Fauna of the USSR
Lepidoptera

Volume IV, Number 5

Clothes Moths (Tineidae)

Part Five

A. K. Zagulajev

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FAUNA OF THE USSR

LEPIDOPTERA

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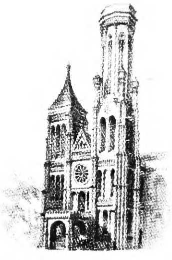
Part Five

SUBFAMILY MYRMECOZELINAE

A.K. Zagulajev

DONALD R. DAVIS
Scientific Editor



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Washington, D.C.
1988

TT 81-52000

Fauna SSSR: Nasekomye Cheshuekrylye, Vol. IV, No. 5,
Nastoyashchie Moli (Tineidae), Part Five.

Akademiya Nauk SSSR, Zoologicheskii Institut
New Series, No. 108
Nauka Publishers, Leningrad, 1975

Translated from the Russian
Translator: Dr. B.R. Sharma
General Editor: Dr. V.S. Kothekar

Library of Congress Cataloging-in-Publication Data
(Revised for vol. 5)

Zaguli͡aev, Alekseĭ Konstantinovich.
True moths = Tineidae.
(Fauna of the U.S.S.R.; new ser. no. . Lepidoptera; v. 4, no.
Vol. 2 has title: Tineidae (Nastoyashchie moli); vol. 5 has title: Clothes moths (Tineidae)
At head of title, v. : Zoologicheskii institut Akademii nauk SSSR.
Vol. 2 has imprint: Jerusalem: Israel Program for Scientific Translations.
Vol. 5 has imprint: Washington, D.C.:

Library of Congress Cataloging-in-Publication Data

Smithsonian Institution Libraries and National Science Foundation; New Delhi: Oxonian Press.
Includes bibliographies and indexes.
Contents: —pt. 2. Nemapogoninae—pt. 3. Subfamily Tineina—
—pt. 5. Subfamily Myrmecozelinae.
Supt. of Docs. no.: SI 1.2:C62
1. Tineidae—Classification—Collected works. 2. Insects—Soviet Union —Classification—Collected works. 3. Nastoyashchie moli. 4. Clothes moths (Tineidae). I. Title. II. Tineidae. III. Series: Fauna SSSR. English; new ser. no. IV. Series: Fauna SSSR, Lepidoptera. English; v. 4, no.
QL561. T55Z3313 595.7'81 79-378526

Translated and published for the Smithsonian Institution Libraries, pursuant to an agreement with the National Science Foundation, Washington, D.C., by Amerind Publishing Co. Pvt. Ltd., 66 Janpath, New Delhi 110 001, India

Typeset by Wordtronic and printed at Pauls Press, New Delhi, India

UDC 595.782 (083.71)

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Illustrations 319, Plates 8, Bibliography 288 citations.

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FOREWORD TO THE ENGLISH EDITION

The cosmopolitan family Tineidae constitutes one of the most economically important groups of Lepidoptera. Included in this family are such primary pests as clothes and carpet moths (several species of *Tinea, Tineola,* and *Trichophaga*) as well as several species that attack mushrooms and stored grains (*Nemapogon* and related genera). Due to such habits, several species are closely associated with human biology and, consequently, occur nearly everywhere humans concentrate. Because of their economic importance, immediate access to the world's literature pertaining to this family is essential to all entomologists.

For more than thirty years, Dr. A.K. Zagulajev has studied the family Tineidae over much of the Palearctic region. His research has culminated in a four-volume series on the Tineidae of the USSR. The first subfamily to be treated in this series was the Tineinae (1960), followed by the Nemapogoninae (1964), Scardiinae (1973), and the present volume, Myrmecozelinae (1975). All have been translated by the Smithsonian Institution Libraries Translation Publishing Program, pursuant to an agreement with the National Science Foundation, and all translations, except that of the Scardiinae have been published: Nemapogoninae (1968), Tineinae (1975), and Myrmecozelinae, the present volume. A total of thirty-four genera and 198 species of Tineidae were treated by Zagulajev in this series, as compared to the fifty-one genera and 173 species included in the 1983 North American (north of Mexico) Checklist.

Individual translations of the four volumes vary considerably in quality, with that on the Tineinae being the poorest. The most serious error in the English translation of the latter is the omission of the terminal portion of the discussion on *Tinea leonhardi* (p. 276) and the adjoining initial portion of the discussion on *Tinea unidentella.*

Dr. Zagulajev is to be congratulated for his efforts on the entire series, which provides us with the most complete reference to date on the Palearctic Tineidae. The present volume, like the earlier ones, commences with an extensive review of the biology and literature resources of the subfamily. The literature review is particularly valuable in that it includes numerous Russian references usually overlooked by Western entomologists. Zagulajev's overall treatment and many of his conclusions reflect a knowledgeable familiarity of most species' biology and habitat preference. Similar to his earlier works, however, he sometimes relies too heavily on antiquated and frequently erroneous references concerning extralimital fauna. The quality of his work throughout the entire series could have benefited greatly had he been able to examine firsthand the extensive collections of a few major Western institutions.

Smithsonian Institution
April 1986.

Donald R. Davis
Curator
Department of Entomology

PREFACE

3 Volume IV, Number 5 of *Fauna SSSR* (Fauna of the USSR) is part of an extensive monograph on the family Tineidae (tineid moths) and covers species of the subfamily Myrmecozelinae.[1] Reviewing an entire family in a single monograph makes it possible to define relations within the family and better understand the natural classification of the entire tineoid group. A natural division of Tineidae was feasible only after the entire family had been reviewed and the taxonomic characters of about 350 Palearctic and more than 100 tropical species, primarily of such artificial genera as *Tinea* L., *Tineola* H.-S., *Myrmecozela* Zll., *Nemapogon* Schr., and a few others, carefully reanalyzed.

These steppe, grass, and detritophagous moths constitute an independent group of lepidopterans, which have adapted to life in arid conditions. The larvae live in silken tunnels, sometimes in anthills, termitaria, or nests of bumblebees. They feed on decomposing plant residue, mycelia of lower fungi, and sometimes mold-covered bodies of insects, especially in old ant colonies, etc. Nevertheless, the life history and behavioral peculiarities of these moths, which are of considerable theoretical interest, are still not known for the majority of species. Only recently have publications on the taxonomy of these moths begun to appear in foreign literature (Petersen, 1957a, 1957b, 1965a, 1965b, 1965c; Cǎpuşe, 1966, 1968; Gozmàny, 1965a, 1965b, 1965c, 1966). In the Soviet Union only I have studied this group of insects. In 1954, on the basis of a series of morphological characters and the biological and ecological peculiarities of these moths, I isolated a few steppe detritophages in a separate group (Zagulyaev, 1954).

An analysis of morphological and biological characteristics of living forms revealed a trend in morpho-ecological changes during the evolutionary development of this group of moths. This material, together with the present distribution of species in the Palearctic and their relations with non-Palearctic forms, formed the basis for a new classification of the subfamily. An examination of the problems involved and descriptions of the subfamily, tribes, genera, and species with

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[1] Information on keratophagous moths grouped in the subfamily Tineinae was published in 1960, on mycetophagous moths constituting the subfamily Nemapogoninae in 1964, and on moths feeding on plant detritus (Scardiinae) in 1973.

respective identification keys constitute the contents of this part of the monograph on Tineidae. Steppe detritophages found in the Soviet Union and known from adjacent countries have also been included.

4 The material analyzed for the present volume comprised the collections of the Institute of Zoology of the Academy of Sciences of the USSR in Leningrad and of Kiev University; some material from the Zoological Museum of the Moscow State University, including the collections of the famous Russian traveller, A.P. Fedchenko (which have been analyzed by the expert lepidopterist, N.G. Ershov), and my collections from the Baltic region, Trans-Carpathians, Moldavia, Middle and Lower Volga regions, the Caucasus, Trans-Caucasus, Kazakhstan, Central Asia, and areas south of Primor'e.

In compiling comparative data and information on related questions discussed in this work, I was ably assisted by H. Amsel from Karlsruhe, Federal Republic of Germany; L. Gozmàny from Budapest, Hungary; A. Diakonoff from Leiden, Holland; I. Căpuşe from Bucharest, Rumania; E. Munro from Ottawa, Canada; G. Petersen from Eberswalde, German Democratic Republic; A. Popescu-Gorj from Bucharest, Rumania; and I. Svensson from Christianstadt, Sweden. I am sincerely grateful to these people but more particularly to Dr. A. Diakonoff who permitted me to analyze his personal collections of Tineidae from Southeast Asia (including Kalimantan, Sumatra, and Java Islands) and to A. Popescu-Gorj who allowed me to examine specimens from the collections of A. Caradja, which are preserved in the Museum of Natural History in Bucharest.

The type specimens of new species described by me are preserved in the Institute of Zoology of the Academy of Sciences of the USSR, or in the Museum of Natural History in Bucharest.

The present volume could not have been completed without the assistance of several colleagues and associates who offered valuable advice or participated directly in the collection and analysis of material. I sincerely thank the late A.S. Danilevskii, Z.S. Gershenzon, T.M. Zabello, V.I. Kuznetsov, V.I. Piskunov, I.L. Sukhareva, and M.I. Fal'kovich, A.V. Tsvetae, and Yu.L. Shchetkin.

Line drawings, including morphological details, were done for the present volume by artists I.V. Bessonova, E.V. Blagoveshchenskaya, T.A. Temkina, and T.N. Shishlova; color plates of moths were prepared by T.A. Temkina. Maps, charts, and all the other drawings of insect structures were prepared by me, using camera lucida for the latter. Illustrations borrowed from other sources are duly acknowledged.

Finally I offer cordial thanks to Professor A.A. Strelkov for his invaluable comments while editing this work and to Z.A. Zagulyaeva for her constant help, support, and suggestions.

A. Zagulyaev*

Leningrad
October 15, 1974

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* Sometimes transliterated Zagulajev.

CONTENTS

LIST OF SPECIES OF SUBFAMILY MYRMECOZELINAE

Subfamily Myrmecozelinae

I. Tribe Cephimallotini Zag.

1. Genus *Cephitinea* Zag.

2. Genus *Cephimallota* Brud.

3. Genus *Anemallota* Zag.

II. Tribe Rhodobatini Zag.

4. Genus *Pararhodobates* Pet.

5. Genus *Rhodobates* Rag.

6. Genus *Ceratuncus* Pet.

III. Tribe Ateliotini Zag.

7. Genus *Ateliotum* Zll.

8. Genus *Eremicola* Ams.

IV. Tribe Myrmecozelini Zag.

9. Genus *Episcardia* Rag.

Subgenus *Episcardia* Rag. (s. str.)

Subgenus *Bilobatana* Zag., subgen. n.

10. Genus *Catabola* Durr.

Subgenus *Catabola* Durr. (s. str.)

Subgenus *Crassicornella* Ag.

Subgenus *Lazocatena* Gozm.

Subgenus *Praelongicera* Ams.

11. Genus *Myrmecozela* Zll.

Subgenus *Myrmecozela* Zll. (s. str.)

Subgenus *Flavida* Zag., subgen. n.

Subgenus *Dulcana* Zag., subgen. n.

Subgenus *Promasia* Chrét.

Group of Species with Undefined Taxonomic Position

12. Genus *Cinnerethica* Ams.

V. Tribe Hapsiferini Zag.

13. Genus *Hapsifera* Zll.

Part I

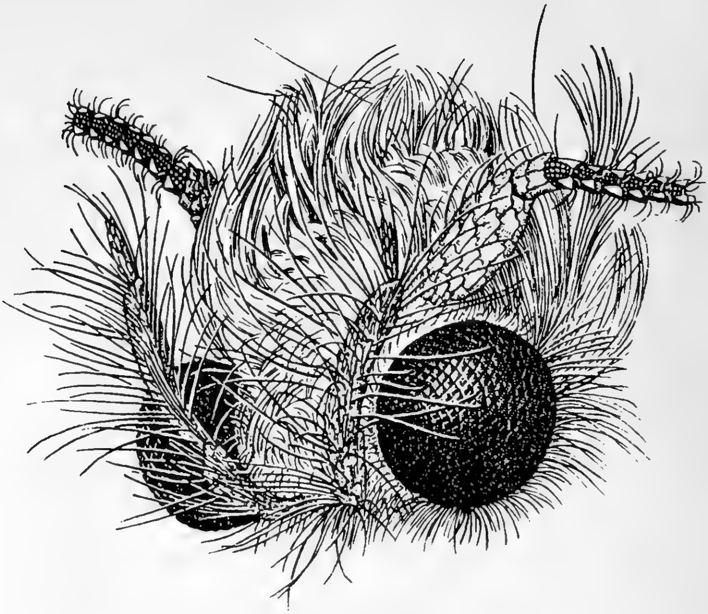
Introduction

MORPHOLOGY

ADULTS

8 Steppe detritophagous moths represent an independent group in the family Tineidae. They are fairly large, light-colored lepidopterans, with yellow and yellowish to chocolate-brown coloration and either a poorly defined uniform pattern or no pattern. Males and females usually are almost equal in size and appearance, which masks morphological differences.

Head (Figures 1 and 2). Color of pubescence on the head varies from dirty-white and light yellow to cinnamon-gray and rusty-red. The pilifers are better developed in *Episcardia* Rag., *Pararhodobates* Pet., and *Ceratuncus* Pet., in members of the tribe Cephimallotini Zag. they are very small, flattened, and covered with short bristles; but in most other species of the subfamily they are completely absent. The galea (Figures 3 and 4) are developed in all species. In members of Cephamallotini Zag., *Episcardia* Rag., *Rhodobates* Rag., *Ceratuncus* Pet., and some species of *Catabola* Durr. they are short and barely reach midlength of the 2nd segment of the labial palpi; in many other species they are absent (Hapsiferini Zag., *Pachyarthra* Ams., *Pararhodobates* Pet.). The maxillary palpi are slender and usually five-segmented. They are long in Cephimallotini Zag., *Myrmecozela* Zll., and *Rhodobates* Rag., short in *Pararhodobates* Pet. and *Ceratuncus* Pet., or completely absent in Hapsiferini Zag., *Pachyarthra* Ams., and many species of *Catabola* Durr. The labial palpi are large and protrude forward and upward, with a dense tuft of long bristles on the 2nd segment (Figures 1 and 2). In some species a brush of elongated spatulate scales is also present on the lower side of the 2nd segment and protrudes forward (*Ateliotum* Zll.). The 3rd segment is usually short, with a rounded tip, and sometimes with sensillary invaginations of varying form (Figure 5). The antennae (Figure 6) are thick, smooth, and with a broad 1st segment carrying a tuft of long bristles. They are usually equal to two-thirds to three-fourths the length of the forewing; rarely they are equal to or in some species longer than the forewings. Their color ranges from yellowish to chocolate-brown to gray. In some species dark fields occur at the apex of each segment (Cephimallotini Zag.), or each segment of the



9 Figure 1. Head of male of *Ceratuncus danubiellus* Mn. (drawn by E.V. Blagoveshchenskaya).

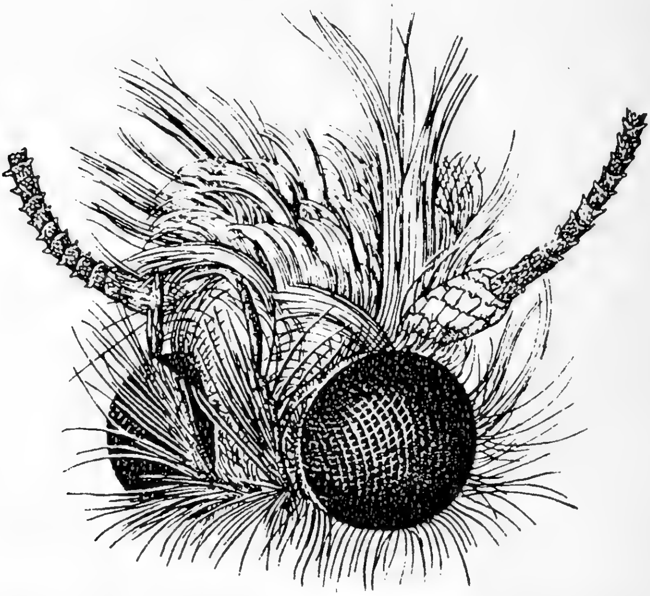


Figure 2. Head of male of *Hapsifera luridella* Zll. (drawn by T.A. Temkina).

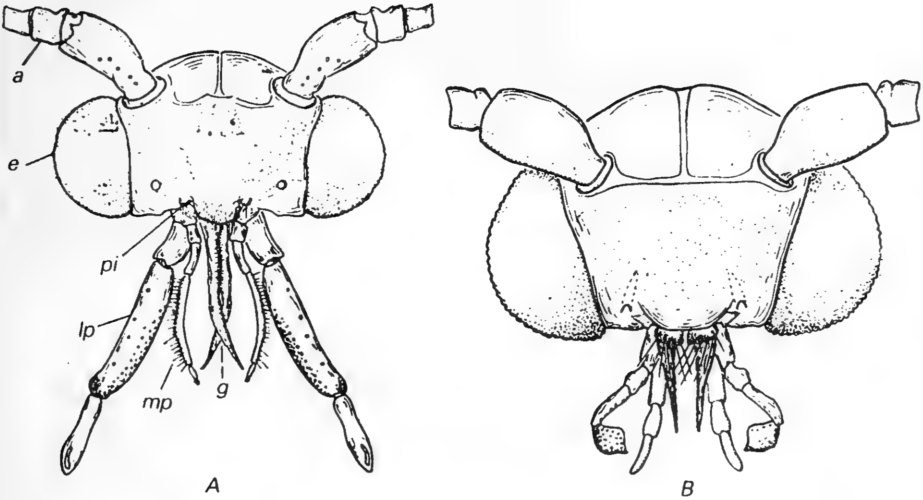


Figure 3. Head: A — *Cephitinae longipennis* Ersch., B — *Episcardia lardatella* Led. a — antenna; e — eye; g — galea; lp — labial palp; mp — maxillary palp; pi — pilifer.

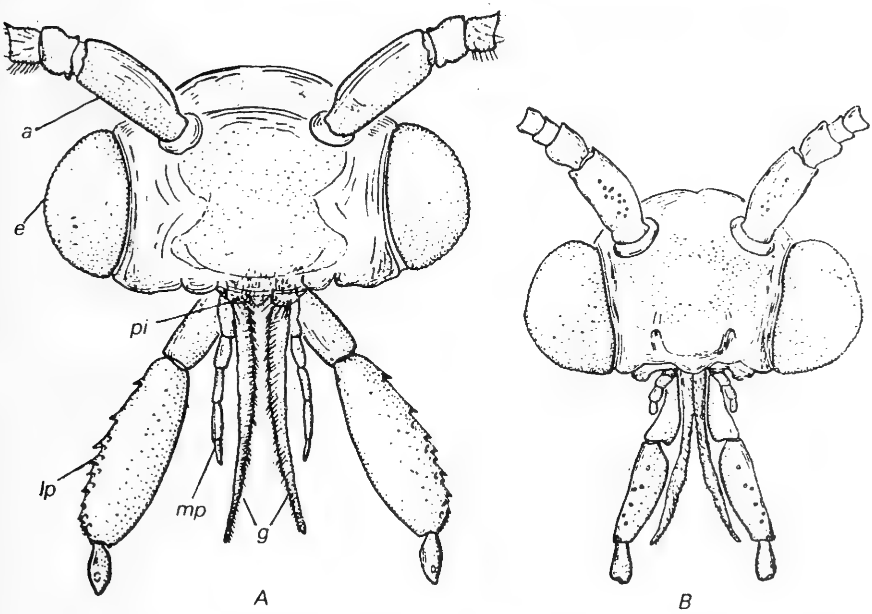
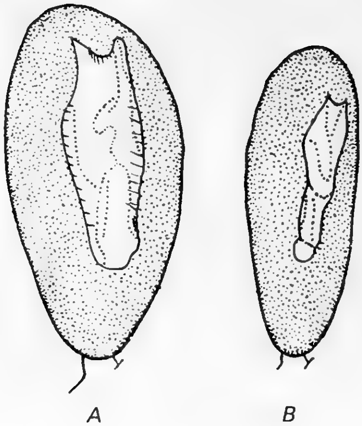


Figure 4. Head: A — *Rhodobates laevigatellus* H.-S.; B — *Myrmecozela ochraceella* Tgstr. Legend same as in Figure 3.



11 Figure 5. Shape of sensillary invagination on 3rd segment of labial palp.

A—*Cephimallota hasarorum* Zag., B—*C. libanotica* Pet. (from Căpuşe, 1968).

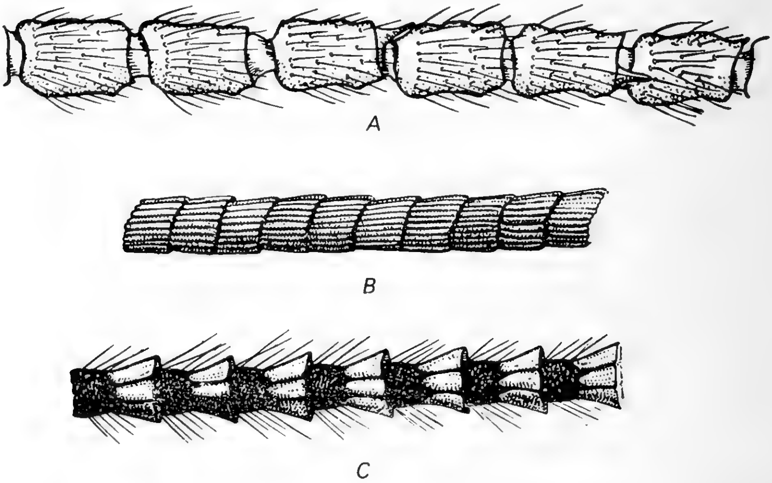


Figure 6. Structure and pubescence of middle antennal segments.

A—*Myrmecozela diacona* Wlsm.; B—*M. lutosella* Ev., C—*Ateliotum hungaricellum* Zll., (drawings "B" and "C" by T.A. Temkina).

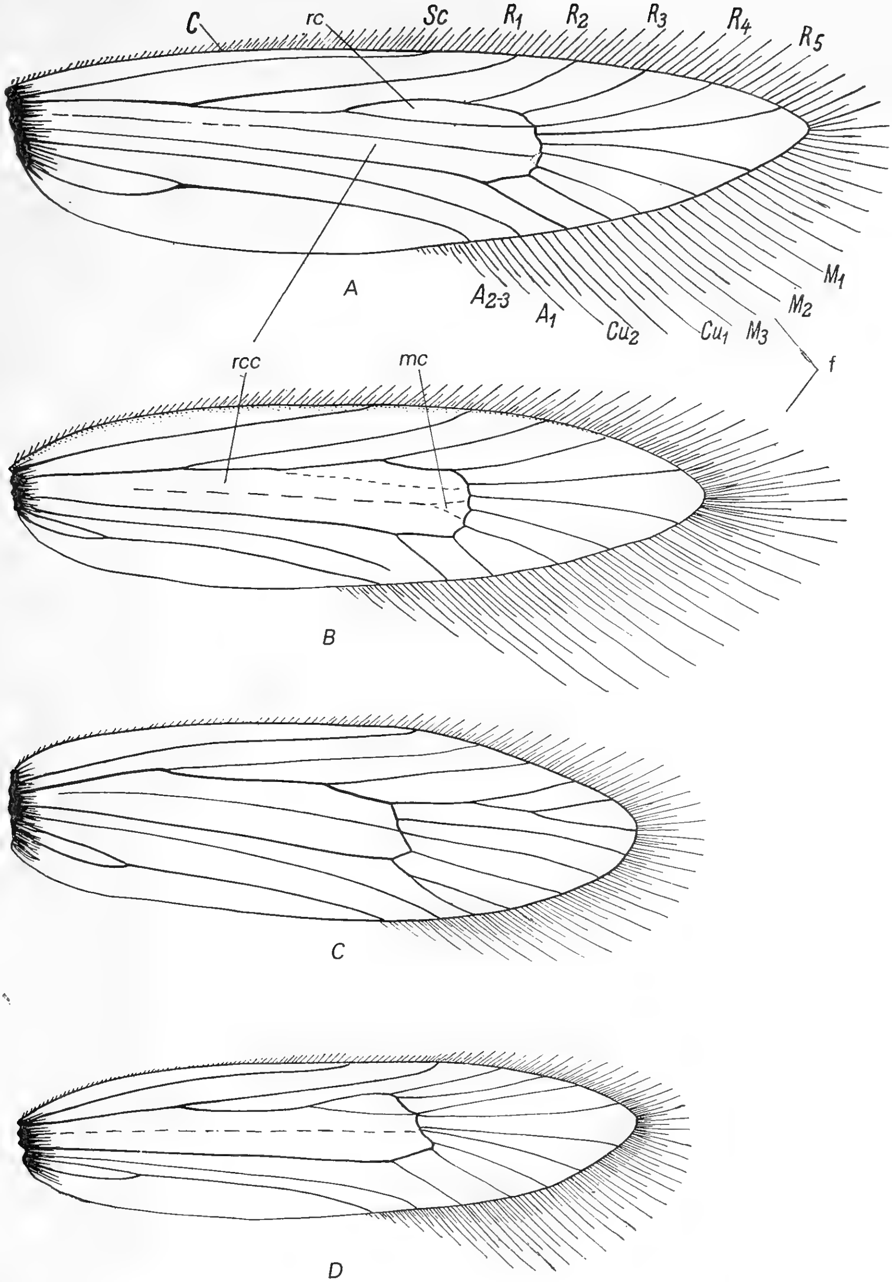
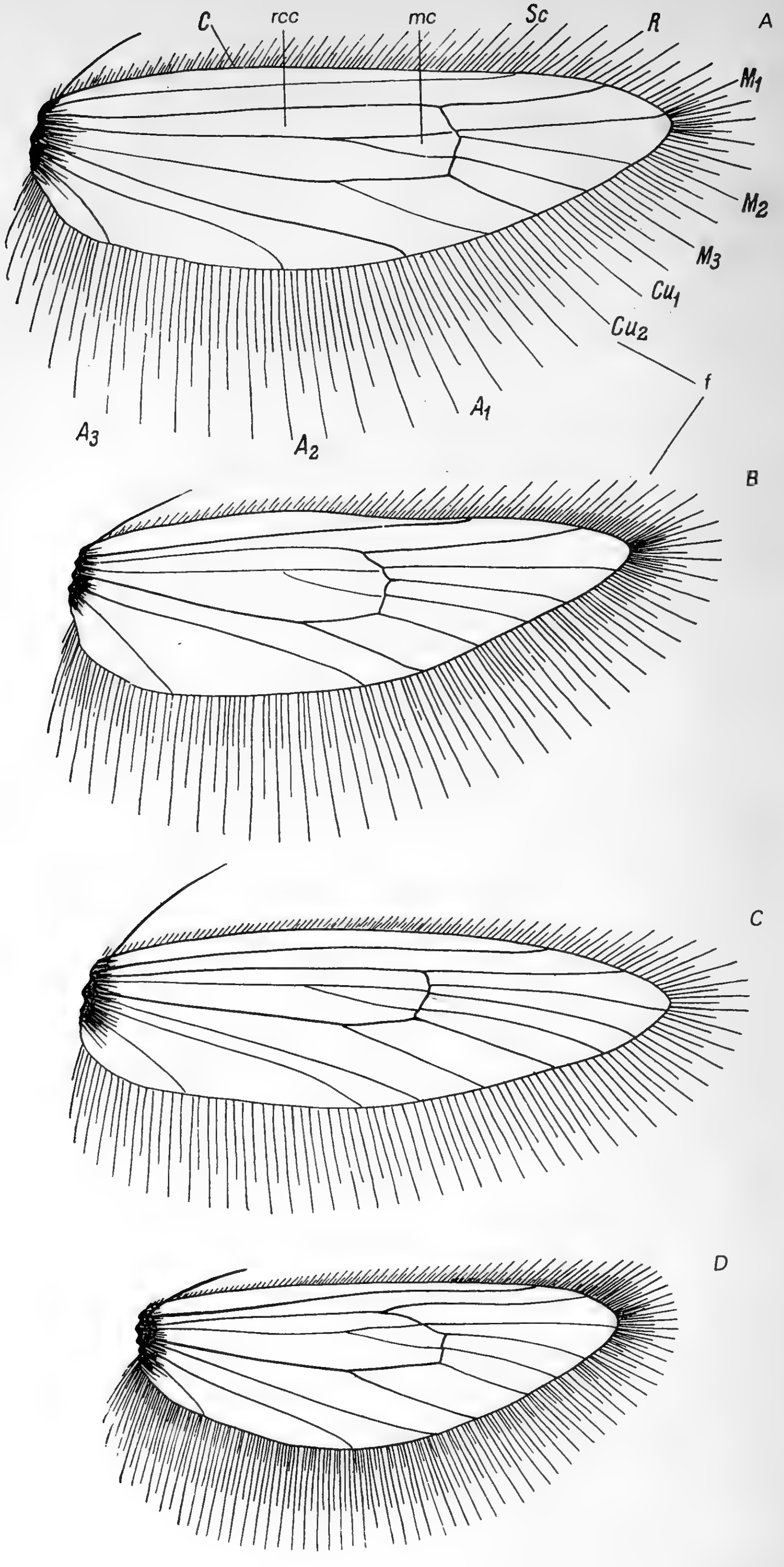


Figure 7. Venation of forewings.

A—*Ceratuncus andalusicus* Zag., B—*Ateliotum syriacum;* Car; C—*Hapsifera luridella* Zll., D —*Myrmecozela lutosella* Ev.

A—anal vein; C—costa; Cu—cubitus; f—fringe; M—media; mc—medial cell; R—radius; rc—radial cell; rcc—radiocubital cell; Sc—subcosta.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flagellum carries a whorl of expanded, funnel-shaped, elongated scales (Ateliotini Zag., *Rhodobates* Rag., *Ceratuncus* Pet., and *Reisserita* Ag.). The antennae of males in some species are densely covered with piliform setae (Cephimallotini Zag., *Ateliotum* Zll., *Rhodobates* Rag., *Ceratuncus* Pet., and *Reisserita* Ag.) or they are smooth and filiform (Hapsiferini Zag., *Pachyarthra* Ams., *Pararhodobates* Pet.). The frons is broad and may be larger than the longitudinal diameter of the eyes (Cephimallotini Zag., Rhodobatini Zag.), or equal to it (*Catabola* Durr.).

Thorax and its appendages. The thorax and tegulae are yellowish-gray, orange, or cinnamon-gray, without pattern, and in some species 11 with a violet or bronze hue. The tegulae are usually darker in front. The moths are medium in size. The wingspan of most species is 13 to 27 mm; however, in a few minute members the wings reach up to 10 mm (some members of Ateliotini Zag., *Catabola* Durr.). The forewings usually have a poorly developed costa which is better defined in Cephimallotini Zag., many members of Rhodobatini Zag., and in *Episcardia* Rag. The length of the forewing is 3.0 to 4.25 times greater than the width and that of the hind wing 2.75 to 4.0 times. The hind wings are mostly equal in width to the forewings, or slightly narrower or broader. The fringe on the hind wing is equal to one-third to three-fourths the width of the wing and only in some species of *Catabola* Durr., is it more than the alar width. Females of *Pararhodobates* Pet. have rudimentary wings.

The forewings in most species are unform in color, from light yellow to yellowish-brown or cinnamon-gray, without a sharply expressed pattern. Only in some species of Cephimallotini Zag. do the wings have sharply demarcated spots and streaks, or dark streaks and spots scattered on a dirty-white background (Ateliotini Zag.). In members of genus *Hapsifera* Zll. the pattern is formed by groups of light-colored scales protruding above the alar surface, with a chocolate-brown to black shade on the upper side. The wings and their fringe in most species have a golden glaze or violet hue. The hind wings are light yellowish to ash, light cinnamon-gray, or even often translucent. Their fringe is slightly darker than the basic background color of the wings. The under surface of all wings is yellowish-brown, brownish with gray granulation and a dull glaze, or with a violet hue (characteristic of

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13 Figure 8. Venation of hind wings.

A—*Ceratuncus andalusicus* Zag.; B—*Ateliotum syriacum* Car.; C—*Hapsifera maculata* Wlsm.; D—*Myrmecozela lutosella* Ev.

Legend same as in Figure 7.

many species of *Episcardia* Rag. and Cephimallotini Zag.).

14 Venation of wings (Figures 7 and 8) in most cases is complete and monotypic, and deviations serve as a reliable character for identification of genera and sometimes also species.

In the forewings (Figure 7, A–D) *Sc* terminates in the middle section of the wing, and only in a few species enters the anterior margin beyond the midpoint of the forewing (*Episcardia* Rag., males of *Pararhodobates* Pet.). All the radial veins are well developed in most species and originate from the radiocubital cell and terminate in the anterior margin. R_1 originates from one-fourth to one-third of the radiocubital cell and terminates at the alar margin at the level of the apex of the radiocubital cell or before it; rarely, this vein terminates far beyond the level of the apex of the cell (*Hapsifera* Zll.). The branches R_3, R_4, and R_5 or only R_4 and R_5 originate from a common stem (*Hapsifera* Zll., *Pararhodobates* Pet.). R_4 may be absent (Ateliotini Zag.). All three medial veins are well developed and in most species widely separated at the base. M_1 terminates at the outer margin of the wing at a notable distance from its apex. The distance between the base of Cu_1 and Cu_2 is two to five times less than the length of the radial cell; only in *Pararhodobates* Pet. is it equal to the radial cell. The terminus of branch Cu_2 is located at about the level of the outer margin of the radiocubital cell (Ateliotini Zag., *Catabola* Durr.) or far beyond it (Cephimallotini Zag., *Episcardia* Rag., Hapsiferini Zag., Rhodobatini Zag.). In some species, Cu_1 and Cu_2 are stalked (*Hapsifera* Zll.). The common trunk of A_{2-3} terminates at about midpoint of the posterior alar margin (Ateliotini Zag., *Catabola* Durr., *Pararhodobates* Pet., *Ceratuncus* Pet., *Reisserita* Ag.) or almost at the level of the point of origin of Cu_2 from the cell (*Episcardia* Rag., Cephimallotini Zag., *Rhodobates* Rag., *Pachyarthra* Ams.), and rarely at the level of the outer margin of the radiocubital cell (*Hapsifera* Zll.). The radiocubital cell is equal to two-thirds the alar length and is closed. In most species this cell shows radial and medial divisions. Only in some genera, e.g., *Catabola* Durr., *Hapsifera* Zll., and *Rhodobates* Rag., are these divisions sometimes evident or only a single cell prominent.

In the hind wings (Figure 8, A–D) *Sc* terminates at the anterior margin at three-fourths to seven-ninths of the wing length and R_1 terminates in the anterior margin before the wing tip. All the medial veins
15 are present and generally widely separated. Only in some isolated species of *Rhodobates* Rag., *Reisserita* Ag., and *Pachyarthra* Ams. are M_1 and M_2 shortly stalked. All three angle veins are well developed in most species and A_1 terminates on the posterior margin of the wing before the level of the outer margin of the radiocubital cell (Cephimallotini Zag., *Episcardia* Rag., *Myrmecozela* Zll., *Hapsifera* Zll., many

members of the Rhodobatini Zag.), almost at the level of origin of Cu_2. The medial cell is well developed in many species and in length may be 1.5 to 2.0 times larger than the distance between the bases of Cu_1 and Cu_2 (*Hapsifera* Zll., *Ceratuncus* Pet.), or is equal in length to the dis-

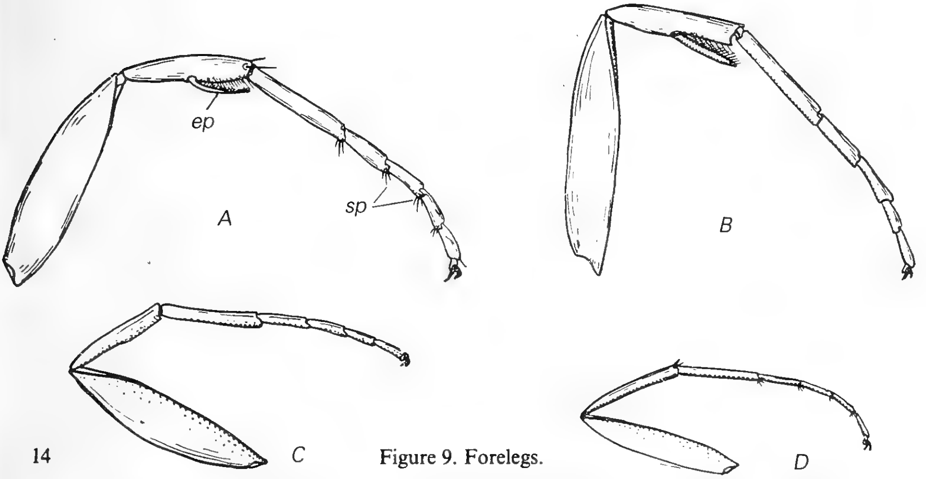

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Figure 9. Forelegs.

A—*Anemallota praetoriella* Chr.; B—*Ateliotum syriacum* Car.; C—*Hapsifera maculata;* D—*Myrmecozela hispanella* Zag.

ep—epiphysis (strigil); sp—spines.

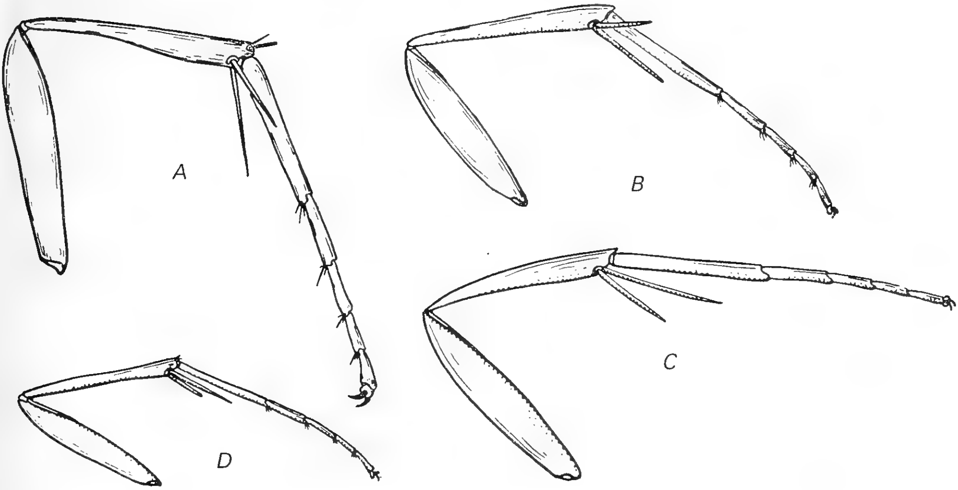

Figure 10. Middle legs.

A—*Anemallota praetoriella* Chr.; B—*Ceratuncus andalusicus Zag.;* C—*Hapsifera maculata* Wlsm.; D—*Myrmecozela hispanella* Zag.

tance between these veins (*Pararhodobates* Pet., *Reisserita* Ag.), or is not developed at all (*Rhodobates* Rag.).

The legs are yellowish-gray or brown and in most species without light-colored bands at the ends of the tibiae and segments of the tarsi. The tibia of the forelegs (Figure 9, A–D) is 2/3 to 1/2 the length of the femur, and in most members without an epiphysis or strigil (*Catabola* Durr., *Myrmecozela* Zll., *Hapsifera* Zll., *Pachyarthra* Ams., and *Pararhodobates* Pet.). The tibia of the middle legs (Figure 10, A–D) is slightly shorter than or equal to the femur; only in species of *Episcardia* Rag. is it longer than the femur. The median pair of spurs of the hind tibia (Figure 11, A–D) is located before the midpoint of the tibia (Cephimallotini Zag.), or in the middle in most species, or rarely beyond the midpoint (Hapsiferini Zag., many species of Rhodobatini Zag.). The ends of the tarsal segments (Figures 9, B, C; 10, C; 11, C)

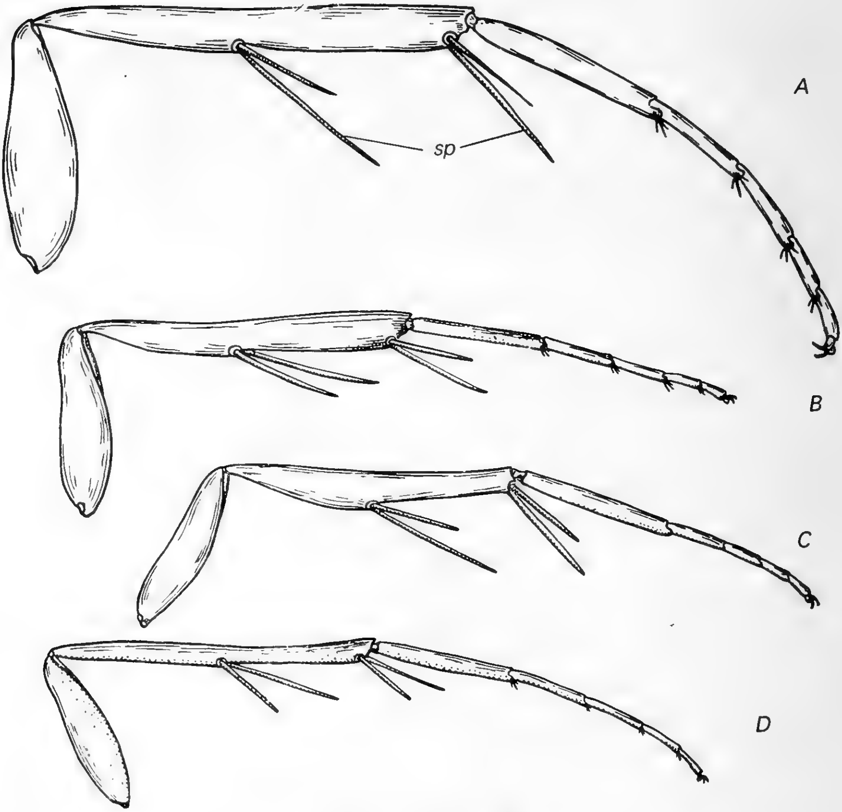

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Figure 11. Hind legs.

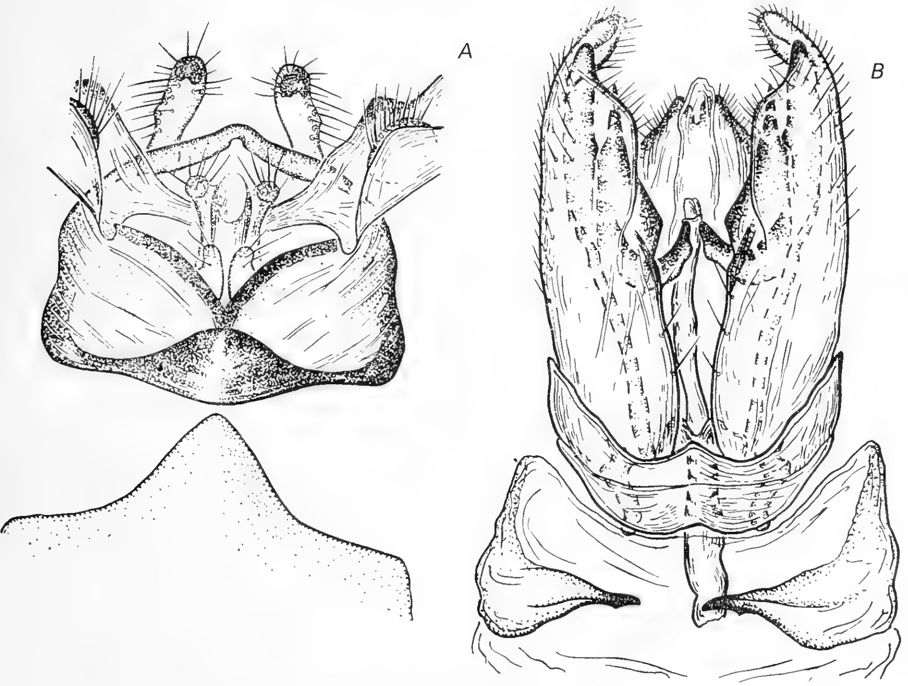
A—*Anemallota praetoriella* Chr.; B—*Ceratuncus danubiellus* Mn.; C—*Ateliotum syriacum* Car.; D—*Myrmecozela hispanella* Zag.

sp—spur.

are spinescent (Ateliotini Zag., *Catabola* Durr., *Hapsifera* Zll., and *Pachyarthra* Ams.), or have just three spines (Cephimallotini Zag., many species of Myrmecozelini Zag. and Rhodobatini Zag.) Figures 9, A, D; 10, A, B, D; 11, A, B, D). The legs of females in most species, as distinct from males, are shorter and of the climbing type; only in wingless females are they long and of the cursorial type.

Abdomen. The cuticle of the abdomen is covered with sparse yellowish-gray or chocolate-brown to gray scales which are glossy in some members. The crest and cluster of anal scales are developed in many species (color plate VI, Figures 2 and 6; color plate VII, Figures 3 and 6).

16 The sternite of segment VIII in males (Figures 12, A and B) has either a bifurcated outgrowth along the posterior margin (*Anemallota* Zag.), or the outgrowth is entire (*Cephitinea* Zag.) (Figure 12, A); in *Rhodobates* Rag. the two sections are separate, narrow, and shaped like two wedges directed toward each other (Figure 12, B). In species of many genera the unique appendages of the copulatory apparatus, the clusters of flate androconial scales or the coremata (Figure 14, B) are located along the sides on the membrane between segments VIII and



17 Figure 12. Genitalia and structure of sternite of segment VIII in males.

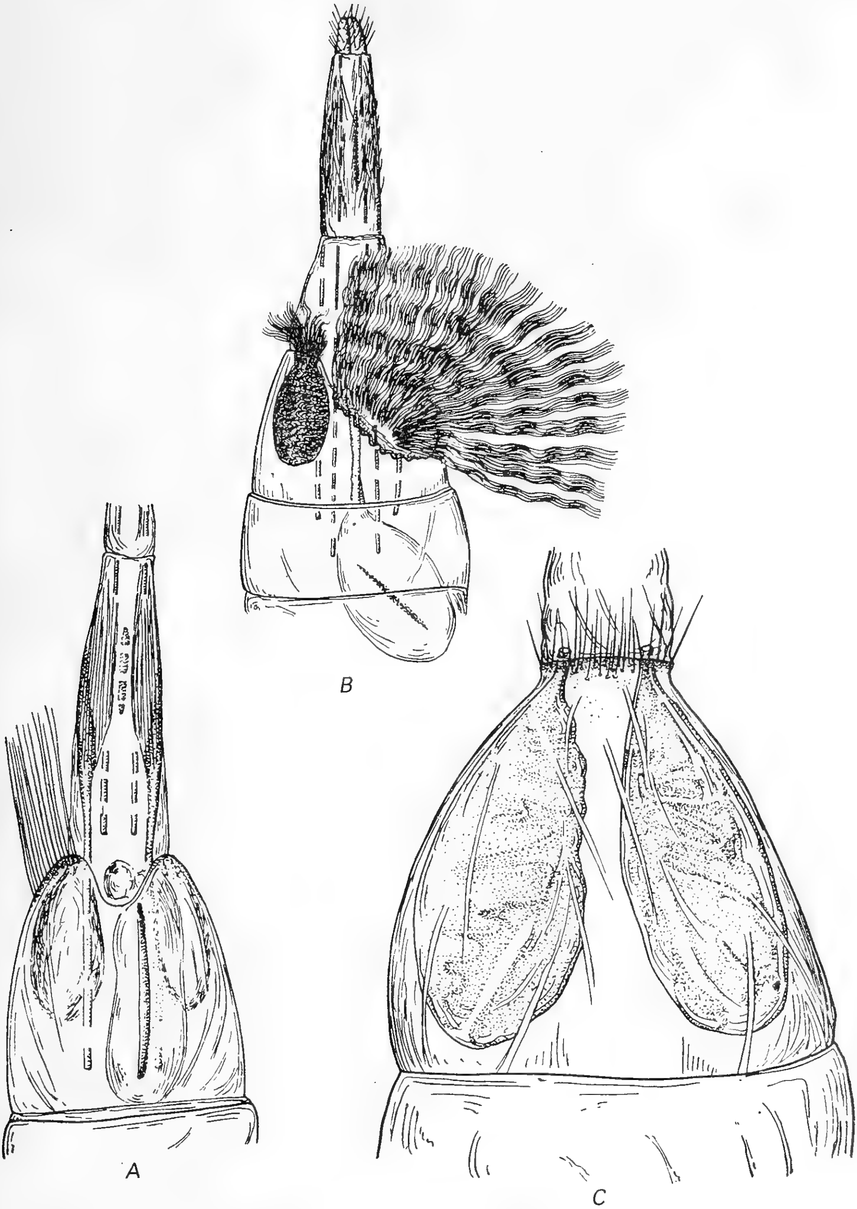
A — *Cephitinea colonella* Ersch., B — *Rhodobates laevigatellus* H.-S.

IX (*Episcardia* Rag., *Myrmecozela* Zll., *Catabola* Durr., *Hapsifera* Zll.); in some forms androconial clusters are not developed (Ateliotini Zag., Rhodobatini Zag., Cephimallotini Zag.).

Paired sacs filled with crimped hairs, the corethrogynes, are found in females on the inner side of the segment along both sides of the duct of the bursa copulatrix (Figure 13, A–B) (Ateliotini Zag., Hapsiferini Zag.; many species of Myrmecozelini Zag.); only in members of tribes Rhodobatini Zag. and Cephimallotini Zag. are these sacs absent (Figure 19, A). In some species the sternite of segment VII tapers narrowly near the posterior margin and resembles a narrow plate (*Ateliotum* Zll.).

Parts of genitalia. The nomenclature used for designating the parts 17 of the genitalia in my book on keratophagous and mycetophagous moths (Zagulyaev, 1960, 1964a) has been used here also.

Male genitalia (Figure 14, A–D). In most species the genitalia are fairly large, compact, and broad. The valvae (Figure 15, A–F) vary in shape; very narrow (*Ateliotum* Zll., *Hapsifera* Zll., *Ceratuncus* Pet., *Reisserita* Ag.), even digitate (*Catabola* Durr., *Pararhodobates* Pet.), or broad and rectangular (*Myrmecozela* Zll.). They may be highly sclerotized, falcate (*Cephimallota* Brud.), with incurved posterior and lower margins with lamelliform folds (*Pachyarthra* Ams., *Rhodobates* Rag.), or with ventral and highly sclerotized dorsal lobes (*Episcardia* Rag.). In some species a membranous fold extends from the apex along the lower margin of the valva, which has strong bristles, spines, or other highly sclerotized structures (Ateliotini Zag.). The sclerotized basal cord or pedicel of the valva (transtilla) (Figure 14, A, D) may be long and protrude beyond the vinculum, or short and not protrude above it, or as in some species of *Rhodobates* Rag. bifurcate in the middle of the valva (Figure 14, D). The uncus (Figure 16, A–E) may consist of two distinct lobes or cords (*Episcardia* Rag., Cephimallotini Zag., Ateliotini Zag., *Hapsifera* Zll., many species of Rhodobatini Zag.), or the lobes may fuse at the apex (*Myrmecozela* Zll.). The membranous anal tube is distinct between the uncal lobes in most species (Figure 16, C, D, G). The subuncus or gnathos is developed only in *Cephimallota* Brud. and in tribes Hapsiferini Zag., Rhodobatini Zag. (Figure 16, F, G) and absent in other species; however, in genera *Cephitinea* Zag. and *Anemallota* 20 Zag. scelrotization of the anellus —supporting structure around the aedoeagus — is present. The aedoeagus (Figure 17) may be short and stout (Cephimallotini Zag., Ateliotini Zag., *Episcardia* Rag., and Hapsiferini Zag.), slender, straight and longer than the valva (*Ceratuncus* Pet., *Reisserita* Ag.), or arcuate (*Myrmecozela* Zll., *Cinnerethica* Ams.). In some specimens the aedoeagus had shifted into the tergal region, making possible an examination of the underlying structures.



18 Figure 13. Genitalia and structure of sternite of segment VII and location of sacs with crimped hairs in females.

A—*Myrmecozella asariella* Zag. (structure of sternite); B—*M. diacona* Wlsm., sacs with crimped hairs (one sac closed); C—*Hapsifera luridella* Zll. (location of sacs filled with hairs).

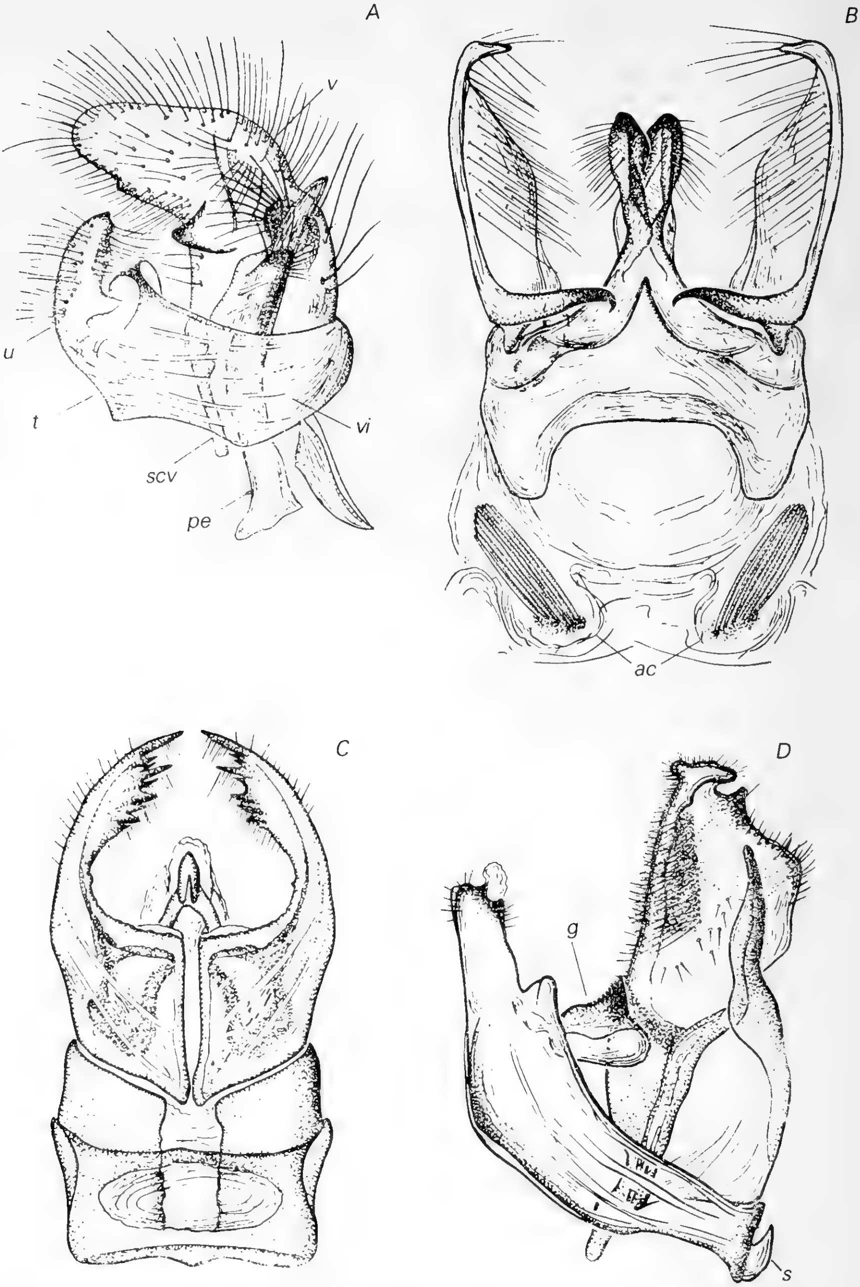
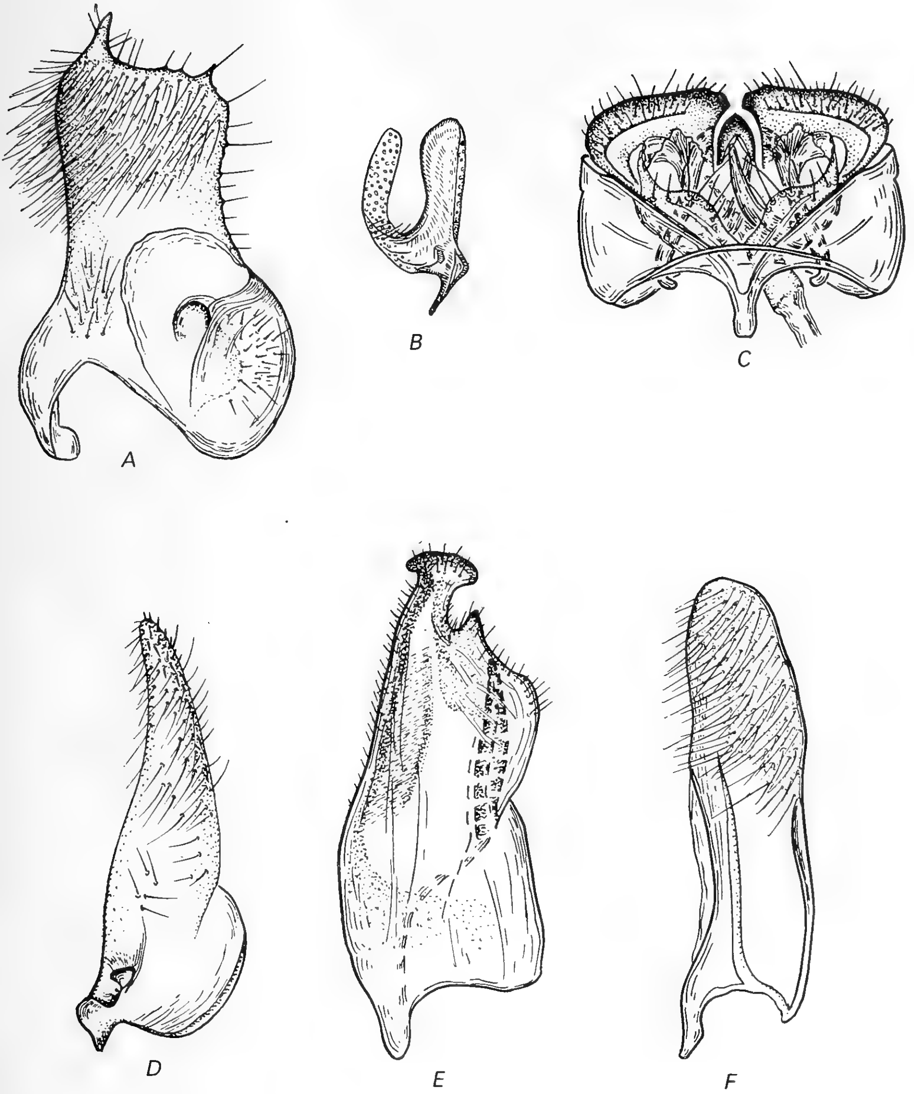


Figure 14. Genitalia of males and androconial clusters.

A—*Cephitinea colonella* Ersch. (lateral view); B —*Episcardia caerulipennis* Ersch. (dorsal view); C—*Myremecozela cuencella* Car. (viewed from ventral side); D—*Rhodobates laevigatellus* H.-S. (lateral view).

ac—androconial clusters; g—gnathos (subuncus); pe—aedoeagus; s—saccus; scv—sclerotized cord of valva (transtilla); t—tegumen; u—uncus; v—valva; vi —vinculum.



20 Figure 15. Shape and structure of valvae.

A—*Myrmecozela ochraceella* Tgster.; B —*Episcardia violacella* Rbl., C—*Cephimallota hasarorum* Zag. (general view of genitalia from ventral side); D—*Pararhodobates syriacus* Led.; E—*Rhodobates laevigatellus* H.-S.; E—*Hapsifera luridella* Zll.

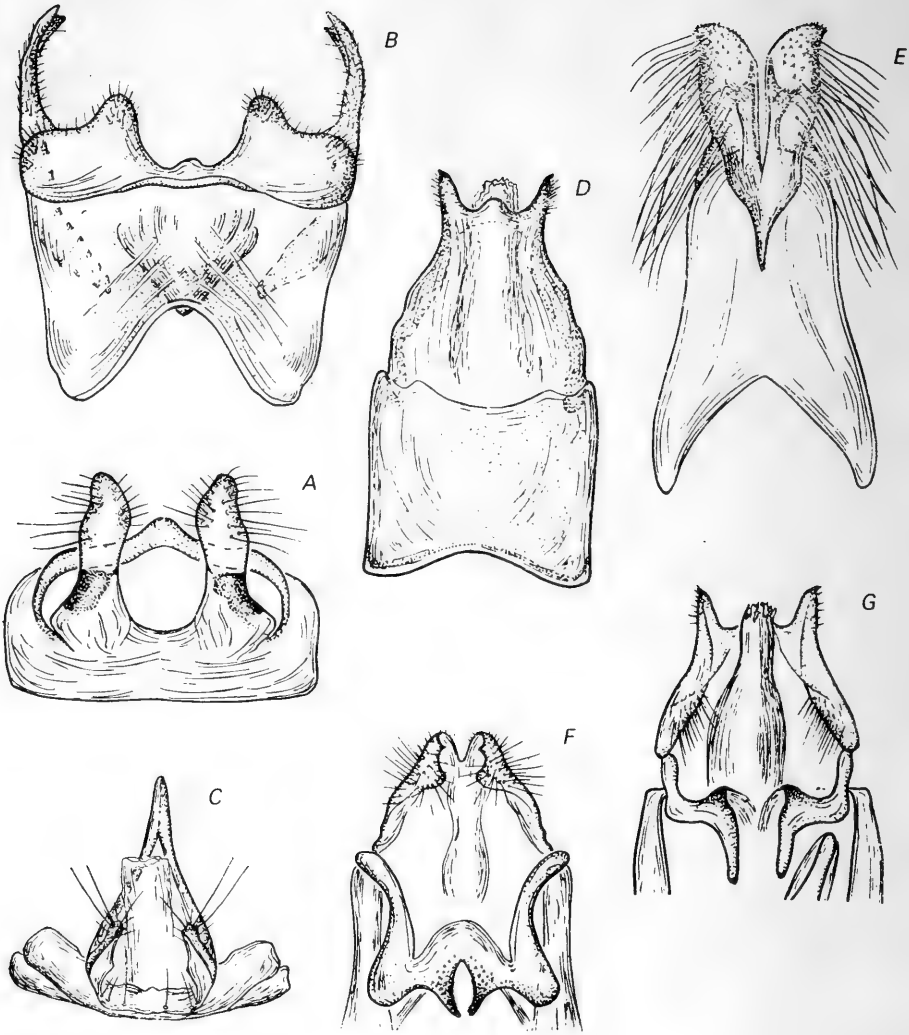


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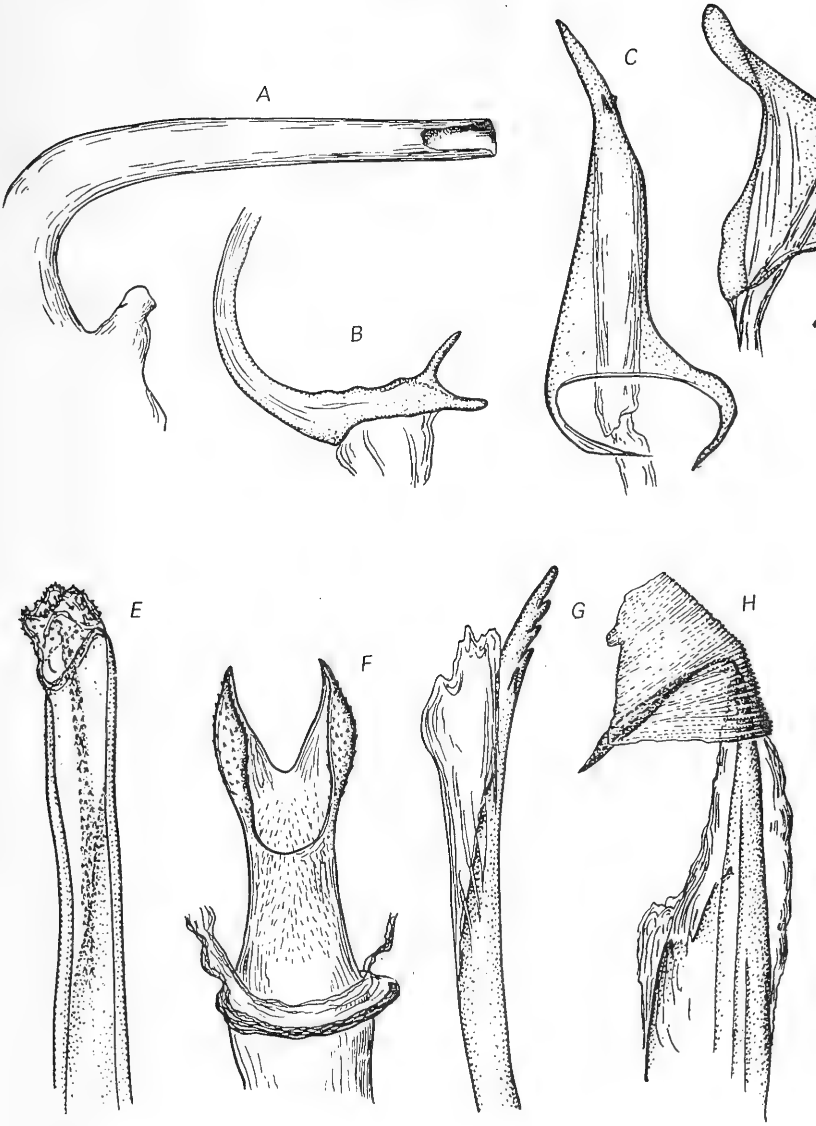
Figure 16. Uncus, gnathos, and tegumen.

A to E—uncus and tegumen (dorsal view): A—*Cephitinea colonella* Ersch.; B—*Ceratuncus affinitellus* Rbl.; C—*Myrmecozela ochraceella* Tgster.; D—*Hapsifera luridella* Zll.; E—*Catabola zernyi* Pet.; F and G—uncus and gnathos (ventral view); F—*Rhodobates laevigatellus* H.-S.; G—*Hapsifera luridella* Zll.



22 Figure 17. Shape and structure of aedoeagus.

A to D—general view: A—*Anemallota praetoriella* Chr.; B—*Myrmecozela lambessella* Rbl.; C—*Catabola zernyi* Pet.; D—*C. crassicornella* Zll.; E to H—apical part of aedoeagus; E—*Rhodobates laevigatellus.* H.-S.; F—*Ateliotum syriacum* Car.; G—*Myrmecozela lambessella* Rbl.; H—*M. taurella* Zag.

The vinculum and tegumen may form a broad ring (*Episcardia* Rag., *Catabola* Durr., *Ateliotum* Zll., *Ceratuncus* Pet., *Reisserita* Ag.) or the vinculum is narrow *Myrmecozela* Zll., *Hapsifera* Zll., *Pachyarthra* Ams., *Rhodobates* Rag.). The saccus is generally broad, short, and groovelike, but in some species bent outward (*Cephitinea* Zag., *Rhodobates* Rag., *Pararhodobates* Pet.), slender and long (*Ceratuncus* Pet., *Reisserita* Ag.), or absent (*Ateliotum* Zll.).

Female genitalia (Figures 18 to 20). The highly variable appearance of the genitalia makes it possible to characterize genera readily as the 21 organs have retained a single type of structure, and minute differences serve as a dependable character for species identification. In most species the vaginal plate is more or less entire and not divided into lobes (Ateliotini Zag., *Rhodobates* Rag., *Pararhodobates* Pet.), or it bifurcates into two narrow lobes (*Ceratuncus* Pet.). The base of the plate may be broad and in the form of a shield covering the ostium bursa (Cephimallotini Zag., *Episcardia* Rag.), or a separate vaginal plate may not be present; instead one sees a darkening of the membrane with a longitudinal interruption in the middle (*Myrmecozela* Zll., *Hapsifera* Zll.), and very dense slender bristles (Figure 18, A). The dorsal side of segment VIII in some species (Figures 19, C and 20, A) has a narrow 22 sclerotized tergal plate (*Myrmecozela* Zll.). A subvaginal plate (Figure 18, C) is present in some species in the form of a sclerotized structure (many species of Cephimallotini Zag.). The duct of the bursa copulatrix is usually without incrustations and armature, and only in members of *Episcardia* Rag. has a complex structure of sclerotized formations (Figure 18, D–F). The terminal portion of the duct of the bursa copulatrix and the ostium are usually membranous, rarely poorly sclerotized (*Ceratuncus* Pet.), or covered with plates (*Rhodobates* Rag.). The bursa copulatrix is either without a signum (*Episcardia* Rag., Cephimallotini Zag., Ateliotini Zag., many members of Rhodobatini Zag.), or 24 with sclerotized structures of varying shape (Figure 20, D–G), for example, a long, narrow, triangular plate (*Myrmecozela* Zll.); a bent plate covered with spinules and located in the wall of the outer half of the sac (*Hapsifera* Zll.); or scattered spinescent plates (*Ceratuncus* Pet.). The anterior apophysis may be simple (Cephimallotini Zag., Rhodobatini Zag.) or bifurcate (Myrmecozelini Zag., Ateliotini Zag., *Hapsifera* Zag.) (Figure 18, A, B). The posterior apophysis (Figure 19) may not reach segment VII or may deeply penetrate it. The ovipositor is long and slender, 1.5 to 2.5 times longer than sternite VII. The last segment of the ovipositor (Figure 20, B, C) in some species of the subfamily is 26 pigmented and covered with plates (*Rhodobates* Rag.) or densely covered with slender bristles (*Hapsifera* Zll.). Accessory apophyses are discernible in many species before the anal papillae.

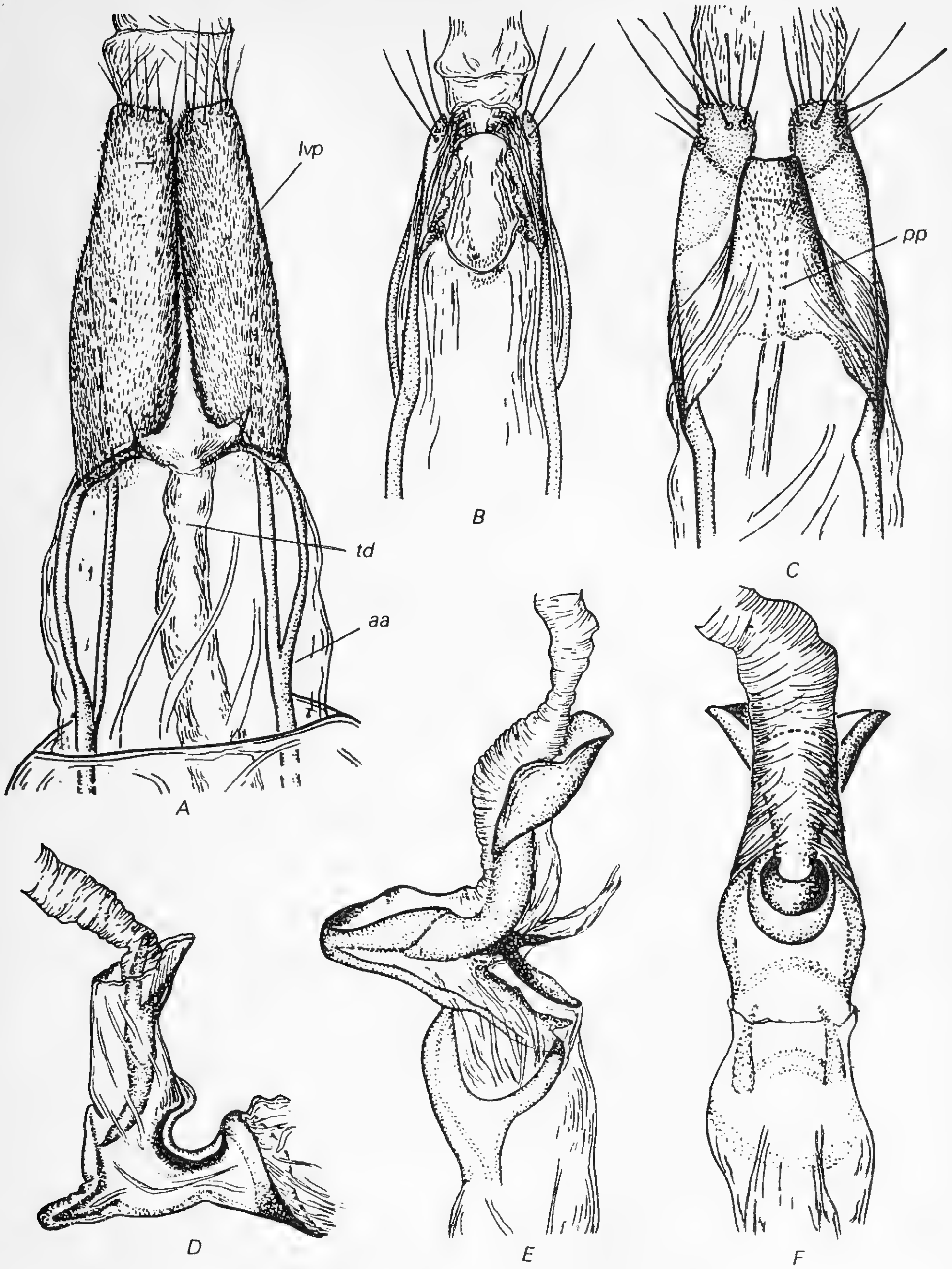
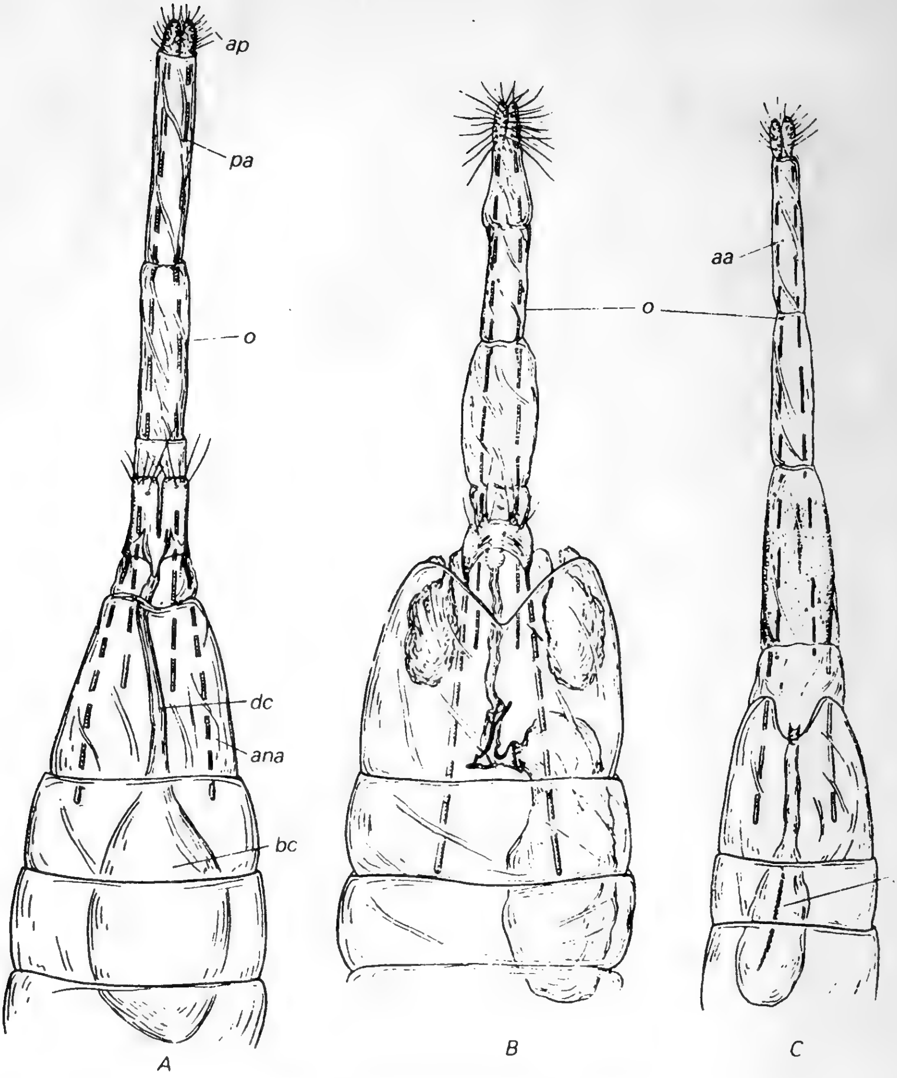


Figure 18. Parts of genitalia of female.

A to C—region of vaginal and prevaginal plates: A—*Hapsifera luridella* Zll.; B—*Anemallota repetekiella* Zag.; C—*Cephitinea colonella* Ersch.; D to E—complex sclerotization in duct of bursa copulatrix: D—*Episcardia lardatella* Led.; E—*E. caerulipennis* Ersch. (lateral view); F—same (ventral view).

aa—anterior apophysis; lvp—lobes of vaginal plates; pp—prevaginal plate; td—terminal part of duct of bursa copulatrix.



24 Figure 19. General view of genitalia of female.

A—*Anemallota praetoriella* Chr.; B—*Episcardia lardatella* Led.; C—*Myrmecozela ataxella* Chrét.

aa—accessory apophyses; ana—anterior apophysis; ap—anal papillae; bc—bursa copulatrix; dc—duct of bursa copulatrix; o—ovipositor; pa—posterior apophysis; s—signum.

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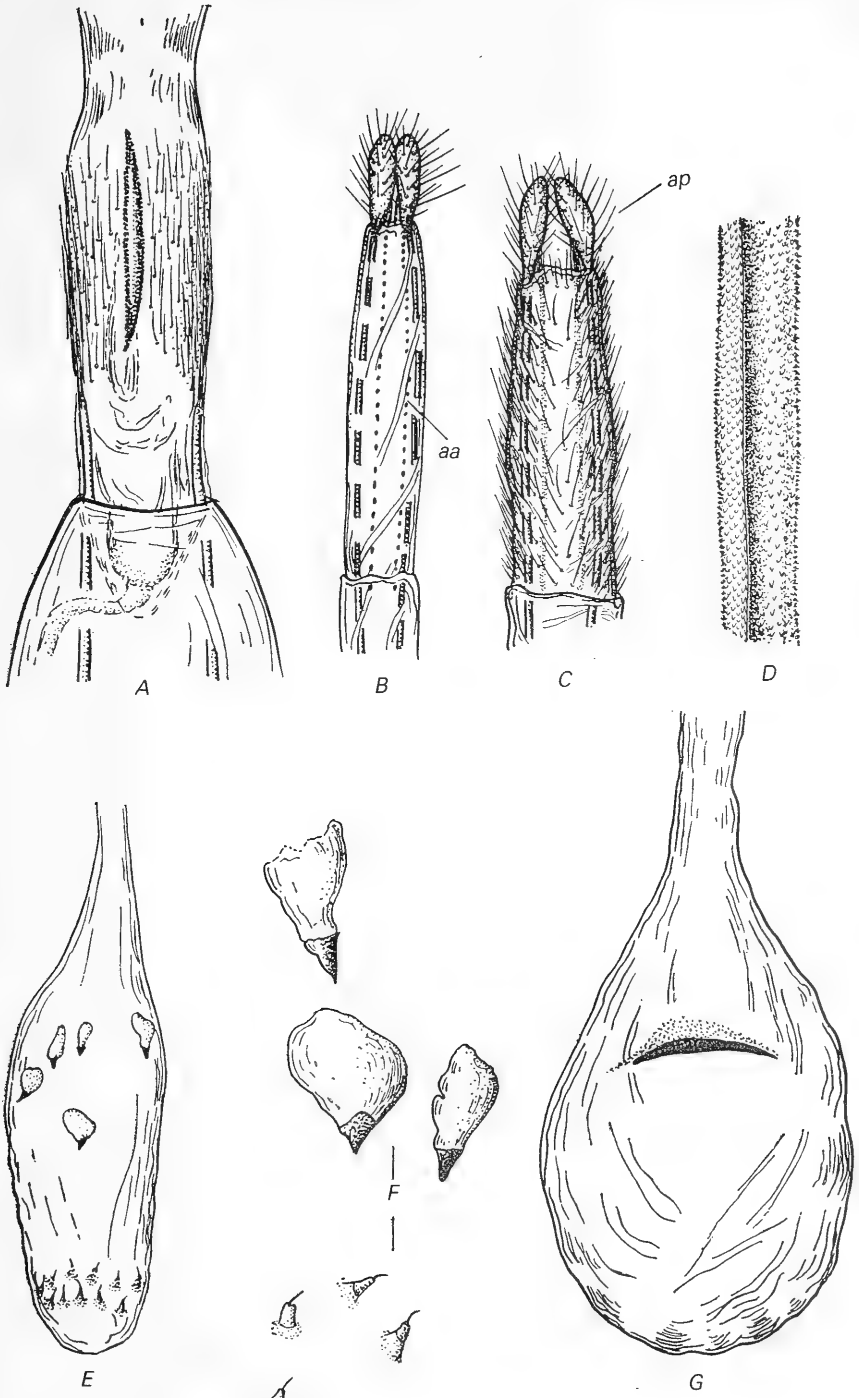
25 Figure 20. Parts of genitalia of female.

A—tergite of segment VIII of *Myrmecozela lutosella* Ev.; B—terminal section of ovipositor of *M. atazella* Chrét.; C—same, in *Hapsifera luridella* Zll.; D—part of signum of *Myrmecozela lutosella* Ev. (highly magnified); E—armature of bursa copulatrix (*Ceratuncus danubiellus* Mn.); F—spinescent segments (highly magnified), same view; G—location of signum in bursa of *Hapsifera luridella* Zll.

aa—Accessory apophyses; ap—anal papillae.


A
B
aa
C
ap
D
E
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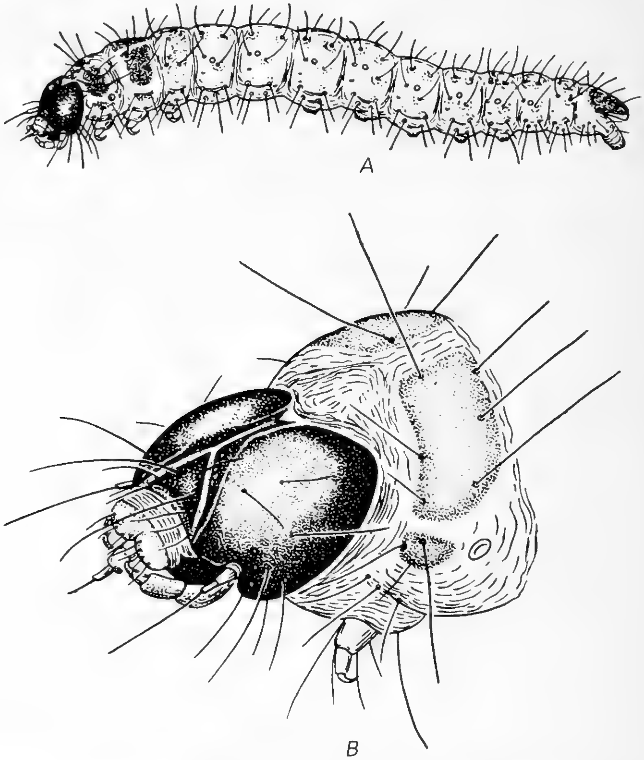
G

PREIMAGINAL STAGES

Information on the structure of the preimaginal stages of steppe detritophagous moths (Myrmecozelinae) is available for just a few species.

Eggs are fairly large, dense, oval, and slightly compressed laterally or shaped like an elongated ellipse. They are whitish, sometimes with a slight yellow tinge, and glossy. The chorion is slightly reticulated.

Larvae on hatching from eggs are milk-white with a chocolate-brown to brown head and shield on the throax. Mature larvae are 10 to 18 mm long, dirty-white or colorless, sometimes translucent; segments IV to VI are perceptibly broader than the rest. Cuticle without pattern (Figure 21, A). Coronal suture on head longer than, equal to, or shorter than frontal triangle; hence head semiprognathous type, partially inserted into prothorax, brown or chestnut-brown, with two parallel



26 Figure 21. Mature larva of *Myrmecozela diacona* Wlsm.

A — general view; B — head with first thoracic segment (highly magnified) (drawn by T.N. Shishlova).

27 broad flat and brownish-black areas along sides under eyes, as in *Anemallota vittatella* Chrét. (Cephimallotini Zag.). Mouthparts, especially mandibles, strong, dark brown, with rust-colored specks. Ocelli three to six; antennae five-segmented. Antennae and setae on head short, but distinctly longer and thicker than in larvae of Scardiinae.

Body slightly flattened, covered with large, light-colored, slightly raised papillae and acicular microtrichia located on raised bases. Spiracular shields round and raised in form of caruncles with dark spot in middle. Setae on body short and light-colored. Thoracic legs dirty-white or yellowish, similar in appearance to those of Scardiinae, but slightly longer due to a more active life (Figure 22, A). Crochets in circle on adbominal legs arranged in single row and simple in *Myrmecozela* Zll. (Figure 22, B) or with broad bifurcate base, as seen in *Ateliotum* Zll.

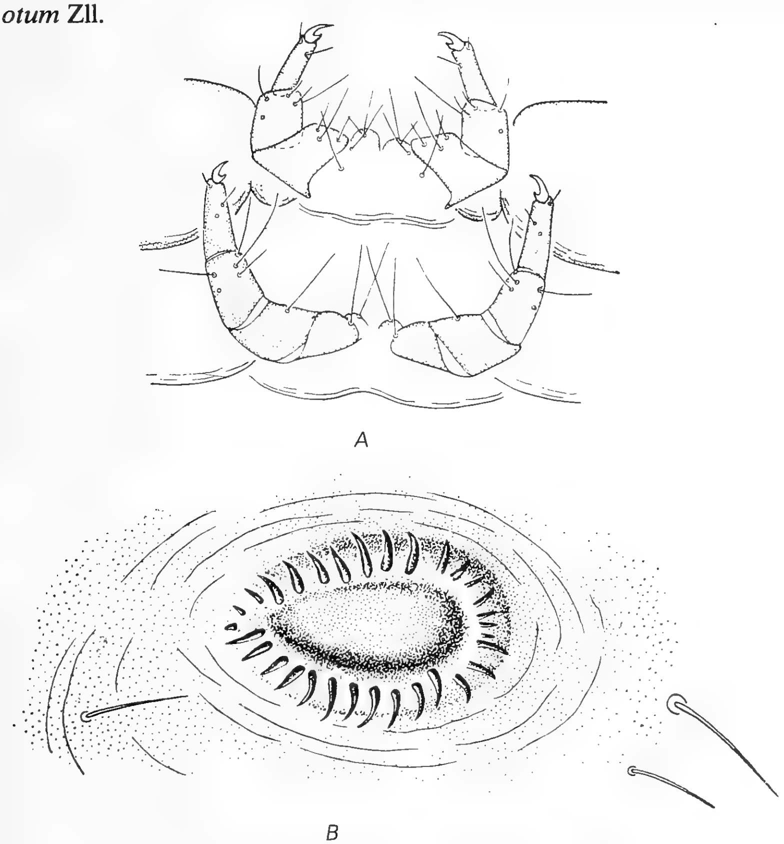


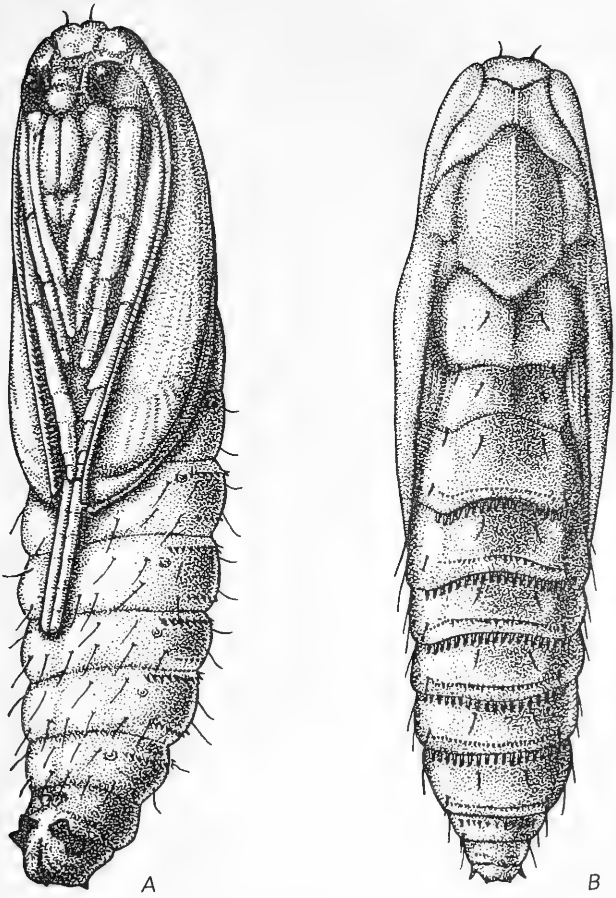
Figure 22. Thoracic legs and crochets on abdominal legs.

A — 1st and 2nd pairs of thoracic legs of *Ateliotum petrinellum* H.-S.; B — crochets on right proleg of abdominal segment III of *Myrmecozela diacona* Wlsm. (drawn by T.N. Shishlova).

The complex of structural peculiarities in the external appearance of the larvae examined here indicates a notable affinity between them and those of Scardiinae; however, the larvae of the latter are biologically and morphologically more uniform and have preserved a large number of archaic characters (Zagulyaev, 1937a). Comparatively, the larvae of
28 Myrmecozelinae are a little more specialized in the direction of development or complexity of certain structures (elongation of thoracic legs and setae, elongation of prolegs, and so on) as a result of a more active life, due to movement on a looser substratum. These peculiarities, as well as the development of three setae (IV, V, VI) on the spiracular shield of the prothorax, and similar trends in the evolution of other external structures display a certain affinity with larvae of Nemapogoninae. Thus the relation between Myrmecozelinae and Scardiinae and Nemapogoninae, established on the basis of external structure of the larvae, fully accords with that of the imaginal stages.

Pupae. The few pupae of different species known are fairly similar in structure. They, like those of other members of Tineidae, belong to the primitive type of incomplete pupae which emerge from cocoons at the time of emergence of the moths. Pupae are yellowish or brownish to chocolate-brown and vary in size from 8 to 15 mm. All the pupae
29 examined had a thin or slightly rugulose cuticle. The frontoparietal region of the head of the pupa was round without a conical frontal outgrowth (Figure 23, A), which is linked with the occurrence of a soft cocoon. The suture between the mesothorax and metathorax was highly arched in the direction of the metathorax (reaching about one-third of the latter) (Figure 23, B). Wings short and broad, with apex reaching beginning or end of abdominal segment IV. Antennae of males in most of the species examined almost equal to or slightly longer than wings (Figure 23, A), rarely reaching midpoint of segment VII of the abdomen.

Spiracles light-colored, yellowish-brown, and located in a depression. Tergites of abdomen with rows of backwardly directed spines (Figure 24): anterior row consists of large spines, and posterior row minute, often acicular spines. Tergites II, VIII, and IX armed with just a single row, and tergites III to VII with two rows of backwardly directed spines, which enable the pupa to move out of the cocoon. Different types of outgrowths in the form of spines, crests, and flaps are located on tergite X (Figure 25, C, D). The cremaster may be short, broad, with various kinds of armature including crochets, spines, various kinds of grooves, and uni- or multiapical crests, e.g., *Hapsifera* Zll. (Figure 25, A, B), or the cremaster may be conical, with a small crest on the upper side and two chocolate-brown to red spines before the apex (Cephimallotini Zag.). The armature of the last segment and



28 Figure 23. Pupa of *Hapsifera luridella* Zll.

A—ventral view; B—dorsal view (drawn by T.A. Temkina).

shape of the cremaster distinguish the pupae of Myrmecozelinae from those of other subfamilies of Tineidae, which confirms the hypothesis (Mosher, 1916) about the possible utilization of these characters in the characterization of large taxonomic units.

