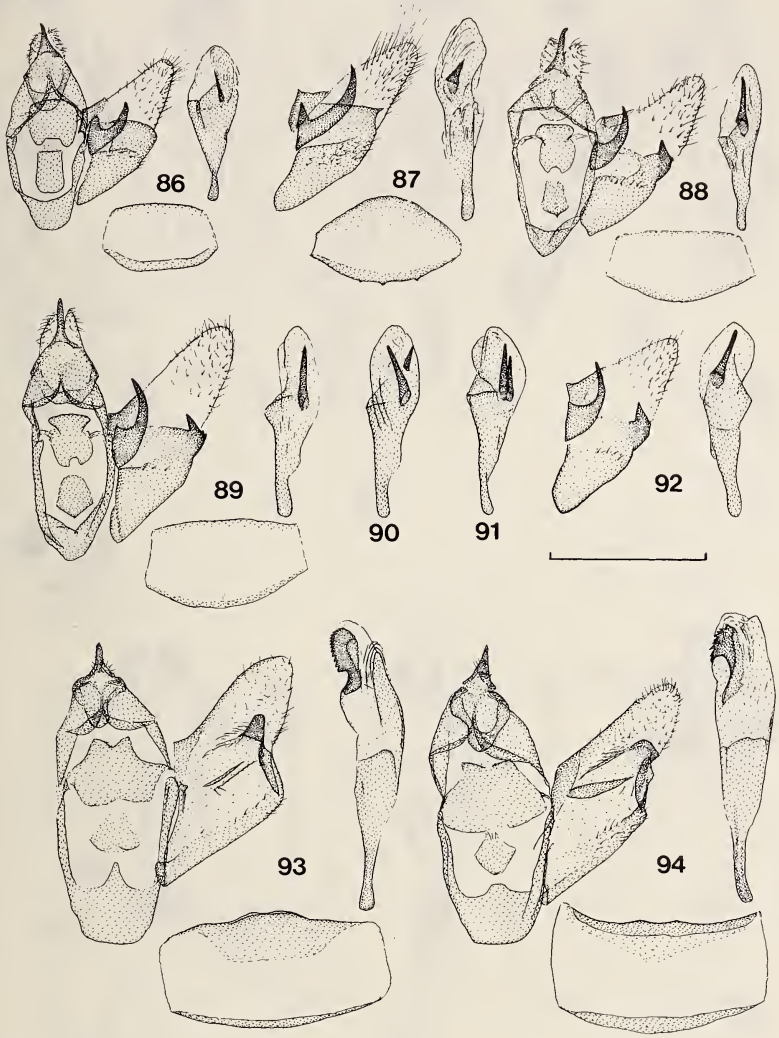
Figs 62-67. ♂ Genitalia with sternite 8 (scale bar = 1 mm)
62) *Victoria plantei* Herbulot, 1976 (C. Israel)
63) *Victoria eremita* Hausmann, 1993 (S. Israel ; Paratype)
64) *Victoria fifensis* Wiltshire, 1994 (W. Saudi Arabia)
65) *Eucrostes indigenata* (de Villers, 1789) (N. Jordan)
66) *Thalera fimbrialis magnata* A. Fuchs, 1903 (C. Turkey)
67) *Culpinia prouti* (Thierry-Mieg, 1913) (S. Turkey)



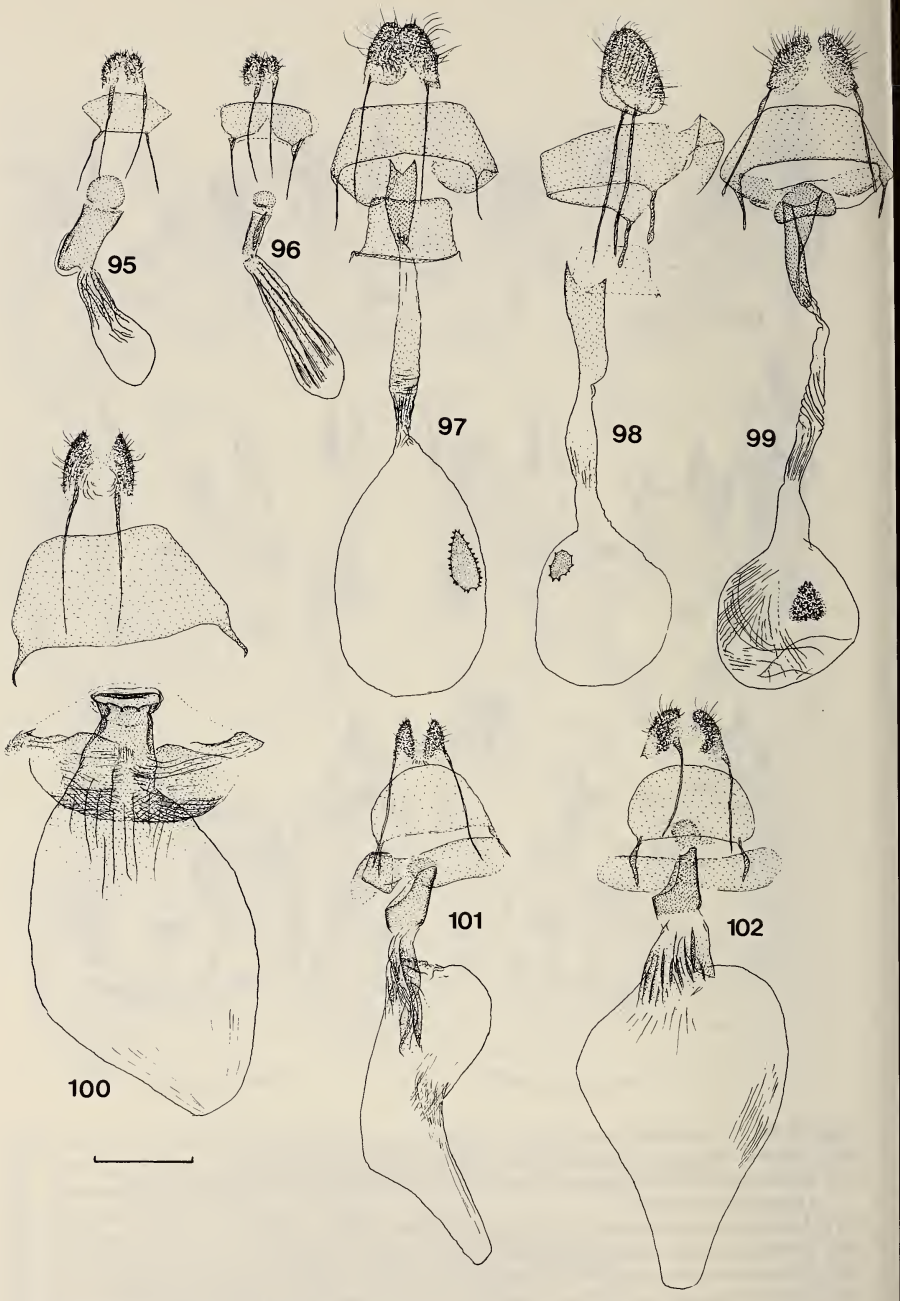
Figs 68-77. ♂ Genitalia with sternite 8 (scale bar = 1 mm)
68) *Chlorissa viridata* (Linnaeus, 1758) (N. Italy)
69) *Chlorissa viridata* (Linnaeus, 1758), right valva only (Transcaucasia)
70) *Chlorissa cloraria* (Hübner, [1813]) (C. Greece)
71) *Chlorissa cloraria* (Hübner, [1813]) (C. Turkey)