An analysis of the characters noted above, especially the deep penetration of the posterior margin of the mesonotum into the region of the metanotum, shape and length of the wings, antennae, mouthparts, and legs, as well as the terminal segments of the abdomen and cremaster, provides a basis for placing Myrmecozelinae closer to Scardiinae. However, the pupae of the latter are more primitive: they have pre-

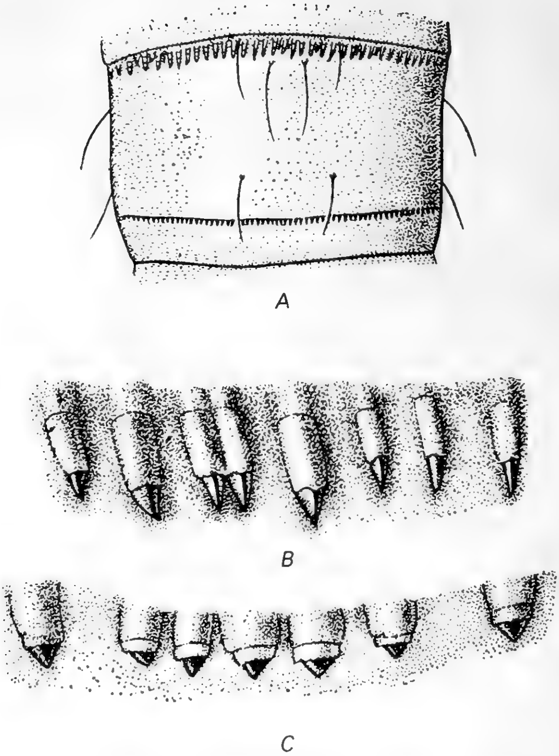


Figure 24. Armature of tergite of abdominal segment V of pupa of *Hapsifera luridella* Zll. A—general appearance; B—structure of spines of upper row (highly magnified); C—same, lower row.

served thinner covers and traces of the abdominal prolegs in the larvae (Zagulyaev, 1973a). The specialization of larvae of Myrmecozelinae, manifested in the development of longer setae on the body and spines on the tergites, as well as the armature of the cremaster and a harder body cover, is probably due not only to their location in a looser substratum, but also to the need for movement over greater distances in a relatively soft tubular path. The properties of specialization indicate a similarity between the pupae of Myrmecozelinae and those of Nemapogoninae.

Thus the position of Myrmecozelinae in the family and its relations established during a study of the morphology of adult insects and larvae finds confirmation in the pupal structure. However, it should be noted that many characters of the external structure of larvae and pupae used in taxonomy are adaptations to living conditions. Such

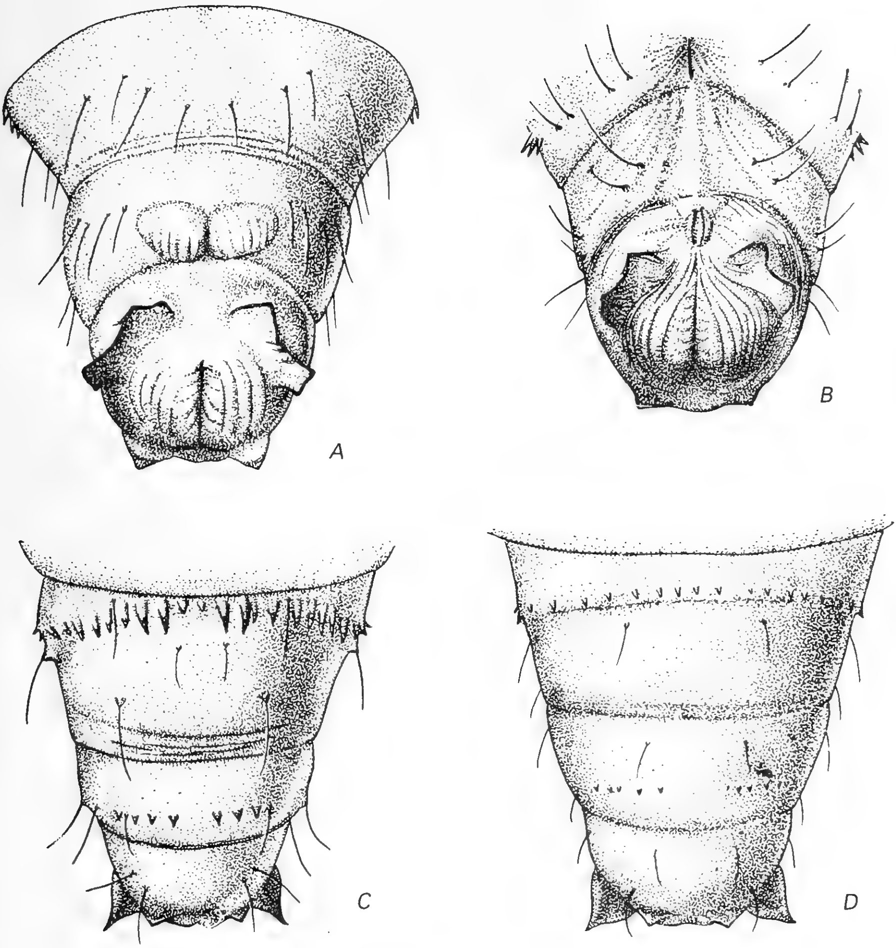


Figure 25. Terminal segments of pupa of *Hapsifera luridella* Zll.

A—structure of cremaster in male; B—same in female; C—armature of tergites of segments VIII to X of male; D—same in female (drawn by I.A. Temkina).

adaptive changes, if they develop convergently in unrelated groups, make it difficult to establish a phylogenetic relationship.

1 From an analysis of the morphological characters of adult insects and preimaginal stages, the following conclusions can be drawn.

In the structure of these moths, among the features of specialization (apomorphic characters), a number of peculiarities have been noted which are found in more primitive members of Tineidae. For example, the head capsule of the imago has preserved sutures and pilifers; also there are relatively broader forewings covered with sparse scales (in many cases they are equal in width to the hind wings), without stigmas, with a poorly developed costa on the anterior margin, with *Sc* terminating beyond the midpoint of the anterior alar margin in some cases, and with all the radial and medial veins and cells developed. The apophyses of the anterior abdominal sternites in many groups of the subfamily have retained their appearance of poorly sclerotized falcate appendages, which have converted into membranous sacs, and so on. All this indicates that in many moths of the subfamily several characters have been retained to a varying degree in their archaic condition (which is close to the ancestral condition), which are also known from subfamily Scardiinae, reflecting a lower level of organization (Zagulyaev, 1973a).

Primitive features or a plesiomorphic condition have also been found in several characters of the genitalia. The males in many members of the group have a groovelike saccus, broad vinculum and tegumen, with a suture between the latter and the bilobate uncus. The clasplike, highly sclerotized, mobile uncus and relatively broad valvae with crochets and lobes attest to the fact that the female is clasped not only by the valvae, but also by the uncus, i.e., as done in primitive types. The females in individual groups have retained a highly sclerotized tergite and sternite in segment VIII and a simple vaginal plate divided into lamellae with the ostium bursa between them, and so on. All this attests to the fact that the male and female genitalia in individual groups of the subfamily are close to the ancestral type, which is seen to the maximum degree only in Scardiinae.

Larvae and pupae have also retained primitive features. Thus in larvae the head is semiprognathous with six ocelli and five-segmented antennae; the coxae of the thoracic legs are widely separated. The pupae are characterized by a slender covering, suture between the mesothorax and metathorax curved in the direction of the metathorax, short wings, etc. These peculiarities of structure indicate that even in the preimaginal stages of these moths several ancestral traits are manifest, which have been preserved to the maximum degree among Tineidae only in Scardiinae.

Thus the complex of primitive characters of the imago and preimaginal stages mentioned above provides a basis for considering Myrmecozelinae a relatively lowly organized and less specialized group in the family Tineidae, which is closer to Scardiinae. However, the evolutionary development of individual links in the subfamily apparently occurred at different rates, which is reflected in the retention of some primitive traits in them, or in the expression of their plesiomorphic condition.

MAIN TRENDS IN CHANGES IN SOME ORGANS

The evolution of members of Myrmecozelinae, as in other Tineidae, proceeded primarily in the direction of formation of ecological adaptations in the imago and is also closely associated with the food specialization of larvae. In moths, including steppe detritophages, changes in 32 wings are maximum in their shape, arrangement of structural elements, pubescence, etc., which, as one would expect, influenced not only the entire locomotory apparatus, but also a series of other organs. Hence it seems appropriate to begin a morphological analysis of the main directions of change in individual organs with the wings.

ADAPTIVE CHANGES IN WINGS DURING EVOLUTION

The wings of Myrmecozelinae in their structural peculiarities are close to those of Scardiinae which, as was shown earlier (Zagulyaev, 1973a), are the most archaic in family Tineidae, and have probably deviated least from the original type. A detailed analysis of the wing structure in moths of the subfamily under examination revealed the following adaptive transformations in evolution which proceeded in several directions: (1) conservation of venation and other peculiarities of wings which are close to the scardioid type; (2) formation of a relatively more developed costa and slightly narrower wings; (3) appearance of characters in the wings which are typical of the first two groups; and (4) development of apterous condition in the females.

The wings of moths in the first stage of evolution are broad (length of forewing 3.0 to 3.33 and that of hind wing 2.66 to 3.0 times greater than width), with a weakly developed costa at the anterior margin, loose pubescence, and a fairly short fringe equal to one-third to one-half the alar width; hind wings are equal to or broader than the forewings. Several primitive features are also preserved in venation (Figure 55). In the forewings Sc terminates on the costal margin beyond its midpoint; termination of branch R_1 is at the level of the apex of the radiocubital cell; the medial vein is well developed, and in some species forms the medial cell. All the veins in the hind wings are widely separated at the base and branch A_1 rests on the posterior margin at the level of origin of Cu_1 from the radiocubital cell; the cell itself is slightly displaced toward the costal region of the wing, but in spite of this the cubital trunk passes through the middle of the wing or anterior to this; and finally the medial trunk and its cell are well preserved. Such wings are typical of the most primitive moths such as *Cephimallota* Brud., *Episcardia* Rag., and some species of *Rhodobates* Rag. The nature of the wings in these moths and their venation are quite close to those of

Scardiinae. However, in some specialized members, e.g., *Cephitinea* Zag., advanced features such as narrowing of the alar surface and an acute apex are evident; the forewings are almost 3.66 to 3.75 and the hind wings 3.25 times longer than their width in the middle (Figure 37), but venation differs little from that described above. The flight of most moths of this group resembles that of Scardiinae in general, although these lepidopterans do not live under a forest cover but in places protected from wind (see section "Mode of Life and Biological Types").

The second line of evolutionary change in the structural components of the wings of Myrmecozelinae led not only to a distinct reduction of the costal margin of the forewings, but also to a displacement of the termination of *Sc* and veins of the radial sector toward the alar apex (Figure 7, B), as well as to a partial fusion of veins R_3, R_4, and R_5 (*Hapsifera* Zll.) or to a complete fusion of some of them (in Ateliotini Zag.), and in the hind wings to a partial fusion of branches M_1 and M_2 (in *Reisserita* Ag., *Pachyarthra* Ams.). In addition to these changes, narrowing of the wings took place and the length of the forewings became 3.75 to 4.0 times, and that of the hind wings 3.25 to 4.0 times greater than the width; the apex of the wings became pointed and the fringe three-fifths the alar width and in some members even equal to
33 the alar width (*Catabola* Durr.). These transformations are characteristic of members of subfamilies Hapsiferini Zag. and Ateliotini Zag. Changes in wings are associated with a series of factors listed in the section "Mode of Life and Biological Types".

The third phase of transformation of structural elements of the wings includes changes characteristic for both of the above groups, since the wings of these moths on the basis of shape and structure occupy an intermediate position between the two. For example, the forewings may be broad with obtuse apices, but some radial veins located on a common stem, or the wings may be elongated and pointed but all the veins not widely separated at the base; the hind wings may be equal in width to the forewings, or slightly narrower, the length of their fringe variable, fluctuating from one-third to three-fourths the alar width, and so on. All these structural peculiarities indicate a primitive type of structure and also lead to the imperfect flight of these moths near the ground surface, as seen in steppes and semideserts (Zagulyaev, 1972e). This group includes the majority of Myrmecozelini Zag., some Rhodobatini Zag., and a few members of Cephimallotini Zag.

The fourth line of evolution of alar transformations characterizes the most divergent tendencies from those listed above and is expressed in their severe reduction. The apterous condition in Myrmecozelinae is known with certainty only in females of *Pararhodobates* Pet. (Zagulyaev, 1971b). The wing rudiments are represented by short nonfunctional appendages (Figure 88). The reduction of wings was probably caused by several factors, including peculiarities of food specialization of larvae, abundance of substrates suitable for their development, as well as the influence of constantly prevailing winds in the late spring and early winter periods (the period of emergence from pupae), and so on. In turn, alar reduction in female moths was accompanied by transformations in other organs in adult and preimaginal stages. In males alar structure and nature of flight in general differ little from those of other members of Myrmecozelinae belonging to the second group. Therefore the wingless condition of females can be considered the result of narrow ecological specialization. A partial or complete reduction of wings in females can probably be found among species of *Catabola* Durr. also. An apterous condition is not rare in different groups of Lepidoptera. It is quite characteristic for females of many members of Psychidae (Kozhanchikov, 1956) and has now been established for all members of Deuterotineidae (Zagulyaev, 1972d). Furthermore, females with underdeveloped or completely reduced wings are also known in higher members of Microfrenata, for example Pyralidae, Gelechiidae, Oecophoridae, etc.

In analyzing the morphological transformations of wings in the subfamily Myrmecozelinae a few conclusions can be drawn:

The structural peculiarities, shape, and texture of the wings in many members of Cephimallotini Zag., *Episcardia* Rag., and others provide a basis for considering them not only the most archaic types in the subfamily, but also exhibiting minimum deviation from the scardioid type. The tendency toward narrowing of the wings and a distinct reduction of the costa, which attest to their specialization, appeared more fully in members of Hapsiferini Zag. and partly Ateliotini Zag.

However, most species of the subfamily (many members of Myrmecozelini Zag., Rhodobatini Zag., etc.) have wings in which the structure together with archaic characteristics also reveals different properties of specialization. Hence one may consider the wings of these moths a further development of the primitive type of wings.

34 The development of an apterous condition in females of *Pararhodobates* Pet. should be considered a consequence of narrow ecological adaptation whereby the locomotory function is primarily taken over by the legs.

ADAPTIVE CHANGES IN LEGS

Among the family Tineidae, the most primitive types of legs are the short, thick ones, with sparse pubescence and without spines at the apex of the tarsal segments, which are characteristic of Scardiinae

(Zagulyaev, 1973a). Legs of Myrmecozelinae are generally close to the primitive condition, although adaptive changes are manifest in them, which are expressed in elongation of the tibiae and tarsal segments, displacement of the median pair of spurs on the posterior tibiae to the middle region, development of spines at the apex of tarsal segments or their secondary disappearance, and in some cases even a reduction of epiphyses. These transformations, which appeared in the ancestral forms of different groups in the subfamily and which are associated with adaptation to different ecological conditions, led to the formation of several lines in the development of adaptive changes within this primitive type.

An analysis of the structure of the legs, proportion of their parts, and nature of their armature reveals three distinct lines of evolutionary changes in them.

Changes in legs of the first type exhibit minimum deviation from the scardioid type. They are seen in moths from the tribe Cephimallotini Zag., genus *Episcardia* Rag., as well as in a few of the most primitive species of *Ateliotum* Zll. In these moths the foretibia is 1/2 or less and in *Episcardia* Rag. almost 1/3 the length of the femur, and 3/7 to 3/14 of the tarsus, and the epiphysis is well developed; the 1st segment of the tarsus is long and 5/6 to 2/3 of the tarsus (Figures 9, A and 158, A). The total length of the femur and tarsus is also 1/2 (8/15) of the tibia and tarsus of the middle legs. The tibia of the middle legs is insignificantly (about 1/10) shorter than the femur and about 2/3 to 5/9 of the tarsus (Figures 10, A and 158, B). The total length of the tibia and tarsus is, on the average, 2/3 of the corresponding parts in the hind legs. The tibia of the hind legs is 5/7 to 3/5 times shorter than the femur and 8/9 to 3/4 the tarsus; only in *Episcardia caerulipennis* Ersch. is the tibia 2/3 shorter than the tarsus. The median pair of spurs is located almost before the midpoint of the tibia or immediately behind it; the 1st segment of the tarsus constitutes 2/3 to 3/5 of the tarsus (Figures 11, A and 158, C).

The proportions of individual parts of the legs, especially in the case of the fore- and middle legs, presented for the first group of moths are fairly close to those found in Scardiinae; however, in moths of the group under examination elongation of the last tarsal segments takes place in the hind legs. The pair of spines on the tergal side of the end of the tibia of the fore- and middle legs and the development of three strong spines at the end of the tarsal segments should also be included among features of specialization. Furthermore, in some species (*Episcardia* Rag.) the armature of the tarsi, especially of the 2nd to the 4th segments, is enhanced by the appearance of a few rows of minute spines on the lower side, The structures noted are undoubtedly adaptive in nature and are associated with the need for movement of the moths on crumbling ground; the well-developed spines at the apices of the tibiae of the anterior legs assist in digging the soil during the emergence on the surface of moths after hatching. Concomitant with the strengthening of the spines, especially in the case of the tibiae, a tendency toward a change in tibial shape is also observed: tibiae with strong spines are usually much thicker and shorter. A similar armature of the legs is also typical of some other moths, for example those of Agrotinae (Kozhanchikov, 1937), pod borers, and many geometrids; in some cases the 35 spines are enlarged and have converted into two strong unguiculate appendages, as seen in *Cheimoptena pennigera* Dan. (Danilevskii, 1969). The data presented here reveal that the leg structure of the species examined is not only close to the scardioid type, but also represents its further evolution.

The second type of leg structure, fairly close to that in the first group, is present in most members of Myrmecozelinae, although the same tendencies are manifest in them also. Thus an elongation of the tibia is perceptible in their forelegs which is the most advanced evolutionary form (many members of genera *Myrmecozela* Zll., *Hapsifera* Zll.) which becomes only 2/3 to 5/7 of the femur and about 5/11 of the tarsus (Figures 9, D and 299, A); the 1st tarsal segment is reduced and becomes 3/5 to 4/7 of the tarsus (Figure 290, A). The epiphysis is reduced in most cases and retained only in a few more generalized members of *Rhodobates* Rag., *Ceratuncus* Pet., and *Catabola* Durr. Spines at the end of the tibiae are mostly preserved and reduced only in some forms such as *Hapsifera* Zll. (Figure 9, C). The total length of the femur and tarsus increases and becomes 2/3 to 3/4 of the femur and tarsus of the middle legs.

The middle legs of this group have changed little and only in the most specialized forms is a slight shortening of the tibia found, which becomes shorter by about 1/8 of the femur and about 4/7 of the tarsus (Figure 10, C), as in some members of *Hapsifera* Zll. Spines at the tips of the tibiae are retained in most members and disappear in species of *Catabola* Durr. and *Hapsifera* Zll. The total length of the tibia and tarsus is about 2/3 of the corresponding parts in the hind legs, i.e., the proportion remains the same as in members of the first group. However, a tendency toward a slight increase in the total size of the femur and tarsus was observed in the moths examined.

The tibiae are perceptibly elongated in the hind legs, which is particularly characteristic of the most specialized or progressive species (many species of *Myrmecozela* Zll.), in which the tibia becomes 1.70 to 2.0 times longer than the femur and very slightly (by 1/10) shorter than the tarsus (Figures 11, D and 275, B). The median pair of spurs maintains its median position or in some cases is very insignificantly shifted toward the midpoint of the tibia. The 1st tarsal segment is 5/7 to 5/8 of the total length of the tarsus, i.e., it maintains its relative size, and is slightly elongated (*Hapsifera* Zll.). Dorsal parts of the ends of the tarsi of all legs in most members have preserved the armature of three spines, which disappear only in such specialized forms as *Hapsifera* Zll.

The foregoing peculiarities of leg structure and their armature in the group of Myrmecozelinae under examination permit one to consider these changes as a further transformation in leg structure from the first group. They have a definite adaptive value associated with the emergence of moths on a harder and looser substrate and, most probably, serve the purpose of enhancing the cursorial capacity. The absence of spines at the end of the fore- and middle tibiae in *Hapsifera* Zll., *Ateliotum* Zll., and some members of *Catabola* Durr., and a number of other peculiarities of leg structure which are generally characteristic for moths of this group, provide an example of further specialization, but do not provide a basis for separation of the above-mentioned genera into a separate adaptive group.

The third line of evolution in modification of legs is characteristic of forms with apterous females (*Pararhodobates* Pet.). The tibiae of the forelegs in these moths are highly elongated and become only slightly (by a difference of 1/6) shorter than the femora and are shorter than the tarsi by half; the 1st tarsal segment is also elongated and becomes only 5/7 of the tarsus. The epiphysis and spines at the end of the tibia are completely reduced (Figure 85, A). It is interesting to note that the
36 femur and tibia of these moths are very narrow, and the total length of the tibia and tarsus is only 1/5 to 1/6 shorter than the total length of the corresponding parts for the middle legs. Such long forelegs distinguish members of *Pararhodobates* Pet. from all members of Myrmecozelinae. Significant changes have taken place in the structure of the middle legs (Figure 85, B) in species of the third group, as distinct from most members of the subfamily. The tibia of these moths is elongated to such an extent that it becomes longer, although slightly (by 1/8), than the femur and about 4/7 of the tarsus; the latter proportion is caused by the elongation of the tarsal segments. The spines at the end of the tibia are reduced. The 1st segment of the tarsus appears shorter due to the elongation of other segments, and is 2/3 of the tarsus. The total length of the tarsus and tibia of these legs is 2/3 of the total length of the tibia and tarsus of the hind legs, i.e., their proportions (with reference to the elongation of other parts) remain almost the same as in most members of Myrmecozelinae.

Changes typical of members of the entire family have been mostly retained in the hind legs (Figure 85, C); however, some characteristic peculiarities are observed here also. The tibia is elongated, twice longer than the femur, and shorter than the tarsus by only 1/7. These proportions are close to those seen in some of the most specialized members of *Myrmecozela* Zll. At the same time the location of the median pair of spurs (located beyond the midpoint of the tibia) and a very short 1st tarsal segment (1/2 of tarsus) sharply distinguish these moths from other members of the subfamily. The ends of the tarsal segments of all legs have three small spines which are about 1/2 to 2/5 the length of the last tarsal segment; however, tarsal claws are long and slender.

Changes in leg structure and armature observed in *Pararhodobates* Pet. are interesting as an example of a far advanced specialization in subfamily Myrmecozelinae. The very long, narrow anterior legs, long tibia of the middle legs, and several other characters are particularly distinct. These peculiarities as well as the characteristic changes in the proportions of the length of different parts of the legs enable moths to run at a high speed over loose soil. It can be assumed that the structure of the legs in *Pararhodobates* Pet. is one of the examples of formation of cursorial legs in moths, which is a further modification of legs typical of Myrmecozelinae. The very narrow and long tibia of the forelegs and absence of spines on their ends attest to the fact that after hatching these moths do not have to dig through a hard substrate to emerge on the soil surface. Observations have shown that pupation takes place in open tunnels near the soil surface, and sometimes even in a cylinder suspended at the surface (Figure 26, A)

An analysis of the major lines in the transformation of legs in subfamily Myrmecozelinae makes it possible to draw the following conclusions.

Changes in leg structure in the subfamily, like those in wing structure, arose through the adaptation of moths to different ecological niches.

Legs of moths of Cephimallotini Zag., *Episcardia* Rag., and some species of other groups deviated least in structure from the scardioid type and represent the most primitive type in the subfamily; however, structures are found in them which indicate the appearance of certain forms of specialization. The data presented here provide a basis for considering the leg structure of these moths one of the possible avenues of modification of the scardioid type.

Further changes in the structure of the legs evolved in the direction 37 of still greater elongation of the tibiae and tarsal segments with a concomitant transformation of the armature, i.e., formation of legs adpated for relatively fast running over hard and loose substrate. This group includes the majority of members of this subfamily and the majority of species of Rhodobatini Zag., Myrmecozelini Zag., Ateliotini Zag., and Hapsiferini Zag. This permits one to consider that changes in these moths are a further modification of the type of leg structure typical of moths of the first group. The absence of spines at the ends of the fore- and middle tibiae and some other peculiarities of leg structure in several members is an example of further specialization within this adaptive group.

The peculiarities of leg structure in apterous forms is an example of progressive specialization in the direction of formation of cursorial legs. This should be considered an independent line in leg modification in Myrmecozelinae. The absence of armature on the tibiae of the forelegs and their characteristic structure attests to the possibility of unhindered emergence of moths on the soil surface.

While comparing the leg structure of moths of the first and second groups, i.e., close to the scardioid type, with the specialized legs of the third group, it should be emphasized that the legs in most members of Myrmecozelinae have changed insignificantly. These moths, although they have moved into forestless areas, have retained their characteristic slow movement over the substrate and accordingly the leg structure is typical of more primitive moths. Some of the changes noted (in armature, proportion of parts of legs, etc.) are apparently progressive in character.

ADAPTIVE CHANGES IN GENITALIA DURING EVOLUTION

The genitalia of males and females of members of Myrmecozelinae are subject to considerable variability. Peculiarities of structure of individual components are widely used in identification, and a comparison of them reveals some major evolutionary changes in the genitalia. Concomitantly an analysis of the structure of the genital apparatus makes it possible to judge the affinity of taxa not only at the level of species and genera, but also at the suprageneric level. General principles of the structure of organs associated with the reproductive process in combination with other characters provide an opportunity to examine the relations of larger taxonomic units. The most indicative features are peculiarities of structure of the tergal and sternal sclerites of the last abdominal segments in males, the structure of segment VIII and its apophyses in females, and the location of the ostium bursa. Changes in these characters have made it possible to identify the main directions in modification of the genitalia during evolution.

The muscles of the genitalia have repeatedly attracted the attention of researchers (Forbes, 1939; Stekol'nikov, 1967; Kuznetsov and Stekol'nikov, 1973), since they provide a deeper understanding of the mechanism of action of different structures during copulation. Different struc-

tures in the sclerites of the male genitalia have formed due to the need for holding and effective detention of the female during copulation. The muscles bring into action sclerites with structures of attachment and retention, and are correlatively associated with these sclerites; they have been subjected to far less variation than the said structures. A weakening or enhancement of sclerotization of a structure or change in its armature can lead to a reduction or, vice versa, development of its respective muscles. The muscular apparatus should probably be considered an auxiliary trait in confirming the rank of any taxon (especially
38 at the suprageneric level) as well as the phylogenetic relations between groups.

Modifications in genitalia of male. The most primitive genitalia in the family Tineidae are those of massive and complex structure with a broad vinculum, i.e., those with a short, troughlike saccus, large and wide-set uncus lobes, divided and multilobate broad valvae, and a short, thick aedoeagus. Such genitalia are typical of members of subfamily Scardiinae (Zagulyaev, 1973a). The method of functioning of the genital structures in these moths, as revealed by my observations, involves clasping the abdomen of the female with the valvae, for subsequent detention, and the pulling of the sternite VIII of the female by using the uncus.

The main modifications of the genitalia in subfamily Myrmecozelinae were in the direction of elongation and reduction in thickness of individual structures, or their thickening and partial reduction, or contrarily elongation with a notable degree of sclerotization of some elements. These changes depend on the degree to which parts of the tergal and sternal outer structures of the genitalia of the male participate in holding, detention, and immobilization of the female during mating. According to these peculiarities I have divided all species of this subfamily into several groups.

The first group includes those species in which the structure of the genitalia and method of holding the female are close to those of Scardiinae. Among Myrmecozelinae such features are retained in many members of tribes Cephimallotini Zag., Ateliotini Zag., and genus *Episcardia* Rag. (tribe Myrmecozelini Zag.). The primitive nature of the structure of their genitalia is indicated partly by a very broad, almost rectangular vinculum (genitalia examined in lateral view), so that the length of the vinculum (dorsoventral direction) is only 1.5 to 2.0 its width (Figure 51, A), the saccus slightly associated, the tegumen fused with the vinculum and uncus, the latter represented by highly sclerotized, elongated structures (Figure 16, A), and the valvae large with various outgrowths, and in some species highly sclerotized and unguiculate (Figure 15, C). Similar archaic properties in the structure of the male genitalia are also found in members of the tropical fauna of Africa: genera *Cylicobathra* Meyr., *Sphallesthasis* Gozm., and *Phalloscardia* Gozm.

However, with the retention of the general scheme of the genitalia within the group, a definite tendency toward a still greater weakening of the tergal sclerites is observed. The uncus is reduced to a tubercular process (Figure 68, B), the tegumen reduced to a narrow and poorly sclerotized structure (Figure 80, A), and the gnathos completely disappears (*Anemallota* Zag., *Cephimallota* Brud.). These changes have been accompanied by a compensatory enlargement of the sclerites in the sternal region. The valvae are better differentiated, lamelliform outgrowths and spines are present along their margins and inner surface, and a strong cucullus with a crest of short and thick bristles developed.

The peculiarities of the genitalia of moths of the first group presented here provide a basis for considering that in most of the members examined the main function of holding and detaining the female, as in Scardiinae, belongs to the valvae, whereas the uncus probably performs the role of a supporting-directing structure and subsequent immobilization of the female. All these changes indicate the relatively primitive nature of the group. At the same time in moths of *Anemallota* Zag. and *Cephimallota* Brud., in which holding and immobilization of the female is done only by the clasper valvae without the participation of the tergal
39 sclerites, the transformation of the genitalia (weakening of the tergal complex) and the principle of interaction of the structures is of a secondary nature and indicates a certain amount of specialization.

Closer to moths of the first group and especially to the genus *Episcardia* Rag. (tribe Myrmecozelini Zag.), on the basis of shape and structure of the broad vinculum and an almost nondefined saccus, are members of genus *Catabola* Durr. and the tropical African genus *Perissomastix* War. and Roth. from the same tribe, which constitute the second group. In these moths the valvae protrude into narrow lamellae (Figures 188, A; 189, A; and 190, A), the tegumen is distinctly elongated, the lobes of the uncus in most species fused into a strong falcate process on the tergal side (Figures 16, E and 197), and the aedoeagus highly sclerotized with a characteristic conical shape with a bent pointed apex carrying spines. An analysis of the genitalia revealed that holding and detention of the female are probably accomplished by the uncus, with the valvae assisting in this process. The shape of the aedoeagus and its strong sclerotization and armature indicate that it participates directly in the immobilization of the female during mating. This type of genital structure should probably be considered one of the directions in the modification of the primitive type of Myrmecozelinae.

The third group includes moths from tribe Rhodobatini Zag. and is characterized by a distinctly narrow vinculum, especially in *Rhodobates* Rag. (its length in the middle part is about three to four times greater than its width); a saccus which from a broad short structure has stretched into a long slender appendage (Figure 116); and a highly developed tegumen which has fused with the broad undivided uncus (fused in many species of *Rhodobates* Rag., *Pararhodobates* Pet., which is accompanied by the development of highly sclerotized and fused sections of the gnathos (Figure 16, F). The valvae are broad or barely elongated with a variety of processes and curves (Figures 14, D and 15, E), and the aedoeagus is mildly sclerotized and usually simple in structure.

Holding and detention of the females is done by the valvae which carry various types of armature for this purpose. In species with a bifurcate gnathos it and the uncus participate in the immobilization of the female (Figure 100, A). In *Ceratuncus* Pet., *Pachyarthra* Ams., and the tropical African genus *Probatostola* Meyr., in which the lobes of the uncus are separate and mobile and form strong unguiculate appendages, precluding the need of a gnathos, the latter is poorly developed. Changes in these structures can be seen in all the species of the aforementioned genera (Figures 116, B and 124, B). The structure of the genitalia described here should probably also be considered a further modification of the primitive type, as it includes structures in the tergal regions for holding and immobilizing the female.

A somewhat simplified type of genitalia is typical of moths of the fourth group, including genera *Myrmecozela* Zll. and *Cinnerethica* Ams. (tribe Murmecozelini Zag.). It is characterized by a reduction of the tegumen, which is fused with a very narrow, ribbon-shaped vinculum; saccus laterally short and narrow; and uncus fused at the apex into a highly sclerotized, bent, and pointed or laterally flattened appendage (Figures 16, C and 232, A), which articulates with the tegumen base and, after bending, may be inserted apically between the branches of the vinculum. The valvae are mostly broad, almost rectangular, with strong inwardly bent spines along the straight, outer margin (Figures 15, A and 232, A). The aedoeagus is slender, highly sclerotized, arcuate, and with a pointed apex. Such a shape causes movement during copulation not in a straight line, as in most other moths of Myrmecozelinae, 40 but along an arc, which makes it possible to pass the lamelliform genital plate of the female and reach the region of sternite VII to penetrate the ostium bursa.

An analysis of the genitalia of moths in this group revealed that clasping and detention of the female are performed by the spines of the clasper valves, while the highly bent uncus presses down and immobilizes its body. This mechanism of detention and immobilization of the female is probably so dependable that the gnathos is completely reduced. Thus the structure of the genitalia and the mechanism of clasping and immobilizing the female in moths of genera *Myrmecozela* Zll. and *Cinnerethica* Ams. are close to those in moths of the third group. However, the type of genitalia of the third group differs from that of the fourth group in the development of a strong mobile uncus fused apically, narrowing of the vinculum, complete reduction of the gnathos, and a series of other peculiarities resulting in the simplification of the entire genital complex. The arcuate shape of the aedoeagus and the mechanism of its movement are also characteristic. All these peculiarities provide a basis for considering the genitalia of this type not only a further modification of the genitalia of the third group toward greater specialization, but also more advanced in evolution.

The Palearctic members of the tribe Hapsiferini Zag. constitute the fifth group with a particular type of genitalia. The uniqueness here primarily lies in the fact that the parts of the genitalia in the tergal region are very well developed. The tegumen is fused with the vinculum and in a lateral view resembles almost a right-angled triangle, which narrows sharply before the short isolated saccus (Figure 305, A). The uncus is massive, fused, and only at its posterior edge do the lobes protrude as small pointed appendages (Figure 16, G). The segments of the gnathos are thick, falcate, and bent, while the valvae contrarily resemble slender, poorly developed lamellae that are very elongated, without outgrowths, spines, and other such armature, except for a tuft of bristles on the inner surface of the cucullus (Figure 15, F). The aedoeagus is in the form of a more or less straight tube and devoid of sclerotized outgrowths (Figure 305, D).

Several other members of the tropical fauna of this tribe, mainly found in Africa, notably genera *Scalidomia* Wlsm., *Dasyses* Durr., *Pitharcha* Meyr., *Paraptica* Meyr., *Hapsiferona* Gorm., and *Cubitofusa* Gozm., as well as genus *Tiquadra* Walk., widely distributed not only in Africa but also in Southeast Asia and South America, have retained a similar organization of the male genitalia.

The structure of the genitalia in moths from tribe Hapsiferini Zag. on the one hand resembles that of members from the second group, and on the other hand that of the third group, especially general *Rhodobates* Rag. and *Pararhodobates* Pet. Clasping and detention of the female in species of tribe Hapsiferini Zag. are performed mainly by the uncus and gnathos; the clasper valvae probably assist since the setae on the cucullus directed toward the abdomen cause only a stronger contraction of the genitalia of the partners before copulation. If in moths of the third group the structures of the tergal region were involved to some extent in the holding and immobilization of the female, then in moths of the fifth group these structures play a major role. The excessive growth of the tergal region of the genitalia and the greater load carried by it during clasping and detention of the female should be considered not only a specialization, but also one of the directions in the further modification of genitalia of the primitive type.

Thus the structure of the male genitalia in subfamily Myrmecozelinae displays a series of significant directed changes. Besides retention of the primitive scardioid type to a lesser or greater degree, the changes 41 have mainly continued in the direction of either strengthening the structures of the sternal region with the involvement of the components of tergite IX, or contrarily stronger development of the structures of the tergal sclerites with a concomitant weakening of those of sternite IX. In the process of modification in each direction a tendency toward the appearance of different types of adaptive structures associated with the function of detaining the female are observed, with a general simplification of the structure of the major components, reduction of a few sclerites, and excessive growth of others, which is manifest most distinctly in specialized groups.

The structure of the genitalia and function of the sclerites in moths of the first group are close to the ancestral pattern (the scardioid type). Clasping and detention of the female are achieved by the valvae.

In the course of evolution of the genitalia in the direction of strengthening the tergal region, not only sclerotization of their structures but also fusion of individual parts and development of additional structures took place. Clasping and detention of the female are mainly performed by the tergal complex. The direction of change in the structure of the genitalia examined here is typical of specialized groups but best expressed in members of Hapsiferini Zag., constituting the fifth group.

In comparing the genitalia of the first and fifth groups one can definitely see not only an early divergence of these groups, but also differences in the direction of their evolution.

The genitalia in moths of the second, third, and fourth groups reflect varying modifications of the genitalia of the first and fifth groups. Hence it is possible to trace transitions in each of the intermediate groups from the most primitive type of genitalia to the most specialized.

Modifications in genitalia of female. The most primitive genitalia of the female in family Tineidae are those in which the tergite and sclerite of segment VIII are highly sclerotized, and the latter forms a convex vaginal plate which is usually divided into two lobes with the ostium bursa located near the posterior margin, the anterior apophyses are entire and connected with the base of the vaginal plate, and the posterior apophyses have a long three-jointed telescopic ovipositor which terminates in a soft anal papilla bearing long setae. This type of structure of the female genitalia is characteristic of Scardiinae (Zagulyaev, 1973a). The genitalia of female moths in subfamily Myrmecozelinae, as distinguished from males, are less variable in structure, more conservative, and have retained a definite type of structure typical of the larger group. Changes in the genitalia in these moths proceeded in the direction of reduction in sclerotization of structures of segment VIII, appearance of a tendency toward displacement of the ostium bursa toward the posterior margin of sternite VII, development of a bifurcated anterior apophysis, and other kinds of complexities.

Among members of Myrmecozelinae, the genitalia of many species of tribe Cephimallotini Zag. are close to the scardioid type and constitute the first group. The female genitalia of these moths are highly developed and the sternite and tergite of segment VIII highly sclerotized, the vaginal plate lobate, the anterior apophysis in most members simple and connected with the base of the vaginal plate, and the ovipositor long and slender. However, unlike the genitalia of Scardiinae several complexities are observed here, for example the fusion of the sternal and tergal sclerites into a strong structure and the development of a large cuneate prevaginal plate. This is particularly well developed in *Cephitinea* Zag. (Figures 18, C; 46; and 49). A still greater change is seen in the genitalia of species of *Anemallota* Zag.: the lobes of the vaginal plate are deeply divided and the large infundibular ostium bursa displaced toward their base.

42 The peculiarities listed above show that the genitalia of members of tribe Cephimallotini Zag. have not only preserved many scardioid properties, but in the process of evolution have also acquired several new specific characters. The development of an ovipositor which is longer than in some members of Scardiinae should be considered an adaptation to the need for hiding eggs deep in the substratum. Thus the structure of the genitalia of females conforms to the primitive nature of moths of tribe Cephimallotini Zag., and the above-mentioned structures represent one of the directions in their development.

Members of tribe Rhodobatini Zag., constituting the second group, are close to moths of the first group in the structure and strong sclerotization of the appurtenances of segment VIII and the presence of a nonbifurcated anterior apophysis. In these moths, primarily in species of *Pachyarthra* Ams. and *Ceratuncus* Pet., a complete division of the vaginal plate into two lobes has been preserved; moreover, in species of the former genus the bursa copulatrix has no signum. Further complexity is observed in females of *Rhodobates* Rag. and *Ceratuncus* Pet. in which fusion of the bases of the lobes of the vaginal plate has taken place, and different sclerotized structures appear in the duct of the bursa copulatrix and in the bursa itself (Figure 20, E, F). The peculiarities of the genitalia of females of this group can probably be considered one of the directions in the further modification of genitalia of the primitive type in subfamily Myrmecozelinae.

The third group on the basis of construction of the female genitalia includes moths from tribe Ateliotini Zag. and is characterized by an undivided highly sclerotized vaginal plate (Figure 134); bifurcate anterior apophysis; connection of abdominal branch with base of vaginal plate and dorsal with lobes of tergite VIII; absence of sclerotization in the bursa copulatrix and its duct; and location of the ostium bursa beyond the midpoint of the vaginal plate. In some species of *Ateliotum* Zll. the posterior margin of the vaginal plate has a notch which varies in depth (Figure 154), and the lobes formed in this process may carry additional armature. In addition to these significant alterations in the genitalia, new structures appear in segment VII. A pair of large sacs filled with silken hairs alter the shape of sternite VII and it narrows sharply at the posterior margin (Figure 133). The appearance of such sacs with hairs is an adaptation for forming a cover for lain eggs. The type of structure of the female genitalia mentioned here also provides a basis for considering it one of the directions in the transformation of the primitive type. However, as distinguished from the direction of modification of the genitalia of the second group, the alterations here continued toward strengthening of sclerotization of the structures of sternite VIII, bifurcation of the anterior apophysis, and changes in the sternal region of segment VII.

A distinct type of genitalia is typical of species of *Episcardia* Rag. and *Catabola* Durr. (tribe Myrmecozelini Zag.), which are grouped into a separate fourth group. This type of genitalia is characterized by an undivided, broad, and highly sclerotized vaginal plate with outgrowths equipped with armature and lobes (Figures 19, B and 165, A); a well-developed, large, and sclerotized tergite of segment VIII which is divided into lobes in some species and carries long bristles along the posterior margin; bifurcate anterior apophysis (Figure 165, B); and presence of a complex sclerotized structure in the duct of the bursa copulatrix in most members (Figures 18, D–F and 19, B). The tergal and sternal sclerites are densely covered with minute acicular spines, the ostium bursa is usually located near the posterior margin of the vaginal plate, and the bursa copulatrix is without a signum. The genitalia of
43 females of several tropical genera have a similar arrangement: *Sphallesthasis* Gozm., *Cylicobathra* Meyr., and *Phalloscardia* Gozm., which are quite close to genus *Episcardia* Rag., while members of *Perissomastix* War. and Roth. are related to the Palearctic genus, *Catabola* Durr.

This type of female genitalia, on the basis of the sternal sclerites of segment VIII, bifurcate anterior apophysis, posterior displacement of the ostium bursa, and absence of signum in the bursa copulatrix, is close to that of the third group. The development of a pair of sacs with bundles of silken hairs on segment VII also brings the two groups together. However, the strong development and sclerotization of structures of sternite and tergite VIII, a complete covering of spines, as well as the development of a complex "locking" in the duct of the bursa copulatrix in many members sharply isolates this type of genitalia from that of the third group. This provides a basis for assuming that the female genitalia included in the fourth group did not evolve from those of the third group, and proceeded in the direction of strengthening of sclerotization of the sternal and tergal structures of segment VIII and development of a strong armature in the duct of the bursa copulatrix. All this indicates an independent direction in the development of genitalia from the primitive type.

A somewhat simplified structure of female genitalia is observed in species of *Hapsifera* Zll. and in some members of tropical fauna such as *Scalidomia* Wlsm., *Cubitofusa* Gozm., *Dasyses* Durr., *Pitharcha* Meyr., and *Tiquadra* Walk., which constitute a separate fifth group. This group is characterized by weakly separated lobes of the vaginal plate, which are fused with the membrane and densely covered with minute bristles (Figure 18, A); location of the ostium bursa near the anterior margin of the lobes; bifurcate anterior apophysis; and a usually lamelliform signum in the bursa copulatrix (Figure 20, G). Such a type of genitalia is probably the result of morphological simplification of the more simplified basic structure of female genitalia in ancestral forms of moths of the first and second groups. This attests to an early separation of these moths from a common trunk along an independent path of evolution. The occurrence of dense thin bristles on the last segment of the ovipositor (Figure 20, C), as well as the development of sacs containing silken hairs on segment VII provide an example of adaptation of these moths to oviposition in steppes and semideserts.

The genitalia of females in species of *Myrmecozela* Zll. and possibly *Cinnerethica* Ams. (tribe Myrmecozelini Zag.), constituting the sixth group, is close to the previous type of genital structure on the basis of construction of sternite VIII and armature of the bursa copulatrix. In these moths a reduction of tergite VIII to a narrow plate has taken place (Figure 20, A), together with the formation of lobes in the vaginal plate, and a darkening of the memberane covered with thin bristles; the bursa copulatrix retains the signum which is virgate and ridge (Figures 19, C and 20, D). Strong desclerotization of sternite VIII is accompanied by a shift of the ostium bursa toward sternite VII or its location in

the notch in the posterior margin of the sternite (Figures 19, C and 233, B). The displacement of the ostium leads to a reduction of the sclerotized cords extending from the base of the anterior apophyses to the ostial margins, so that the anterior apophyses become simple. From the material presented here it can be seen that the female genitalia of *Myrmecozela* Zll. not only exhibit substantial morphological simplifications and distinct shifts in individual structures, but also an involvement of sternite VII in reproduction. All these peculiarities attest that the modification of genitalia in female moths of this group proceeded in the direction of still greater specialization and further modification of the
44 type of genitalia typical of members of tribe Hapsiferini Zag. Here it should be noted that the evolution of the genitalia of female moths of genus *Myrmecozela* Zll. and others is not a direct continuation of the evolution of these structures in species of Hapsiferini Zag.; it only indicates their apparent origin from a common stem.

Thus an analysis of alterations in the female genitalia of the subfamily Myrmecozelinae shows that with retention of the ancestral scheme (scardioid type) to a lesser or greater degree, the major tendency in the modification of the genitalia was in the direction of reduction in sclerotization of the structures, displacement of the ostium bursa toward the posterior margin of sternite VII, development of a bifurcate anterior apophysis, and so on.

* * * * *

The assessment of major morphological changes in the structure of the wings and legs, as well as in the male and female genitalia of members of Myrmecozelinae, makes it possible to draw the following general conclusions:

An analysis of changes in any single character permits the division of genera of the subfamily into several groups, indicating in each the tendency of transformation of the given character and its varying magnitude. Only a consideration of the sum total of characters and the leading role of the genitalia permits the delineation of a series of major directions in the evolution of these moths and a statement of the general tendency for simplification of some structures, accompanied by the formation of several adaptive structures associated with living in forestless areas. On this basis all the Palearctic and many tropical genera of Myrmecozelinae can be divided into five large groups (tribes), corresponding to the major lines of morphological evolution.

The first group includes moths from tribe Cephimallotini Zag. which have retained the maximum number of ancestral properties and a large complex of archaic characters in all the systems of organs examined, attesting to the primitive nature of Cephimallotini Zag. The well-known similarity between male genitalia in *Cephimallota* Brud. and *Haplotinea* Diak. and Hint. (Nemapogoninae) does not exclude the possibility of ancient links between these two groups.

The second group includes moths from the tribe Rhodobatini Zag. and is characterized by retention of several primitive peculiarities together with features of every advanced specialization in the structure of the legs and wings, as well as a fairly high degree of change in the genitalia of both male and female. All this proves not only the earlier divergence of moths of this group from the common stem, but also their closeness to those included in the first group.

The third group comprises moths from the tribe Ateliotini Zag. Retention of several primitive features together with the development of specialized characters attests to the independent evolution of these moths. The presence of structural peculiarities in members of Ateliotini Zag., which are characteristic of other groups that may be more primitive (Cephimallotini Zag.) or also specialized (Myrmecozelini Zag., Hapsiferini Zag.), bespeaks not only an early divergence of Ateliotini Zag. from the common trunk, but also the retention of certain links with these groups.

The fourth group includes moths from the tribe Myrmecozelini Zag. Those members (*Episcardia* Rag., *Catabola* Durr. and a series of closely related tropical genera) which have retained the scardioid features in type of venation, structure of legs and female genitalia, are close to primitive moths of the first and third groups. The other members of this group (*Myrmecozela* Zll., *Cinnerethica* Ams.) which exhibit strong morphological simplification in the structure of the genitalia 45 and shifts in structures, especially in females, comprise fairly specialized moths which are close to the fifth group. On the whole, species of the fourth group even though retaining some primitive features, represent one of the phylogenetically advanced groups of the subfamily, which evolved from a common stem in the direction of simplification of the skeletal structures of male and female genitalia.

The fifth group includes moths from the tribe Hapsiferini Zag. and a large complex of members from tropical fauna. The shifts observed in the locomotory apparatus bespeak the earlier and fairly significant adaptation of these moths to life in arid conditions. Significant changes in the structure of the genitalia attest to a definite evolutionary direction in their modification. Hence one may suggest that moths of the fifth group represent an early isolated branch in subfamily Myrmecozelinae, which is closer to the third and fourth groups.

Thus tribes in subfamily Myrmecozelinae are characterized by a definite type of venation and leg and genital structure, and most probably represent natural suprageneric units, which diverged ages ago and evolved in different directions. The first group includes the primitive forms, while the fourth and fifth groups contrarily are quite specialized; however, their specialization evolved from a primitive base.

The division of the subfamily Myrmecozelinae into five groups on the basis of differences in several structures confirms the basis for my separation of the five tribes earlier (Zagulyaev, 1968a). In spite of far-reaching specialization and taxonomic isolation, these tribes constitute a single phylogenetic branch and retain all the major characteristics of structures typical of subfamily Myrmecozelinae.

Myrmecozelinae, like Scardiinae, has preserved fairly ancient forms to date, although with characters of more recent specialization.

SOME BIOLOGICAL ASPECTS

DEVELOPMENT OF MOTHS AND BEHAVIORAL CHARACTERISTICS OF LARVAE AND ADULTS

These moths are confined to open landscapes: steppes and forest-steppes of temperate latitudes (Plates II, III), deserts and semideserts (Plates IV, V), as well as savannas and tropical steppes. Their larvae are steppe (grass or turf) detritophages living in silken tunnels burrowed in soil, turf, grasses, etc.

Development of eggs. Unlike moths of other subfamilies in which eggs usually develop inside the food substratum, eggs of several members of Myrmecozelinae are laid on the soil surface and to a greater or lesser extent exposed to the effects of sunlight, moisture, and wind. Their only protection from natural factors is a cover of silken hair. Only in a relatively small group of species (Cephimallotini Zag., Rhodobatini Zag.) do the eggs develop in a broad chamber made by the female or in various slits and cavities. Egg development depends on temperature. On the average larvae emerge 5 to 12 days after oviposition.

Development of larvae. Most larvae immediately after hatching dig into the upper layer of the soil and make tunnels by gluing together soil particles and plant parts with silken threads.

Only in a small group of species, for example *Pararhodobates* Pet., do the larvae emerging from eggs crawl different directions, attempting 46 to climb as high as possible onto stems of grass, stones, etc. After this they release silken threads and are carried by air currents large distances, similar to larvae of many members of Ochsenheimeriidae and some other lower lepidopterans. Possibly, the larvae are carried by the wind along with the dry stems of plants to which they have attached. On landing, the larvae move into the soil and lead the same kind of life as other members of Myrmecozelinae. After the first molt they remove the integument by rubbing, converting it into a passage in which the larva first moves vertically into the earth, then leaves the discarded cover among roots in the turf. In all subsequent phases larvae live in the soil layer near the roots of grasses and other plants in tubular, branched silken tunnels compactly covered with minute soil particles. The diameter of a tunnel of a mature larva is 3.0 to 5.0 mm and its length 15 mm or more.

The larvae of some species of *Hapsifera* Zll. and *Pararhodobates* Pet. extend their underground tunnel above the soil surface in the form of a small vertical cylinder up to 5.0 cm long and 5.0 to 7.0 mm in

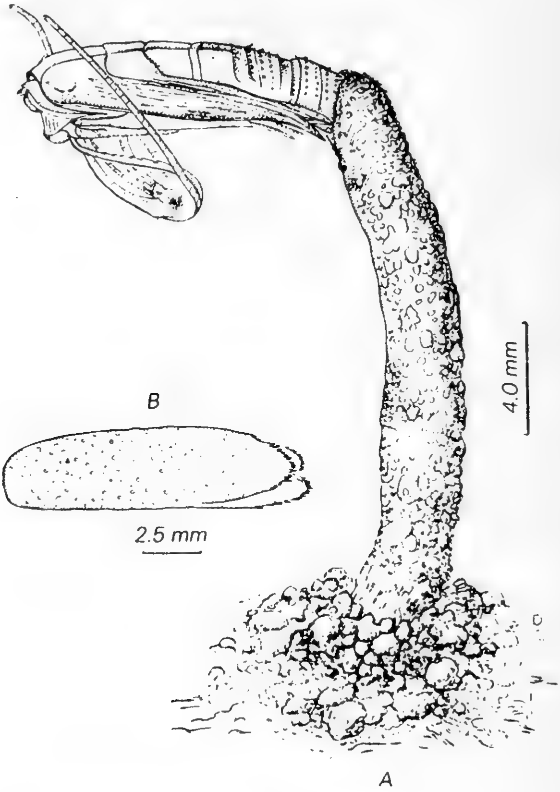


Figure 26. Sections of tubular passage of larvae.

A — *Pararhodobates syriacus* Led. with exuvium protruding above soil surface; B — *Hapsifera luridella* Zll., converted into a cocoon (drawn by N.V. Bessonova).

diameter, covered with sand particles on the outer side (Figure 26, A). Such protruding tubes have a flattened conical terminal with a closed slit at the apex of the cone. The raised part of the passage protects the underground tunnel connected with it from ingress of sand or rain. As the larva grows the tubular tunnel widens, which ultimately makes it easier for the moth to emerge. The larvae of some species emerge from the tunnel onto the soil surface in search of food; in this case silken threads are formed beyond the larvae emerging on the surface, which serve as a passage for its return to the burrow.

The covered life style of larvae in the soil, consumption of larval exuviae, and the difficulty of locating tunnels prevents a precise estimate of the number of larval instars.

Larval development in the soil layer and turf depends on temperature and humidity, which exert a significant influence on the larva directly as well as on its food by changing the quality. During summer, 47 at the time of drought when the soil is extremely desiccated and hot, the larvae of most species probably enter diapause until the onset of rains.

Most larvae feed on plant detritus, dead roots, the previous year's growth of stems, and so on.[1] Larvae of the steppe species of Ateliotini Zag. make tubular tunnels in the turf between the dead roots of grasses, wormwood, and stipes. Some larvae of Cephimallotini Zag. live in the lining of bird nests built on the ground and in nests of rodents and bumblebees. Reports of the occurrence of larvae of *Anemallota praetoriella* Chr. in nests of bumblebees have been published by several authors (Rapp, 1936; Petersen, 1963d). Larvae of other species of this tribe live in detritus under plants near roots of trees. Larvae of some species of *Myrmecozela* Zll. (Plate I) live in clusters of dead standing wood and old anthills. They prepare silken tunnels on which they glue particles from the material of the anthills. Mature larvae can be found in early spring or late autumn.

Larvae of some species of Cephimallotini Zag. have been found in village grain stores. For example, in Kazakhstan and Central Asia larvae of *Cephitinea colonella* Ersch. were found in grain stores. They had glued grains together with silken threads and were living inside the bag thus produced, feeding on the old grain.

Pupation and pupa. Before pupation the larva widens the tunnel near the surface or makes a small branch off the passage which is directed toward the surface. In the elongated chamber, about 20 mm × 6 mm in size, it spins a compact multilayered silken cocoon incrusted on the outer side with sand particles, and pupates inside it (Figure 26,

[1] Food specialization will be examined in a later subsection.

B). The duration of pupation depends on temperature. With a daily temperature of 15 to 17°C, development continues for about two weeks; under lower temperatures development may continue for a month. In Central Asia high diurnal temperatures scorch and dry the soil, which probably delays development of the pupa and emergence of the moth.

Imago. Emergence of moths takes place in a manner typical of lepidopterans, namely after sunset or in the early morning hours. Emergence of moths of species living in deserts is associated with moistening of the places of pupation. It has been noted that the emergence of moths begins soon after heavy rains at the end of summer. After emergence the moths hide in various raised parts of the soil or grasses, and remain motionless until their wings have straightened and dried.

Moths lead a crepuscular or nocturnal mode of life and are most active in the late evening and early morning hours. On cloudy days they fly during the day. In areas of Central Asia (Ashkhabad, Repetek) flying moths were collected during the day at the end of February to the beginning of March when the air temperature was not more than 10°C. Male moths fly low above the soil between shrubs of saxaul, while females are less mobile and sit on the stems of dry grass of previous years or near the ground on twigs of leafless saxauls. In some members of the subfamily, for example *Pararhodobates* Pet., the females have reduced wings and do not move far from the place of their emergence.

Adult moths do not feed and emerge from pupae with fully developed gametes. Hence mating of moths is possible just a few hours after their emergence. In most members of Myrmecozelinae, especially in species with apterous females, the males fly to the females in the early morning hours; cool weather and abundant dew do not disturb their flight. Females of these species sit quietly, awaiting the males, clinging
48 to a dry stem of grass or some other material. They are not capable of selecting their partner and submit to any male which attempts to mate. However, in species of *Cephimallota* Brud., *Cephitinea* Zag., *Hapsifera* Zll., etc., in which the females are very mobile and can fly to meet the opposite sex, they are probably more active in the selection of a mate and in the process of mating.

The duration of mating varies but on the whole continues for an average of one hour. Three to four hours after mating the female commences oviposition. Female participation in the dispersal of the species is a characteristic feature only of winged insects. Apterous females usually lay their eggs at the site of mating. During oviposition the female rotates her ovipositor and releases bundles of silken hair protruding from the sacs. Then by stretching her ovipositor she holds the fluffy hair with the help of bristles on the anal papillae and covers every egg

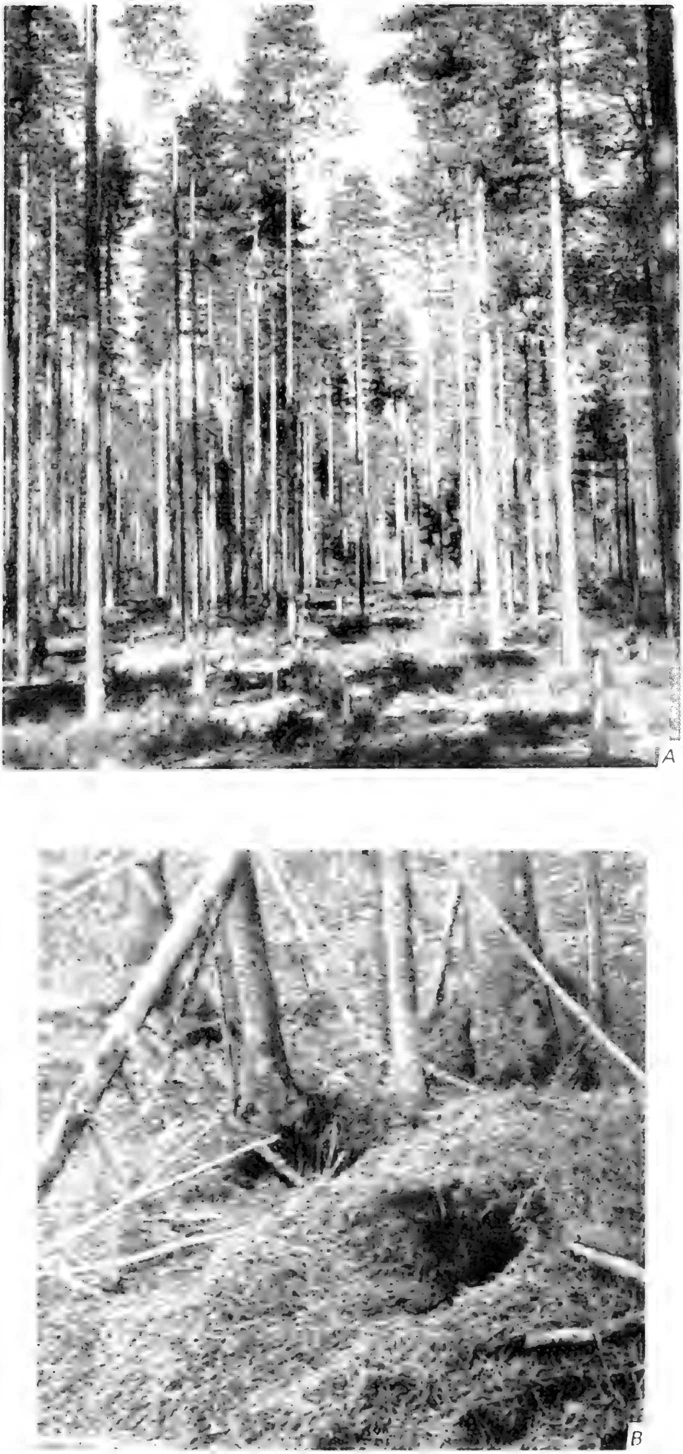


Plate I. Habitat of *Myrmecozela ochraceella* Tgstr., pine (belomoshnik).
A — general view; B — abandoned anthill, place of moth development (photographs by I.A Neifel'dt).
Southern Karelia.

Plate II. Habitat of *Anemallota praetoriella* H.-S., *Ateliotum hungaricellum* Zll., steppe gorge with areas of bairach forest.

A — general view; B — an isolated pocket (photographs by: A — A. L. L'vovskii and B — I.A. Neifel'dt).

Central belt of the European part of the USSR.

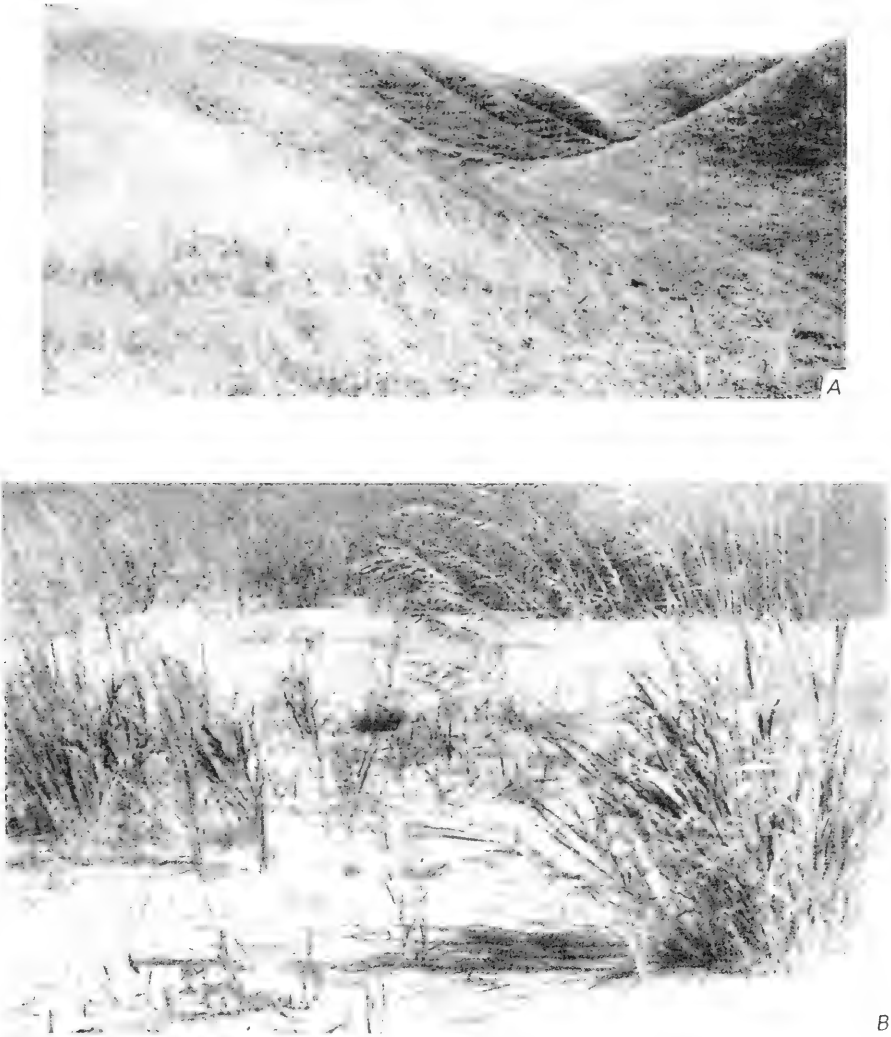


Plate III. Habitats of different species.

A — *Myrmecozela lutosella* Ev., steppe ravine with motley grass; B — *Pararhodobates syriacus* Led., wormwood grass-covered deserts (photograph by A.L. L'vovskii).

Southeastern European part of the USSR.

Plate IV. Habitat of *Anemallota repetekiella* Zag., thickets of black and white saxaul.

A – general view; B — individual habitat (photograph by V.A. Fokanov).

Turkmenia, Repeteksii forest reserve.

with the fluff as it is laid. This fluffy cover makes the eggs less noticeable and probably to some extent protects them from sharp fluctuations in day and night temperatures and from desiccation during scorching heat. This peculiarity is also seen in the behavior of winged females of lower Psychidae.

Breeding in steppe detritophagous moths takes place at different times. In temperate latitudes it occurs in the beginning of summer, but in deserts of Central Asia and Trans-Caucasus (Nakhichevan region) in early spring and again, after sufficient rains, from the end of summer to the beginning of autumn.

The rate of fertility of moths is not known for most species. *Myrmecozela ochraceella* Tgstr. under conditions of an experiment conducted by me laid an average of about 100 eggs per female.

The duration of life of moths (males and females) after mating is, on the average, 7 to 10 days.

A correlation between the number of generations and temperature and humidity is observed in moths of this subfamily. In species living in the northern and central regions of the European part of the USSR and Western Europe one generation is observed per year. In these regions moth emergence, mating, and oviposition take place in June and July. In the southern regions—Kazakhstan, Central Asia, and Mediterranean region—at least two, and for some species even three, generations develop per year. The Mediterranean species of *Myrmecozela* Zll., with two generations, develop approximately as follows:

	First generation	*Second generation*
Imago	May–June	August–Septemeber
Egg development	7–12 days	10–15 days
Larve	June–August	October–April
Pupae	12–16 days	20–30 days

Temperature and humidity have no less influence on the duration of a generation. The onset of a dry period delays development.

Dispersal of most of the species in the subfamily probably takes place mainly as a result of flight of fertilized females and an active search by them for suitable conditions for larva growth. Only a few species have apterous females (*Pararhodobates* Pet., and possibly some species of *Catabola* Durr.). The dispersal of these moths takes place primarily through wind-borne young larvae. The dispersal of adult moths by wind is less likely as they cling firmly to the ground and have strong legs with powerful tarsal claws.

Like other species of the family Tineidae, moths of Myrmecozelinae lead a concealed life. This peculiarity developed as an adaptive mechanism to an increasing xerophilous environment.

49 Ecologically, members of Myrmecozelinae are basically mesoxerophils and xerophils. Moisture- and cold-loving species are practically absent among them. Only a few species, constituting a small group of mesophils, have penetrated north up to Gulf of Finland and even beyond the 60th parallel. These mesophilic species are widely distributed in Europe. *Myrmecozela ochraceella* Tgstr. has penetrated Finland, and *Ateliotum hungaricellum* Zll. and *Cephimallota simplicella* H.-S. the northern part of the geographic range including the Baltic region. In forest regions these species live in meadows, large forest glades, felled forests, hedgerows, treeless areas, and other similar open places. They are also common in sparse forest areas and in the steppe regions in wood cuttings. Species associated with anthills penetrate pine forests. Large numbers of *Myrmecozela ochraceella* Tgstr. have been reported from sandy soils in the pine forests of northern and central regions of the European part of the USSR and Western Europe. The moths were usually caught in July and August before evening near old abandoned ant colonies and brushwood.

Moths of this subfamily are almost totally absent in the taiga, although some species live quite close-by. Some species are found in the Far East, up to eastern Sayan (*Myrmecozela dzhungarica* Zag., *M. mongolica* Pet., *Pararhodobates syriacus* Led.) and some have penetrated the forest-steppe in Trans-Baikal and northern Mongolia (*Cephitinea colonella* Ersch.). Only three species in the entire subfamily of steppe detritophages — *Cephitinea colonella* Ersch., *Cephimallota chasanica* Zag., *Hapsifera barbata* Chr. — have been found in southern Primor'e and Japan, of which the first one is widely distributed in Central Asia, and the other two are endemic to the Far East. However, in these regions the species noted are associated with the steppe sections of sparse oak forests. It should be mentioned that in June forest habitats are not characteristic places for Myrmecozelinae.

A great majority of the Palearctic species in this subfamily are associated with open biotopes where vegetation has exerted little influence on the micro-climate in most cases, but fluctuations in temperature and humidity have left a definite imprint not only on the behavior of moths, but caused a complex of adaptive changes in them associated with the movement of larvae in the soil. Since the latter live in silken tunnels in the soil which protect them from the drying effect of sun and wind, certain changes have been effected in the structure and behavior of the emerging moths. Larvae spend a large part of the summer in a condition of low activity. The imago appears in early spring and late autumn, and usually flies in the morning hours and after sunset. Moths of

Pararhodobates syriacus Led. have often been found in Turkmenia in mid-February, and in western Kazakhstan in the beginning of April on soil scorched by the sun. The unique requirement for warmth, a characteristic feature of many species of Myrmecozelinae, restricts their habitation to well-heated habitats. Such places of habitation for the majority of species of this subfamily are low-lying areas and plains, including steppes, semideserts and deserts, as well as foothills, hill slopes, and plateaus.

Many species of *Cephimallota* Brud., *Anemallota* Zag., *Myrmecozela* Zll., *Ateliotum* Zll., and *Pararhodobates* Pet. are associated with steppe landscapes. For example, innumerable *Ateliotum hungaricellum* Zll. were collected near a lamp placed in the wormwood steppes of southern Ural'sk from June 20 to August 20. Females of this species were less active than males, and sometimes a few males hovered over a single female sitting on the grass.

A large number of xerophilic species of the subfamily, primarily members of genera *Cephitinea* Zag., *Episcarida* Rag., *Catabola* Durr., 50 *Hapsifera* Zll., *Rhodobates* Rag. and *Ceratuncus* Pet., as well as many species of *Myrmecozela* Zll. and *Ateliotum* Zll. live in semidesert and desert areas of southern Kazakhstan and Central Asia. Most of these moths have adapted to life in sandy deserts, where they concentrate in well-stabilized areas in the interridge depression; others inhabit outgrowths of saxaul bushes and bushes of cherkez and kandym. Some species are common along river banks, irrigation channels, in oases, and near habitations, e.g., *Cephitinea colonella* Ersch. Moths fly in the desert from the end of March to the end of June and in August to September. Males fly low above the soil surface in evening hours. Instances of moths flying toward artificial light in the early hours of the night have been recorded. *Hapsifera luridella* Zll. and some other species, mostly males, fly toward light quite often.

The number of species living in the belt of submontane and montane plateaus among members of Myrmecozelinae is not less than the number found in steppes and semideserts. The great ecological elasticity of some species from the plains such as *Ateliotum hungaricellum* Zll., *Myrmecozela lutosella* Ev., *Hapsifera luridella* Zll., etc., has probably expedited their penetration into hilly regions. Such a dispersal is more common along river valleys and ravines. The majority of species associated with hilly regions represent a fairly variable fauna of Myrmecozelinae on the basis of ecological adaptation. Thus certain species of *Myrmecozela* Zll.—*M. armeniaca* Zag., *M. ordubasis* Zag., *M. asariella* Zag.—have adapted to life in the gravelly and sun-baked conditions of stony deserts at an elevation of 1,000 to 1,200 m, more or less well-covered with grass and shrub vegetation as in Trans-Caucasus, Armenia, and Azerbaidzhan (Nakhichevan ASSR). Other species live in the hilly deserts of Asia Minor and northwest Asia (*Rhodobates* Rag., *Ceratuncus* Pet., *Ateliotum* Zll., *Episcardia* Rag., and *Hapsifera* Zll.); some species have penetrated the dry areas of Trans-Caucasus (*Rhodobates laevigatellus* H.-S., *Episcardia violacella* Rbl.), or steppe areas in the Crimean mountains (*Ceratuncus affinitellus* Rbl.). *Hapsifera luridella* Zll. and *H. eburnea* Btl. are found in wormwood plateaus in different areas of Afghanistan at an elevation of 1,200 to 1,600 m and have been collected from the beginning of May through September (Petersen, 1959b; 1963c). Some species of *Catabola* Durr. live in similar habitats. Many species of *Pachyarthra* Ams. and *Reisserita* Ag. are mainly montane species and live in the Great Atlas mountains at a height of 2,500 to 3,000 m.

Most species of Myrmecozelinae react negatively to excessive humidity. Only a few widely distributed species in forest zones, living in forest litter and nests of bumblebees (for example, *Cephimallota simplicella* H.-S.), or in deserted anthills in forests (such as *Myrmecozela ochraceella* Tgstr.), can develop under conditions of high humidity.

Thus an analysis of data on the peculiarities of mode of life, behavior, and habitat of Palearctic members of Myrmecozelinae provides a basis for considering these moths fairly well adapted to life under arid conditions. Such characteristic properties as maximum activity of moths in the spring and autumn with flight primarily in the morning and evening hours and summer diapause in larvae are more distinctly manifest in moths living in deserts and semideserts. The ecological adaptations examined here have enabled these moths to exist under conditions of high temperature and a high degree of moisture deficiency.

Most of the non-Palearctic species are also xerophils associated with savannas, prairies, and dry tropical forests, or other similar regions. Only a small number of species in the subfamily are associated with humid tropical forests. Xerophytic habitats are characterized by
51 tall turf-type grasses with coarse leaves and various trees and shrubs which form deadwood forests. The climate in areas with such vegetation alternates between dry and humid periods; in some places drought continues for seven to eight months.

Of all the non-Palearctic regions, the fauna of Myrmecozelinae in the savannas, semideserts, and dry forests of Africa is the best studied due to the assiduous efforts of Gozmàny (1965b, 1965c, 1966, 1967, 1969). More than 200 species of 40 genera were found here, some of which belong to subfamily Myrmecozelinae; however many species, and in some cases even some genera, are known so far only from restricted territories. Most of these moths (more than 60%) were found in different types of savannas (according to the classification of Shmitkhyuzen, 1966), which include the xerophytic and mesomorpho-tropophytic grass species and open wood farms rich in graminaceous grasses. Members of *Rhodobates* Rag., *Perissomastix* War. and Roth., *Scalidomia* Wlsm., *Pitharcha* Meyr., *Myrmecozela* Zll., *Hoplocentra* Gozm., *Tracheloteina* Gozm., *Syngeneta* Gozm., *Dasyses* Durr., *Tiquadra* Walk., *Scalamatica* Meyr., *Drosica* Walk., *Hapsifera* Zll., etc., have adapted to life among turf grasses, short bushes, and undershrubs. Some species of *Perissomastix* War. and Roth. and *Scalmatica* Meyr. have been found in similar habitats of Madagascar, and species of *Myrmecozela* Zll., *Tiquadra* Walk., and *Harmaclona* Busck in prairies of South America. A few members of Myrmecozelinae—for example *Ardiosteres* Meyr., *Harmaclona* Busck, and *Parochmastis* Meyer.—are known from the savannas of northeastern Australia.

The tropical dry deciduous forests of Africa are close to savannas ecologically speaking. These are light woods, usually with a single forest layer and strong dense foliage, which in the dry period forms a layer of litter on the soil. Undergrowth is either absent or represented by small-leaved evergreen and prickly shrubs. The soil is somewhat shaded and covered with very sparse low turf grasses. The grass cover dries out in the dry period. “Open forests” represent a unique type of tropical dry forests, which are widely distributed in central Brazil and occupy an intermediate position between the grass and forest communities.

The fauna of Myrmecozelinae of the dry tropical forests in Africa south of the equator is quite rich, although less so than the fauna of savannas. In addition to such widely distributed genera as *Episcardia* Rag., *Myrmecozela* Zll., *Perissomastix* War. and Roth., and *Hapsifera* Zll., it also includes such monotypic genera as *Dicanica* Meyr., *Ochetoxena* Meyr., and others. The number of moth species of this subfamily found in similar formations in South America and Australia is not great. Species of *Myrmecozela* Zll., *Tiquadra* Walk., and *Homilostola* Meyr. have been recorded in the dry forests of Brazil, and members of *Mesopherna* Meyr., *Moerarchis* Meyr., and *Iphierga* Meyr. in the northeastern regions of Australia.

Several interesting moth species have been collected from termitaria and hygrophilic woody groups in open spaces covered with mesophilic grasses. The islands of termitaria forests, consisting of trees which are more demanding of soil moisture, probably serve as shelters for moisture-loving species of moths and preserve them to different degrees. The possibility that individual members of *Perissomastix* War. and Roth. and *Myrmecozela* Zll. adapted to life in perennial nests of social insects, including termitaria, especially abandoned ones, cannot 52 be excluded. Petersen (1963d) has reported the occurrence of moths close to Cephimallotini Zag. in termitaria.

In savannas with a more or less continuous grass cover of different grasses, including coarse-leaved bush species growing solitarily, as well as in dry tropical and usually sparse and deciduous forests, moths live near the soil surface. The larvae live in the upper soil layer or in perennial turf grasses. The time of flight of the moths coincides with the humid period, and at the time of drought the larvae probably enter diapause, which sometimes continues for half the year or more.

Evergreen or rain forests in the tropics are complex vegetative formations. The dense forest canopy created by multitiered trees allows only a greenish gloom inside. A grass cover occurs only in better-lit areas, and differs due to the presence of a large variety of spore-forming organisms and a small number of graminaceous grasses. Monsoon forests are close to such forest formations and are characteristic of regions in which alternation of rains and drought occurs; in such forests the trees shed their leaves at the time of drought. In forests of both types fallen leaves and branches are usually destroyed very quickly by various insects, especially termites and members of Dictyoptera, so that a bed of forest litter does not form. The absence of turf grasses, litter, and high soil humidity under the forest cover create unfavorable conditions for the development of moths of subfamily Myrmecozelinae. This probably explains why in most cases moths were found on forest fringes, glades, along roads, in open areas near inhabited places, and along verges of fields, i.e., in forestless, relatively dry, well-heated areas and in secondary, man-made places.

The fauna of moths in humid tropical forests has hardly been studied. Only in recent years have publications started to appear which elucidate the composition of Tineidae fauna from individual regions, primarily from Africa and Southeast Asia. Thus, for example, in the forests of Western Equatorial Africa a series of interesting species from this subfamily have been found. In Sierra Leone three species of *Episcardia* Rag., two species of *Syncalipsis* Gozm., one species each of *Perissomastix* War. and Roth. and *Machaeropteris* Wlsm., as well as the monotypic genus *Semeoloncha* Gozm. have been found; from Ghana three species each of *Perissomastix* War. and Roth. and *Syncalipsis* Gozm., and two species of *Episcardia* Rag., are known; from Guinea the monotypic genus *Histiovalva* Gozm. and two species of *Syncalipsis* Gozm.; from the Ivory Coast and Nigeria one species of *Syncalipsis* Gozm. for each country; and the monotypic genus *Cataxipha* Gozm. from Cameroon (Gozmàny, 1965a, 1968, 1969). From similar forests in individual regions of India and Sri Lanka, members of *Machaeropteris* Wlsm., *Hypophrictis* Meyr., *Harmaclona* Busck, *Dasyses* Durr., etc., have been reported. In the forests of Sumatra species of *Hypophrictis*

Meyr., and in Java of *Hapsifera* Zll., *Hypophrictis* Meyr., and *Machaeropteris* Wlsm. have been reported. Thanks to the study of Diakonoff (1948, 1967) three species of *Dasyses* Durr., *Episcardia* Rag., *Hapsifera* Zll., and *Tinissa* Walk. are now known from forests in the Philippines. Species of *Tinissa* Walk. and *Harmaclona* Busck have been found in forests of New Guinea.

An analysis of the peculiarities of the habitats of moths revealed that burrowing into the soil increased the possibilities of utilization of different climatic zones by Myrmecozelinae, and their feeding on various kinds of plant residue facilitated their wide distribution. These factors, as well as the constant occurrence of feeding substrata in different zones, facilitated the distribution of these moths in all continents.

53 FOOD SPECIALIZATION

Larvae of myrmecozeline moths live in the floor of forests, in steppes, and semideserts and generally feed on decomposing residue of grasses. This is indicated by the occurrence of larvae species of *Cephitinea* Zag., *Ateliotum* Zll., *Myrmecozela* Zll., etc., feeding on the dead parts of plants damaged by mold. However, some species, such as *Cephimallota simplicella* H.-S., *Anemallota praetoriella* Chr., and *Myrmecozela ochraceella* Tgstr. (the first two develop in nests of bumblebees, and the last in termitaria) eat the mold-covered residue of plant cells and probably of dead animals also (Zagulyaev, 1969, 1971b, 1972e).

Information on the trophic relation of non-Palearctic members of Myrmecozelinae, especially of such primitive genera as *Perissomastix* War. and Roth., *Dasyses* Durr., *Hyperbola* Gozm., etc., is practically nonexistent. Indications are available only for some species of Cephimallotini Zag. from termitaria (Petersen, 1963d).

Understanding the details of food specialization in Myrmecozelinae is difficult because of the hidden mode of life of the larvae in silken tunnels laid in forest litter, turf, and in the case of certain species inside nests of social insects.

Since most species are closely associated with the forest floor and decomposing residue of herbaceous plants, I shall briefly discuss the characteristics of the environment in which these moths develop.

Dead aerial plant parts form rags or steppe fluff which, after falling on the ground, gradually transform into soil. Fallen parts accumulate simultaneous with the decomposition of dead residue and hence the steppe floor consists of a layer of herbaceous residue in different degrees of decomposition. The dead underground parts of the plants and roots also constitute a significant component in the accumulated material. The most intense decomposition of steppe litter occurs in spring and autumn and coincides with the maximum moisture level. This engenders the abundant growth of Basidiomycetes, large parasitic fungi, and a complex of micromycetes from sac fungi and fungi Imperfecta (Chastukhin and Nikolaevskaya, 1969). The most vigorous growth of larvae of Myrmecozelinae, which feed voraciously on decomposing plant residue and fungi, coincides with this time.

A brief description of the environment in which larvae live confirms the earlier proposition (Zagulyaev, 1969) that this group of moths is closely linked with the dead parts of plants and a large complex of saprophytic fungi. All this provides a basis for assuming that steppe (grass or turf) detritophagy is a further development of the initial type of feeding, i.e., the ancestral forest detritophagy. This is also indicated by the distinct resemblance between steppe and forest litters. In both cases they are densely penetrated by fungal mycelia and destruction is mainly wrought by fungi of family Agaricaceae and micromycetes (Chastukhin and Nikolaevskaya, 1969). Furthermore, the steppe floor exerts a strong influence on the thermal conditions of the soil and the accumulation and conservation of moisture, which is similar to the influence of forest litter (Semenova-Tyan-Shanskaya, 1966). During summer, with a reduction in moisture content of the steppe soil, the quantity of actinomycetes increases, which in the opinion of Bondarenko-Zozulina (1955) also indicates the resemblance between steppe meadow and forest conditions.

Although I consider steppe detritophagy a product of ancestral
54 (forest) detritophagy, at present no direct transitional link between them is known. Nevertheless there are reasons for believing that this transition took place through a series of intermediate links, as a result of which xerophilization of moth species took place gradually. Such intermediate links were the floors of forest glades and meadows after the moths left the forest litter and shifted to steppe habitats, and later to semideserts and deserts, which is an expression of the still higher xerophilization of moths.

At present it is known that the most primitive steppe detritophages are some members of Cephimallotini Zag., which develop in the floor of forest glade swales, a part of which consists of decomposing woody elements (branches, leaves, and other such fallen woody matter). The forest glades represent the primary centers of meadow flora and have always existed in the forest zone. With their southward movement, where climatic conditions become less favorable for forest development, the importance of meadow vegetation (which is more photophilic but less water cooling) increases (Shennikov, 1938, 1941).

The next stage most probably was the transition of moths from

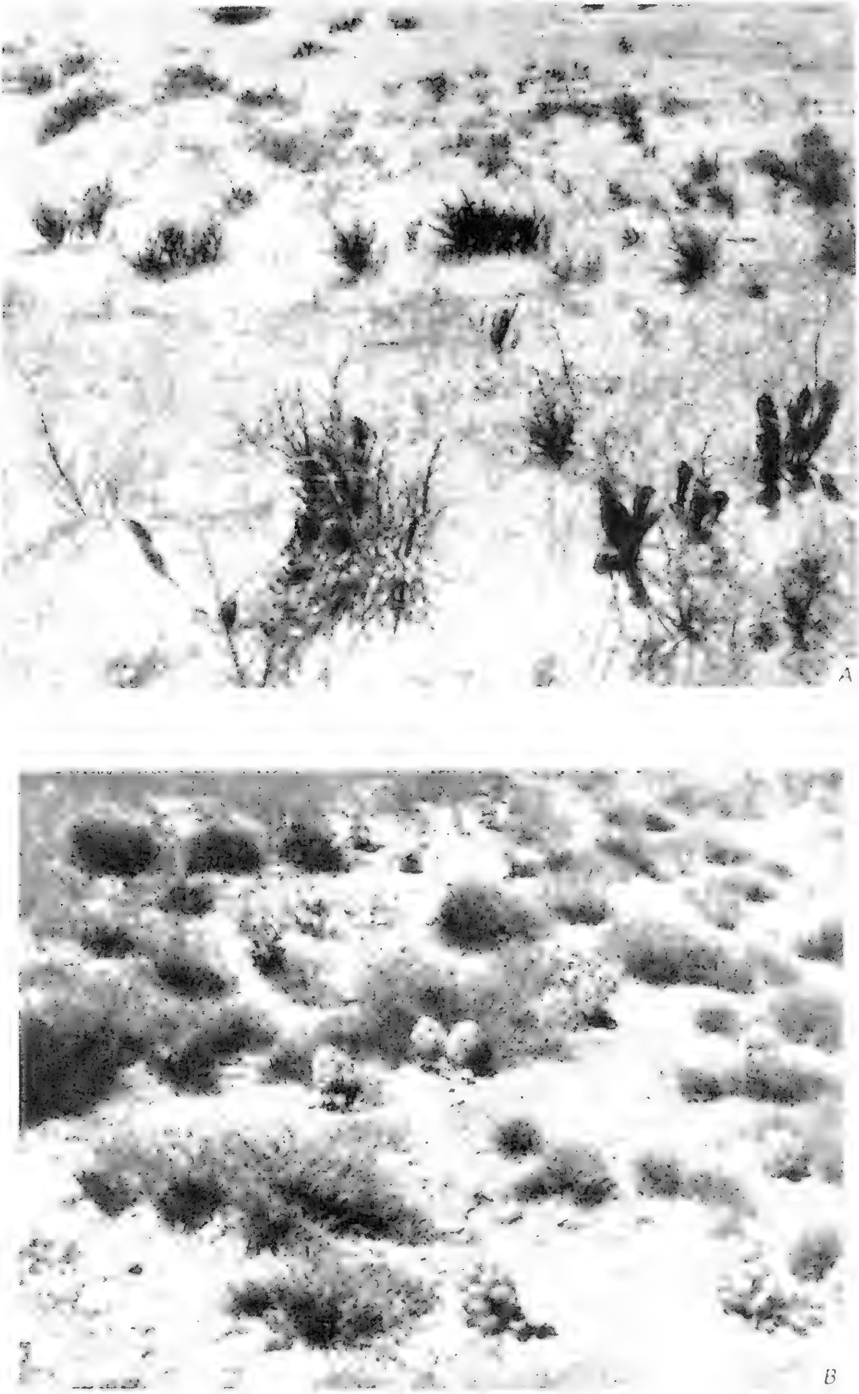


Plate V. Habitat of moths of genera *Myrmecozela* Zll. and *Hapsifera* Zll.

A—shrub-covered desert (Turkmenia); B—argillaceous desert with thickets of wormwood and succulents (photographs by V.A. Fokanov).

Lower reaches of Ural River.

meadows to steppes. This is not difficult to understand if one takes into account the opinion of several authors (Shennikov, 1938; Lavrenko, 1940; Semenova-Tyan-Shanskaya, 1966) that steppes and meadows contain the same group of herbaceous vegetation, and steppe meadows, which are widely distributed in the forest-steppe belt, should be considered a link between them. Gilyarov (1960) and Arnol'di (1965), on the basis of a study of biocenoses, express similar views and believe that the grass communities grouped by a series of characters into the concept of steppe are linked with a gradual range of transition from the more hygrophilic associated (meadow), and that all the transitions between them can be visualized.

However, at present among members of Myrmecozelinae living in meadows and steppes (*Ateliotum* Zll. and *Myrmecozela* Zll.), it is difficult to identify individual groups which have adapted more to one than to the other habitat. Meadows and steppes with their large concentration of food reserves create conditions for the development of steppe detritophages and morphoecological radiation, which permit moths to settle not only on the steppe floor, but to also achieve great species variability (Zagulyaev, 1972e).

Further specialization of individual groups (*Catabola* Durr., *Hapsifera* Zll., and *Pararhodobates* Pet.), facilitated their penetration of the ground and soil of semideserts and deserts. Thus the most primitive members of the subfamily such as *Cephitinea* Zag., etc., have still not lost their links with the forest and develop in the floor of forest glades. However, most of the specialized branches of Myrmecozelinae are closely associated with only meadow and steppe vegetation, and these should be considered steppe (grass or turf) detritophages. The resemblance in feeding in the floor of forest glades and the floor of steppes is not disputed since in both cases the larvae feed mainly on fungal mycelia and products of enzymatic decomposition of plant tissue—in one case on grass and wood tissue and in the other case only on grass tissue.

The possible development of partial keratophagy in certain members of this subfamily also attracts attention. It may have appeared due to mixed feeding, i.e., with the constant inclusion of mold-covered products originating from insect activity, their dead bodies, larval skins, etc., in the diet together with decomposing plant residue. Such a food specialization should probably be considered a further evolution of mycetophagy. However, specialized keratophages among members of
55 Myrmecozelinae are not known to date, although apparently facultative feeding on various substances of animal origin may take place. A similar situation is observed in subfamily Nemapogoninae (Zagulyaev, 1964a, 1969). Examples of facultative keratophagy are also known in some other insects (Arnol'di and Arnol'di, 1948).

Feeding on the residue of herbaceous plants and to some extent the absence of transitional links connecting these moths with primitive detritophages, indicates that the transition from steppe detritophagy took place long ago, most probably in the Paleogene. It is commonly believed that forests which occupied a predominant position in the Tertiary period gradually receded, leaving forestless spaces. Simultaneous with the forest recession, Scardiinae and many members of Nemapogoninae also receded, and only members of Myrmecozelinae adapted to the new conditions and thus became widespread. Steppes and semideserts became the habitats for most of these moths and deserts for individual groups (Zagulyaev, 1972e).

Steppe detritophages have not been reported as pests of cultivated plants of food reserves. However, some members, for example *Cephitinea colonella* Ersch. and *C. colongella* Zag., under favorable conditions can develop in village grain stores.

BIOLOGY AND BIOLOGICAL TYPES

In generalizing what has been stated above about the peculiarities of development and food specialization in Myrmecozelinae, I shall discuss the characteristics of their mode of life and biotypes in accordance with the scheme proposed by Mazokhin-Porshnyakov (1952, 1954). A few peculiarities of structure have been used for a more complete characterization. An elaboration of the biological peculiarities of the group studied is relevant to an analysis of the direction of its morphoecological changes during evolution (Zagulyaev, 1972b).

Biology

Types of eggs. The eggs of Myrmecozelinae belong to the group of dispersed eggs since the females oviposit on any substrate: dry plants, stones, soil, etc. The eggs are fairly large, with a dense chorion, and rich in yolk. Hence the larvae emerging from them are very active and can remain without food for several days. In most species the eggs are laid in clusters or plaques and covered on the upper side with a silken fluff (Ateliotini Zag., Myrmecozelini Zag., and Hapsiferini Zag.). I have included the eggs of these moths in the subgroup of concealed eggs since a concern for the progeny is evidenced. The eggs of other moths (Cephimallotini Zag. and Rhodobatini Zag.) are laid singly or in small groups in a brood chamber or different types of cavities and are not covered with fluff; these have been included in the subgroup of unconcealed eggs. Both subgroups are typical of primitive as well as specialized members.

Biology of larvae. I have included the larvae of these moths in the category of concealed larvae and divided them into two types: concealed and semiconcealed mobile larvae.

Concealed larvae. This type is seen in most species of the subfamily. The larvae of these species during their lifetime are found inside the 56 substratum. The body of the larva is slightly flattened and covered with a few raised pigmented protuberances with short bristles on each segment. The muscles of the body are well developed and provide the required elasticity. The relatively thin whitish or colorless cuticle of the body attests to larvae development under relatively constant hydrothermal conditions. The concealed mode of life of larvae living in tubular tunnels under conditions of sufficient food reserves and constant mining through a relatively hard substrate explain the retention of short sensory organs in them: antennae and bristles on the head and thoracic and abdominal segments. Short thoracic legs, semiprognathous head, and strong mandibles attest to the existence of several primitive traits in these larvae. They exhibit negative phototropism throughout their life and are not capable of prolonged migrations. On the basis of feeding habits they are steppe detritophages with keratophagy manifest in some species. In most cases the larvae are protected from unspecialized predators and parasites.

Since these larvae live in the floor of steppes and beds of graminaceous grasses they could readily inhabit arid regions. Their changeover from the forest to the steppe floor was accompanied not only by retention, but even further development of corresponding ecological and physiological adaptive mechanisms, e.g., formation of the vertical, externally protruding ventilation tubes similar to those produced by some desert borers (moths) (Fal'kovich, 1969). In structure these tubes are quite close to those of Scardiinae living in decomposing wood and fruiting bodies of polyporous fungi. All this shows that members of Myrmecozelinae, while changing to a life in soil still preserved several features of their ancestral mode of life.

Based on the substrate in which larvae with a hidden mode of life develop, they can be divided into two groups: those developing in the steppe floor and turf of graminaceous grasses and feeding on plant detritus (most members of Myrmecozelinae); and those living in nests of social insects in which the larvae utilize together with plant residue material of animal origin as food.

Semiconcealed mobile larvae. This category includes those moths in which the larvae change their location during their lifetime and, unlike concealed larvae, occur for some time in less constant hydrothermal conditions. A small number of moth species such as *Pararhodobates* Pet. constitute this group. Because of their detritophagous habits these larvae, readily wind-borne, find food without difficulty. Transfer by wind is a method of dispersal arising from the polyphagous nature and life of larvae on open landscapes.

This interesting group through its mode of life reveals certain biological peculiarities, for example transfer of the function of dispersal from imago to 1st-instar larvae in species in which the females are apterous; methods of changeover from tunnel-dwelling larvae mining the substrate to larvae that carry their bags; and so forth.

An analysis of the larval mode of life permits a few generalizations. Larvae leading a concealed life possess several primitive peculiarities of structure, including poor development of tactile structures and organs of orientation. This indicates that from the point of view of evolution concealed forms are close to the ancestral type. The semiconcealed mobile types should be considered relatively more specialized groups and a further modification of the ancestral type.

Biology of pupae. The pupae of Myrmecozelinae belong to the group of mobile pupae, which undergo hibernation in a relatively hard 57 substratum. They are characterized by fairly thin covers, a relatively raised frons, and strong armature on the tergites and cremaster, which is essential for cutting through the walls of the brood chamber and emergence from the flight hole. The pupae are located in the compact dense brood chamber in the sod, etc. An analysis of the morphobiological peculiarities of the pupal reveals that they are close to members of Scardiinàe and belong to the primitive type found in family Tineidae.

Biology of imagoes. The moths of Myrmecozelinae, like other subfamilies of Tineidae, according to the classification of Mazokhin-Porshnyakov (1954) should be included under the group of nonfeeding insects. On the basis of the extent of mobility of the females, I have divided all members of Myrmecozelinae into two categories: those in which the females can fly a little, and those in which the females do not fly (apterous, cursorial females). Such a division accords well with the morphological peculiarities and biological specificity of the species.

Females fly little. This category includes those moths which are usually active at twilight and during the night. These females experience difficulty even in a short flight. The moths have slightly sclerotized wings, a relatively sparse scale cover on the body, short weak legs of the scansorial type, etc. The males usually fly to the females and mating and oviposition take place near the site of emergence of the females. The female's life span is not more than 10 days (Zagulyaev, 1972b).

This type also includes members of Scardiinae, but unlike them members of Myrmecozelinae live in forestless areas (primarily steppes and semideserts), and have been included by me under the group of steppe or meso-xerophilous and xerophilous moths. These females fly rarely, mostly near the ground, and usually in the morning and at dusk. The males of several species have a characteristic swinging or pendulum-type flight, staying close to the ground, and in this feature very much resemble males of Hepialidae.

Moths of Myrmecozelinae of this category, on the basis of structural peculiarities of their wings can be included under the first three groups (see section "Main Trends in Changes in Some Organs"). Under the first group are included those members which have a wing structure close to Scardiinae, as is observed in Cephimallotini Zag., *Episcardia* Rag., and *Rhodobates* Rag. Very often these moths live in large forest glades and fringes, along river banks, in low-lying areas, along slopes of gorges and ravines, as well as in felled forests, burnt forests, wastelands, verges of roads, and sometimes in forest parks, old cemeteries, etc. They fly between sparse grassy growth, bushes standing in isolation, and stumps, i.e., in open places protected from strong winds to varying degrees.

The second group (moths with slightly narrowed and sclerotized wings) includes species of Ateliotini Zag., Hapsiferini Zag. and individual members of other tribes. In the Palearctic these are the steppe and semisteppe xerophilous species living amidst grassy vegetation penetrated by the sun, on sunny slopes, and in the mountains of southern Armenia and Dagestan, in hilly dry steppes, or in areas of hilly xerophytic vegetation. For example, some species have been found only in saline areas in the Nakhichevan trough, in the southeastern part of Kura-Araksinskaya depression, in Kobystan, i.e., in the driest regions of the Caucasus, and in places with a poor grass cover or in other such habitats in southern Kazakhstan. These moths have adapted to continuous winds and fly low above the ground. The males are particularly distinct due to their active, fairly rapid, and wobbly flight.

58 The third group (moths with wing structure of both groups) includes most of the species of the subfamily, most Myrmecozelini Zag., many members of Rhodobatini Zag., and certain members of other tribes. These are typical steppe, rarely forest-steppe, and semidesert mesophilous or meso-xerophilous species. A few moths develop on mountains, plateaus, and in passes at a height of 2,500 to 3,000 m.

Nonflying (apterous, cursorial) females. Apterous forms of tineid moths were not known before my studies. In some other groups of lower lepidopterans apterous forms are quite common, for example in psychids (Kozhanchikov, 1956). The group examined comprises members of *Pararhodobates* Pet. Wings in the females are reduced to varying degrees and the antennae likewise reduced; the eyes bulge slightly, the legs are long and cursorial, and the claws well developed. The females move out of the cocoon or pupal cell and remain near the place of oviposition on stems of grasses or on stones. They can make small movements but almost do not participate in the dispersal of the species. Males have a rapid flight and fly to females in the morning and evening hours. Eggs are laid in various cavities or in a brood chamber. These moths are seen in late autumn or early spring and live in steppes and semideserts. A similar type of female behaviour has also been observed in some other lepidopterans, e.g., Deuterotineidae and Micropsychinae (Zagulyaev, 1972d).

The existence of moths in nature with wingless females can be explained by the peculiarities of their biology. The larvae develop in decomposing litter and hence possess a low specialization. At the same time an abundance of food obviates the need for prolonged search and migration over large distances. The function of passive dispersal is performed by the first-instar larva. All these peculiarities do not contradict the general concept of development of an apterous condition in insects as proposed by Gilyarov (1966).

* * * * *

The biology of moths elaborated above permits certain conclusions. The moths of the first category (poorly flying females) are characterized by a complex of nonspecialized morphological peculiarities. This attests to the fact that moths from the steppe meso-xerophilous and xerophilous groups (Myrmecozelinae), like the forest hygro-mesophilous group (Scardiinae), lead a primitive mode of life close to ancestral type.

It may be assumed that the migration of ancestral moths to forestless areas was accompanied by several adaptive changes and a varying degree of specialization in flight. A large number of ancestral moths preserved low levels of flight and became adapted to life in the steppes, giving rise to many present-day members of the subfamily. The rest of the ancestral forms evolved in the direction of reduction of wings in females, which led to extreme specialization, namely "apterism," in some present-day members of Myrmecozelinae (the second category). The gradual development of winglessness possibly should be accompanied by compensatory specific eco-physiological changes in the larvae.

The scheme presented here reflects not only the direction of specialization of moths, primarily their mode of flight, from the primitive and ancestral type to a more specialized one, but also correlates the development of these forms with the type of preimaginal phases, especially larvae.

59 Biological Types

The biological type is the adaptive form of organization of the life cycle of a species that includes the biology of eggs and pupae, mode of life of larvae and imagoes, and adaptive peculiarities which are closely interlinked (Mazokhin-Porshnyakov, 1952, 1954). On the basis of the foregoing all members of Myrmecozelinae should be included under the hepialoid type (Zagulyaev, 1972b).

Hepialoid type. This is one of the primitive biological types of lepidopterans that is close to the ancestral type, and includes members of Hepialidae, Cossidae, etc. In the family Tineidae it also includes the most archaic groups such as Scardiinae, and many members of Nemapogoninae and Myrmecozelinae. The larvae of these moths exhibit two modes of life—concealed and semiconcealed mobile. All are phytophages, detritophages, or mycetophages, and live under conditions of an unlimited food supply. Pupae belong to the dormant type and are found in a hard substrate in a brood chamber, and are characterized by corresponding morphological characters. The imagoes also exhibit two modes of life—those with weak flight (majority of species) and nonflying ones (apterous). The moths usually remain near the site of their metamorphosis and have a short life span.

All the moths of this type, on the basis of the mode of life of larvae, can be divided into two subtypes—those developing in decomposing wood and polyporous fungi or the scardioid subtype (including all members of Scardiinae and a large number of Nemapogoninae), and those living in forest litter or the myrmecozeloid type, including all members of Myrmecozelinae (Zagulyaev, 1972b).

Myrmecozeloid subtype. Larvae live either a concealed or semiconcealed mobile type of existence, and on the basis of feeding habits are either grass or steppe detritophages. They live in silken tunnels located in grass stands and in litter and many construct ventilation tubes. They pupate in the widening of the ventilation passage near the surface. The moths (mostly males) are active in the morning and at sunset. Species with apterous females are known. Eggs are of the scattered variety. Larvae emerging from the eggs may remain without food for a few days, and in several species are passively carried in their silken threads by the wind.

The steppes produce a large quantity of food reserves (grass detritus) and hence female moths require neither prolonged flight nor longevity to search for a nutrient substrate for their progeny. This is probably one of the reasons for the apterous characteristic of females of certain species. On the other hand, in semideserts and deserts nutrient substrata are located in isolated centers and females on becoming airborne may be carried by their wings away from the site of emergence and thus die without progeny. Possibly, this is another reason why the wings in females of some desert species have been reduced (*Pararhodobates* Pet.).

It is interesting to note that the poor mobility of females and, correlatively, the rarity of their collection by lepidopterists have resulted in a situation whereby females of most species of Myrmecozelinae are not known to specialists.

The egg cover of silken fluff, the existence of larvae in deep soil layers, and the activity of moths in early morning and evening hours protect them from direct sun rays and the drying effect of air. These facts, as well as the low mobility of females and dispersal of 1st-instar 60 larvae, are of considerable biological significance. Adaptation to life in arid landscapes has facilitated a widespread distribution of Myrmecozelinae over the steppes and semideserts of the Palearctic and tropical savannas.

The above peculiarities as well as apterous females of some species, ovipositing of a large number of eggs, and the specificity of behavior of 1st-instar larvae reveal that the apterous state can develop in groups which are trophically poorly specialized, and is followed by several significant biological changes. These facts correspond to the general principles laid down by Gilyarov (1966) concerning the changeover from dispersal of the imago to the larva and the compensatory increase in fertility of the females, and also provide additional data regarding the evolutionary trend toward the development of an apterous condition.

* * * * *

In summary it should be noted that the food specialization of larvae was the primary phenomenon in the evolution of modes of life. Food specialization as well as the peculiarities of flight of the imago determine the biological type to a great extent. The preimaginal phases in Myrmecozelinae are closely associated with the floor of the steppes, and the imagoes, which are steppe meso-xerophils with poor flight like members of Scardiinae, exhibit a primitive mode of life and are close to the ancestral types of the family. This assumption is further supported by the entire complex of their primitive morphological characters.

One may also hypothesize that the evolution of moths of this family proceeded in several directions and was primarily associated with the movement of their ancestors away from humid forests, which would have been simultaneously accompanied by a series of adaptive changes and different degrees of specialization. The changeover of the group of moth ancestors to steppe detritophagy with the movement of the larvae into the steppe floor led to the isolation of Myrmecozelinae.

The biological type examined here is one of the most generalized ancient types of lepidopterans and includes the most primitive members of family Tineidae. The subtypes identified here reflect one of the lines in the evolution of these moths.

GEOGRAPHIC DISTRIBUTION

Information concerning the distribution of species of Myrmecozelinae is very scanty. In published literature only isolated indications are available, which usually do not present the general picture of distribution of the group of moths examined, nor the number of species in genera in a given territory. Hence in preparing this section, in addition to data from literature I have also used the extensive collection available in various museums (see Preface).

The subfamily Myrmecozelinae in its broadest sense at present includes about 450 species of world fauna, of which about three-fourths live in non-Arctic regions, with Ethiopia the richest area.

Information on the distribution of individual moth species in the Palearctic has been given in publications and catalogues on the fauna of Lepidoptera per se (Staudinger and Rebel, 1901; Spuler, 1910; Petersen, 1957a, 1957b, 1963b, 1965a; Zagulyaev, 1964b, 1965, 1966a; Krogerus et al., 1971). Among regional publications, interesting information is provided by Pierce and Metcalfe (1935) for England; Hrubý (1964) for Czechoslovakia; Capuse (1968) for Rumania; Klimesch (1968) for Yugoslavia; Parenti (1962, 1965, 1966) for Italy; Amsel 61 (1951a, 1951b) for Sardinia and Morocco; Petersen (1959a, 1959b, 1963c, 1964a) for Iran and Afghanistan; Issiki (1957) and Okano (1959) for Japan; and so forth. My own studies of moth fauna are also included, in particular those of Moldavia (Zagulyaev, 1971d), Caucasus and Trans-Caucasus (1968b, 1971c), Mongolia (1972a), and others.

The sources of literature and composition and analysis of fauna of Myrmecozelinae for individual non-Palearctic regions are given in the discussion of each.[2] Here it should be noted that the non-Palearctic fauna of moths — steppe detritophages — has been studied rather inadequately, and their generic composition insufficiently explained. However, these data are essential for a comparison withthe Palearctic fauna and for establishing relations between the two groups. The tentative area of distribution of genera and all five tribes are presented in Figures 27 to 30.

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[2] The major zoogeographic division of the world and the Palearctic is based on the scheme accepted in *Physio-Geographic Atlas of the World, 1964.*

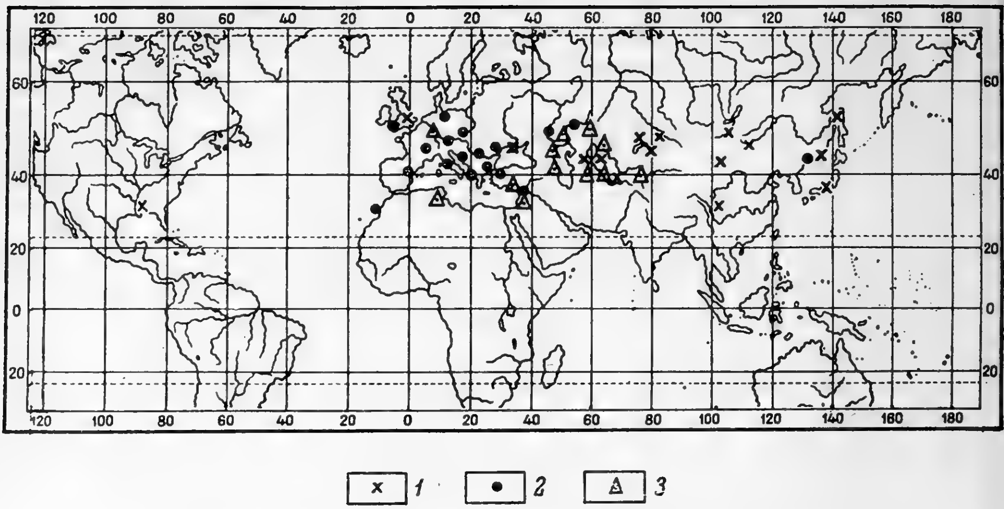


Figure 27. Area of distribution of genera from tribe Cephimallotini Zag.

1 — *Cephitinae* Zag.; 2 — *Cephimallota* Brud.; 3 — *Anemallota* Zag.

Holarctic region. Of all the zoogeographic regions, the fauna of Myrmecozelinae from the Holarctic, especially from the Old World — the Palearctic — has been studied best. At present 115 species of moths of 22 genera are known from this region, including 107 species and 10 genera which are endemic. The moth fauna from the Palearctic is examined in greater detail, since my studies mainly concern the fauna of the Soviet Union and adjacent countries. The approximate areas of distribution of the genera and tribes of the subfamily known from the Palearctic are shown in Figures 27 to 30.

In the Myrmecozelinae fauna from the Palearctic 113 species of 20 genera are known, of which 105 species and 9 genera are endemic to this region; the remaining four genera are represented by one species each. On the basis of number of species the Palearctic fauna is less than half of the Ethiopian region, but twice greater than the Indo-Malayan or Australian faunas.

The development of larvae of Myrmecozelinae in grass detritus and their association primarily with forestless areas determined the distribution of these moths in the territory under discussion.

62 The distribution of moths in the subregions and provinces of the Palearctic is shown in Table 1, from which it can be seen that the Mediterranean subregion has the richest fauna of Myrmecozelinae in the Palearctic.

Mediterranean subregion. The fauna includes 97 species of 19

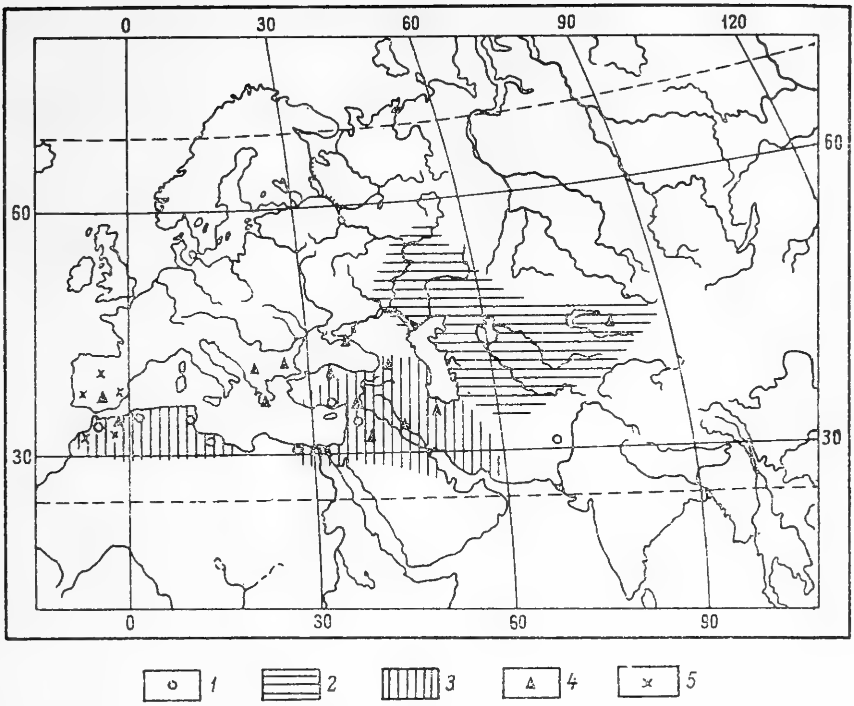


Figure 28. Area of distribution of tribe Rhodobatini Zag.

1—*Pachyarthra* Ams; 2—*Pararhodobates* Pet.; 3—*Rhodobates* Rag.; 4—*Ceratuncus* Pet.; 5—*Reisserita* Ag.

genera, or 86.3% of the Palearctic species in the subfamily. More than half the species (81) and genera *Pachyarthra* Ams., *Reisserita* Ag., *Eremicola* Ams., and *Catabola* Durr. are endemic. Of all the provinces, the largest number of species is concentrated in the Mediterranean province. This province is distinguished not only by an abundance of members of Myrmecozelinae, but also by a notable species diversity. The fauna of this province includes 58 species of 11 genera, of which more than half the species (31) are endemic. However, the moths are distributed unevenly and found in greatest numbers in the western part of the Mediterranean province. Thus 24 of the 31 endemic species of Myrmecozelinae are known almost solely from the Iberian Peninsula, southern France, and northwestern Africa. The presence of a large number of endemics indicates that in this area of the province over a long period of time the unique, moderately xerophilous moths became established. It is also interesting to note that species of certain genera are distributed differently between the western and eastern regions.

TABLE 1. DISTRIBUTION OF SPECIES OF MYRMECOZELINAE IN

	Circumboreal subregion			Mediterranean subregion			
	Provinces			Provinces			
Genera	European forests	European-Siberian taiga	Total	Sahara-Arabian	Mediterranean	Iran-Turanian	Total
Cephitinea Zag.	1 (0)	1 (0)	2 (0)	—	—	2 (0)	2 (0)
Cephimallota Brud.	1 (0)	—	1 (0)	1 (0)	2 (0)	—	2 (0)
Anemallota Zag.	1 (0)	—	1 (0)	1 (0)	3 (1)	3 (1)	4 (2)
Pararhodobates Pet.	1 (0)	—	1 (0)	1 (0)	—	1 (0)	1 (0)
Rhodobates Rag.	—	—	—	4 (2)	4 (3)	1 (0)	6 (6)
Ceratuncus Pet.	1 (0)	—	1 (0)	1 (0)	4 (2)	1 (0)	4 (2)
Pachyarthra Ams.	—	—	—	3 (0)	3 (0)	1 (1)	4 (4)
Reisserita Ag.	—	—	—	—	6 (6)	—	6 (6)
Ateliotun Zll.	2 (0)	—	2 (0)	2 (1)	5 (3)	3 (1)	8 (7)
Eremicola Ams.	—	—	—	1 (1)	—	—	1 (1)
Episcardia Rag.	—	—	—	2 (0)	2 (0)	6 (5)	8 (6)
Catabola Durr.	—	—	—	5 (2)	9 (6)	7 (5)	16 (16)
Perissomastix War. and Roth.	—	—	—	2 (2)	—	—	2 (2)
Myrmecozela Zll.	2 (1)	—	2 (1)	4 (2)	16 (10)	5 (2)	24 (22)
Cinnerethica Ams.	—	—	—	1 (0)	—	—	1 (0)
Hapsifera Zll.	1 (0)	—	1 (0)	4 (1)	4 (1)	2 (0)	5 (5)
Hypophrictis Meyr.	—	—	—	—	—	—	—
Latypica Meyr.	—	—	—	1 (1)	—	—	1 (1)
Ptilopsaltis Meyr.	—	—	—	1 (1)	—	—	1 (1)
Titaenoses Hint. and Bradl.	—	—	—	1 (0)	—	—	1 (0)
Total number of species	10 (1)	1 (0)	11 (1)	35 (13)	58 (31)	32 (15)	97 (81)
Percentage of endemic species	10	0	9	37.1	53.4	46.8	83.5

Note: Figures before parentheses indicate the number of species found in a given region; figures in

SUBREGIONS AND PROVINCES OF THE PALEARCTIC REGION

Central Asian subregion				Chinese-Himalayan subregion				
Provinces				Provinces				
Alpine-Asian	Gobi-Kashgar	Kazakhstan-Mongolian	Total	Chinese-Korean	Japan-Central China	Total	Total in Palearctic	Total in world
—	1 (0)	2 (0)	2 (0)	1 (0)	1 (0)	1 (0)	3 (3)	4
—	—	2 (1)	2 (1)	1 (1)	—	1 (1)	4 (4)	4
—	—	1 (0)	1 (0)	—	—	—	4 (4)	4
1 (0)	1 (0)	1 (0)	1 (0)	—	—	—	1 (1)	1
—	—	—	—	—	—	—	6 (6)	9
—	—	3 (1)	3 (1)	—	—	—	5 (5)	5
—	—	—	—	—	—	—	4 (4)	4
—	—	—	—	—	—	—	6 (6)	6
—	—	1 (0)	1 (0)	—	—	—	8 (7)	11
—	—	—	—	—	—	—	1 (1)	1
—	—	—	—	—	—	—	8 (6)	39
—	—	—	—	—	—	—	16 (16)	16
—	—	—	—	—	—	—	2 (2)	51
2 (1)	1 (1)	5 (4)	8 (6)	—	1 (1)	1 (1)	32 (30)	48
—	1 (0)	—	1 (0)	—	—	—	1 (1)	1
—	—	—	—	1 (0)	1 (0)	1 (1)	8 (8)	42
—	—	—	—	—	1 (1)	1 (1)	1 (0)	12
—	—	—	—	—	—	—	1 (1)	4
—	—	—	—	—	—	—	1 (0)	1
—	—	—	—	—	—	—	1 (0)	1
3 (1)	4 (1)	15 (6)	19 (8)	3 (1)	4 (2)	5 (4)	113 (105)	264
33.3	25	40	42.1	33.3	50	80	92.92	

parentheses indicate the number of endemic species.

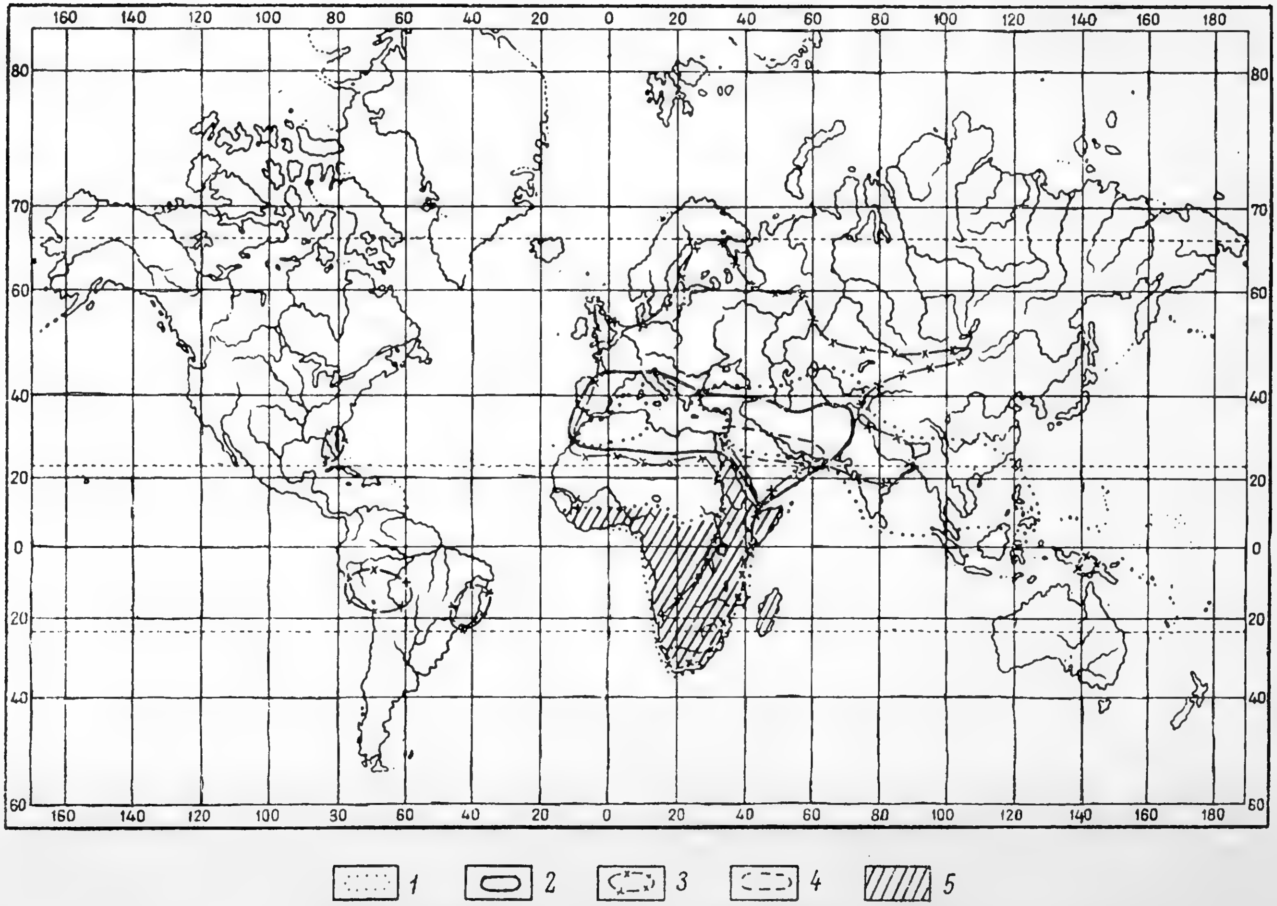
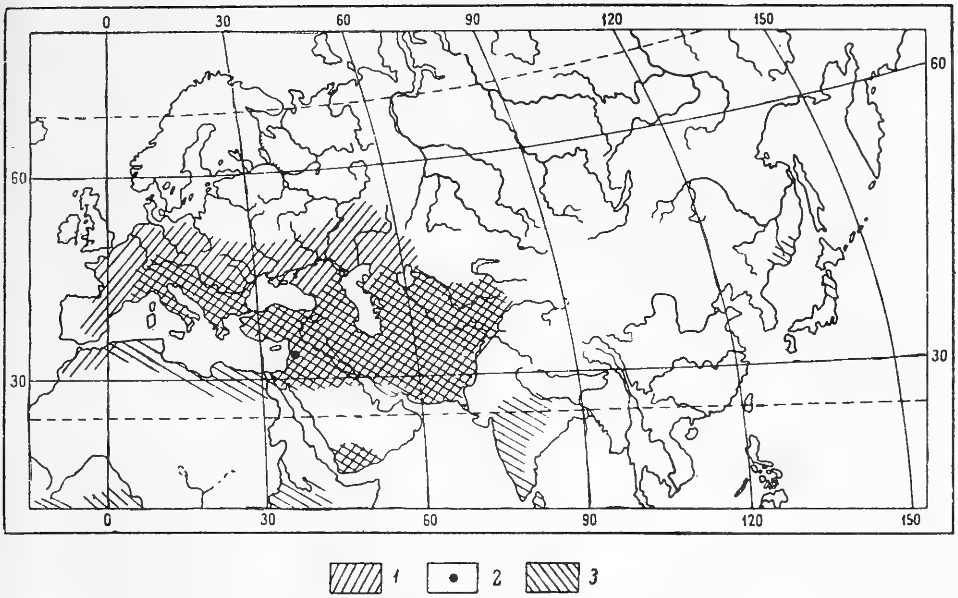


Figure 29. Areas of distribution of genera of tribe Myrmecozelini Zag.

1—*Episcardia* Rag.; 2—*Catabola* Durr.; 3—*Myrmecozela* Zll.; 4—*Cinnerethica* Ams.; 5—*Perissomastix* War. and Roth.



65 Figure 30. Areas of distribution of genera of tribe Ateliotini Zag.

1—*Ateliotum* Zll.; 2—*Eremicola* Ams., *Hapsiferini* Zag.; 3—*Hapsifera* Zll.

Thus from genus *Myrmecozela* Zll. (tribe Myrmecozelini Zag.) in the western region nine species are known, and in the eastern region (Balkans and Asia Minor) one species: the number of species of these two regions of *Catabola* Durr. five and one respectively. This attests to 65 intensive radiation of individual branches of terrestrial genera due to the diverse conditions persisting in the Iberian Peninsula and Atlas mountains.

Another small center of species formation in the tribe Myrmecozelini Zag. has been found in the uplands of Trans-Caucasus (Zagulyaev, 1968b, 1971c). Here in areas of grassy xerophytic vegetation four endemic species of genus *Myrmecozela* Zll. have been found. Species formation of moths—steppe detritophages—in this region was probably caused to a great extent by variations in the natural conditions favorable for the development of Myrmecozelini Zag. in particular. Here it is important to realize that several typical species of the hilly-xerophytic landscapes of Armenia and Nakhichevan plateau (for example, from Hapsiferini Zag.) are basically close to members of the fauna of Asia Minor, especially Northwest Asia, whereas in Dagestan in northern Azerbaidzhan, among members of Myrmecozelini Zag. species close to members of the fauna of the eastern European steppe and Kazakhstan predominate, i.e., the latter group of moths occupy the

Black Sea-Kazakhstan type of range according to Arnol'di (1969), and only certain species occupy the Iranian type of range.

It is known that many insects penetrated eastern Trans-Caucasus along the forestless shore of the Capsian Sea, valleys of Kur', Araks, and other rivers during the period of onset of glaciation, when the periglacial steppes of southeastern Europe adjoined the Caucasus (Ryabov, 1958; Isakov et al., 1966). Steppe-dwelling members of Tineidae probably also penetrated through this route. Here in the relatively close alpine-steppe and semidesert habitats with an abundance of sod grasses and wormwood, those species genetically close to the European steppe species evolved. Hence one may assume that the center of speciation of Myrmecozelinae in Trans-Caucasus is relatively young.

66 In the Mediterranean province the genera *Myrmecozela* Zll. (16 of 24 species known for the subregion) and *Catabola* Durr. (9 of 16 species) predominate (both genera in the tribe Myrmecozelini Zag.). Nonendemic species (27) in 11 genera from all the five known tribes of the subfamily are also common here. Most of them are widely distributed in other provinces.

The Myrmecozelinae fauna from the Iran-Turanian province, especially the southeastern regions, has not been studied well. In terms of abundance of species (32) its moth fauna is half that of the Mediterranean. All the species belong to 11 genera in 5 tribes and are mostly xerophilous and capable of tolerating prolonged droughts. Many of the 15 known endemic species in 6 genera (*Anemallota* Zag., *Ceratuncus* Pet., *Ateliotum* Zll., *Episcardia* Rag., *Catabola* Durr., *Myrmecozela* Zll.) are closely related to species from the most arid regions of the Mediterranean. In addition to this complex, the fauna of this province consists of 10 widely distributed species which have also mainly penetrated from the eastern Mediterranean; five species from genera *Cephitinea* Zag., *Anemallota* Zag., *Pararhodobates* Pet., *Ateliotum* Zll., and *Myrmecozela* Zll. are known from the fauna of the Kazakhstan-Mongolian Province, and only one species (*Cephitinea colonella* Ersch.) from Kazakhstan and Central Asia is widely distributed in central Mongolia and China. In the southern region of the province some primitive members of genera represented in large numbers in the Ethiopian fauna are known (*Rhodobates* Rag., *Ateliotum* Zll., *Episcardia* Rag., *Myrmecozela* Zll., *Hapsifera* Zll.), which bespeaks the strong influence of the eastern African fauna on the fauna of this region. Moreover, the last three genera have some relation with the Indian fauna. In this respect the genus *Episcardia* Rag. is particularly interesting. The area of its distribution in addition to the Iran-Turanian province (6 species), also includes eastern Africa (14 species) and India (5 species). This is the most primitive genus in the tribe Myrmecozelini

Zag., and is close to the archaic genera *Hyperbola* Gozm. (eastern Africa), *Harmaclona* Busck, and *Tinissa* Walk. (Southeast Asia); the last two genera are distributed almost up to the border of [west] Pakistan and therefore their location within the limits of the Palearctic is possible.

In the faunal composition of Myrmecozelinae of this province, in addition to local elements, members of the eastern Mediterranean fauna and species from the Kazakhstan-Mongolian province are also known. In the elements of the Iran-Turanian fauna, in addition to endemic species, those members can also be included whose primary center of speciation is probably located in southwest Iran, from where they penetrated Central Asia and Kazakhstan. Such species belong to the primitive genera *Cephitinea* Zag. and *Anemallota* Zag. of the most archaic tribe, Cephimallotini Zag.

An important role in the formation of the Iran-Turanian fauna has also been played by the Mediterranean branch of Myrmecozelinae, as this fauna includes genera and species common to the Mediterranean region, or genera closely related to forms in the Mediterranean region. Thus the existence of small centers of species concentration, including endemic species from almost all tribes of the subfamily, permit one to assume that one of the centers of formation of this subfamily was located in the hilly region of the province. It should be noted that this fauna, especially in the extreme south and southeast, was highly influenced by the fauna of India and eastern Africa, and relations in the case of three genera are distinct. Central Asia is probably the northern boundary of the area of distribution of tropical members. It can be assumed that the establishment of the moth fauna of the territory under
67 consideration paralleled the formation of the meso-xerophilous communities, i.e., probably in the same manner known for other groups of insects, which has been thoroughly analyzed by Kryzhanovskii (1965).

The fauna of Myrmecozelinae from the Sahara-Arabian province has been poorly studied, especially for the southern regions, and is much smaller in volume that the Mediterranean fauna. At present 35 species in 17 genera are known in this fauna, and 13 species in 9 genera are endemic to this territory. A characteristic peculiarity of the fauna of this province is the predominance of groups including xerophilous forms. A relation with the fauna of the Mediterranean province can be seen in the case of eight genera, in which only four species from three genera are common to the western region: *Rhodobates algiricellus* Rbl., *Catabola biskraella* Rbl., *Myrmecozela lambessella* Rbl., and *M. diacona* Wlsm. Ten species from all eight genera are common to the eastern region. It is interesting to note the fairly close relation between Myrmecozelinae from the Sahara-Arabian province and the Ethiopian moth fauna, especially with the eastern and south African faunas. This association is distinct in nine genera from all the five tribes. Five genera (*Rhodobates* Rad., *Ateliotum* Zll., *Episcardia* Rag., *Myrmecozela* Zll., and *Hapsifera* Zll.) common to the faunas of the Sahara-Arabian and Iran-Turanian provinces are also commonly found in other subregions of the Palearctic. The existence of endemic members of such Eastern African genera as *Perissomastix* War. and Roth., *Latypica* Meyr., *Ptilopsaltis* Meyr., and *Titaenoses* Hint. and Bradl. in this province shows that the center of xerophilous fauna, genetically related to eastern and south African faunas, exists in the arid regions of northern Africa and western Arabia. The group of species of these genera is distributed in territory occupied by subtropical and tropical deserts and does not penetrate other regions of the Palearctic.

It should be noted that for many tropical species this province is the northern boundary of the area of distribution. The data presented here permit one to conclude that a specific xerophilous fauna of moths, with a small northern African-Arabian center of speciation, evolved in the territory of the Sahara-Arabian province.

Summarizing the studies of the fauna of Myrmecozelinae from the Mediterranean subregion, it should be noted that it primarily consists of moderately xerophilous species, which are related to steppe vegetation and ephemerals. The existence of several concentrations of endemic species here suggests the existence of ancient centers of species formation of many branches of Myrmecozelinae. At the same time some of the members of the fauna of this subfamily in the Sahara-Arabian province are close to the fauna of eastern and southern Africa. A part of the fauna from the southeastern areas of the subregions (Iran-Turanian province) came under the strong influence of Indian and east African faunas. Thus the present fauna of Myrmecozelinae in the Mediterranean subregion developed from fauna of the ancient Mediterranean region, which was greatly influenced by the fauna of eastern and southern Africa, and in the southeastern regions also influenced by the Indian fauna. In this case the Afro-Arabian-Mediterranean region and Central Asia are the northern boundaries of the areas of distribution of many tropical xerophilous and xero-mesophilous species. It should also be noted that several species associated with the Mediterranean have penetrated northern Europe or through Kazakhstan into eastern Siberia, Mongolia, and southern Primor'e.

Circumboreal subregion. The moth fauna (within the limits of the Palearctic) includes only 11 species in 8 genera, including one endemic 68 species. The major part of the species (10) is known from the European forest province. Most of the species belong to genera which are amply represented in the Mediterranean; individual species have penetrated northward up to the Baltic region (*Cephimallota simplicella* H.-S.) or the southern regions of Scandinavia (*Myrmecozela ochraceella* Tgstr.). These species are associated with warm open spaces and their movement northward took place along glades, meadows, river banks, burnt areas, and areas abundantly covered with grasses and wormwood.

Among the moth fauna from the European-Siberian taiga province, to date only one species is known—*Cephitinea colonella* Ersch.—which has been found in the steppe oak groves of Primor'e (lower reaches of Amur).

An analysis of the Myrmecozelinae fauna from this subregion within the limits of the Palearctic reveals that in volume it comprises one-tenth of the Palearctic species of the subfamily. The species are found predominantly in forestless spaces and distributed in the south European-Kazakhstan areas. Formation of this fauna took place under the notable influence of Mediterranean fauna, the influence diminishing perceptibly in an easterly direction. Penetration of Mediterranean elements, especially into the European forest province, took place along the forest-steppe and steppe in the postglacial period.

The influence of the Central Asian fauna and especially the Kazakhstan-Mongolian fauna on the fauna of this subregion is quite insignificant and seen mainly through a series of species from very widely distributed genera (*Ateliotum hungaricellam* Zll., *Pararhodobates syriacus* Led., etc.) and is most distinct in the southern regions.

Central Asian subregion. The moth fauna of this subregion includes 19 species of 8 genera, of which 8 species are endemic. Almost all the species belong to genera abundantly represented in the Mediterranean, especially in its eastern part. It should also be noted that the area of distribution of *Cinnerethica* Ams. does not extend beyond the limits of the Mediterranean and Central Asian subregions. Of all the provinces, the richest moth fauna (15 species in 7 genera) is present in the Kazakhstan-Mongolian province. Many species are distributed throughout the territory from Hungary to Trans-Baikal, and *Cephitinea colonella* Ersch. has penetrated up to Ulan-Bator (Mongolia), i.e., it has a transzonal steppe or Pannonian-Kazakhstan range, according to Arnol'di (1969). Five species (of which four are endemic) of the genus *Myrmecozela* Zll. (tribe Myrmecozelini Zag.), and two more endemics are known: *Cephimallota hasarorum* Zag. (Cephimallotini Zag.) and *Ceratuncus dzhungaricus* (Rhodobatini Zag.). Interestingly, many species of these genera, especially *Myrmecozela* Zll., are abundantly represented in the Mediterranean region and form small secondary centers of species formation in the southern areas of the European part of the USSR (including plains of eastern Caucasus) and in the western Kazakhstan steppes. Steppe species of this subfamily, which have penetrated Western Europe, are genetically related to the fauna of southern Russian steppes. Furthermore, some species of genera *Anemallota* Zag., *Ateliotum* Zll., etc., characteristic for the entire belt of dry steppes, partly moved out of their area of distribution into the desert steppes of the Iran-Turanian province, where they are found in dry river beds and lowlands, but do not penetrate deserts, i.e., the distribution of these species is confined to the south European-Kazakhstan area of distribution.

Information on the Myrmecozelinae fauna of the mountains of the Asian province is very scanty, especially for the Tibetan fauna, and mostly concerns the western part of the province. Only three species are known from this territory: *Pararhodobates syriacus* Led., *Myrmecozela dzhungarica* Zag., and *M. mongolica* Pet. Four species are known from 69 Gibi-Kashgar province: *Cephitinea colonella* Ersch., *Pararhodobates syriacus*, Led., *Myrmecozela saule* Zag., and *Cinnerethica optodes* Meyr.

An analysis of the information available on the Myrmecozelinae fauna from the Central Asian subregions reveals that this fauna has been poorly studied, and at present constitutes about one-sixth of the Palearctic species of this subfamily in size. In composition the fauna is heterogeneous and can be divided into two groups. The first displays a close relation to the Mediterranean fauna—species of *Ceratuncus* Pet. of the tribe Rhodobatini Zag. and *Ateliotum* Zll. of the Ateliotini Zag. The second is genetically close to the Iran-Turanian center and includes members of genera *Cephitinea* Zag. and *Anemallota* Zag. of the tribe Cephimallotini Zag. It is known that in the Late Paleogene (Middle and Upper Oligocene) in Kazakhstan, Central Asia, and some other regions, plant formations existed which were close to subtropical sparse forests and savannas (Kryzhanovskii, 1965). Deterioration in climate at the end of the Pliocene, although it was not as lethal for the fauna here as in Central Asia, nevertheless caused adaptations, primarily of Myrmecozelinae and Tineinae, to more severe conditions. The small size of the Myrmecozelinae fauna in the montane Asian and Gibi-Kashgar provinces with notable variation in natural conditions, is primarily explained by the poor level of study of the territories under discussion. It is expected that future studies of these montane regions will lead to the discovery of endemic moths as well as centers of autochthonous formations. It is known that this hilly country has existed for a long time (beginning of the Tertiary period) and hence one has to assume development of an endemic Myrmecozelinae fauna here.

Chinese-Himalayan subregion. To date five species of Myrmecozelinae (including four endemic) are known here from five genera. Most probably these figures reflect not the poor status of the fauna of this subregion, but insufficient study. Most information relates to southern Primor'e and Japan. The largest number of moth species is shared by the Japan-central Chinese province. From this territory four species of four genera are known; species *Cephitinea colonella* Ersch. and *Hapsifera barbata* Chr. are common to the Primor'e province, and one species is endemic to Japan from the universally distributed genus *Myrmecozela* Zll. In addition, one species has been found in Japan which belongs to the Paleotrophic genus *Hypophrictis* Meyr. The greater majority of species (12) live within the limits of the Indo-Malayan region. These data indicate relations between the Myrmecozelinae faunas of this region and the non-Palearctic regions of Indochina.

In the moth fauna from the Chinese-Korean province only three species are known at present. For example, *Cephitinea colonella* Ersch., found in Primor'e as mentioned above, is distributed in Central Asia and Kazakhstan, from where it probably penetrated the Trans-Baikal steppes. The second species—*Cephimallota chasanica* Zag.—is endemic for this territory, while the third—*Hapsifera barbata* Chr.—has moved out of the limits of the province and is found in southern Japan.

Members of Myrmecozelinae are not known in the Tineidae fauna from the Himalayan-Yunnan province, in spite of diverse natural conditions.

An analysis of the data on the Myrmecozelinae fauna of this subregion reveals that geographically, it consists of different elements. More than half of the species are morphologically close to the Kazakhstan-Central Asian region, which indicates a common origin and more intimate relation between these regions in the past. The 70 occurrence of members of Mediterranean fauna in Primor'e should probably be placed in the Upper Miocene. Subsequent cooling led to the migration or death of warm adapted forms from Siberia, thereby causing a break in the continuous ancient area of distribution and isolation of its eastern part, where members of tribes Cephimallotini Zag. and Hapsiferini Zag. are distributed. Such a division is also known in many other groups of insects. Other species belong to genera genetically related to the moth fauna of Southeast Asia are Paleotropic in distribution.

Presumably further studies on the moth fauna of the Chinese-Himalayan subregion will reveal more precisely the total number of species in this territory, and no doubt widen the areas of distribution of the already known centers while discovering primary centers of speciation.

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Myrmecozelinae of the Soviet Union comprise 36 species in 10 genera or about one-third of the moth species known from the Palearctic. The peculiarity of their distribution was assessed during an analysis of the moth fauna from the Palearctic. Hence I shall discuss here only the faunal diversity of species and genera of such large regions as the European part of the USSR, the Caucasus and Trans-Caucasus, Kazakhstan and Central Asia, and the Far East (southern regions) (Figures 27 to 30).

In the European part of the USSR (excluding Caucasus) 12 species in 6 genera are known. Basically the moth fauna consists of species genetically related to Mediterranean fauna. In the southern Ukraine and the steppes of the Don species of genus *Myrmecozela* Zll. form a small secondary center of speciation.

The fauna of the Caucasus and Trans-Caucasus includes 19 species in 6 genera. The uniqueness of the fauna of this region is apparent not only in the significant endemism (7 species), but also in the heterogeneity of faunal links. Formation of individual groups of moths as well as faunal relations have been detailed above.

The fauna of Kazakhstan and Central Asia comprises 19 species in 9 genera. Xerophilous species characteristic of the Iran-Turanian province form the base of this fauna. Species of Pannonian-Kazakhstan distribution are found in northern Kazakhstan. Faunal relations in Kazakhstan and Central Asia have been detailed in my analysis of the Kazakhstan-Mongolian and Iran-Turanian provinces.

In the southern part of the Far East (mainly Primor'e), only three species of moths (steppe detritophages) in three genera have been discovered to date: *Cephitinea colonella* Ersch., *Cephimallota chasanica* Zag., and *Hapsifera barbata* Chr. These species are genetically related to the fauna of Kazakhstan and Central Asia.

A comparison of the quantitative data available for large regions in the USSR reveal considerable heterogeneity in the distribution of moths throughout the country and their concentration in individual natural zones. The largest number of species and genera is known from the Caucasus and Trans-Caucasus—50% of the species and 60% of the genera of Myrmecozelinae fauna of the USSR. The fauna of Kazakhstan and Central Asia comprises 47.2 and 90.0% respectively, while the faunas of other regions contain a lesser number of species and genera: European part of the USSR—33.3 and 60.0%, and in the southern part of the Far East—8.3 and 30.0%. If the abundance of forms depending on the area and variability of natural zones is compared, maximum density of species, variability of genera, and number of endemics are greatest in the Caucasus and Trans-Caucasus.

Western American and eastern American subregions. In North

71 America only three endemic species are known to date: two belong to the monotypic genus *Dorata* Meyr. and were described from the state of New Mexico (Meyrick, 1928c), and the other to the widely distributed genus *Myrmecozela* Zll. (Meyrick, 1919) detected in Florida. The reliability of these species identifications was recently confirmed by Clarke (1970). The third species was discovered in Texas and described by me under the genus *Cephitinea* Zag. (Zagulyaev, 1964b). Such an unusually poor representation of Myrmecozelinae over a large and fairly variable territory in terms of landscape and vegetation attests to the lack of study in this region.

Ethiopian region. The earliest mention of moths in this region, including those of Myrmecozelinae, occur in the notes of Stainton (1860), Walker (1863, 1864), and Walsingham (1881); many species from this area were described by Meyrick (1906, 1908, 1909, 1921). In recent years a large-scale study of Tineidae was initiated in this region with the reexamination of earlier described species and the identification of new ones. Of notable interest are the studies of Viette (1954), Gozmàny (1965b, 1966, 1967, 1968, 1969, 1970), and Gozmàny and Vàri (1973). Variation in the ecological conditions within the limits of the Ethiopian region has resulted in a significant differentiation in fauna. Many genera constitute endemic suprageneric groups, mainly in tropical areas, which are comparable to tribes. Their morphological characters completely conform to the present-day identification of subfamily Myrmecozelinae. Gozmàny (1968) and Gozmàny and Vàri (1973) have separated several groups from the subfamily and given them the status of independent subfamilies, i.e., Siloscinae Gozm., Perissomasticinae Gozm., etc. However, the diagnosis of these new subfamilies is based on characters of a level lower than that accepted for subfamilies of Tineidae, and biologically they do not differ from Myrmecozelinae; hence I have retained them in subfamily Myrmecozelinae.

An analysis of the material available revealed that at present 295 species of 54 genera are known from the Ethiopian region (of these 279 species of 39 genera are endemic). The total number of species of this region is three times larger than that of the Palearctic.

East African subregion. The fauna of Myrmecozelinae is rich in species—184 species of 36 genera—of which 104 species and 5 genera—*Dinika* Gozm., *Hoplocentra* Gozm., *Zygosignata* Gozm., *Endromarmata* Gozm., and *Syngeneta* Gozm.—are endemic to this subregion. The last four genera are presently monotypic. Some genera such as *Perissomastix* War. and Roth. and *Latypica* Meyr. have retained relations with the Mediterranean fauna; genera *Episcardia* Rag. and *Hapsifera* Zll. have additionally retained relations with Central Asian and Indian fauna; *Dasyses* Durr. is associated only with Indian forms. In this respect the distribution of species of *Episcardia*

Rag. is noteworthy; they are known from the Palearctic (Mediterranean and Central Asia), Indo-Malayan (Darjeeling and Deccan plateau), and the continent of Africa, including eastern Africa, and almost half of all these species (14 of 35) have been found in the latter. On the basis of the foregoing one may assume that eastern Africa is one of the regions in which this genus established itself. Possibly the dispersal of members of *Episcardia* Rag. from eastern Africa occurred firstly through Arabia into the Mediterranean region and Central Asia, and secondly into India.

It is rather interesting that a small group of Indian genera, phylogenetically close to genera of moths from the Malayan subregion (*Machaeropteris* Wlsm., *Alavona* Walk.), is also represented in the east African subregion. These data provide a basis for assuming that ele-
72 ments of the Indian fauna in turn, over a long period of time, may have penetrated the east African subregion and given rise to an endemic group of species.

A high degree of affinity between the fauna and flora of Africa and the Indo-Malayan region has been reported in literature as arising from a mutual exchange of species (Campbell, 1948; Darlington, 1966). With such an exchange, transitional zones ought necessarily to form at the boundaries of these geographic regions (Darlington, 1966). One genuine transitional zone Darlington thinks exists between Africa and India and occurs in Arabia and its adjacent boundary with Southwest Asia. This assumption fully accords with my views on the spread of species of Myrmecozelinae.

West African subregion. In spite of abundant humid tropical forests the moth fauna here is quite rich in species of Myrmecozelinae, which are associated with uplands covered by the grassy vegetation of savannas. Of the 105 species of moths of this subregion, 41 are endemic. Endemic genera are relatively few; of the 26 known, only 3 are endemic monotypic genera and have been found so far in a limited territory: *Semeoloncha* Gozm. from Sierra Leone, *Histiovalva* Gozm. from Guinea, and *Cataxipha* Gozm. from Cameroon. Two other genera are monotypic—*Phalloscardia* Gozm. and *Drosica* Walk.—but they have a wider distribution and are also known in the east African subregion. The faunal link between moths of these subregions is fairly significant and can be seen in 22 other genera, of which 9 are characteristic only for both territories. The link with south African fauna can be traced through 14 widely distributed genera.

South African subregion. In the fauna of this subregion 88 moth species are known from 31 genera, of which 58 species and 9 genera are endemic. On the basis of the large percentage (65.9) of endemic species concentrated in a relatively small area, this subregion far exceeds other subregions; this fact is associated with the variability of the landscape of the southern part of the African mainland and with the geological history of this region.

The endemic suprageneric groups, small in volume, are scattered in different areas of the subregion. Such monotypic genera as *Acanthocheira* Gozm., *Phyciodyta* Meyr., *Dicanica* Meyr., *Ochetoxena* Meyr., *Probatostola* Meyr., and *Propachyarthra* Gozm. form one related endemic group, which is associated with the litter of sparse, dry, subtropical rough-leaved forests and shrubs. Other elements of this group have been found in the Karro semideserts and between short shrubs and acacia in Kalahari. In the southern part of the subregion (Cape region), in the zone of distribution of tree-shrub vegetation resembling the "maquis" of the Mediterranean zone, a complex of 7 genera is represented, including 15 endemic species (*Tracheloteina* Gozm.—4 species, *Ellochotis* Meyr.—5, *Scalidomia* Wlsm.—2, etc.), many of which moreover, have been found on plateaus in the savannas.

The faunal link between the moths of this subregion with those of the east African fauna can be traced through 20 rather widely distributed genera of the African mainland and other continents, for example: *Dasyses* Durr., *Episcardia* Rag., *Myrmecozela* Zll., *Hapsifera* Zll., *Hyperbola* Gozm., *Perissomastix* War. and Roth., etc.

Some ancient and primitive genera absent in the east African subregion are found in the south African region, and the most archaic
73 forms also represented in India and Australia (*Harmaclona* Busck), or only in Australia (*Mesopherna* Meyr.). The ancient and primitive genus *Tiquadra* Walk. is interesting since it links the fauna of the south African subregion with the fauna of South America.

Madagascar subregion. The island fauna of Myrmecozelinae has not been sufficiently studied. At present only 10 species of 8 genera are known, of which 8 species and the monotypic genera *Protagophleps* Viet. and *Callocosmeta* Gozm., *Ancystrocheira* Gozm., and *Chrysocrata* Gozm. are endemic to the subregion. The remaining four genera (*Theatrista* Meyr., *Perissomastix* War. and Roth., *Silosca* Gozm., and *Scalmatica* Meyr.) are widely distributed in the African continent.

In addition to the large number of endemic species, also noteworthy is the absence of many genera in Madagascar which are rich in species and widely distributed in east and southeast Africa, such as *Hyperbola* Gozm., *Hapsifera* Zll., *Dasyses* Durr., *Episcardia* Rag., etc. This indicates not only that the hurdle for their penetration appeared relatively a long time back, but also that members of these genera possibly reached the east African coasts after the formation of the Strait of Mozambique.

Indo-Malayan region. Information on the fauna of Tineidae, including Myrmecozelinae, of this region is contained in older works (Walker, 1863, 1864; Walsingham, 1887; Meyrick, 1894, 1908, 1916, 1917, 1931, 1937a, 1937; Fletcher, 1933) and more recent publications (Diakonoff, 1948, 1967; Clarke, 1970, 1971; Common, 1970). My studies on tropical moths from the collection of Karadki (Bucharest, Rumania) and D'yakonov (Leiden, Holland,) and from the islands of Somalia, Java, and Kalimantan (Borneo), made it possible to confirm the inclusion of most of the species identified by earlier authors in Myrmecozelinae, and provided data for describing new species and genera.

An analysis of the available information shows that at present 58 species of Myrmecozelinae in 12 genera are known from the Indo-Malayan region (Indochina and Malayan subregions). The majority of species (51) and two monotypic genera (*Graphicoptila* Meyr. and *Macrosaristic* Meyr.) are endemic to this region.

Indian-Indochina subregion. Two-thirds of the known species of nine genera from both subregions concentrate here, including 36 species found in the Indian province. A large number of endemic species (26) belong to many widely distributed genera, e.g., *Myrmecozela* Zll.—4 species, *Hapsifera* Zll.—4, *Machaeropteris* Wlsm.—10, and so on, which permits one to trace the fairly close faunal relations with other regions. The monotypic genus *Graphicoptila* Meyr. is known from this province, and has also been described from eastern India and Bihar. From the Indochina province, 11 species of 4 genera are known. Most of these species (9) belong to genera *Hypophrictis* Meyr. and *Episcardia* Rag., members of which are also known from the Palearctic, which indicates a relation between these two faunas.

Malayan subregion. Twenty species from 8 genera are known, of which 14 species are endemic. Of all the provinces, the largest number of species (12) has been found in Zondsk; the monotypic genus *Macrosaristis* Meyr. described from Java also belongs to this province. In the Philippine province seven species in three genera are known and genus *Episcardia* Rag. is represented by five endemic species, and *Hapsifera* Zll. by one species, while *Dasyses* Durr. includes one species widely
74 distributed throughout the region. Exactly five species are known from the Celebes province: *Episcardia* Rag.—one and *Machaeropteris* Wlsm.—four.

Australian region. Only a few species of Myrmecozelinae from Australia and the islands of this region were known until recently from the publications of Walker (1863) and Meyrick (1916, 1917). Clarke (1970, 1971) and Common (1970) have greatly enhanced this scanty information. Today 49 species in 12 genera are known from this region, of which 39 species and 8 genera (including 3 monotypic) are endemic to it. Most of the moths have been detected in the Australian subregion: 42 species in 8 genera, of which 40 species and 6 genera are endemic to this territory. Species known from the mainland have been found so far only in Torres province, the vegetation of which, aside from being of the savanna type, is also characterized by the development of sparse subtropical forests with elements of Paleotropic flora.

Papua subregion. In the fauna of Myrmecozelinae eight species have been found, of which six are endemic and belong to three widely distributed genera: *Harmaclona* Busck (one species from New Guinea and one from the Bismarck archipelago), *Myrmecozela* Zll. (one species from New Britain), and *Tinissa* Walk. (three species from New Guinea).

Polynesian subregion. Only two monotypic genera are known in the fauna of moths: *Amphisyncentris* Meyr. from Fiji Islands and *Petula* Clar., just recently described from Rapa Island (Clarke, 1971).

Neotropical region. Until recently almost nothing was known about the fauna of Myrmecozelinae from South America, except for brief descriptions of a few species by Walker and Meyrick. Considerable clarification about the composition of this fauna has been provided by Clarke (1970). Available data now reveal that 29 species of Myrmecozelinae in 10 genera are presently known from the Neotropic fauna. All the species and six genera (including four monotypic) are endemic to the region.

Guiana-Brazilian subregion. The fauna of Myrmecozelinae from this subregion is the richest and includes 23 species in 7 genera, of which 17 species from 3 genera—*Syncraternis* Meyr., *Hormantris* Meyr., and *Lithopsaestis* Meyr. (last two monotypic)—are endemic to this territory. The moths are distributed in different provinces as follows: Amazon province—10 species in 4 genera, including 3 species of *Myrmecozela* Zll., montane Brazilian province—8 species in 4 genera; sub-Andes province—3 species in 3 genera, including 1 species of *Myrmecozela* Zll. in each subregion; and the Central-American province—2 species of *Tiquadra* Walk.

Patagonian-Andes subregion. The moth fauna comprises six species of six genera, of which three species and the monotypic genus *Brachysimbola* Meyr. are endemic to this territory. Almost all the species (five) are known to date only from the Andes province, including one species from genus *Myrmecozela* Zll. and the aforementioned monotypic genus. Only two species from genera *Tiquadra* Walk. and *Autocnaptis* Meyr. (the latter genus is monotypic) have been described from the Patagono-Pampas province, and one species of *Harmaclona* Busck from the Chilean-Terra del Fuego province.

Antilles subregion. The fauna of steppe detritophages includes just four endemic species to date: from *Myrmecozela* Zll.—one species, *Ateliotum* Zll.—one species, and *Tiquadra* Walk.—two species.

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Data on the distribution of members of Myrmecozelinae presented here for different ecological regions provide an opportunity for tracing 75 the relations of the fauna of the Palearctic with the faunas of other regions from the western and eastern hemispheres.

The Palearctic Myrmecozelinae possess individual elements of tropical origin, e.g., species of *Episcardia* Rag. In addition to such species, there are 10 more genera (Table 2) which are common to the faunas of Palearctic and individual non-Palearctic regions.

The closest relations have been found between the moth fauna from the Palearctic and the Ethiopian regions. These relations can be traced from the closely related species of nine genera, of which seven from tribe Rhodobatini Zag. are known only from these regions. Thus the relation between the faunas of these territories, in addition to genera, is also manifest in the tribe known only from here. A large number of genera and members of this tribe are tropical in origin. A direct relation between the fauna of the semiarid regions of the Palearctic and savannas of Africa is difficult to establish at present because of the belt of deserts occupying northern Africa. However, conservation of the genetic link between the faunas of both regions, as can be seen from genera *Episcardia* Rag., *Perissomastix* War. and Roth., *Hapsifera* Zll., etc. attests to the presence of more intimate faunal relations between them in the past (probably during the Neogene, after the drying of waters in the southwestern part of Tethys). These links were undoubtedly not only more variable, but also associated with moderately xerophytic elements. It may be assumed that the tropical African fauna of 76 Myrmecozelinae had a great influence on the faunas of the Mediterranean region and partly Central Asia, which contained several genera abundantly represented in the fauna of southern Africa.

The faunal link of Myrmecozelinae of the Palearctic and Indo-Malayan regions, although more free because of the absence of natural barriers, was less abundant than between the Palearctic and African faunas. Four common genera are known for both regions: *Episcardia* Rag., *Myrmecozela* Zll., *Hapsifera* Zll., and *Hypophrictis* Meyr., of which the last is typical only for the faunas mentioned here. Genus *Hypophrictis* Meyr. is probably of Indochinese origin, and only a single species has penetrated the transitional zone of the Palearctic region.

Preservation of the tropical species of Myrmecozelinae, as well as possibly the penetration of individual elements from India and Indochina into the southern regions of the Palearctic with their continental climate and change in seasons was facilitated by the affinity of the moths for forest litter and decomposing grassy detritus.

The relation of the Myrmecozelinae fauna from the Palearctic with that of North America, especially its southeastern forest-steppe regions,

TABLE 2. RELATIONS BETWEEN PALEARCTIC MOTHS AND FAUNA OF NON-PALEARCTIC REGIONS

		Number of species in different regions					
		Holarctic					
Genera	Total no. of species	Palearctic	Nearctic	Indo-Malayan	Ethiopian	Australian	Neotropic
Cephitinea Zag.	4	3 (3)	1	—	—	—	—
Cephimallota Brud.	4	4 (4)	—	—	—	—	—
Anemallota Zag.	4	4 (4)	—	—	—	—	—
Pararhodobates Pet.	1	1 (1)	—	—	—	—	—
Rhodobates Rag.	9	6 (6)	—	—	2	—	—
Ceratuncus Pet.	5	5 (5)	—	—	—	—	—
Pachyarthra Ams.	4	4 (4)	—	—	—	—	—
Reisserita Ag.	6	6 (6)	—	—	—	—	—
Ateliotum Zll.	11	8 (7)	—	—	2	—	1
Eremicola Ams.	1	1 (1)	—	—	—	—	—
Episcardia Rag.	39	8 (6)	—	9	22	—	—
Catabola Durr.	16	16 (16)	—	—	—	—	—
Perissomastix War. and Roth.	51	2 (2)	—	—	49	—	—
Myrmecozela Zll.	48	32 (30)	1	4	6	1	5
Cinnerethica Ams.	1	1 (1)	—	—	—	—	—
Hapsifera Zll.	42	8 (8)	—	6	28	—	—
Hypophrictis Meyr.	12	1 (0)	—	12	—	—	—
Latypica Meyr.	4	1 (1)	—	—	2	—	—
Ptilopsaltis Meyr.	1	1 (0)	—	—	1	—	—
Titaenoses Hint. and Bradl.	1	1 (0)	—	—	1	—	—
Total number of species	264	113 (105)	2	31	111	1	6
Total number of genera	20	20 (9)					

is reflected only in two genera—*Cephitinea* Zag. and *Myrmecozela* Zll. The first genus is characteristic only of these territories. Such weak links are explained by the very poor study of fauna of the forestless regions of the Nearctic. Information about the relation with the Myrmecozelinae fauna from the Australian region is even scantier. At present only one species from genus *Myrmecozela* Zll. is known, which is abundantly represented also in the Palearctic. This species has been described by Meyrick from the island New Britania (Meyrick, 1928c), and its affinity to genus *Myrmecozela* Zll. needs to be confirmed.

The relation between the Palearctic and Neotropical faunas of Myrmecozelinae is evident in the example of individual members of two genera known from the Palearctic: *Ateliotum* Zll.—one species and *Myrmecozela* Zll.—five species. While the first genus has been found only in the Antilles Islands, the second one is known from all the subregions of the Neotropics.

Thus an analysis of the information available on the distribution of Myrmecozelinae in the Palearctic and non-Palearctic regions permits the following conclusions:

Members of Myrmecozelinae are distributed throughout the temperate and tropical regions of the world. The subfamily is represented in Palearctic fauna by 113 species of 20 genera, or 22% of the species of world fauna. A large percent of endemic species and genera (92.9 and 45.0) confirms the considerable faunal separation. In addition, the moths fauna in the Palearctic consists of two groups. One group includes the universally distributed genus *Myrmecozela* Zll. and genera abundantly represented in the Ethiopian and Indo-Malayan regions (*Episcardia* Rag., *Hapsifera* Zll., etc.). Individual elements of these genera are not only widely distributed in the steppe and desert regions of the Palearctic, but have also formed secondary centers of speciation. The other group forms a complex (nine) of autochthonous genera from nearly all the tribes of the subfamily. The areas of distribution of the genera of this complex are restricted to certain natural zones with penetration of only individual members into adjacent zones. Hence a few regions of species variability and concentration of endemic species are identifiable in the Palearctic. Most probably the following areas should be considered such regions: the Mediterranean region per se (western and eastern centers), the Caucasus, Kazakhstan-Central Asia (Iran-Turanian), and east Asia. Analysis of present-day fauna of Myrmecozelinae from the arid regions of the Palearctic reveals that it is character-
77 ized by a high percentage of endemic species and genera. Most of these members exhibit distinct morphological and biological specialization for living in arid conditions. All this attests to their extreme antiquity and the important role played by autochthonous processes in their for-

mation. It should also be noted that genera such as *Cephimallota* Brud. and *Cephitinea* Zag., associated with the ancient Mediterranean, at present have discontinuous areas of distribution, one part of which is located in Trans-Caucasus or Kazakhstan and Central Asia, and the other part in southern Primor'e and Japan, which suggests the possibility of a migrational flux of moth fauna from the ancient Mediterranean to the east during the Neogene.

An analysis of the relations between the moth fauna from the Palearctic and the fauna of non-Palearctic regions reveals certain peculiarities. Of the 71 genera in the world, which today can be included to some extent under Myrmecozelinae (broadly speaking), 11 are common in Palearctic fauna and only 9 endemic. This provides a basis for assuming that the Palearctic fauna of steppe detritophages is the residue of a rich fauna existing in the past. The closest relations (e.g., nine genera) can be traced between the fauna of Myrmecozelinae from the Palearctic with that of the Ethiopian region, which indicates the existence of close contact with the faunas of both regions in the relatively recent past.

CLASSIFICATION AND PHYLOGENY

The natural division of Tineidae into subfamilies became possible after a revision of such large and artificial genera as *Tinea* L., *Myrmecozela* Zll., *Catabola* Durr., *Nemapogon* Schr., and a few others. One of the results of studies conducted in recent years is the division of this family into five well-demarcated subfamilies with complexes of characteristic morphological and biological characters (Zagulyaev, 1968a; 1972).

In the present volume only the subfamily Myrmecozelinae has been examined of the family Tineidae. From this subfamily 20 genera are found in the Palearctic: *Cephitinea* Zag., *Cephimallota* Brud., *Anemallota* Zag., *Pachyarthra* Ams., *Pararhodobates* Pet., *Rhodobates* Rag., *Ceratuncus* Pet., *Reisserita* Ag., *Ateliotum* Zll., *Eremicola* Ams., *Episcardia* Rag., *Catabola* Durr., *Perissomastix* War. and Roth., *Myrmecozela* Zll., *Cinnerethica* Ams., *Hapsifera* Zll., *Hypophrictis* Meyr., *Latypica* Meyr., *Ptilopsaltis* Meyr., and *Titaenoses* Hint. and Bradl. The subfamily is based on such ancient genera as *Cephimallota* Brud., *Ateliotum* Zll., *Myrmecozela* Zll., and *Hapsifera* Zll.

One of the first to mention moths living in wormwood and sheep's fescus (*Festuca kolymensis)* steppes was Zeller (1839). He described *Tinea hungaricellum* Zll. and on the basis of this species established a new genus, *Ateliotum*. Subsequently he described the genus *Hapsifera* with a new species *H. luridella* (Zeller, 1847a). By this time considerable factual material had accumulated in different parts of Western Europe and Russia, which led to the publication of faunistic works (Eversman, 1844) and catalogues (Duponchel, 1844). In the publications on classification of moths by Stainton (1849, 1851) and Zeller (1852), an attempt was made to group genera on the basis of such external characters as pubescence of head and legs, size of labial palpi, and structure of antennae, as well as mode of life and feeding of larvae. Thus, Zeller included three sections in genus *Tinea* L., one of which constituted a new genus, *Myrmecozela* (type *Tinea ochraceella* Tgstr.). At the same 78 time genera *Hapsifera* Zll. and *Ateliotum* Zll., described by him earlier, and a few genera of other authors, were not included in either group.

The next stage in the study of Tineidae was ushered in by Herrich-Schäffer (1853–1855) who used the peculiarities of venation for identification. He described 14 new species of tineid moths, including steppe detritophages, and also established a new genus, *Dysmasia* (type *D. petrinella* H.-S.). Another step forward in the classification of the family as well as in the interpretation of genera was the work of Frey (1856). Incorporation of information on biology into the data on distribution of species gave a new impetus to the study of Tineidae, and descriptions of new species from Europe, the Mediterranean, and the Caucasus (Christoph, 1876). Ragonot (1895) established a few new genera of moths, including such genera as *Episcardia* (type *Psecadia lardatella* Led.) and *Rhodobates* (type *Euplocamus laevigatellus* H.-S.).

In the famous catalogue of Staudinger and Rebel (1901) results of studies of the nineteenth century are summarized. About 40 Palearctic species of moths are described in the catalogue which today are included under Myrmecozelinae. More than half the species were placed in genera *Myrmecozela* Zll., *Rhodobates* Rag., *Episcardia* Rag., *Ateliotum* Zll., and *Hapsifera* Zll., but some were retained in genera *Tinea* L., *Tineola* H.-S., *Scardia* Tr., and *Morophaga* H.-S.

Spuler (1910) mostly retained the system of Staudinger but considered 12 species of Myrmecozelinae European. Several subsequent researchers reported interesting moth records from different regions of the Palearctic. Chretien (1915) described species from Algeria and northwest Asia. Caradja (1920, 1926, 1934) discovered new localities for several members of Myrmecozelinae and described a few species from the southern and eastern regions of Eurasia. Petersen (1924) reported three species of steppe detritophages for the Baltic region.

A new approach to the classification of moths appeared only after the characters of the genitalia were included in the diagnostics.

On the basis of comparative morphological studies of male genitalia, Eyer (1924) divided family Tineidae into four sections. In one of these, together with *Solenobia* Dup., *Talaeporia* Hb., *Diplodoma* Zll., *Teichobia* H.-S., etc., i.e., mainly members of lower psychids, he also included a few members of Tineidae: *Myrmecozela* Zll. and *Ateliotum* Zll. In another section, in addition to *Roeslerstammia* Zll., *Lypusa* Zll., *Narycia* Steph., and others, he included *Rhodobates* Rag., which also belongs to Tineidae. In this connection he indicates that this genus can, moreover, serve as the basic model for understanding the genitalia of Neotropical members of Acrolophidae. In these studies Eyer showed a relation between individual members of Tineidae with other families of lower Lepidoptera, and primarily such steppe detritophages as *Myrmecozela* Zll. and *Ateliotum* Zll. with lower members of Psychidae.

Subsequent to Eyer's work additional data and the publication of new revisions and faunistic lists expanded. For example, in a monograph on British Lepidoptera, Meyrick (1928a) reported two species of steppe detritophages: *Cephimallota simplicella* H.-S. and *Myrmecozela ochraceella* Tgstr. Sometime later Pierce and Metcalfe (1935) provided for the first time illustrations of the genitalia of these species. Gerasimov (1930) reported the discovery of a large series of moths in Tadzhikstan, identified by him as *Hapsifera luridella* Zll. Lucas (1933) described a new species of moths from Morocco. Reisser (1933) and Turati
79 (1934) published interesting information on moths of Spain and northern Africa, and the latter described three species of *Hapsifera* Zll. from Cyrenaica. Numerous faunistic studies were conducted by Amsel (1935a, 1935b, 1935c), who described from Palestine several interesting species and two monotypic genera: *Eremicola*, which is close to *Ateliotum* Zll., and *Cinnerethica* related to *Myrmecozela* Zll. Later (1940, 1949, 1951a, 1951b, 1955) he published additional information on the discovery of earlier described species from different regions of the Mediterranean and northwest Asia.

An important step forward in the study of moths of genera *Myrmecozela* Zll., *Catabola* Durr., *Hapsifera* Zll., and others was taken by Petersen (1957a, 1958, 1959a, 1959b, 1960a, 1960b, 1961a, 1961b), Gozmàny (1959, 1960, 1965a, 1965b, 1966), and Căpuşe (1963, 1964, 1966, 1968). An important position among these belongs to Petersen, who redefined the family of Palearctic Tineidae on the basis of genitalia. He combined all genera characterized by a common type of genitalia into seven groups. He included steppe detritophages mainly in two groups—IV and VII. For example, genus *Catabola* Durr. serves as the basis for group IV, with the inclusion of six other genera: *Myrmecozela* Zll., *Episcardia* Rag., *Ateliotum* Zll. *Eremicola* Ams., *Cinnerethica* Ams., and *Pachyarthra* Ams. (Petersen, 1957b). Genus *Rhodobates* Rag. together with other genera such as *Pararhodobates* Pet. and *Hapsifera* Zll., was placed in group VII (Petersen, 1958). Some genera were included in other groups. Thus genus *Cephimallota* Brud. was included among hybrid moths in group I. Genera *Ceratuncus* Pet. and *Reisserita*

Ag. were included among keratophages (group II).

The most important aspect of Petersen's work is that almost all the western Palearctic species of Tineidae are covered on the basis of genitalia, mainly of the type specimens. In addition, synonyms are established, and in this process several species and genera described more recently included under older ones. A brief identification has been provided for each species on the basis of structure of male and female genitalia as well as their illustrations, and the total distribution of the species and location of the type are indicated. Finally, for genera of steppe detritophages such as *Episcardia* Rag. (Petersen, 1959b), *Ateliotum* Zll. (Petersen, 1957b), *Catabola* Durr. (Petersen, 1963b) and a few others, identification keys to species are given.

However, in his studies Petersen did not fully appreciate the traits of external structure, especially venation, armature of legs, and appendages of head, and has barely considered information on biology (in particular, food specialization) and distribution. Insufficient use of the entire complex of external characters and the absence of material from central and eastern Palearctic (Kazakhstan, Central Asia, Siberia, the Far East, etc.) probably precluded generalization of his conclusions. In Petersen's studies there is no relation between individual groups and genera in the groups, the groups have not been given a taxonomic status, and there is no key to the identification of genera, i.e., moths which are steppe detritophages have not been separated into a taxonomic unit, as a result of which there is no general characterization of this group of moths and indications of their relations with closely related equivalent taxonomic units of mycetophages (Nemapogoninae), wood detritophages (Scardiinae), and keratophages (Tineinae). However, in spite of these significant shortcomings, the work of Petersen facilitated a quick analysis of tineid fauna on the whole, and in particular groups of steppe detritophages (Myrmecozelinae). Moreover, after the publication of articles by Petersen an active study of individual groups of tineid moths from non-Palearctic regions was initiated. The studies by
80 Gozmàny on the group of steppe detritophages are very interesting, especially those on genera *Episcardia* Rag., *Catabola* Durr., *Myrmecozela* Zll., *Ateliotum* Zll., and many other genera from the savannas of east and southeast Africa. After analyzing the species described by Meyrick, Gozmàny provides additional and more precise descriptions, giving illustrations and descriptions of the genitalia. While analyzing material from tropical regions, he described a large number of new species and genera (Gozmàny, 1960, 1965a, 1965b, 1965c, 1966, 1967).

Considering mainly the structure of the genitalia, Gozmàny identified three subfamilies in Myrmecozelinae: Perissomasticinae, Siloscinae, and Hapsiferinae (Gozmàny, 1965d, 1968). However, the brief and generalized identification of these subfamilies with no basis for their separation given, nor consideration of their phylogenetic relations, makes a comparison between them and with Myrmecozelinae difficult.

These subfamilies were accepted by Căpuşe (1968, 1971) without critical analysis. Particularly noteworthy in this respect is the publication in which he proposes his own classification of the family Tineidae. Căpuşe, without considering phylogenetic relations nor taking into account eco-biological adaptations and food specialization, divides the family into ten subfamilies. In this process he established several new subfamilies, including Rhodobatinae, and also a large number of new tribes such as Perissomasticini and Episcardiini in subfamily Perissomasticinae, and tribes Protaphreutini and Semeolonchini in Hapsiferinae.

My studies on the typical members of different genera of the new subfamilies revealed that these subfamilies are fully accommodated within the frame of subfamily Myrmecozelinae. Furthermore, subfamilies Perissomasticinae and Hapsiferinae on the basis of a complex of characters are almost identical to tribes Myrmecozelini Zag. and Hapsiferini Zag. respectively (Zagulyaev, 1968a). Hence the identification of new subfamilies was apparently based on characters below the level of expected subfamilies of Tineidae, as already indicated above (see section "Geographic Distribution"). It should also be noted that each subfamily of Tineidae, in addition to morphological characters, is characterized by its own type of food specialization and a series of ecological peculiarities, including habitat. Finally, the subfamilies established by Gozmàny and Căpuşe do not differ in eco-biological characters from Myrmecozelinae. This provides a basis for retaining the status of tribes for these groups and retaining them in subfamily Myrmecozelinae. As for the new tribes established by Căpuşe, their separation appears premature and is merely formal; hence they are not accepted in the present publication.

In summarizing the history of the study of these moths (namely steppe detritophages), it should be noted that researchers mainly described new species, incorporated clarifications for individual disputed questions, and separated unrelated or distant species and groups; most did not work on the aspects of classification and phylogenetic relations between genera and suprageneric groups, and only recently have some authors concerned themselves with this problem.

My analysis of a notable majority of European species and some non-Palearctic elements (Zagulyaev, 1964b, 1965, 1966a, 1966b, 1968a, 1971b) revealed that the two groups (IV and VII) separated by Petersen actually include the majority of steppe detritophagous moths. At the same time, heterogeneity was established within these groups. For

example, within group IV *Myrmecozela* Zll. and *Episcardia* Rag. are
81 combined, which are actually close to each other, with genus *Ateliotum* Zll. in which the forewings lack R_4. The subuncus, anellus, and saccus absent in the male, and the females have no signum in the bursa copulatrix. In this group Petersen also includes genus *Pachyarthra* Ams., which differs sharply from *Myrmecozela* Zll. as well as *Ateliotum* Zll., since the middle pair of spurs on the hind tibiae are located far beyond the midpoint of the tibia; in the male the aedoeagus is thick, shorter than the valvae, and bent at a right angle, and the vinculum short; and the sclerotized lobes of the vaginal plate are well expressed in the female. Similarly, group VII is also an aggregate, in which closely related genera *Rhodobates* Rag. and *Pararhodobates* Pet. are combined with *Hapsifera* Zll., which differs by a complex of sharply expressed characters: absence of galea and maxillary palpi, presence of cluster of androconial scales in the male on the membrane between segments VII and VIII of the abdomen, and bifurcate anterior apophysis and paired sacs filled with hairs inside segment VII in the female.

Analysis of genera *Ceratuncus* Pet. and *Reisserita* Ag., included by Petersen in group VII (Petersen, 1957a), revealed that a large complex of characters such as dense pubescence of labial palpi and antennae, presence of additional cells in the forewings, A_1 in the hind wings terminates on the alar margin at the level of divergence of branch Cu_1 from the cell, and structure of male genitalia (divergent branches of uncus, broad vinculum), attest to the relation between these genera and *Rhodobates* Rag. and *Pararhodobates* Pet. The affinity between these genera and steppe detritophages is also confirmed by the adaptation of species to steppe biotopes, where many develop in the sod of graminaceous grasses. However, these genera exhibit a few peculiarities of structure indicating their similarity to Tineinae (more or less long and straight aedoeagus and saccus, absence of androconial clusters). These characters permitted Petersen to include these genera in group II, i.e., under Tineinae.

Thus a revision of different genera biologically associated with grass detritus of steppes, semideserts, and savannas, enabled me to establish an affinity between them, and the complex of characters common to all of them provided a basis for combining them under subfamily Myrmecozelinae (Zagulyaev, 1968a).[3] It should be added that I have also included genus *Cephimallota* Brud. in this subfamily, which was included by Petersen in group I (Petersen, 1957a). A revision of this genus revealed its heterogeneity and provided a basis for identifying

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[3] However, the name Myrmecozelinae for moths living in deforested steppe regions and semideserts, and Meessiinae for moths associated with lichens were assigned as early as 1958 (Zagulyaev, 1958).

two more genera—*Cephitinea* Zag. and *Anemallota* Zag.—and placing all of them in tribe Cephimallotini Zag. (Zagulyaev, 1964b). Analysis of the morphological characters of members of this tribe revealed that in general appearance these moths are closer to steppe detritophages: structure of antennae, dense pubescence of labial palpi, broad wings, type of venation, as well as life in steppe and semidesert regions where the larvae (most species) make silken tunnels in the sod of grasses. However, it should be remembered that the general type of structure of male genitalia in most members of Cephimallotini Zag. (short and bent clasper valvae, short and thick uncus, broad tegumen and vinculum) also resembles that of tribe Haplotineini Zag. of subfamily Nemapogoninae. Such a similarity in genitalia enabled Petersen to include genus *Cephimallota* Brud. under group I and bring it closer to *Haplotinea* Diak. and Hint. Căpuşe (1968, 1971) also considered these
82 two genera close and included them in subfamily Nemapogoninae. Further study of species from the southern regions of the Palearctic and tropical regions and the structure of the preimaginal phases will possibly allow us to combine Cephimallotini Zag. and Haplotineini Zag. in a separate supratribe or even subfamily (Zagulyaev, 1964a, 1964b, 1965).

Members of subfamily Myrmecozelinae differ from other subfamilies of tineid moths in a complex of morphological characters: light color of the wings which are often without patterning, existence of long but sparsely located bristles on the 2nd segment of the labial palpi, and the more or less median location of the middle pair of spurs of the hind tibiae. Male genitalia are characterized by the highly broad-based aedoeagus, which may be arcuate, with a thin apex or straight, in which case apex bifurcate, and uncus with long and widely separated, rarely fused lobes. The lobes of the vaginal plate in the female are covered with thin bristles in most species, the anterior apophyses bifurcate except in *Myrmecozela* Zll. and genera close to *Rhodobates* Rag., and the bursa copulatrix in many members without a signum. Ecologically, most of the genera of this subfamily are adapted to steppes, semideserts, and in Africa also to savannas. The larvae of most members make silken tunnels in the sod of grasses and feed on dead grass residue.

My classification of subfamily Myrmecozelinae in presented below:[4]

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[4] The proposed classification pertains only to Palearctic members. Genera without serial numbers are not found in the Soviet Union and are not considered in the taxonomic section. Genera *Hypophrictis* Meyr., *Latypica* Meyr., *Ptilopsaltis* Meyr., *Titaenoses* Hint and Bradl. are known from southern regions of the Palearctic, but their position in the classification requires further study and hence they have been excluded.

Subfamily MYRMECOZELINAE Zag., 1958, 1968a
(type genus, *Myrmecozela* Zll., 1852)

I. Tribe *Cephimallotini* Zag., 1968a
  (type genus *Cephimallota* Brud.)
  1. Genus *Cephitinea* Zag., 1964b
    (type species, *Tinea colonella* Ersch.)
  2. Genus *Cephimallota* Brud., 1849 sensu Zag., 1964b
    (type species, *Tinea simplicella* H.-S.)
  3. Genus *Anemallota* Zag., 1965
    (type species, *Cephimallota praetoriella* Chr.)

II. Tribe *Rhodobatini* Zag., 1968a[5]
  (type genus, *Rhodobates* Rag.)
  Genus *Pachyarthra* Ams., 1940
    (type species, *Amydria ochroplicella* Chrét.)
  4. Genus *Pararhodobates* Pet., 1958
    (type species, *Chimabacche* ? *syriaca* Led.)
  5. Genus *Rhodobates* Rag., 1895
    (type species, *Euplocamus laevigatellus* H.-S.)
  6. Genus *Ceratuncus* Pet., 1957a
    (type species, *Myrmecozela danubiella* Mn.)
  Genus *Reisserita* Ag., 1952
    (type species, *Tinea haasi* Rbl.)

III. Tribe *Atellotini* Zag., 1968a
  (type genus, *Ateliotum* Zll.)
  7. Genus *Ateliotum* Zll., 1839
    (type species, *Tinea hungaricellum* Zll.)
  8. Genus *Eremicola* Ams., 1935a
    (type species, *E. semitica* Ams.)

IV. Tribe *Myrmecozelini* Zag., 1968a
  (type genus, *Myrmecozela* Zll.)
  9. Genus *Episcardia* Rag., 1895 s. str.
    (type species, *Psecadia lardatella* Led.)
  10. Genus *Catabola* Durr., 1913
    (type species, *Tineola biskraella* Rbl.)
  Genus *Perissomastix* War. and Roth., 1905
    (type species, *P. nigriceps* War and Roth.)
  11. Genus *Myrmecozela* Zll., 1852
    (type species, *Tinea ochraceella* Tgstr.)

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[5] I cannot agree with the priority of Căpuşe (1968) for the introduction of suprageneric taxon Rhodobatini, since *Fauna RSR*, vol. 11, no. 9, sent to members on March 15, 1968, was published slightly later than the journal *Entom. Obozr.*, vol. 47, no. 1, sent to members on March 26, 1968 and received in the Library of the Institute of Zoology of the Academy of Sciences of the USSR on April 9, 1968.

12. Genus *Cinnerethica* Ams., 1935c
    (type species, *C. optodes* Ams.)

V. Tribe *Hapsiferini* Zag., 1968a
    (type genus, *Hapsifera* Zll.)
  13. Genus *Hapsifera* Zll., 1847a
    (type species, *H. luridella* Zll.)

83 Relations and sequence of divergence of the major phylogenetic branches of Myrmecozelinae are presented in Figure 31. It should be noted that all the taxonomic characters and phylogenetic structures are based mainly on a study of the Palearctic members of this subfamily and some tropical elements (members of 35 genera out of a total of 55). A study of non-Palearctic species and genera, especially from Africa and Southeast Asia, might possibly lead to a slight rearrangement in the position of individual groups. Considerable assistance in establishing phylogenetic links between genera would be found in studies of the preimaginal phases, primarily the structure of larvae and pupae.

The natural classification given above is based on external characters as well as morphological criteria of genitalia and biological peculiarities, including food specialization, as well as distribution and habitats of the moths. All these aspects revealed the phylogenetic affinity of genera, leading to their combination in five independent groups, which correspond to the five main branches presented in the scheme above. These groups are so well-delineated from each other that taxonomically they are comparable to tribes. Thus subfamily Myrmecozelinae includes these five tribes: Cephimallotini Zag., Rhodobatini Zag., Ateliotini Zag., Myrmecozelini Zag., and Hapsiferini Zag. (Zagulyaev, 1968a).