72) *Chlorissa asphaleia* Wiltshire, 1966 (N. Turkey)
73) *Phaiogramma pulmentaria* (Guenée, 1857) (N. Israel)
74) *Phaiogramma faustinata* (Millière, 1868) (N. Israel)
75) *Phaiogramma faustinata* (Millière, 1868), aedeagus only (S. Israel)
76) *Phaiogramma faustinata* (Millière, 1868), aedeagus only (Cyprus)
77) *Phaiogramma discessa* ♂ (Walker, 1861), aedeagus only (Bahrein)



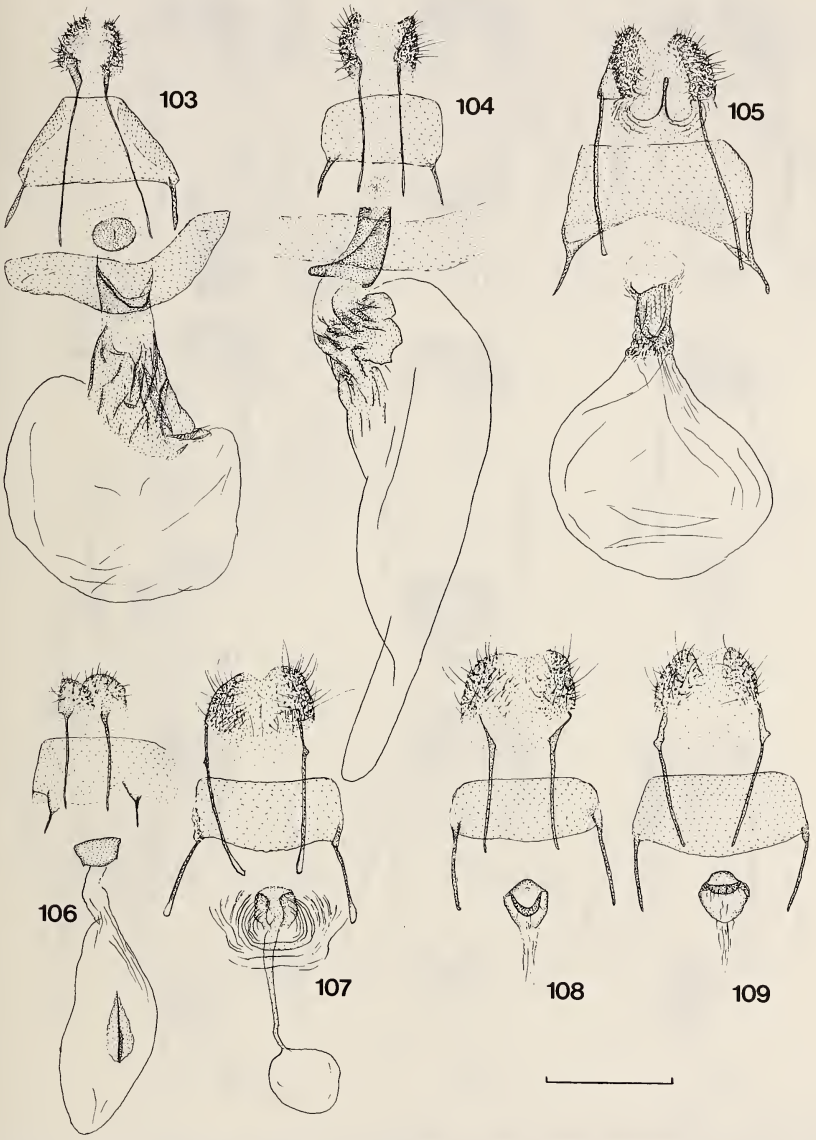
Figs 78-85. ♂ Genitalia with sternite 8 (scale bar = 1 mm)
78) *Neromia pulvereisparsa pulvereisparsa* (Hampson, 1896) (N. Oman)
79) *Neromia pulvereisparsa jodisata* Staudinger, 1898 (C. Israel)
80) *Neromia simplexa* Brandt, 1938 (N. Oman)
81) *Kuchleria gisisi* Hausmann, 1995 (C. Israel ; Holotype)
82) *Acidromodes nilotica* (Wiltshire, 1985) (Sudan ; Paratype)