The first tribe, Cephimallotini Zag., is characterized by the location

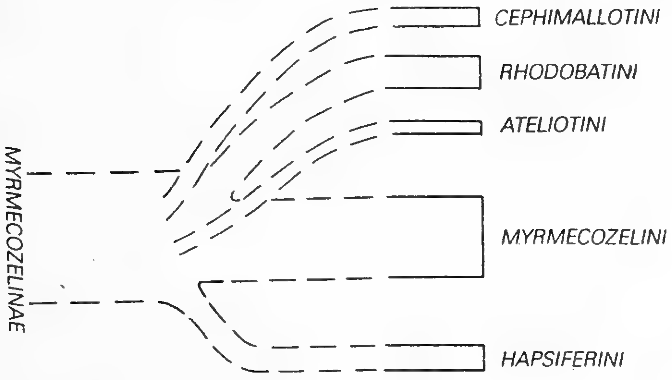


Figure 31. Phylogenetic relations of tribes of subfamily Myrmecozelinae.

of the middle pair of spurs on the hind tibiae before their midpoint, a violet glaze on the under-surface of the wings, male genitalia with a very broad vinculum and bent aedoeagus, and female genitalia with well-developed prevaginal plate and very long anterior apophysis in segment VI of the abdomen. Furthermore, members of the tribe retain a relatively large complex of primitive morphological characters: broad hind wings, presence of medial cell in the forewings, development of pilifers, long maxillary palpi, etc. (see section "Morphology"). These peculiarities indicate that this tribe represents the most generalized branch in the subfamily. It is also interesting that on the basis of the structure of the male genitalia and peculiarity of the larvae of some species which live in nests of social insects and feed on mold-covered
84 plant residue and, possibly, partially on the products of the life activity of the host insects, this tribe represents the connecting link between Myrmecozelinae and specialized members of Nemapogoninae, such as Haplotineini Zag. To include tribe Cephimallotini Zag. in subfamily Nemapogoninae, as as done by Căpuşe (1968, 1971), is phylogenetically not well-founded. Morpho-ecological characters of the tribe reveal the significant links between this tribe and other members of Myrmecozelinae, rather than with Nemapogoninae.

In tribe Cephimallotini Zag. (Figure 32) genera *Cephimallota* Brud. and *Cephitinea* Zag. are close to each other on the basis of general appearance and presence of a well-developed prevaginal plate. Genus *Anemallota* Zag. with a bright dotted alar pattern and female genitalia without a prevaginal plate is isolated and can only be considered close to *Cephimallota* Brud. on the basis of type of structure of male genitalia (valvae spoon-shaped, elongated, and more or less parallel, uncus well developed, branches of subuncus not expressed, and so on).

The second tribe, Rhodobatini Zag., is characterized by the location of the middle pair of spurs on the hind tibiae beyond their midpoint, yellowish-gray color of the under-surface of the wings without a violet glaze, well-developed branches of the subuncus and saccus in the male genitalia, and in the female genitalia sclerotized lobes of the vaginal plate, absence of prevaginal plates, and anterior apophysis located in segment VII. On the basis of a complex of characters the tribe occupies

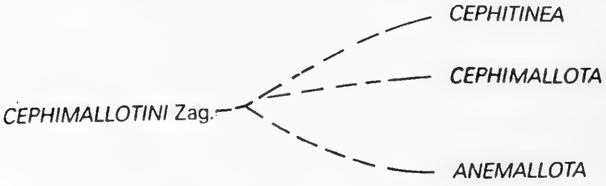


Figure 32. Phylogenetic relations of genera of tribe Cephimallotini Zag.

an intermediate position between Cephimallotini Zag. and Ateliotini Zag. (Figure 31). In all these tribes the males lack androconial clusters on the membrane between segments VIII and IX. At the same time, on the basis of structure of the legs (tibia of middle legs shorter or equal to the femur), and in females absence of sacs with hairs inside segment VII and simple anterior apophysis (nonbifurcated), tribe Rhodobatini Zag. is close to Cephimallotini Zag. This tribe comprises five genera: *Pachyarthra* Ams., *Pararhodobates* Pet., *Rhodobates* Rag., *Ceratuncus* Pet., and *Reisserita* Ag. On the basis of absence of epiphyses on the tibiae of the forelegs and a short aedoeagus, the first two genera are closest to each other. Others are close because of the epiphyses and long aedoeagus (Figure 33). In this group *Reisserita* Ag. and *Ceratuncus* Pet., due to the presence of additional cells in the forewings and A_1 in the hind wings terminating in the alar margin at the level of the outer margin of the radiocubital cell, are most closely related. The general type of structure of the male genitalia (long and thin saccus, straight aedoeagus, and long valvae) also bring these two genera closer. It may be assumed that these genera had a common ancestor and separated only relatively recently. Genus *Rhodobates* Rag. includes characters of both groups and occupies an intermediate position between them. Broad valvae with incurved anterior and lower margins brings it closer to *Pachyarthra* Ams., while the presence of an entire vaginal plate in the female genitalia relates it to *Reisserita* Ag. and *Pararhodobates* Pet.

85 Analysis of the complex of morphological characters of genera *Pachyarthra* Ams., *Pararhodobates* Pet., *Rhodobates* Rag., *Ceratuncus* Pet., and *Reisserita* Ag. reveals that phylogenetically these genera are closely related branches which originated from a common stem. Hence in elevating individual genera into independent tribes, for example genus *Ceratuncus* Pet. into tribe Ceratuncini Căp. and including it in subfamily Tineinae, as proposed by Căpuşe (1964, 1968, 1971), or separating tribe Rhodobatini Zag. into an independent nominative subfamily, Rhodobatinae (Căpuşe 1968, 1971) is without basis and not acceptable. I have retained these genera in tribe Rhodobatini Zag., and the tribe itself in subfamily Myrmecozelinae.

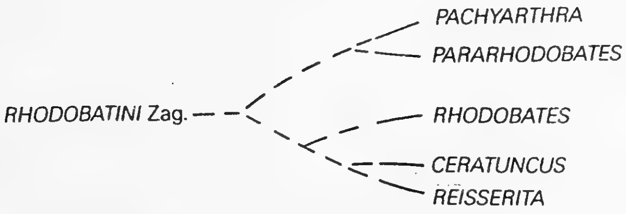


Figure 33. Phylogenetic relations of genera of tribe Rhodobatini Zag.

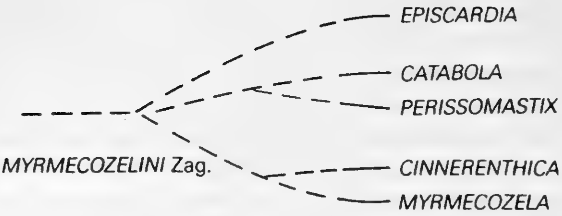


Figure 34. Phylogenetic relations of genera in tribe Myrmecozelini Zag.

The third tribe, Ateliotini Zag., comprises two genera—*Ateliotum* Zll. and *Eremicola* Ams.—which are characterized by the absence of spinules at the tips of the tarsal segments, branches of R_4 in the forewings, and subuncus and saccus in the genitalia of males; in the genitalia of females the duct of the bursa copulatrix and the bursa itself are without sclerotized structures. This tribe, on the basis of the presence of paired sacs filled with silken hairs inside segment VII in females and bifurcate anterior apophysis, is close to Myrmecozelini Zag. and Hapsiferini Zag. In the absence of clusters of androconial scales on the membrane between segments VIII and IX in males it is closer to Cephimallotini Zag. and Rhodobatini Zag. (Figure 31). Thus Ateliotini Zag. includes characteristics of the other four tribes and probably represents a branch which diverged early, occupies a position between them, and brings them closer to each other.

Tribe Myrmecozelini Zag. is the central group and the richest in species in this subfamily. It is characterized by the presence of all branches of the radius in the forewings, neither gnathos nor anellus developed in the genitalia, and the bursa copulatrix in the female in many cases with a highly sclerotized signum; if the latter is absent, as in *Episcardia* Rag., the duct of the bursa has a complex of sclerotized formations. On the basis of structural peculiarities this group is close on the one hand to Hapsiferini Zag. (Figure 31) and linked with it through common characters (in the male clusters of androconial scales are located on the membrane between segments VIII and IX, and in the female the bursa copulatrix has a signum); on the other hand, it shares certain features such as the absence of both anellus and gnathos in the male genitalia with Rhodobatini Zag. and Cephimallotini Zag. The presence of sacs with hairs in segment VII of females indicates a deep link between this tribe and Ateliotini Zag. and Hapsiferini Zag.

86 In examining the relations of the five genera included in tribe Myrmecozelini Zag.—*Episcardia* Rag., *Catabola* Durr., *Perissomastix* War. and Roth., *Myrmecozela* Zll., and *Cinnerethica* Ams.—their phylogenetic relations should also be considered (Figure 34). The considerable affinity between genera *Myrmecozela* Zll. and *Cinnerethica* Ams.

is known, which is expressed not only in external characters (general type of structure and coloration of the forewings, presence of additional cell in them, A_1 in the hind wing terminating at the level of the outer margin of the radiocubital cell, and ends of tarsal segments with three spinules), but also in many common features of the male genitalia (valvae rectangular, long arcuate aedoeagus, narrow vinculum, broad and very short saccus). These genera are also biologically close. These facts indicate their common origin and their separation most probably started relatively recently and is manifest in the details of venation and shape of the outer margins of the valvae.

Other closely related genera are *Catabola* Durr. and *Perissomastix* War. and Roth., which have common features manifest in venation and structure of the male genitalia. Genus *Episcardia* Rag. displays a certain amount of affinity to these genera, which is indicated by the short and almost straight aedoeagus and broad vinculum in the male genitalia, and strong sclerotized vaginal plate in the female genitalia. This genus, however, has a complex of characters which distinguish it from *Catabola* Durr. and *Perissomastix* War. and Roth. (tibia of forelegs with epiphysis; tibia of middle legs longer than femur; in male genitalia valvae complex and consist of dorsal and ventral lobes; and in female genitalia duct of bursa copulatrix with complex sclerotized structure). At the same time the presence of three spinules at the ends of the tarsal segments and a common type of venation attest to the retention of links between *Episcardia* Rag. and *Myrmecozela* Zll. and *Cinnerethica* Ams. Moreover, *Episcardia* Rag. exhibits links with *Ateliotum* Zll. in some peculiarities of venation, absence of saccus in the male genitalia, and development of bifurcate apophyses in the female genitalia. On the basis of complex of characters and taking into account phylogenetic relations, I have separated the genus *Episcardia* Rag. from the base of the branch which gave rise to genera *Catabola* Durr. and *Perissomastix* War. and Roth., and placed it at the border of Ateliotini Zag. This genus is quite ancient and its members have retained several archaic characters. Thus in terms of phylogeny genera *Episcardia* Rag., *Catabola* Durr., *Perissomastix* War. and Roth., *Myrmecozela* Zll. and *Cinnerethica* Ams. at present appear close branches of a common stem in tribe Myrmecozelini Zag., and their separation into independent tribes or subfamilies, as proposed by Gozmàny (1965d, 1968) and Căpuşe (1968, 1971), is unfounded.

The last or fifth tribe of the subfamily, Hapsiferini Zag., is represented in the Palearctic by one widely distributed genus *Hapsifera* Zll., and is characterized by the absence of galea and maxillary palpi, presence of protruding groups of scales on light-colored forewings, subuncus or anellus well-developed in the male genitalia, and the signum in the bursa copulatrix in the female genitalia resembling a small falciform plate covered with spinules. Genus *Hapsifera* Zll. exhibits individual peculiarities which bring it closer to tribe Myrmecozelini Zag. In males clusters of androconial scales are located on the membrane between segments VIII and IX, and in females the bursa copulatrix has a signum, and instead of the vaginal plate the membrane is covered with 87 slender bristles. Moreover, the presence of paired sacs with silken hairs in segment VII of females indicates an affinity with Ateliotini Zag. The characters of the two tribes attest not only to a common origin of these groups, but also suggests the early separation of Hapsiferini Zag. from a common root (Figure 31).

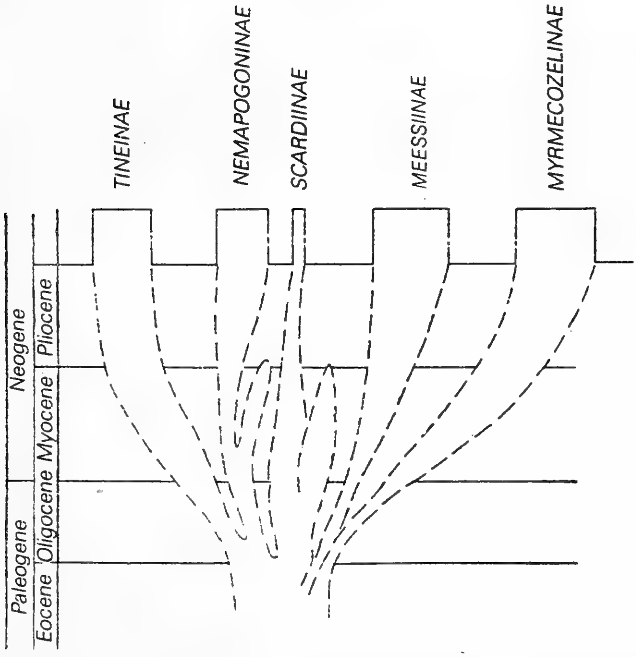
The early separation of these moths is indicated by the retention of such primitive characters as the stalked radius in the forewings and the short fringe on the hind wings, as well as the presence of subuncus in the male genitalia, etc.

Separation of Hapsiferini Zag. into an independent subfamily, as done by Gozmàny (1968) and subsequently by Căpuse (1971), without considering the morphological structure of the imago (besides the genitalia) and the phylogenetic links with other subfamilies is not only formal but unfounded. The morphological identification of subfamily Hapsiferinae mainly corresponds to the characteristics of the nominative tribe, which means that the identification of the new subfamily is not equivalent to those of other closely related subfamilies of Tineidae. Therefore, I have retained the status of a tribe for Hapsiferini Zag. and kept it in subfamily Myrmecozelinae. A study of tropical members of Myrmecozelinae, especially of the African savannas will possibly result in the identification of new groups close to Hapsiferini Zag.

The affinity of Myrmecozelinae with the family of tineid moths is beyond dispute. This is indicated by their general appearance, ruffled pubescence of the head, absence of ocelli, structure of mouthparts, shape of wings, armature of legs, type of genitalia, and biology of larvae in silken tunnels. A fairly close relation is revealed between Myrmecozelinae and Scardiinae, which is confirmed not only by structural peculiarities such as pubescence of the antennae, broad hind wings (equal in width to forewings or slightly broader with fairly short fringe), armature of legs, and structure of the genitalia (bilobate uncus, poorly developed subuncus or gnathos, reduction or absence of saccus, articulation of lobes of vaginal plate, etc.), but also by the mode of life of the larvae, which feed on herbaceous detritus and the sod of grasses. At the same time Myrmecozelinae, like lichenophagous moths, are distinct from other tineid moths as a group which has progressed far on the path of adaptation of life in forestless landscapes under conditions of moisture deficiency.

The primitive nature of many members of Myrmecozelinae is indicated by the presence of the following peculiarities of structure: distinct fusion of the tegumen and vinculum into a broad ring, saccus in the form of a plate or a broad trough (*Rhodobates* Rag., *Hapsifera* Zll.), or its absence, etc., which is found in present-day members of the subfamily (*Episcardia* Rag., *Ateliotini* Zag.) and in moths preserved in amber, *Palaeoscardiites mordvilkoi* Kuzn.—ancient members of Scardiinae. All these characters confirm not only their origin from a common ancestor, but also permit one to consider Myrmecozelinae a separate branch originating from a common stem of ancient Scardiinae (Figure 35).

One reason the common stem of ancient Tineidae split into large groups was, most probably, divergence in larval feeding behavior and the isolation of individual groups from the primitive forest-dwelling forms (Zagulyaev, 1964a, 1968a, 1972b). Myrmecozelinae moths, after reaching arid landscapes, had an opportunity to find suitable ecological conditions and necessary food base and, probably, transition to such a life pattern took place through the savannas, forest-steppes, and clumps of shrubs, which do not require notable larval specialization. Much



88 Figure 35. Position of Myrmecozelinae among other members of family Tineidae.

later, moths of this group inhabited steppes and semideserts. The present-day moths of this subfamily are the warmth-loving mesophils 88 and xerophils. They are not capable of prolonged active flight and the females of some species have reduced wings. The forest massifs are hurdles beyond the capacity of these moths to overcome. Individual features of the structure of the copulatory apparatus and venation are more archaic in them than in present-day forest moths, namely the forest detritophages (Scardiinae). For example, wing venation of the steppe species of *Hapsifera* Zll., *Episcardia* Rag., and *Ateliotum* Zll. is very close to that of ancient members of Scardiinae found in amber.

The origin of Myrmecozelinae in the Palearctic took place under the influence of the formation of xerophilous communities. The links of affinity between Myrmecozelinae and ancient members of Scardiinae on the one hand, and with primitive members of Nemapogoninae on the other, allow one to place the origin of this subfamily in the mid-Paleogene (end of the Eocene to beginning of the Oligocene). At this time, as indicated by Komarov (1961), sparse well-lit forests appeared with present-day forms of these insects, which are typical of a temperate climate, and herbaceous plants.

* * * * *

An analysis of the morphological characters and ecological peculiarities of Recent members of the subfamily provides a basis for confirming that initially these moths were associated with the forest litter of deciduous forests. It is known that present-day mesophilous and moderately xerophilous forms of Myrmecozelinae are adapted to sparse forests and forest-steppes and, unlike the inhabitants of semideserts and deserts, possess a large number of primitive traits. They are characterized by broad hind wings with short fringes, persence of a medial cell 89 and sparse scaly cover on the forewings, and apophyses of sternite I of the abdomen in the form of poorly sclerotized falcate process; in addition, they have retained a complex structure of male and female genitalia (several members of Cephimallotini Zag., Rhodobatini Zag. as well as genera *Episcardia* Rag., *Ateliotum* Zll.). In these moths, in addition to long five-segmented maxillary palpi, epiphyses have been retained on the tibiae of the forelegs, but androconial clusters in males and corethrogynes in females are absent, etc. These peculiarities indicate to some extent the primtive nature of these groups of moths. The evolution of Myrmecozelinae further proceeded in the direction of adaptation to arid conditions and plant canopy of the semideserts and deserts which were being formed. Adaptation to the conditions of life in these cases and life in forestless areas is reflected in both the external and internal structure, which is most distinctly manifest in Myrmecozelini Zag. and Hapsiferini Zag. In members of these tribes one finds sclerotization of the forewings and the disappearance of the medial cell, elongation of fringes on the hind wings, reduction of the epiphysis on the tibia of the forelegs, a tendency toward displacement of the middle pair of spurs on the hind tibia to a point beyond its midpoint, strong reduction of galea and maxillary palpi, etc. Moreover, in these groups androconia (coremata) are developed in males and corethrogynes in females, and a simplification of structures is perceptible in the genitalia, especially the male valvae, with the uncus lobes fusing into a strong hook; in females the lobes of the vaginal plate are not sclerotized, the prevaginal plate is reduced, and a well-developed signum is present in the bursa copulatrix. All these progressive changes permit one to consider these groups the most specialized and more advanced branches in the subfamily.

Steppe and semisteppe landscapes within the limits of the ancient Mediterranean zone were areas of variable degree of aridness where, most probably, on the one hand formation of many genera from tribes Cephimallotini Zag., Rhodobatini Zag., and Ateliotini Zag. took place, and on the other hand forms of Indian and African origin penetrated (Myrmecozelini Zag., Hapsiferini Zag.). Possibly, therefore, the present fauna of the subfamily in the Palearctic is heterogeneous and consists of several elements widely distributed in other regions which are autochthonous in origin. Such autochthons are particularly numerous in the Mediterranean region, and furthermore there are centers of endemic speciation in the Caucasus, Kazakhstan, and Central and East Asia.

Studies of the moth fauna from east and southeast Africa by Gozmàny (1960, 1965a, 1965b, 1965c, 1966, 1967, 1968, 1969) are of great interest for understanding the process of formation of species of Myrmecozelinae in the Palearctic. As already indicated in the section "Geographic Distribution," Gozmàny reported a large complex of species of *Episcardia* Rag., *Myrmecozela* Zll., *Perissomastix* War. and Roth. (Myrmecozelini Zag.), as well as a series of genera related to Mediterranean genera in the tribes Rhodobatini Zag. and Hapsiferini Zag. An analysis of the members of all closely related genera not only confirms the existence of closer links in the past between the faunas of both regions, but also permits one to consider the Mediterranean fauna of these tribes as the relict fauna preserved, after its separation, in the Sahara region, the only common African area of distribution.

It should be noted, however, that the numerous genera described by Gozmàny from the savannas of tropical Africa, although included in subfamilies established by him on the basis of the structure of their genitalia, remain insufficiently analyzed in terms of taxonomy and phylogeny.

90 A study of the venation, leg armature, head structure and genitalia, especially in females, might possibly result in the establishment of several endemic tribes.

Members of Myrmecozelinae from the Nearctic as well as Indo-Malayan, Australian, and Neotropical regions have only recently attracted study and it is still too early to speak of generic groupings within the subfamily. However, there is no doubt that the following genera constitute unique independent lines of development: *Harmaclona* Busck, *Alavona* Walk., *Machaeropteris* Wlsm., and *Tinissa* Walk.—from the Indo-Malyan region; *Ardiosteres* Meyr.—from northern Australia; and *Brachysymbola* Meyr., *Homilostola* Meyr., *Autocnaptis* Meyr., and *Syncraternis* Meyr.—from South America. An analysis of material from the tropical regions, where less specialized fauna is more predominant than in the arid regions of the ancient Mediterranean, should make it possible to better understand the origin of Palearctic Myrmecozelinae.

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Part II

Taxonomy

100

Subfamily MYRMECOZELINAE

Zagulyaev, 1958: 920; 1968a: 219; Căpuşe, 1968: 137–139; Zagulyaev, 1969; 4–5, 17–18; 1971a: 220–221; 1971b: 416–417; Căpuşe, 1971: 233–234; Zagulyaev, 1972b: 485–497.

Type genus. Myrmecozela Zll., 1852.

Imago. Pubescence of head from dirty white to cinnamon-gray with brownish tinge. Galea, if present, reaches end of 2nd segment of labial palpi (Figures 3 and 4). Maxillary palpi five-segmented, not longer than labial palpi, or absent (Hapsiferini Zag., *Pachyarthra* Ams.). Labial palpi large; 2nd segment with dense brush of long bristles (Figures 1 and 2). Palpi usually equal to two-thirds to three-fourths length of forewing; in many species with light-colored rings or with whorl of infundibular, broadened, elongated scales (Figure 6); antennae rarely equal to length of forewing. Frons almost equal to or slightly larger than longitudinal diameter of eyes.

Thorax and tegulae usually light-colored. Span of forewings 3.0 to 4.25 times, and of hind wings 2.75 to 4.0 greater than width. Hind wings in most species equal in width to forewings or slightly broader. Fringe of hind wings one-thrid to three-fourths width of wing. Forewings from light yellow to cinnamon-ash, in many species without sharply expressed pattern; only in members of Cephimallotini Zag. do the wings have a distinct pattern or (*Hapsifera* Zll.) scattered groups of protruding scales.

Sc of forewings (Figure 7) terminates midpoint of anterior margin of wing or slightly beyond it. In most species all branches of R developed but in some R_4 absent (Ateliotini Zag.). All medial veins well developed and M_1 terminates on outer margin of wing. Distance between base of Cu_1 and Cu_2 one-half to one-fifth length of radial cell. Anal veins three; fork of A_{2-3} well developed. Radiocubital cell closed, and in most species radial and middle cells present. In hind wings (Figure 8) Sc terminates on anterior margin of wing at three-fourths to seven-ninths its length. All three medial veins wide-set at base. Anal veins well developed. Radiocubital cells closed in all genera except *Rhodobates* Rag.

Tibia of forelegs (Figure 9) two-thirds to one-half femur, many genera without epiphysis. Tibia of middle legs shorter than femur or equal to it (Figure 10). Middle pair of spurs of hind tibia in most species located almost at midpoint (Figure 11); end of tarsal segments either without spinules (Ateliotini Zag., *Catabola* Durr., *Hapsifera* Zll., *Pachyarthra* Ams.), or with three spinules, as in many other species.

In males, clusters of androconial scales located on membrane between segments VIII and IX, absent only in Ateliotini Zag. and Rho-
101 dobatini Zag. In females, segment VII with paired sacs filled with silken hairs; sacs absent in species of Cephimallotini Zag. and Rhodobatini Zag.

Genitalia of male (Figures 12 and 14) large and simple. Uncus with wide-set lobes; rarely are lobes fused at tip (*Myrmecozela* Zll.). Gnathos absent or present (Cephimallotini Zag., Hapsiferini Zag., Rhodobatini Zag.). Aedoeagus in most genera short and thick or slender and arcuate (*Myrmecozela* Zll., *Cinnerethica* Ams., *Rhodobates* Rag.). Saccus broad and long (*Ceratuncus* Pet., *Reisserita* Ag.), but sometimes absent (*Ateliotum* Zll.).

Genitalia of female (Figures 13 and 18 to 20) variable, and difficult to characterize by any common features. Vaginal plate in most species entire, rarely divided into two narrow lobes (*Ceratuncus* Pet.), or poorly developed and replaced by membrane covered with slender bristles (*Myrmecozela* Zll., *Hapsifera* Zll.). Ostium bursa and duct of bursa copulatrix membranous, in some cases covered with spinules. In *Episcardia* Rag. and some members of *Catabola* Durr. duct with complex sclerotized structures. Bursa copulatrix without signum or with inclusions of various shapes: a long cord in *Myrmecozela* Zll., or bent plate in *Hapsifera* Zll. Anterior apophyses simple (*Hapsifera* Zll.) or bifurcate. Ovipositor 1.5 to 2.5 length of sternite VII.

Larvae (Figures 21 and 22). In most known species larvae minute or medium-sized, without cuticular pattern (Figure 21, A). Epicranial suture on head large, almost equal to frontal triangle or even larger (Figure 21, B). Prothoracic pinacula dark-colored, with long bristles, many of which are longer than pinacula. In known species prestigmal pinacula with three bristles (Figure 21, B). Pinacula on abdominal segments poorly developed. Coxa of thoracic legs glabrous; claws with indentation at base (Figure 22, A); crochets of abdominal legs simple, uniserial (Figure 22, B), rarely with broad base (*Ateliotum* Zll.).

Pupa (Figures 23 to 25). Pupae minute or medium in size; head of many species without frontal outgrowth (Figure 23, A). Suture between mesothorax and metathorax deeply curved in direction of metathorax (Figure 23, B). Alar covers and antennae short. Supporting structures represented by two rows of spinules (Figure 24) and development of strong armature on short, broad cremaster (Figure 25).

Biology. Moths are steppe detritophages. Biology still poorly studied.

Most Palearctic members of Myrmecozelinae are associated with deforested steppe regions (Plates II and III), while others live in semideserts (Plates IV and V), including stony and sandy deserts, where they concentrate in stabilized areas, especially in interridge depressions. A fairly large number of species of different genera have adapted to life in foothills, hills, hilly plateaus, screes, etc. Only isolated species live in forests (Plate I).

Most non-Palearctic members of the subfamily live in tropical steppes, savannas, semideserts, and plateaus. A few members of Myrmecozelinae live in humid tropical regions (India), where they concentrate in regions with open meso-zerophytic landscapes, for example, the Deccan plateau.

On the basis of peculiarities of life pattern these moths have been included by me (Zagulyaev, 1972b) in the hepialoid biological type (Mazokhim-Porshnyakov, 1954). Their larvae live under conditions of
102 abundant food and are trophically associated with dead parts of herbaceous plants. They live in silken galleries, primarily in the residue of grasses, where many species make ventilation tubes which usually protrude above ground (Figure 26, A). The larvae are mesophils or xerophils. Pupation takes place in a cylindrical cocoon (Figure 26, B) directly in the ventilation passage or in its lateral branch near the surface, but the pupae are hidden in the soil or under forest litter. They are characterized by a strong armature on the tergites and cremaster. The moths are active in the morning and second half of the day; mostly males fly, while females are less mobile and usually continue to perch on the stems of plants near the oviposition site. Eggs are laid in cluster on various substrata, and the females cover them with a silken fluff. Larvae emerging from eggs in some species release a long silken thread readily wafted by the wind. After their wind-borne flight they penetrate the soil and build galleries between roots of grasses.

Association with decomposed plant residue is one of the characteristic peculiarities of this subfamily. Grass, turf, or steppe detritophagy is a further evolution over the primitive type of feeding, namely forest detritophagy. This is indicated by the fact that the most primitive members of the subfamily, such as *Cephitinea* Zag., have not yet lost their association with forests and develop in forest litter, whereas most of the specialized branches of Myrmecozelinae are closely associated only with steppe vegetation. Resemblance between the two types of feeding is not disputable since in both cases the larvae mainly feed on fungal mycelia and products of enzymatic degradation of plant tissues, but in one case those of trees and in the other those of grass. Along with feeding on herbaceous detritus, development of partial keratophagy in individual genera of this subfamily also deserves attention (Zagulyaev, 1969).

Steppes provide generous food reserves (herbaceous detritus); consequently, female moths do not require prolonged flight and a long life to search for food for their progeny. This is possibly one reason why females of some species (*Pararhodobates* Pet.) have reduced wings. The low mobility of females and rarity of their discovery by lepidopterists has led to a situation wherein females of most species of Myrmecozelinae are not known to specialists.

Myrmecozelinae are distributed in the Palearctic mainly in arid regions (Figures 27 to 30). Non-Palearctic members of the subfamily are known from almost every continent, but found in greater numbers in the savannas of southeast Africa.

Classification. Currently the subfamily Myrmecozelinae found within the limits of the Palearctic includes 20 primarily Eurasian genera, divided into five tribes:

I. Tribe Cephimallotini Zag. includes genera *Cephitinea* Zag., *Cephimallota* Brud., and *Anemallota* Zag.

II. Tribe Rhodobatini Zag. includes genera *Pachyarthra* Ams., *Pararhodobates* Pet., *Rhodobates* Rag., *Ceratuncus* Pet., and *Reisserita* Ag.

III. Tribe Ateliotini Zag. includes genera *Ateliotum* Zll. and *Eremicola* Ams.

IV. Tribe Myrmecozelini Zag. includes genera *Episcardia* Rag., *Catabola* Durr., *Perissomastix* War. and Roth., *Myrmecozela* Zll., and *Cinnerethica* Ams.

V. Tribe Hapsiferini Zag. includes only one genus, *Hapsifera* Zll.

Genera *Hypophrictis* Meyr., *Latypica* Meyr., *Ptilopsaltis* Meyr., and *Titaenoses* Hint. and Bradl. are known from the southern regions of the Palearctic, but their taxonomic position requires further investigation.

103 The phylogenetic relations of the tribes in the subfamily have been presented in Figure 31. I have divided the tribes into two groups: the first includes Cephimallotini Zag. and Rhodobatini Zag., characterized by the absence of androconial scales in the males and sacs containing silken fluff in segment VII of females. These tribes are furthermore linked by a series of peculiarities of structures: genitalia of male always comprises gnathos, saccus, etc. The second group includes tribes Myrmecozelini Zag. and Hapsiferini Zag., characterized by the presence of well-developed androconia in males and corethrogynes in females. The latter character places tribe Ateliotini Zag. closer to this group, while the absence of androconial clusters in the male brings it closer to the first group. Thus Ateliotini Zag. is intermediate between the two groups.

It should also be noted that the first group includes the most primitive moths in the subfamily. On the basis of some characters like the epiphyses on the foretibiae, archaic genera in the second group such as *Episcardia* Rag. are closer to this group.

Key to Tribes of Subfamily Myrmecozelinae on the Basis of External Characters

1 (2). Forewings with groups of protruding scales. Galea and maxillary palpi absent .... V. **Hapsiferini** Zag. (p. 501).

2 (1). Forewings smooth, without protruding scales. Galea or maxillary palpi present.

3 (4). R_4 absent in forewings .... III. **Ateliotini** Zag. (p. 262).

4 (3). R_4 present in forewings.

5 (6). Foretibia without epiphysis .... IV. **Myrmecozelini** Zag., in part (**Myrmecozela** Zll., **Catabola** Durr.) (p. 304).

6 (5). Foretibia with epiphysis.

7 (8). Middle tibia longer than the femur .... IV. **Myrmecozelini** Zag., in part (**Episcardia** Rag.) (p. 308).

8 (7). Tibia of middle legs shorter or equal to femur in length.

9 (10). Middle pair of spurs on hind tibia located before midpoint of tibia. Under surface of wings with violet hue. .... I. **Cephimallotini** Zag. (p. 134).

10 (9). Middle part of spurs of hind tibia located beyond midpoint of tibia. Under surface of wings yellowish-gray, without violet hue. .... II. **Rhodobatini** Zag. (p. 200).

Key to Tribes of Subfamily Myrmecozelinae on the Basis of Male Genitalia[1]

1 (4). Clusters of androconial scales located on membrane between segments VIII and IX.

2 (3). Gnathos or anellus present .... V. **Hapsiferini** Zag. (p. 501).

3 (2). Gnathos or anellus absent..... IV. **Myrmecozelini** Zag. (p. 304).

4 (1). Clusters of androconial scales not present on membrane between segments VIII and IX.

104 5 (8). Gnathos or anellus present; saccus developed.

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[1] The androconial clusters do not belong to genitalia, but are located near them and perceptible after making preparations of copulatory organs; it is more convenient to consider them here.

6 (7). Vinculum narrow; if broad, aedoeagus thick and straight .... II. **Rhodobatini** Zag. (p. 200).
7 (6). Vinculum broad, equal to or greater than length of uncus; aedoeagus bent. .... I. **Cephimallotini** Zag. (p. 134).
8 (5). Gnathos or anellus as well as saccus absent. .... III. **Ateliotini** Zag. (p. 262).

Key to Tribes of Subfamily Myrmecozelinae on the Basis of Female Genitalia[2]

1 (6). Paired sacs present inside segment VII and filled with fluff. Anterior apophysis bifurcate.
2 (3). Bursa copulatrix without signum; duct of bursa without sclerotized structures .... III. **Ateliotini** Zag. (p. 262).
3 (2). Bursa copulatrix with signum; if without, then duct of bursa with complex of sclerotized structures.
4 (5). Signum in bursa copulatrix in form of bent plate covered with spinules .... V. **Hapsiferini** Zag. (p. 501).
5 (4). Signum in bursa copulatrix varies in shape; if absent, then duct of bursa with complex of sclerotized structures .... IV. **Myrmecozelini** Zag. (p. 304).
6 (1). Sacs with fluff not present inside segment VII. Anterior apophysis simple.
7 (8). Lobes of vaginal plates well developed; prevaginal plate present; anterior apophysis enter segment VI .... I.**Cephimallotini** Zag. (p. 134).
8 (7). Vaginal plate entire; if divided into lobes, then termination of duct of bursa copulatrix resembles sclerotized tube; prevaginal plate not present; anterior apophysis enter segment VII .... II. **Rhodobatini** Zag. (p. 200).

I. Tribe CEPHIMALLOTINI

Zagulyaev, 1965: 386–395; 1968a: 219–222; Căpuşe, 1968: 259–260 (Nemapogoninae); 1971: 235 (Nemapogoninae); — Phthoropoeinae Gozmàny and Vàri, 1973: 10–11, type genus *Phthoropoea* Walsingham, 1896: 282.

Type genus. Cephimallota Brud., 1849, s. str. Zag., 1964.

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[2] Paired sacs filled with fluff do not belong to the genitalia, but are located near them and more readily discernible after making preparations of the genitalia; hence it is convenient to consider them here.

Imago. Head covered with fairly long ruffled hair. Galea short, not reaching midpoint or apex of 2nd segment of labial palpi (Figures 3, A and 36). Maxillary palpi shorter or slightly longer than labial palpi. Antennae two-thirds length of forewing, yellowish or cinnamon-gray; in some insects with dark- or light-colored rings at end of each segment.

Thorax and tegulae yellowish or cinnamon-gray, in some species glossy. Moths small or medium in size, with wing span of 12 or 25 mm. Fore and hind wings long and narrow, in most members acute at apex. Hind wings almost equal in width to forewings, rarely slightly broader.

105 Forewings dark, often cinnamon-gray, glossy, without pattern or with slightly demarcated spots or streaks.

Radial veins in forewings (Figure 37, A) widely separated at base; R_1 to R_4 terminate on anterior alar margin and R_5 at alar apex; only in some species of *Cephimallota* Brud. are R_1 and R_5 close to each other and R_5 terminates on anterior margin before alar apex. End of Cu_2 located at level of outer margin of radiocubital cell. In hind wings (Figure 37, B) A_1 terminates on posterior margin of wing before level or at level of apex of radiocubital cell.

Tibia of anterior legs with epiphysis (Figures 9, A and 38). Middle pair of spurs of hind tibia located before middle or almost in middle of tibia. End of tarsal segments of all legs with three strong spinules (Figures 11, A and 40).

Tip of abdomen in males without clusters of androconial scales, and in females without sacs of silken hair.

Genitalia of male compact (Figures 12, A; 14, A; and 44), broad and extended only in members of *Anemallota* Zag. Valvae elongated and simple or with lobate processes, or valvae highly sclerotized, bent, and unguiculate (*Cephimallota* Brud.). Sclerotized cord or pedicel of valva may be long and protrude beyond vinculum, or short and not emerging from under it. Uncus in form of two outgrowths (*Cephitinea* Zag.) or small tuberculate appendages (*Cephimallota* Brud.). Gnathos developed only in *Cephimallota* Brud., its branches in form of arcuate and intercrossing cords; in other genera replaced by anellus functionally. Aedoeagus small, slightly longer than valva or shorter than width of genitalia (ventral view), usually slightly curved, with pointed tip and broad base. Tegumen broad, without notch at base (*Cephitinea* Zag.) or with notch (*Cephimallota* Brud.). Vinculum broad and together with tegumen forms continuous massive ring. Saccus on lower side broad and short, in some genera curves outward (*Cephitinea* Zag.) or slender (*Cephimallota* Brud.).

Genitalia of female (Figures 18, B, C; 19, A; and 45) more or less uniform in structure. Vaginal plate divided into two large, well-developed lobes. Duct of bursa copulatrix, like bursa itself, without sclerotized structures. Anterior apophysis simple or bifurcate. Posterior apophysis included in segment VII or reaches it (*Cephimallota* Brud.).

Biology. Mesophilous forest-steppe and zerophilous steppe or desert species, sometimes found in mountains, and associated with feeding on plant residue. Larvae develop in turfy growth of grasses or in bird nests, nests of bumblebees, and burrows of rodents. Some species may live in granaries.

Distribution. Soviet Union except Siberia and north; Western Europe, Canary Islands, Tunisia, Asia Minor and northwest Asia, Mongolia, China, Japan, North America (Figure 27).

Analysis of data available on fauna reveals that Cephimallotini Zag. in distribution spreads beyond limits of the Palearctic; however, the greater majority of its members (including also endemics) concentrate in the territory of the ancient Mediterranean, which provides a basis for assuming the existence of ancient centers of formation here of present-day fauna of these species.

The tribe includes three genera: *Cephitinea* Zag., *Cephimallota* Brud., and *Anemallota* Zag.

106 Phylogenetic relations within the tribe are presented in Figure 32. Genera *Cephimallota* Brud. and *Cephitinea* Zag. are close to each other in general appearance and on the basis of well-developed prevaginal plate. Genus *Anemallota* Zag. is close to *Cephimallota* Brud. in structure of male genitalia (valvae with normal structures, uncus well-developed, and so on).

Morphologically, some members of the tribe (*Cephimallota* Brud.) are quite similar to *Haplotinea* Diak. and Hint. Similarity is manifest in color, type of markings, as well as certain peculiarities of genital structures. Species of these genera have adapted to similar ecological conditions, which also brings them closer. Thus Cephimallotini Zag. has some characteristics of Nemapogoninae, although it belongs to Myrmecozelinae. On this basis one may assume that isolated links are still preserved between the two subfamilies.

Characteristics of tribe Cephimallotini Zag. and certain links between genera included under it and other genera of the subfamily, as well as those of genus *Cephimallota* with *Haplotinea* Diak. and Hint. (Nemapogoninae), provide a basis for considering Cephimallotini Zag. not only the most generalized tribe of Myrmecozelinae, but also a connecting link between archaic Myrmecozelinae and specialized members of Nemapogoninae. Including this tribe under the subfamily of fungal moths (Nemapogoninae), as done by Căpuşe, (1968, 1971), has little basis and is not acceptable to me. I have retained tribe Cephimallotini Zag. in subfamily Myrmecozelinae. However, it cannot be ruled out that in studying members of tribes Haplotineini Zag. and Cephimallotini Zag. from non-Palearctic regions it is possible to combine them into an independent subfamily (Zagulyaev, 1964a, 1968a). Genus *Dinica* Gozm., described from the south African subregion (Uganda, Kenya), as well as genus *Phthoropoea* Wlsm. from the same area and separated into a nominative subfamily (Gozmàny and Vàri, 1973) are of special interest.

Key to Genera of Tribe Cephimallotini Zag. on the Basis of External Characters

1 (2). Forewings with bright pattern of spots and stripes .... 3. **Anemallota** Zag. (p. 177).
2 (1). Forewings monotonous, without sharply developed pattern.
3 (4). Forewings dark cinnamon-gray to cinnamon-black, lustrous; wing span up to 17 mm; wings broad, short, obtuse at apex ... . 2. **Cephimallota** Brud. (p. 157).
4 (3). Forewings yellowish-gray, with distinct darker streaks; wing span 17 to 25 mm; wings narrow, long, with acute apex .... 1. **Cephitinea** Zag. (p. 138).

Key to Genera of Tribe Cephimallotini Zag. on the Basis of Male Genitalia

1 (2). Valvae highly sclerotized, unguiculate, curved, and pressed to uncus; uncus small, undeveloped; branches of gnathos narrow, long .... 2. **Cephimallota** Brud. (p. 157).
2 (1). Valvae poorly sclerotized, spoon-shaped, protrude parallel to each other, and not pressed to uncus; uncus large, well-developed; branches of gnathos usually not developed and replaced by highly sclerotized anellus.
107 3 (4). Uncus in form of two long, straight highly sclerotized outgrowths; saccus outcurved. Posterior margin of sternite VIII with entire outgrowth .... 1. **Cephitinea** Zag. (p. 138).
4 (3). Uncus broad, with two poorly developed apices; sacus incurved. Posterior margin of sternite VIII with deeply notched outgrowth .... 3. **Anemallota** Zag. (p. 177).

Key to Genera of Tribe Cephimallotini Zag. on the Basis of Female Genitalia

I (4). Sclerotized prevaginal plate well developed.
2 (4). Prevaginal plate in form of sclerotized outgrowth .... 1. **Cephitinea** Zag. (p. 138).

3 (2) Prevaginal plate in form of broad bulging triangle .... 2. **Cephimallota** Brud. (p. 157).
4 (1). Prevaginal plate not developed .... 3. **Anemallota** Zag. (p. 177).

1. Genus *Cephitinea* Zag.

Zagulyaev, 1964: 680–682; 1965: 387–390; 1968a: 219–221; 1971b: 416; Căpuşe, 1971: 235 (Nemapogoninae).

Type species. Tinea colonella Erschoff (Ershov) 1874a, vol. II, p. 97, Tab. 6, Figure 106 (Turkestan).

Close to genus *Cephimallota* Brud., but differs from it in larger size, venation, chaetotaxy of legs, and structure of genitalia. Valvae of males elongated, spoon-shaped; uncus and anellus well developed; large sclerotized prevaginal plate present in females.

Imago. Head covered with light yellowish-gray or cinnamon-gray hairs. Maxillary palpi shorter than labial palpi; their 5th segment very small and several times (four to eight) shorter than 4th (Figures 3, A and 36). Antennal segments with broad brown or light yellow rings before apex. Antennae of males covered with short bristles.

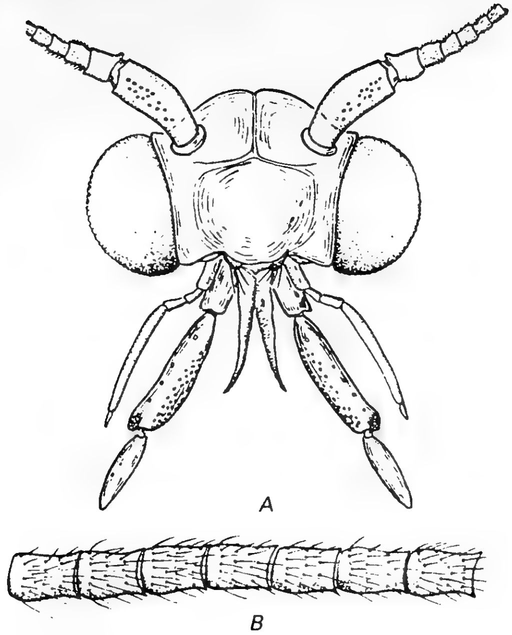
Span of forewings varies from 17 to 25 mm. Forewings and hind wings narrow, their length more than three times width. Fringe of hind 108 wings slightly shorter than width of wing. Color of wings uniformly yellowish or cinnamon-gray, with brownish or reddish tinge, without sharply expressed pattern. Under surface of wings with slight violet hue.

Venation of forewings (Figure 37, A). *Sc* terminates at midpoint of forewing; R_1 terminates on anterior margin before level of apex of radiocubital cell. Distance between bases of Cu_1 and Cu_2 four-fifths to one-half distance between R_2 and R_3. A_1 terminates on posterior margin of wing at level of apex of radiocubital cell or slightly before. In hind wings (Figure 37, B) end of *Sc* slightly closer to alar apex than to apex of radiocubital cell. A_1 terminates on posterior margin of wing before level of apex of radiocubital cell.

End of foretibia with three spinules (Figure 38). Middle pair of spurs on hind tibia located almost in middle of tibia (Figure 40). Spinules at ends of tarsal segments with usual structure (Figure 39).

109 Abdomen yellowish-gray. Sternite of segment VIII in male with undivided process along posterior margin (Figures 12, A and 41).

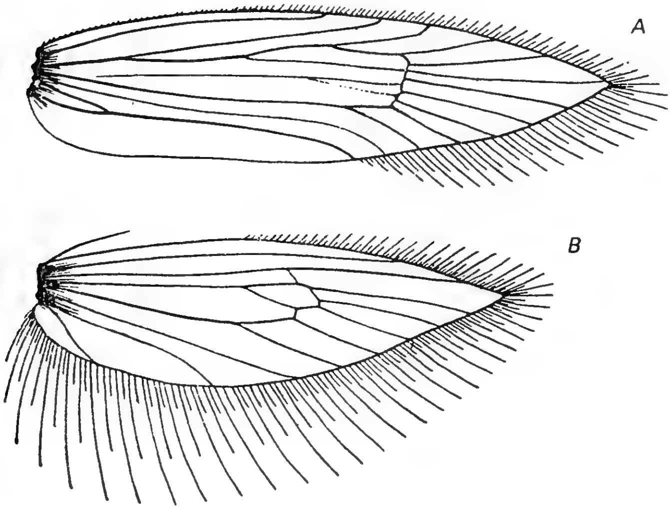
Genitalia of male (Figures 14, A and 44). Typical for tribe. Valvae spoon-shaped, lobes broad or elongated, or slightly bent in direction of uncus, covered with short and long bristles. Sclerotized cord of valva visible from under vinculum. Uncus large, in form of long, straight,



107 Figure 36. *Cephitinea colonella* Ersch.

A — male, head; B — middle segment of antenna (highly magnified).

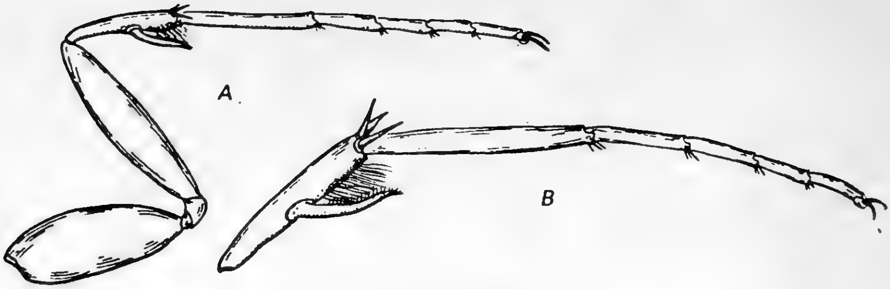
Preparation No. 4590, male. Kuldja.



108 Figure 37. Venation wings of *Cephitinea colonella* Ersch.

A — forewing; B — hind wing.

Preparation No. 4590, male. Kuldja.



108 Figure 38. Forelegs.

A — *Cephitinea longipennis* Ersch.; B — *C. colonella* Ersch.

109 Figure 39. Middle leg of *Cephitinea colongella* Zag.

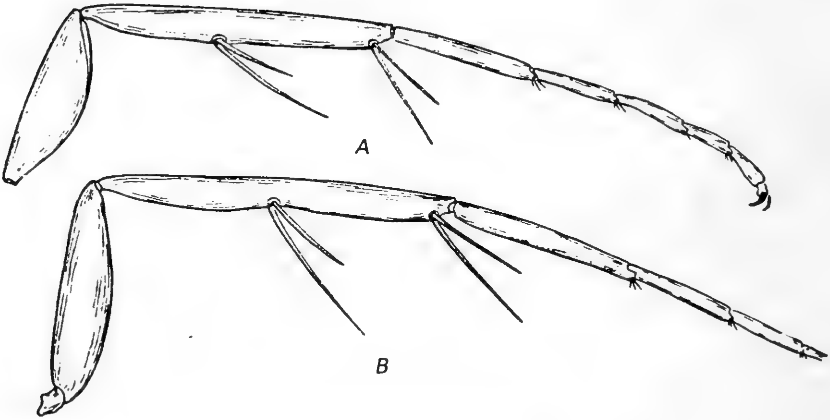
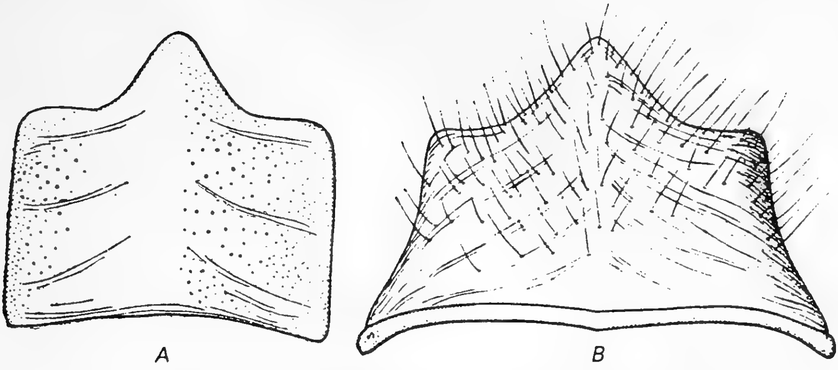


Figure 40. Hind legs

A — *Cephitinea colonella* Ersch.; B — *C. longipennis* Ersch.



110 Figure 41. Structure of sternite of segment VIII of males.
A—*Cephitinea colonella* Ersch.; B—*C. longipennis* Ersch.

highly sclerotized process, and does not protrude above valvae. Branches of gnathos not developed, their function performed by anellus—the poorly sclerotized appendage surrounding base of aedoeagus. Aedoeagus an elongated, slightly sclerotized tube. Tegumen in dorsal view straight at base. Saccus lobate and outcurved.

Genitalia of female (Figures 18, C and 45). Lobes of vaginal plate wide-set, with large number of long bristles along posterior margin. Terminal quarter of lobes pigmented and distinctly sclerotized. Prevaginal plate in form of sclerotized process, with wide base, and small notch along anterior margin. Duct of bursa copulatrix short. Anterior apophysis simple, enter segment VI; posterior apophysis located in segment VII. Ovipositor long. 1.5 to 2.0 length of segment VII. Anal papillae large and well developed.

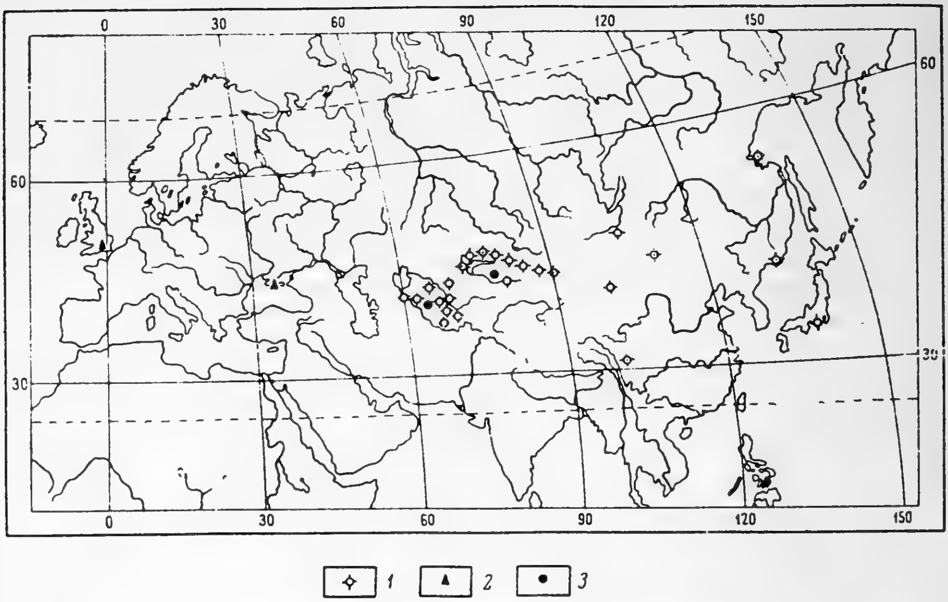
110 Body structure and chaetotaxy of larvae and pupae not known.

Biology. Xerophilous species, associated with decomposing grassy residue in steppes, semideserts, or mountains, including sod grasses. Development of larvae and emergence of moths takes place at warm and humid seasons of the year. In periods of drought or cold larvae probably enter long diapause. Species with two generations per year.

Movement of species of this genus to granaries possible. Moth *Cephitinea colonella* Ersch. is widespread in the granaries of Kazakhstan and Central Asia, feeding on grain and seeds of different technical crops.

Biology not studied in greater detail.

Distribution. Species of this genus in the Soviet Union occur in localized regions of Crimea, southeastern Kazakhstan, Central Asia, and Primor'e. Also found in England, Mongolia, China, Japan, and North America (Figure 42).



111 Figure 42. Distribution of species of genus *Cephitinea* Zag.

1 — *C. colonella* Ersch.; 2 — *C. colongella* Zag.; 3 — *C. longipennis* Ersch.

Distribution of three of the four species known at present is restricted to the Palearctic, but all are found in the Soviet Union. The area of distribution of one species extends beyond the limits of Eurasia and hence the range of the genus is Holarctic. *C. colonella* Ersch. has the greatest range. It includes southeastern Kazakhstan, Central Asia, Trans-Baikal steppes, southern Primor'e, Mongolia, China, and Japan. The range of *C. longipennis* Ersch. is limited to Central Asia. *C. colongella* Zag. is so far known only from Crimea and England. The known Arctic member of the genus — *C. longinella* Zag. — has been described from Texas. However, it should be assumed that several endemic species of *Cephitinea* Zag., as well as other genera, may be found in North America with its varied topography.

In all probability the center of species formation of the Palearctic member of the genus should be considered the eastern regions of the ancient Mediterranean. This is attested to by numerous finds as well as by the archaic nature of species *C. longipennis* Ersch., which is found there. On the other hand, interruption of the area of distribution suggests the ancient nature of the genus.

Comparison. The genus under examination has been separated from the heterogeneous *Cephimallota* Brud., but exhibits close links with this genus in terms of phylogeny according to our present restricted

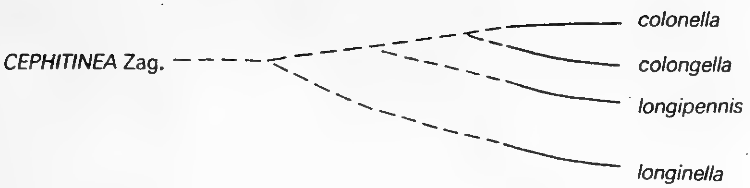


Figure 43. Phylogenetic links of species of genus *Cephitinea* Zag.

understanding (Zagulyaev, 1964b, 1965).

111 At present the genus *Cephitinea* includes four species: *Cephitinea colonella* Ersch., *C. longipennis* Ersch., *C. colongella* Zag., and *C. longinella* Zag.[3]

The relation between species is shown in Figure 43. The scheme is based on the peculiarities of venation and genital structure. *C. colonella* Ersch. and *C. longipennis* Ersch. are close to each other and linked by similar oral appendages, venation of wings, as well as peculiarities of male genitalia in such structures as the uncus and aedoeagus. These species form the nucleus of the genus. Distribution of the species in the Mediterranean region, Central Asia and the Far East, and their absence in Europe indicate the ancient nature of this group as well as the southeastern origin of the species of this group. Species *C. colongella* Zag. is quite close to *C. colonella* Ersch. and, most probably, the two share a common origin. *C. longinella* Zag. from Texas, on the basis of venation of wings, median location of middle pair of spurs of hind tibiae, presence of three spinules at end of tarsal segments, as well as general appearance and color, is included in the genus *Cephitinea* Zag. The absence of
112 characters such as prevaginal plate and more elongated lobes of the vaginal plate isolate this genus and permit one to consider it the earliest separated branch from a common ancestor.

Possibly, all the Palearctic species will be combined into a nominative subgenus in the future, and the North American member placed in a new subgenus.

Key to Species of Genus Cephitinea Zag. on the Basis of External Characters

1 (4). Distance between bases of R_2 and R_3 in forewings not less than two-fifths of radial cell; R_5 terminates on alar margin near apex.

2 (3). Common stem of A_{2-3} in forewing terminates on alar margin far ahead of level of divergence of Cu_2 from cell. .... 3. **C. longipennis** Ersch.

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[3] Species *C. longinella* Zag. from Texas is not considered in the present book, although included in the identification key.

3 (2). Common stem of A_{2-3} in forewing terminates on alar margin at level of origin of Cu_2 from cell .... 1. **C. colonella** Ersch.

4 (1). Distance between bases of R_2 and R_3 in forewing less than one-third of redial cell; R_5 terminates on alar margin far from alar apex.

5 (6). R_5 terminates in forewing about 1.5 times closer to alar apex than M_1. Distance between bases of M_1 and M_2 half distance between R_5 and M_1 .... 2. **C. colongella** Zag.

6 (5). R_5 terminates in forewing about 1.5 times farther from apex than M_1. Distance between bases of M_1 and M_2 equal to or slightly more than between bases of R_5 and M_1.. 4. **C. longinella** Zag.

Key to Species of Genus Cephitinea Zag. on the Basis of Male Genitalia[4]

1 (2). Valvae elongated, their length 2.33 greater than width, with conical tip; lobes of uncus in lateral view in form of wedge-shaped appendages .... 1. **C. colonella** Ersch.

2 (1). Valvae broad, their length slightly greater than width, with flattened, almost rectangular tip; lobes of uncus in lateral view in form of straight appendages which broaden toward end .... 3. **C. longipennis** Ersch.

Key to Species of Genus Cephitinea Zag. on the Basis of Female Genitalia

1 (6). Prevaginal plate in form of sclerotized process; infundibular end of duct of bursa copulatrix covered under process of prevaginal plate.

2 (3). Process of prevaginal plate continues beyond lobes of vaginal plate .... 3. **C. longipennis** Ersch.

3 (2). Process of prevaginal plate does not reach end of lobes of vaginal plate.

4 (5). Inner margins of lobes of vaginal plate diverge at base and hence are not covered by prevaginal plate, and therefore visible; prevaginal plate small, conical .... 2. **C. colongella** Zag. 113

5 (4). Inner margins of lobes of vaginal plate not divergent at base, and hence covered by prevaginal plate, and therefore not visible; prevaginal plate large, slightly conical ... 1. **C. colonella** Ersch.

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[4] Males of *C. colongella* Zag. and *C. longinella* Zag. not known.

6 (1). Prevaginal plate absent; infundibular end of duct of bursa copulatrix exposed .... 4. **C. longinella** Zag.

1. **Cephitinea colonella** Ersch. (Figures 12, A; 14, A; 16, A; 18, C; 36; 37; 38, B; 40, A; 41, A; 42–46; Plate VI, *2*)

Ershov, 1874a: II, 97, Tab. 6, Figure 106 (*Tinea*); 1874b: 413 (*Tinea*); Alferaki, 1891; 15 (*Tinea*); Staudinger and Rebel, 1901: II, 238 (*Tinea*); Petersen, 1957a: 100–103 (*Cephimallota*); Zagulyaev, 1964b: 681–682; 1972a: 686; —*lignea* Butler, 1879: 82, Pl. 60, Figure 15 (*Safra*); Matsumura, 1901: 24 (*Safra*); Caradja, 1920: 170 (*Gefra*); —*agglutinata* Meyrick, 1931: 96 (*Homalopsycha*) syn. n.

External appearance of imago. Head covered with fairly long grayish hairs with yellowish tinge. Galea reach midpoint of 2nd segment of labial palpi (Figure 36, A). Maxillary palpi filiform, light-colored, and reach only up to 3rd segment of labial palpi; 5th segment of maxillary palpi about one-seventh length of 4th segment. Labial palpi musty-yellow; 2nd segment on lower side with tuft of yellowish-gray bristles; 3rd segment two-thirds length of 2nd segment, basal half dark chocolate-brown, tip light-colored. Width of frons about one-fifth greater than longitudinal diameter of eyes. Antennae dark yellow with dark rings. 1st segment yellowish, without dark rings; length of basal segment 2.33 width, with 14 to 18 bristles on anterior side. Pubescence of antennae in males as shown in Figure 36, B.

Thorax and tegulae yellow to gray. Wing span of forewings in male 22 mm, in female 20 to 24 mm. Hind wings fairly acute, slightly broader in female than in male. Fringe of hind wing three-fourths alar width.

Forewings (Plate VI, *2*) cinnamon-gray with weak reddish tinge and irregular dark gray spots, a few of which fuse; a few slightly yellowish gray spots located on anterior margin; and inner side distinctly covered with gray to ocherous-yellow spots. Blackish spot located at apex of radiocubital cell. Hind wing yellowish-gray, translucent. Fringe light yellow to ash-colored with golden tinge.

Venation of forewings (Figure 37, A). R_2 terminates on alar margin immediately beyond level of apex of radiocubital cell. Distance between bases of R_2 and R_3 three-sevenths length of radial cell. End of R_5 slightly closer to alar apex than M_1. Distance between bases of Cu_1 and Cu_2 three-tenths length of radial cell and two-thirds distance between bases of R_2 and R_3. Common trunk of A_{2-3} terminates on posterior margin of wing slightly behind level of origin of R_2 from cell but at level of origin of Cu_2. In hind wings (Figure 37, B) R and M_1 terminate on alar margin at equal distance from apex of M_1 slightly close to apex. Branches M_2 and M_3 widely separate at base so that distance between them only one-half to one-third distance between bases of M_1 and M_2. Distance between bases of Cu_1 and Cu_2 only three-fourths length of medial cell.

Fore- and middle legs cinnamon-gray with slightly light-colored ring at end of each segment; hind legs yellowish-gray. Structure of legs as shown in Figures 38, B and 40, A.

114 Structure of sternite VIII as shown in Figures 12, A and 41, A.

Genitalia of male (Figures 14, A; 16, A; and 44). Valvae elongated, their length 2.33 × width, with well-developed elongated tips; sclerotized teeth occur off-center along upper margin; hind margin with lobate processes; inner surface of valvae with long erect bristles; uncus in lateral view looks like a wedge-shaped, pointed process (Figure 44); in dorsal or ventral view lobes of uncus widely separate and covered with short bristles (Figure 16, A). Aedoeagus arcuate, without sclerotized lobes at base. Saccus in lateral view looks like elongated narrow appendage, equal to width of vinculum; on lower side in form of lobate process.

Genitalia of female (Figures 18, C; 45; and 46). Lobes of vaginal plate broad with a more of less straight posterior margin. Inner margin

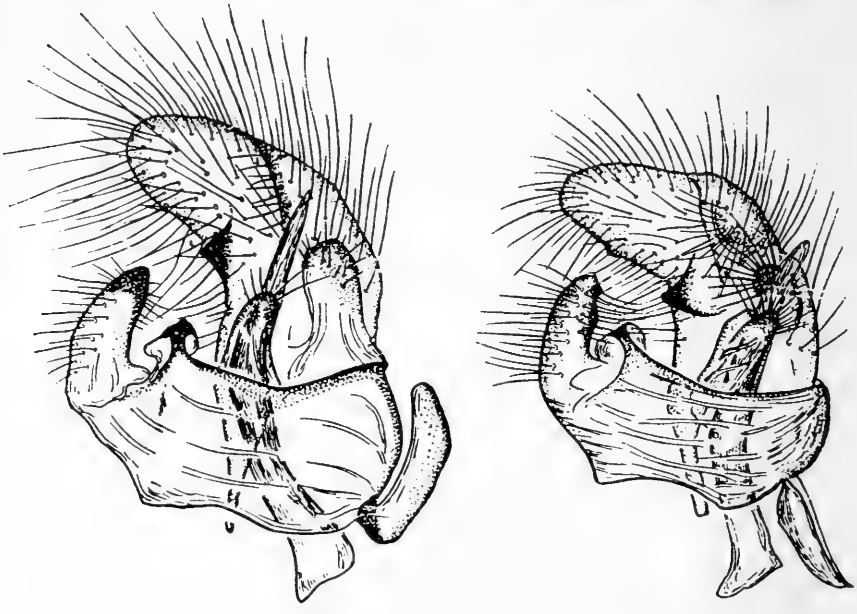


Figure 44. General appearance of male genitalia of *Cephitinea colonella* Ersch.

A—from Kuldja (preparation No. 4590, male); B—from southern Primor'e (preparation No. 5383, male).

of lobes more or less parallel to each other, and basal half located under prevaginal plate. Prevaginal plate slightly conical with obliquely truncated or flat tip, covered with acicular spinules, and two small bristles along margin; prevaginal plate short and does not reach posterior margin of lobes of vaginal plate. Bursa copulatrix located in segments III to V. Anterior apophyses slightly included in segment VI, posterior apophyses enter segment VII up to one-third its length. Ovipositor twice length of segment VII.

Comparison. On the basis of a complex of external genitalic characters close to *C. longipennis* Ersch., but *C. colonella* differs from it and 115 other species of the genus in the following peculiarities: Forewings cinnamon gray with darker diffused spots; distance between bases of Cu_1 and Cu_2 two-sevenths the length of radial cell. In hind wings distance

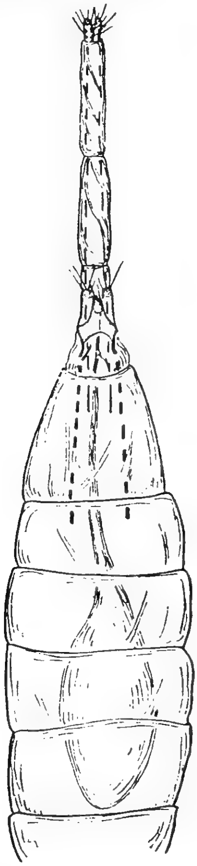


Figure 45. General appearance of female genitalia of *Cephitinea colonella* Ersch.

Preparation No. 4590, female. Kuldja.

between bases of Cu_1 and Cu_2 three-fourths the length of medial cell. Valvae in male genitalia elongated, with elongated tips; uncus in lateral view resembles a wedge-shaped, pointed process. In genitalia of females inner margin of lobes of vaginal plate not divergent at base and not visible from under prevaginal plate.

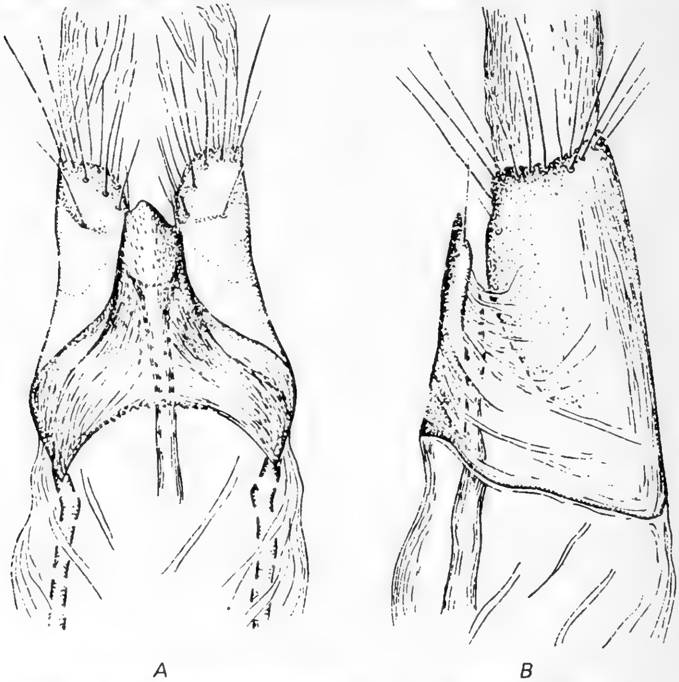
Discontinuity of the range between Southeastern Central Asia and Primor'e and absence in Europe attest to the relatively ancient nature of this species.

Petersen (1957a) examined the type specimes of *Safra lignea* Butl., described by Butler (1879) from Japan, and showed that this species is identical to *C. colonella* Ersch.

Distribution. Kazakhstan, Central Asia, and the Far East, as well as China, Mongolia, and Japan (Figure 42).

Recorded in literature from Kazakhstan: Alma-ata (Petersen, 1957a), Central Asia: Tashkent and Samarkand (Erschov, 1874a), Amur (Petersen, 1957a), Japan, Honsu Island: Yokohama (Butler, 1879).

Material examined. 21 males and 32 females.



116 Figure 46. Vaginal and prevaginal plates of *Cephitinea colonella* Ersch.

A — ventral view; B — lateral view.

Preparation No. 4590, female. Kuldja.

Kazakhstan. Dzhungarian Alatau, Baskan, two females, May 3–4, 1910 (Shnitnikov); Topolevka, three females May 6–9, and two males June 28–30, 1957 (V. Kuznetsov); Alma-Ata, deep crevice, one male January 16 (Shaidurov), one male May 12, 1936 (Filip'ev), one male April 29, and one female May 2, 1937; Issyk, one female April 28, one male and one female May 28, 1957 (Fal'kovich); state grain farm "Aksai," two males and three females June 18, 1963 (in granary) (Kosolapova).

Uzbekistan. Khiva, one female March 24, and one female April 9, 1927 (Zimin); Tashkent, Salar, one male March 11, holotype (Erschov), one female June–July, 1927 (Lebedev), one male March, 1947 (in granary); Ayakguzhumdy, 40 km east of Dzhingil'da, one male April 1, 1966 (Pastukhov): st. Golodnaya steppe (Gulistan), one female August 31, 1903 (Yakobson); environs of Samarkand, two females March 25, one of which allotype (Erschov).

Tadzhikistan. Dushanbe, two males and one female March 21–22, 1964 (Dagtereva).

Far East. Khabarov territory, Bolshoi Shantar Island, one male June 17, 1925 (Dulkeit); Primor'e territory, Chernigovka, one male July 27, 1916 (Emel'yanov); Yakovlevka, one male and one female May 6 and 9, 1926 (D'yakonov and Filip'ev); Ussuri, two females May 29 and June 2, 1929 (Indoleva); Vladivostok, st. Okeanskaya, one female May 7, 1926 (Mordvilko); Suchan, two females May 1, 1928 (Kurentsov), one female April 24, 1933 (Palshkov).

Mongolia. Middle Goby aimak, Jargalant well, one female July 21, 1909 (P. Kozlov).

China. Sin-Czyan Kuldja, two males and one female February 25–29, 1879, 6 females in 1884; San-chuan, Xun-xe River, 1 male November 11, 1885 (Potanin); southwestern China, Batan, one female March 7, 1936 at an elevation of 2,800 m (H. Hone), identified by Meyrick as *Homalopsycha agglutinata*; I studied this specimen from the Caradja collection (Bucharest) and its genitalia in preparation No. 169 (female) are not distinguishable from *Cephitinea colonella* Ersch.

Biology. Warmth-loving species of southeastern region, at present found in south-eastern regions of Kazakhstan, Central Asia, and Primor'e territory.

Moths fly in Kazakhstan from end of April to end of June; in Uzbekistan the first moths were sighted at the beginning and end of March (3 and 25) (Erschov, 1874a); in China in Kuldja, they are found from the end of February. These moths have also been caught in
116 August, November, and March, and in Mongolia in the middle of July.

Larval biology is associated with decomposing plant residue, but they also live in granaries. Probably two generations, sometimes three per year.

Predators and parasites not known.

Significance as pest. On reaching granaries moths find favorable conditions and multiply rapidly. They mainly damage old grain but with intensive breeding also attack fresh healthy grains; the larvae cement seeds with silken threads into balls. Damage derives from grain consumption and grain pollution.

Preventive and control measures. Prophylactic cleaning of granaries should be done regularly at the proper time, and if the pest detected, complete disinfection carried out.

2. **Cephitinea colongella** Zag. (Figures 39; 42; 43; and 47–49).

Zagulyaev, 1964b: 682–684.

External characters of imago. Head covered with long cinnamon-gray hair. Galea and maxillary palpi slender and almost reach apex of 2nd segment of labial palpi. Labial palpi light-colored, yellowish-gray; tuft of scales and bristles on 2nd segment long, with bristles equal in length to 3rd segment; 3rd segment almost half length of 2nd. Frons slightly less in width than longitudinal diameter of eyes. Antennae dark 117 brown with slightly light-colored rings near end of each segment. Length of basal segment almost twice width, on front with seven bristles.

Thorax and tegulae dark brown with faint violet tinge. Span of forewings 25 mm. Fore- and hind wings with acute apex; fringe of hind wing almost equal to half alar width, or slightly larger.

Forewings yellowish-gray with large number of cinnamon-gray spots and minute dots scattered throughout wing, as a result of which color appears darker. Hind wing yellowish-gray. Both pairs of wings and their fringes lustrous. Under surface of wings cinnamon-gray, with faint violet tinge.

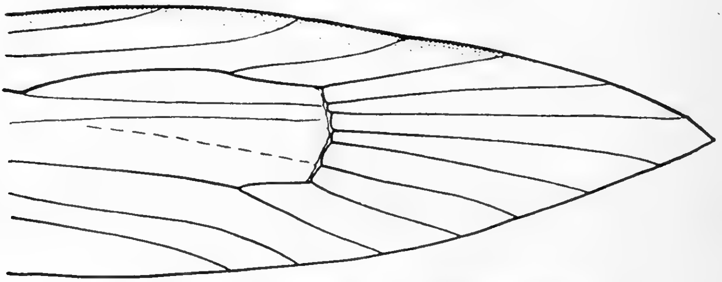


Figure 47. Venation of forewings of *Cephitinea colongella* Zag.
Preparation No. 4589, female. England.

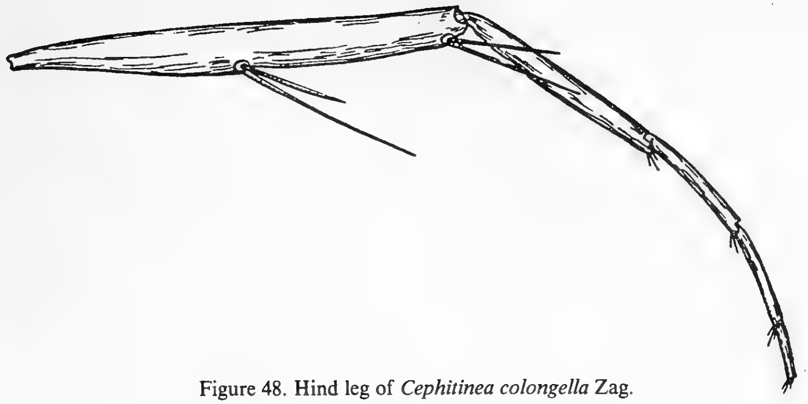


Figure 48. Hind leg of *Cephitinea colongella* Zag.
Preparation No. 4589, female. England.

Venation of forewing (Figure 47). R_2 terminates on alar margin at level of apex of radiocubital cell. Distance between bases of R_2 and R_3 less than one-third length of radial cell. Terminus of R_5 about 1.5 times closer to alar apex than terminus of M_1. Distance between bases of Cu_1 and Cu_2 one-fourth length of radial cell and two-thirds to three-fourths distance between bases of R_2 and R_3. Common trunk of A_{2-3} terminates on posterior alar margin between levels of origin of R_2 and Cu_2 from cell. Venation of hind wing mainly similar to that of *C. colonella* Ersch.

118 Forelegs cinnamon-gray, middle and hind legs yellowish-gray; ends of all segments of all legs with indistinct light-colored rings; tibiae of fore- and middle legs with diffused belt in middle. Structure of middle leg and armature shown in Figure 39, and that of hind leg in Figure 48.

Male. Not known.

Female genitalia (Figure 49). Lobes of vaginal plate wide-set; posterior margin straight; inner margins diverge considerably at base and visible along sides of prevaginal plate. Latter conical, almost triangular, with shallow notch at tip; two small bristles located along edge of notch; plate short and does not reach posterior margin of lobes of vaginal plate. Posterior apophysis reaches midpoint of segment VII. Location of anterior apophysis and bursa copulatrix as well as structure of ovipositor similar to other members of the genus.

Comparison. On the basis of general appearance and color pattern of forewings, this species is close to *C. colonella* Ersch. and slightly similar to *Tinea pallescentella* Stt. It differs from both in darker pattern and venation of forewings: distance between bases of R_2 and R_3 less than one-third length of radial cell; terminus of R_5 about 1.5 times closer to alar apex than terminus of M_1. In female genitalia, inner margins of lobes of vaginal plate diverge notably at base, visible, and not

119 covered by prevaginal plate. Prevaginal plate smaller, highly conical, with notch at tip.

Distribution. Southern European part of the USSR (Crimean Peninsula) as well as Western Europe (England) (Figure 42).

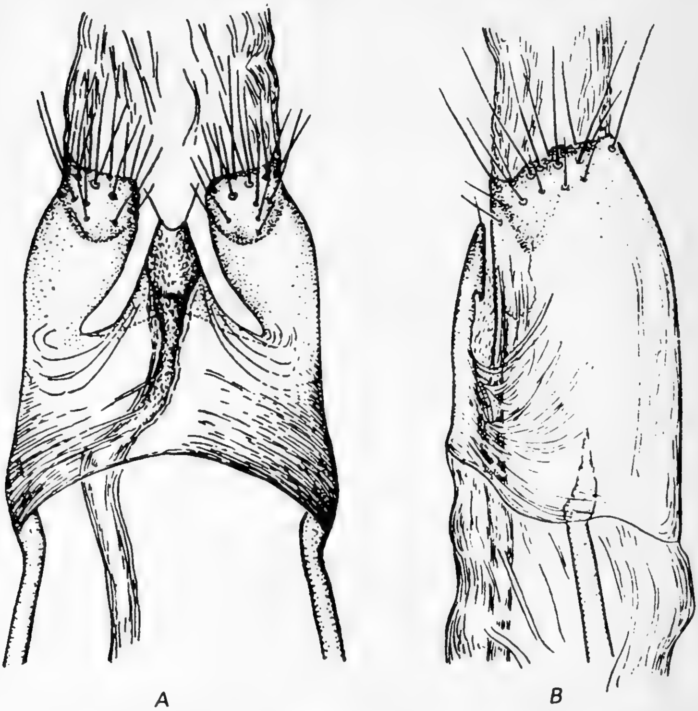
Material examined. 2 females.

European part of the USSR. Crimean Peninsula. Old Crimea, one female May 1, 1913 (S. Chetverikov).

England. One female, 1889, holotype gen. Preparation No. 4589, female (Vokke collection).

Type specimen found in collection of Vokke and identified by Staudinger as *Tinea pallescentella* Stt. The specimen bore the original label of Vokke, a green rectangle with double black border, with the inscription "Anglia, 89, Stgr."

Most probably the species has a broader distribution along the southern, predominantly coastal regions of Europe. Its occurrence is possible in the Caucasus, northeastern Kazakhstan, and Central Asia, as well as the Mediterranean region, Iran, and Afghanistan.



118 Figure 49. Region of vaginal and prevaginal plates of *Cephitinea colongella* Zag.

A — ventral view; B — lateral view.

Preparation No. 4589, female. England.

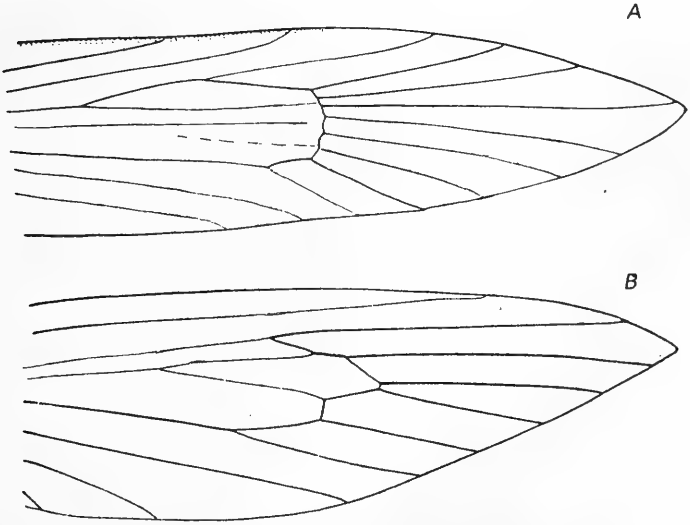
Biology. Not known. However, on the basis of analogy with the biology of *Cephitinea colonella* Ersch., to which this species is quite close, it may be assumed that the larvae feed on decomposing plant residue, and on the Black Sea coast the moth produces two generations per year. Development of this species in granaries is possible.

3. **Cephitinea longipennis** Ersch. (Figures 3; 38, A; 40, B; 42; 43,50–53)

Erschov, 1874a: II, 97, Tab. 6, Figure 107 (*Deuterotinea*); 1874b: 413 (*Tinea*); Staudinger and Rebel, 1901; II, 240 (*Deuterotinea*); Petersen, 1957a: 100 (*Cephimallota*); Zagulyaev, 1964b: 681–682.

External characters of imago. Head covered with musty-yellow to gray hair. Galea continues beyond midpoint of 2nd segment of labial palpi (Figure 3, A). Maxillary palpi slender, filiform, and definitely does not reach end of 2nd segment of labial palpi. 5th segment one-fourth to one-fifth length of 4th. Labial palpi yellowish-gray; 3rd segment almost half length of 2nd. Frons yellowish-gray, broad, about 1.5 times broader than longitudinal diameter of eyes. Antennae yellowish-gray; dark rings on segments broad and well defined. Length of basal segment almost twice width; front side with five bristles.

Thorax and tegulae yellow to gray, cinnamon-gray, lustrous. Span



120 Figure 50. Venation of wings of *Cephitinea longipennis* Ersch.

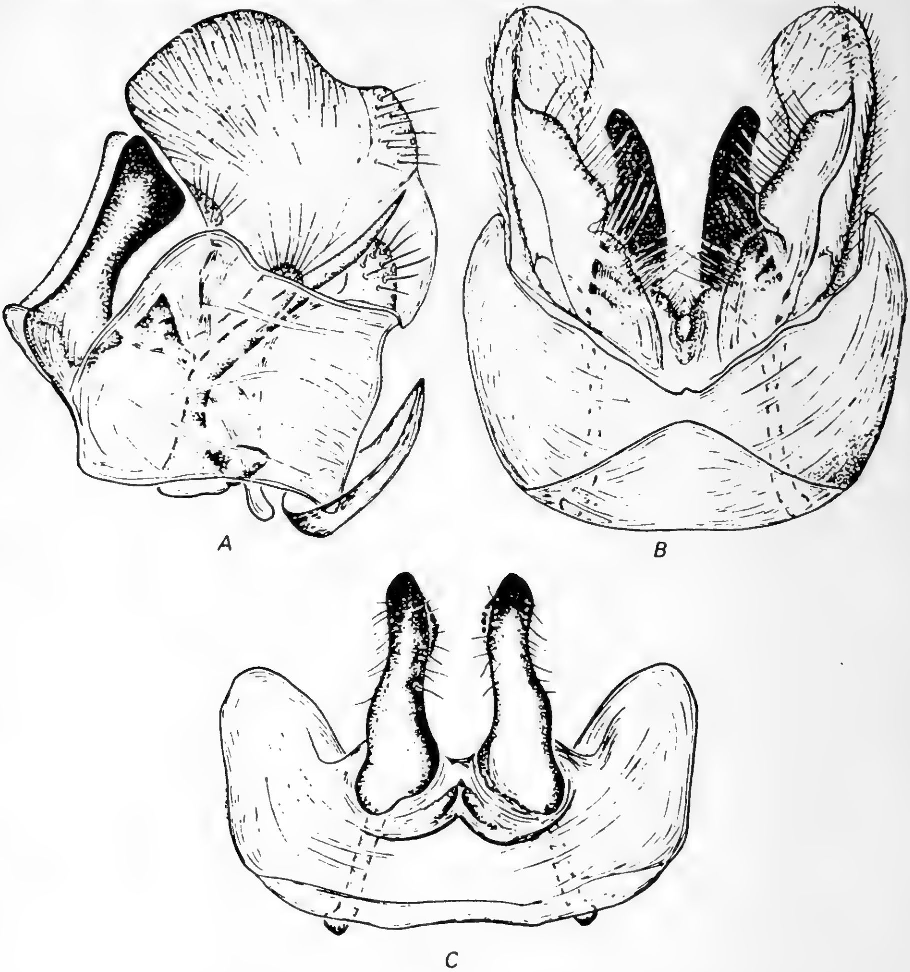
A—forewing; B—hind wing.

Preparation No. 9937, male. Central Asia.

of forewings, in male 17 to 18 mm, in female 25 mm. Wings narrow, elongated.

Forewings musty-yellow to gray, slightly glossy, without pattern. Hind wings lighter in color than forewings, with an indistinct purple tinge. Fringe of wings yellowish-gray. Under surface of all wings with faint violet hue.

Venation of forewings (Figure 50, A). R_2 terminates on alar margin far from level of apex of radiocubital cell. Distance between bases of R_2



120 Figure 51. Genitalia of male *Cephitinea longipennis* Ersch.

A—general appearance (lateral view); B—same (ventral view); C—uncus and tegumen (dorsal view).

Preparation No. 9937. Central Asia.

and R_3 two-thirds to one-half length of radial cell. Terminus of R_5 slightly closer to alar apex than terminus of M_1. Distance between bases of Cu_1 and Cu_2 one-fifth length of radial cell and less than half distance between bases of R_2 and R_3. Common stem of A_{2-3} terminates on posterior margin of wing at level of origin of R_2 from cell and is distinctly basad of level of origin of Cu_2 from cell. In hind wings (Figure 50, B) R terminates on alar margin almost at double the distance between apex than M_1. Branches of M_2 and M_3 very close-set at base, so that distance between them is about one-seventh distance between M_1 and M_2. Distance between bases of Cu_1 and Cu_2 two-fifths length of medial cell.

Legs dirty yellowish-gray, without light-colored rings at ends of segments. Structure of forelegs shown in Figure 38, A, of hind legs and arrangement of spurs in Figure 40, B.

Male genitalia (Figure 51). Valvae so broad that length only slightly greater than width, with flattened ends, and with lobate processes along anterior and posterior margins; inner surface of valvae covered with short compressed bristles. Uncus in lateral view in form of straight process which broadens toward tip (Figure 51, A); in dorsal or ventral view uncus branches notably wide-set (Figure 51, B, C). Anellus T-shaped, in lateral view with acute tip. Aedoeagus at basal fourth geniculate, with lobate process at base. Saccus in lateral view in form of pointed appendage, distinctly shorter than width of vinculum, and on lower side with broad lobate process. Structure of sternite VIII shown in Figure 41, B.

Female genitalia (Figures 52 and 53). Lobes of vaginal plate narrow, with pointed posterior margin. Prevaginal plate with elongated, slightly sclerotized tip, and continues beyond posterior margin of lobes of vaginal plate. Bursa copulatrix located in segments VI to VII. Anterior apophysis barely included in segment VI, posterior apophysis reaches first third of segment VII. Ovipositor 1.5 times longer than segment VII; additional apophyses present.

Comparison. Species close to *C. colonella* Ersch., but differs from it and other species of the genus in the following complex of characters: In forewings, distance between bases of Cu_1 and Cu_2 one-fifth length of radial cell. In hind wings, distance between bases of Cu_1 and Cu_2 two-fifths length of medial cell. Valvae of male genitalia broad, with flattened tip; uncus in lateral view resembles dumbbell, broadened at base and tip. Prevaginal plate in female genitalia long and continues beyond end of lobes of vaginal plate; posterior apophysis reaches first third of segment VII; ovipositor 1.5 times longer than segment VII.

Adaptation of the species to the southeastern region of Kazakhstan and Central Asia and its absence in Europe indicate an ancient Asian origin.

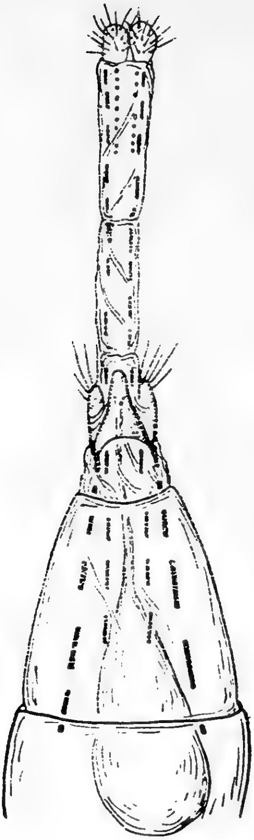


Figure 52. General appearance of female genitalia of *Cephitinea longipennis* Ersch. Preparation No. 9937, female. Central Asia.

Distribution. Kazakhstan, Central Asia (Figure 42).

In literature indicated from Central Asia: environs of Samarkand (Ershov, 1874a). Its occurrence in Iran and Afghanistan is possible.

122 *Material examined.* 2 males and 1 female.

Kazakhstan. Middle reaches of Ili River, 30 to 50 km northwest of town of Ili, Kopchagai ravine, one male April 11, 1936.

Central Asia. Uzbekistan, environs of Samarkand, one male and one female March 16 and 29 (Ershov). Male collected March 29, gen. preparation No. 9937, considered lectotype. Type specimen with original tag 16 mm × 8 mm, which has turned yellow and bears inscription "Russian Turkestan"; another tag 5 mm × 3 mm states "29".

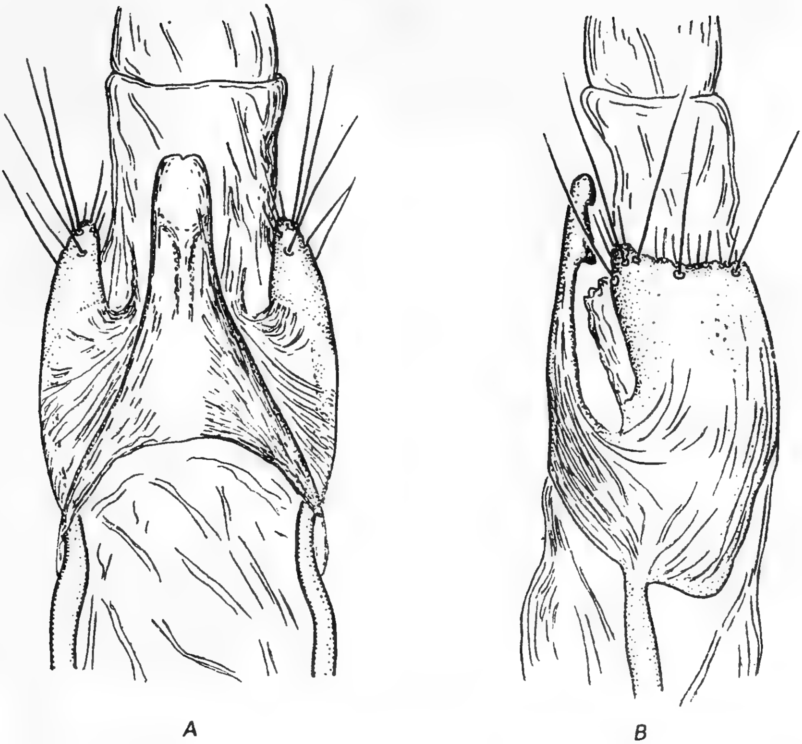


Figure 53. Region of vaginal and prevaginal plates of *Cephitinea longipennis* Ersch.

A—ventral view; B—lateral view.

Preparation No. 9937, female. Central Asia.

Biology. Warmth-loving Central Asian species, associated with decomposing plant residue. Larvae in turfy grasses. Moths collected in March–April.

2. Genus *Cephimallota* Brud., 1849 sensu Zag. (1964)

Bruand, 1849: 32; Pierce and Metcalfe, 1935: 102; Petersen, 1957a: 98–99; Zagulyaev, 1964b: 680; 1965: 390; 1968a: 219–221; Căpuşe, 1968: 1968: 260–61 (Nemapogoninae); Petersen, 1969: 369; Căpuşe, 1971: 235 (Nemapogoninae).

Type species. *Tinea simplicella* H.-S.

Close to genus *Cephitinea* Zag., but differs from it in slightly

smaller dimensions, rounded shape of outer margin of fringe of forewings, monotonous dark chocolate-brown lustrous color, and peculiarities of venation, as well as genital structure: valvae in males falcate, uncus poorly developed, branches of gnathos slender and long; in female
123 duct of bursa copulatrix thin, without sclerotized inclusions.

Imago. Head covered with ocherous-yellow or yellowish-brown hair. Maxillary palpi longer than labial palpi; 5th segment one-half to one-third length of 4th (Figure 54). Antennae monochromatic; in males smooth or covered with very short bristles.

Span of forewings ranges from 12 to 17 mm. Fore- and hind wings broad, apex obtuse; length of forewing 3.0 to 3.5 and of hind wing 2.66 to 2.75 times greater than width; fringe of hind wing equal to one-half to two-thirds width of wing. Forewings monochromatic dark chocolate-brown, chocolate-brown to black, without pattern, but with well-defined luster. Under surface of wings with violet or bronze tinge.

Venation of forewings (Figure 55, A). *Sc* terminates almost in middle or beyond midpoint of anterior margin of wing; R_1 terminates on alar margin at level of apex of radiocubital cell. Distance between bases Cu_1 and Cu_2 slightly less than distance between R_2 and R_3. A_1 well developed and terminates on alar margin at level of apex of radiocubital cell. In hind wing (Figure 55, B), terminus of *Sc* slightly closer to apex of radiocubital cell than to alar apex. A_1 terminates on alar margin at

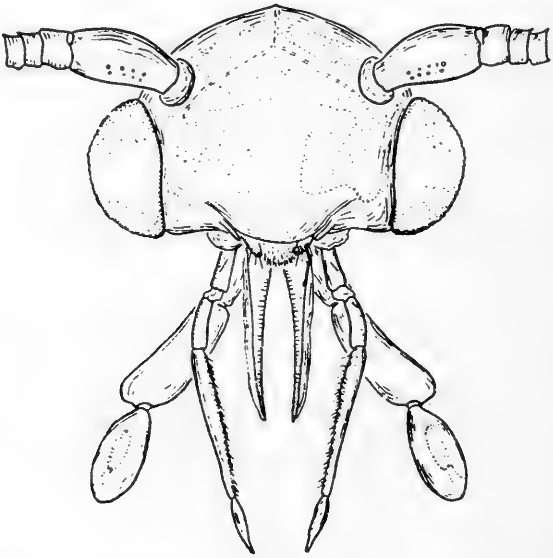


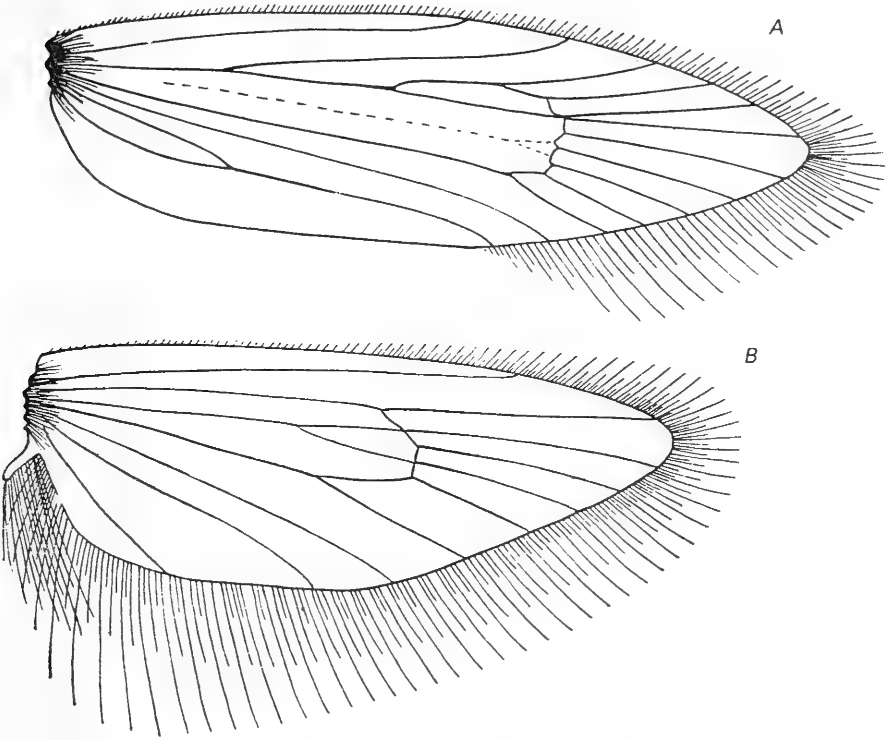
Figure 54. *Cephimallota simplicella* H.-S., female, head.
Preparation No. 4657, female. Poland, Vortslav.

level of apex of radiocubital cell.

End of tibia of forelegs with spinules (Figure 56, A). Middle pair of spurs of hind tibia located before midpoint (Figure 56, C). Spinules at end of tarsal segment thick and strong (Figure 56, B, C).

Abdomen yellowish or cinnamon-gray, lustrous; sternite of segment VIII in males usual in structure.

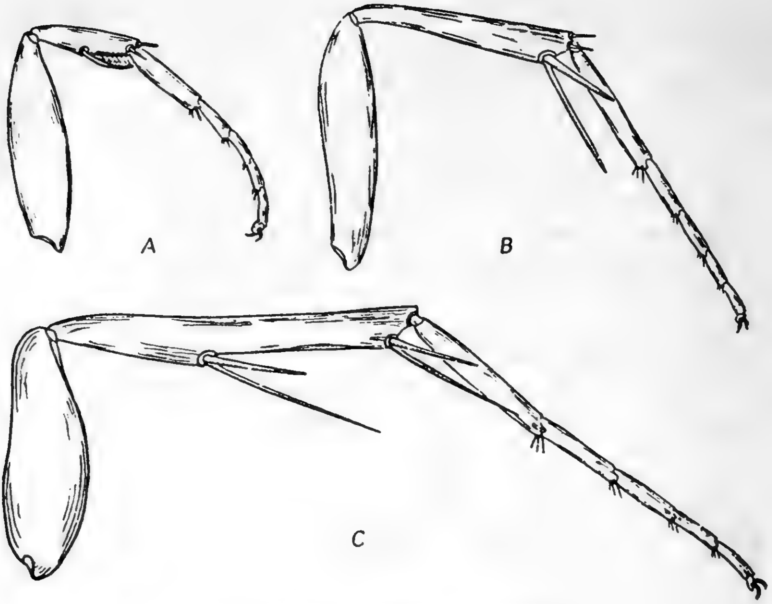
Male genitalia (Figure 59). Compressed. Valvae highly sclerotized, falcate with tips directed toward each other, outer margin arcuate or straight, and covered with short sparse bristles. Sclerotized cord of valvae almost equal to width of vinculum. Uncus small, in form of papillate appendages, and close- or wide-set. Apex of uncus may be raised above valvae and readily perceived when viewed from below, or contrarily, tips may be short and discernible only when genitalia examined from dorsal side. Branches of gnathos arcuate pointed structures, overlapping in most species. Aedoeagus in most species resembles a narrow,



124 Figure 55. Venation of wings of *Cephimallota simplicella* H.-S.

A—forewing; B—hind wing.

Preparation No. 4657, female. Poland, Vrotslav.



124 Figure 56. Legs of *Cephimallota simplicella* H.-S.

A — foreleg; B — middle leg; C — hind leg.

Preparation No. 4657, female. Poland, Vrotslav.

slightly sclerotized, short tube, shorter than width of genitalia (at level of vinculum in ventral view); only in Far Eastern species is aedoeagus
125 very long (twice greater than width of genitalia). Tegumen, when viewed from dorsal side, with rounded or acute notch at base. Saccus in most species a very short, slender appendage; only in *C. chasanica* Zag. is it long, curved, and three-fourths width of genitalia.

Female genitalia (Figures 60 and 61). Lobes of vaginal plate in most species fused basally. Prevaginal plate large and highly sclerotized, resembling truncated triangle. Duct of bursa copulatrix small. Anterior apophyses do not reach segment VII or are included in it. Ovipositor long, 2.0 to 2.5 length of segment VII.

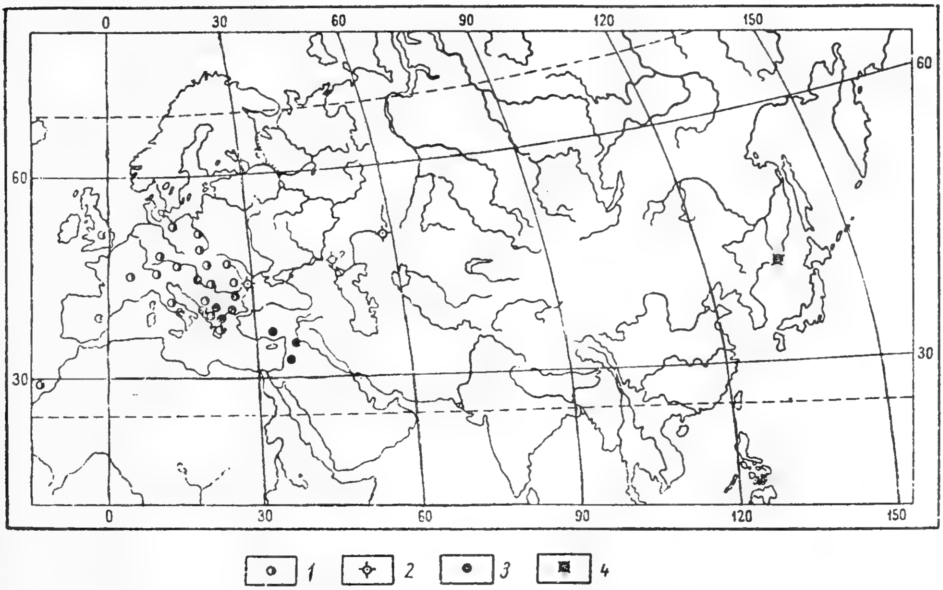
Body structure and chaetotaxy of larvae and pupae not known.

Biology. Predominantly species of plains; however, some members such as *C. libanotica* Pet., concentrate in hilly regions, where they rise up to a height of more than 1,000 m. Species which concentrate in areas of temperate and hot climates are associated with sparse forests, parks, orchards, and steppe regions with tree cuttings. Moths usually fly before evening. Larvae feed on dead plant parts, infested with plant fungi, and are capable of developing in forest litter between roots of trees.

Distribution. Species of the genus are found in Europe (except Scandinavia), Canary Islands, Asia Minor, Northwest Asia, and southern Primor'e. Thus the area of distribution of *Cephimallota* Brud. is restricted to the Palearctic (Figure 57). The range of the genus is discontinuous: the major part lies in the Mediterranean, whereas *C. chasanica* Zag. is distributed in southern Primor'e. *C. simplicella* H.-S has the greatest range in the genus, covering Western Europe including the Mediterranean. *C. libanotica* Pet. is limited to the eastern Mediterranean. The last species. *C. hasarorum* Zag., is known only from the Ural'sk steppes and delta of the Danube.

126 In the Soviet Union two species have been found to date. However, the possible occurrence of *C. simplicella* H.-S. and *C. libanotica* Pet. in the steppes of Moldavia, southern Ukraine, and Crimea cannot be excluded.

Species of the genus exhibit varying degrees of xerophilization, a direct result of their distribution. The greatest degree is seen in the typical steppe species, *C. hasarorum* Zag., and the least in *C. chasanica* Zag., living in coastal forests. The Mediterranean species occupy an intermediate position, living in dry sparse forests of the park type.



125 Figure 57. Distribution of species of *Cephimallota* Brud.

1—*C. simplicella* H.-S.; 2—*C. hasarorum* Zag.; 3—*C. libanotica* Pet.; 4—*C. chasanica* Zag.

Furthermore, members of genus *Cephimallota* Brud. exhibit a tendency to concentrate in warm or even hot regions. These peculiarities of distribution, against the background of a discontinued range indicate the ancient nature of this genus. In all probability the center of species dispersal of the genus was the Mediterranean, from where they spread east and north. In ancient times, when broad-leaved forests formed a solid belt from the Mediterranean Sea up to the Pacific Ocean, apparently the area of distribution had no gaps. Disappearance of the broad-leaved forests in the Asian part of our country led to the disappearance of species of *Cephimallota* Brud. These species have been preserved only in those places where broad-leaved forests remained such as the Mediterranean and Western Europe, steppe cut forests in the Urals, and forests of southern Primor'e.

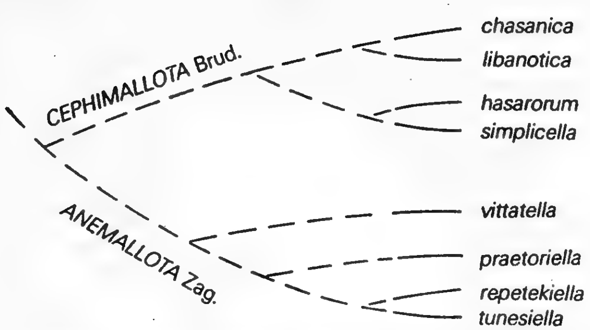
It is quite possible that with more detailed studies, species of *Cephimallota* Brud. will be detected in new regions: *C. simplicella* H.-S. and *C. libanotica* Pet. in southern Ukraine, Crimea, and the Caucasus, and *C. hasarorum* Zag. in the western region of Kazakhstan and Central Asia.

Comparison. Morphologically, this genus is close to *Cephitinea* Zag. and *Anemallota* Zag.; however, it is also somewhat close to *Haplotinea* Diak. and Hint. Similarity with the latter genus is displayed not only in external characters but also in common type of genitalia: male with short saccus, broad vinculum, uncus in form of two tubercles, valvae with long sclerotized cord, and short and simple aedoeagus; female genitalia with well-developed prevaginal plate and bursa copulatrix without signum.

The presence of larvae in silken galleries constructed in forest litter or between the roots of grasses, and their feeding on residue of plant origin also indicate similarity with *Haplotinea* Diak. and Hint. All these characters provide a basis for proposing the ancient phylogenetic relations of *Cephimallota* Brud., and through this genus the entire tribe Cephimallotini Zag. with Haplotineini Zag. from Nemapogoninae. However, there is no basis for including tribe Cephimallotini Zag. in the subfamily of fungal moths, Nemapogoninae, as was done by Căpuşe, (1968, 1971).

This genus presently includes four species: *C. simplicella* H.-S., *C. hasarorum* Zag., *C. libanotica* Pet., and *C. chasanica* Zag.

127 Relations of the species in the genus are shown in Figure 58. In addition to venation, this scheme is based on the peculiarities of structure of male genitalia, and especially structure of the saccus, aedoeagus and uncus, which permitted me to combine the species into two groups. One group includes *C. simplicella* H.-S. and *C. hasarorum* Zag. These



126 Figure 58. Phylogenetic relations of species of genera *Cephimallota* Brud. and *Anemallota* Zag.

species are close to each other in external appearance and details of structure, for example short saccus, and most probably have only recently separated from a common eastern Mediterranean ancestor. Species *C. libanotica* Pet. and *C. chasanica* Zag. constitute the other group and are allied by their relatively long saccus, similar structure of uncus, and similarity in external appearance. However, significant differences in morphology, especially the very long aedoeagus in *C. chasanica* Zag. and the adaptation of this moth to life in a humid climate, indicate not only an early divergence of this species, but also its early separation from *C. simplicella* H.-S. and *C. hasarorum* Zag.

Key to Species of Genus Cephimallota Brud. on the Basis of External Characters[5]

1 (2). In the forewings, terminus of R_1 located at level of apex of radiocubital cell; six to eight light-coloured specks arranged along anterior margin of wing .... 4. **C. chasanica** Zag.

2 (1). Terminus of R_1 in forewings located before level or at level of apex of radiocubital cell; anterior margin of wing without light-colored specks.

3 (4). Forewings dark chocolate-brown. In hind wings termina of branches of *R and* M_1 located at equal distance from alar apex. .... 1. **C. simplicella** H.-S.

4 (3). Forewings yellowish gray. In hind wings terminus of branch M_1 located several times closer to alar apex than terminus of *R* .... 2. **C. hasarorum** Zag. 126

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[5] Live specimens of *C. libanotica* Pet. are not known and the original description does not elucidate its external distinguishing features.

Key to Species of Genus Cephimallota Brud. on the Basis of Male Genitalia

1 (6). Aedoeagus thick, short, straight.

2 (3). Saccus in ventral view very short, barely extends beyond margin of vinculum and bifurcate at apex .....1. C. **simplicella** H.-S.

3 (2). Saccus in ventral view long, extends far beyond margin of vinculum and is not bifurcate at apex.

4 (5). Uncus with two small close-set lobes, in ventral view does not protrude from under ends of valvae; aedoeagus with small spine near tip .... 2. **C. hasarorum** Zag.

5 (4). Uncus with two large, widely separated lobes, in ventral view protrudes from under valvae; aedoeagus without spine near apex .... 3. **C. libanotica** Pet.

6 (1). Aedoeagus slender, very long, angular, curved .... 4. **C. chasanica** Zag.

Key to Species of Genus Cephimallota Brud. on the Basis of Female Genitalia[6]

1 (2). Lobes of vaginal plates widely separated .... 1. **C. simplicella** H.-S.

128 2 (1). Lobes of vaginal plates fused along 4/5 their length at base.

3 (4). Prevaginal plate with thick spine in middle; posterior apophysis 6.75 to 7.0 length of vaginal plate ....2. **C. hasarorum** Zag.

4 (3). Prevaginal plate with long crest in middle; posterior apophysis about 6.25 length of vaginal plate .... 3. **C. libanotica** Pet.

1. **Cephimallota simplicella** H.-S. (Figures 54–61)

Herrich-Schäffer, 1851: Abb. 322 (*Tinea*); 1853–1855 (1854): V, 73 (*Tinea*); Zeller, 1852: 169–170 (*Tinea*); Stainton, 1859: 294 (*Tinea*); Walker, 1863: 469 (*Tinea*); Rossler, 1866: 217 (*Tinea*); Heinemann, 1870: 56 (*Tinea*); Mann, 1873: 127 (*Tinea*); Turati, 1879: 198 (*Tinea*); Snellen, 1882: 461 (*Tinea*); Knapp, 1887: 363 (*Tinea*); Meyrick, 1895: 792 (*Tinea*); Rebel, 1889: 175 (*Tinea*); Disque, 1901: 199 (*Tinea*); Staudinger and Rebel, 1901: II, 239 (*Tinea*); Rebel, 1904: 372 (*Tinea*); 1906: 44 (*Tinea*); Walsingham, 1907b: 1025–1026 (*Tinea*); Spuler, 1910: II, 461 (*Tinea*); Caradja, 1920: 170 (*Tinea*); Zerny, 1927: 485 (*Tinea*); Meyrick, 1928b: 831 (*Tinea*); Caradja, 1931: 51 (*Tinea*); Hering, 1932: 27 (*Tinea*); Pierce and Metcalfe, 1935: 102, Pl. 62; Amsel, 1951b: 96 (*Tinea*); 1954: 17 (*Tinea*); Hartig, 1956: 142 (*Tinea*); Petersen, 1957a:

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[6] Female of *C. chasanica* Zag. not known, and hence not included in key.

103–104; 1960b: 219; 1961b: 531; Kasy, 1961: 81; Parenti, 1962: 390; Petersen, 1962: 207; 1963a: 10; 1964b: 401; 1965c: 179; Căpuşe, 1968: 261–263; —*angusticostella* Zeller, 1851: V, 310 (*Incurvaria*); Herrich-Schäffer, 1854; V, 73 (*Tinea*).

Biology: Zeller, 1852: 169–170; Stainton, 1859: 294; Rossler, 1866: 217; Hering, 1932:. 27; Klimesch, 1961: 776; Parenti, 1965: 302; Petersen, 1965c: 179; Klimesch, 1968: 181–182; Petersen, 1969: 370.

External characters of imago. Head covered with ocherous-yellow or yellowish-brown hair with a reddish tinge. Galea yellowish, short. Pilifers compressed (Figure 54). Maxillary palpi covered with sparse yellowish scales. Labial palpi short, thick, light yellow or yellowish-gray, lustrous; end of 2nd segment broadened; 3rd segment broad, ovate, about three-fourths length of 2nd. Width of frons about twice (1.75) larger than longitudinal diameter of eyes. Antennae brown; basal segment short and broad, its length only twice greater than width, with eight bristles in front.

Thorax and tegulae cinnamon-colored with a brownish tinge. Span of forewings 12 to 15 mm.

Color of forewings almost uniform, dark brown, with faint violet luster, and metallic tinge before apex; sometimes basal half with indistinct dark spots or yellowish speckles; beyond midpont of anterior yellowish margin a few thin lines of yellowish tinger occur. Fringe lighter than wing, and with cinnamon granulation near base. Hind wings cinnamon-colored with brownish or purple-violet glaze. Fringe same color as wings.

Venation of forewings (Figure 55, A). *Sc* terminates about middle of forewings. Distance between bases of R_1 and R_2 five times greater than distance between bases of R_2 and R_3. Branches of R_4 and R_5 at base very close-set or may even originate from a single point. Terminus of R_5 two to three times closer to alar apex than that of M_1. Distance between bases of M_3 and Cu_1 less than distance between M_2 and M_3. In hind wing (Figure 55, B) termina of branches of R_1 and M_1 located at
129 equal distance from apex. All medial veins widely separated at base and about equal in distance. Distance between bases of Cu_1 and Cu_2 equal to one-fourth length of radiocubital cell.

Fore- and middle legs cinnamon-colored, lustrous, with distinct light-colored rings at ends of segments. Hind legs yellowish or cinnamon-gray, with barely discernible light-colored rings at end. Structure of legs shown in Figure 56.

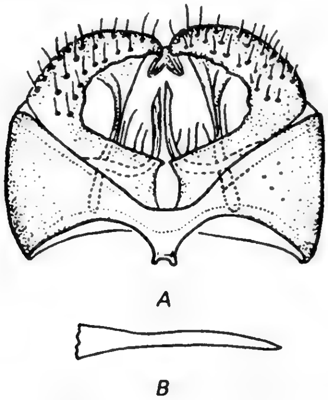
Abdomen short and stout.

Male genitalia (Figure 59, A). Valvae arcuate and pressed to uncus, with a few serrations directed toward each other. Sclerotized cord of valvae thin, straight, and does not protrude from under vinculum. Uncus does not protrude from under valvae. Branches of gnathos slender, pointed, parallel. Aedoeagus slightly bent, 1.66 width of genitalia at level of vinculum (Figure 59, B). Saccus very short, with a small notch at end.

Female genitalia (Figures 60 and 61). Lobes of vaginal plate wide-set; posterior margin pigmented, and with four to six long bristles. Prevaginal plate with concave anterior margin and small spinule in middle of posterior margin (Figure 61, A); in lateral view, prevaginal plate with small projections before posterior margin (Figure 61, B). Bursa copulatrix located in segment VI. Anterior apophyses included in segment VI, posterior apophyses only slightly enter regions of vaginal plate and more than five times length of vaginal plate.

Comparison. In general appearance this species is close to *C. libanotica* Pet., but is readily distinguished from it and other species of the genus by the following peculiarities: In hind wing termina of branches 130 of R and M_1 located at equal distance from apex. Valvae of male genitalia arcuate, narrow toward their ends; uncus does not protrude from under valvae; aedoeagus slightly curved and equal to 1.66 width of genitalia at level of vinculum; saccus very short. In female genitalia vaginal plate bilobate; prevaginal plate entire and highly sclerotized.

Petersen (1963a) in his study of the genitalia in a few specimens from Albania, identified them as *C. libanotica* Pet., although on the basis of wing pattern and coloration they were earlier identified as *C. simplicella* H.-S. Petersen in the same publication noted that *C. simplicella* H.-S. most probably is not distributed further in the southeast, but



129 Figure 59. Genitalia of male *Cephimallota simplicella* H.-S.

A—general view (ventral); B—separated aedoeagus (from Petersen, 1957a) is replaced by *C. libanotica* Pet., which is similar in coloration.

Distribution. Possibly, western regions of the European part of the USSR and all of the Western Europe (except Scandinavia) and the Canary Islands (Figure 57).

In literature, reported from the following places: England (Stainton, 1859), Holland (Snellen, 1882), France (Petersen, 1961b; Parenti, 1965), Germany (Zeller, 1852), German Democratic Republic (Petersen, 1969), Switzerland and Austria (Hering, 1932), Hungary and Rumania (Caradja, 1931; Căpuşe, 1968), Czechoslovakia (Petersen, 1965c), Spain

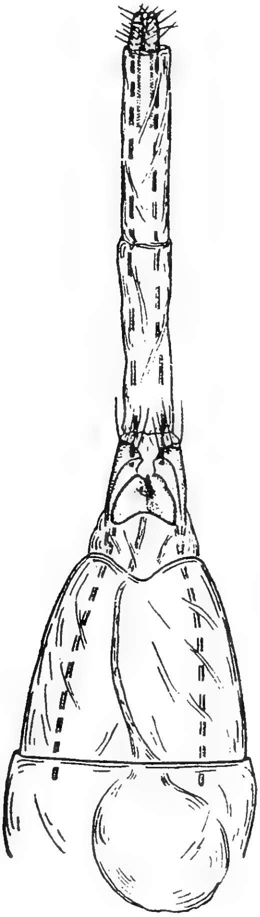


Figure 60. General view of female genitalia of *Cephimallota simplicella* H.-S. Preparation No. 4657, female, Poland, Vrotslav.

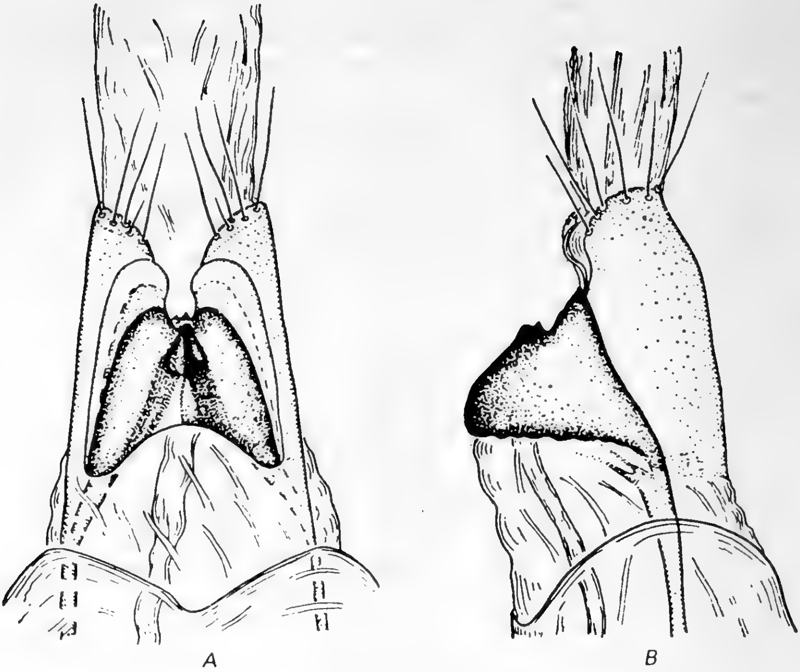


Figure 61. Region of vaginal plates of *Cephirnallota simplicella* H.-S.

A — ventral view; B — lateral view;

Preparation No. 4657, female, Poland, Vrotslav.

(Zerny, 1927; Petersen, 1964b), Corsica and Italy (Mann, 1873; Hartig, 1956), Albania (Klimesch, 1968), Yugoslavia (Kasy, 1961), Greece and Canary Islands (Walsingham, 1907b: Parenti, 1962).

131 *Material examined.* 6 females.

Poland. Vrotslav, two females July, 1848; one female July 1, 1849; one female July 27, 1861; one female August 23, 1867; and one female July 18, 1872 (Wocke).

Biology. European boreal species adapted to areas of warm climate in central Europe and southern mountains.

Very sparse mixed forests and forest parks serve as habitats.

Moths emerge from May to August. Indications of earlier occurrence, for example Zeller (1852), reported moths in mid-June in Germany in pine forests, dry grass, and tree trunks. In England they usually fly in July (Stainton, 1859). Rössler (1866) often found moths in mid-June on uncultivated sandy places in grass near the ground. In Yugoslavia (Macedonia) moths emerge from June 10 to 20; in Italy (Abruzzen Ovindoli) they were collected from July 3 to 13 at a height of 1,400 m; in the central Alps one female was collected at a height of 800 m, and in southeastern France (Durance-Tal., St. Crepin) one female at a height of 900 m between June 24 and 30. In the northern regions of Italy moths have been found in valleys and at altitudes up to 2,900 m (Hartig, 1956). In the northern and northeastern regions of Spain moths were collected from July 1 to 19 at an altitude of 810 and 1,211 m, and in the environs of Catalonia two males between June 18 and July 1 (Petersen, 1964b). Reportedly moths were caught on light in Spain in the beginning of July (Zerny, 1927). In Italy one male and one female were caught between May 26 and August 4 (Parenti, 1965). In Corsica emergence of moths takes place in June (Petersen, 1960b). Sometimes moths were caught near wine stores or inside them, as well as in the vicinity of stone walls covered with grapevines.

Larvae live in decomposing grass litter as well as in nests of bumblebees and other social insects.

In the central regions of Europe this species has one generation per year, and in southern regions two generations.

2. **Cephimollota hasarorum** Zag. (Figures 5, A; 15, C; 57; 58; and 62–64)

Zagulyaev, 1965: 390–391; Capuşe, 1967; 110–112; 1968: 263–267.

External characters of imago. Color of pubescence of head as in other species of the genus. Galea light yellow, short. Pilifers small. Labial palpi small, thick, lustrous; 2nd segment light yellow, 3rd segment yellowish-cinnamon. Maxillary palpi thin, light yellow, lustrous. Antennae dark cinnamon with slightly compressed scales and without visible hair; basal segment of antennae broad, chocolate-brown.

Thorax and tegulae dark cinnamon with light bronze-colored tinge. Span of forewings 12.5 mm.

Forewings yellowish-gray, or cinnamon with tinge of honey and violet glaze. Hind wings brownish, with bronze glaze. Fringe lighter in color than wing.

Venation of forewings (Figure 62, A). *Sc* terminates on alar margin markedly beyond its midpoint. Distance between bases R_1 and R_2 4.5 times greater than distance between R_2 and R_3. Branches of R_4 and R_5 widely separated at base. Terminus of R_5 closer to alar apex than M_1. Distance between bases of M_3 and Cu_1 equal to or slightly greater than that between M_2 and M_3. In hind wings (Figure 62, B) M_1 terminates on outer margin of wing right near alar apex so that branch of R remains far beyond apex.

Fore- and middle legs chocolate-brown to gray, lustrous, with light-

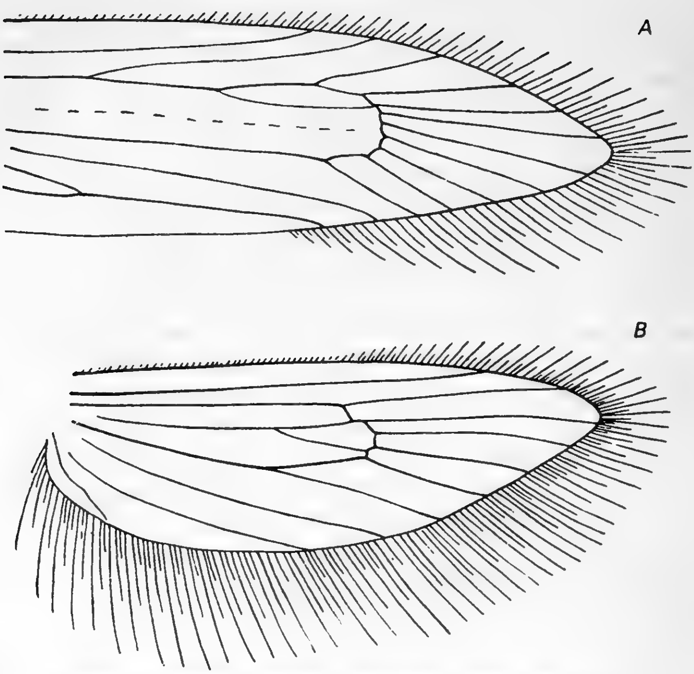


Figure 62. Venation of wings of *Cephimallota hasarorum* Zag.

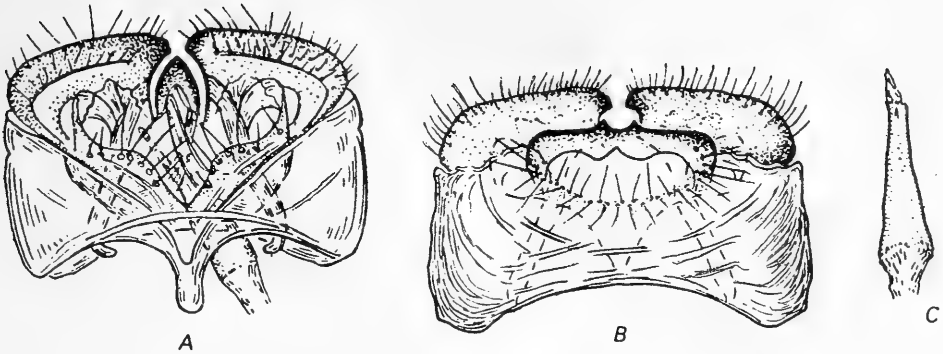
A—forewing; B—hind wing.

Preparation No. 9928, male. Volga region, Sarepta.

colored rings at ends of segments. Hind legs yellowish-gray.

Male genitalia (Figure 63, A). Valvae falcate, directed toward each other, with their tips obliquely truncated, and posterior margin more or less straight. Sclerotized cord of valvae falcate, bent at end, and extends beyond vinculum. Uncus with two small, close-set, pointed projections does not reach end of valvae, but readily visible when viewed from dorsal side (Figure 63, B). Branches of gnathos arcuate, pointed cords, 133 which intercross at tips. Aedoeagus short conical tube with small spinule at tip, about two-fifths width of genitalia (Figure 63, C). Tegumen on dorsal side with arcuate notch on anterior end. Saccus narrow, short.

Female genitalia (Figure 64). Lobes of vaginal plate fused over three-fourths length from base; posterior margin with up to eight long bristles. Prevaginal plate with straight anterior margin and large thick spine in middle. Anterior apophysis included in segment VI; posterior apophysis enter segment VII and very long, 6.75 to 7.0 length of vaginal plate.



132 Figure 63. Genitalia of male *Cephimallota hasarorum* Zag.

A — general appearance (ventral view); B — same (dorsal view); C — aedoeagus.

Preparation No. 9928, male. Volga region, Sarepta.

Comparison. In general appearance and color this species resembles *C. simplicella* H.-S.; however, it is well distinguished by the following peculiarities: Lighter colored and yellowish-gray forewings; venation: distance between bases of M_3 and Cu_1 slightly more than between M_2 and M_3. In hind wings end of M_1 many times closer to alar apex than end of R. This species also differs from other species in the genus in structure of male genitalia: Valvae more or less straight; uncus with two close-set projection and does not extend up to valvae; aedoeagus short and broad, conical; saccus in form of short appendage. Lobes of vaginal plate in female genitalia fused in basal part; posterior apophysis 6.75 to 7.0 length of vaginal plate.

Distribution. Southeastern part of the European part of the USSR, and possibly regions of western Kazakhstan; Rumania (Căpuşe, 1967, 1968) (Figure 57).

Material examined. 1 male.

The only known specimen, a male (type), was caught by Christoph on July 21 either in Krasnoarmeisk (Sarepta) or Guberlya (Southern Ural); exact place and year of collection not indicated. Holotype gen. preparation No. 9928, male, has original label in form of a yellowish-grayish rectangular piece of paper (4.0 mm × 2.5 mm) with reddish line in middle; above line figure "21" has been written, under the line "7"; lower side of label light blue, glossy.

Biology. Steppe xerophilous species associated with open dry forest-steppe region. Larvae develop in decomposing plant residue. Moths emerge in July. In the Lower Volga a moth was caught in the second half of July and in the Danube delta (Rumania) a few specimens collected in the beginning of July (Căpuşe, 1967, 1968).

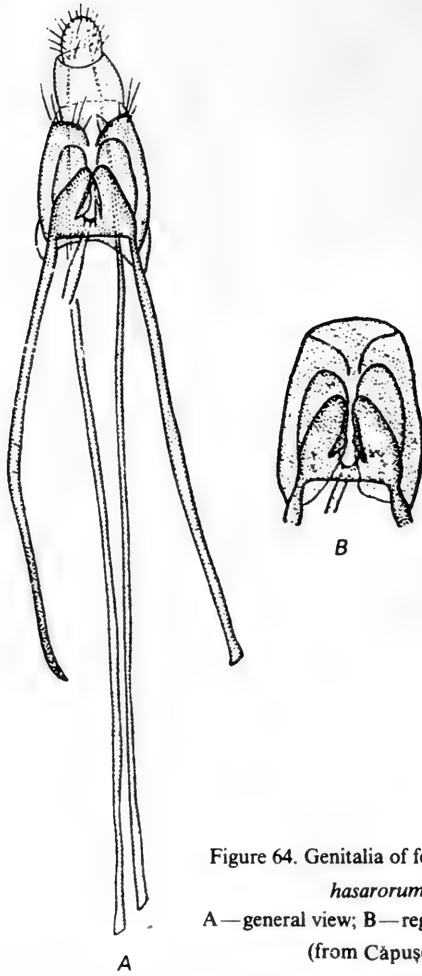


Figure 64. Genitalia of female *Cephimallota hasarorum* Zag.
A — general view; B — region of vaginal plate (from Căpuşe, 1968).

134 **3. Cephimallota libanotica** Pet. (Figures 5, B; 57; 58; and 65–67)

Petersen, 1959c: 154 – 155; Rebel and Zerny, 1931: 158 (*simplicella* H.-S.); Petersen, 1962: 207; 1963a: 10; Căpuşe, 1966: 103; Căpuşe and Gogov, 1966: 82; Căpuşe, 1967: 112–113; Soffner, 1967: 120; Căpuşe, 1968: 267–269; Klimesch, 1968: 182; Petersen, 1968: 54.

External characters of imago. Pubescence of head orange to yellow. Galea short, not more than half length of labial palpi. Maxillary palpi yellowish and slightly longer than labial palpi. Antennae cinnamon-

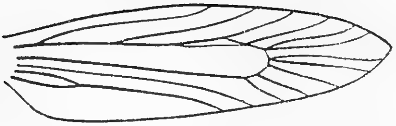


Figure 65. Venation of forewing of *Cephimallota libanotica* Pet. (from Căpuşe, 1968).

yellow; 1st segment large, oblong, its length twice width and four times, longer than 2nd segment.

Thorax and tegulae monochromatic, cinnamon-gray; apex of tegula with a few light-colored scales.

Forewings cinnamon-black, without pattern; lower margin lighter in color; under surface blackish. Both pairs of wings on upper and lower surfaces with violet glaze.

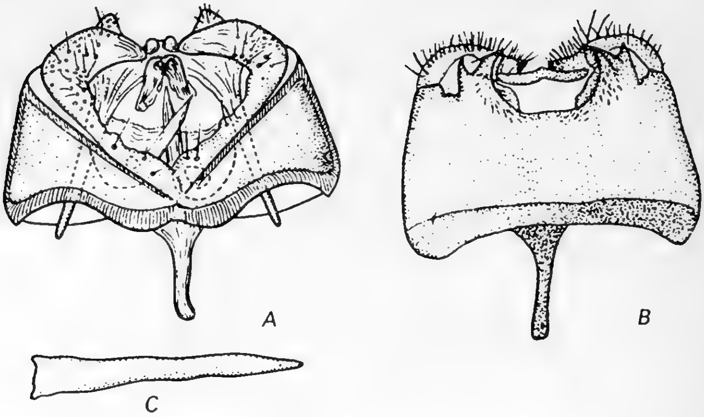
Legs yellowish-cinnamon with yellowish rings at ends of tarsal segments.

Venation of forewing (Figure 65). *Sc* terminates on alar margin beyond its midpoint. Distance between bases of R_1 and R_2 five to six times greater than distance between R_2 and R_3. Branches R_4 and R_5 approximate at base or connate. Terminus of R_5 about 1.5 times farther from alar apex than M_1. Distance between bases of M_3 and Cu_1 almost twice greater than between M_2 and M_3. Venation of hind wing similar to that of *C. hasarorum* Zag.

Male genitalia (Figure 66, A, B). Valvae arcuate, conically taper toward apex, densely pubescent, with short bristles. Sclerotized cord of valva straight at tip and extends beyond vinculum. Uncus well deve-
135 loped in form of wide-set cones covered with bristles, which extend beyond valvae (in ventral view). Branches of gnathos arcuate, pointed, and intercross at apices. Aedoeagus in form of long pointed tube, three-fourths width of genitalia (Figure 66, C). Tegumen and vinculum similar to those of *C. simplicella* H.-S. Saccus resembles narrow, relatively long appendage; length one-third width of genitalia.

Female genitalia (Figure 67). Lobes of vaginal plate fused over three-fourths to four-fifths length of base, slightly pigmented, with six to eight short bristles on posterior margin. Prevaginal plate with straight anterior margin and small protruding long crest in middle. Anterior apophyses penetrate almost up to midpoint of segment VI; posterior apophyses reach segment VII, and length about 6.25 length of vaginal plate.

Comparison. On the basis of external appearance this species is very close to *C. simplicella* H.-S., but differs from it and other species of the genus in structure of the genitalia: valva of male arcuate and narrows toward apex; uncus in form of two wide-set cones, which extend beyond valvae; aedoeagus long, narrow; saccus long, slightly bent; lobes



134 Figure 66. Genitalia of male *Cephimallota libanotica* Pet.

A—general appearance (ventral view); B—same (dorsal view); C—Aedoeagus (A and C—from Petersen, 1959c; B—from Căpuşe, 1966).

of vaginal plate in female fused in basal part and posterior apophysis about 6.25 length of vaginal plate.

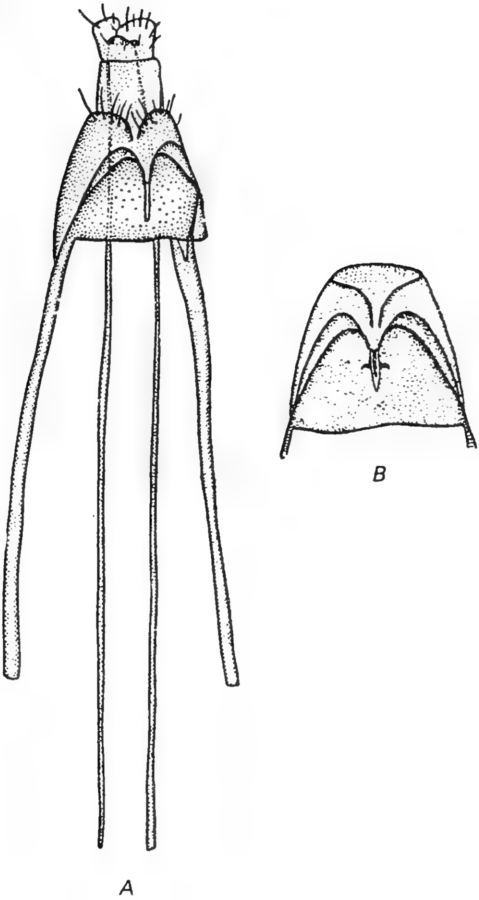
Petersen (1963a) has reported that regions of Yugoslavia (Serbia) and Albania constitute the northern most boundary of the species.

No specimens examined by me.

Distribution. Southern Europe, Balkans, Asia Minor, and northwest Asia. Occurrence of this species possible in southern xerophytic regions of the Soviet Union (Figure 57).

In literature indicated from the following places: Type specimen (male) collected from Lebanon (1897). Also known from Hungary (Petersen, 1968), Rumania and Bulgaria (Căpuşe, and Gogov, 1966; Căpuşe, 1967), central Italy, Yugoslavia [southern Serbia, 2 males July 16–19, 1939, at an altitude of 1,100 m (Petersen, 1962)]; Albania [Bize, Borshi, and Dajti (Petersen, 1963a)]; Greece [Peloponnesus, 1 male July 1–14, 1959, at an altitude of 600 m: Turkey (Petersen, 1968)].

Biology. Eastern Mediterranean warmth-loving species adapted to dry steppe or semidesert uplands and hilly areas. Moths emerge from May to August. Thus in Albania, in the region of Borshi, one male was collected at light between May 14 to 27, 1961; in the region of Kula 136 one male between May 18 and 28, 1918; in region of Dajti one male at an altitude of 850 m at light between June 27 and July 2, 1961; in the region of Bize one male at light between July 10 to 15, 1961. Moths were collected in different regions of Rumania on June 27, July 7 and 15, and August 29 (Căpuşe, 1966, 1967). In Lebanon one male was caught may 16, 1963; in Syria one male in July 1961; and in Turkey one



135 Figure 67. Genitalia of female *Cephimallota libanotica* Pet.

A — general appearance; B — region of vaginal plate (from Căpuşe, 1968).

male August 27–28, 1968, at an altitude of 1,600 m (Petersen, 1968).

On the basis of similarity to other species of the genus, it can be assumed that larvae develop in decomposing plant residue, constructing silken galleries in grassy litter. Possible occurrence of larvae in the bedding of bird nests located on the ground cannot be ruled out; they are also found in the nests of bumblebees and in old anthills.

Moths produce two generations per year.

4. **Cephimallota chasanica** Zag. (Figures 57; 58; and 68)

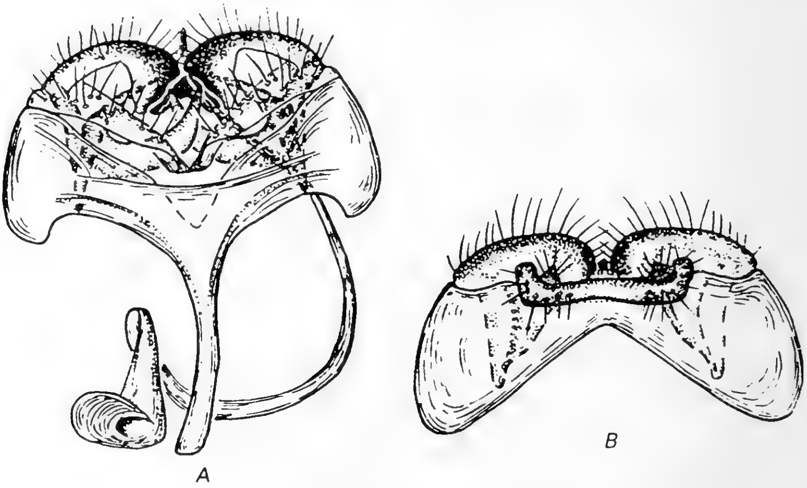
Zagulyaev, 1965: 392–393; Căpuşe, 1967: 113.

External characters of imago. Head covered with bright ocherous-yellow hair. Galea very short, light-colored. Pilifers small. Labial palpi small, flattened, and hang downwards and outwards; inner side yellowish-gray, outer side cinnamon with a blackish tinge; end of 2nd segment broadens and with a few (four to six) bristles on outer side. Maxillary palpi covered with sparse light yellow scales. Basal segment of antennae short and broad, on outer side dark chocolate-brown, on lower side yellow or yellowish-gray, lustrous.

Thorax on upper side cinnamon-black with a violet glaze; tegulae cinnamon-gray. Span of forewings of male 17 mm.

Forewings uniformly cinnamon-gray, with light bronze tinge and golden glaze. Anterior margin with six to eight rather indistinct light-colored speckles or small streaks. Fringe same color as rest of wing. Hind wings cinnamon-gray, but slightly lighter than forewings, and with distinct bronze hue; basal half of wings slightly yellowish to grayish with light golden tinge. Fringe cinnamon-gray, merging with outline of wing. Under surface of wings cinnamon-gray, with slight violet tinge in forewings and distinct bronze tinge in hind wings.

Venation of forewings. Sc terminates in middle part of forewing. Distance between bases of R_1 and R_2 six to seven times greater than between R_2 and R_3. Branches R_4 and R_5 widely separated at base. Termina of branches R_5 and M_1 at almost equal distance from alar apex. Venation of hind wing similar to that of *C. simplicella* H.-S.



137 Figure 68. Genitalia of male *Cephimallota chasanica* Zag.

A — general appearance (ventral view); B — same (dorsal view).

Preparation No. 9930, male. Primor'e, Khasan region.

Fore- and middle legs light cinnamon-gray on lower and inner sides, on outer side black to chocolate-brown, lustrous, with sharp yellowish-gray rings on ends of segments.

Male genitalia (Figure 68). Valvae arcuate, with wedge-shaped apex. Sclerotized cord of valva straight at end, pointed, and does not protrude beyond vinculum. Uncus in form of two small wideset tubercles, rounded at apex, and does not reach end of valvae. Branches of gnathos stout, pointed, and crossed near apex. Aedoeagus very slender and long, broadens at base like a funnel, and forms loop; length almost twice width of genitalia. Tegumen (dorsal view) with large acute notch on anterior margin. Saccus thin, long, slightly bent, and only three-fourths width of genitalia.

137 *Female.* Not known.

Comparison. Differs from other species in cinnamon-gray color of forewings and their venation: R_1 terminates on alar margin at level of apex of radiocubital cell; distance between bases of M_3 and Cu_1 one-half to one-third distance between M_2 and M_3. In general appearance of genitalia differs in structure of uncus; long saccus, similar to *C. libanotica* Pet., but distinguished by very long, slender aedoeagus, and short sclerotized cord of valva, which is straight at end, as well as widely separated short apices of uncus, which do not protrude beyond end of valvae.

Distribution. Far East, southern Primor'e (Figure 57).

Material examined. 1 male.

Primor'e territory, village Verkhnie Brus'ya of Khasan region, 1 male, holotype gen. preparation No. 9930, July 10, 1950 (Zagulyaev).

Biology. South Ussurian warmth-loving species associated with humid habitats. Moths fly in evening at sunset. Species caught while hovering around base of an old willow tree.

Biology not known.

3. Genus *Anemallota* Zag.

Zagulyaev, 1965: 393–394; 1968a: 219–222; Căpuşe, 1971: 235 (Nemapogoninae).

Type species. Cephimallota praetoriella Chr. (*Tinea*).

This isolated genus occupies an intermediate position between genera *Cephimallota* Brud. and *Cephitinea* Zag. On the basis of wing venation it is closer to the former; presence of a well-developed process on posterior margin of sternite VIII in males and broader, spoon-shaped valvae bring it closer to *Cephitinea* Zag. It differs from both genera in punctate pattern of forewings and structure of genitalia: in males valvae simple and in the females prevaginal plate absent.

138 *Imago*. Head covered with rusty-yellow or ocherous-red hairs. Maxillary palpi slightly shorter than labial palpi. Antennae monochromatic, without light-colored rings, smooth in males.

Span of forewings 11–12 mm. Forewings and, in many species, hind wings as well, narrow, with an acute apex; length of forewing 3.5 to 4.0, of hind wing 3.0 times greater than width. Fringe of hind wing equal to one-half to two-thirds width. Wing color not uniform, with a well-expressed pattern in form of bright spots on dark chocolate-brown background, or oblique stripes. Under surface of wings with golden or bronze glaze.

Venation of forewing (Figure 69, A). *Sc* terminates on anterior margin before its midpoint. R_1 terminates on alar margin much before level of apex of radiocubital cell. Distance between bases of Cu_1 and Cu_2 slightly more or slightly less than distance between R_2 and R_3. A_1 poorly expressed and terminates on alar margin before level of apex of radiocubital cell. In hind wings (Figure 69, B) terminus of *Sc* on wing margin almost between apex of radiocubital cell and alar apex. A_1 terminates on alar margin at level of apex of radiocubital cell.

End of tibia in foreleg with spinule. Middle pair of spurs of hind

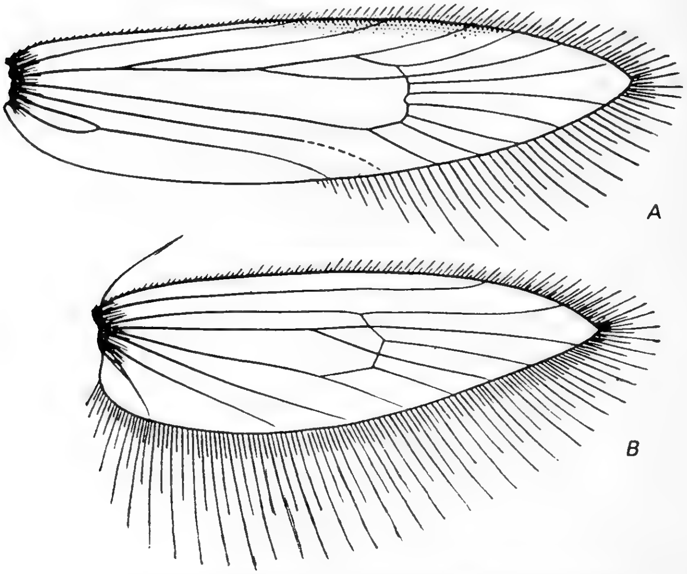


Figure 69. Venation of wings of *Anemallota praetoriella* Chr.

A—forewing; B—hind wing.

Preparation No. 4661, male. Southern Ural, Guberli.

tibia located slightly basad of middle. Spinules on ends of tarsal segments in all legs long and strong.

Structure and armature of legs shown in Figure 70.

Abdomen usual in structure, yellowish-gray or gray, with brownish tinge. Sternite of segment VIII in males with bifurcate process along posterior margin, or in form of narrow sclerotized horseshoe (Figure 72, A, B).

Male genitalia (Figure 72). Elongated, highly sclerotized. Valvae simple, without processes, with highly sclerotized anterior margin, and curve slightly toward each other but not pressed to uncus. Sclerotized cord of valvae short and in most species does not protrude beyond 139 vinculum. Uncus well developed, biapical; branches of gnathos obtuse but if gnathos absent, then anellus highly sclerotized. Aedoeagus either slightly curved or arcuate (Figure 17, A). Tegumen in dorsal view with long or wedge-shaped notch on anterior margin. Saccus slender and long, or reduced.

Female genitalia (Figures 18, B; 19, A; and 73). Vaginal plate with well-defined, long, close-set lobes with narrow slit or fairly broad cavity between them. Prevaginal plate absent. Duct of bursa copulatrix slender and variable in length. Anterior apophyses bifurcate, included in segment VI; posterior apophyses reach midpoint of segment VII. Ovipositor 1.5 to 2.5 length of segment VII.

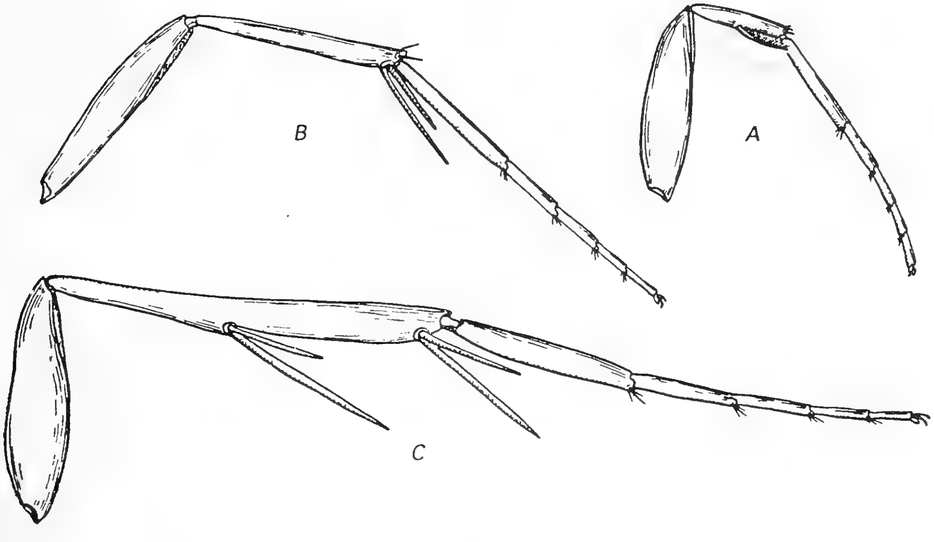


Figure 70. Legs.

A—foreleg of *Anemallota praetoriella* Chr.; B—middle leg of *A. tunesiella* Zag.; C—hind leg of same species.

Structure of larva and pupa not studied. Preimaginal stages known only for *Anemallota vittatella* Chrét. (Chrétien, 1915).

Biology. Xerophilous steppe and desert species living in turfy growth of grasses. In mountains associated with hill steppes and formations of hill xerophytes. Quite possibly species of this genus may be found in deserts in bird nests and burrows of rodents, where they develop in bedding.

Larvae of this species have probably developed the capacity to enter a long diapause with the onset of drought or frost.

Biology not studied in detail.

Distribution. European part of the USSR, the Caucasus, Trans-Caucasus, Kazakhstan, Central Asia, central regions of Western Europe, Mediterranean region, northern Africa, Asia Minor, and northwest Asia. In other words, the area of distribution of this genus is restricted to steppe and semidesert regions of the Palearctic, closely linked with the biology of the species (Figure 71). *A. praetoriella* Chr. is known from Western Europe and steppes in the southeastern European

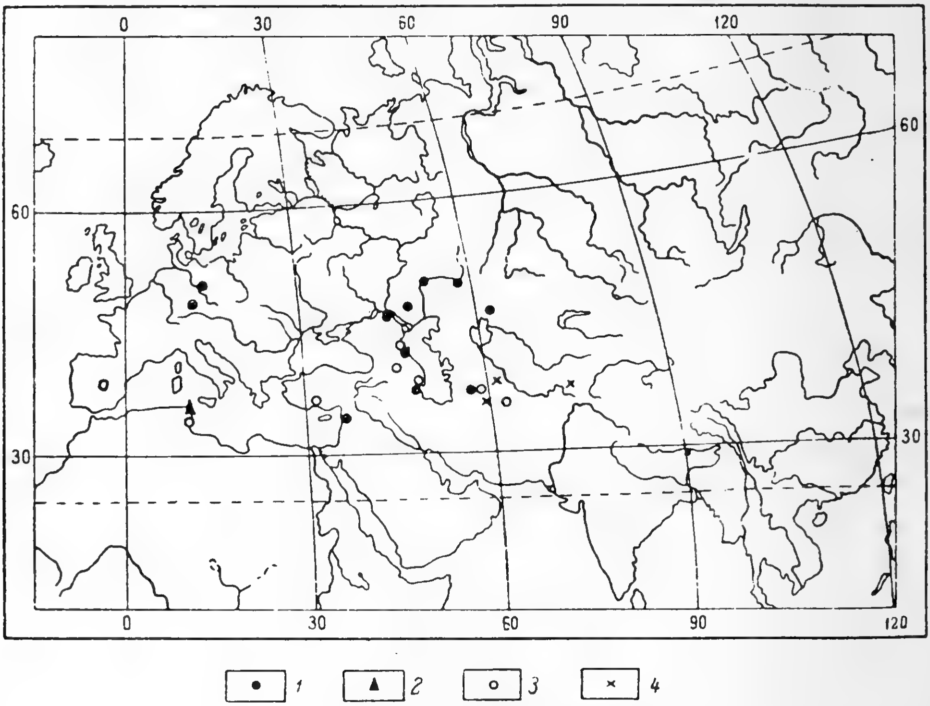


Figure 71. Distribution of species of *Anemallota* Zag.

1—*A. praetoriella* Chr.; 2—*A. vittatella* Chrét.; 3—*A. tunesiella* Zag.; 4—*A. repetekiella* Zag.

part of the USSR. In the south the area of distribution of this species continues into the Caucasus and forest-steppes of Trans-Caucasus. *A. tunesiella* Zag. is distributed no less widely, but its range is confined to 140 the south and includes the Caucasus, Trans-Caucasus, Central Asia, Turkey, and Tunisia. *A. repetekiella* Zag. is confined to deserts in Central Asia *A. vittatella* Chrét. is local in distribution and known only from Tunisia. Three species have been found in the Soviet Union. However, the occurrence of *A. vittatella* Chrét. in Kazakhstan and Central Asia is quite possible.

In all probability the center of concentration of this genus is associated with the eastern part of the ancient Mediterranean region from where its species spread to steppes and deserts.

Comparison. The genus under discussion has been separated from *Cephimallota* Brud. and includes four species: *A. praetoriella* Chr., *A. vittatella* Chrét., *A. tunesiella* Zag., and *A. repetekiella* Zag. Phylogenetic relations between the species in this genus (Figure 58) are not yet fully understood due to insufficient study of the venation of *A. vittatella* Chrét. On the basis of structure of male genitalia this species occupies an intermediate position between genera *Anemallota* Zag. and *Cephimallota* Brud. Based on pattern of wings *Anemallota vittatella* Chrét. is similar to *A. tunesiella* Zag. and *A. praetoriella* Chr. In terms of wing venation and structure of male and female genitalia, *A. tunesiella* Zag. is close to *A. repetekiella* Zag. The preservation of a large number of primitive characters in *A. vittatella* Chrét. permits one to consider it the most archaic species and place it closer to the base of the evolutionary stem.

Key to Species of Genus Anemallota Zag. on the Basis of External Characters

1 (2). Forewings with six yellow spots .... 1. **A. praetoriella** Chr.
2 (1). Forewings with seven to eight oblique streaks or stripes and four to five round spots.
141 3 (4). Forewings with eight oblique streaks without sharply expressed spots .... 2. **A. vittatella** Chrét.
4 (3). Forewings with seven to ten diffused oblique streaks along anterior margin and four to five round well-defined spots.
5 (6). In forewings terminus of R_1 located before origin of R_2 from cell; R_5 terminates almost near apex of wing; distance between bases of Cu_1 and Cu_2 more than distance between bases of R_2 and R_3 .... 3. **A. tunesiella** Zag.
6 (5). In forewings terminal of R_1 located at level of origin of R_2 from cell; R_5 terminates on alar margin at a distance almost 1.5 times

greater than termination of M_1 from alar apex; distance between bases of Cu_1 and Cu_2 less than distance between bases of R_2 and R_3. .... 4. **A. repetekiella** Zag.

Key to Species of Genus Anemallota Zag.
on the Basis of Male Genitalia

1 (6). Uncus lobes small, with acute apices, without spinescent processes; valvae in basal half with sclerotized processes.
2 (3). Valvae in ventral view bent, unguiculate; uncus in form of two small lobes with bristles. .... 1. **A. praetoriella** Chr.
3 (2). Valvae in ventral view more or less straight; uncus in form of two long narrow lobes.
4 (5). Valvae with constriction near apex forming cucullus; aedoeagus 2.33 length of valvae and almost 2.0 width of genitalia. .... 4. **A. repetekiella** Zag.
5 (4). Valvae broaden before apex, without constriction and cucullus; aedoeagus twice longer than valvae and almost three times width of genitalia. .... 3. **A. tunesiella** Zag.
6 (1). Uncus lobes large, broadly rounded; valvae in basal half without processes. .... 2. **A. vittatella** Chrét.

Key to Species of Genus Anemallota Zag.
on the Basis of Female Genitalia[7]

1 (2). Inner margins of lobes of vaginal plate straight and close-set. Ostium bursa with lobate margins. ..... 1. **A. praetoriella** Chr.
2 (1). Inner margins of lobes of vaginal plate concave, so that cavity occurs between lobes. Ostium bursa in form of sclerotized funnel.
3 (4). Ovipositor 2.33 times longer than sternite VII. Ostium bursa covered with minute sclerotized patches...... 3. **A. tunesiella** Zag.
4 (3). Ovipositor 1.5 times longer than sternite VII. Ostium bursa covered with minute spinules. .... 4. **A. repetekiella** Zag.

1. **Anemallota praetoriella** Chr. (Figures 9, A; 10, A; 11, A; 17, A; 19, A; 58; 69; 70, A; and 71–73; Plates II and VI, 1)

Christoph, 1872: 19, Plate I; Figure 15 (*Tinea*); Staudinger and Rebel, 1901: II: 239 (*Tinea*); Spuler, 1910: II: 461 (*Tinea*); Petry, 1925: 138–140 (*Tinea*); Hering, 1932: 28 (*Tinea*); Rapp, 1936: 1–240; Petersen, 142 1957a: 99 (*Cephimallota*); 1961b: 531 (*Cephimallota*); 1963a: 412–413 (*Cephimallota*); 1968: 53 (*Cephimallota*); 1969: 370 (*Cephimallota*);—

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[7] Female of *A. vittatella* Chrét. not known to me, and hence not included in key.

uralskella (*Promiasia*) Caradja, 1920: 169.

External characters of imago. Head covered with rusty-yellow hair. Labial palpi project down, in males ocherous-yellow, in female rusty-yellow; 2nd segment on lower side with isolated, protruding, long, filiform scales and bristles, which are equal in length to 3rd segment; last segment covered with closely compressed scales. Antennae cinnamon, whitish-gray, lustrous, setaceous, slightly dentate.

Thorax and tegulae dark chocolate-brown, lustrous. Span of forewings in males 12 mm, in female 14 mm. Length of forewing about four × width, of hind wing almost 3.25 width.

Forewings (Plate VI, 1) dark cinnamon with six yellow spots; three roundish and apically pointed spots located near anterior margin; two large spots located near inner margin, first of which with oblique anterior margin and may fuse with first spot of anterior margin through an indistinct intermediate stripe; anterior margin of second spot straight; sixth spot large, round, and located before alar apex, not touching its margin. Fringe dark cinnamon and only near apex yellowish or whitish. Hind wings light gray with pink glaze and dark veins. Fringe gray.

Venation of forewings (Figure 69, A). Distance between bases of R_1 and R_2 five to seven times greater than distance between R_2 and R_3. Branches R_4 and R_5 widely separate at base. Terminus of branch R_5 slightly closer to alar apex than M_1. Distance between bases of Cu_1 and Cu_2 equal to distance between R_2 and R_3. Common trunk of A_{2-3} 2.5 times longer than forked part near base. In hind wing (Figure 69, B) 143 terminus of branch R 1.5 to 2.0 times closer to alar apex than M_1. Distance between bases of Cu_1 and Cu_2 equal to one-fifth length of radiocubital cell.

Legs pale, yellowish, lustrous. Tarsal segments cinnamon, at end with pale yellow interception. Structure of legs shown in Figures 9, A; 10, A; 11, A; and 70, A.

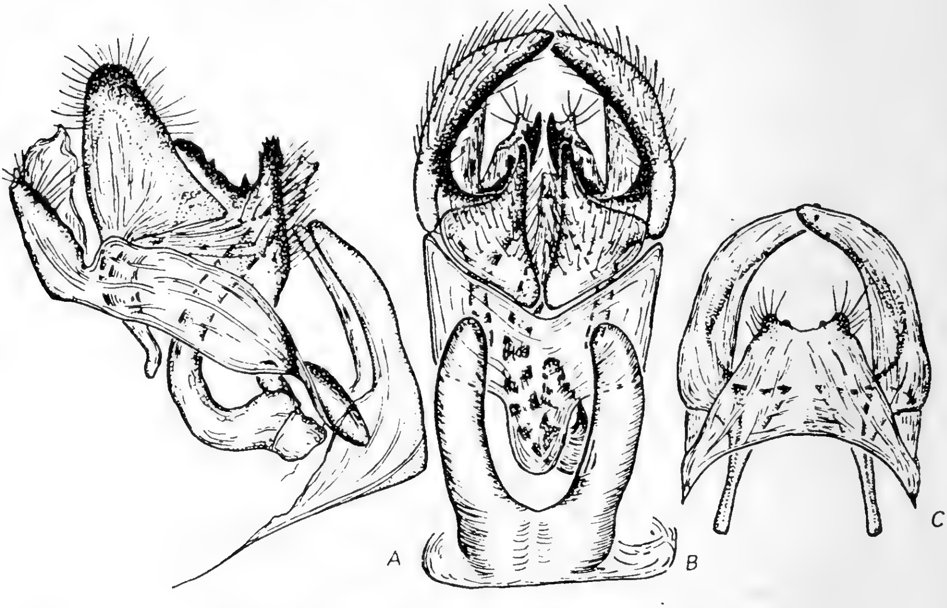
Abdomen gray, with brownish tinge, lustrous; anal tuft small, grayish-yellow. Sternite of segment VIII resembles broad thick horseshoe.

Male genitalia (Figure 72, A). Valvae in lateral view obtusely wedge-shaped; on lower side falcate, highly sclerotized, with hooks directed toward each other and covered with short bristles. Sclerotized cord of valvae in ventral view arcuate and does not protrude from under vinculum (Figure 72, B). Base of valvae highly sclerotized, tilted, and connected with anellus; latter well developed and two apices with highly dentate and darkly pigmented margins. Uncus small, almost reaching midpoint of valvae, with two, small, relatively widely separated apices with bristles (Figure 72, C). Gnathos not present; probably functionally replaced by well-developed anellus. Aedoeagus arcuate (Figures 17, A and 72, A), one-fourth longer than width of genitalia, broad, thick, and falcate at base, with distinct short obtuse processes. Saccus in form of a broad appendage (Figure 72, B).

Female genitalia (Figures 19, A and 73). Lobes of vaginal plate highly sclerotized, with straight posterior margin with three to four long bristles and five to six short bristles. Slit between lobes very deep and almost reaches base. Ostium bursa open between ridge-shaped, thickened lobes of vaginal plate. Duct of bursa copulatrix slender and membranous. Bursa copulatrix located in segments VI to IV. Ovipositor long, about 2.5 length of segment VII.

Comparison. On basis of color and pattern of wings somewhat resembles *A. vittatella* Chrét. and *Cephimallota simplicella* H.-S., from which it is readily distinguished by absence of bands before midpoint. Moreover, it differs from other species of the genus in presence of six yellow spots in wings which do not touch alar margin, and are located on dark cinnamon background. In presence of broad vinculum and short and broad saccus, *Anemallota praetoriella* Chr. resembles species of *Haplotinea* Diak. and Hint.

After studying the preparation of a male *Promasia uralskella* Car. prepared by Petersen and preserved in the collections of Caradja in



142 Figure 72. Genitalia of male *Anemallota praetoriella* Chr.

A—general view (lateral side); B—same (ventral view); C—uncus and valvae (dorsal view).

Preparation No. 4661, male. Southern Ural, Guberli.

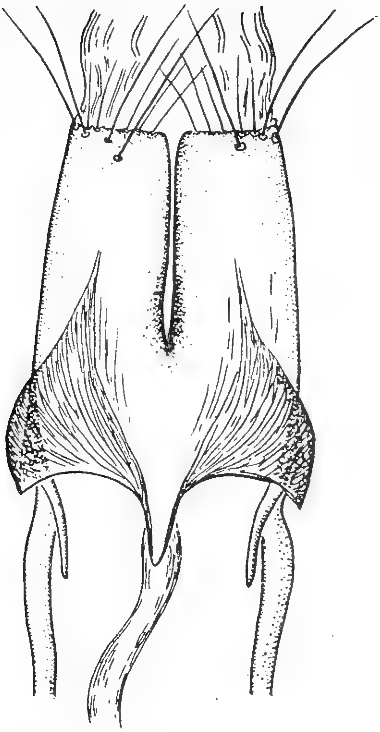


Figure 73. Region of vaginal plate of *Anemallota praetoriella* Chr.

Preparation No. 7472, female. Dagestan, Kapchugai.

Bucharest, I confirm the identity of this species with *Anemallota praetoriella* Chr.

144 *Distribution.* Southeastern region of the European part of the USSR, Ural region; western and central Kazakhstan; Caucasus, Trans-Caucasus, and Central Asia, as well as central regions of Western Europe; middle East (Figure 71).

In literature these localities for this species are mentioned: southern Volga region: Sarepta (Christoph, 1872); Ural'sk (Caradja, 1920); Germany: Turingia (Petry, 1925); German Democratic Republic (Petersen, 1969); Syria (Petersen, 1968).

Material examined. 21 males and 6 females.

European part of the USSR. Southern Volga region, Krasnoarmeisk (Sarepta), one male July 22, 1868 (Christoph) considered by me as the lectotype, gen. Preparation No. 4661, male. Type specimen with original label in form of rectangle 11 mm × 7 mm, with black border, and notation on upper side "male, Sarepta," and on reverse side "22.7.68. Chr. *praetoriella*". Southern Ural, Orenburg region, Village

Verkhnyaya Dneprovka (left bank of Ural River), one male June 27, 1932 (Zimin); Guberli two males June 1 and 15, 1891; two males and three females June 21–28 and one male July 3, 1892 (Christoph).[8] Environs of Lake Elton, one male June 29, 1952 (Zagulyaev). Ural'sk, eight males June 30, 1907, of which one male designated by Petersen as hololectotypus for *Promasia uralskella* Car. (Caradja collection, Museum of Natural History, Bucharest, Rumania).

Caucasus. Dagestan, Kapchugai, one female October 29, 1932 (Ryabov); Levashi, one male June 17, 1926 (Ryabov); Azerbaidzhan, Lerik, one female July 5–6, 1962, at light (Zagulyaev).

Kazakhstan. St. Zhana-Arka three males and one female June 24, 1958 (Zagulyaev).

Central Asia. Turkmenia, environs of Kara-Kala, peak of Syunt mountain, one male June 26, 1953 (V. Kuznetsov).

Biology. Widely distributed steppe species but rarely found, adapted to dry open regions (Plate II).

Moths emerge in June, July–August, and October. In Lerik region of Azerbaidzhan one female was caught in the beginning of July at light at the edge of an old graveyard (altitude about 1,000 m), which was covered with large zelkovas and sparse grass cover. In the Southern Volga and Ural steppes moths emerge from June to August. This time of emergence is almost characteristic for the steppe regions of Dagestan. However, there too (Kanchughai) M.A. Ryabov recorded the last flight of this species at the end of October. I collected moths in the second half of June in the spurs of Koksinger (Kazakhstan).

Larvae probably live in silken galleries constructed in soil in turfy grass growth. However, indications are available that larvae live in galleries made in nests of bumblebees (*Bumbus* sp.) (Rapp, 1936; Petersen, 1936d, 1969).

Usually one generation per year, but in Dagestan two.

Biology and behavior not studied.

2. **Anemallota vittatella** Chrét. (Figures 58; 71; and 74)

Chrétien, 1915: 371–372 (*Tineola*); Caradja, 1920: 171 (*Tineola*); Petersen, 1957a: 103 (*Cephimallota*).

External characters of imago. Chrétien (1915) in his description of the species listed the following peculiarities: head ocherous, with reddish tinge. Labial palpi project down; 2nd segment ocherous; 3rd segment covered with close-fitting scales. Antennae dark cinnamon, lustrous.

[8] Specimens collected by Christoph should be considered paratypes.

Thorax and tegulae ocherous, slightly reddish. Span of forewings 11.5 to 22.0 mm.

145 Forewings dark, lustrous, more or less speckled with minute reddish or ocherous spots. Pattern of eight oblique, irregularly arranged, dark cinnamon-ocherous stripes on basal half of wings reaches inner margin; stripes located at base simple, straight or oblique; stripes in middle part of wing broader and divided into sections which, when connected with each other, form a reticulate pattern. Remaining four parallel oblique stripes located in outer half of the wing. Fringe yellow to ocher, darker at base and lighter near outer margin. Hind wings whitish, translucent; their fringe whitish, with ocherous stripes near base.

Abdomen yellowish.

Male genitalia (Figure 74). On the basis of illustration of the genitalia prepared by Petersen (1957a) the following description is possible. Valvae not falcate, but more or less straight, spoon-shaped. Sclerotized cord of valvae slender, straight, and does not protrude beyond vinculum. Uncus distinctly visible in ventral view between valvae in form of two rounded tuberculate appendages well separated from each other and densely covered with virgate spinules. Branches of gnathos slender, pointed, with intercrossing apices. Aedoeagus slender, slightly curved, narrowing toward tip in form of a tube, and four-fifths width of genitalia; base of aedoeagus with two, small, lateral, pointed outgrowths. Saccus not developed.

Female. Not known.

Egg[9]. Elongated-ellipsoid, with smooth lustrous surface, whitish, with faint polygonal markings.

Mature larvae. Head chocolate-brown to chestnut with two parallel broad stripes and chocolate-brown to black regions along sides under

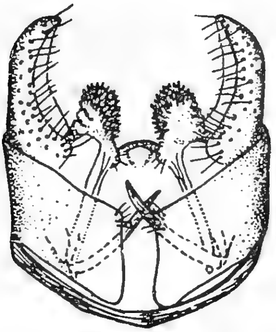


Figure 74. Genitalia of male *Anemallota vittatella* Chrét., ventral view (from Petersen, 1957a).

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[9] Description of preimaginal stages prepared from data of Chrétien (1945).

eyes. Mouthparts yellowish to chocolate-brown, with rust-colored specks.

Body cylindrical, 15 to 16 mm long, with somewhat shallow segmental furrows. Median dorsal stripe distinct. Larvae covered with small caruncles of same color as body; long white bristles (hairs) originate from caruncles. Prothoracic scutellum light-colored, yellow-tinged. Crochets chocolate-brown to rusty. Spiracles on most segments indistinct, excluding first and last ones.

Pupa. Light chocolate-brown to yellowish, fairly robust, tapering sharply in last three segments; surface light rugulose and lustrous; on thorax and wing covers (pterotheca) veins raised and quite distinct. Abdominal segments near anterior margin with oblique row of prickly chocolate-brown denticles directed backward. Body covered with caruncles with very long chocolate-brown to yellow hairs. Spiracles poorly distinguishable. Terminal segment of abdomen in form of short conical pincer, with small crest near end on upper side, which bears two chocolate-brown to red spinules. Cusp of crest points forward.

146 *Comparison.* On the basis of genital structure this species occupies an intermediate position between *A. praetoriella* Chr. and *Cephimallota simplicella* H.-S. However, it is readily distinguished from them by the drooping valvae, uncus in form of two rounded tuberculate appendages covered with spines, and absence of saccus. Wing pattern in form of streaks and stripes brings it somewhat closer to *Anemallota praetoriella* Chr. Until the peculiarities of venation and armature of legs are clarified, the generic affinity of this species remains problematical. Hence I have only temporarily retained this species in genus *Anemallota.* I agree with the remarks of Petersen (1957a) that the structure of the genitalia of *Anemallota vittatella* Chrét. helps one to understand the origin and evolution of the genitalia of *Cephimallota simplicella* H.-S. Thus if the straight drooping valvae of *Anemallota vittatella* Chrét. were pressed to the uncus and slightly curved, their genitalia would be very similar to those of *Cephimallota simplicella* H.-S.

Petersen indicates that he examined one female of this species preserved in Paris (Museum of Natural History), which he designated the hololectotype. Females of this species are otherwise not known. Two males are present in the collection of Caradja (Bucharest, Rumania) and designated *Tineola vittatella* Chrét. I studied both and established that one belongs to *Catabola biskraella* Rbl., and the other to a new species, *Anamellota tunesiella* Zag.

Live specimens not observed by me.

Distribution. Northern Africa, Tunisia, and possibly the southern steppe, semidesert regions of the Soviet Union (Figure 71).

Among the entire series of moths collected by Chrétien in Tunisia (Hafsa region), at present the only known specimen of the species is a

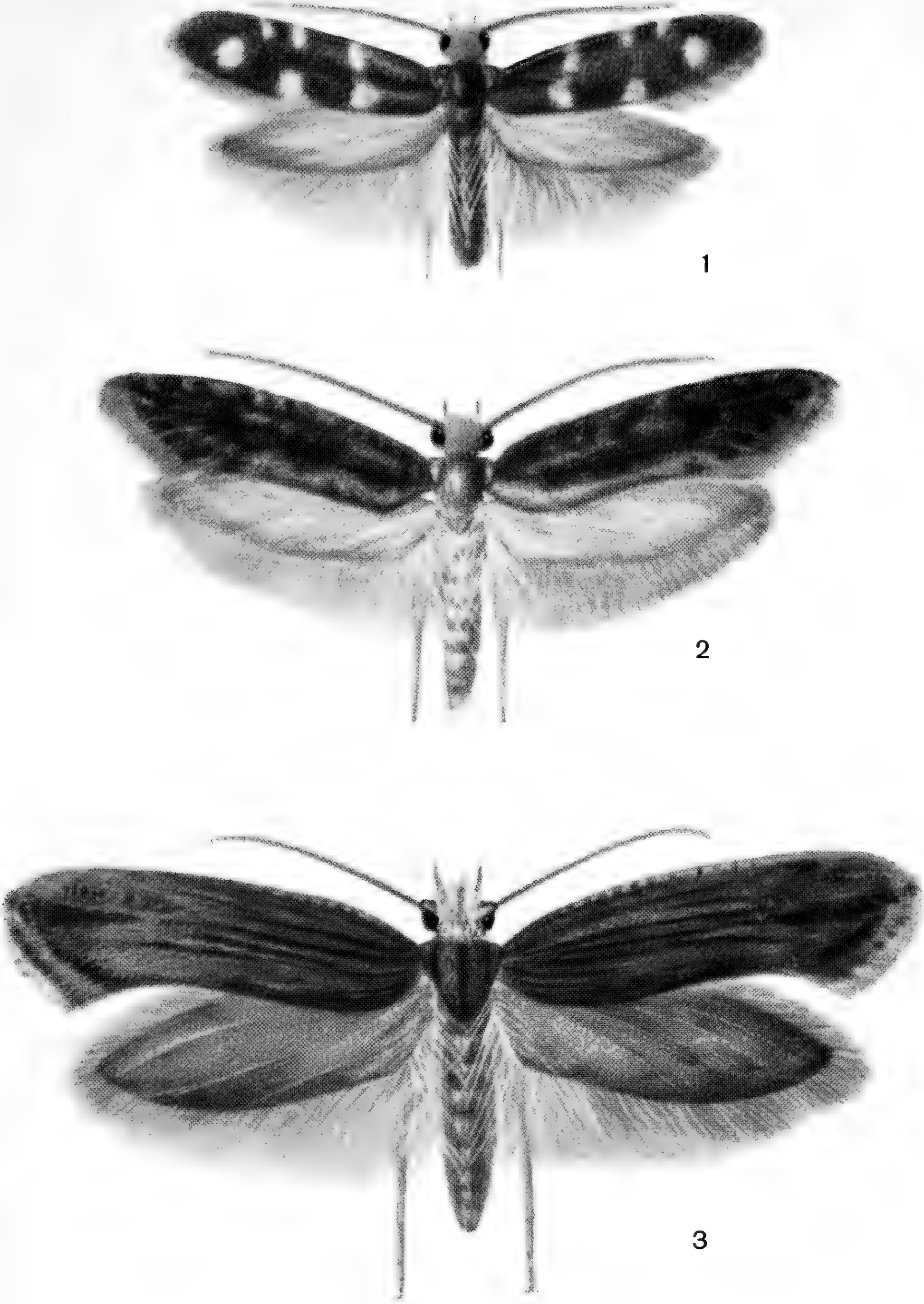
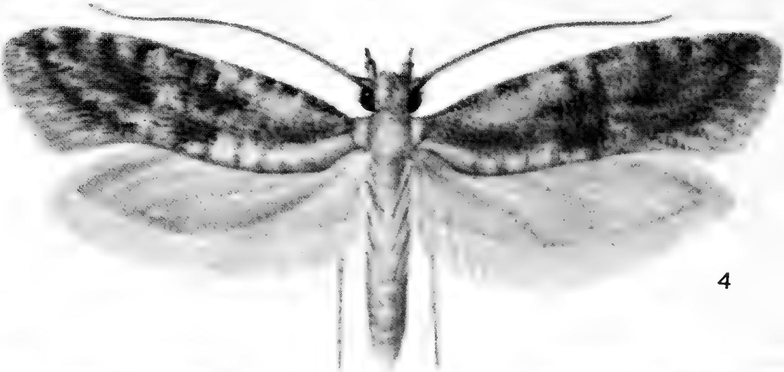


Plate VI

1 — *Anemallota praetoriella* Chr.; 2 — *Cephitinea colonella* Ersch.; 3 — *Rhodobates algiricellus* Rbl.; 4 —*Ateliotum taurensis* Zag.; 5 — *Episcardia caerulipennis* Ersch.; 6 — *Hapsifera luridella* Zll. (drawn by T.A. Temkina)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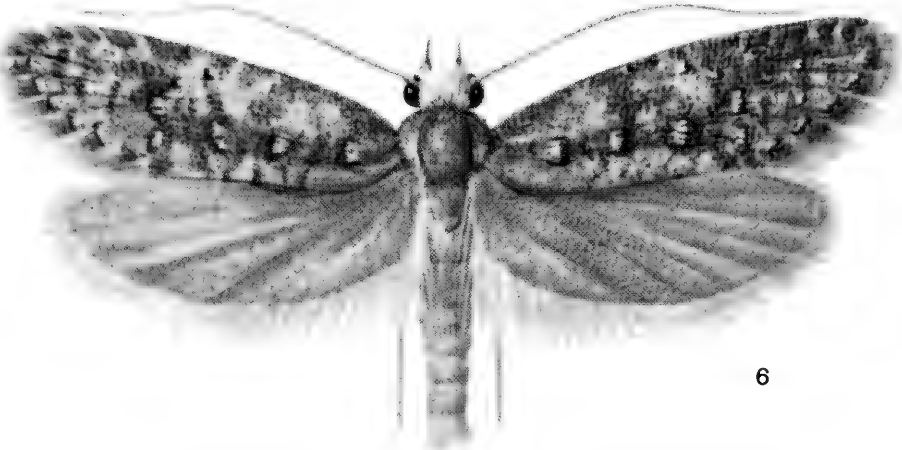
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Plate VI (continued)

male, which has been accepted as the type, *Anemallota vittatella* Chrét., and preserved in the Museum of Natural History, (Paris).

Biology. According to Chrétien (1915) larvae live in detritus under plants and near roots of trees from October to July–August. Before pupation the larvae make dense oblong cocoons of whitish silk with a pinkish tinge.

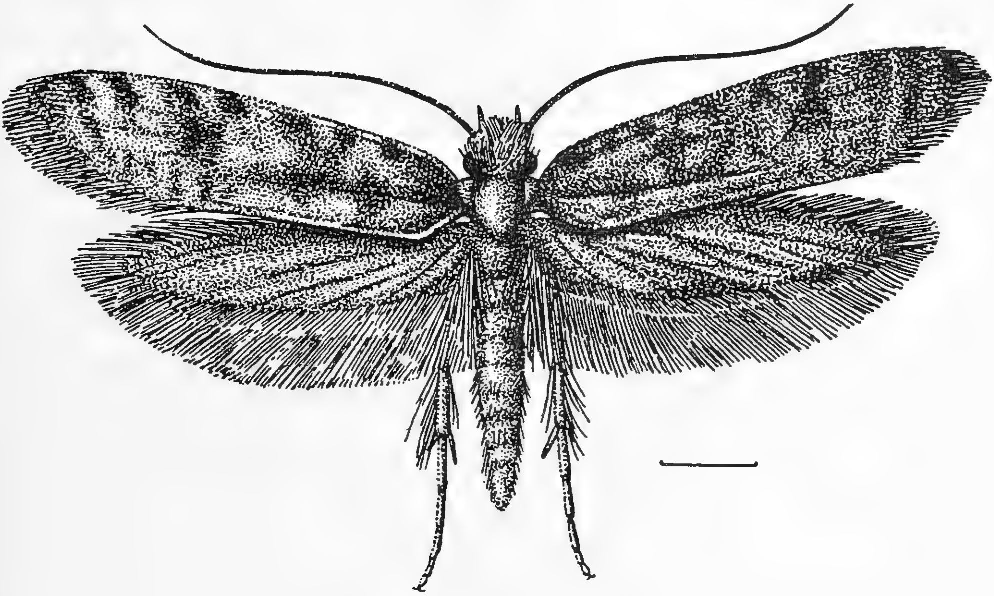
Moths emerge in September and October. Chrétien noted that moths reared from larvae in boxes are much larger than those collected in nature.

3. **Anemallota tunesiella** Zag. (Figures 58; 70, B, C, 71; and 75–77)

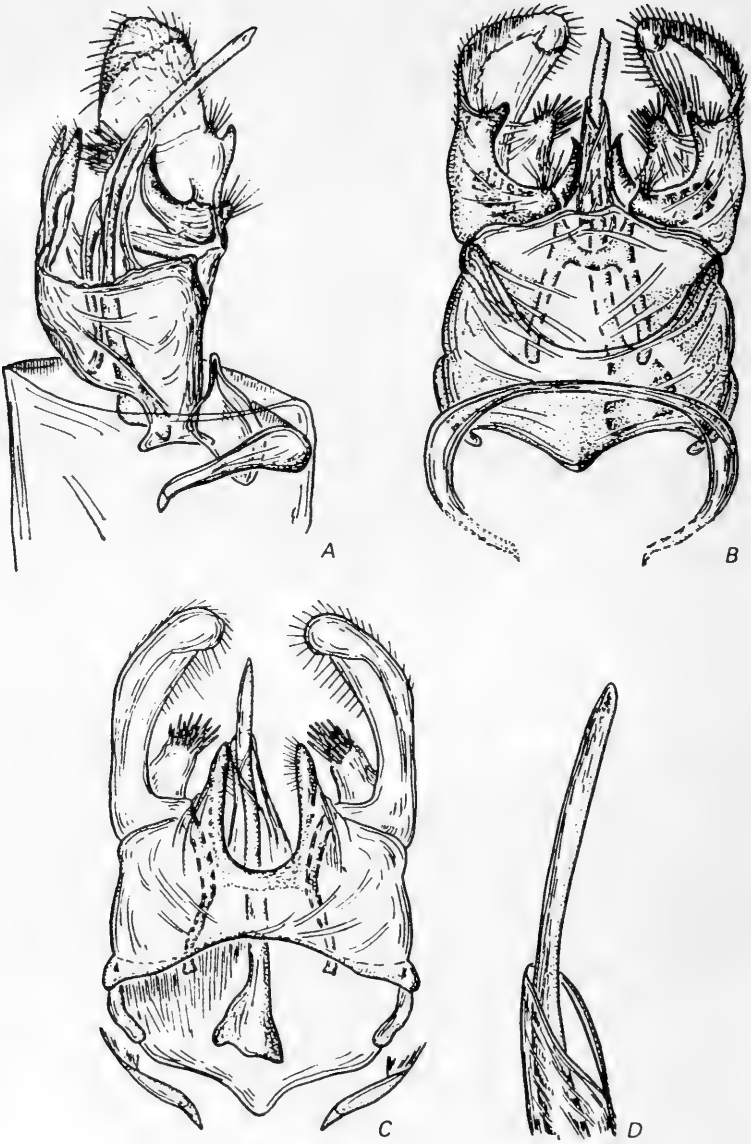
Zagulyaev, 1966a: 166–169; Petersen, 1968: 53–54 (*Cephimallota*).