83) *Microloxia herbaria* (Hübner, [1813]) (C. Turkey)
84) *Microloxia ruficornis* (Warren, 1897) (S. Israel)
85) *Acidaliastis micra* Hampson, 1896 (S. Israel)



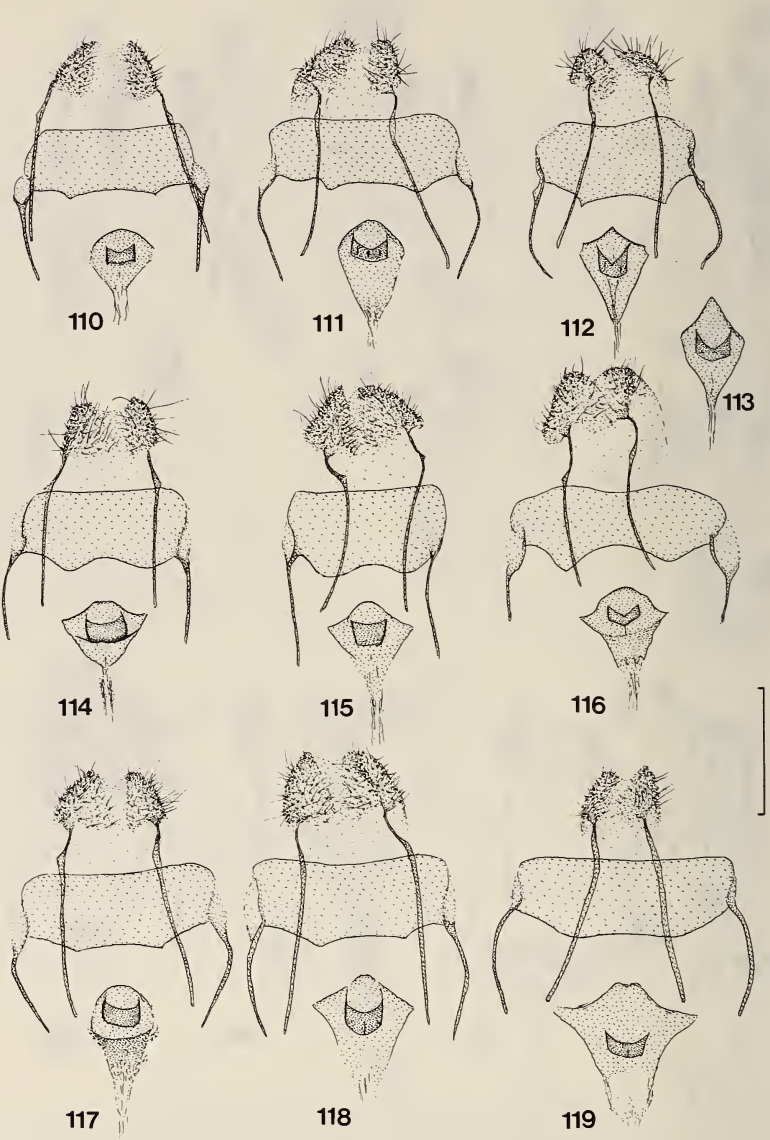
Figs 86-94. ♂ Genitalia (scale bar = 1 mm)
86) *Hemidromodes robusta robusta* (Prout, 1913) (NE. Sudan)
87) *Hemidromodes unicolorata* sp. n. ; valva, aedeagus and sternite 8 only (Kenya ; Holotype)
88) *Hemidromodes sabulifera sabulifera* Prout, 1922 (E. Iran)
89) *Hemidromodes sabulifera hessa* Prout, 1935 (C. Israel)
90) *Hemidromodes sabulifera hessa* Prout, 1935 ; aedeagus only (S. Israel)
91) *Hemidromodes sabulifera hessa* Prout, 1935 ; aedeagus only (S. Israel)
92) *Hemidromodes sabulifera triforma* Wiltshire, 1949 ; valva and aedeagus only (W. Saudi Arabia ; Holotype)