External characters of imago. Head light yellow to light cinnamon-gray. Labial palpi large, directed forward and upward; 2nd segment straw-yellow to light cinnamon-ocher; 3rd segment with distinct dark cinnamon ring before midpoint, apex straw-yellow. Antennae cinnamon-gray, lustrous.

Thorax and tegulae cinnamon-ocher with golden glaze. Wing span in male 13 mm, in female 19 mm. Length of forewing 3.5, of hind wing almost 3.0 times greater than width; fringe slightly larger than half width of wings.



147 Figure 75. *Anemallota tunesiella* Zag., male (drawn by T.A. Temkina).



148 Figure 76. Genitalia of male *Anemallota tunesiella* Zag.

A — general appearance (lateral view); B — same (ventral view); C — same (dorsal view); D — apex of aedoeagus (high magnification).

Preparation No. 9929, male. Turkmenia, Kara-Kala.

Forewings (Figure 75) yellowish to ash-colored, lustrous, with indistinct diffused pattern in form of seven to eight oblique streaks arranged along anterior margin, and four to five rounded spots, of which first spot located at basal fourth along fold on hind margin, second and
147 third spots one over the other before midpoint of wings, fourth spot large and located at apex of radiocubital cell, and fifth spot small, indistinct, and located beyond apical fourth near margin of fringe. Along outer margin two to three small streaks discernible before fringe. Fringe yellowish-ocher. Hind wings light yellowish to ash-colored. Under surface of all wings yellowish to chocolate-brown, with golden glaze.

Venation of forewings. R_1 originates from first third of radiocubital cell. Distance between bases of R_1 and R_2 almost nine times greater than distance between R_2 and R_3. Branch R_5 terminates almost at alar apex. Distance between bases of Cu_1 and Cu_2 more than distance between R_2 and R_3. Common stem of A_{2-3} twice longer than radial fork. In hind wing terminus of branch R located at a distance from alar apex two to three times greater than that of M_1. Distance between bases of Cu_1 and Cu_2 equals to one-fourth length of radiocubital cell and more than length of medial cell.

Legs light yellowish to chocolate-brown, without visible dark rings at ends of tarsal segments. Structure and armature of legs shown in Figure 70, B, C.

Abdomen yellowish-gray. Sternite of segment VIII looks like a narrow sclerotized horseshoe (Figure 76, B).

Male genitalia (Figure 76, A). Valvae well separated, not falcate, fairly broad, with rounded broad and slightly incurved apices. Long, sclerotized, falciform outgrowth originates from the base of each valva; midpoint of lower margin of each valva with strong tooth, base with process, on which small cluster of short bristles located. Sclerotized cord of valva slender, straight, and in lateral view not visible from under tegumen, and does not protrude on anterior side of vinculum. Uncus in lateral view narrow and acutely pointed; in dorsal view seen as two wide-set narrow lobes (Figure 76, C). Aedoeagus (Figure 76, D) long,
148 slender, arcuate tube 2.5 length of vinculum and 2.0 length of valvae. Tegumen and vinculum resemble broad ring. Saccus not present, although vinculum in ventral view has small process (Figure 76, B).

Female genitalia (Figure 77). Lobes of vaginal plates with sclerotized posterior margin with four long and seven to eight short bristles; inner margins of lobes highly concave so that cavity forms between them, on which infundibular sclerotized ostium bursa opens. Duct of
149 bursa copulatrix slender, membranous, and very short; bursa located in segment VII. Ovipositor 2.33 length of segment VII.

Comparison. In general appearance and color pattern of fore-

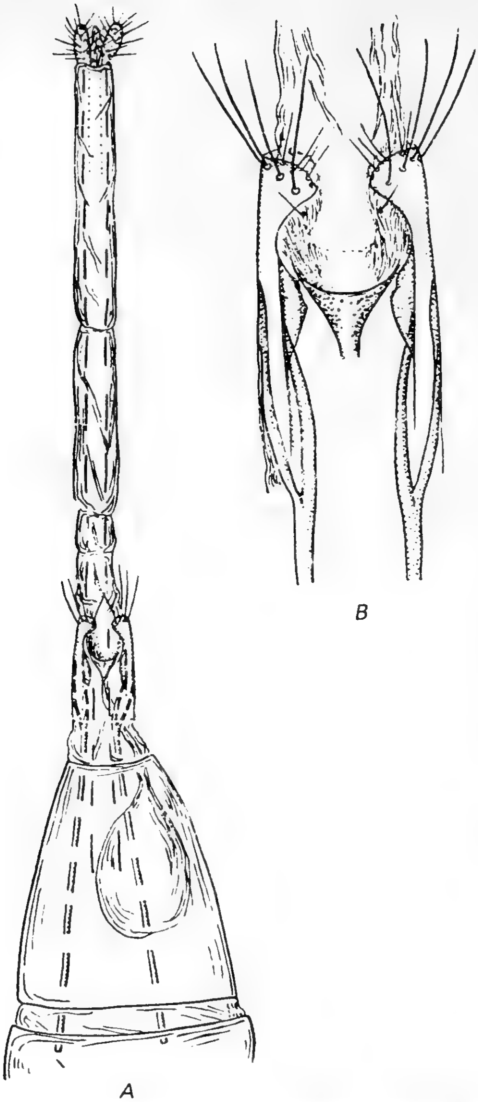


Figure 77. Genitalia of female *Anemallota tunesiella* Zag.

A — general appearance; B — region of vaginal plates.

Preparation No. 9929, female. Turkmenia. Kara-Kala.

wings this species resembles *A. vittatella* Chrét. On the basis of venation and structure of legs it is closer to *A. praetoriella* Chr. However, the structure of the male genitalia, although with properties commonly characteristic of the genus, differs sharply in details from both species.

Lower margin of valvae with two processes, one in the middle and the other at the base; in addition, a large falciform appendage originates at base of each valva, which functionally replaces the gnathos and anellus. These peculiarities, as well as the very long aedoeagus and structure of the uncus, make identification of the species easy. The female found recently in Turkmenia, Kara-Kala region, confirms the morphological peculiarities of this species. Structure of the lobes of the vaginal plate and infundibular, highly sclerotized ostium bursa distinguish this species readily from other members of the genus.

The male specimen from the collection of Caradja was identified as *Tineola vittatella* Chrét. Petersen (1957a) has provided some idea of the genitalia of male *Cephimallota vittatella* Chrét. (*Tineola*) preserved in Paris, and indicates that females are included in the collection of Caradja in Bucharest. I examined both the males in this collection and established that one of them is *Catabola biskraella* Rbl., and the other belongs to genus *Anemallota* Zag., and is close to *A. praetoriella* Chr. and *A. vittatella* Chrét. I have named this species *A. tunesiella* Zag.

It is known that Chrétien for his description of *Tineola vittatella* Chrét. had a few male specimens at his disposal, but he did not indicate which specimen served as the type for this species. It cannot be ruled out that my new species, *A. tunesiella* Zag., was used as a reference by Chrétien in his description. Now it is not possible to establish
150 the real type of *Tineola vittatella* Chrét. and hence, like Petersen, I accept the specimen preserved in Paris (Museum of Natural History) as the type species of *Tineola vittatella* Chrét.

Distribution. Caucasus, Central Asia: Turkmenia; northern Africa: Tunisia; Asia Minor: Turkey (Petersen, 1968) (Figure 71).

Material examined. 14 males and 5 females.

Caucasus, Dagestan, Makhachkala. One female September 4, 1953, in room (Ryabov); Georgia, Lago Dekhi, one male August 22, 1890 (Christoph); Azerbaidzhan, Lerik, one female August 25 1962, at light (Zagulyaev).

Central Asia. Turkmenia, Kara-Kala, seven males September 22 to October 9 and three females September 21 to 28, 1961, at light; five females August 30 to September 12, 1962, at light, in garden of VIR (Krasil'nikova). Female caught September 21, 1961 accepted as allotype. Specimen provided with standard label of red color with inscription "Allotypus"; seven males and two females of this series accepted as paratypes. Murgab, one male August 17, 1915, at light.

Tunisia, Gafsa, one male, holotypus, gen. Preparation No. 25 (collection of Caradja in Bucharest). Specimen with original label, white rectangle (10 mm × 5 mm), with a notation "Gafsa" in black ink and named *Tineola vittatella* Chrét.

Biology. Desert (Sahara-Gobi) species, adapted to southern, mainly arid regions of the Palearctic.

Moths emerge from mid-July to beginning of October. Thus in Lerik region I collected one female near an old well on August 25, 1962 on the slope of hill at an altitude of 1,100 m. In Turkey, in the saline steppe of Konya region, one male was caught on July 14, 1965 (Petersen, 1968).

Biology not studied. However, it can be assumed that larvae live in steppe litter and nests of birds and rodents.

Most probably this species produces two generations per year, and emergence of the first generation may occur in March–April, and that of the second generation from July to October.

4. **Anemallota repetekiella** Zag. (Figures 18, B; 58; 78–82; Plate IV)

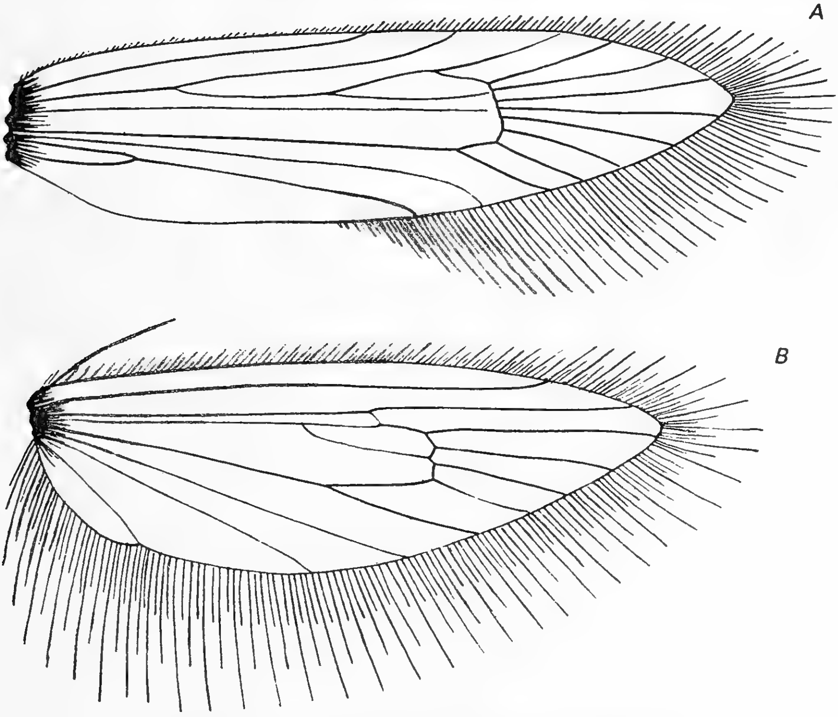
Zagulyaev, 1971b: 417–419.

External characters of imago. Pubescence of head and labial palpi yellowish-ash-colored. Labial palpi large, directed anteriorly and upward or slightly downward; 2nd segment straw-yellow, lustrous; 3rd segment darker, without isolated dark belt in basal half. Antennae smooth, dark cinnamon, lustrous; 1st segment broad, yellowish-ash-colored.

151 Figure 78. *Anemallota repetekiella* Zag., male (drawn by T.A. Temkina).

Thorax and tegulae yellowish-cinnamon on anterior side; tegulae on upper side straw-yellow. Span of forewings of males 16 to 18 mm, of females 16 to 18.5 mm. Length of forewing almost four, of hind wing three times greater than width; hind wings broader than forewings and their fringe equal to two-thirds width of wing.

Forewings (Figure 78) yellowish-ocher, golden, with cinnamon-gray markings in form of diffused spots scattered throughout wing surface and also three distinct transverse bands in males: one at base, second before midpoint, and third beyond midpoint of wing (Figure 78). In females spots more irregularly scattered and transverse stripes not discernible. However, two large spots distinguishable on apex of radiocubital cell and before midpoint of hind margin. Along anterior margin up to ten cinnamon-gray streaks distinguishable, and near outer margin and at base of fringe five diffused streaks. At base of posterior margin two spots noticeable. In addition, wing with cinnamon-gray granules. Fringe yellowish-ocher, golden. Hind wings yellowish-ash-colored with golden-brown hue; in basal half translucent and darker along margins



151 Figure 79. Venation of wings of *Anemallota repetekiella*.

A—forewing; B—hind wing.

Preparation No. 10350, male. Turkmenia, Repetek.

and at base of fringe. Fringe yellowish-ash-colored. Under surface of 152 wings yellowish-gray, on forewings with prominent dark markings, and on hind wings with brown and violet hues.

In the forewing (Figure 79, A) R_1 originates from the first third of radiocubital cell. Distance between R_1 and R_2 four to five times more than distance between bases of R_2 and R_3. Terminus of R_5 at a greater distance from alar apex than that of M_1. Distance between bases of Cu_1 and Cu_2 less than distance between R_2 and R_3. Common stem of A_{2-3} 2.25 length of radial fork. In hind wing (Figure 79, B) terminus of branch R at a distance two to three times greater from alar apex than terminus of M_1. Distance between bases of Cu_1 and Cu_2 about equal to one-fourth length of radiocubital cell and distinctly less than length of medial cell.

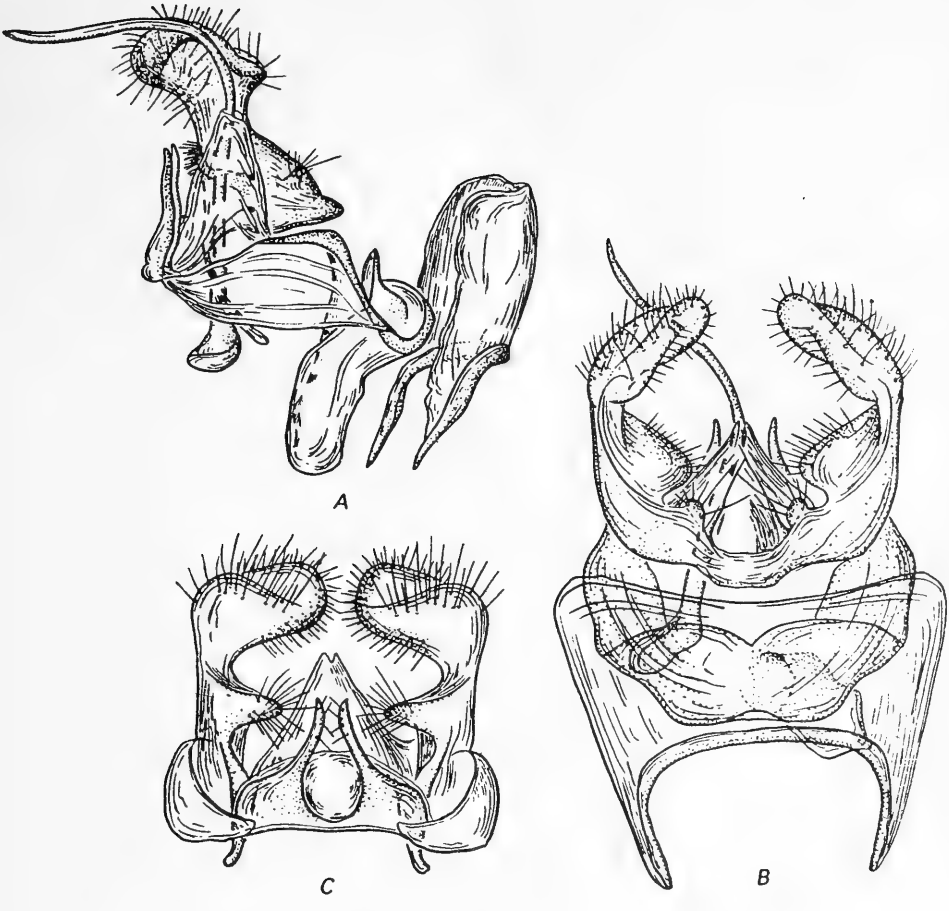
Fore- and hind legs on ourer side cinnamon-gray with light-colored bands at ends of tibiae and tarsal segments on outer side yellowish-ash. Hind legs yellowish-ash and tibiae on upper side covered with golden hairs.

Abdomen yellowish-gray. Sternite of segment VIII resembles narrow sclerotized horseshoe with large membranous flap which covers saccus and vinculum on lower side (Figure 80, A, B).

153 *Male genitalia* (Figure 80, A,B). Valvae elongated, barely incurved, not unguiculate; cucullus of valvae well defined and somewhat incurved. Papillate processes at base of valvae with bristles; ridge-shaped fold across valvae covered with bristles. Sclerotized cords of valvae slender, arcuate, and in lateral view protrude from under tegumen. Uncus in lateral view narrow, unguiculate; in dorsal view in form of two wide-set lobes with large pitcher-shaped cavity between them (Figure 80, C). Aedoeagus very slender, long, sinuous; length 2.5 times greater than length of saccus and 2.33 times greater than length of valvae. Tegumen and vinculum form broad ring. Saccus broad, thick, and incurved.

Female genitalia (Figures 18 B; 81; and 82). Lobes of vaginal plates more or less sclerotized, wide-set, with three to four bristles each along posterior margin. Ostium bursa broad, cyathiform, with sclerotized margin. Terminus of duct of bursa copulatrix and middle part of ostium bursa covered with minute spinules. Duct of bursa copulatrix thin and short. Bursa copultrix located in segments VII to VI. Ovipositor short, only 1.5 length of segment VII.

Comparison. In coloration and type of wing pattern this species is close to *A. tunesiella* Zag., but differs in larger size and irregular arrangement of dark spots on light-colored field of wing. In forewing distance between bases of R_1 and R_2 four to five times greater than distance between bases of R_2 and R_3; terminus of R_5 at a greater distance



152 Figure 80. Genitalia of male *Anemallota repetekiella* Zag.

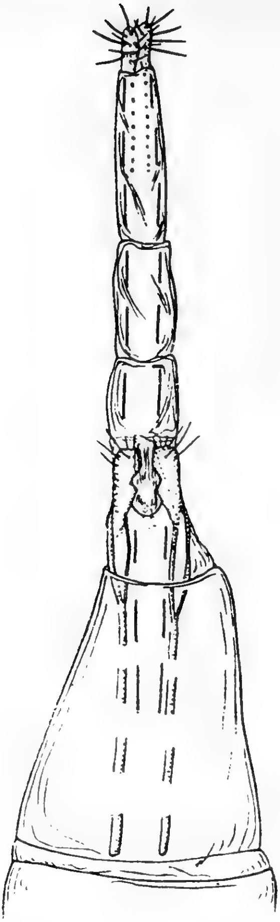
A—general appearance (lateral view); B—same (ventral view); C—same (dorsal view).

Preparation No. 10350, male. Turkmenia, Repetek.

from alar apex than that of M_1. In hind wing distance between Cu_1 and Cu_2 less than length of medial cell. Species is readily and reliably distinguished by genital structure: valvae with cucullus, papillate process, and transverse fold in basal half; aedoeagus sinuous and 2.33 length of valvae saccus broad and thick. In genitalia of female a broad, cyathiform ostium bursa and short ovipositor are characteristic features. Latter only 1.5 times longer than segment VII.

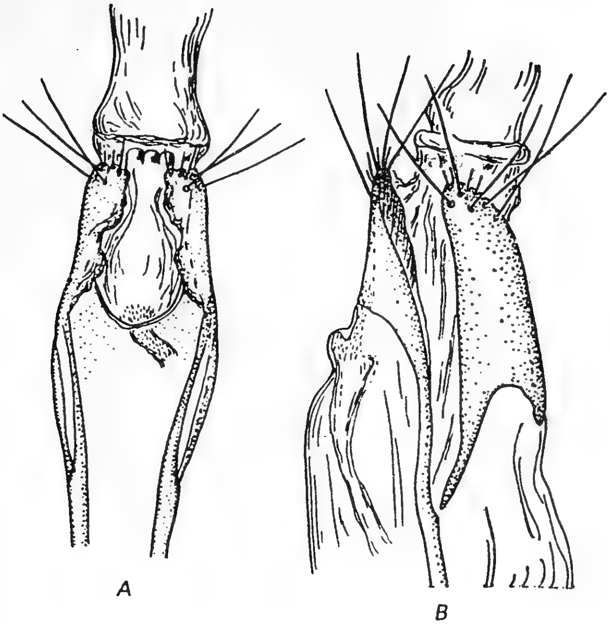
Distribution. Central Asia: Turkmenia and Tadzhikistan (Figure 71).

Material examined. 5 males and 6 females.



153 Figure 81. General appearance of genitalia of female *Anemallota repetekiella* Zag. Preparation No. 10350, female. Turkmenia, Repetek.

Turkmenia. Repetek forest reserve, three males and three females October 10–12, 1964 (Tsvetaev). Male specimen from series caught October 10–12, 1964 in Repetek accepted as holotype; specimen with standard red label with inscription "Holotypus" and in black ink "*Anemallota repetekiella* Zagulyaev sp. n., Repetek, male"; reverse side of label marked "Repetek, 10–12 October, 64 (Tsvetaev), gen. preparation No. 10350, male, det. A. Zagulajev." Female from same series accepted as allotype and designated by standard red label with



154 Figure 82. Region of vaginal plate of *Anemallota repetekiella* Zag.

A—ventral view; B—lateral view.

Preparation No. 10350, female. Turkmenia, Repetek.

inscription "Allotypus". Other two males and two females designated as paratypes. Karakul, 70 km north of Ashkhabad, one female September 27, 1967 (Fal'kovich).

Tadzhikistan. Murgab, two males September 26–27, 1965, at light (Guliev).

Biology. Central Asian desert species adapted to loose sands and possibly penetrating into deserts of Iran, Afghanistan, and Pakistan. Adult moth shown in Plate IV. Moths were found from end of September to mid-October. Reports are available of their flight toward light.

The possibility of association of this species with burrows of rodents is not excluded: jerboas, marmots, etc. or porcupine. The species may also be associated with bird nests in which the larvae develop in bedding, feeding on various substances of plant and animal origin.

Probably the species produces two generations per year: the first in summer, March–April, and the second generation in September–October.

II. Tribe RHODOBATINI Zag.

Zagulyaev, 1968a: 219; Căpuşe, 1971: 231 (Rhodobatinae); Zagulyaev, 1972b: 487, 491, 493.

Type genus. Rhodobates Rag., 1895.

Imago. Head covered with fairly short ruffled hair. Galea and maxillary palpi present only in *Rhodobates* Rag. and *Ceratuncus* Pet. (Figure 4, A); absent in *Pachyarthra* Ams. Pilifers small, rarely well developed. Labial palpi and their pubescence typical of subfamily. Eyes small, highly convex. Antennae two-thirds to three-fifths length of wing; they may be smooth and monochromatic (*Pachyarthra* Ams., *Pararhodobates* Pet.) or with infundibular scales arranged at base of 155 each segment (*Rhodobates* Rag., *Ceratuncus* Pet., *Reisserita* Ag.). In addition, antennae of male may be covered with dense cilia (*Rhodobates* Rag., *Ceratuncus* Pet., *Reisserita* Ag.).

Thorax and tegulae musty-yellow, yellowish-gray, or yellowish-cinnamon. Span of forewings 12 to 30 mm. Width of hind wing equal to width of forewing or slightly more. Female of *Pararhodobates* Pet. with rudimentary wings.

Forewings yellowish-cinnamon with ocherous, brownish, or grayish granulation. Pattern in most cases not expressed or a few dark streaks discernible, especially near anterior margin. Hind wings uniformly light yellowish-gray or grayish- to chocolate-brown.

In forewings of most species (Figures 7, A and 92, A) all the radial veins originate from the cell independently and terminate on the anterior margin of the wing. Only in *Pararhodobates* Pet. are R_4 and R_5 shortly stalked (Figure 84, A). In many species R_5 terminates at alar apex. Terminus of Cu_2 located far beyond level of outer margin of radiocubital cell. In hind wings (Figures 8, A and 92, B) A_1 terminates on alar margin at level of origin of Cu_2 from cell (*Rhodobates* Rag.), or outer margin of radiocubital cell, as in other members of the tribe.

Foretibiae either with well developed epiphysis (*Rhodobates* Rag., *Ceratuncus* Pet., *Reisserita* Ag.) or without it (*Pachyarthra* Ams., *Pararhodobates* Pet.). Middle pair of spurs of hind tibiae located immediately beyond midpoint (Figure 93, C). Ends of tarsal segments with three spinules (*Rhodobates* Rag., *Pararhodobates* Pet., *Ceratuncus* Pet., *Reisserita* Ag.) or without spinules (*Pachyarthra* Ams.)

Terminal segment of abdomen in males without clusters of androconial scales; female without sacs of silken hair.

Male genitalia (Figures 12 B; 14, D; and 89): In most species broad, rarely elongated (*Ceratuncus* Pet., *Reisserita* Ag.). Valvae broad, with incurved anterior and lower margins (*Pachyarthra* Ams., *Rhodobates* Rag.), or elongated with tapering apex, as in other genera. Sclerotized cord or pedicel of valvae simple or bifurcate; uncus either narrow with two wide-set branches (*Ceratuncus* Pet., *Pachyarthra* Ams.), or broad with a small notch in middle, as in other genera of tribe. Branches of gnathos developed and either slender, rod-like (*Pachyarthra* Ams., *Ceratuncus* Pet.), or fused into strong trough (*Rhodobates* Rag., *Pararhodbates* Pet.). Aedoeagus stout, equal to or shorter than valvae (*Pararhodobates* Pet.), curved or slender, straight, and usually longer than valvae (*Ceratuncus* Pet., *Reisserita* Ag.). Tegumen and vinculum in most species broad, narrow only in *Rhodobates* Rag. Saccus long and slender (*Ceratuncus* Pet., *Reisserita* Ag.), or short and broad. In some species of *Rhodobates* Rag., *Pararhodobates* Pet. it may be recurved.

Female genitalia variable (Figures 90, 96, and 118): Vaginal plate may be entire (*Rhodobates* Rag., *Pararhodobates* Pet.), or divided into lobe (*Pachyarthra* Ams., *Ceratuncus* Pet.). Duct of bursa copulatrix, especially its terminus, in species of *Pachyarthra* Ams. and *Pararhodobates* Pet. membranous, in members of *Rhodobates* Rag. and *Reisserita* Ag. covered with sclerotized patches and spinules, or in form of sclerotized tube (*Ceratuncus* Pet.). Bursa copulatrix without signum or with spinescent patches as in *Ceratuncus* Pet. (Figure 20, E, F). Anterior apophyses simple; posterior apophyses do not reach lobes of vaginal plate (*Rhodobates* Rag.), or extends into segment VII (*Pararhodobates* Pet.).

156 *Biology*. Meso-xerophilous species associated with steppe and semidesert habitats (Plate III). Many species live in mountains. Moths emerge from end of July to October and from March to June. Records of moths appearing in February and March are not rare.

Life history of larvae and their food are not known for most species.

Distribution. European part of USSR (except north), Caucasus, Kazakhstan, Central Asia, as well as European and African Mediterranean regions, Balkans, Asia Minor, northwest Asia, northwest China (Figure 28).

At present five genera, primarily Palearctic, are known in the tribe which include 24 species, 22 of which are primarily distributed in the ancient Mediterranean territory, and only five species from three genera (*Pararhodobates* Pet., *Rhodobates* Rag., *Ceratuncus* Pet.) found in the steppe and desert regions of the Soviet Union. It is too early to assess the distribution in non-Palearctic regions due to inadequate study of the fauna. Two species of genus *Rhodobates* Rag. have been described from equatorial and South Africa. Undoubtedly, further study of the fauna of this continent, similar to other regions, will not only increase the size of the tribe but also define its range.

The association of most members (including endemics) with the western or eastern regions of the Mediterranean suggests the existence of two ancient centers of origin for the present fauna of Rhodobatini Zag.

The tribe Rhodobatini Zag. occupies a position between Cephimallotini Zag. and Ateliotini Zag. on the basis of the following complex of characters: absence of androconial clusters on the membrane at the side of segment VIII in males, well-developed branches of gnathos and saccus in genitalia of male, absence of prevaginal plate in genitalia of female, and so on. It is closer to Cephimallotini Zag. and Ateliotini Zag. as indicated by the structure of the middle legs and presence of simple apophyses in the genitalia of females.

The tribe includes five genera: *Pachyarthra* Ams., *Pararhodobates* Pet., *Rhodobates* Rag., *Ceratuncus* Pet., and *Reisserita* Ag.[10]

Phylogenetic relations within the tribe are depicted in Figure 33. Genera *Pachyarthra* Ams. and *Pararhodobates* Pet. are close to each other on the basis of absence of epiphysis on tibiae of forelegs, similar type of venation, and short aedoeagus; most probably they constitute a single branch of the tribe. The other three genera are close to each other on the basis of a complex of characters, including the presence of epiphyses and long aedoeagus and constitute the other branch of the tribe. The genera *Ceratuncus* Pet. and *Reisserita* Ag. are closely related on the basis of occurrence of an additional cell in the forewings, and a long slender saccus, straight aedoeagus etc. in the genitalia of male. Genus *Rhodobates* Rag., although it belongs to the second branch, exhibits individual relations with *Pararhodobates* Pet. and *Pachyarthra* Ams. Preservation of some primitive traits—hind wings broader than forewings, development of lobate processes on valvae, simple structure of vaginal plate—suggests *Rhodobates* Rag. to be one of the archaic genera of the tribe.

Analysis of the genera included in tribe Rhodobatini Zag. reveals their morphological proximity to other genera of the subfamily, which is
157 reflected in the type of wing venation, great width of hind wings, length of middle tibiae, median location of middle pair of spurs on hind tibiae, as well as structure of male genitalia (biapical uncus, broad tegumen and vinculum). Such features provide a basis for retaining Rhodobatini Zag. as a tribe among steppe detritophages (Myrmecozelinae), and

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[10] Genera *Pachyarthra* Ams. and *Reisserita* Ag. have adapted mainly to the African Mediterranean region and Iberian Peninsula, and are not found in the territory of the Soviet Union and adjoining countries; hence descriptions of these genera and species are not given here.

at the same time for disagreeing with the separation of the tribe as an independent subfamily (Rhodobatinae), as proposed by Căpuşe (1968, 1971). The existing morphological shift in the structure of the imago distinctly characterizes the tribe and differentiates it from other tribes; members are not so distinguished phylogenetically, however, as to warrant separation into an independent subfamily.

Of the non-Palearctic members, most probably the monotypic South African genus *Probatostola* Meyr. will be included in the tribe under discussion at some future date, and brought closer to the Mediterranean genus *Pachyarthra* Ams. A special study is required before this action can be taken, however.

Key to Genera of Tribe Rhodobatini Zag. on the Basis of External Characters

1 (6). Anterior tibiae with epiphyses.
2 (3). Radial cell not present in forewings; in hind wings A_1 terminates on alar margin at level of origin of Cu_2 from cell. . . . . 5. **Rhodobates** Rag. (p. 214).
3 (2). Radial cell present in forewings; in hind wings A_1 terminates on alar margin at level of outer margin of radiocubital cell . . . .
4 (5). In hind wings M_1 and M_2 shortly stalked. . . . . . . **Reisserita** Ag.
5 (4). In hind wings M_1 and M_2 separate . . . . 6. **Ceratuncus** Pet. (p. 239).
6 (1). Anterior tibiae without epiphyses.
7 (8). Ends of tarsal segments with three spinules. In forewings R_4 and R_5 with common stem; stem of A_{2-3} terminates on posterior margin of wing before its midpoint. . . . . 4. **Pararhodobates** Pet. (p. 204).
8 (7). Ends of tarsal segments without spinules. In forewings R_4 and R_5 separate; stem of A_{2-3} terminates on posterior margin of wing far beyond its midpoint, almost at level of origin of Cu_2 from cell. . . . . **Pachyarthra** Ams.

Key to Genera of Tribe Rhodobatini Zag. on the Basis of Male Genitalia

1 (4). Valvae broad, with incurved anterior and lower margins.
2 (3). Aedoeagus stout, shorter than valvae, and bent at a right angle. . . . . **Pachyarthra** Ams.
3 (2). Aedoeagus slender, longer than valvae, arcuate. . . . . 5. **Rhodobates** Rag. (p. 214).
4 (1). Valvae narrow, margins not incurved.
5 (8). Saccus slender, narrow, long; aedoeagus straight, longer than valvae.

6 (7). Uncus lobes narrow and wide-set . . . 6. **Ceratuncus** Pet. (p. 239).
7 (6). Uncus lobes broad and fused at base . . . . **Reisserita** Ag.
158 8 (5). Saccus broad, short; aedoeagus shorter than valvae. . . . . 4. **Pararhodobates** Pet. (p. 204).

Key to Genera of Tribe Rhodobatini Zag. on the Basis of Female Genitalia

1 (4). Vaginal plate divided into two narrow lobes.
2 (3). Bursa copulatrix with signa in form of spinescent patches. . . . . 6. **Ceratuncus** Pet. (p. 239).
3 (2). Bursa copulatrix without signa . . . . **Pachyarthra** Ams.
4 (1). Vaginal plate entire, or with notch along posterior margin.
5 (8). Terminus of duct of bursa copulatrix covered with spinules or plates.
6 (7). Terminus of duct of bursa copulatrix covered with spinules . . . . **Reisserita** Ag.
7 (6). Terminus of duct of bursa copulatrix covered with plates . . . . 5. **Rhodobates** Rag. (p. 214).
8 (5). Terminus of duct of bursa copulatrix membranous, without incrustation. . . . . 4. **Pararhodobates** Pet. (p. 204).

4. Genus *Pararhodobates* Pet.

Petersen, 1958: 404; Zagulyaev, 1968a: 219; 1971b: 417; 1972b: 487, 491, 493.

Type species. Chimabacche ? syriaca Led., 1857.

On the basis of many external characters, especially relatively narrow wings with unique coloration and markings, members of this genus differ from other members of the tribe and resemble greatly those of *Deuterotinea* Rbl. Females with only rudimentary wings.

Imago. Head broad, flattened, and covered with rough setaceous scales. Galea absent. Pilifers (Figure 83, A) in the form of large hemispheres that touch each other, carrying very short bristles on the outer side. Maxillary palpi very short, two-segmented, and noticeable only in preparations. Labial palpi stout and protrude forward and below; 2nd segment very long, almost twice longer than 1st and 3.5 times longer than 3rd, and covered with dense, suspended brush of setaceous scales, which are two to three times longer than the terminal segment and usually cover it; 2nd segment additionally with a few long bristles; 3rd segment very slender and densely covered with scales and bristles. Antennae slender, setaceous, and in males equal to two-thirds to three-fifths length of forewing; 1st segment long, three times longer than 2nd,

1

2

3

Plate VII

1—*Ceratuncus danubiellus* Mn.; 2—*C. dzhungaricus* Zag.; 3—*Rhodobates laevigatellus* H.-S.; 4—*Catabola crassicornella* Zll.; 5—*Myrmecozela ochraceella* Tgstr.; 6—*M. lutosella* Ev. (drawing by T.A. Temkina.)


4

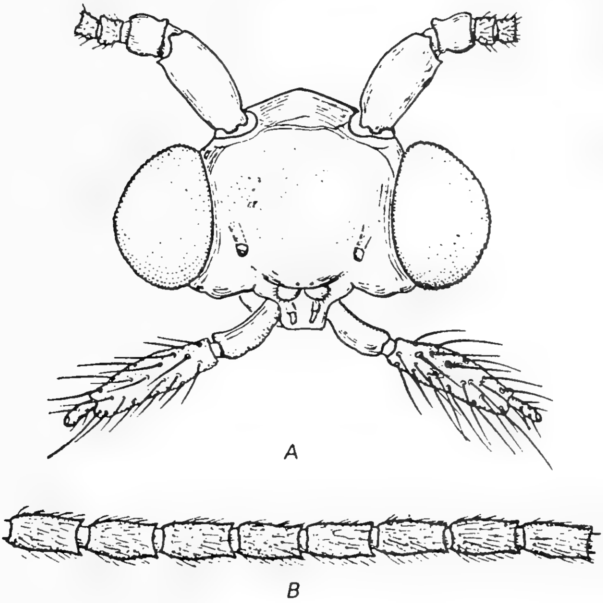

5


6

Plate VII (continued)

and without bristles; segments of pedicel elongated, without processes, and covered with very short, slender cilia, discernible only in preparations (Figure 83, B). Examined under a lens, antennae covered with compactly arranged scales that appear smooth. Eyes highly convex and naked. Width of frons slightly more than longitudinal diameter of eyes.

Thorax and tegulae ash-gray with dull brownish granulations. In males wings normally developed with span of forewings reaching 23 mm. In females vestigial wings reach midpoint of 2nd segment of abdomen (Figure 88). Forewings of male long, narrow, with obtuse apex and oblique fringe; length four times greater than width. Length of hind wings in male 3.5 times greater than width; length of fringe about half width of wing.



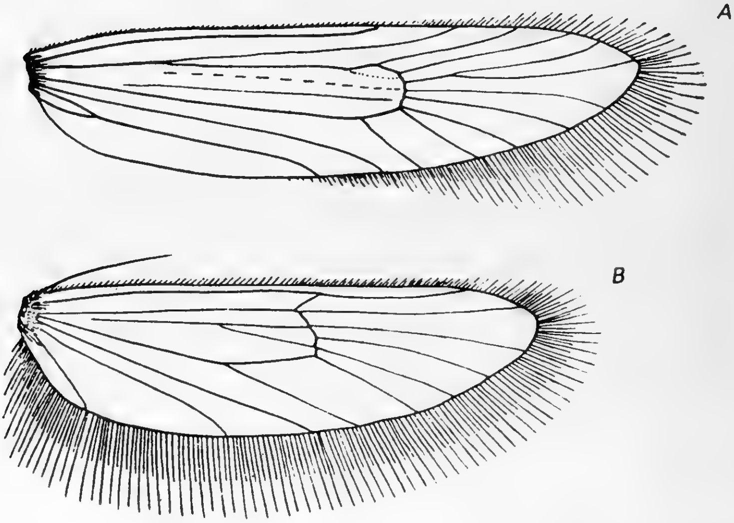
159 Figure 83. Head of male *Pararhodobates syriacus* Led.

A—general appearance; B—middle segments of antennae.

Preparation No. 10024, male. Turkmenia, Ashkhabad.

Fore- and hind wings light gray, but appear musty because of light chocolate-brown granulations. Pattern on wings in form of minute blackish transverse streaks scattered over wing surface. Color and pattern described in greater detail for each species.

Venation of forewings of males (Figure 84, A). *Sc* continues beyond midpoint of anterior margin. R_4 and R_5 with short stem. R_5 terminates almost at alar apex. M_3 and Cu_1 close-set at base. Distance between bases of Cu_1 and Cu_2 almost twice greater than distance between R_2 and R_3. Branches of A_{2-3} only one-third length of stem. In hind wings (Figure 84, B) *Sc* connected by cross-vein to radial trunk. R_1 terminates on anterior margin of wing before apex. All medial veins wide-set at base. Distance between Cu_1 and Cu_2 large and equal to length of medial cell. A_2 terminates on posterior alar margin at level of origin of branch of Cu_1 from cell.



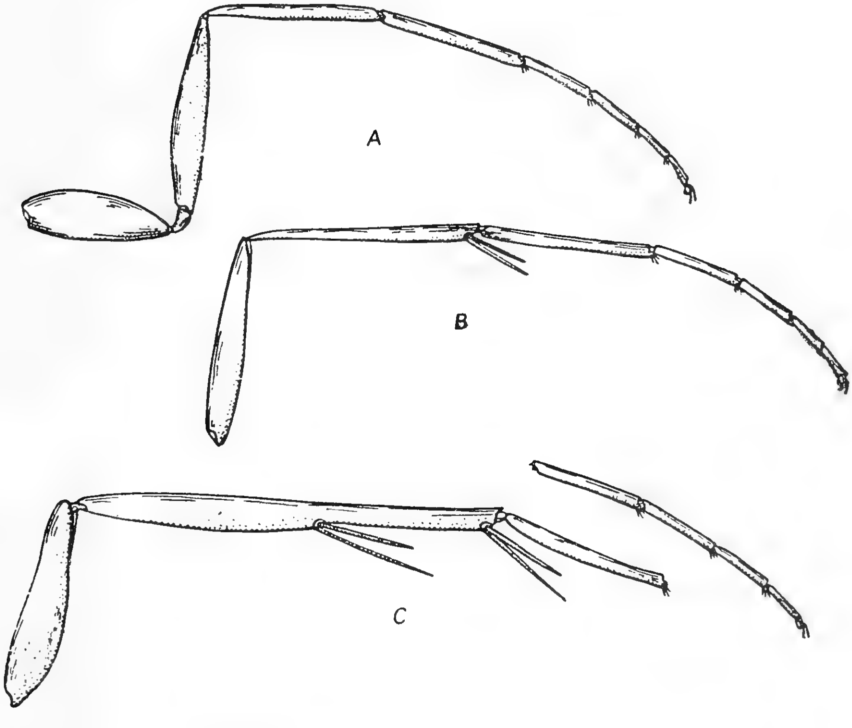
160 Figure 84. Venation of wings of *Pararhodobates syriacus* Led.
A—forewing; B—hind wing.
Preparation No. 10024, male. Turkmenia, Ashkhabad.

Legs large, strong, long, cursorial, with dense pubescence. Foretibiae (Figure 85, A) shorter than femora and without epiphyses. Middle tibiae (Figure 85, B) longer than femora. Hind tibiae (Figure 85, C) twice longer than femora.

Anal segment of abdomen without tuft. Sternite of segment VIII in males usually in structure.

Male genitalia. Compact, protrude freely in form of claws and densely covered with scales (Figure 89). Valvae with narrow elongated apex and lobate broad fold in basal part of lower margin (Figure 15, D); base of anterior margin with two small folds. Inner surface of valvae covered with short bristles; part anterior to apex covered with long spinules. Sacculus of valvae poorly developed. Uncus in lateral view in form of elongated rectangle, in ventral view with small notch in middle 161 of posterior margin. Branches of gnathos geniculate, massive, and highly sclerotized; in ventral view with process on inner side connected through a membrane. Aedoeagus small, equal to half length of valvae, conical, fairly sclerotized, and with a spine and processes. Saccus small, with recurved fold.

Female genitalia (Figure 90). Fairly simple in structure. Vaginal plate broad, with concave anterior margin and broad notch along posterior margin; length of two lobes more than length of undivided basal part of vaginal plate. Ostium bursa at end of duct of bursa copulatrix broad and nonpigmented. Duct of bursa copulatrix broad and short, without sclerotized structures. Bursa copulatrix located in segment VII, its simple sac without signa. Anterior apophyses reach segment VI; posterior apophyses included in segment VII. Ovipositor stout and long, 2.5 length of sternite VII. Anal papillae large, with fairly strong bristles.



160 Figure 85. Legs of *Pararhodobates syriacus* Led.
A—foreleg: B—middle leg; C—hind leg.

Preparation No. 10024, male. Turkmenia, Ashkhabad.

Biology. Psammophils, with preference for dry areas, associated with ephemeral vegetation (Plate III), and adapted to rapid movement on ground. Species live in large groups. Absence of wings in females associated with terrestrial mode of life, and long legs facilitate movement over open ground. Two sacs with silken fluff in females serve the purpose of covering eggs after oviposition, which is a reliable protection against sharp fluctuations in temperature during day and night and desiccation under a scorching sun. Larvae live among dead roots in the soil layer in silken galleries covered with minute particles of sandy soil, or construct small cylindrical tubes which protrude above the soil surface (Figure 26, A). They feed on plant detritus and pupate in the main or lateral galleries.

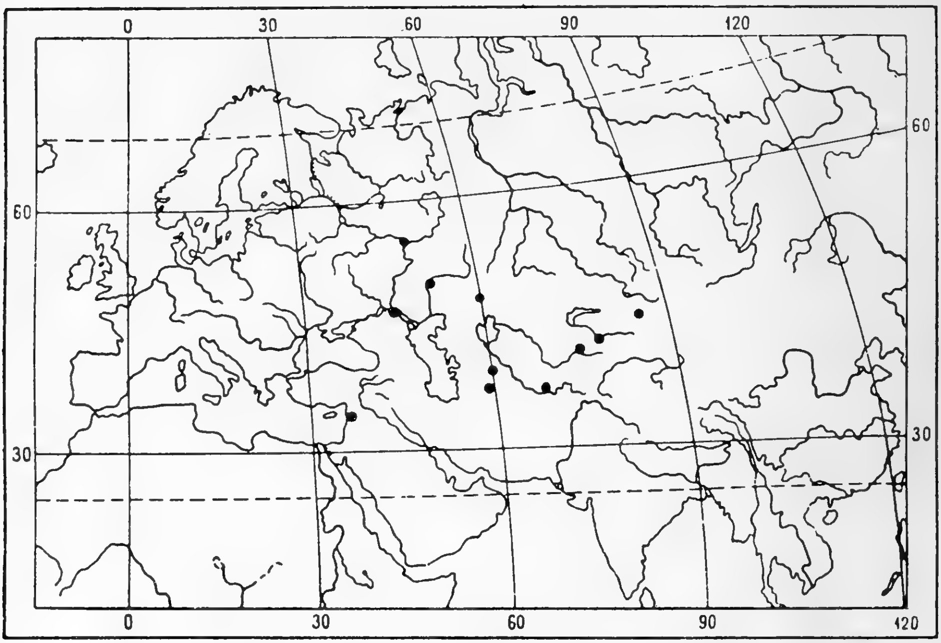


Figure 86. Distribution of *Pararhodobates syriacus* Led.

162 *Distribution.* The range of the genus includes the eastern part of the European part of the USSR, Kazakhstan, Central Asia, as well as Siberia and northwest China, but does not extend beyond the limits of the Palearctic (Figure 86).

Comparison. In general appearance, color and pattern of wings, and peculiarities of behavior, this genus is very similar to *Deuterotinea* Rbl. Structure of head and its appendages, type of venation, and genitalia attest to the affinity of this genus and Myrmecozelinae. The peculiarities of leg structure (absence of epiphyses), genitalia of male (short simple aedoeagus), and other features permit the inclusion of this genus in Rhodobatini Zag., and place it closer to *Pachyarthra* Ams. from the African Mediterranean region.

The genus under consideration includes one species, *Pararhodobates syriacus* Led.

1. **Pararhodobates syriacus** Led. (Figures 15, D; 26, A; 83–91; and Plate III, B).

Lederer, 1857: 120 (*Chimabacche* ?); Staudinger and Rebel, 1901; II, 240 (*Deuterotinea*); Petersen, 1958: 404–405.

External characters of imago. Pubescence of head on frons light yellowish to ash-colored, on vertex yellowish-gray with admixture of isolated cinnamon-colored scales. In labial palpi 2nd segment yellowish-cinnamon in basal half and whitish at end; 3rd segment very small and barely noticeable from above (Figure 83, A). First segment of antennae covered with cinnamon-gray and whitish scales and therefore appears mottled. Segments of flagellum cinnamon-gray with barely noticeable light-colored rings at end of each segment.

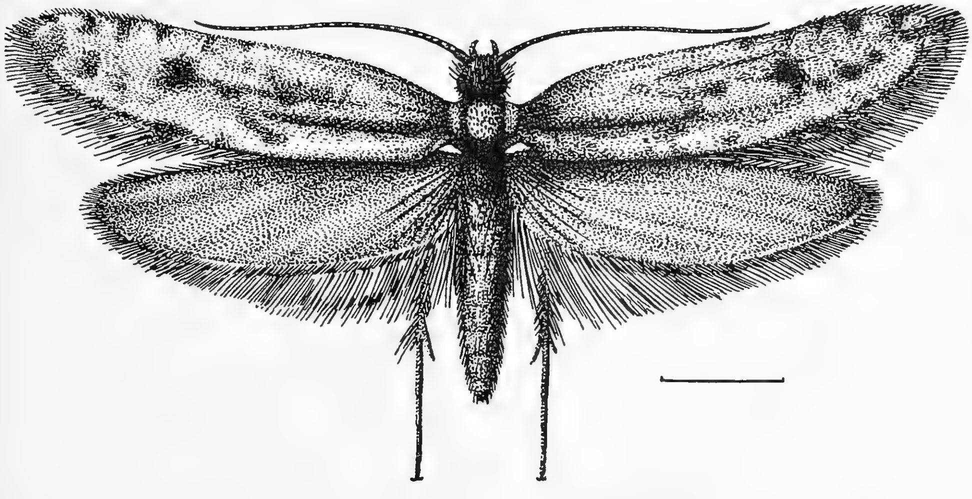
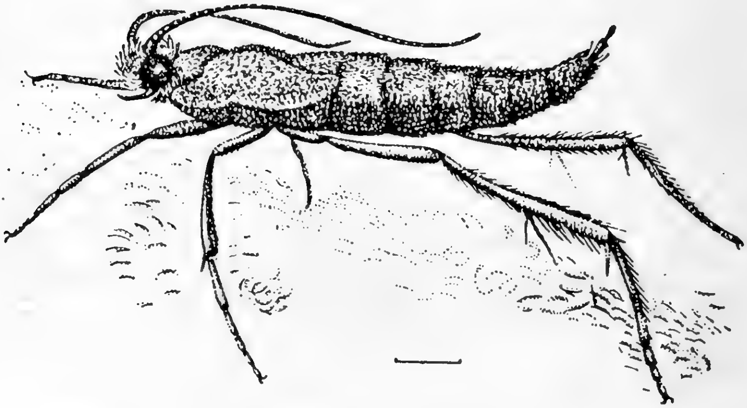


Figure 87. *Pararhodobates syriacus* Led., male (drawn by T.A. Temkina).

Description of thorax and tegulae and dimensions of wings in males given in description of genus. Span of forewings of males usually 17 to 20 mm and only in some specimens reaches 23 mm. In females, as indicated in diagnosis of the genus, wings are not developed. General appearance of female shown in Figure 88.

Forewings usually ash-gray, with brownish or dull chocolate-brown to blackish granulation. Pattern in form of diffused dark spots and streaks, more or less distinct (Figure 87). Largest diffused spot located 164 at the apex of radiocubital cell. Basal half of forewing with dark granulations; behind midpoint and up to apex four to five distinct streaks, which are almost equidistant from each other. Outer margin in front of fringe darker; three to four highly diffused spots occur closer to midpoint of wing. Moreover, a few such indistinct spots are discernible in middle of radiocubital cell. Fringe punctate, light gray with brownish granulations. Hind wings ash-gray with slight golden glaze; their fringe light ash-colored. Lower side of both pairs of wings ash-gray, but forewings darker. Fringe of forewings variegated, that of hind wings dark in basal half and musty-white in outer half.

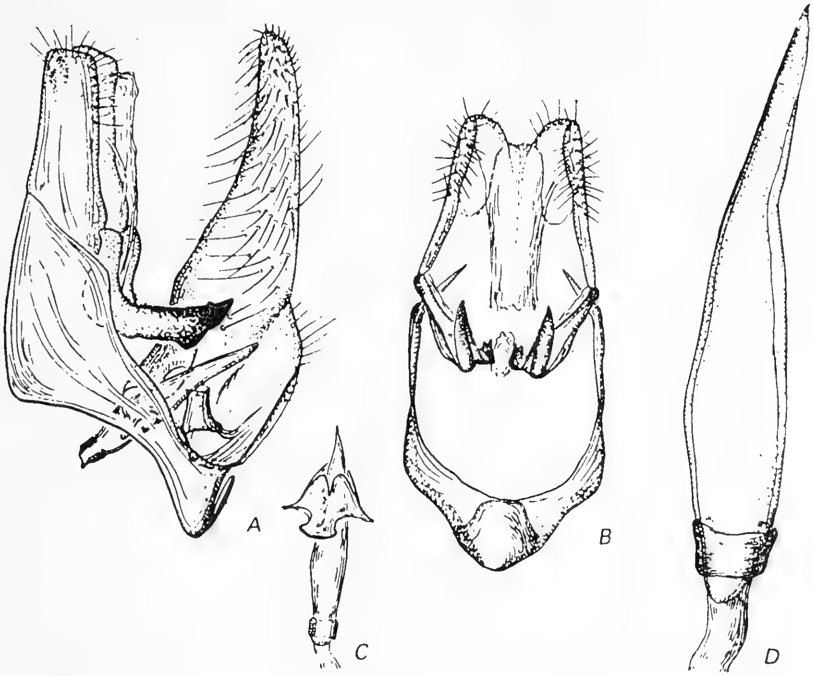


163 Figure 88. *Pararhodobates syriacus* Led., female (drawn by T.A. Temkina).

Fore- and middle legs ash-gray with dense chocolate-brown granulations; hind legs light ash-colored with similar light-colored dense pubescence of long piliform scales on upper and outer sides of tibiae. Ends of tibiae of fore- and middle leg as well as epiphyses of tarsal segments of all legs with light-colored rings. Last segment of tarsi usually somewhat darker than others. Tarsal claws large, long, and slender.

Abdomen musty-cinnamon-gray.

Male genitalia (Figure 89, A). Valvae digitate or wedge-shaped, with somewhat upcurved apex; length of valva four times width (before sacculus). Uncus along upper margin two-thirds length of tegumen; posterior and ventral margins of lobes of uncus covered with bristles. Branches of gnathos pointed, on outer side minutely serrated, and on inner side with process (Figure 89, B). Aedoeagus more than 2.5 length of saccus, in basal half broad, with pointed apex (Figure 89, C, D). Vallum of aedoeagus sclerotized and saddle-shaped. Saccus small, two-fifths length of tegumen.



163 Figure 89. Genitalia of male *Pararhodobates syriacus* Led.

A—genitalia (lateral view); B—same (ventral view); C—aedoeagus; D—same (higher magnification).

Preparation No. 10024, male.
Turkmenia , Ashkhabad.

Female genitalia (Figures 90 and 91). Lobes of vaginal plate conical, without bristles; additional apophyses well developed.

Comparison. Lederer (1857) described the species on the basis of a single male which was not fresh and in general appearance somewhat resembled *Chimabacche fagella* (Gelechiidae), and tentatively named his species *syriaca* Led., placing it in genus *Chimabacche.* Studies of several subsequent specialists endorsed the transfer of this species to genus *Deuterotinea* Rbl., where it continued to remain until just recently. Petersen (1958), on the basis of an examination of male geni-

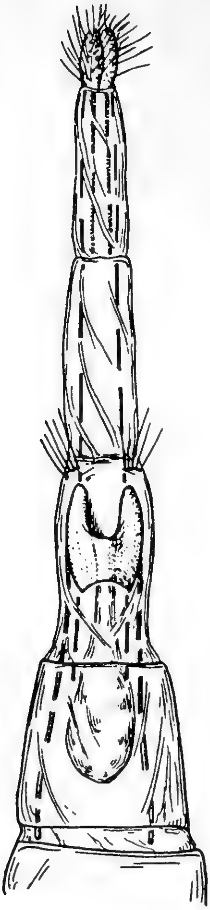


Figure 90. General appearance of female genitalia of *Pararhodobates syriacus* Led.

Preparation No. 10038, female.
Turkmenia, Ashkhabad.

talia, separated this species into a monotypic genus, *Pararhodobates* Pet.

I have examined a large number of specimens of this species, and on the basis of venation, structure of mouthparts, armature of legs, and a complex of genital characters endorse the separation of this species in the independent genus *Pararhodobates* Pet.

165 *Material examined*[11]. 36 males and 4 females.

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[11] General distribution given in description of genes.

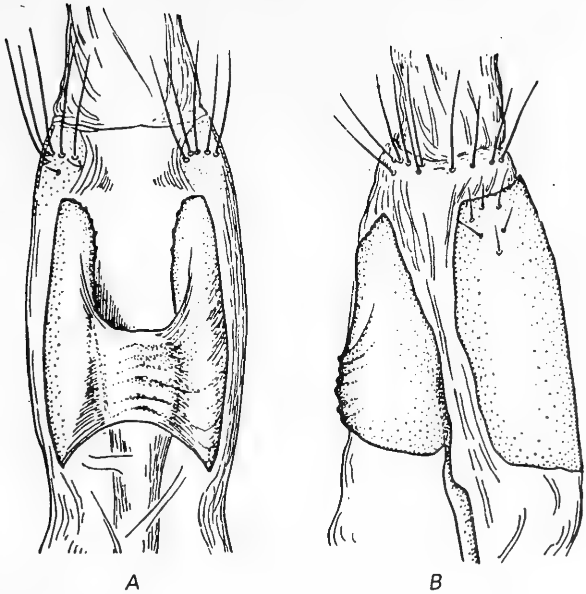


Figure 91. Region of vaginal plate of *Pararhodobates syriacus* Led.

A — ventral view; B — lateral view.

Preparation No. 10038, female.
Turkmenia, Ashkhabad.

European part of the USSR. Kazan, one male (Eversmann); Krasnoarmeisk (Sarepta), two males (collection of Ershov), one male (coll. Acad. Petrop.).

Kazakhstan. Ural'sk District, Ural'sk, one male and one female, April 24, 1918 (Borodin); former Trans-Caspian District, two males (Komarov); Aktyubin District, Temir, one male April 27, 1908 (Borodin); southern Kazakhstan, region of Ili River, Kopchegai, one male April 11, 1936; region of Karagata River, north of Merke, one male in October, 1932 (Chetyrkina).

Central Asia. Turkmenia, environs of Ashkhabad, six males January 28, 1966 (Zaitsev), five males and three females March 2–3, 1966, of which one female March 2, 1966 labeled allotype, gen. preparation No. 10038 (Zagulyaev). Tadzhikistan, Staraya Pristan (12 km south of Dzhilikul), five males February 16 and one female March 4, 1946 (Shchetkin); "Russian Turkestan," one male (Ershov).

Northwestern China. Kuldja (Tarjen), six males March 4–12, 1879 (Alferaki), of which one male from March 12 by N.N. Filip'ev identified as *Deuterotinea macropodella* Ersch.; Jar'su River, one male

March 12, 1879 (Alferaki).

Biology. Central Asian desert species. Moths emerge in early spring and late autum and fly low above the ground on clear days when soil heated by sun and air temperature reaches 10 to 15°C, although frost may occur at night. In western Kazakhstan (Ural'sk region) at the end of April, that is, at the time of emergence of moths from cocoons, snow is still present in low-lying places and ground vegetation visible only on higher areas.

Adult insects in most cases were collected in early spring: in northwest Kazakhstan at the end of April and in southern Kazakhstan at the beginning of April, and in Turkmenia in mid-February; in Kuldja region (northwest China) they were caught in mid-March. Collections of this species in late autumn are also known. For example, one male together with cocoon was found in southern Kazakhstan in October. Here in a submontane valley in loess with sandy loam soils covered with grasses, wormwood, and Koelpinia, tubular cocoons were found in large numbers.

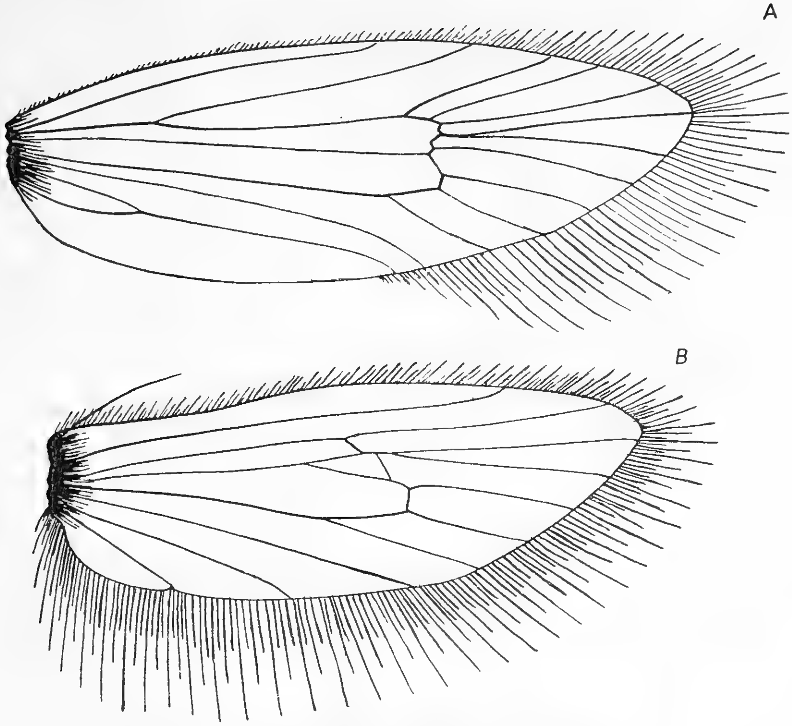
166 Larvae live near the soil surface among roots of grasses and wormwood in tubular branched silken galleries, which are compactly covered with very minute particles of loess. Often larvae continue their underground gallery above the soil surface in vertical protruding tubes up to 5.0 cm long and 5.0 to 7.0 cm in diameter. The outer side of these vertical tubes is compactly covered with sand particles (Figure 26, A). When feeding has finished, the larva pupates either in the vertical tube, its exuvium jutting out of the tube when the moth has emerged, or it constructs thicker walls in one of the branches of the gallery leading toward the surface and converts it into a long cocoon (20 mm × 4 mm). In such "sausage" cocoons covered with soil, larvae pupate and moths emerge 7 to 10 days later. The typical habitat of the moths is wormwood-grass-covered deserts (Plate III, B).

This species produces two generations per year and hence moths emerge in early spring during February–April and in autumn during October–November.

5. Genus *Rhodobates* Rag.

Ragonot, 1895: CIV; Staudinger and Rebel, 1901: II, 235; Petersen, 1958: 398-399; 1965a: 87–88; Zagulyaev, 1968a: 219; Căpuşe, 1968: 73 (Rhodobatinae); 1971: 231 (Rhodobatinae): Gozmàny and Vàri, 1973: 141–142; —*Paraplutella* Rebel, 1901: 163–164; type *P. algiricella* Rebel, 1901: 164 (Algerian); —*Tineodoxa* Amsel, 1955: 32; type *Myrmecozela tibulella* Rebel, 1963b: 100 (Sardinien).

Type species. Euplocamus laevigatellus H.-S., 1851, Figure 270.



167 Figure 92. Venation of wings of *Rhodobates laevigatellus* H.-S. A—forewing; B—hind wing.

Preparation No. 4672, female. Turkey.

Moths of fairly large dimensions, up to 28 mm, broad-winged, dark uniform coloration or weakly spotted, and large, long brush on labial palpi that protrudes forward and downward, not only distinguish these moths from most of members of the subfamily, but reflect an external similarity with species of other families such as Talaeporidae and Plutellidae.

Imago. Head usual in shape and covered with yellowish or cinnamon hairs with a large admixture of gray or brown. Galea light-colored, long and straight, may reach end of 2nd segment of labial palpi; pilifers small, with short pubesence. Maxillary palpi small, slender, grayish-yellow, five-segmented, and continue up to midpoint of 2nd segment of labial palpi (Figure 4, A). Labial palpi thick, shaggy, with protruding brush of long, cinnamon-colored scales originating from side and from lower side of 2nd segment; brush very long, directed forward and downward, and exceeds length of 2nd segment; 2nd segment very stout, twice longer than 1st and four times longer than terminal segment; 3rd segment small, slender, and usually covered by protruding scales of 2nd segment. Antennae with distinctly separate segments, moniliform, and equal to one-half to three-fourths length of wing; infundibular scales originate from base of each segment; antennae of males pubescent with ciliate setae. First antennal segment long, but narrow, four times longer than 2nd segment. First segment of flagellum cyathiform with length less than width; middle segments elongated, cylindrical, their length twice greater than width (Figure 99). Eyes small and wide-set so that frons broad, almost twice broader than longitudinal diameter of eye.

Thorax and tegulae yellowish-cinnamon, or cinnamon-gray, with brownish or grayish granulations. Wings may be present in males and females; wing span in males 15 to 28 mm, in females 18 to 28 mm. Forewings obtuse at apex; length 3.0 to 3.75 width. Hind wings oval, 167 with rounded apex; length 2.75 to 3.0 width. Fringe equal to half alar width.

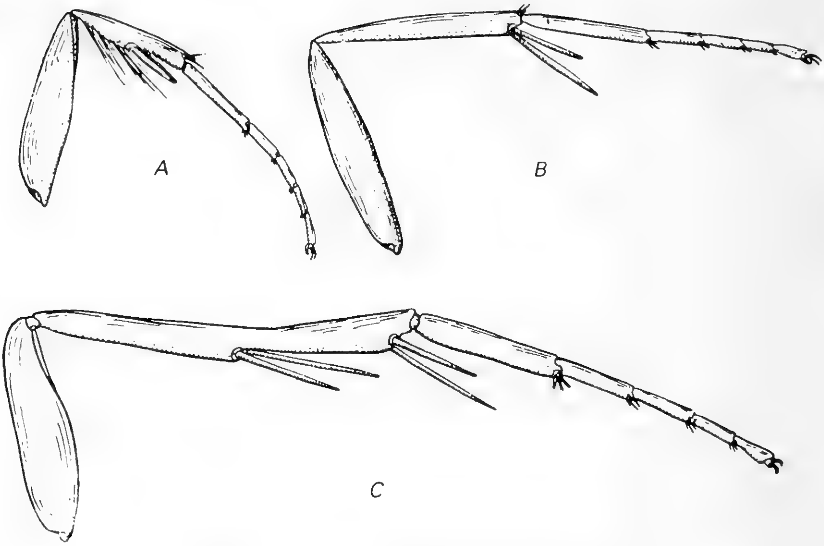


Figure 93. Legs of *Rhodobates laevigatellus* H.-S.

A — foreleg; B — middle leg; C — hind leg.

Preparation No. 11049, male. Turkey.

Forewings in most members dark, with cinnamon tones and brownish or grayish tinge; may be devoid of pattern or with small darker streaks. Hind wings and fringe same color as forewings but usually lighter.

In forewings (Figure 92, A) Sc terminates in middle or slightly beyond midpoint of anterior margin. All radial veins wide-set at base. R_5 terminates at alar apex or on anterior margin. Distance between bases of M_3 and Cu_1 one-fourth to one-fifth distance between Cu_1 and Cu_2. Distance between bases of Cu_1 and Cu_2 about 1.5 to 3.0 times greater than distance between R_2 and R_3. Fork of A_{2-3} at base almost twice smaller than common trunk [*sic*]. In hind wings (Figure 92, B) Sc not connected by cross-veins with radial trunk. R terminates on anterior margin before alar apex. M_1 and M_2 shortly stalked or separate. Distance between Cu_1 and Cu_2 more than length of medial cell. A_1 terminates on alar margin almost at level of origin of branch Cu_1 from cell.

Legs usual in structure. Anterior tibiae almost two-thirds length of femora and with short epiphyses (Figure 93, A). Middle tibiae slightly shorter than femora (Figure 93, B). Hind tibiae (Figure 93, C) more than 1.5 length of femora.

Anal segment of abdomen without tuft. Sternite of segment VIII in males in form of wedges directed toward each other (Figure 12, B).

168 *Male genitalia.* Valvae strong, with processes or folds (Figure 14, D). Valvae usually long, with more or less curved anterior margin (Figure 94), in many species with well-demarcated cucullus; lobe of ventral margin of valvae large and in some species converts into wedge-shaped or bolt-shaped sacculus. Uncus in lateral view in form of narrow or broad rectangle, with straight or rounded apex, or with falciform notch; viewed from lower side with two apices, with small notch in middle, and sclerotized lobes. Branches of gnathos fused; ends highly sclerotized and dentate. Aedoeagus (Figure 95) in form of slender, curved tube, shorter or longer than valvae; membranous apical part with sclerotized armature of spinules. Vinculum very narrow, which distinguishes members of this genus from members of other genera. Saccus short and end may be recurved.

Female genitalia. Similar in structure, narrow and long (Figure 96). 169 Vaginal plate entire, not divided into lobes, only its posterior margin with notch, which may vary in shape and in some cases reach midpoint of plate. Ostium bursa infundibular. Mildly sclerotized end of duct of bursa copulatrix more or less straight and covered with minute plates; such a sclerotization (lamellae) continues in some species in form of broader field on membrane situated in notch of vaginal plate. Duct of bursa copulatrix short and thus bursa located in segment VII. Bursa copulatrix a thin membranous sac without sclerotized structures or signa. Anterior apophyses usually do not reach beginning of segment VII and their base a tridactyl structure (Figure 101, C). Posterior apophyses do not reach vaginal plate. Ovipositor slender, long, 2.5 to 3.0

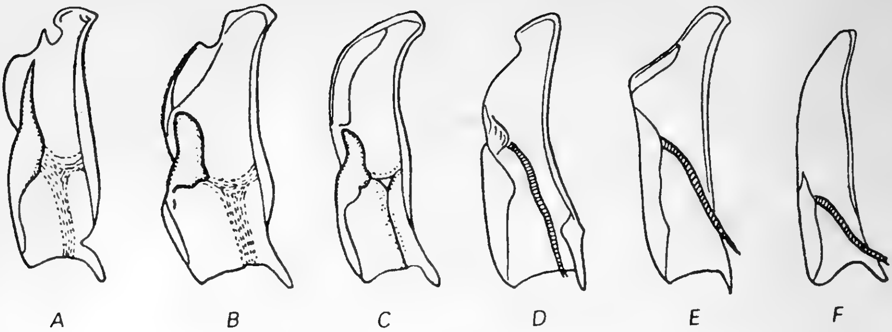


Figure 94. Valvae.

168 A—*Rhodobates laevigatellus* H.-S.; B—*R. pallipalpellus* Rbl.; C—*R. transjordanus* Ams., D—*R. nodicornellus* Rbl.; E—*R. unicolor* Stgr.; F—*R. algiricellus* Rbl. (from Petersen, 1965a).

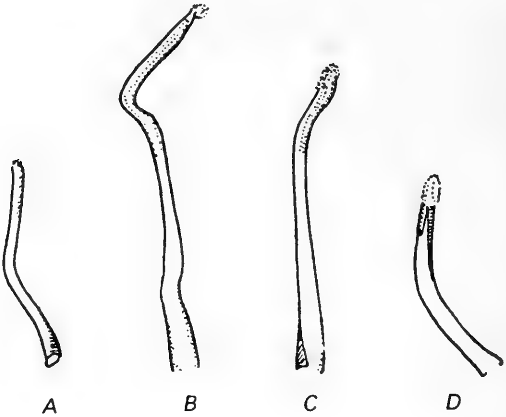


Figure 95. Aedoeagus.

A—*Rhodobates laevigatellus* H.-S.; B—*R. nodicornellus* Rbl.; C—*R. unicolor* Stgr.; D—*R. algiricellus* Rbl. (from Petersen, 1965a).

length of sternite VII; last segment of ovipositor pigmented and covered with very minute plates. Anal papillae small and with long bristles.

Biology. Meso-xerophilous species associated with steppe and semidesert habitats. Moths mostly collected during the day from February–July and in August–September. Habitat of larvae and feeding not known.

The species probably produces two generations per year.

Distribution. Area of distribution in the Palearctic includes the Caucasus and Trans-Caucasus, as well as islands of the Mediterranean

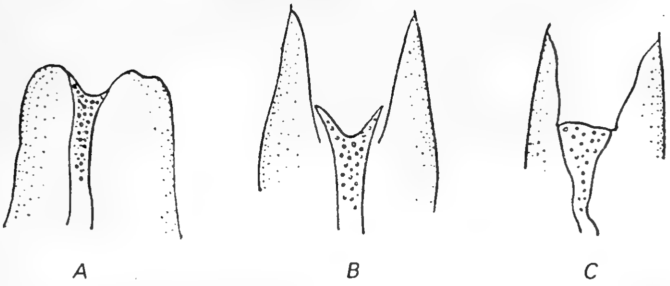


Figure 96. Area of lobes of vaginal plate and terminal of duct of bursa copulatrix.

A—*Rhodobates laevigatellus* H.-S.; B—*R. nodicornellus* Rbl.; C—*R. unicolor* Stgr.; D—*R. algiricellus* Rbl. (from Petersen, 1965a).

Sea, North African Coast, Asia Minor, and northwest Asia (Figure 97). In the Soviet Union one species known from Armenia—*R. laevigatellus* H.-S. In the non-Palearctic only two members of the genus have been found: one in equatorial Africa and the other one in South Africa. However, studies of the fauna of Ethiopia have only started and hence descriptions of new species can be expected.

170 Concentration of species in the eastern Mediterranean provides a basis for considering this region one of the centers of species formation of the Palearctic members of *Rhodobates* Rag.

Comparison. Members of this genus have been found among genera *Eriocottis* Zll., *Morophaga* H.-S., and *Pachyarthra* Ams. in collections; in literature species have been reported under seven genera of three families (Table 3).

Table 3. Taxonomic position of some species of genus *Rhodobates* Rag. in literature

	Erroneous position		
Present position	Tineidae	Talaeporidae	Plutellidae
R. laevigatellus H.-S.	*Euplocamus*		
R. pallipalpellus Rbl. (= *atactopis* Meyr.)		*Talaeporia*	
R. transjordanus Ams.			
R. nodicornellus Rbl.		*Eriocottis*	
R. unicolor Strg. (= *tibulella* Rbl.)	*Morophaga* *Myrmecozela*		
R. algiricellus Rbl. (= *mauretanicus* Pet.)			*Paraplutella*

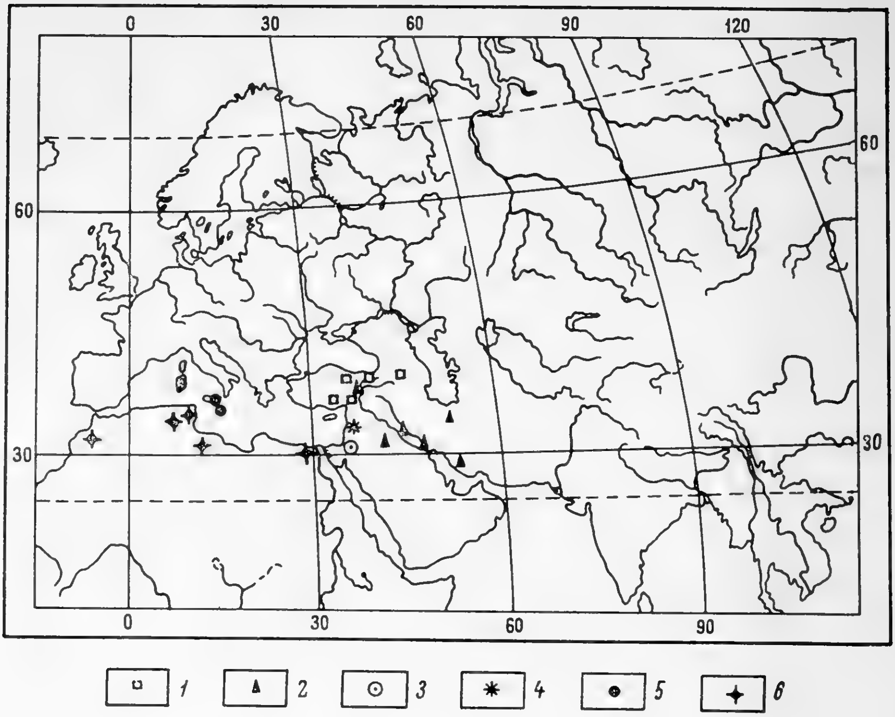


Figure 97. Distribution of species of *Rhodobates* Rag.

1 — *R. laevigatellus* H.-S.; 2 — *R. pallipalpellus* Rbl.; 3 — *R. transjordanus* Ams.; 4 — *R. nodicornellus* Rbl.; 5 — *R. unicolor* Stgr.; 6 — *R. algiricellus* Rbl.

171 Such variation in taxonomic assignment of species of genus *Rhodobates* is proof of the great external similarity between these species and members of taxonomically distant genera. Similarity is mainly reflected in two characters: long brush of labial palpi and median location of middle pair of spurs of hind tibiae.

Phylogenetically the genus is close to *Reisserita* Ag. and *Ceratuncus* Pet., which is indicated by the presence of epiphyses. The retention of several archaic characters — hind wings broader than forewings, valvae broad with lobate folds — permits one to consider *Rhodobates* Rag. an isolated branch which separated early from the common trunk (Figure 33).

The characters of genus *Rhodobates* Rag. and the peculiarities of its relations with other genera of the subfamily noted above, provide a basis for challenging the separation of this genus into an independent nominative subfamily, as done by Căpuşe, (1968, 1971).

At present six Palearctic species are included in the genus: *R. laevi-*

gatellus H.-S., *R. pallipalpellus* Rbl., *R. transjordanus* Ams., *R. nodicornellus* Rbl., *R. unicolor* Stgr., and *R. algiricellus* Rbl., as well as two African species: *R. emorsus* Gozm. from Tanzania (Tanganyika) and *R. paracosma* Meyr. (*Chliarostoma relecta* Meyr.) from the South African Republic (Transvaal) (Meyrick, 1908), which are not considered in the present work.

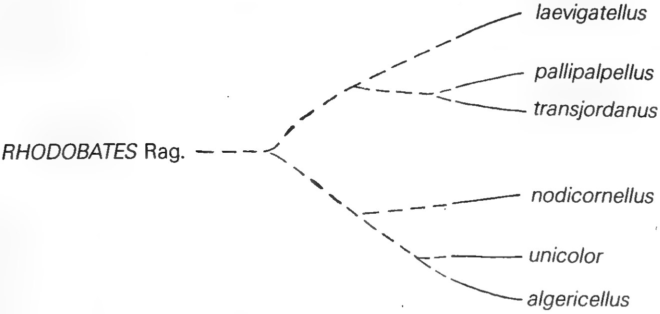


Figure 98. Phylogenetic relations between species of genus *Rhodobates* Rag.

The phylogenetic relations of the species in the genus are shown in Figure 98.

On the basis of wing venation (presence of common stem for R_4 and R_5 or M_1 in forewings, M_1 and M_2 in hind wings) as well as structure of male genitalia (development of forked cord of valvae), the Palearctic species of the genus are divided into two groups, also characterized by their distribution: one group occupies the western Mediterranean region, while the other has concentrated in the eastern Mediterranean region. The peculiarities of structure of the male genitalia, especially the sacculus of the valvae and aedoeagus, form the basis of interrelations between species in each group.

Key to Species of Genus Rhodobates Rag. on the Basis of External Characters[12]

1 (4). R_5 in forewings stalked with R_4 or M_1. In hind wings M_1 and M_2 either shortly stalked or separate.

172 2 (3). R_5 in forewings stalked with R_4. In hind wings M_1 and M_2 connate. .... 2. **R. pallipalpellus** Rbl.

3 (2). R_5 in forewings stalked with M_1. In hind wings M_1 and M_2 stalked .... 1. **R. laevigatellus** H.-S.

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[12] Live specimens of species *R. transjordanus* Ams., *R. nodicornellus* Rbl., and *R. unicolor* Stgr. are not known to me and hence not included in the key.

4 (1). R_5 in forewings far removed from base of R_4 and M_1. In hind wings M_1 and M_2 widely separated at base. .... 6. **R. algiricellus** Rbl.

Key to Species of Genus Rhodobates Rag. *on the Basis of Male Genitalia*

1 (6). Longitudinal cord in middle of valvae broad and bifurcate.

2 (3). Sacculus of valva long, unguiculate, almost reaches apex of valva.................................. 1. **R. laevigatellus** H.-S.

3 (2). Sacculus of valva short, wedge-shaped, and extends slightly beyond midpoint of valva.

4 (5). Cucullus of valva well developed; length of valva three times greater than width in narrow median part ...2. **R. pallipalpellus** Rbl.

5 (4). Cucullus of valva not developed; length of valva almost four times width in narrow median part.... 3. **R. transjordanus** Ams.

6 (1). Longitudinal cord in middle of valva narrow and entire (not bifurcate).

7 (8). Lower margin of valva before apex with sharp notch. .... 4. **R. nodicornellus** Rbl.

8 (7). Lower margin of valva without notch before apex, entire.

9 (10). Aedoeagus longer than valva; lower margin of valva obliquely truncated before apex, and lobe at base continues beyond midpoint of valva .... 5. **R. unicolor.** Stgr.

10 (9). Aedoeagus shorter than valva; lower margin of valva curves gently toward apex on terminal side, and lobe at base does not reach midpoint of valva .... 6. **R. algiricellus** Rbl.

Key to Species of Genus Rhodobates Rag. on the Basis of Female Genitalia[13]

1 (2). Posterior margin of vaginal plate with small notch, and margin of ostium bursa reaches only posterior margin of plate......... .... 1. **R. laevigatellus** H.-S.

2 (1). Posterior margin of vaginal plate with deep notch, and margin of ostium bursa extends into notch.

3 (4). Posterior margin of notch of vaginal plate rectangular; margin of ostium bursa straight .... 5. **R. unicolor** Stgr.

4 (3). Posterior margin of notch of vaginal plate wedge-shaped; margin of ostium brusa incised.

5 (6). Notch deep and continues beyond midpoint of vaginal plate; margin of ostium bursa unguiculate; end of duct of bursa copu-

[13] Females of *R. transjordanus* Ams. and *R. algiricellus* Rbl. are not known and hence not included in the key.

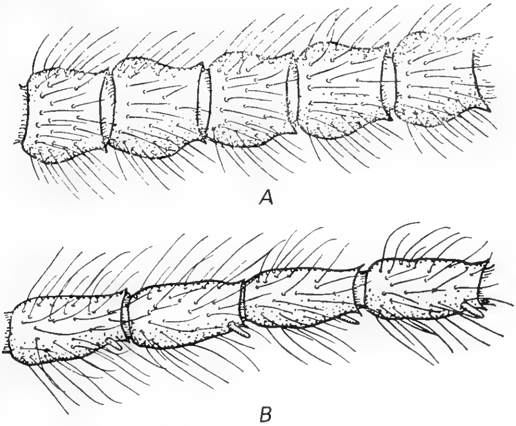
latrix sclerotized .... 2. **R. pallipalpellus** Rbl.

6 (5). Notch shallow and does not continue up to midpoint of vaginal plate; margin of ostium bursa indistinct; sclerotization at end of duct of bursa copulatrix continues farther onto membrane in notch of vaginal plate. .... 4. **R. nodicornellus** Rbl.

173 1. **Rhodobates laevigatellus** H-S. (Figures 4, A; 12, B; 14, D; 15, E; 16, F; 17, E; 92; 93; 94, A; 95, A; 96, A; 97-101; Plate VII, *3*)

Herrich-Schäffer, 1851, Fig. 270, Suppl. (*Euplocamus*); 1853–1855 (1854); V, 82 (*Euplocamus*); Mann, 1861: 186, Tab. 3, Fig. 2; Staudinger, 1880: 270 (*Euplocamus*); Ragonot, 1895: CIV (*Euplocamus*); Staudinger and Rebel, 1901: II, 235; Caradja, 1920: 167, 172; Osthelder, 1936: 89; Petersen, 1958: 399–400, Figs. 253, 254; 1965a: 88–89, Figs. 1, 7, 11; —*laevigatellus* var. *decolorellus* Caradja, 1920: 167.

External characters of imago. Pubescence of head chocolate-brown to brown. Structure of head and its appendage shown in Figure 4, A. 2nd segment of labial palpi densely pubescent with protruding scales; 3rd segment not raised from under cluster of scales of 2nd segment. Antennae of male light cinnamon, thin, and covered with short cilia; in female black-chocolate-brown, stout, and covered with protruding blackish scales, especially at middle segments of flagellum, so that antennae appear thickened in middle. Antennae equal to two-thirds length of forewings. Structure of segments shown in Figure 99.



173 Figure 99. Segments of antennae of male *Rhodobates laevigatellus* H.-S.

A—segments IV to VIII; B—middle segments.

Preparation No. 11049, male. Turkey.

Thorax and tegulae light or dark cinnamon. Wing span of male 19 to 21 mm, of female 19 mm. Length of forewing almost three times width; length of hind wings almost three times width but wing narrower than forewing; fringe of hind wing slightly more than half wing width.

Forewing (Figure VII, *3*) uniform in color, without pattern; in males light brown, in females blackish-brown. Posterior margins dark brown with light-colored fringe. Under surface of all wings cinnamon-gray.

In forewing (Figure 92, A) R_5 and M_1 with short stem. M_3 and Cu_1 widely separated at base. Distance between bases of Cu_1 and Cu_2 twice greater than distance between bases of R_2 and R_3. Terminus of A_1 located before level of origin of Cu_1 from cell. Radial cell not developed. In hind wing (Figure 92, B) *Sc* terminates on wing margin at three-fourth its length. Terminus of branch *R* located slightly farther away from wing apex than M_1. M_1 and M_2 with short stem. Distance between bases of M_3 and Cu_1 one-fourth to one-third distance between Cu_1 and Cu_2. A_2 terminates on wing margin before level of origin of Cu_2 from cell.

Structure of armature of leg shown in Figure 93. Pubescence of leg cinnamon-gray; weak light-colored rings occur at ends of tibiae and tarsal segments.

Abdomen and anal tuft ocherous-brown.

Male genitalia (Figure 100, A). Valvae (Figure 94, A) with straight anterior margin, their length 3.25 width at middle part; lower margin of valvae, before apex, with deep notch that separates flat apical cucullus;
174 lobes of lower margin of valvae narrow and convert into highly sclerotized, long, unguiculate sacculus, which terminates just short of apex of valvae; pedicel of valvae broad and either simple or slightly bifurcate; longitudinal cord of valvae slightly sclerotized and bifurcates before midpoint of valvae. Uncus in lateral view broad, with round apex (Figures 16, F and 100, B). Branches of gnathos on lateral side with row of spinules arranged on outer margin. Aedoeagus (Figure 95, A) shorter than valvae, arcuate beyond midpoint; membranous apical part of aedoeagus with minute spinules (Figure 17, E).

Female genitalia (Figures 96, A and 101). Vaginal plate with shallow notch along posterior margin in which infundibular terminal part of duct of bursa copulatrix accommodated. Ostium bursa, end of duct, and membrane behind vaginal plate covered with minute lamellae.

Comparison. Sexual dimorphism well developed, represented in darker coloration of forewings and shorter pubescence of antennae of females. *R. laevigatellus* is similar to *R. pallipalpellus* Rbl., but differs from it in venation: in forewing, R_5 and M_1 shortly stalked; M_3 and Cu_1 widely separated at base; M_3 terminates on alar apex. It is further readily distinguished by genitalia: in male, valvae with well-formed cucullus and

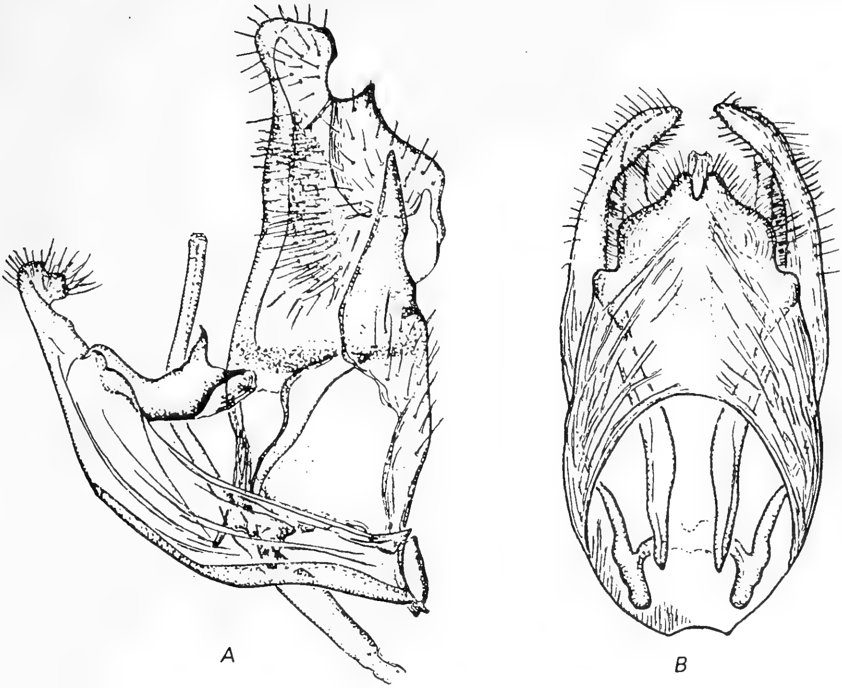


Figure 100. Genitalia of male *Rhodobates laevigatellus* H.-S.

A — general appearance (lateral view); B — same (dorsal view).

Preparation No. 4672, male. Turkey.

long unguiculate saccus. Aedoeagus shorter than valvae and arcuate beyond midpoint. Genitalia of female characterized by shallow notch in posterior margin of vaginal plate and by ostium bursa reaching posterior margin of plate.

Distribution. Caucasus, Armenia, Asia Minor (Figure 97). Literature reports the occurrence of this species in Turkey at Karaman and Maidan (Staudinger, 1880), in the region of Amasia (Herrich-Schäffer, 1853–1855), and Malatia and Marash (Caradja, 1920). Petersen (1965a) reports finds of this species in Armenia.

Material examined. 6 males and 1 female.

Turkey. Amasia, one male and one female in 1860 (collection of Wocke); Pontiac Mountains, three males (collection of Erchov and Alferaki); Konia, two males ("types" *Rhodobates laevigatellus* var. *decolorellus* Rbl., collection of Caradja, Bucharest, Museum of Natural History; gen. preparation Nos. 55, male and 56, female; det. A. Zagulajev).

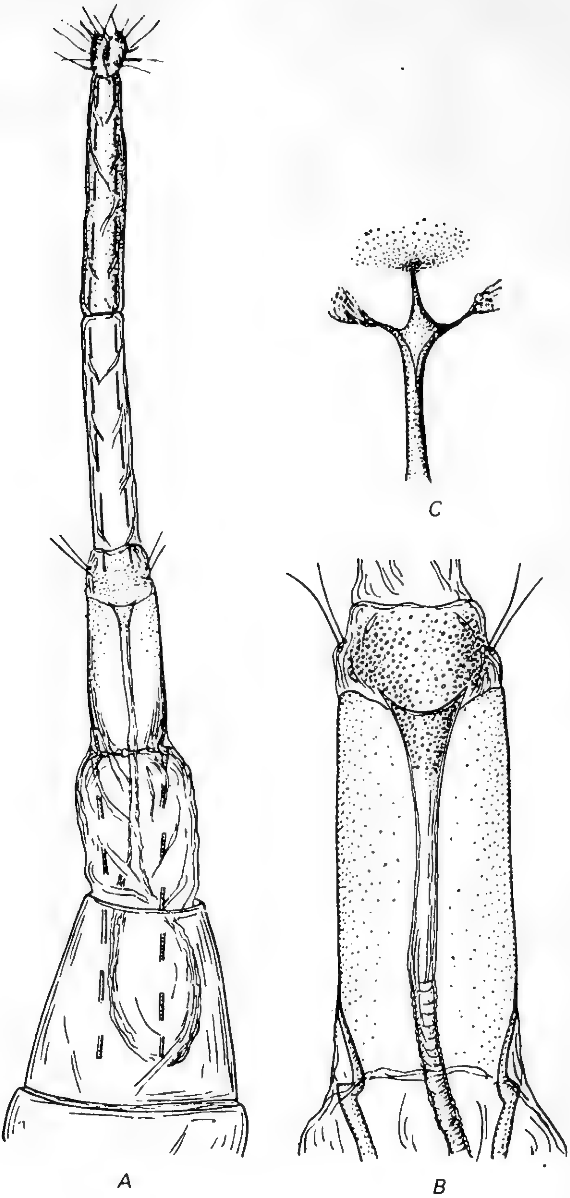


Figure 101. Genitalia of female *Rhodobates laevigatellus* H.-S.

A — general appearance; B — region of vaginal plate (ventral view); C — base of anterior apophysis (lateral view).

Preparation No. 4672, female. Turkey.

Biology. Species from Asia Minor live in open landscape and are associated with steppe vegetation.

In Turkey (Amasia region) moths emerge in May but only males were caught on May 4 flying low over grass; females usually hide under grass or sit on leaves and were collected in June (Staudinger, 1880). In the Pontiac Mountains moths were found in August (Petersen, 1958).

This species probably produces two generations per year, with the emergence of moths in May and August.

2. **Rhodobates pallipalpellus** Rbl. (Figures 94, B; 96, B; 97; 98; 102–104)

Rebel, 1901: 179–180; Staudinger and Rebel, 1901: II, 235; Eyer, 1924, pl. XXXI, Fig. 9; Petersen, 1958: 400–401, Fig. 255; Amsel, 1959b: 36–37; Petersen, 1964a: 114–115; 1965a: 89, Figs. 2, 7, 12; 1966: 24; —*atactopis* Meyrick, 1936: 56 (*Talaeporia*); Amsel, 1949: 324, pl. 10, Fig. 74; 1959a: 73.

External characters of imago. Pubescence of head yellowish to ash-colored or light brown with whitish tinge. Cluster of scales on 2nd segment of labial palpi dense; upper side of segment yellowish-ash-colored and lower side dark brown; scales mainly light brown with whitish tips; 176 3rd segment not visible because of scales. Antennae light brown in male, densely pubescent, with long ciliate setae, length of which more than width of segment. Antennae equal to two-thirds length of wing.

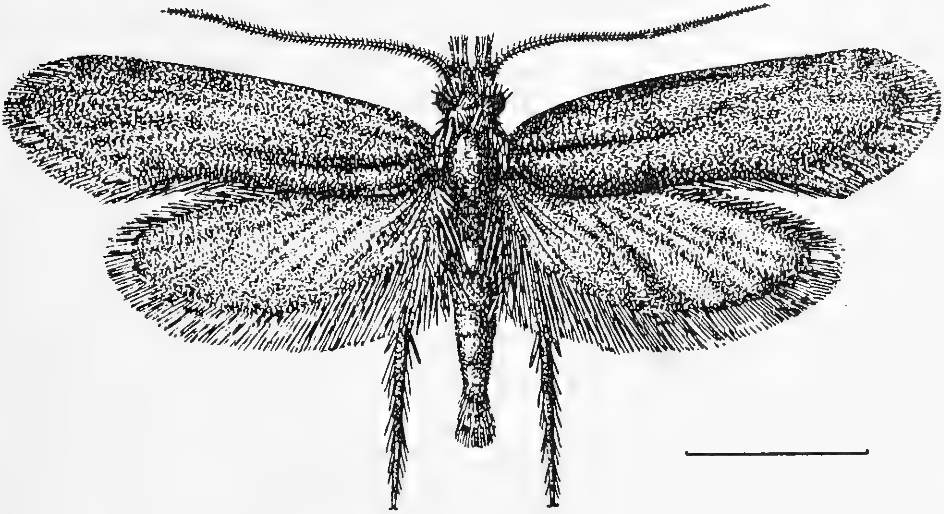
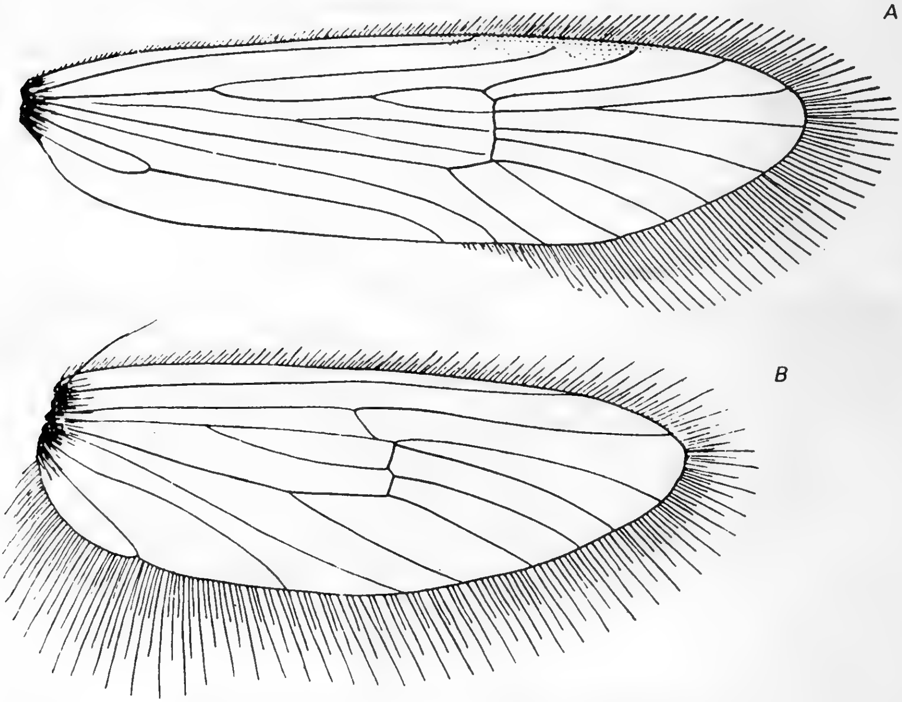


Figure 102. *Rhodobates pallipalpellus* Rbl. (drawn by T.A. Temkina).

Thorax and tegulae cinnamon-brown, terminus of scales of tegulae whitish. Span of forewings in male 23 to 28 mm, in female 23 mm; length of forewing 3.75 and of hind wing 2.75 width; hind wing broader than forewing, with broadly rounded apex; its fringe equal to half wing width.

Forewings matte, cinnamon-gray (Figure 102), with darker streaks along anterior margin and at apex of radiocubital cell; veins in outer region of wing and fold of inner margin covered with darker granulations. Fringe with lime-colored band in middle. Hind wings light chocolate-brown, slightly glossy; fringe near base light-colored and with dark stripe at base. Under surface of all wings ash-gray, forewings darker.

In forewing (Figure 103, A) R_4 and R_5 stalked. M_3 and Cu_1 connate. Distance between bases of Cu_1 and Cu_2 two to three times greater than distance between R_2 and R_3. Terminus of A_1 located at level of origin of Cu_1 from cell. Radial cell developed. In hind wing (Figure 103, B) Sc



177 Figure 103. Venation of wings of *Rhodobates pallipalpellus* Rbl.

A—forewing; B—hind wing.

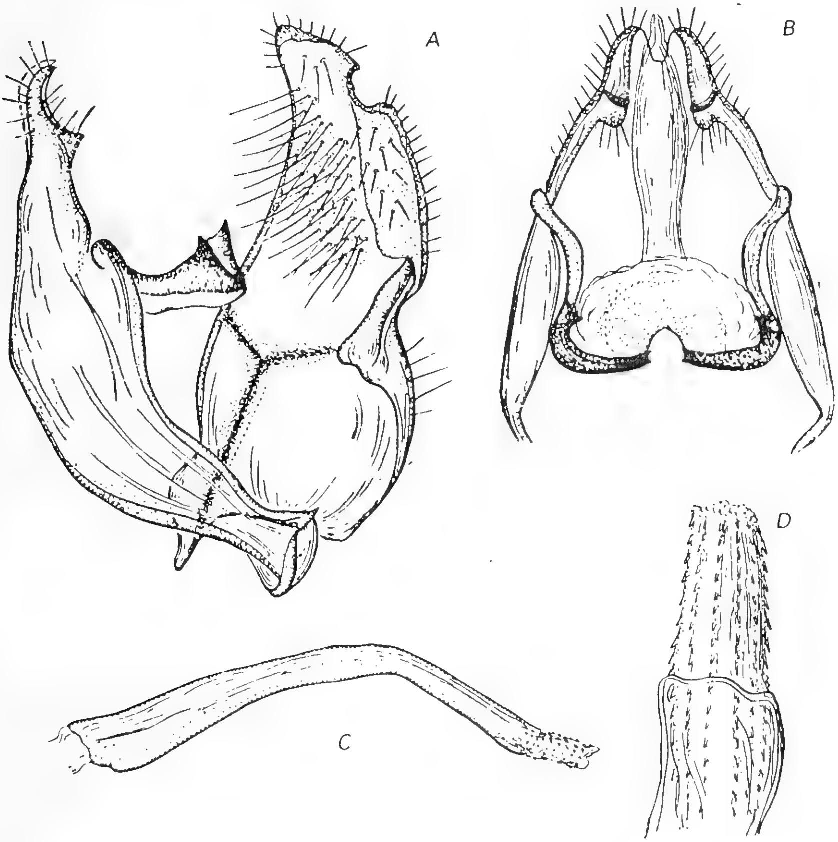
Preparation No. 11048, male. Northern Mesopotamia.

terminates on alar margin at four-fifths its length. Terminus of R 1.5 to 2.0 times closer to alar apex than terminus of M_1. M_1 and M_2 originate from common point. Distance between bases of M_3 and Cu_1 one-sixth to one-fourth distance between bases of Cu_1 and Cu_2. A_2 terminates on alar margin at level of origin of Cu_2 from cell.

Structure and armature of legs typical for genus. Fore- and middle legs cinnamon-gray, with light rings at ends of tibiae and tarsal segments. Pubescence of hind tibiae dirty brown.

Abdomen dark brown. Anal tuft brownish.

Male genitalia (Figure 104, A). Valvae with slightly curved anterior margin (Figure 94, B); length of valvae three times greater than width



178 Figure 104. Genitalia of male *Rhodobates pallipalpellus* Rbl.

A — general appearance (lateral view); B — uncus and gnathos (ventral view): C — aedoeagus; D — apex of aedoeagus (higher magnification).

Preparation No. 11048, male. Northern Mesopotamia.

177 in middle narrow part; lower margin of valvae with deep notch before apex, separating conical cucullus; lobe of lower margin of valvae narrow and converts into thick sacculus which extends beyond midpoint of valvae; pedicel of valvae simple, broad, and short; longitudinal cord highly sclerotized and bifurcates before midpoint of valvae. Uncus in lateral view narrow, falcate (Figure 104, B). Branches of gnathos in lateral view with two acute apices. Aedoeagus equal to or much longer than valvae, arcuate beyond midpoint. Membranous apical part of aedoeagus covered with spinules arranged in rows (Figure 104, C, D).

Female genitalia (Figure 96, B). Posterior margin of lobe of vaginal plate with deep notch which reaches midpoint of plate. Ostium bursa infundibular, with acute corners directed backward, and without straight posterior margin as seen in *R. unicolor* Strg. Wall of ostium bursa and terminal of duct of bursa copulatrix with incrustations.

Comparison. In contrast to closely related members of the genus, this species is characterized by more elongated, light-colored wings with speckles along the anterior margin. R_4 and R_5 stalked in the forewing; M_3 and Cu_1 connate; in the hind wing the terminus of R is closer to the alar apex than that of M_1. On the basis of genital structure the species is close to *R. laevigatellus* H.-S., but males readily distinguished by structure of the valvae: sacculus stout, wedge-shaped; aedoeagus almost equal to length of valvae. Females are characterized by structure of the anterior apophysis and ostium bursa, and are readily distinguished from known species by the deep notch in the posterior margin of the vaginal plate and infundibular ostium bursa.

178 *Distribution.* Asia Minor, southwestern Iran, and Iraq (Figure 97).

Literature reports these places as well: Turkey: Mardin (Rebel, 1901); Iran: Shadegan, Bushire region, Shapur (Petersen, 1964), Fars (Petersen, 1966); Iraq: Hai Omran (Amsel, 1959a), Amadia (Petersen, 1964a), Baghdad (Meyrick, 1936, as *Talaeporia atactopis* Meyr.; Ansel, 1949, as *Rhodobates atactopis* Meyr.).

Occurrence possible within the limits of the Soviet Union, primarily in Trans-Caucasus and southern part of Central Asia.

Material examined. 5 males.

Turkey. Mardin, one male (collection of the Institute of Zoology of the Academy of Sciences, USSR); two males (collection of Caradja, Bucharest).

Iraq. Mesopotamia, two males (Wocke, collection of the Institute of Zoology of the Academy of Sciences, USSR).

Biology. Xerophilous species associated with open habitats.

Moths were collected from February to June in stony semidesert among hard grassy vegetation. In Iran, Fars region, one male was collected April 29 at an altitude of 2,200 m (Petersen, 1966). In Iraq, Hai

Omran region, males fly from June 2 to 13 (Amsel, 1959a; *Rhodobates atactopis* Meyr.); in Shadegan, one male February 24–29 (Amsel, 179 1959a); in Baghdad, one male collected in March (Meyrick, 1936), while Amsel found a few moths on March 1, 18, and 22 and in Amadia region on May 28 (Amsel, 1949). In Bushira region, six males and one female were collected in February, and one male found in the environs of Shapua at an altitude of about 1,000 m on April 21 (Petersen, 1964a).

Two generations known per year.

3. **Rhodobates transjordanus** Ams. (Figures 94, C; 97; and 98)

Amsel, 1935c: 312, Tab. 15, Fig. 19; 1935b: 273; 1949; 324; Petersen, 1958: 401, Fig. 225; 1965a: 90, Figs. 3, 7.

External characters of imago. Pubescence of head light chocolate-brown. 2nd segment of labial palpi with dense cluster of brown scales; 3rd segment hidden under scales of 2nd segment. Antennae of male pubescent with short ciliate setae.

Thorax and tegulae light brown. Wing span of male 26 mm.

Forewings uniformly brown, granulated, with blackish scales forming reticulate pattern. Fold and anterior margin darker, blackish-brown. Posterior margin light brown, fringe with light-colored stripe at base. Lower side of wings light brown.

Male genitalia (Figure 94, C). Valvae narrow, with curved anterior margin; length of valvae four times width in middle narrow part; lower margin of valvae before apex with small notch so that cucullus slightly separated; lobe of lower margin of valvae narrow and converts into highly developed, thick, wedge-shaped sacculus, which extends slightly beyond midpoint of valvae. Pedicel of valvae straight and slender. Longitudinal cord of valvae sclerotized and bifurcates before midpoint of valvae.

Females. Not known.

Comparison. In general appearance close to *R. pallipalpellus* Rbl., but distinguished by vivid though light coloration. Species readily distinguished from former and other closely related members of the genus by structure of male genitalia: valvae with poorly defined cucullus and thick wedge-shaped sacculus. Longitudinal cord of valvae sclerotized and bifurcate.

No specimens examined by me.

Distribution. Northwest Asia: Jordan (Figure 97). To date known only from Jordan, environs of Amman (Amsel, 1935c).

Biology. Xerophilous species. Two males caught during day in environs of Amman on April 6–7 (Amsel, 1935c). Biology not studied.

4. **Rhodobates nodicornellus** Rbl. (Figures 94, D; 95, B; 97; 98; 105; and 106)

Rebel, 1911: 155–156 (*Eriocottis*); Osthelder, 1936: 90 (*Eriocottis*); Petersen, 1958: 401–402, Fig. 256; 1965a: 90, Figs. 4, 8, 14; 1968: 53.

External characters of imago. Pubescence of head cinnamon-gray. 2nd segment of labial palpi covered with relatively short brown cluster of scales; 3rd segment visible beyond scales of 2nd segment. Atennae of male covered with short cilia, in female smooth.

Thorax and tegulae brown. Span of forewings in male 19 mm, in female 18 to 22 mm. Wings broad; fringe of hind wings equal to half alar width.

180 Forewings dark brown; in male posterior margin yellowish before inner corner; in female wings with brown granulations, apices covered with almost black scales. These scales form small, upwardly directed clusters at one-fourth and one-half of posterior margin, as in typical species of *Hapsifera* Zll. Hind wings and their fringe dark cinnamon-gray.

Male genitalia (Figure 105). Valvae (Figure 94, D) with curved anterior margin. Length of valva four times width in median narrow part; lower margin of valvae before apex with sharp notch, so that cucullus well developed; lobes on lower margin of valvae extend to middle. Pedicel of valvae straight, slender, simple, not bifurcate; sacculus in form of small tubercle. Longitudinal cord of valvae highly sclerotized,

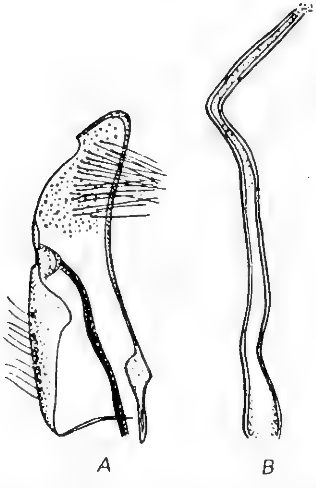


Figure 105. Genitalia of male *Rhodobates nodicornellus* Rbl. A—valva; B—aedoeagus (from Petersen, 1958).

not bifurcate. Aedoeagus 1.5 times longer than valva, bent at right angle in apical part (Figure 95, B). Membranous apical part with microscopic spinules.

Female genitalia (Figure 106). Vaginal plate with broad deep conical incision along posterior margin, extending to slightly short of midpoint of plate. Ostium bursa and terminus of duct of bursa copulatrix poorly pigmented and covered with minute lamellae, which continue in form of slightly broadened field on membrane in notch of vaginal plate.

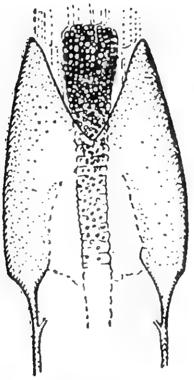
Comparison. This species in structure and distribution forms a connecting link between species living in Asia Minor and species in the Mediterranean region. Its inclusion by Rebel (1911) under genus *Eriocottis* Zll. attests to a certain similarity with other species of this genus. A study of the genitalia revealed the affinity between this species and genus *Rhodobates* Rag. *R. nodicornellus* is close to *R. unicolor* Stgr., but readily distinguished from it and other closely related species of the genus in structure of the genitalia: valvae in male with well-developed 181 cucullus and sacculus, lobes of lower margins of valvae reach its midpoint; aedoeagus 1.5 length of valvae, sharply bent before apex; posterior margin of vaginal plate in female with deep conical incision, which almost extends to middle of plate.

No specimens examined by me.

Distribution. Northwest Asia: Lebanon (Figure 97).

To date two males and three females are known from Beirut (Rebel, 1911; Petersen, 1965a, 1968).

Biology. Xerophilous species adapted to open landscape. Three



180 Figure 106. Region of vaginal plate and terminal of duct of bursa copulatrix of *Rhodobates nodicornellus* Rbl. (from Petersen, 1965a).

females were found by Kasy on dunes near Beirut on May 10–14, 1963 (Petersen, 1965a).

Mode of life and habitats not known.

5. **Rhodobates unicolor** Stgr. (Figures 94, E; 95, C; 96, C; 97; 98; 107; 108)

Staudinger, 1870: 287 (*Morophaga*); Staudinger and Rebel, 1901: II, 235 (*Morophaga*); Spuler, 1910: II, 457; Petersen, 1958: 402–403, Figs. 257, 258; Parenti, 1965: 313; Petersen, 1965a: 87–88, 91, Figs. 5, 9, 13; —*tibulella* Rebel, 1936b: 100 (*Myrmecozela*); Amsel, 1955: 32 (*Myrmecozela*).

External characters of imago. Pubescence of head cinnamon-gray. 2nd segment of labial palpi with large cinnamon-gray cluster of scales partially covering slender gray 3rd segment. Antennae cinnamon-gray, equal to three-fourths length of forewing and in male distinctly covered with short pubescence; in female smooth, without cilia.

Thorax and tegulae dark brown with oily glaze. Span of forewings in males 15 to 17 mm, in females 16 to 19 mm.

Forewings of male brownish-black, of female light brown; pattern in form of black dots on anterior and posterior margins of wing; dots particularly numerous on fold of first third of wing. Apex of radiocubital cell with black dot. Fringe dark with yellowish line at base and in middle. Hind wings blackish-gray, yellowish-chocolate-brown, lustrous, with yellowish line at base of fringe. Coloration of under surface of wing similar to that of upper surface but without pattern.

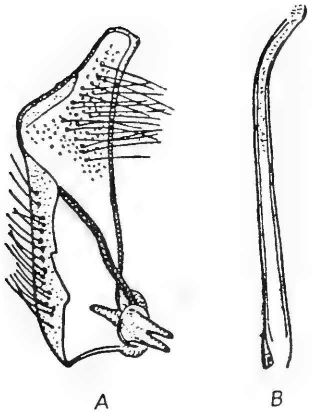
Legs light gray. Tibiae and tarsal segments granulated, black.

Abdomen light gray.

Male genitalia (Figure 107). Valvae (Figure 94, E) with almost parallel upper and lower margins; length four times greater than width of narrow middle part; lower margin of valvae in middle third curves sharply with poorly developed cucullus; lobe of lower margin of valvae long and extends beyond midpoint of valvae; pedicel of valvae bifurcate; sacculus not developed. Aedoeagus slightly longer than valvae and curves slightly in apical part (Figure 95, C).

Female genitalia (Figure 108). Vaginal plate along posterior margin with deep and almost rectangular notch, almost reaching midpoint of plate (Figure 96, C). Ostium bursae and terminus of duct of bursa copulatrix broad and infundibular. Membrane in notch of vaginal plate, ostium bursae, and terminus of duct covered with large lamellae.

Comparison. According to Rebel (1936b) *Myrmecozela tibulella* Rbl. is close in external appearance to *M. ochroplicella* Chrét., but



182 Figure 107. Genitalia of male *Rhodobates unicolor* Stgr.
A—valva; B—aedoeagus (from Petersen, 1958).

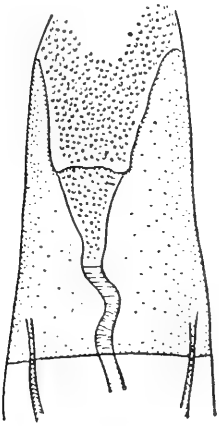


Figure 108. Region of vaginal plate of
Rhodobates unicolor Stgr. (from Petersen, 1958).

readily distinguished from it by long labial palpi. Even Amsel (1955) mentioned the separation of this species from the genus *Myrmecozela* Zll. However, on the basis of genitalia (uncus, aedoeagus, and ostium bursae), the species belongs to the genus *Rhodobates* Rag. and, as estab-
182 lished by Petersen (1958), *Myrmecozela tibulella* Rbl. is a synonym for *Rhodobates unicolor* Stgr. It is readily distinguished from other members of the genus by the structure of the genitalia: in male, valvae with parallel margins and poorly developed cucullus, pedicel of valvae

bifurcate, and aedoeagus small but longer than valvae. Vaginal plate in female genitalia with deep rectangular notch.

No specimens examined by me.

Distribution. Islands of the Mediterranean Sea (Figure 97).

In literature, indicated from Sardinia, north of village Ploaghe (Staudinger, 1870); Aritzo (Rebel, 1936b); Sicily (Barbaurra) (Amsel, 1955); Malta (B'kara) (Amsel, 1955; Petersen, 1965a).

Biology. Mediterranean species.

Moths were collected in August and September. On Sardinia, in the environs of the village Ploaghe, two males were found in a forest near an old oak tree (Staudinger, 1870) and one male caught between August 7 and September 10, 1934 (Rebel, 1936b, labeled *Myrmecozela tibulella* Rbl.) In Sicily, in the environs of Babaurra, one male was found on September 3, 1946, and on Malta Island on September 6, 1948 (Amsel, 1955, labeled *Myrmecozela tibulella* Rbl.).

6. **Rhodobates algiricellus** Rbl. (Figures 94, F; 95, D; 97; 98; 109; 110; Plate VI, *3*).

Rebel, 1901: 164 (Paraplutella); Petersen, 1965a: 91–92, Figs. 6, 10, genitalia of male; —*mauretanicus* Petersen, 1958: 403–404, Fig. 59, genitalia of male; Gozmàny, 1960: 115; Parenti, 1965: 313.

External characters of imago. Pubescence of head and labial palpi light brown. Scales at top of head bifurcate with base and terminus whitish, brown in middle. 2nd segment of labial palpi with cluster of dark brown scales; 3rd segment extends distinctly beyond brush of 2nd segment. Antennae of male covered with short cilia, which extends beyond midpoint of wing.

Thorax and tegulae cinnamon-gray.

183 Wing span of males 4 to 28 mm. Forewings long and narrow. Hind wings large and broad.

Color of forewings (Plate VI, *3*) light brown with large number of dark brown scales which form spots or often even streaks in fold, and extend almost to midpoint of wing. In addition to brown scales, wing also covered with whitish scales. Wing ornamentation slightly variable. Margin brownish-white. Fringe cinnamon-gray to whitish-yellow, with brown stripe near base. Hind wings light brown, lustrous, with darker scales near base. Fringe slightly lighter in color than wings. Under surface of forewings without pattern and brown; under surface of hind wings cinnamon-gray.

In forewings (Figure 109, A) R_4, R_5 and M_1 wide-set at base. M_3 and Cu_1 close-set at base. Distance between bases of Cu_1 and Cu_2 1.5 times distance between bases of R_2 and R_3. Terminus of A_1 located before

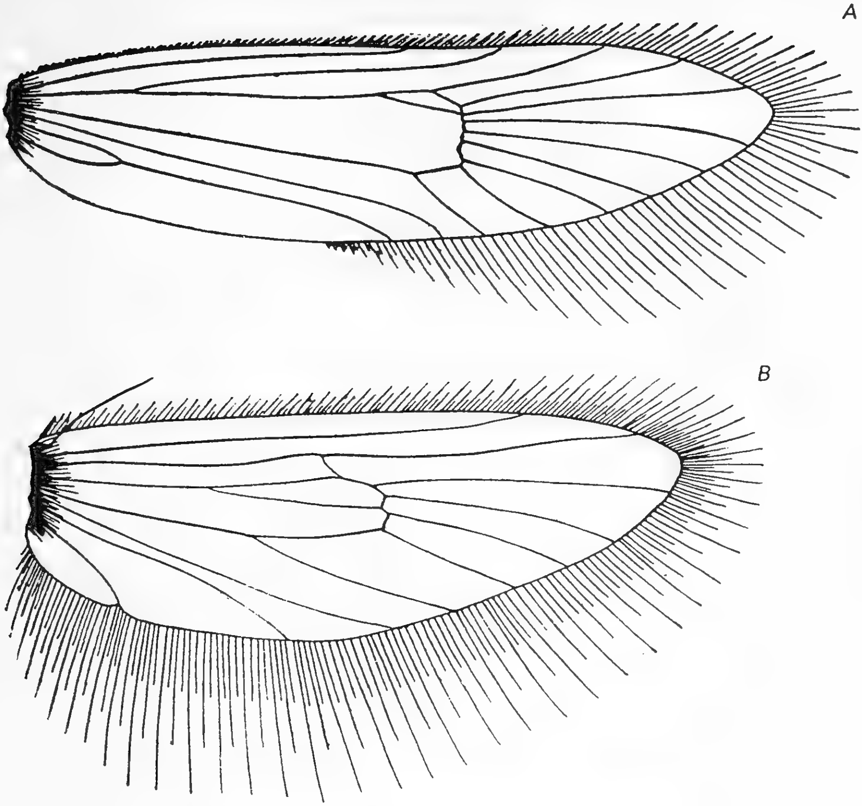


Figure 109. Venation of wings of *Rhodobates algiricellus* Rbl.

A—forewing, B—hind wing.

Preparation No. 4045, male. Spain.

level of origin of Cu_1 from cell. Medial cell not developed. In hind wings (Figure 109, B) *Sc* terminates on alar margin at three-fourths its length. Terminus of *R* almost twice distance from alar apex than M_1. M_1 and M_2 wide-set. Distance between bases of M_3 and Cu_1 one-eighth to one-sixth distance between Cu_1 and Cu_2. A_2 terminates on alar margin much beyond origin of branch of Cu_2 from cell.

184 Legs on outer side dark brown with whitish bands at ends of segments. Structure of legs same as in *R. laevigatellus* H.-S.

Abdomen cinnamon-gray, with lighter colored anal tuft.

Male genitalia (Figure 110, A). Valvae narrow (Figure 94, F); length 3.5 times greater than width, with gradually tapering elongated apex; cucullus not developed; lobes of lower margin of valvae small, do not reach middle of valvae; pedicel of valva entire, not bifurcate; sacculus not developed or if present, very small. Uncus with two pointed apices. Branches of gnathos with strong hook at end. Aedoeagus short, one-half to two-thirds length of valvae, slightly curved at basal half (Figures 95, D and 110, B). Membranous apical part of aedoeagus with sparse microscopic spinules.

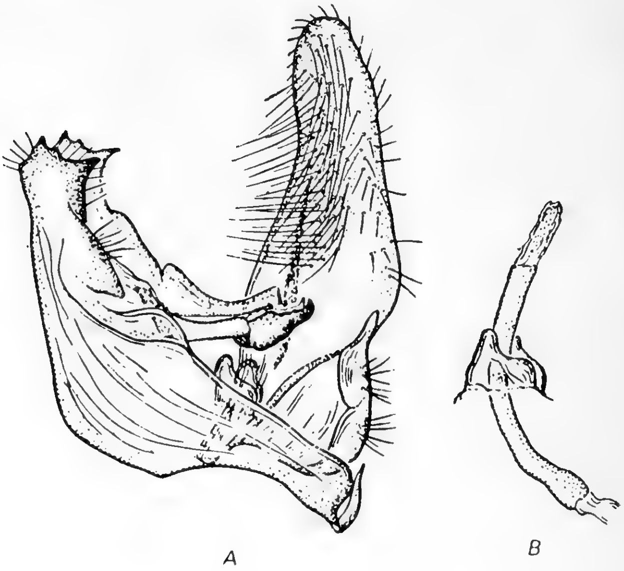


Figure 110. Genitalia of male *Rhodobates algiricellus* Rbl.
A—general appearance (lateral view); B—aedoeagus
Preparation No. 4045, male. Spain.

Female. Not known.

Comparison. Some specimens were found among a series of *Pachyarthra mediterranea* Bak., to which this species is superficially similar in color and wing pattern. On the basis of several morphological characters this species is close to *Rhodobates nodicornellus* Rbl. and *R. unicolor* Stgr., but differs from them and other known species in mottled coloration of forewings—dark with light-colored patches and streaks—as well as in venation of wings—in forewings base of R_5 wide-set from R_4 and M_1; in hind wings bases of M_1 and M_2 wide-set. Valvae in genitalia of male narrow, without cucullus and sacculus, and aedoeagus one-half to two-thirds length of valvae.

Distribution. Northern Africa (Figure 97).

In literature, reported from Algeria, Chellala (Rebel, 1901);

Morocco, region of Constantine, Tunisia, and Libya (Petersen, 1958; Parenti, 1965), as well as from Egypt (Gozmàny, 1960, labeled *Rhodobates mauretanicus* Pet.)

Material examined. 2 males.

Mauritania, one male in 1896 and one male in 1899 (Staudinger).

185 *Biology.* Xerophilous Mediterranean species.

Species adapted to open landscapes and associated with hard grassy vegetation.

In Libya in Jefren region three males were caught in February, 1935 (Gozmàny, 1960, labeled *R. mauretanicus* Pet.).

6. Genus *Ceratuncus* Pet.

Petersen, 1957a: 105: Căpuşe, 1964: 93 (Tineinae); Zagulyaev 1968a: 219; Căpuşe, 1968: 274–276 (Tineinae); 1971: 235 (Tineinae).

Type species. Myrmecozela danubiella Mann. 1866.

Light-colored wings without pattern and dense pubescence of antennae distinguish this genus from other members of the tribe.

Imago. Head normal in shape. Pubescence of head yellowish-brown or with brownish tone and ash-colored or orange to reddish tinge. Galea large, light yellow; when straight reaches 2nd segment of labial palpi. Pilifers small, covered with short bristles (Figure 111, A). Maxillary palpi five-segmented and do not reach apex of 2nd segment of labial palpi. Labial palpi lustrous on outer side and upper side, light-colored, musty white or yellowish; 2nd segment with protruding sparse bristles on all sides, forming a crown at end of segment; 3rd segment short and very slender. Antennae equal to two-thirds length of forewing; clusters of bright musty white scales present at base of each segment of flagellum on anterior and dorsal sides. They are also densely pubescent with long cilia (Figure 111, B); pubescence in female short. 1st segment of flagellum three times longer than 2nd and with bristles; segments of flagellum oblong, glabrous. Eyes small, convex; width of frons slightly larger than vertical diameter of eye.

Thorax and tegulae yellowish or brown with gray, ocherous, or brownish tinge. Wings developed in males and females; wing span of males 15 to 21 mm, of females 14 to 19 mm. Length of forewing 3.66 to 4.0 times and that of hind wing 3.0 to 3.33 greater than width. Fringe of hind wing equal to two-thirds to five-sixths width of wing.

Forewings yellowish-ocher to yellowish-brown, in some insects with grayish or brownish granulations, and without distinct pattern; fringe slightly ligher in color than basic color of wing. Hind wings yellowish-
186 gray or light cinnamon-gray; fringe more light gray or yellowish to ash-colored. Under surface of all wings cinnamon-gray to yellowish-ash.

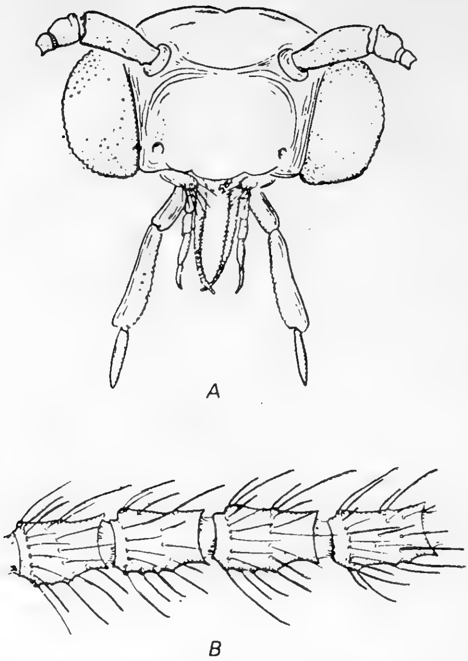


Figure 111. Head of *Ceratuncus dzhungaricus* Zag.

A—general appearance; B—middle segments of antenna (higher magnification).

Preparation No. 11116, male. Dzhungarian Alatau.

In forewing (Figures 7, A and 112) *Sc* terminates at midpoint of anterior margin. All branches of radial veins originate from radiocubital cell independently. R_5 terminates on anterior margin 1.5 to 2.0 times closer to alar apex than M_1. Space between base of M_3 and Cu_1 broad, but only half distance between Cu_1 and Cu_2. Distance between bases of Cu_1 and Cu_2 varies in species and may have more or less distance between R_2 and R_3. Fork of A_{2-3} one-half to four-fifths of common fused trunk. In hind wing (Figures 8, A and 112, B) *Sc* without connecting cross-vein with radial trunk. M_1 terminates on anterior margin of wing before its apex. All three medial veins wide-set at base. Distance between Cu_1 and Cu_2 less than length of medial cell. A_1 terminates on posterior margin of wing before level of origin of branch of Cu_1 from radiocubital cell.

Legs usual in structure. Tibiae of forelegs almost half (4/7) of femur; epiphyses originate from midpoints of tibiae and extend slightly beyond ends of tibiae (Figure 113, A). Middle tibiae slightly larger or

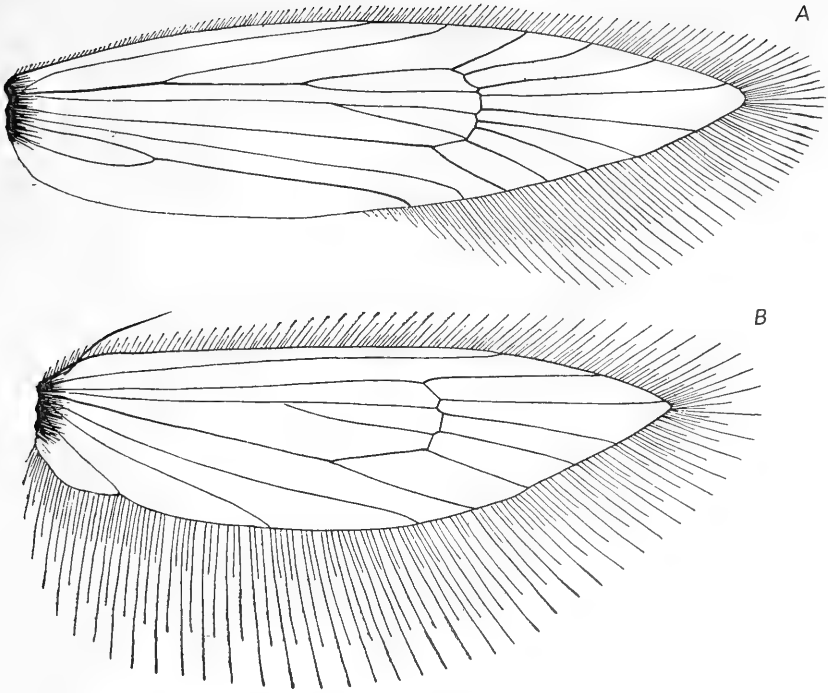


Figure 112. Venation of wings of *Ceratuncus danubiellus* Mn.

A—forewing; B—hind wing.

Preparation No. 11055, male. Caucasus, Tbilisi.

shorter than femora (Figures 10, B and 113, B). Hind tibiae 1.66 times larger than femora (Figure 11, B and 113, C).

Anal segment of abdomen with tuft and cluster of scales. Sternite of segment VIII in males usual in structure.

Male genitalia (Figure 116) compact and fairly uniform in structure. 187 Valvae with gradually tapering apex (without separate cucullus) and broad lobe in basal half of ventral margin, without process and sclerotized structures; both sides of valvae covered with sparse short bristles. Sacculus of valvae not developed. Uncus in lateral view appears broad with highly protruding pointed lower margin and two long pointed and unguiculate branches in most species; examined from lower side, lobes distinctly widely separated and extend backward in form of acute cords, which bifurcate at end in several species (Figure 16, B). Branches of gnathos free and in lateral view narrow, long, and directed forward and downward; examined from below, broad at base with elongated narrow ends. Aedoeagus straight, short or long, tubular, and without sclero-

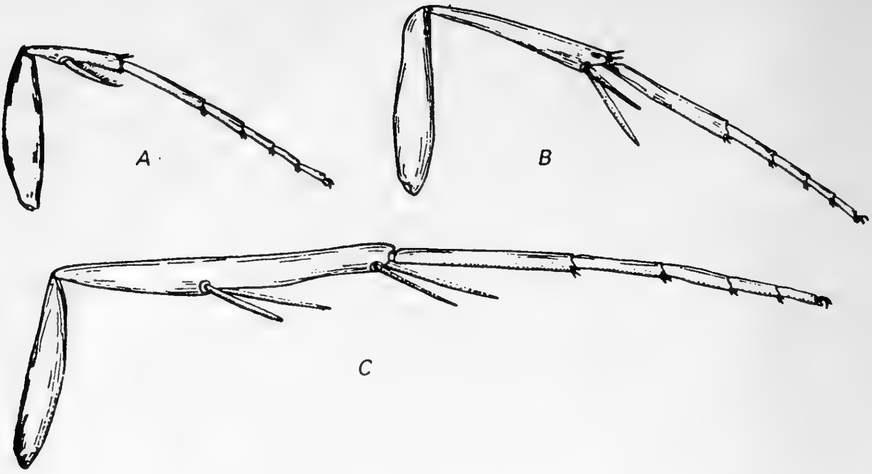


Figure 113. Legs of *Ceratuncus danubiellus* Mn.
A—foreleg; B—middle leg, C—hind leg.
Preparation No. 11055, male. Caucasus, Tbilisi.

tized structures; membranous apical part without spinules. Saccus long, slender, narrow (Figure 117). Differs from other genera in presence of pocket-shaped sclerotized structure (subscaphium) located under anal tube, which opens dorsally.

Female genitalia (Figure 118). Uniform. Vaginal plate divided into two long narrow lobes with pointed, pigmented apices; length of lobes three to five times greater than width of middle part. Ostium bursae narrow, with sclerotized margins. End of duct of bursa copulatrix rectangular, slightly pigmented; duct itself short and membranous. Bursa copulatrix located at end of segment VII and with two groups of signa: 4 to 11 strong signa in form of broad plates with tooth in middle arranged in form of crown before entry into pouch, and a larger number (8 to 16) of minute spinescent signa located at base of bursa. Anterior apophysis reach basal third of segment VII; posterior apophysis do not extend this far. Ovipositor long, 1.5 times longer than sternite VII. Last segment of ovipositor without incrustation. Anal papillae fairly large, with short, strong bristles.

Biology. Life history of most species not studied. These are steppe, semidesert species adapted to living in xerophytic conditions. Moths found in spring from April to May and in autumn during September–October. Moths found in montane regions of Caucasus, Algeria, and Lebanon at a height of 2,000 m in June.

188 Habitat of larvae and food not known. It can be assumed that lar-

vae construct silken galleries in litter and feed on residue of plant and, possibly, animal origin.

Distribution. Genus *Ceratuncus* Pet. contains only five species, and it is not reliably known beyond the limits of the Palearctic. Range of the genus lies in the ancient Mediterranean territory and covers the southern area of the European part of the USSR, Caucasus, Trans-Caucasus, and eastern Kazakhstan, as well as the east European and west African Mediterranean, Asia Minor, and Northwest Asia (Figures 28 and 114). In the Soviet Union three species are found: *C. danubiellus* Mn. and *C. affinitellus* Rbl. in the southern area of the European part of the USSR and Caucasus, and *C. dzhungaricus* Zag. in Caucasus and Dzhungarian Alatau.

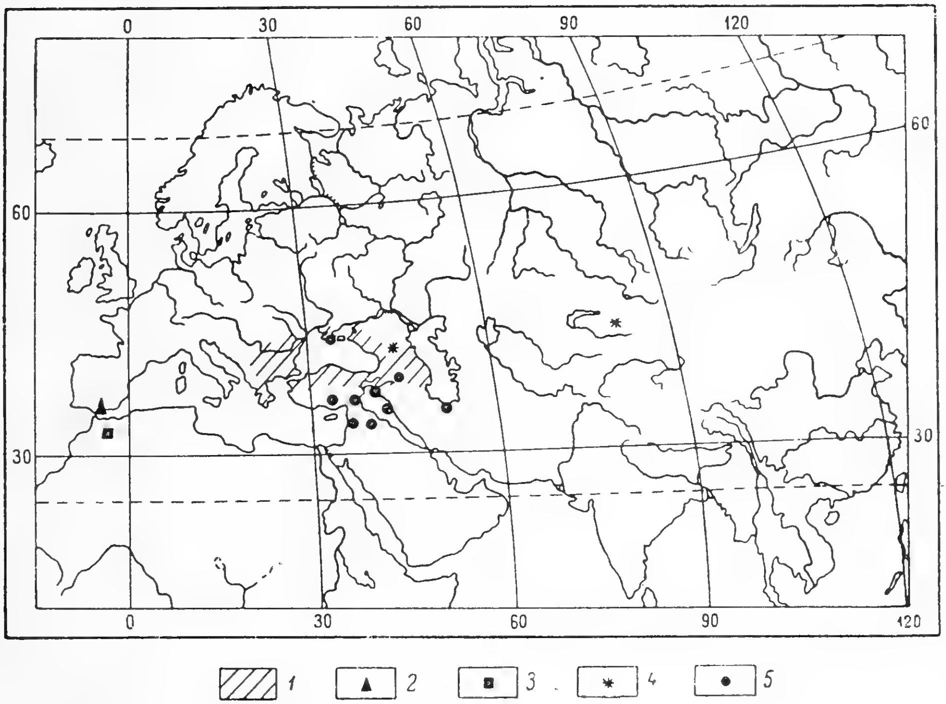


Figure 114. Distribution of species of *Ceratuncus* Pet.

1—*C. danubiellus* Mn.; 2—*C. andalusicus* Zag.; 3—*C. maroccanellus* Ams.; 4—*C. dzhungaricus* Zag.; 5—*C. affinitellus* Rbl.

Analysis of the material listed above provides a basis for considering the western and eastern Mediterranean the main centers of species formation.

Comparison. Petersen (1957a) in his description of this genus indicates that it combines a fairly monolithic group of species, which include some characters developed in Tineinae, e.g., this genus on the basis of characters of the male genitalia is quite close to *Fermacelina* Hrtg.

After studying four members of this genus of the five known to date, I only partially agree with the remarks of Petersen. The complex of characters typical of *Ceratuncus* Pet., such as pubescence of antennae and labial palpi, venation of wings, armature of legs, and peculiari- 189 ties of structure of male genitalia, attest to the undeniable affinity of these species to tribe Rhodobatini Zag., and a phylogenetic proximity with *Reisserita* Ag. On the basis of these considerations I cannot agree with the separation of genus *Ceratuncus* Pet. by Căpuşe, (1968, 1971) into an independent tribe of subfamily Tineinae. The relation between *Ceratuncus* Pet. and *Reisserita* Ag. is indicated not only by the peculiarities of venation and type of structure of male genitalia (long saccus and straight aedoeagus), but also by the similarity in life history. *Ceratuncus* differs from *Reisserita* and other genera of the tribe, however, in the following peculiarities: In the hind wing M_1 and M_2 separate uncus lobes in male genitalia very narrow, lobes of vaginal plate in female genitalia well-developed, and copulatory pouch with signa.

This genus represents a fairly compact group of closely related species; their relationships are depicted in Figure 115. In totality of characters, especially structure of the male genitalia, *C. danubiellus* Mn. is close to *C. andalusicus* Zag., while *C. maroccanellus* Ams., on the basis of presence of dorsal tubercle of uncus, is close to *C. affinitellus* Rbl. *C. dzhungaricus* Zag. exhibits structural features pointing to its origin from a common ancestor of *C. maroccanellus* Ams. and *C. affinitellus* Rbl., and the well-developed saccus and aedoeagus indicate its affinity to *C. maroccanellus* Ams.

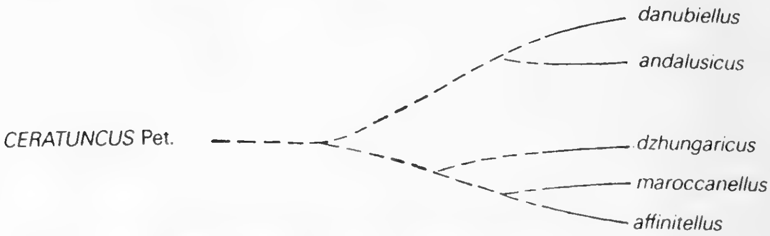


Figure 115. Phylogenetic relations of species of genus *Ceratuncus* Pet.

I have included five species under the genus *Ceratuncus* Pet.: *C. danubiellus* Mn., *C. andalusicus* Zag., *C. maroccanellus* Ams., *C. dzhungaricus* Zag. and *C. affinitellus* Rbl.

Key to Species of Genus Ceratuncus Pet. on the Basis of External Characters

1 (4). Forewings straw-yellow to yellow-ocher and lustrous.

2 (3). Pubescence of head yellowish to brownish. Thorax and tegulae yellowish to ocher .... 1. C. **danubiellus** Mn.

3 (2). Pubescence of head straw-yellow. Thorax and tegulae straw-yellow. .... 3. C. **maroccanellus** Ams.

4 (1). Forewings yellowish-gray and matte, yellow to chocolate-brown with gray granulations.

5 (6). In forewing, common stem of A_{2-3} terminates on alar margin much before level of origin of Cu_2 from cell; in hind wing distance between bases of R and M_1 slightly less than distance between Cu_1 and Cu_2; base of M_3 closer to M_2 than to Cu_2 .... 4. C. **dzhungaricus** Zag.

190 6 (5). In forewing, common stem of A_{2-3} terminates on alar margin almost at level of origin of Cu_2 from cell; in hind wing, distance between bases of R and M_1 one-fifth to one-third distance between Cu_1 and Cu_2; base of M_3 at equal distance from bases of M_2 and Cu_1.

7 (8). In hind wing, M_1 terminates almost at alar apex.............. .... 2. C. **andalusicus** Zag.

8 (7). In hind wing, terminus of M_1 two to three times closer to alar apex than to M_2. .... 5. C. **affinitellus** Rbl.

Key to Species of Genus Ceratuncus Pet. on the Basis of Male Genitalia[14]

1 (4). Aedoeagus 1.5 to 2.0 length of valva; saccus 1.5 to 2.0 length of vinculum.

2 (3). Apex of aedoeagus bifurcate; lobes of uncus in dorsal view without tooth near apex and reach tegumen. .. 4. C. **dzhungaricus** Zag.

3 (2). Apex of aedoeagus simple; lobes of uncus in dorsal view with tooth near apex and do not reach tegumen .... 4. C. **maroccanellus** Ams.

4 (1). Aedoeagus equal to or slightly longer than valvae; saccus slightly (over one-fourth to one-sixth) longer than vinculum.

5 (8). Lobes of uncus bifurcate at apex, without tubercle at base.

6 (7). Saccus one-fourth longer than vinculum and equal in length to tegumen; in ventral view slender or barely broadens at end......

[14] Of the five Palearctic species, females are known only in two—*C. danubiellus* Mn. and *C. affinitellus* Rbl. Hence a key based on female genitalia is not possible.

.... 1. **C. danubiellus** Mn.

7 (6). Saccus equal in length to vinculum and three-fourths to four-fifths length of tegumen; in ventral view wedge-shaped and broaden at end. .... 2. **C. andalusicus** Zag.

8 (5). Lobes of uncus entire at apex, with large broad tubercle at base. .... 5. **C. affinitellus** Rbl.

1. **Ceratuncus danubiellus** Mn. (Figures 1; 11, B; 20, E–F; 112–118; Plate VII, *1*)

Mann, 1866: 349–350; Stainton, 1867: 58, 61 (*Tinea*); Ershov and Fil'd 1870: 180 (*Myrmecozela*); Caradja, 1899: 198 (*Myrmecozela*); Radde, 1899: 440 (*Myrmecozela*); Caradja, 1901: 144 (*Myrmecozela*); Rebel, 1901: 185 (*Myrmecozela*); Staudinger and Rebel, 1901: II, 241 (*Myrmecozela*); Rebel, 1903: 343 (*Myrmecozela*); Spuler, 1910: II, 463 (*Myrmecozela*); Caradja, 1920: 172 (*Myrmecozela*); Petersen, 1957a: 105–106; 1961b: 531; 1962: 208; Căpușe, 1964: 93; 1968: 276–278.

External characters of imago. Pubescence of head dark brownish, lightly colored on occiput (Figure 1). Labial palpi on outer side and upper side yellowish-whitish; tuft of bristles on 2nd segment of palpi brown, located at end of segment, and very long, longer than 3rd segment of labial palpi. Pubescence of antennae in male long, greater than length of segments, and 1.5 to 2.0 width; basal segment of antennae toward front and upper side cinnamon-gray, on lower side whitish.

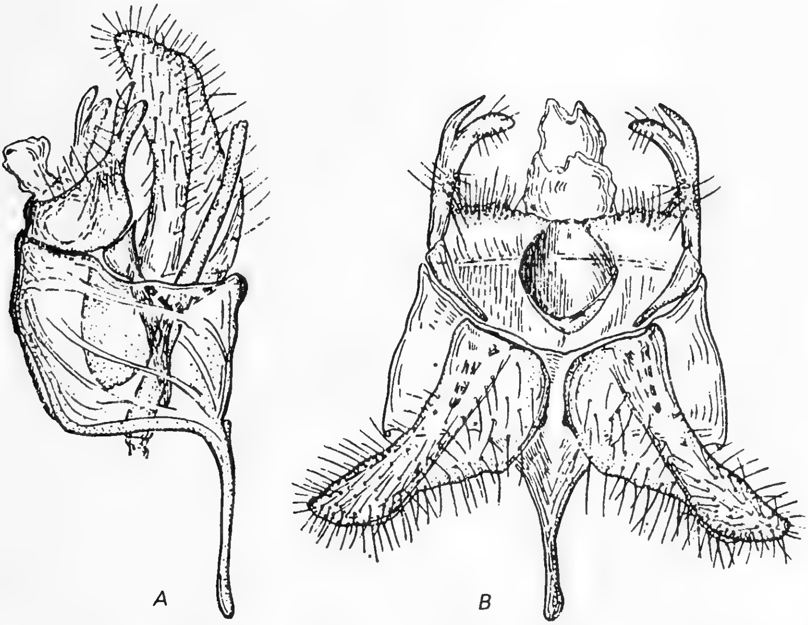
Thorax and tegulae toward front yellowish to ocher; apex of tegulae yellowish. Span of forewings in males 17 mm, in females 14 to 19 mm. Length of forewing 3.5 width.

191 Forewings (Plate VII, *1*) bright yellowish-ocher with dark anterior margin near base and rusty granulations; fringe lighter in color. Hind wings cinnamon-gray with yellow marginal line and bronze hue; fringe distinctly lighter than wings, yellowish, gray near inner margin. Lower side of forewings cinnamon-gray to yellowish-chocolate, with violet sheen, and lighter colored fringe. Under surface of hind wings cinnamon- or ash-gray, with yellowish fringe; both pairs of wings lustrous.

In forewing (Figure 112, A) distance between bases of R_2 and R_3 very small, one-half to two-thirds distance between bases R_3 and R_4. R_1 terminates on alar margin before level of origin of R_2 from cell. Distance between bases of Cu_1 and Cu_2 two to three times more than distance between bases of R_2 and R_3. Common trunk of A_{2-3} terminates on alar margin before level of origin of branch of Cu_2 from cell. In hind wing (Figure 112, B) alar apex acute and terminus of M_1 seven to eight times closer to it than terminus of M_2. Bases of M_1 and M_2 widely separated and distance between them slightly less than distance between M_2 and M_3.

192 Fore- and middle legs on outer side cinnamon-gray, on inner side silvery-gray; ends of tibiae and tarsal segments with light-colored belts. Hind legs yellowish-gray. All legs lustrous. Structure of legs as shown in Figure 113.

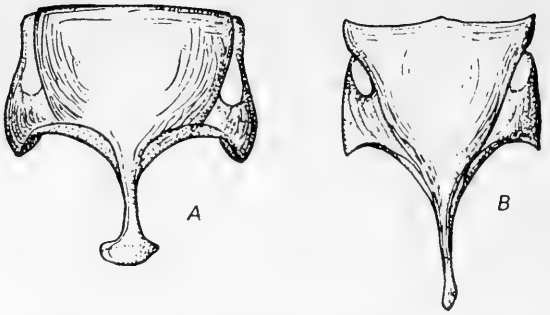
Male genitalia (Figures 116, A and 117). Valvae in lateral view with concave anterior margin and pointed apex; length three times greater than width of broadest part. Lobes of uncus bifurcate at apex; lower half of fork broad with rounded apex, upper half more slender and pointed. Branches of gnathos very wide-set at base, taper abruptly toward apex, and directed toward vinculum (Figure 116, B). Aedoeagus approximately equal in length to saccus and vinculum taken together, and slightly (over one-sixth) longer than valvae; apex of aedoeagus slightly sclerotized. Saccus in lateral view one-fourth longer than vinculum and equal in length to tegumen; viewed from lower side, narrow, slender, sometimes with dilatation at end (Figure 117); distance between end of saccus and vinculum one-fourth to one-fifth greater than length of vinculum.



191 Figure 116. Genitalia of male *Ceratuncus danubiellus* Mn.

A — general appearance (lateral view); B — same (ventral view).

Preparation No. 11055, male. Caucasus, Tbilisi.



191 Figure 117. Variability in shape of saccus and vinculum of *Ceratuncus danubiellus* Mn.

A—preparation No. 4029, male; B—preparation No. 11055, male.

Caucasus, Tbilisi

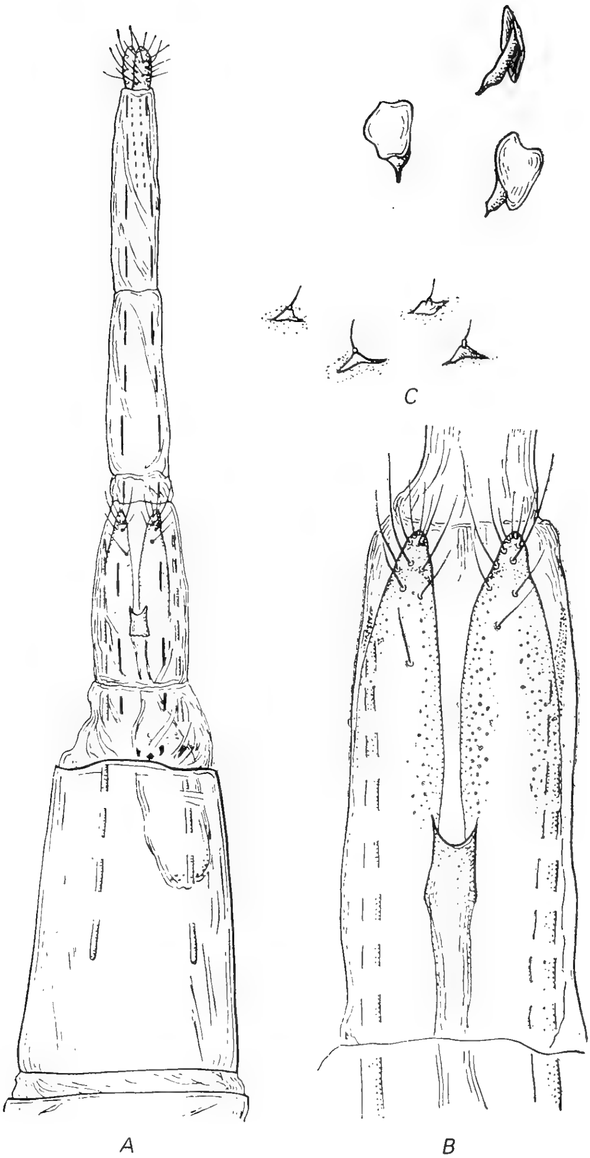
Female genitalia (Figure 118). Length of lobes of vaginal plate three times greater than width of central part of lobes; apical part of lobes with seven to eight long bristles, four of which located in pigmented field. Basal half of bursa copulatrix located in segment VII; 7 to 11 large signa located in posterior third of bursa; 8 to 13 minute signa present at base of bursa (Figures 20, E–F and 118, A). Number of signa probably varies. Thus Petersen (1957a) indicated the presence of
193 four large signa and eight small signa. Structure of signa given in Figure 118, C.

Comparison. In general appearance similar to *C. maroccanellus* Ams., but distinguished by bright yellowish-ocher forewings as well as venation: distance between bases of R_2 and R_3 one-half to two-thirds distance between bases of R_3 and R_4; distance between bases of Cu_1 and Cu_2 two to three times more than between R_2 and R_3; in hind wing bases of M_1 and M_2 widely separated. On the basis of genital structure, close to *C. andalusicus* Zag., but distinguished by longer saccus, which is one-fourth longer than vinculum and equal in length to tegumen; on lower side saccus narrow, slender, sometimes widening at end. Lobes of vaginal plate in female genitalia three times greater in length than width in middle part. Readily distinguished by shape and structure of signa.

Distribution. Southwestern regions of the Europan part of the USSR, Crimea, Caucasus, and Trans-Caucasus, as well as Rumania, Yugoslavia, Greece, Turkey, and Iran (Figure 114).

In literature, indicated from Trans-Caucasus (Mann, 1866; Ershov and Fil'd, 1870), Rumania (Caradja, 1899), Yugoslavia, Dalmatia (Rebel, 1903), and Turkey (Caradja, 1920).

Material examined. 115 males and 3 females.



192 Figure 118. Genitalia of female *Ceratuncus danubiellus* Mn.

A—general appearance; B—lobes of vaginal plate (higher magnification); C—signa of bursa copulatrix (higher magnification).

Preparation No. 11055, female. Caucasus, Tbilisi.

European part of the USSR. Southeastern Ukraine, Donets District, reserve forests, Khomupobskaya steppe, one male May 24, 1960, on light; sanctuary, Kamennye mogily, one male June 3, 1968, on light (Gershenzon); Lugansk, one male May 20, 1927 (Lekhosherstov).

Crimea. Sevastopol', 13 males April 28 to May 15, and one male and one female July 7 to 24, 1905-1908 (Pliginskiy); Karadag, one male April 25, 1930 and three females May 26 to 31, 1931 (A. D'yakonov); one male April 29, 1962 and one male June 17, 1963 (Ermolenko); Bakhchi Sarai region, Scolkovichnoe Village, three males May 2 to 8, 1962 (Ermolenko); old Crimea, two males May 16, 1913 (S. Chetverikov).

Caucasus. One male, "Grunfeld", one male May 11, 1926 (I. Kozhanchikov); Stavropol' territory, Grushelika, one male May 13, 1921 (collection of N. Filip'ev); Dagestan, Maksachkala, one male June 15, 1945 (Ryabov); Derbent, six males May 14 to September 5 and one female September 23, 1928 (Ryabov); St. Belidzhe, one male April 24, 1926 (Ryabov); Kumtorkale, one male May 6 and one male May 8, 1926 (Ryabov).

Georgia. Tbilisi, one male May 18, 1873 (collection of Ershov); one male on May 18, 1873 (collection of Ershov as *Tinea chrysopterella* Stgr.); one male April 13, 1879 (Christoph); Manglisei, one male, 1873 (Christoph); Lagodekhi, two males April 11, 1891 (Mloksevich); two males April 27, six males May 3 to 5, and two males May 14, 1880 (Mlokosevich); Vashlovanskii sanctuary, eight males April 30, 1970 (Zagulyaev); Eldari, three males May 2, 1970 (Zagulyaev).

Armenia. Dilizhan region, Tarsachai River, one male May 30, 1955 (Zagulyaev); Ijivana region, Agdan Verin village, one male May 22, 1955 (Zagulyaev): Kotaiskii region, Gekhard village, one male May 19, 1955, at light (Zagulyaev); Erevan, zoo, one male May 13, 1955, at light (Zagulyaev); Rubas, two males May 12, 1886 (Christoph).

Azerbaidzhan. Alazani, one male May 6, 1892; Gauja ? (Grundfeld); one male May 11, 1928 (I. Kozhanchikov); Nakhichevan ASSR, Chananab, nine males June 28, 1955, on light (Zagulyaev); Ordubald, one male April 30 and two males May 3, 1888 (Christoph); 16 males April 20 to 23, 1955 (Zagulyaev); Nyus-Nyus village, three males April 25, 1955 (Zagulyaev); Aza village (left bank of Araks River), five males May 2, 1955 (Zagulyaev); Abrakunis village, near Ilan-Ludag, three males May 4, 1955 (Zagulyaev); Negram village, left bank of Araks River, one male May 6, 1955 (Zagulyaev).

Rumania. Tulcha, two males and one female, 1865 (collection of Staudinger and Wocke), and two males 1866 (Wocke); Dobrudzha, one male (collection of Ershov).

Turkey. One male (collection of Ershov); Kazikoparan, two males

June 18, 1888 (Christoph).

Iran. Tebriz (Tavriz), two males April 6, 1914 (Andeevskii).

Biology. Southern mesophilous species living in steppes and semidesert regions, usually near reservoirs.

Moths emerge from April to July and in September. They are active in morning and evening hours, especially at sunset. Agitated moths fly several dozen meters and then alight on grass. Females are less mobile, usually more quiescent, and males can be seen hovering around them. In Caucasus and Trans-Caucasus I found this species at 1,000 to 2,000 m. In Greece (Peloponnesus) one male was found at an elevation of 750 m (Peterson, 1962).

194 Larvae live in soil between roots, especially in the turf of grasses, where they construct silken galleries. They feed on dead parts of plants. Before pupation they construct cocoons of compactly arranged sand particles.

This species produces two generations per year.

2. **Ceratuncus andalusicus** Zag. (Figures 7, A; 8, A; 10, B; 114; 115; 119; 120)

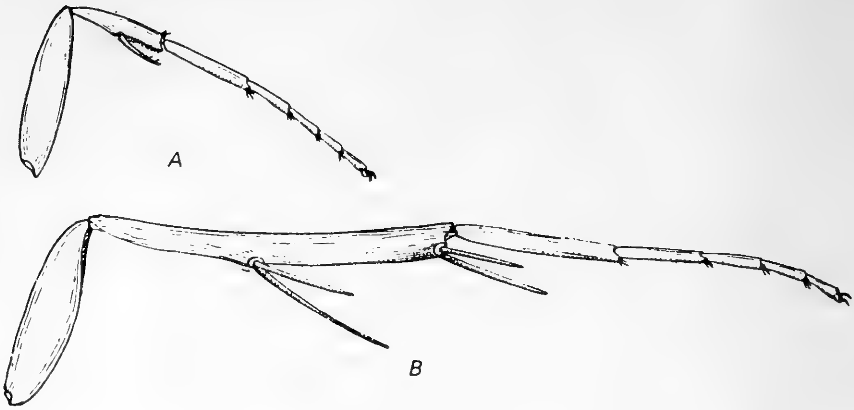
Zagulyaev, 1971b: 419–420.

External characters of imago. Pubescence of head yellowish-brown, on occiput yellowish-ash. Labial palpi on outer side and upper side musty white; tuft of bristles of 2nd segment of palpi brownish and crown of bristles at end of segment short, reaching end of 3rd segment. Pubescence on antennae of males longer than segments and 1.5 to 2.0 greater than width of segment. Basal segment of antennae on front and top cinnamon-gray with whitish scales, on the lower side silvery-gray.

Thorax yellowish-gray; tegulae toward front brownish, on upper side lighter in color. Span of forewings in males 15 to 16 mm. Length of forewings almost four times width; length of hind wing 3.20 width.

Forewings yellowish-gray with lighter subapical anterior margin and fringe of outer margin; basal half of wing darker. Entire wing with slight golden glaze. Hind wings and fringe cinnamon-gray, lustrous. Lower side of forewings dark chocolate-brown, of hind wings yellowish-brown; both pairs of wings with oily sheen.

In forewings (Figure 7, A) distance between bases of R_2 and R_3 great, three times more than distance between bases of R_3 and R_4, but one-fifth distance between bases of R_1 and R_2. Terminus of branch of R_1 situated on alar margin at level of origin of R_2 from cell. Distance between bases of Cu_1 and Cu_2 slightly less than distance between bases of R_2 and R_3. Common trunk of A_{2-3} terminates on alar margin before 195 level of origin of branch of Cu_2 from cell. In hind wings (Figure 8, A)



194 Figure 119. Legs of *Ceratuncus andalusicus* Zag.

A—fore leg; B—hind leg.

Preparation No. 4595, male. Spain, Andalusia.

alar apex rounded; terminus of M_1 four to five times closer to it than terminal of M_2. Bases of M_1 and M_2 very close-set.

Legs cinnamon-gray, lustrous; apices of tarsal segments with poorly defined light-colored rings. Structure of legs as shown in Figures 10, B and 119.

Abdomen yellowish-gray.

Male genitalia (Figure 120, A). Valvae in lateral view with highly concave anterior margin and pointed apex; length 3.5 width in broadest part. Lobes of uncus bifurcate at apex; lower part of fork broad and lobate and upper part slender and pointed. Branches of subuncus broad, at base with elongated pointed ends directed into vinculum. Aedoeagus slightly longer than length of saccus and vinculum taken together and one-fourth longer than valvae; aedoeagus tip (under higher magnification) with three slightly sclerotized cords (Figure 120, C, D). Saccus in lateral view equal in length or slightly larger than vinculum but noticeably shorter than tegumen; in ventral view wedge-shaped, broad (only tip narrow), and distance from end of saccus to vinculum about equal to length of vinculum (Figure 120, B).

Female. Not known.

Comparison. In external appearance species close to *C. affinitellus* Rbl., but differs from it in several characters: forewings matte, yellowish-gray, with lightly colored subapical anterior margin and fringe. In forewing distance between bases of R_2 and R_3 three times greater than distance between R_3 and R_4. Distance between bases of Cu_1 and Cu_2 slightly less than distance between R_2 and R_3. In hind wing

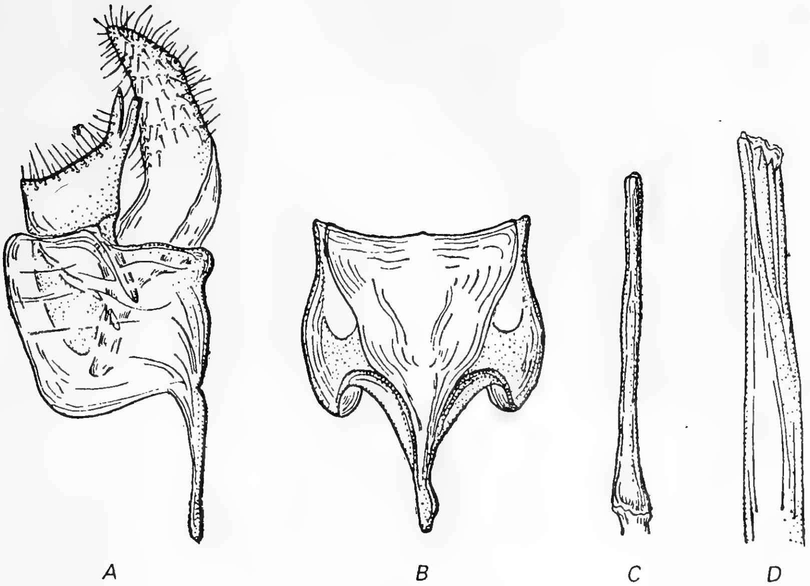


Figure 120. Genitalia of male *Ceratuncus andalusicus* Zag.

A—general appearance (lateral view); B—saccus and vinculum (ventral view); C—aedoeagus; D — apex of aedoeagus (higher magnification).

Preparation No. 4595, male. Spain, Andalusia.

bases of M_1 and M_2 approximate. In structure of genitalia it is quite 196 close to *C. danubiellus* Mn., but distinguished by longer tegulae and vinculum; hence saccus in lateral view almost equal to length of vinculum and significantly shorter than tegumen (by one-fifth to one-fourth); in ventral view saccus wedge-shaped and broad.

Distribution. Spain (Figure 114).

Material examined. 2 males.

Spain. Andalusia, two males (in collection of Alferaki identified as *Tinea cubiculella* Stgr.), with original label in form of rectangular piece of paper with black border (11.0 mm × 6.0 mm), with note on upper side "male, Andalus.", on back side "*cubiculella*, Alph." Another label (red in color) also attached to specimen with the inscription "Holotypus", gen. preparation No. 4595, det. A. Zagulyaev; second specimen gen. preparation No. 11057, male, taken as "paratype".

Biology. Not known.

3. **Ceratuncus maroccanellus** Ams. (Figures 114; 115; 121)

Amsel, 1951a: 177–178 (*Tinea*); Petersen, 1957a; 108, Fig. 60.

External characters of imago. According to the first description proposed by Amsel (1951a) pubescence of head straw-yellow; labial palpi coarse, short, pubescent; antennae with dark- and light-colored rings and in male, with short cilia.

Thorax and tegulae straw-yellow. Wings span in male 20 mm. Forewings and their fringe straw-yellow, slightly glossy; base of anterior margin darker. Hind wings gray, fringe dark grey. Under surface of both pairs of wings uniformly gray, with weak yellowish glaze on forewings.

Male genitalia (Figure 121). Valvae simple and with lobate broad apex; length 3.5 to 4.0 width in middle part. Dorsal tubercles on lobes of uncus very small. Tegumen on dorsal side with broad and deep notch reaching uncus.

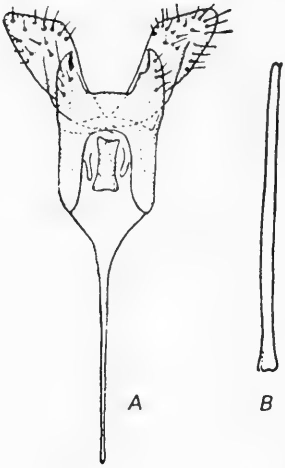


Figure 121. Genitalia of male *Ceratuncus maroccanellus* Ams.

A—general appearance (dorsal view); B—aedoeagus (from Petersen, 1957a).

Female. Not known.

Comparison. On the basis of structure of uncus (very small dorsal tubercle), this species is close to *C. affinitellus* Rbl., but readily distinguished from it and other species by long saccus, which is 1.5 times length of valvae, and long aedoeagus.

Live specimens not known to me.

Distribution. Morocco.

In literature, indicated from Morocco from Greater Atlas Mountains, Goundafa region.

Biology. In Goundafa region one male caught at an elevation of 1,200 m between June 15 and 20 (Amsel, 1951a).

4. **Ceratuncus dzhungaricus** Zag. (Figures 111; 114; 115; 122–124; Plate VII, *1*)

Zagulyaev, 1971b: 420.

External characters of imago. Pubescence of head chocolate-brown, rusty-red, yellowish on frons. Labial palpi (Figure 111, A) large and directed forward and slightly downward; 2nd segment covered with 197 sparsely arranged long yellowish-gray bristles. Pubescence of antennae in male greater than length of segment (Figure 111, B); middle segments covered with protruding infundibular scales.

Thorax and tegulae yellowish-chocolate-brown, with gray granulation. Span of forewings in male 13 to 17 mm. Forewings and hind wings with acute apex. Length of forewings 4.0 times and hind wings 3.5 their width.

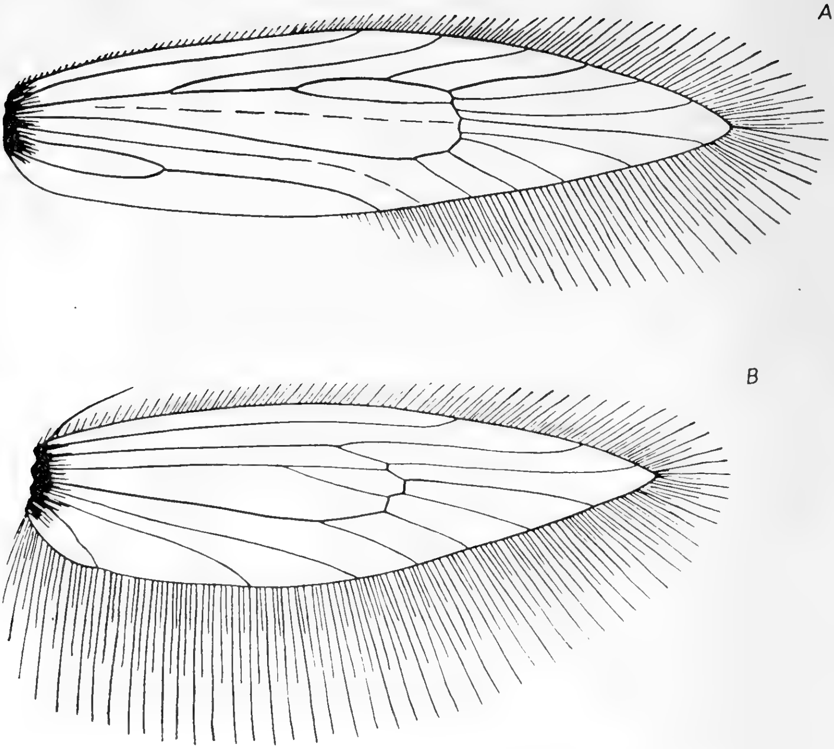
Forewings (Plate VII, *2*) yellowish-chocolate-brown, densely granulated, with darker scales. Fringe yellowish-gray. Hind wings and their fringe yellowish-gray with brownish tinge. Under surface of all wings yellowish-gray.

Anterior margin of forewing (Figure 122, A) highly arced. Distance between bases of R_1 and R_2 3.5 times greater than distance between bases of R_2 and R_3. Terminus of R_1 situated on alar margin at level of origin of R_2 from the cell. Distance between bases of Cu_1 and Cu_2 about two-thirds distance between bases of R_2 and R_3. Common trunk of A_{2-3} terminates on alar margin much before level of origin of branch Cu_2 from cell. Alar apex in hind wing (Figure 122, B) acute; terminus of M_1 three to four times closer to alar apex than M_2. M_2 and M_3 approximate at base and M_3 much closer to M_2 than to Cu_1.

198 Fore- and middle legs cinnamon-gray, with dark granulation; hind legs yellowish-brown. Ends of tibiae and tarsal segments with light-colored bands. Structure and armature of legs as shown in Figure 123.

Abdomen cinnamon-gray, golden.

Male genitalia (Figure 124, A). Valvae long, digitate, with rounded apex; length three times width in broadest part. Uncus in lateral view broad, with flat apex; viewed from lower side lobes of uncus with more or less parallel branches and acute apex, without additional processes at base or on dorsal side. Lobes of gnathos sharp, wedge-shaped (Figure 124, B). Aedoeagus long, equal to or somewhat longer than length of saccus and vinculum taken together, and almost twice longer than valvae; apex of aedoeagus with two acute teeth (Figure 124, C). Saccus very long, 1.66 times longer than vinculum; viewed from lower side tip



197 Figure 122. Venation of wings of *Ceratuncus dzhungaricus* Zag.

A—forewing; B—hind wing.

Preparation No. 11116, male. Dzhungarian Alatau.

of saccus more or less straight and obtuse.

Female. Not known.

Comparison. Pubescence of head chocolate-brown to brown, forewings yellowish-chocolate-brown, due to which this species resembles *C. affinitellus* Rbl. and *C. andalusicus* Zag., but is readily distinguished from them by venation: In forewing common trunk of A_{2-3} terminates on alar margin much before level of origin of Cu_2 from cell; in hind wing base of M_3 closer to M_2 than to Cu_1. On the basis of peculiarities of genital structure—lobes of uncus simple, without additional processes at base or on dorsal side; aedoeagus twice larger than valvae; saccus 1.66 times longer than vinculum—this species is close to *C. maroccanellus* Ams.

Distribution. Southern area of the European part of the USSR; Caucasus; eastern Kazakhstan: Dzhungarian Alatau (Figure 114).

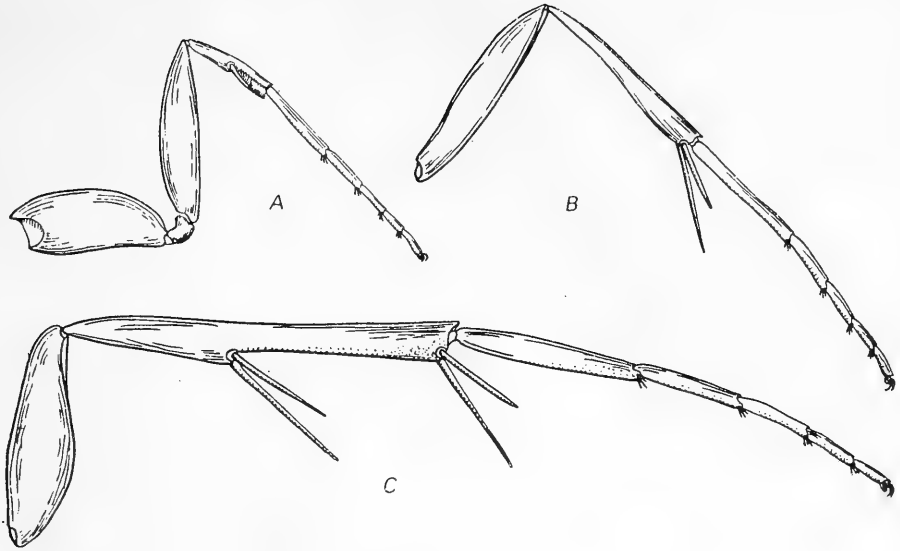


Figure 123. Legs of *Ceratuncus dzhungaricus* Zag.
A—foreleg; B—middle leg; C—hind leg.
Preparation No. 11117, male. Dzhungarian Alatau.

Material examined. 9 males.

European part of the USSR. Stavropol' territory, Pyatigorsk, dry slope of Mashuk mountain, one male October 15, 1968 (Zagulyaev).

199 Eastern Kazakhstan. Dzhungarian Alatau, Topolevka, eight males July 11, 1957 (Danilevskii, V. Kuznetsov). Type specimen provided with standard red label with inscription "Holotypus" and note in black ink "*Ceratuncus dzhungaricus* Zag., Dzhungarian Alatau, July 11, 57", reverse side with: "Collection of Inst. Zool., gen. preparation. No. 11117, male det. A. Zagulajev". All other specimens designated "paratypes".

Biology. Meso-xerophilous species associated with steppe vegetation. Type series caught in mid-July in sun parched areas in spurs of Dzhungarian Alatau. Males found in mid-October among dried grasses on the slope of Mashuk Mountains attest to the association of moth fauna with xerophytic habitats in Caucasus and eastern Kazakhstan. Possibly, Caucasus is the western boundary of the range of this species. Collection of moths in mid-July and mid-October indicates that the species produces three generations per year (moths of the first generation probably emerge at the end of April–May).

Life history not known.

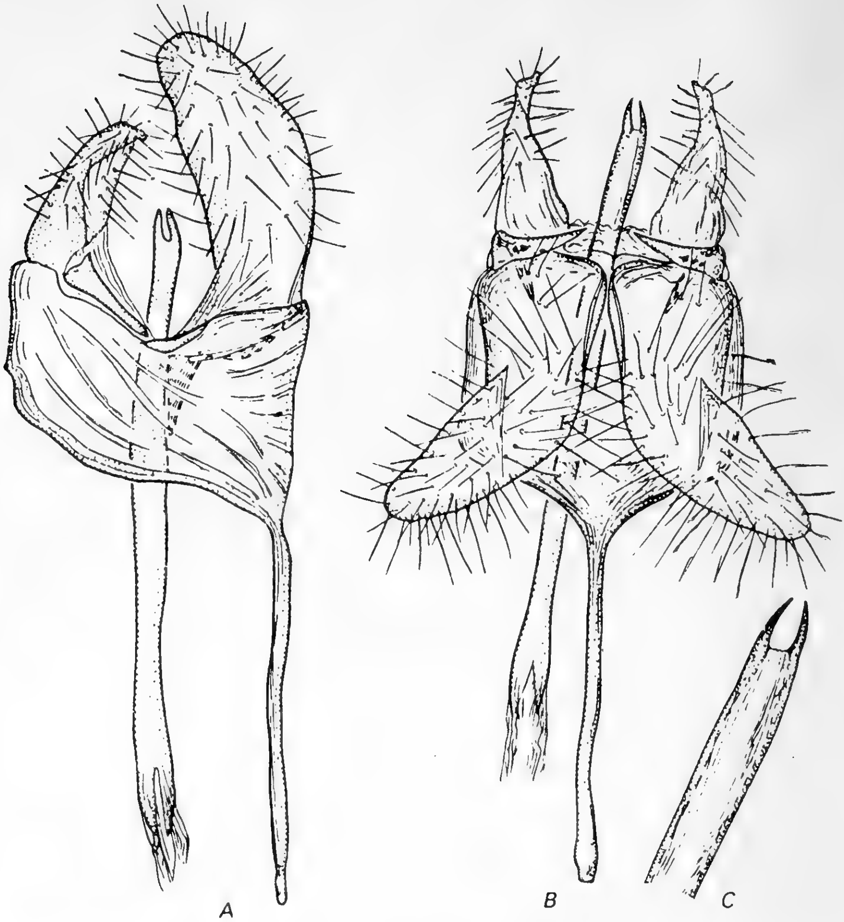


Figure 124. Genitalia of male *Ceratuncus dzhungaricus* Zag.

A—general appearance (lateral view); B—same (ventral view); C—apex of aedoeagus (higher magnification).

Preparation No. 11117, male. Dzhungarian Alatau.

200 5. **Ceratuncus affinitellus** Rbl. (Figures 15, B; 114; 115; 125; 126)

Rebel, 1901: 184 (*Myrmecozela*); Staudinger and Rebel, 1901: II, 240 (*Myrmecozela*); Caradja, 1920: 172 (*Myrmecozela*); Petersen, 1957a: 106–108; Amsel, 1959a: 72; Petersen, 1959c: 155; 1961b: 531; 1966: 27, 29; 1968: 56; 1971: 270; —*extinctella* Caradja, 1920: 172 (*Myrmecozela*); —*maraschensis* Rebel, 1936a: 90 (*Eriocottis*); Osthelder, 1936: 90; —*talhouki* Amsel, 1940: 38 (*Tinea*); Petersen, 1957a: 108; —*irakella* Amsel, 1949: 323 (*Tinea*); —*libatonica* Amsel, 1951a: 178 (*Tinea*).

External characters of imago. Pubescence of head light yellowish-ash with brownish tinge on frons and whitish on vertex. Labial palpi on outer and upper sides light brown; 2nd segment covered with long sparse cilia, light-colored in the basal half and cinnamon-gray at tip. Length of antennal setae more than cross section of segments; basal and 2nd segments of antennae yellowish-brown.

Thorax and tegulae yellowish-gray. Span of forewings in males 16.5 to 21.0 mm., in female 17 mm. Length of forewings four times, of hind wings three times greater than their respective widths.

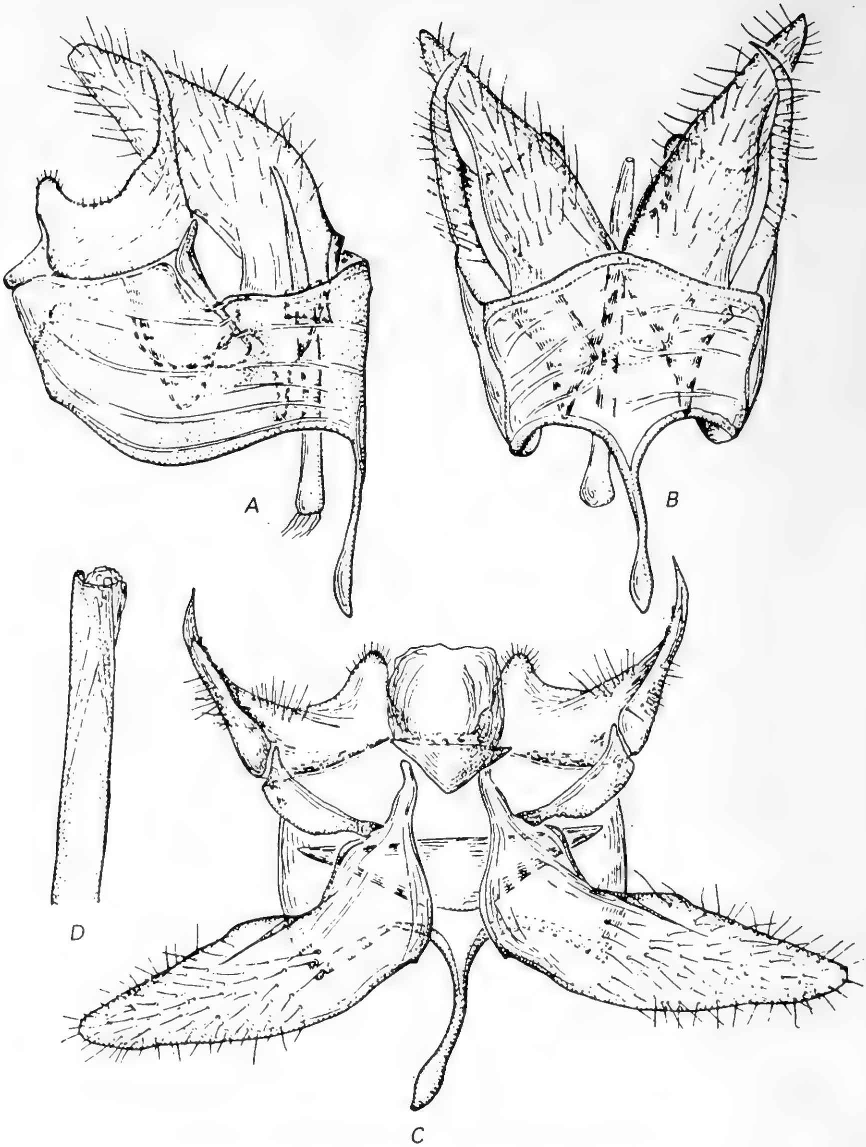
Forewing uniformly yellowish-gray with brownish granulation, dense in apical region of wing and in folds near apex of radiocubital cell and anal region of wing. Fringe slightly lighter than basic background color of wing. Wings and their fringe with weak honey-brown glaze. Hind wings yellowish-gray, light cinnamon-gray; translucent in basal half and with slight violet tinge; fringe lighter than wing. Under surface of forewings cinnamon-ash with lightly-colored fringe, and that of hind wings yellowish-gray with light violet tinge and light-colored fringe.

Venation of forewing. Distance between bases of R_1 and R_2 six to seven times greater than distance between bases of R_2 and R_3. R_1 terminates on alar margin at level of origin of R_2 from cell. Distance between bases of Cu_1 and Cu_2 slightly less than distance between bases of R_2 and R_3. Common trunk of A_{2-3} terminates on alar margin almost at level of origin of branch Cu_2 from cell. Apex of hind wing acute; terminus of M_1 two to three times closer to alar apex than end of branch of M_2. Bases of M_1 and M_2 approximate. Base of M_3 located almost at equal distance from bases of M_2 and Cu_1.

Fore- and middle legs on outer side light cinnamon-gray, on inner side silvery-gray; hind legs light cinnamon-ash. Apices of tibiae and tarsal segments with light-colored belts. All legs lustrous.

Abdomen ocherous-gray, with tuft of yellowish scales at end.

Male genitalia (Figures 16, B and 125, A). Valvae narrow, long, lanceolate; length four times greater than width in broadest part. Uncus in lateral view broad, with two appendages: dorsal one broad and short, covered with bristles, and ventral one long and narrow, with sclerotized pointed apex. In ventral view lobes of uncus wide-set and encompass valvae (Figure 125, B, C). Branches of gnathos broad but taper abruptly at end. Aedoeagus of most specimens equal in length to saccus and vinculum taken together and almost equal to length of valvae; apex of aedoeagus obliquely truncated and slightly sclerotized



201 Figure. 125. Genitalia of male *Ceratuncus affinitellus* Rbl.

A — general appearance (lateral view); B — same (ventral view); C — same (with straightened valvae); D — apex of aedoeagus (higher magnification).

Preparation No. 99, male. Turkey (collection of Caradja, Bucharest).

(Figure 125, D). Saccus long, equal in length to vinculum when viewed from lower side; end of saccus slightly rhomboidly broadened.

201 *Female genitalia* (Figure 126). Lobes of vaginal plate elongated, their length four to five times greater than width in middle part. Bursa copulatrix with two groups of signa: 6 large ones located before mouth of bursa and 14 to 16 small ones located in middle and in basal half.