93) *Hierochthonia pulverata* (Warren, 1901) (C. Lebanon)
94) *Hierochthonia semitaria* (Püngeler, 1901) (C. Israel ; Holotype)



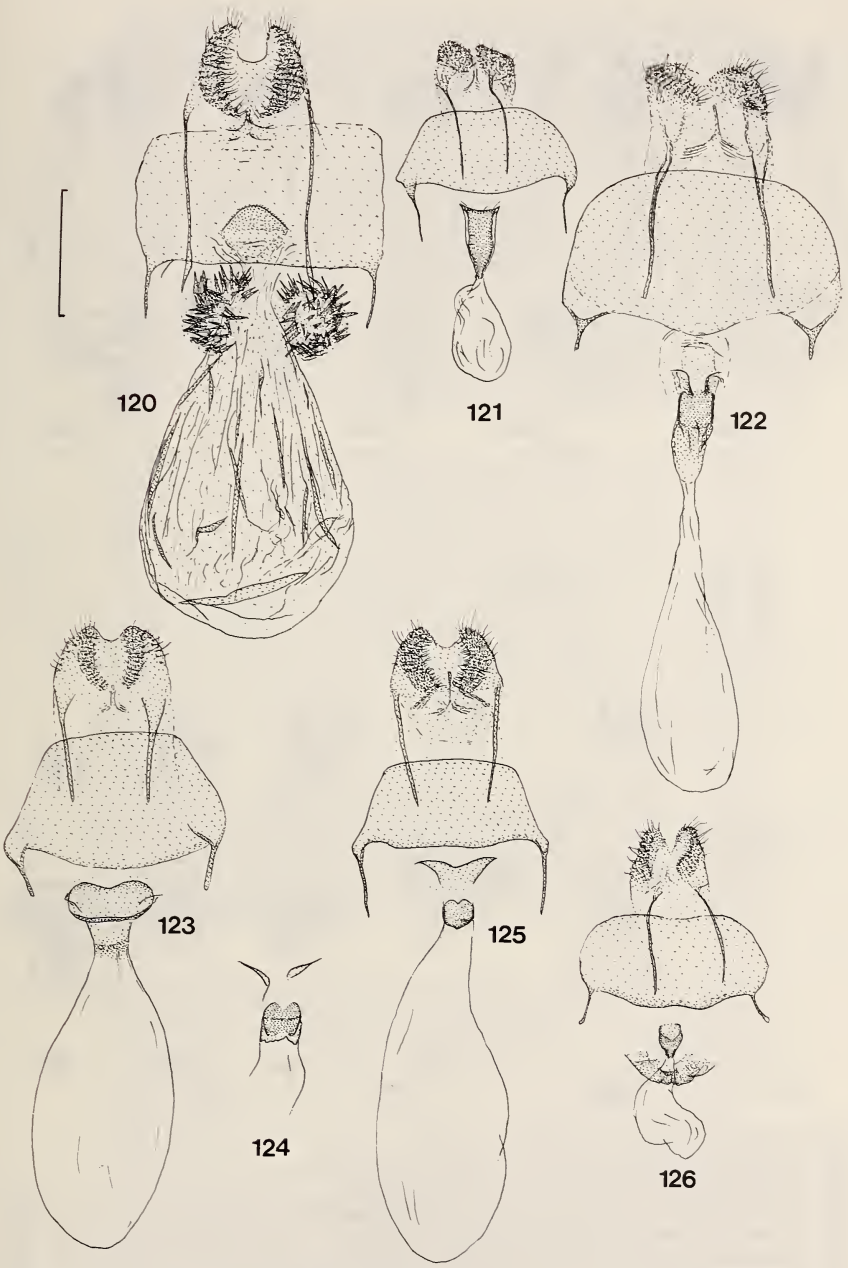
Figs 95-102. ♀ Genitalia (scale bar = 1 mm)
95) *Myinodes shohami* Hausmann, 1994 (N. Israel ; Paratype)
96) *Eumegethes tenuis* Staudinger, 1898 (C. Algeria)
97) *Orthostixis cribraria* (Hübner, [1799]) (C. Turkey)
98) *Orthostixis calcularia* Lederer, 1853 (C. Turkey)
99) *Orthostixis cinerea* Rebel, 1916 (Cyprus)
100) *Pingasa lahayei* (Oberthür, 1887) (Nigeria)
101) *Pseudoterpna coronillaria axillaria* Guenée, 1857 (C. Lebanon)
102) *Pseudoterpna coronillaria halperini* ssp. n. (NE. Israel ; Paratype)



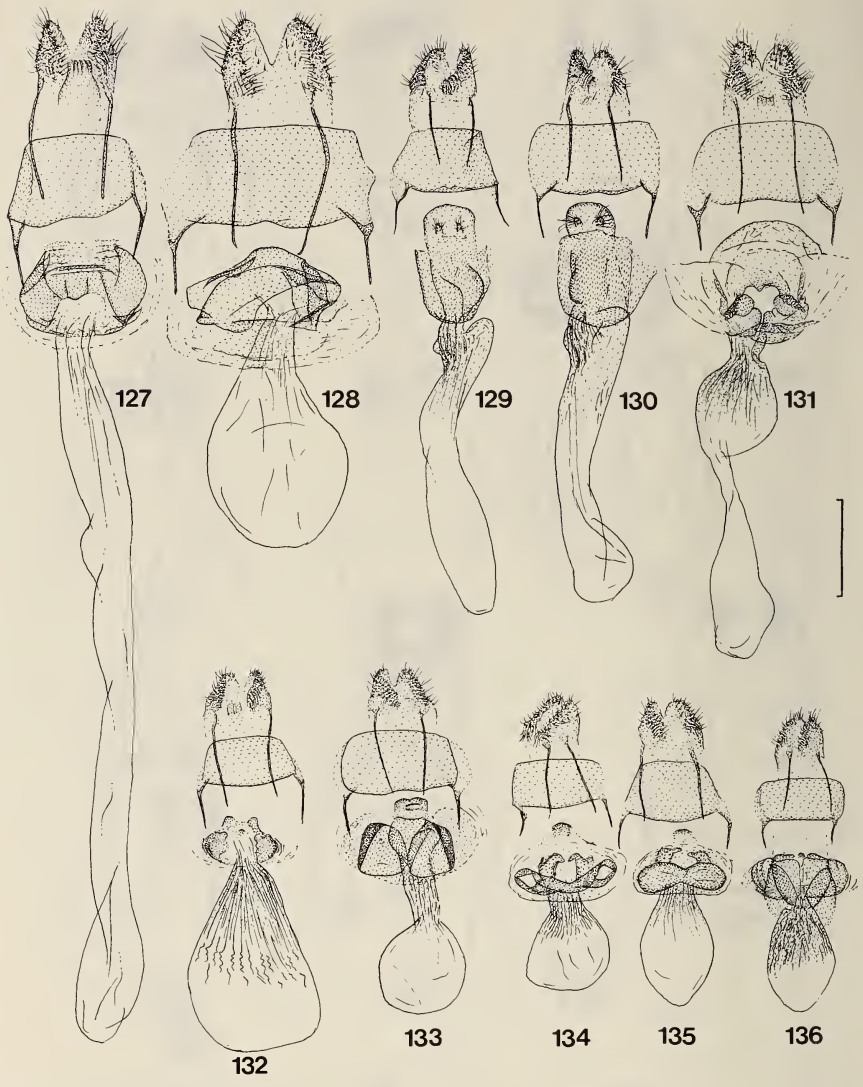
Figs 103-109. ♀ Genitalia (scale bar = 1 mm)
103) *Pseudoterpna coronillaria cinearascens* (Zeller, 1847) (C. Italy)
104) *Pseudoterpna rectistrigaria* Wiltshire, 1948 (Cyprus)
105) *Holoterpna pruinosata* (Staudinger, 1898) (N. Israel)
106) *Aplasta ononaria* (Fuessly, 1783) (N. Israel ; f. *faecataria* Hübner)
107) *Comibaena bajularia* ([Denis & Schiffermüller], 1775) (C. Turkey)
108) *Proteuchloris neriaria* (Herrich-Schäffer, 1852) (N. Israel)
109) *Proteuchloris neriaria* (Herrich-Schäffer, 1852) (Makedonia)



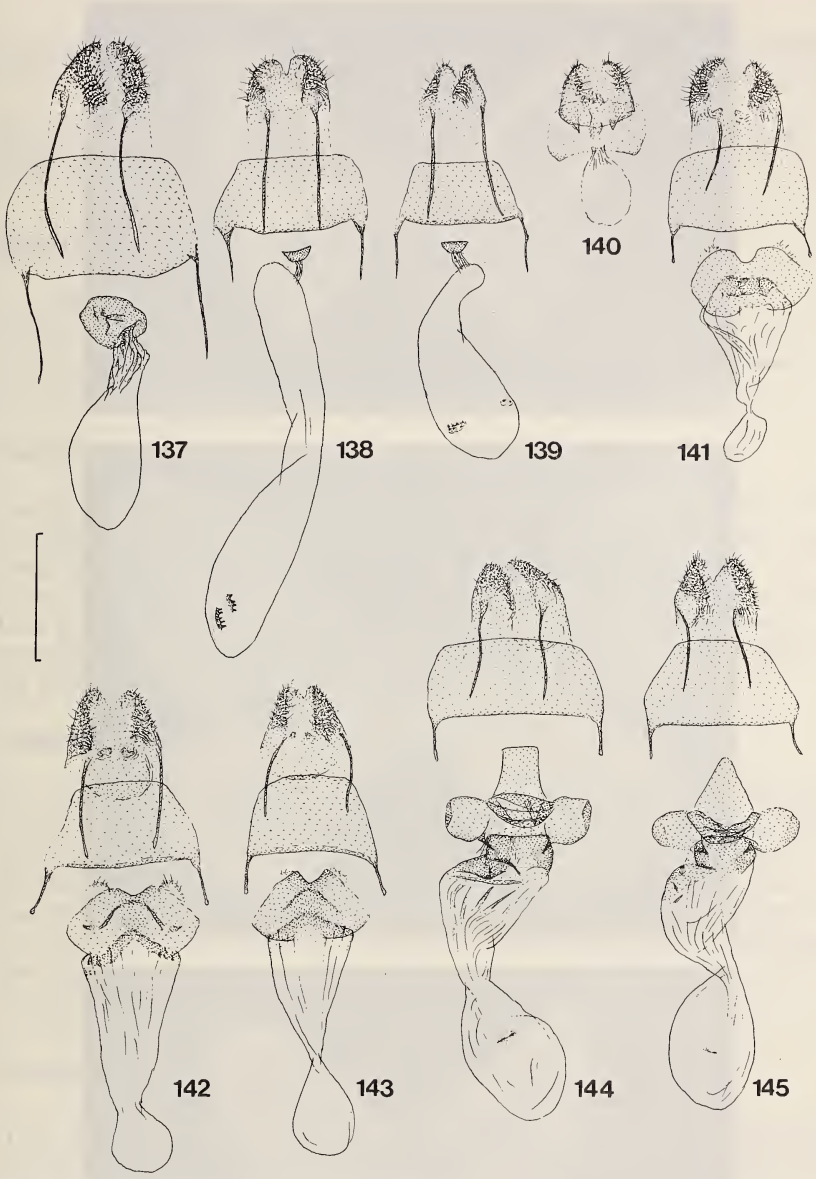
Figs 110-119. ♀ Genitalia (scale bar = 1 mm)
110) *Thetidia (Antonechloris) smaragdaria* (Fabricius, 1787) (C. Italy)
111) *Thetidia (Antonechloris) smaragdaria* (Fabricius, 1787) (NW. Caucasus)
112) *Thetidia (Antonechloris) volgaria* (Guenée, 1857) (S. Russia)
113) *Thetidia (Antonechloris) volgaria* (Guenée, 1857) ; vaginal plate only (Armenia)
114) *Thetidia (Antonechloris) persica* sp. n. (N. Iran ; Holotype)
115) *Thetidia (Antonechloris) persica* sp. n. (E. Turkey ; vaginal plate only)
116) *Thetidia (Antonechloris) persica* sp. n. (C. Turkey ; vaginal plate only)
117) *Thetidia (Antonechloris) silvia* Hausmann, 1991 (C. Jordan ; Paratype)
118) *Thetidia (Antonechloris) bilineata* Hausmann, 1991 (C. Jordan ; Holotype)
119) *Thetidia (Aglossochloris) euryrithra* Prout, 1935 (N. Jordan)



Figs 120-126. ♀ Genitalia (scale bar = 1 mm)
120) *Hemistola chrysoprasaria* (Esper, 1795) (S. Turkey)
121) *Xenochlorodes olympiaria cremonaria* (Staudinger, 1897) (N. Israel)
122) *Gnophosema palumba* Brandt, 1938 (S. Iran)
123) *Victoria sematoperas* Prout, 1916 (Kenya ; Paratype)
124) *Victoria plantei* Herbulot, 1976 ; ostium-bursae-region only (C. Israel ; Holotype)
125) *Victoria eremita* Hausmann, 1993 (S. Israel ; Paratype)
126) *Eucrostes indigenata* (de Villers, 1789) (C. Israel)



Figs 127-136. ♀ Genitalia (scale bar = 1 mm)
127) *Thalera fimbrialis magnata* A. Fuchs, 1903 (N. Iran)
128) *Culpinia prouti* (Thierry-Mieg, 1913) (C. Israel)
129) *Chlorissa viridata* (Linnaeus, 1758) (Transcaucasia)
130) *Chlorissa cloraria* (Hübner, [1813]) (C. Greece)
131) *Chlorissa asphaleia* Wiltshire, 1966 (N. Turkey)
132) *Phaiogramma pulmentaria* (Guenée, 1857) (N. Israel)
133) *Phaiogramma faustinata* (Millière, 1868) (N. Israel)
134) *Neromia pulvereisparsa pulvereisparsa* (Hampson, 1896) (N. Oman)
135) *Neromia pulvereisparsa jodisata* Staudinger, 1898 (C. Israel)
136) *Neromia simplexa* Brandt, 1938 (N. Oman)



Figs 137-145. ♀ Genitalia (scale bar = 1 mm)
137) *Kuchleria gisisi* Hausmann, 1995 (C. Israel ; Paratype)
138) *Microloxia herbaria* (Hübner, [1813]) (SE. Turkey)
139) *Microloxia ruficornis* (Warren, 1897) (S. Israel)
140) *Acidaliastis micra* Hampson, 1896 (S. Israel)
141) *Hemidromodes robusta robusta* (Prout, 1913) (NE. Sudan)
142) *Hemidromodes sabulifera sabulifera* Prout, 1922 (E. Iran)
143) *Hemidromodes sabulifera hessa* Prout, 1935 (S. Israel)
144) *Hierochthonia pulverata* (Warren, 1901) (C. Lebanon)
145) *Hierochthonia semitaria* (Püngeler, 1901) (C. Israel ; Paratype)

Figs 146-148.
146) *Microbaena pulchra minor* ssp. n., ♂, holotype
147) *Thetidia persica* sp.n., ♀, holotype
148) *Eucrostes indigenata lanjeronica* ssp.n., ♂, paratype