Comparison. Externally resembles *C. dzhungaricus* Zag. and *C. andalusicus* Zag., but distinguished by greater size, yellowish-gray color 202 of wings, and antennae with rings. On the basis of genital structure species close to *C. maroccanellus* Ams. and characterized by the following peculiarities: uncus with two appendages, branches of gnathos with pointed ends; aedoeagus almost equal to length of valvae; apex of aedoeagus obliquely truncated and slightly sclerotized; lobes of vaginal plate much longer than in any other species; and bursa copulatrix with 6 large and 14 to 16 minute signa.

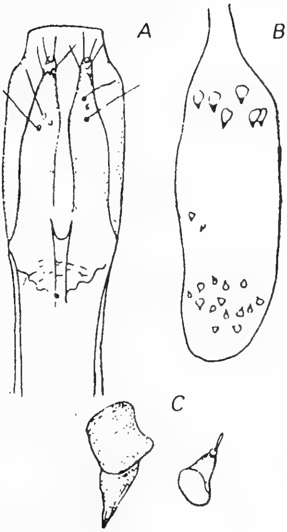


Figure 126. Genitalia of female *Ceratuncus affinitellus* Rbl..

A—lobes of vaginal plate; B—bursa copulatrix; C—shape of signa (higher magnification) (from Petersen, 1957a).

Distribution. Crimea. Trans-Caucasus as well as Asia Minor and Northwest Asia (Figure 114).

In literature, indicated from Crimea (Petersen, 1957a, 1961b); Turkey (Mardin) (Rebel, 1901); Lebanon (Amsel, 1940); Syria (Petersen, 1961b); Iraq (Qaraghan) (Amsel, 1949); Iran, Elbrus mountains. (Petersen, 1966, 1971).

Material examined. 4 males.

Trans-Caucasus. Armenia, one male April 30 (collection of Eversmann).

Asia Minor. Turkey, Mardin, one male, 1899 (collection of Wocke); Konia, two males, gen. preparation No. 99, type No. 100 (collection of Caradja as ab. *extinctella* Car.).

Biology. Southern desert species. Moths emerge from March to June. H. Zerny caught one male in northern Lebanon in the mountains near Bechare at a height of 1,900 m between June 12 and 19, 1931 (Amsel, 1951a); in Aley region one male was found on April 25, 1937 (Amsel, 1940; Petersen, 1959c). In Turkey, Marasch region, one male was caught on May 29, 1928 (Rebel, 1936a; labeled *Eriocottis maraschensis* Rbl.). In Iraq, Qaraghan region, three males were collected on March 13, 1937 (Amsel, 1949), as well as in Haj Amran region, eight males from June 2 to 13, 1956 (Amsel, 1959a). In Iran, north of Teheran, seven males were found by F. Kasy between May 28 and 30, 1963 (Petersen, 1971).

In all probability this species produces two to three generations per year.

III. Tribe ATELIOTINI Zag.

Zagulyaev, 1968a: 219–220; Căpuşe, 1971: 233–234.

Type genus. Ateliotum Zll., 1839.

Imago. Head covered with relatively short protruding hair. Galea and maxillary palpi very short (Figure 127). Pilifers poorly developed. Labial palpi and their pubescence characteristic of subfamily. Eyes small and wide-set, so that width of frons more than vertical diameter of eyes. Antennae long and may be equal to five-sixths length of wing; each segment with whorl of long scales; antennae of males dorsally covered with cilia (Figure 6, C).

Thorax and tegulae dark, with grayish-brown tones. Span of wings not more than 17 mm. Hind wings equal in width to forewings or slightly smaller. Forewings whitish to cinnamon-gray, speckled with dark streaks and dots.

In forewings R_4 absent (Figure 7, B and 128, A). R_5 terminates on anterior margin or on alar apex. Terminus of Cu_2 located almost at 203 same level as outer margin of radiocubital cell. In hind wings A_1 terminates on alar margin almost at level of radiocubital cell (Figures 8, B and 128, B) or much closer to it (*Eremicola* Ams.).

Foretibiae with epiphyses (Figures 9, B and 129, A). Median pair of spurs in hind tibiae located in middle of tibia or slightly before it (Figures 11, C and 129, C). Ends of tarsal segments of all legs without spinules.

Terminus of abdomen in male without cluster of androconial scales, in female with sac of silken hairs; furthermore, posterior margin of sternite VII tapers notably (Figure 133).

Male genitalia. More or less broad. Valvae simple, rarely with spines on inner surface; sclerotized cord of valvae not developed. Lobes of uncus narrow, long, and wide-set. Gnathos absent. Aedoeagus straight, usually thick and shorter or longer than valvae, with bifurcate apex, rarely with process (Figure 17, F). Tegumen short and broad, vinculum broad, with characteristic notch in middle of inner margin. Saccus not present.

Female genitalia. Uniform (Figure 133). Vaginal plate well developed, its posterior margin covered with bristles. Duct of bursa copulatrix without signa. Anterior apophyses bifurcate; posterior apophyses reach beginning of segment VII.

Larva. Body of larvae musty white, translucent, with poorly developed bristles on abdominal segments. Length of mature larvae 10 to 12 mm. Thoracic legs long, so that second pair of legs reaches coxae of first pair; coxae of legs close-set but not fused; tarsal claws at base with tooth (Figure 22, A). Base of hooks in crochets of prolegs broad and bifurcated.

Biology. Species associated with open landscape. Predominantly warmth-loving meso-xerophils. Some species found in mountains at a height of 2,000 m.

Life history of larvae virtually unknown.

Distribution (Figure 30). Area of distribution of tribe covers Europe (except northernmost region), Caucasus, Kazakhstan, and Central Asia, northwestern Africa, Asia Minor, and Northwest Asia, Iran, Afghanistan, southern part of Arabian Peninsula, as well as tropical Africa, South Africa, and the West Indies.

Concentration of the majority of Palearctic members in the ancient Mediterranean territory provides a basis for concluding that several ancient centers of formation of present-day fauna of Ateliotini Zag. are located here.

The scope of the tribe vis à vis world fauna requires many refinements. Fauna of Ateliotini Zag. includes two genera: *Ateliotum* Zll., with 11 species, and the monotypic genus, *Eremicola* Ams. Members of only the former genus are found in the fauna of the Soviet Union.

From a phylogenetic point of view, Ateliotini Zag. displays a relationship with Myrmecozelini Zag., as attested to by bifurcate anterior apophyses, and concomitantly with tribes Cephimallotini Zag. and Rhodobatini Zag. (absence of androconial clusters on membrane of segment VIII). These peculiarities, as well as the retention of several archaic characters such as broad vinculum, bifurcate uncus lobes, and certain other primitive traits, together with the presence of specialized characters permit one to consider Ateliotini Zag. an independent branch of the subfamily (Figure 31).

204

Key to Genera of Tribe Ateliotini Zag. on the Basis of External Characters[15]

1 (2). In forewings M_2 and M_3 widely separated at base; in hind wings M_1 and M_2 widely separated at base. .... **Ateliotum** Zll. (p. 264).

2 (1). In forewings M_2 and M_3 connate; in hind wings M_1 and M_2 stalked .... **Eremicola** Ams (p. 302).

7. Genus *Ateliotum* Zll.

Zeller, 1839: 189; Staudinger and Rebel, 1901: II, 236; Spuler, 1910: II, 457; Petersen, 1957b: 557–558; Căpușe, 1968; 139–140; Gozmàny and Vàri, 1973: 150–152 (Scardiinae); —*Dysmasia* Herrich-Schäffer, 1853: V: 23, type *D. petrinella* Herrich-Schäffer; 1853: V, 80 (Spanien); —*Hyoprora* Meyrick, 1908: 754, type *H. crymodes* Meyrick, 1908; 754

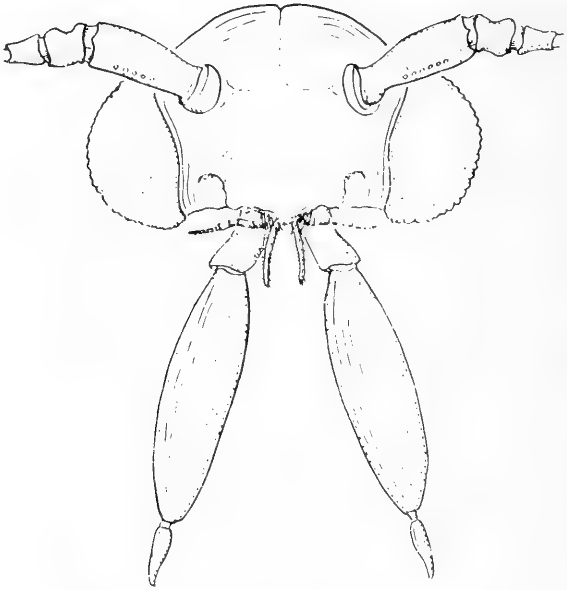


Figure 127. Head of *Ateliotum hungaricellum* Zll.

Preparation No. 4021, male. Tanganrog.

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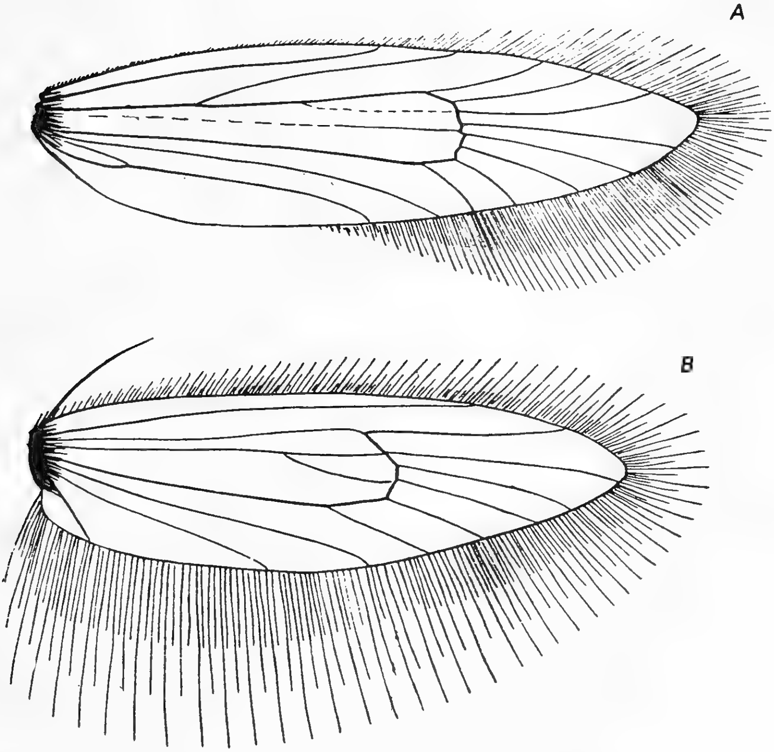
[15] Male and female genitalia have not been studied in members of genus *Eremicola*. Hence it is not possible to compile an identification key based on the genital structure.

(South Africa); —*Hylophygas* Meyrick, 1932: 119, type *H. convicta* Meyrick, 1932: 119 (Ethiopia); —*Saridocompsa* Meyrick, 1937b: 112–113, type *S. cypellias* Meyrick, 1937b: 113 (Russia), syn. nov.

Type species. Ateliotum hungaricellum Zll., 1839.

Imago. Pubescence of head from white and light ash in color to light yellowish-brown. Galea and maxillary palpi slender and barely exceed length of 1st segment of labial palpi (Figure 127). Labial palpi very large, stout, velvety; 2nd segment fusiform, almost four times greater than 3rd segment, and with long dense pubescence. In dorsal view labial palpi extend far ahead of frons. Antennae equal to three-fourths to five-sixths length of wings; basal segment with long crest of light-colored bristles, length of which two to three times greater than cross section of segment; pubescence of antennae as shown in Figure 6, C.



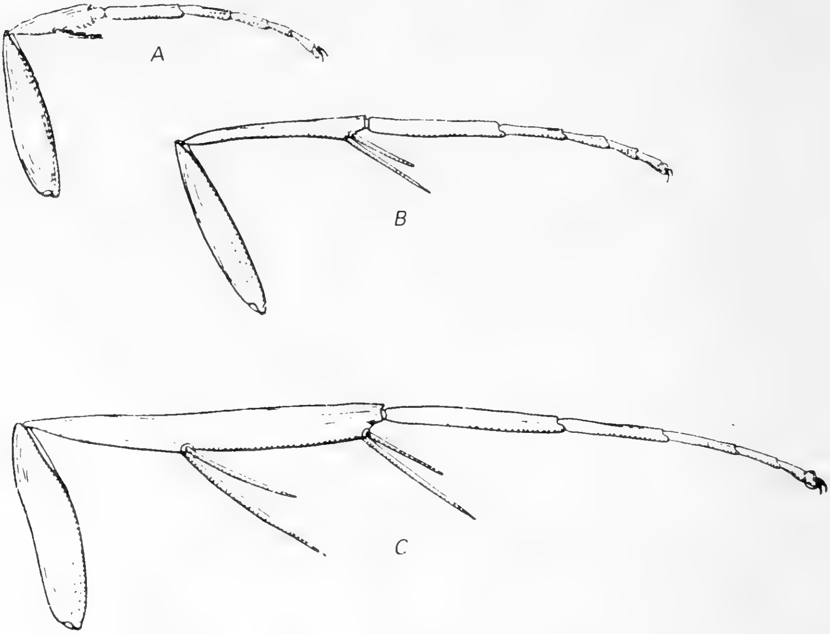
205 Figure 128. Venation of wings of *Ateliotum hungaricellum*.

A—forewing: B—hind wing.

Preparation No. 4021, male. Taganrog.

Thorax and tegulae with grayish-brown tinge, in some species glossy. Span of forewings in males 10 to 17 mm, in females up to 17 mm. Length of forewings 3.50 to 3.75 times, of hindwings 3.0 to 3.5 times greater than their respective widths; fringe of hind wings almost equal to width of wing or two-thirds width.

Forewings from musty white, yellowish-ash, to cinnamon-ash gray;
205 in most species with pattern in form of minute dark oblique streaks and spots arranged along anterior margin, before midpoint, and at apex of radiocubital cell. Anal fold always dark. Hind wings yellowish or dark gray, in many species with metallic or oily sheen.



206 Figure 129. Legs of *Ateliotium hungaricellum* Zll.
A—foreleg; B—middle leg; C—hind leg.
Preparation No. 11155, male. Budapest.

In forewings (Figure 7, B and 128, A) R_1 terminates on alar margin almost at level of outer margin of radiocubital cell M_2 and M_3 widely separated. In hind wings (Figures 8, B and 128, B) *Sc* terminates on anterior margin almost at level of three-fourths its length from base. All three *M* widely separate. In most species all three anal veins well developed. A_1 terminates on inner margin of wing almost at level of outer margin of radiocubital cell or slightly closer to it. Radiocubital cell almost equal to two-thirds length of wing.

Legs in most species dark with light-colored bands at ends of tarsal segments. Foretibiae (Figures 9, B and 129, A) half length of femora; epiphysis originates from midpoint of tibia and extends up to its end. Tibiae of middle legs (Figures 129, B) slightly shorter than femora but longer than 1st tarsal segment. Hind tibiae 1.5 to 1.66 times longer than femora. Armature of hind legs as shown in Figures 11, C and 129, C.

Male genitalia. Fairly large and massive (Figure 132). Valvae elongated, sometimes with convex lateral margin and more or less elongated narrow apex. Uncus in lateral view usually appears elongated, 206 pointed, and slightly bent; rarely it is broad and with an additional process as in *A. insulare* Rbl., *A. petrinellum* H.-S., and *A. arabicum* Pet. In dorsal view lobes wide-set. Plate or tube well developed between lobes of uncus. Aedoeagus almost two-thirds to five-sixths length of valvae, or longer than valvae, with two lobes covered with spinules at tip (Figures 17, F and 132, D), or with long slender appendage originating almost from base.

Female genitalia. Either with entire and usually long vaginal plate (Figures 133, and 134), or posterior margin of plate with notch, depth of which variable. Ovipositor almost twice longer than sternite VII.

Larvae. Characteristics of larvae given in the identification of tribe Ateliotini Zag. Structure of middle legs as shown in Figure 22, A..

Biology. Steppe and semisteppe species, predominantly from southern Mediterranean region. Moths mostly emerge from May to October; however, a few specimens were found in Yemen at the end of January. Moths have been found at a height of up to 2,000 m in Spain and Afghanistan.

Females lay lamelliform eggs on different substrata, more often in small depressions, and each egg is covered with silken fluff. Larvae live in litter in silken galleries.

Most species probably produce two generations per year.

Distribution. Range of genus in the Palearctic coincides with range of tribe (Figure 30). Of the eight Palearctic species, two are known in the Soviet Union.

The northernmost area of distribution covers the steppe region of Western Europe, the European part of the USSR and Kazakhstan, and enters Central Asia; it is primarily the range of *A. hungaricellum* Zll. (Figure 130). The main group of species is characterized by a Mediterranean distribution and *A. petrinellum* H.-S., boasts the maximum 207 range (Europe, Afghanistan, and Asian Mediterranean). *A. insulare* Rbl. is restricted to the western Mediterranean, and *A. syriacum* Car. and *A. taurensis* Zag. to the eastern Mediterranean. *A. cypellias* Meyr. is at present found only in Caucasus and in Trans-Caucasus. *A. arabi-*

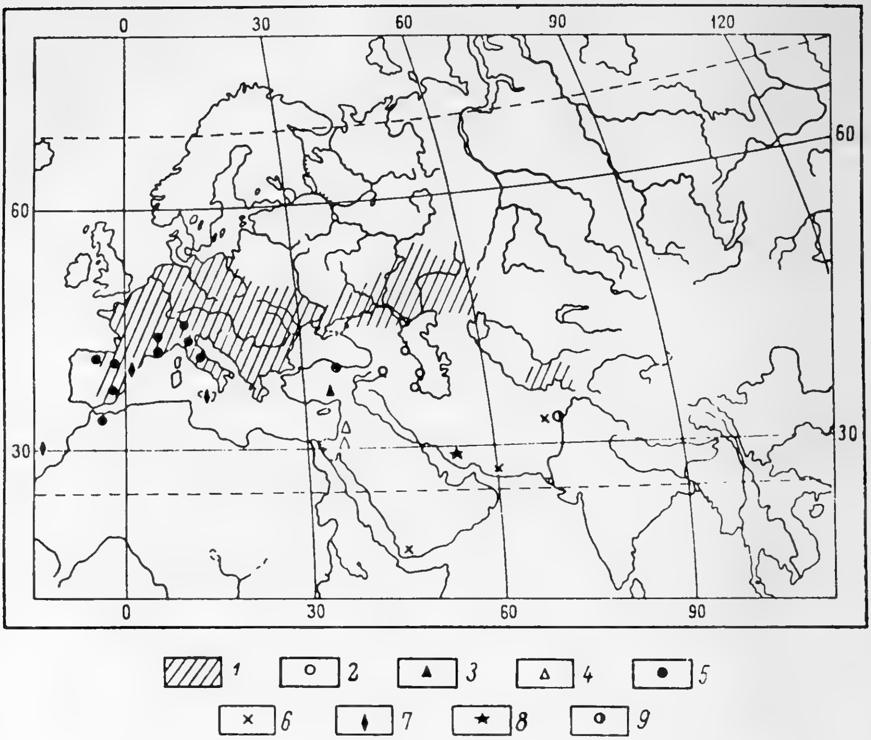


Figure 130. Distribution of species of genus *Ateliotum* Zll.

1—*A. hungaricellum* Zll.; 2—*A. cypellias* Meyr.; 3—*A. taurensis* Zag.; 4—*A. syriacum* Car.; 5—*A. petrinellum* H.-S.; 6—*A. arabicum* Pet.; 7—*A. insulare* Rbl.; 8—*A. confusum* Pet.; 9—*A. petrinellum orientale* Pet.

cum Pet. and *A. confusum* Pet. are known from Iran, Afghanistan, and Southwest Asia.

From the non-Palearctic region three species are known, two of which are Ethiopian—*A. convicta* Meyr. from Ethiopia per se and *A. cyrmodes* Meyr. from South Africa; the third species has been described from the West Indies.

The centers of species formation of Palearctic members of the genus are probably the western and eastern Mediterranean and the Iranian plateau.

Comparison. On the basis of a series of external characters this genus is close to *Eremicola* Ams.

During a study of genera *Dysmasia* H-S. and *Saridocompsa* Meyr. it was found that they differ from *Ateliotum* Zll. only in the dense pubescence of the labial palpi and different position of their 3rd segment. However, these characters are highly variable from species to

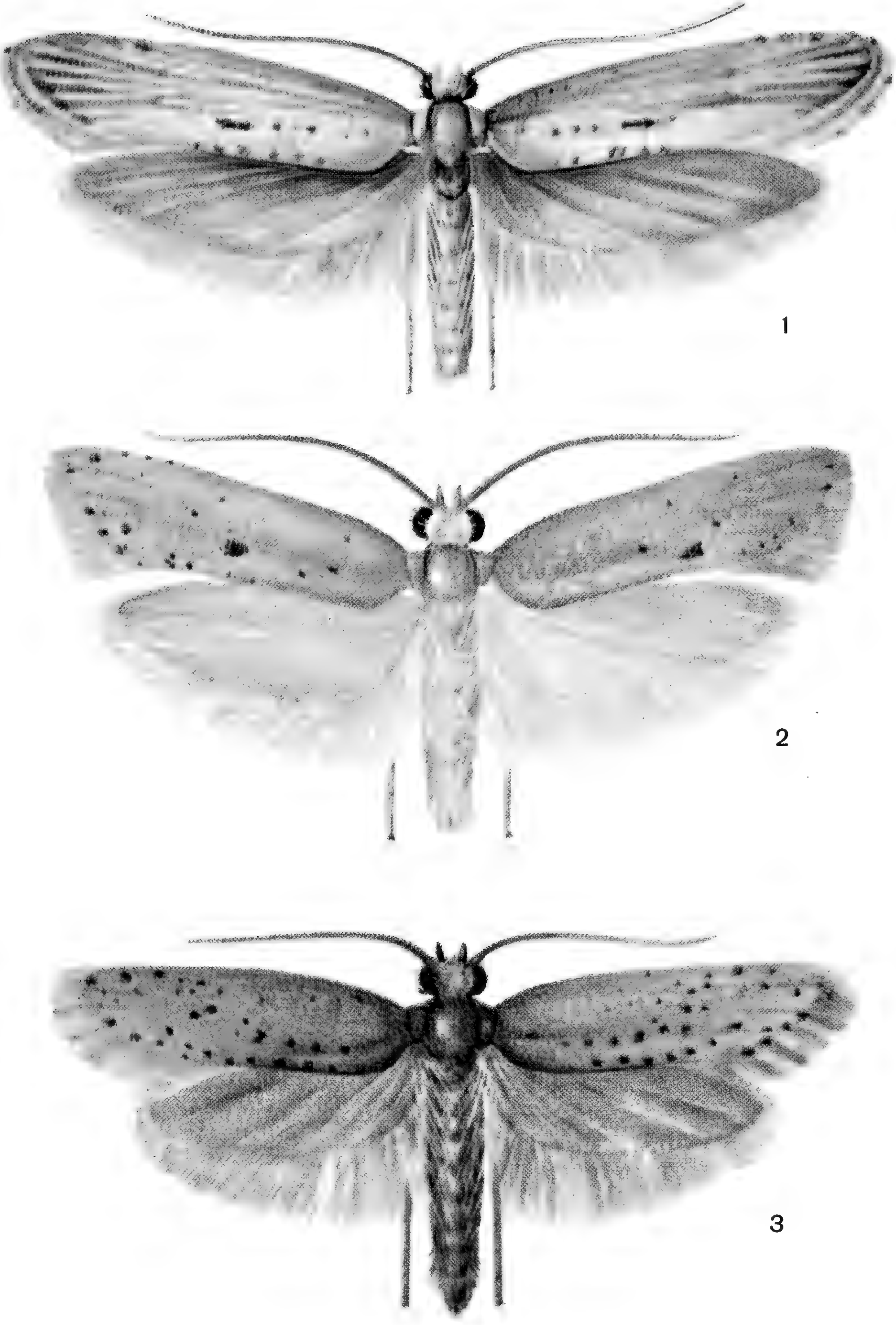


Plate VIII

1 — *Myrmecozela diacona* Wlsm.; 2 — *M. hispanella* Zag.; 3 — *M. ataxella* Chrét.;
4 — *Ateliotum cypellias* Meyr.; 5—*A. hungaricellum* Zll.; 6 — *Episcardia lardatella* Led.
(drawn by T.A. Temkina.)


4


5


6

Plate VIII (continued)

species. Venation, armature of legs, and structure of genitalia provide a basis for considering genera *Dysmasia* H.-S. and *Saridocompsa* Meyr. synonyms of genus *Ateliotum* Zll.

Eight Palearctic species are included in genus *Ateliotum* Zll.: *A. hungaricellum* Zll., *A. cypellias* Meyr., *A. taurensis* Zag., *A. syriacum* Car., *A. petrinellum* H.-S., *A. arabicum* Pet., *A. insulare* Rbl., and *A. confusum* Pet. Subspecies *A. petrinellum orientale* Pet., described by
208 Petersen (1973) on the basis of seven males from mountain valleys (1,650 to 1,700 m) in the environs of Kabul (Afghanistan), has been excluded in the present work.

The phylogentic relations of the species are shown in Figure 131. This scheme is based on similarity of structure of the genitalia of males and females. Thus, the same type of uncus lobes (without spinescent appendage) in the genitalia of males and the entire (unnotched) posterior margin of the vaginal plate in the genitalia of females, unites the species *A. hungaricellum* Zll., *A. cypellias* Meyr., *A. taurensis* Zag. and *A. syriacum* Car. into a single group and, most probably, indicates their origin from a common ancestor. The characteristic shape of the vinculum and tegumen and structure of the valvae and aedoeagus affiliate the latter two species. The similarity in structure of the valvae, apex of aedoeagus, and a number of other characters suggest the origin of *A. hungaricellum* Zll. and *A. cypellias* Meyr. from a common ancestor, and the retention of a large number of primitive characters in these species provides a basis for considering them a connecting link between this group and the other in the genus.

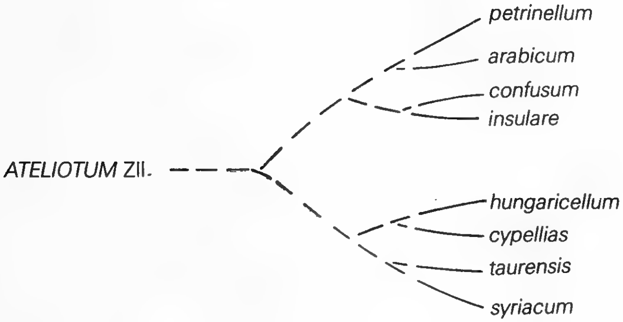


Figure 131. Phylogentic relations of species of genus *Ateliotum* Zll.

The second group includes *A. petrinellum* H.-S., *A. arabicum* Pet., *A. insulare* Rbl., and *A. confusum* Pet. They are linked by the development of a very strong spinescent appendage on the uncus lobes in the male genitalia and a characteristic notch on the posterior margin of the vaginal plate in the female genitalia. Based on the valvae and simple lobes of the vaginal plate (without process), the first two species are close to each other, while *A. insulare* Rbl. and *A. confusum* Pet., with processes on the valvae and a relatively small notch on the vinculum, are not only fairly close to each other but also occupy a slightly isolated position.

The phylogenetic links of genus *Ateliotum* Zll. in the subfamily were discussed under the characteristics of the tribe and in the Section "Classification and Phylogeny," where the affinity of this genus to Myrmecozelinae is established. This idea was announced in an earlier work of mine (Zagulyaev, 1968a) and in the publications of Căpuşe, (1968, 1971). Gozmàny in his work on the Ethiopian members of Tineidae (Gozmàny and Vàri, 1973) shifted genus *Ateliotum* Zll. to Scardinae. The basis for such a change was a study of the genitalia of males of two species from the tropics, the affinity of which to genus *Ateliotum* Zll. is undeniable. Gozmàny noted that *Ateliotum* Zll. is close to *Scardia* Tr. and *Morophaga* H-S. on the basis of several characters: antennae of males covered with cilia, gnathos reduced, and shape of valvae, uncus, and aedoeagus; and in the female genitalia structure of the ostium bursa and absence of signa. However, he recognized that such characters as twin saccus and presence of sacs with
209 silken hairs in segment VII may justify the consideration of this genus as an isolated entity among other members of Scardinae.

The transfer of genus *Ateliotum* Zll., members of which inhabit open areas and develop in decomposing grassy litter, to the subfamily of detritophages — Scardiinae (even as an isolated branch) — is a significant move and I consider it necessary to make a few remarks. The peculiarities listed by Gozmàny demonstrate only a certain convergent similarity, which is justified by a large complex of morphological and biological characters. Thus *Ateliotum* Zll. is characterized by shape of wings (elongated apex), termination of *Sc* in forewings toward midpoint of costal margin, absence of R_4 etc., which are typical features of steppe detritophages. In the male genitalia the fused uncus and tegumen, bifurcate saccus, and absence of gnathos, and in the female genitalia, bifurcate anterior apophysis, strong bristles covering the vaginal plate, etc. are significant. In addition, the presence of sacs with silken hairs (corethrogyne) used for covering the eggs, etc., is an important feature.

All the foregoing characters as well as habitat of larvae in steppe litter among grasses and wormwood are similarly found in members of Myrmecozelinae. Hence the conclusions of Gozmàny are not convincing and I have kept genus *Ateliotum* Zll. in the nominative tribe in Myrmecozelinae.

Key to Species of Genus Ateliotum Zll. on the Basis of External Characters[16]

1 (8). Thorax and tegulae yellowish or chocolate-brown.
2 (3). In forewings distance between bases of Cu_1 and Cu_2 less than distance between bases of R_2 and R_3 .... 4. **A. syriacum** Car.
3 (2). In forewings distance between bases of Cu_1 and Cu_2 equal to or more than distance between bases of R_2 and R_3.
4 (7). In hind wings all three anal veins developed.
5 (6). In forewings distance between bases of R_1 and R_2 eight to ten times greater than distance between bases of R_2 and R_3 .... 1. **A. hungaricellum** Zll.
6 (5). In forewings distance between bases of R_1 and R_2 five to six times greater than distance between bases of R_2 and R_3 .... 2. **A. cypellias** Meyr.
7 (4). In hind wings only two anal veins developed. .... 5. **A. petrinellum** H.-S.
8 (1). Thorax and tegulae grayish-ash, sometimes with chocolate-brown specks.
9 (10). Lower side of all wings light cinnamon-gray with oily sheen. In forewings distance between bases of Cu_1 and Cu_2 1.5 times greater than distance between R_2 and R_3... 3. **A. taurensis** Zag.
10 (9). Lower side of all wings dark gray with violet tinge. In forewings distance between bases of Cu_1 and Cu_2 two-thirds distance between bases of R_2 and R_3 .... 7. **A. insulare** Rbl.

210

Key to Species of Genus Ateliotum Zll. on the Basis of Male Genitalia

1 (8). Lobes of uncus with spinescent appendage.
2 (5). Valvae on inner side with spinescent processes.
3 (4). Valvae long, narrow; length more than twice width; near apex with two spinescent appendages. Aedoeagus straight with bifurcate tip .... 7. **A. insulare** Rbl.
4 (3). Valvae short, triangular; length about 1.5 width; near apex with one spinescent appendage. Aedoeagus curved, with entire apex. .... 8. **A. confusum** Pet.
5 (2). Valvae on inner side without sclerotized processes.
6 (7). Aedoeagus with long, digitate appendage; lower margin of valva near apex entire. .... 6. **A. arabicum** Pet.

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[16] Live specimens of *A. arabicum* Pet. and *A. confusum* Pet. were not examined by me and the characters listed in the first description do not suffice to include them in the key.

7 (6). Aedoeagus without sclerotized processes; lower margin of valvae with notch near apex. . . . . 5. **A. petrinellum** H.-S.
8 (1). Lobes of uncus without spinescent process.
9 (12). Vinculum (viewed from lower side) with very deep notch, which continues beyond midpoint of its length; lobes of uncus poorly sclerotized, broad, and straight; apex of valvae with notch.
10 (11). Subapical appendage of aedoeagus narrow, short, and barely extends beyond midpoint of apex of aedoeagus; ends of branches of vinculum (viewed from lower side) straight, rounded. . . . . 1. **A. hungaricellum** Zll.
11 (10). Subapical appendage of aedoeagus broad, long, and extends up to two-thirds tip of aedoeagus; ends of branches of vinculum (viewed from lower side) arcuate, pointed . . . . 2. **A. cypellias** Meyr.
12 (9). Vinculum (viewed from lower side) with small notch not reaching one-third its length; lobes of uncus highly sclerotized, narrow, curved, unguiculate; apex of valvae entire.
13 (14). Vinculum with wide notch along anterior margin, which does not reach one-third its length; notch on tegumen (viewed from dorsal side) reaches midpoint; terminal part of branches of uncus (measured from tubercle covered with pubescence) almost equal to basal part . . . . 3. **A. taurensis** Zag.
14 (13). Vinculum with barely perceptible notch along anterior margin; notch on tegumen (dorsal view) poorly developed; terminal part of branches of uncus (measured from tubercle covered with pubescence) one-half to one-fourth their basal part. . . . . 4. **A. syriacum** Car.

Key to Species of Genus Ateliotum Zll. on the Basis of Female Genitalia[17]

1 (6). Posterior margin of vaginal plate entire (without notch).
2 (3). Posterior margin of vaginal plate drawn out in form of digitate appendage . . . . 1. **A. hungaricellum** Zll.
3 (2). Posterior margin of vaginal plate drawn out in form of broad cone.
4 (5). Anterior margin of vaginal plate with rectangular process . . . . 2. **A. cypellias** Meyr.
5 (4). Anterior margin of vaginal plate concave. . . . .

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[17] Females of *A. taurensis* Zag. and *A. confusm* Pet not known and hence not included in key.

.... 4. **A. syriacum** Car.
211 6 (1). Posterior margin of vaginal plate with notch.
7 (8). Lobes of vaginal plate with process, i.e., double............. .... 7. **A. insulare** Rbl.
8 (7). Lobes of vaginal plate without process.
9 (10). Vaginal plate broad, with shallow notch, and hence lobes not well developed........................... 6. **A. arabicum** Pet.
10 (9). Vaginal plate narrow and long, with deep notch, and hence lobes well developed................ 5. **A. petrinellum** H.-S.

1. **Ateliotum hungaricellum** Zll. (Figures 6, C; 127–134; Plate VIII, *5*)

Zeller, 1839: 189; Herrich-Schäffer, 1853–1855: V, 80; Staudinger and Rebel, 1901: II, 236; Spuler, 1910: II, 458; Caradja, 1920: 167; Eyer, 1924: 336, Pl. 32, Fig. 3; Petersen, 1957b: 558–559; 1959c: 157; 1960b: 206; Kasy, 1960: 524; Klimesch, 1961: 770; Căpuşe, 1963: 382–383; Hurbý, 1964: 169; Petersen, 1964b: 396; Popescu-Gorj, 1964: 24; Parenti, 1965: 310; Petersen, 1965c: 180; Căpuşe, and Gogov, 1966: 82; Petersen, 1967: 357; Soffner, 1967: 120; Căpuşe, 1968: 240–243; Klimesch, 1968: 185.

External characters of imago. Pubescence of head silvery-white. Labial palpi on outer side brown, on inner side dirty white; 2nd segment with very long brush of scales, which is twice longer than 3rd segment; brush with light and brown scales; 3rd segment rises upward from brush, pointing upward and almost perpendicular to brush, and is covered with light-colored whorl of scales. Structure of head and its appendage as shown in Figure 127; structure and pubescence of middle antennal segments as shown in Figure 6, C.

Thorax and tegulae yellowish-white, with chocolate-brown granulation. Span of forewings in males 16 mm, in females 12 to 17 mm. Length of forewings 3.66 times, of hind wings 3.33 greater than their respective widths; fringe of hind wing equal to width of wing.

Forewings (Plate VIII, *5*) in females whitish-yellow with slight brown granulation behind radiocubital cell, and in males yellowish-brown, with sharp darker-colored markings in form of patches and spots. One oblique patch located near base of wings; large spot sometimes with white center in middle of proximal third of wing; a circular spot with white border located at apex of radiocubital cell. Five more or less distinct patches, streaks or spots located along anterior margin before alar apex. Three to four minute patches, sometimes fused into continuous strip, located along outer margin of wing. Diffused stripes continue from these spots onto fringe of wing, and reach midpoint or two-thirds length of fringe; thereafter along fringe light-colored broad band passes which is bordered on outer side by dark narrow stripe; outer margin of fringe light in color. Hind wings and their fringe light gray or light yellowish-ash. Under surface of both pairs of wings light cinnamon-ash with lighter colored fringe.

In forewing (Figure 128, A) distance between bases of R_1 and R_2 eight to ten times greater than distance between R_2 and R_3. Terminus of M_1 1.5 times closer to alar apex than R_5. Base of M_3 at equal distance from M_2 and Cu_1. Distance between bases of Cu_1 and Cu_2 greater than distance between bases of R_2 and R_3. Fork of A_{2-3} near base one-third to two-fifths length of fused part. In hind wing (Figure 128, B), anterior margin straight or slightly convex. Terminus of R located five to six times farther from apex than that of M_1. Distance between bases of Cu_1
213 and Cu_2 three times greater than distance between M_3 and Cu_1. All three anal veins well developed. A_1 terminates on alar margin before level of posterior margin of radiocubital cell.

Pubescence of legs yellowish-gray or light cinnamon-ash; fore- and middle legs darker, with light-colored rings in middle and at end of tibia and end of tarsal segment. Foretibiae longer than 1st tarsal segments. Structure of legs as shown in Figure 129.

Male genitalia (Figure 132, A–B). Valvae with notch before apex on ventral margin; apex of valvae conical; length of valvae (without pedicel) three times larger than width of basal part; uncus in lateral view broad, with pointed apex, and an additional short protuberance at base. Aedoeagus five-sixths total length of valvae and with bifurcate tip; upper lobe of fork entire and longer than lower one, which has bifurcate outer margin (Figure 132, D). Vinculum broad, with deep notch where saccus should be (Figure 132, C). Tegumen in dorsal view with broad and shallow notch along anterior margin.

Female genitalia (Figures 133 and 134). Hind margin of vaginal plate in form of highly sclerotized digitate appendage covered with short and long bristles. Anterior apophysis almost reach anterior margin of sternite VII; posterior apophysis included in segment VII for about one-third its length.

Comparison. Light coloration of wings with characteristic diffused dark markings in form of patches brings *A. hungaricellum* Zll. close to *A. cypellias* Meyr., but this species is readily distinguished from latter and other species of the genus by a series of structural characters. In forewings distance between bases of R_2 and R_3 very small, one-tenth to one-eighth distance between R_1 and R_2. Distance between Cu_1 and Cu_2 more than distance between R_2 and R_3. In hind wings M_1 terminates almost at alar apex; all three anal veins well developed. On the basis of male genitalia this species is distinguished by presence of a well-

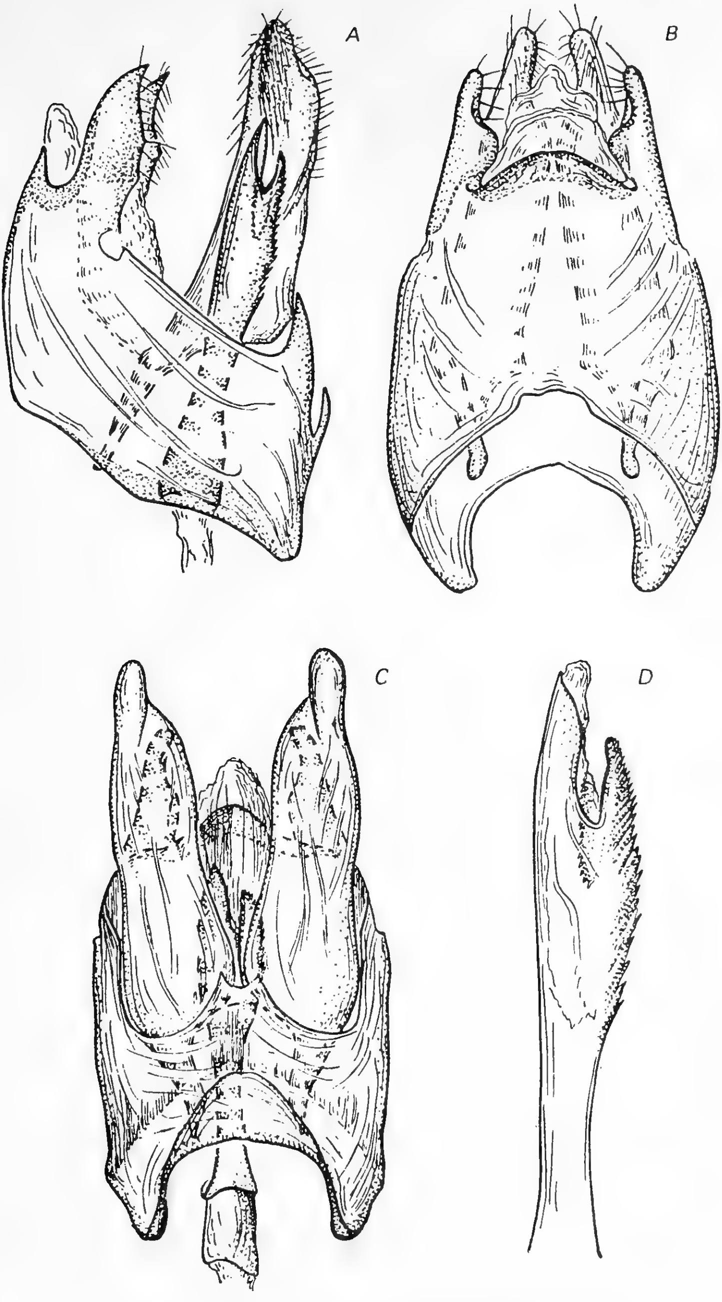


Figure 132. Genitalia of male *Ateliotum hungaricellum* Zll.

A—general appearance (lateral view); B—same (dorsal view); C—same (ventral view); D—apex of aedoeagus (higher magnification).

Preparation No. 4021, male. Taganrog.

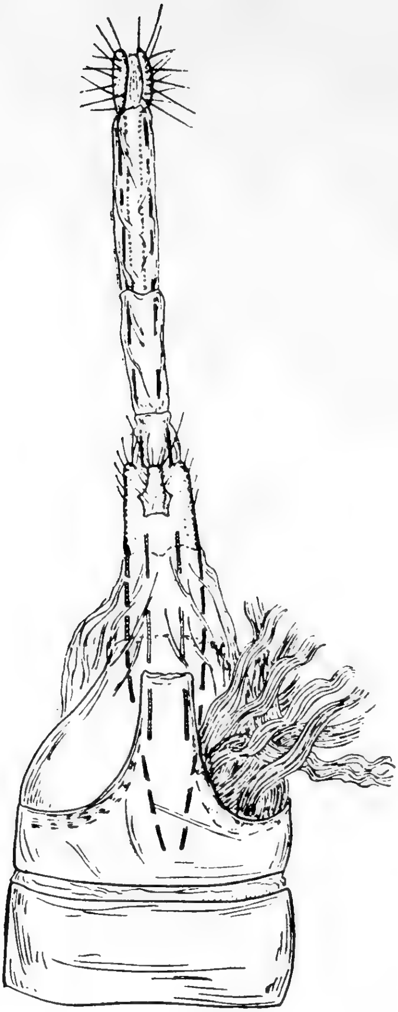
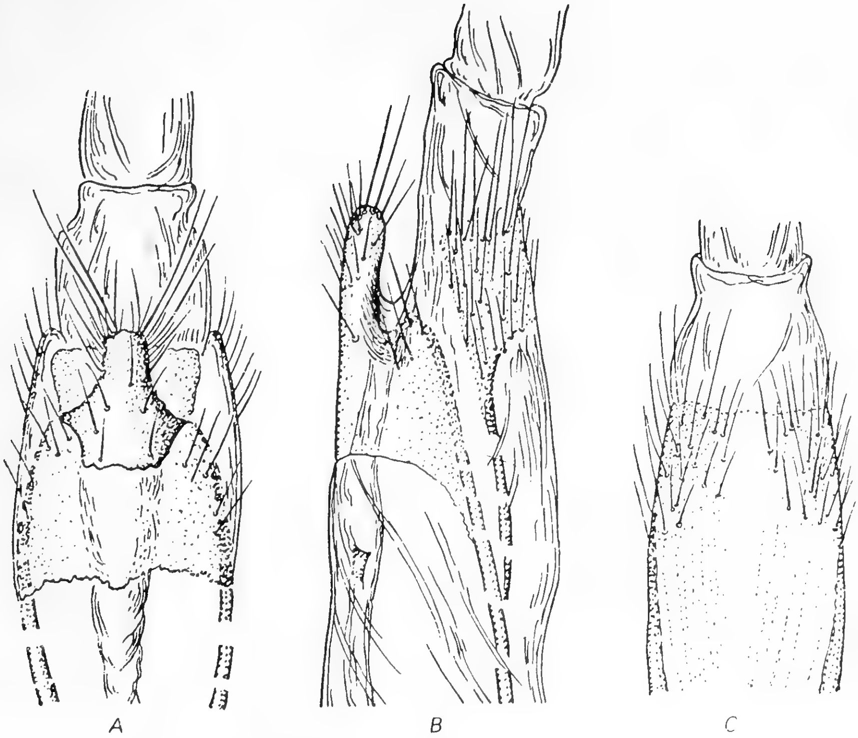


Figure 133. General appearance of female genitalia of *Ateliotum hungaricellum* Zll. Preparation No. 11155, female. Budapest.

developed notch on valvae before apex of lower margin, short and narrow subapical appendage of aedoeagus and broad lobate uncus. Posterior margin of vaginal plate in female genitalia in form of highly sclerotized digitate appendage.

Distribution. Steppe regions of the European part of the USSR, Kazakhstan, Central Asia, central regions of Western Europe, and



214 Figure 134. Region of vaginal and prevaginal plate of *Ateliotum hungaricellum* Zll.
A — ventral view; B — lateral view; C — tergite of segment VIII.
Preparation No. 11155, female. Budapest.

European Mediterranean (Figure 130).

214 In literature, indicated from central regions of Western Europe, France (Parenti, 1965); Germany (Spuler, 1910); Austria (Petersen, 1957b); Hungary (Parenti, 1965); Czechoslovakia (Petersen, 1965c); Rumania (Căpuşe, 1963); Bulgaria (Căpuşe and Gogov, 1966; Soffner, 1967); Yugoslavia: Macedonia (Klimesch, 1961, 1968); Spain (Petersen, 1960b, 1964b, 1967); central Italy (Parenti, 1965).

Material examined. 47 males and 2 females.

European part of the USSR. Taganrog, one male August 10, 1875, (Alferaki); Middle Volga region, Kelekess area, three males and two females June 22, and two males July 28–29, 1948 (Zagulyaev); Krasnoarmeisk, (Sarepta) three males and one female August 18, 1884 (Christoph, Ershov); two males (collection of Staudinger); Astrachan' forest reserve, Damchik, one male July 15, 1965 (Zagulyaev); Orenburg

District, Dneprovka Village, two males June 27, 1932 and nine males July 18, 1934 (Zimin).

Crimea. Karadag, two males June 15–29 and one male July 22, 1924, on light (A. D'yakonov).

Southern Ural. Guberli, three males July 20–24, 1891 (Christoph).

Kazakhstan. Yanvartsevo, right bank of Ural River, three males June 19–24 and one male July 26, 1949; two males July 10–28, 1950, on light (Martynova); one male June 20, one male July 8, and one male August 20, 1950 (V. Kuznetsov); Petrovka, Embulatovka River, three males July 17, 1950 (Martynova).

Central Asia. Aivaj, Kafirnigan River, Tadzhikistan, three males July 28, 1934 (Gussakovskii).

Austria. Vienna, one male August 3, 1840 and one male, 1870 (Wocke).

Hungary. One male (Ershov).

Biology. Species associated with open steppes (Plate II). In central regions of the European part of the USSR moths emerge from mid-June to end of August. They fly in the evening low over grass.

215 In the Middle Volga region, area of Melekess, I collected moths in the evening after sunset on the fringe of a forest and in a large forest glade near Cheremsham River from June 22 to July 29, 1948. In Western Kazakhstan a large series of males was collected at light in the floodplaines of Ural River (region of Yanvartsevo) from June 18 to 26, 1949 and July 10 to 28, 1950 (Martynova) while taking samples of insect fauna from wormwood steppes and aspen fellings. V.I. Kuznetsov collected moths in a floodland forest on light from June 20 to August 20, 1950.

Moths were caught in the central regions of Western Europe from the beginning of June to mid-July (Parenti, 1965). This species has also been found in mountains—one male caught in Spain (Albarracin) on July 20, 1960 at a height of 1,600 m (Petersen, 1967).

Females are less active and sometimes several males hover around a female sitting on grass.

Under experimental conditions a female survived for 4 days and laid 210 eggs in clutches. The eggs were covered with a silken fluff during oviposition. On dissecting the females about 100 more eggs were recovered.

Larvae live in tubular silken galleries constructed in the turf between dead roots of grasses, wormwood, and feathergrass.

In the steppe regions of the European part of the USSR this species produces a single generation per year, but in Central Asia two generations per year.

2. **Ateliotum cypellias** Meyr. (Figures 130; 131; 135–137; Plate VIII, *4*)

Meyrick, 1937b: 112–113 (*Saridocompsa*).

External characters of imago. Head covered with dense white piliform scales. Labial palpi fairly long, directed forward and downward; 2nd segment with long brush of bristles, which are about one-third longer than 3rd segment; brush white on outer side and in basal half. with brown scales; 3rd segment protrudes almost perpendicular to brush; basal half of segment brown, apical half pure white.

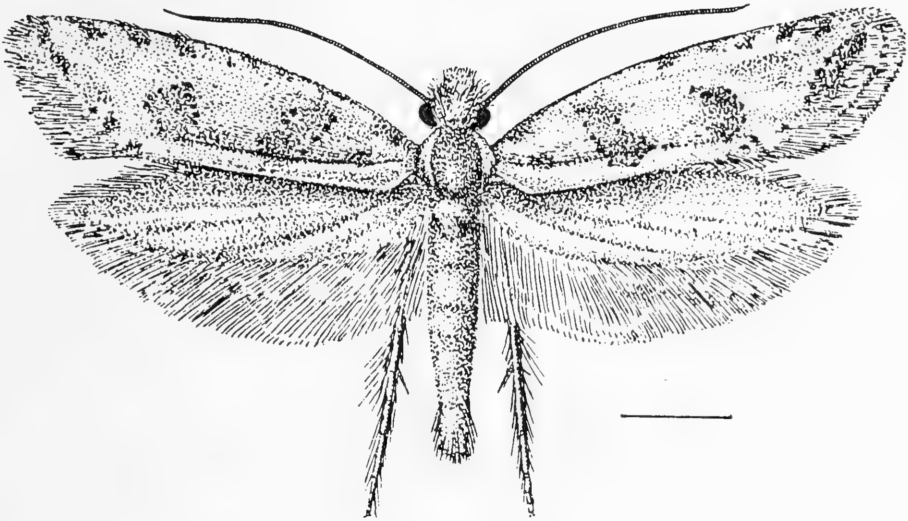


Figure 135. *Ateliotum cypellias* Meyr. male, Dagestan (drawn by T.A. Temkina.)

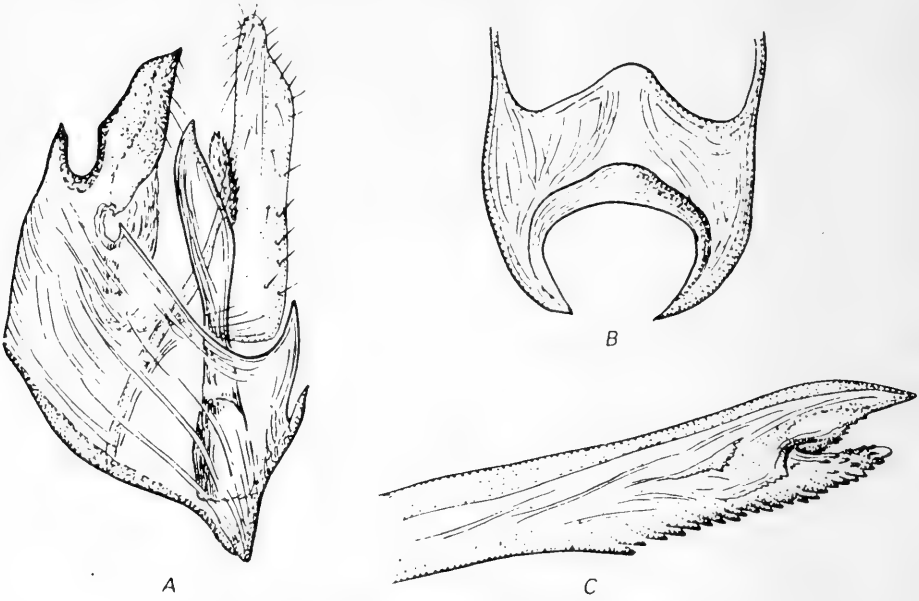
216 Thorax and tegulae whitish. Span of forewings in males 11 to 18 mm, in female 14 mm. Length of forewings 4.0 times, of hind wings 3.5 times greater than respective widths, and fringes almost equal to alar width.

Forewings (Plate VIII, *4*) dirty white with light brown spots, bordered with scattered light brownish-black scales (Figure 135). Basal third of anterior margin brownish, with four matte orange spots and diffused stripe located along outer margin. Apex of radiocubital cell with round spot; two spots located one above the other before midpoint of wing; another spot occupies anal region before root of wing. Fringe white with series of brown scales near base and in middle. Hind wings light gray, their fringe whitish to ash-colored. All elements of wing maculation less distinct in female.

In forewing distance between bases of R_1 and R_2 five to six times more than distance between R_2 and R_3. Terminus of M_1 much closer to alar apex than terminus of R_5. Base of M_3 almost equidistant from bases of M_2 and Cu_1. Distance between bases of Cu_1 and Cu_2 almost equal to distance between bases of R_2 and R_3. Fork of A_{2-3} about one-third length of common trunk. In hind wing anterior margin flat. Terminus of R almost twice distance from alar apex than that of M_1. Distance between bases of Cu_1 and Cu_2 four times greater than distance between M_3 and Cu_1. All three anal veins well developed. A_1 terminates on alar margin almost at level of midpoint of distance between Cu_1 and Cu_2.

Color and structure of middle legs similar to *A. hungaricellum* Zll.

Male genitalia (Figure 136, A). Valvae with smalll projection below tip, on ventral margin; apex of valvae rounded; length of valvae (with-
217 out pedicel) three times greater than width in basal part. Uncus in lateral view broad, with pointed apex and sharply narrow base; base of each lobe on dorsal side with small process. Aedoeagus five-sixths total length of valvae with lobate process covered with coarse spines below



216 Figure 136. Genitalia of male *Ateliotum cypellias* Meyr.

A—general appearance (lateral view), B—saccus* (ventral view); C—apex of aedoeagus (higher magnification).

Preparation No. 8482, male. Dagestan.

*Misprint in Russian; should read "vinculum"—General Editor.

tip (Figure 136, C). Vinculum broad (Figure 136, B) on lower side, with deep outer notch in place of saccus. Tegumen in dorsal view with rounded notch along anterior margin.

Female genitalia (Figure 137). Posterior margin of vaginal plate sclerotized, pyramid shaped with obtuse apex covered with bristles. Anterior apophyses almost reach anterior margin of sternite VII; posterior apophysis do not reach segment VII.

Comparison. On the basis of general appearance and wing color and pattern, very similar to *A. hungaricellum* Zll., but readily distinguished from it and other species of the genus by peculiarity of genital structure. Subapical appendage of aedoeagus broad, long, and extends up to two-thirds of apical part of aedoeagus; apices of branches of vinculum in ventral view arcuate and pointed; valvae narrow, their length five times

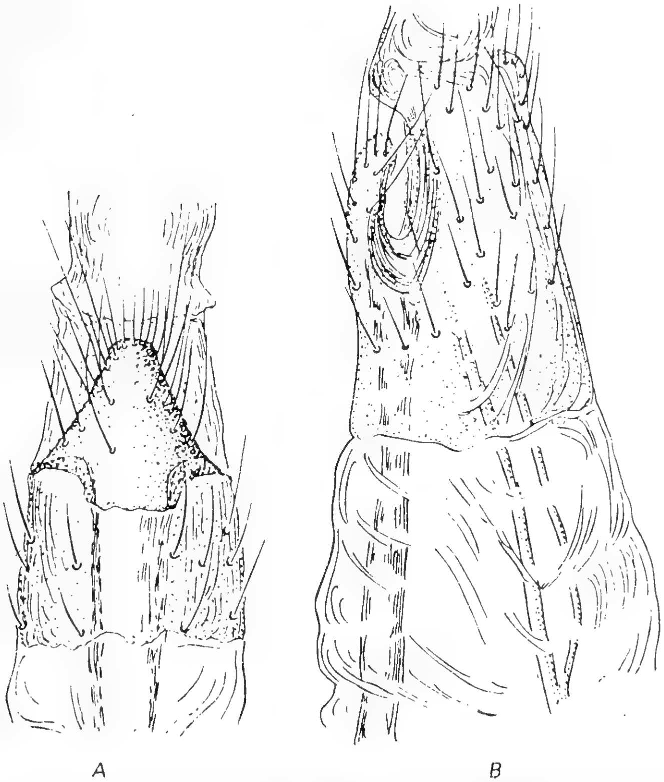


Figure 137. Region of vaginal and prevaginal plates of *Ateliotum cypellias* Meyr.

A — ventral view; B — lateral view.

Preparation No. 11163, female. Trans-Caucasus, Talysh.

width in adult males. In females posterior margin of vaginal plate conical.

Distribution. Caucasus and Trans-Caucasus. Asia Minor (Figure 130).

218 *Material examined.* 6 males and 1 female.

Dagestan. Makhachkala (Petrovskii Port), one male July 28, 1926, on light (N. Filip'ev), holotypus, gen. preparation. No. 8482, male. Specimen with two original labels 8.0 mm × 18.0 mm: one inscribed "Petrovskii Port, Dagestan, on light, 28 VII 1926, Ryabov," and the other with inscription in black ink "*Saridocomposa cypellias* Meyrik".

Ajerbaidzhan. Kuba, one male July 23, 1962 (Zagulyaev); Talysh, Zuvand Trough, Kosmol'yan, one male and one female August 4, 1962 (Zagulyaev); Dzhul'fa, one male October 12, 1931 (Ryabov).

Turkey. Kazikoporan, two males August 8, 1882 (Christoph).

Biology. Species associated with arid regions, primarily stony slopes. In Azerbaidzhan moths were caught in August and October in the evening at sunset and during the night on light. This species produces two generations per year, or possibly three, in the Nakhichevan plateau.

3. **Ateliotum taurensis** Zag. (Figures 130; 131; 138–140; Plate VI, *4*)

Zagulyaev, 1966a: 156–158; Petersen, 1968: 54.

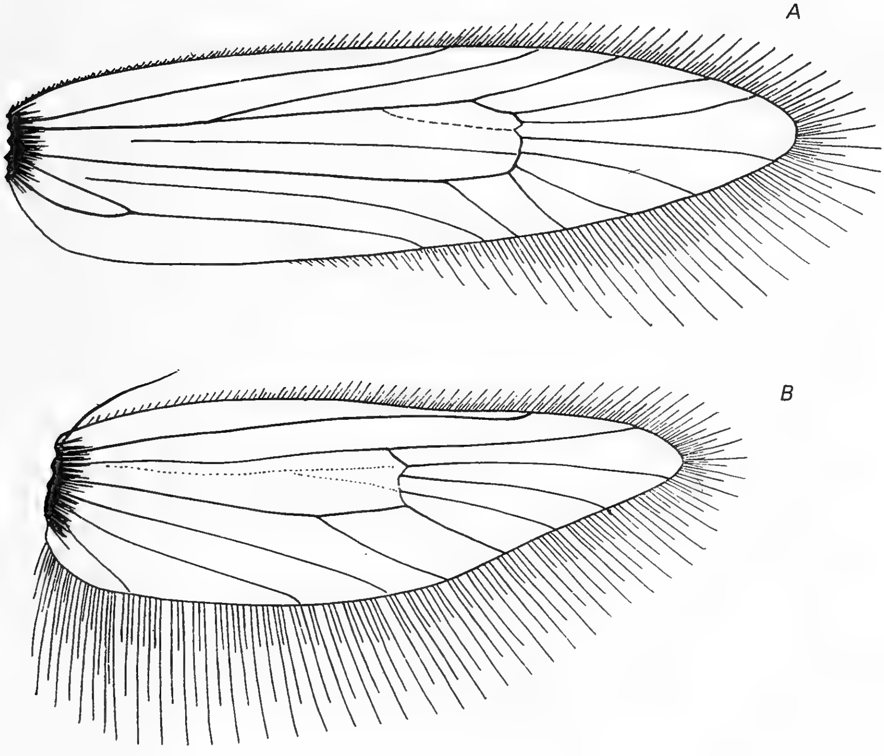
External characters of imago. Pubescence of head light ash-colored with bundles of blackish scales on frons between antennae. Labial palpi cinnamon-gray, with same color all along brush of scales on 2nd segment; terminal half of 3rd segment light yellow.

Thorax and tegulae light gray. Span of forewings in males 14 mm. Length of forewings 3.75 times, of hind wings 3.0 greater than width; fringe of both equal to two-thirds width of wing.

Forewings (Plate VI, *4*) light ash-colored, speckled brown or gray. Anterior margin with eight to nine oblique streaks. Dark stripe passes along inner margin from base of wing and farther along fold. Two large oblong spots located crosswise before midpoint of wing; spot at apex of radiocubital cell distinct. Minute streaks located along inner margin, which subsequently fuse into dark stripe along outer margin before fringe of wing. Fringe yellowish to ash-colored, with streaks and granulation of darker color. Hind wings and fringe light gray with slight yellowish tinge. Under surface of all wings light cinnamon-gray with oily sheen.

In forewing (Figure 138, A) distance between bases of R_1 and R_2. almost six times greater than distance between bases of R_2 and R_3. Terminus of R_5 1.5 times farther from alar apex than terminus of M_1.

Base of branch M_3 closer to base of Cu_1 than M_2. Distance between bases of Cu_1 and Cu_2 almost 1.5 times greater than distance between bases of R_2 and R_3. Fork of A_{2-3} twice shorter than common trunk. In hind wing (Figure 138, B) anterior margin convex before midpint. Terminus of R almost three times farther from alar apex than terminus of M_1. Distance between bases of Cu_1 and Cu_2 five to six times greater than distance between bases of M_3 and Cu_1. All three anal veins present.

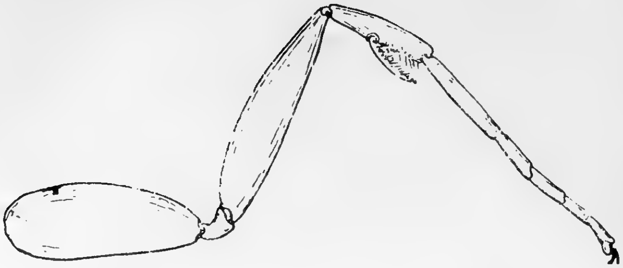


219 Figure 138. Venation of wings of *Ateliotum taurensis* Zag.

A—forewing, B—hind wing.

Preparation No. 74, male. Turkey (collection of Caradja, Bucharest).

Legs yellowish-gray with light-colored rings at ends of tibiae and tarsal segments. Anterior tibiae equal in length to lst tarsal segments (Figure 139).



219 Figure 139. Foreleg of *Ateliotum taurensis* Zag.

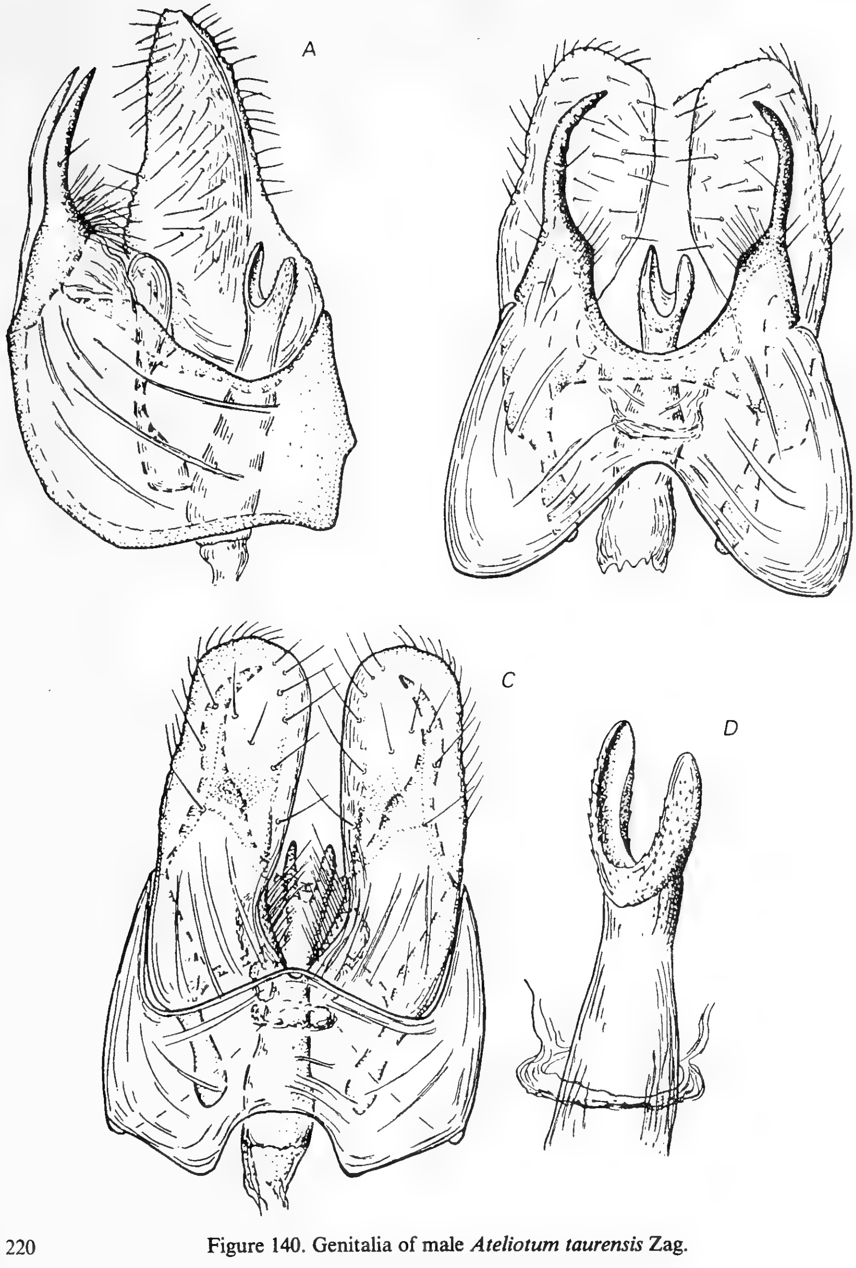
Preparation No. 74, male. Turkey (collection of Caradja, Bucharest).

Male genitalia (Figure 140, A). Valvae in lateral view with conically pointed apices, in ventral view with almost parallel sides and broad-rounded apices; length, excluding pedicel, 2.5 times width; costal margin of valvae dilated near base; membranous fold originates from apex along lower margin and is covered with bristles; lower margin poorly sclerotized, uneven, and covered with bristles. Uncus in lateral view narrow, long, and slightly bent; in dorsal view narrow pointed lobes of uncus wide-set at base, ends highly sclerotized, and basal part of lobes 219 with tufts of bristles (Figure 140, B). Poorly sclerotized, arcuate plate protrudes between lobes of uncus. Aedoeagus short, three-fourths length of valvae, bifurcate at end, and lobes covered with spinules (Figure 140, D). Vinculum broad, with broad deep notch at junction of saccus (Figure 140, C). Tegumen in dorsal view with deep broad notch along anterior margin.

Female. Not known.

220 *Comparison.* In general appearance this species is close to *A. syriacum* Car., but is slightly lighter in color and with sharper wing pattern; furthermore, middle spots distinctly larger. In forewing distance between bases of R_1 and R_2 six times greater than distance between bases of R_2 and R_3, and latter much less than distance between bases of 221 Cu_1 and Cu_2. Species readily distinguished by genital structure of male: uncus lobes in dorsal view wide-set at base and each lobe narrows abruptly before midpoint to form very long appendage; notch in anterior margin of tegumen very deep and continues beyond its midpoint; anterior margin of vinculum in ventral view with broad deep notch covering one-third its length; and so on. All these characters prove that this species cannot be considered a synonym of *A. syriacum* Car., as proposed by Petersen (1968).

Caradja (1930) in describing *Ateliotum syriacum* Car. had at his



220 Figure 140. Genitalia of male *Ateliotum taurensis* Zag.

A—general appearance (lateral view); B—same (dorsal view); C—same (ventral view); D—apex of aedoeagus (higher magnification).

Preparation No. 74, male. Turkey (collection of Caradja, Bucharest).

disposal two male specimens, one from Beirut and the other from Zeitoon (Turkey). On studying these type specimens, I discovered that they are not identical and belong to two different but closely related species. The name "*syriacum*," given by Caradja, was retained for the specimen from Beirut, and I have proposed the name "*taurensis*" for the male from Turkey.

Distribution. Asia Minor (Figure 130).

Material examined. 1 male.

Asia Minor. Turkey, Zeitoon, one male, holotypus, gen. preparation. No. 74, male (collection of Caradja, Bucharest). This specimen bears three original labels: one is long and narrow, 10.0 mm x 3.5 mm, with the inscription "Zeitoon"; the second is small with the number "340"; and the third is inscribed "male". In the collection of Caradja this specimen was labeled *Dysmasia syriacum* Car.

The presence of this species within the limits of the Soviet Union is possible, primarily in Trans-Caucasus.

Biology. Not known.

4. **Ateliotum syriacum** Car. (Figures 7, B; 8, B; 9, B; 11, C; 17, F; 130; 131; 141; 142

Caradja, 1920: 172–173 (*Dysmasia*); Petersen, 1957b; 559–560; 1959c: 158; 1969: 54.

External characters of imago. Pubescence of head light gray, on frons with brown tinge. Labial palpi pubescent, with gray scales; middle and terminal segments with black granulation; brush of bristles dense and reaches apex of 3rd segment.

Thorax and tegulae cinnamon-ash; tegulae toward front with dark chocolate-brown granulation. Span of forewings in males 14 mm. Length of forewings 3.75 times, of hind wings 3.0 times greater than width; fringe of hind wings slightly less than alar width.

Forewings yellowish-gray, with scattered chocolate-brown scales. Dark brown oblique streaks located around anterior margin. Two dark spots located in middle part of wing; more distinct one in first third of wing and the other in remaining two-thirds, i.e., almost at apex of radio cubital cell. Darkening from base of wing along fold distinct. Minute streaks present along inner margin. Dark marginal border passes along outer margin before fringe. Fringe cinnamon-gray. Hind wings and fringe light ash with brown tinge. Under surface of all wings yellowish-ash, with dense granulation and brown sheen.

In forewing (Figure 7, B) distance between bases of R_1 and R_2 almost three times greater than distance between bases of R_2 and R_3. Termina of R_5 and M_1 equidistant from alar apex. Base of M_3 equidistant from bases of M_2 and Cu_1. Distance between bases of Cu_1 and Cu_2 slightly less than distance between bases of R_2 and R_3. Fork of A_{2-3} one-third length of common trunk. In hind wings (Figure 8, B) anterior margin slightly convex before midpoint. Terminus of R twice distance from alar apex than terminus of M_1. Distances between bases of Cu_1 222 and Cu_3 three to four times greater than distance between M_3 and Cu_1. A_2 absent or very poorly developed.

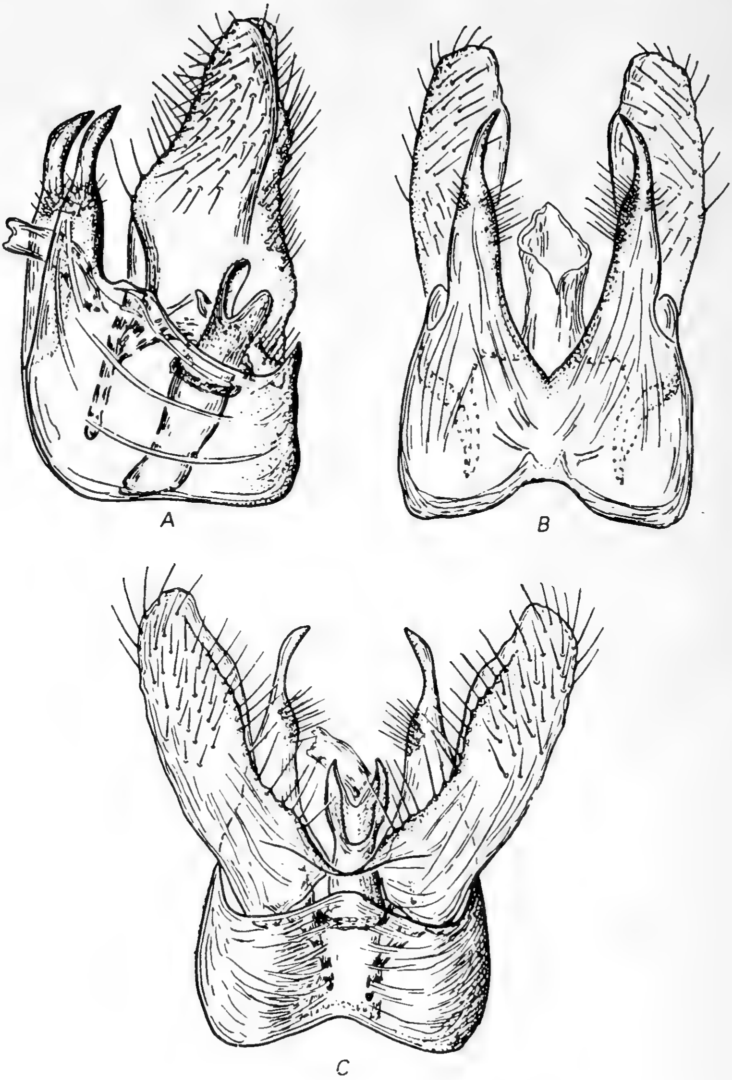
Legs ash-gray; tarsal segments on outer side cinnamon-gray with light-colored rings on ends. Median pair of spurs on hind tibiae located in middle of tibia. Foretibiae slightly longer than lst tarsal segments. Armature of fore- and hind legs as shown in Figures 9, B and 11, C.

Male genitalia (Figure 141, A). Valvae narrow beyond midpoint into conically rounded apex; costal margin dilated at base; membranous fold, covered with bristles, extends from apex toward base along 223 lower margin; lower margin poorly sclerotized, uneven, with bristles; length of valvae 2.25 times greater than width. Uncus in lateral view narrow, slightly curved, and pointed; in dorsal view narrow pointed lobes wedge-shaped at base and widely separate at ends. Lobes with tufts of bristles in middle (Figure 141, B). Slightly sclerotized curved plate discernible between lobes of uncus. Aedoeagus short, two-thirds length of lower margin of valva, and bifurcates at upper end into two wide-set, troughlike lobes covered with minute spinules (Figure 17, F). Vinculum broad, with weak notch in place of saccus (Figure 141, C). Tegumen in dorsal view with weak notch in middle of anterior margin.

Female of this species not examined by me and hence description of its genitalia taken from Petersen (1959c).

Female genitalia (Figure 142). Posterior margin of vaginal plate more arched than in *A. hungaricellum* Zll.; bristles located along posterior margin and not midpoint of surface. Poorly sclerotized triangular plates located on both sides at base of vaginal plate.

Comparison. On the basis of totality of characters *A. syriacum* is closer to *A. taurensis* Zag. than to *A. hungaricellum* Zll., but distinguished from both by these characters: In forewing distance between bases of R_1 and R_2 three times more than distance between R_2 and R_3, which is distinctly more than distance between bases of Cu_1 and Cu_2. In male genitalia lobes of uncus in dorsal view close-set at base and each lobe narrows beyond midpoint into short appendage; notch on anterior margin of tegumen small, equal to about one-third its length; anterior margin of vinculum in ventral view with relatively shallow notch equal to one-fourth its length; and so on. Characters of the genitalia definitely distinguish *A. syriacum* from other members of the genus and especially from *A. taurensis* Zag., with which it was combined (Petersen, 1968). Female genitalia characterized by highly arcuate posterior mar-



222 Figure 141. Genitalia of male *Ateliotum syriacum* Car.

A — general appearance (lateral view); B — same (dorsal view); C — same (ventral view).

Preparation No. 73, male. Beirut (collection of Caradja, Bucharest).

gin of vaginal plate and arrangement of bristles along posterior margin.

Distribution. Northwest Asia: Syria, Palestine (Figure 130). Also known from Lebanon. Beirut (type) (Caradja, 1902); Palestine: Haifa, one male May 7, 1930 (Petersen, 1957b).

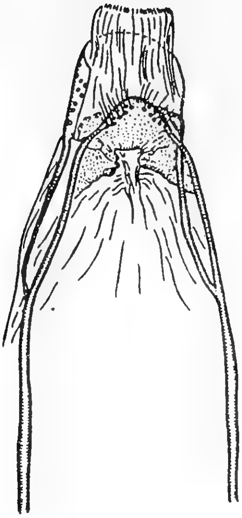


Figure 142. Female genitalia of *Ateliotum syriacum* Car. (from Petersen, 1959c).

Material examined. 1 male.

Northwest Asia. Lebanon, Beirut, one male (type) (collection of Caradja, Bucharest). Type specimen bears original, bordered rectangular label (6.5 mm × 5.0 mm) with the inscription "Beyrut".

Biology. Not studied. Moths collected mid-May, north of Beirut; one male May 11, 1963 (Petersen, 1968).

5. **Ateliotum petrinellum** H.-S. (Figures 22, A; 130; 131; 143–147)

Herrich-Schäffer, 1853: abb. 633; 1854: V, 80 (*Dysmasia*); Stainton, 1869: 239 (*Dysmasia*); Staudinger and Rebel, 1901: II, 241 (*Dysmasia*); 224 Spuler, 1910: II, 458 (*Dysmasia*); Gregor and Povolny, 1955: 122, Fig. 40 (*Dysmasia*); Petersen, 1957b: 560–561; 1959c: 158; 1960b: 206–207; 1962: 206; —*turatiella* Milliere, 1885: 111 (*Tinea*); 1886, Pl. 1, Fig. 10 (*Tinea*); Rebel, 1896: 126; Staudinger and Rebel, 1901: II, 237 (*Tinea*); Spuler, 1910: II, 459 (*Tinea*); Caradja, 1920: 169 (*Tinea*); Zerny, 1927: 485 (*Tinea*); Reisser, 1933: 296 (*Tinea*); Zerny, 1935: 156 (*Dysmasia*).

Biology. Petersen, 1964b: 396; Parenti, 1965; 311; 1966: 290; Petersen, 1967: 357.

External characters of imago. Head covered with yellowish-gray hairs, with orange tinge on frons, and distinct gray tinge on vertex; 2nd segment of labial palpi cinnamon-gray, with dense yellowish to chocolate brown cluster of scales almost reaching apex of 3rd segment; basal half of 3rd segment brown, outer half yellowish.

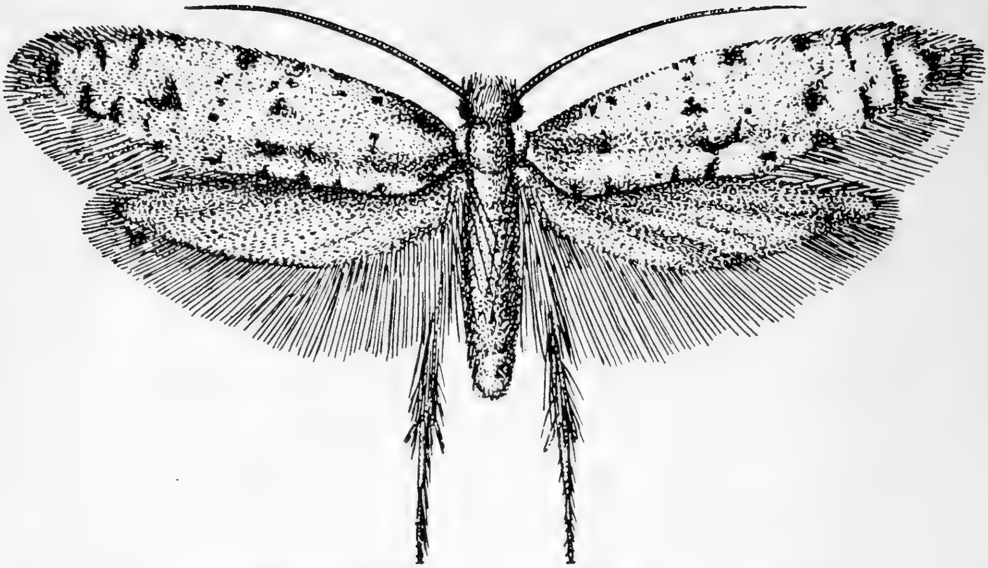


Figure 143. *Ateliotum petrinellum* H.-S., male. France (drawn by T.A. Temkina).

Thorax and tegulae toward front cinnamon-gray, lustrous. Span of forewings in male 16 to 17 mm, in female 17 mm. Length of forewings 3.5 times, of hind wings 3.0 times greater than width; hind fringe equal to two-thirds width of hind wing.

Forewings yellowish to light gray, with brownish or reddish tinge, and dense large and minute punctation; six spots quite large (Figure 143). First longitudinal spot situated near base of forewing; second and third spots located one above the other near base of wing; fourth and fifth spots also one above the other in first third of wing; sixth spot located at apex of radiocubital cell. In addition, five small patches discernible along anterior margin near almost midpoint, which continue into alar apex. Hind wings yellowish-gray with oily sheen and slight bronze hue; fringe same tone as wing. Under surface of wings cinnamon-gray, with violet tinge.

In forewing (Figure 144, A) distance between bases of R_1 and R_2 five times more than distance between bases of R_2 and R_3. Termina of R_5 and M_1 equidistant from alar apex. Base of branch M_3 much closer to base of M_2 than to base of Cu_1. Distance between bases of Cu_1 and 225 Cu_2 slightly more than distance between bases of R_2 and R_3. Fork of A_{2-3} slightly shorter than common trunk. On hind wing (Figure 144, B) anterior margin with small bulge in first third of wing. Terminus of branch R three to four times farther from alar apex than terminus of M_1. Distance between bases of Cu_1 and Cu_2 two to three times greater

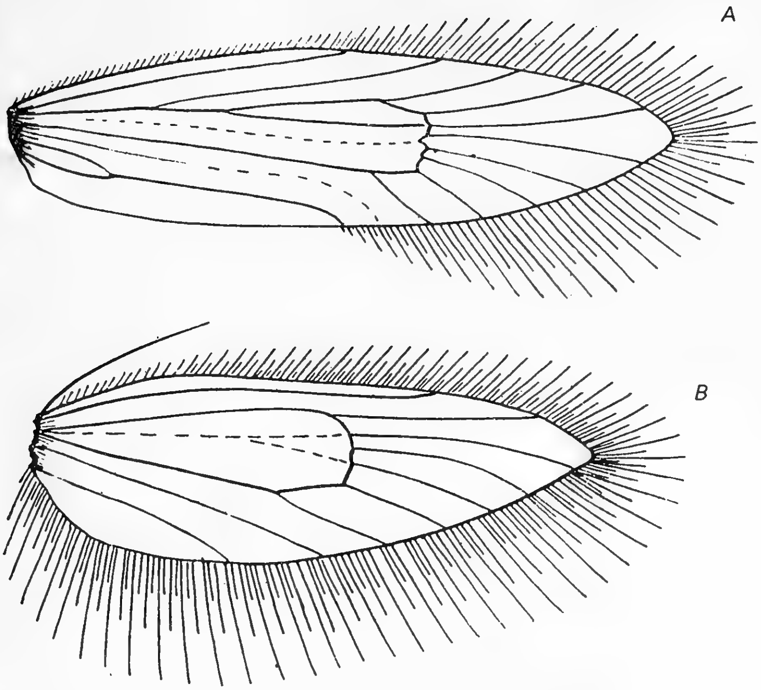


Figure 144. Venation of wings of *Ateliotum petrinellum* H.-S.

A—forewing, B—hind wing.

Preparation No. 11177, male. France.

than distance between M_3 and Cu_1. A_3 not developed.

Legs cinnamon-gray, with bright light-colored rings at ends of tibiae and tarsal segments. Foretibiae almost equal to 1st tarsal segments (Figure 145).

Male genitalia (Figure 146, A, B). Valvae medium in size; length 2.25 to 2.20 width; fairly deep broad subapical notch on ventral apex almost flat and highly incurved; inner side of valvae with sparse brush of short bristles. Uncus in lateral view on dorsal side with sharp, almost rectangular process; lower part of uncus elongated, with obtuse apex, and covered with bristles; in dorsal view lobes of uncus wide-set, obtuse, with highly sclerotized processes located at base of each lobe on inner side. Aedoeagus narrow; relatively long, 1.5 length of valvae; apex of aedoeagus covered with minute spinules. Base of aedoeagus broad. Vinculum broad toward front with two string wide-set processes (Figure 146, C). Tegumen with deep broad notch.

227 *Female genitalia* (Figure 147). Vaginal plate very long, its posterior

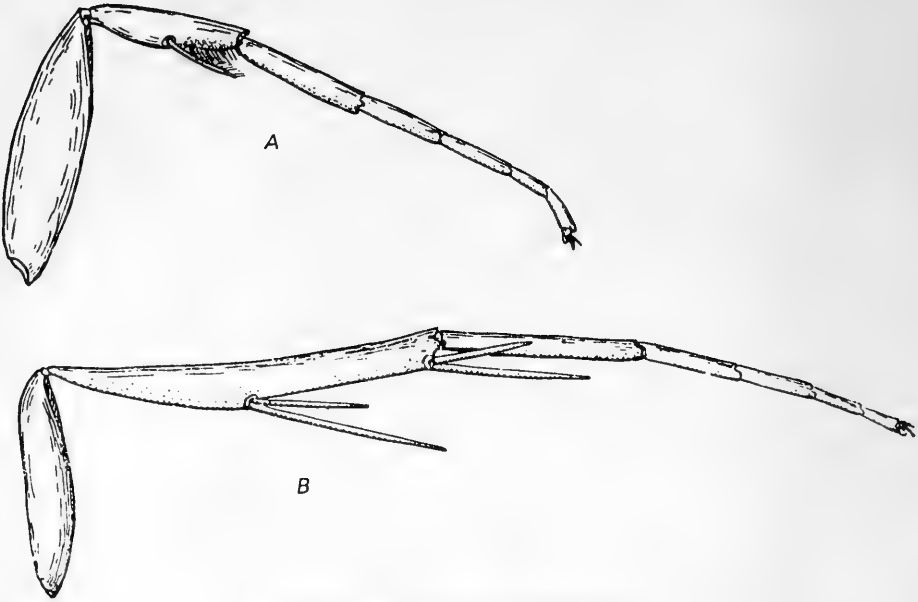


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Figure 145. Legs of *Ateliotum petrinellum* H.-S.

A—foreleg, B—hind leg.

Preparation No. 11177, male. France.

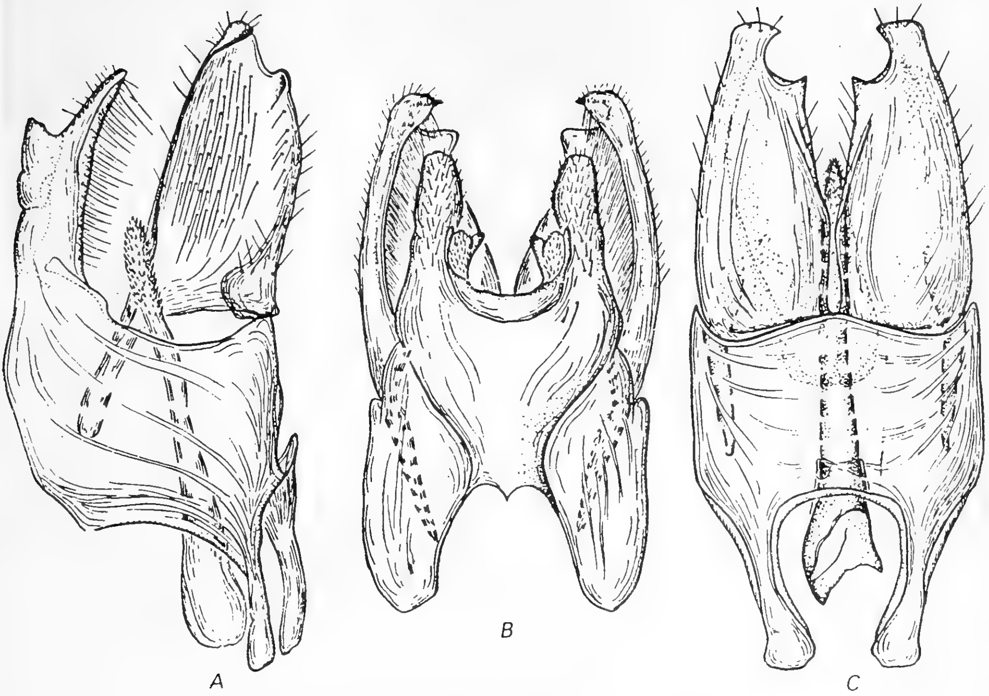
margin with deep notch which forms small lobes; lobes pigmented and covered with bristles.

Larva. Structure of thoracic legs as shown in Figure 22, A.

Comparison. This species is close to *A. arabicum* Pet. and *A. insulare* Rbl., but differs as follows: Yellowish-gray wings with brownish tinge, and darker dense punctation, of which six spots quite large (four located one above the other). Male genitalia: valvae with subapical notch, uncus with rectangular obtuse protuberance, and aedoeagus with slender, narrow apex. Female genitallia: vaginal plate with deep notch along posterior margin.

I examined two males from the collection of Caradja (Bucharest) identified as "*Tinea turatiella* Mill." Their wing pattern and color correspond completely with the drawing and description of *Dysmasia petrinella* H.-S. (Herrich-Schäffer, 1853, 1854) and the drawing of *Tinea turatiella* Mill. (Milliere, 1886).

Milliere (1885) in his description of "*turatiella*" included it in genus *Tinea* L. and considered it close to *corticella* Curt. (*Nemaxera* Zag.) and *parasitella* Hb. (*Triaxomera* Zag.). However, even Rebel (1896) showed that "*Tinea turatiella* Mill." should be included under *Dysmasia* H.-S.



226 Figure 146. Male genitalia of *Ateliotum petrinellum* H.-S.

A—general appearance (lateral view), B—same (dorsal view); C—same (ventral view).

Preparation No. 11177, male. France.

On the basis of my studies I, like Petersen (1957b), I am inclined to consider "*Tinea turatiella* Mill." a synonym of *Ateliotum petrinellum* H.-S.

Subspecies *A. petrinellum orientale* Pet., described by Petersen (1973) from the environs of Kabul, differs from the nominative subspecies *A. petrinellum petrinellum* H.-S. in a slightly curved and narrower aedoeagus with poorly developed spinules at the apex. The new subspecies is probably endemic to Afghanistan.

Distribution. Southern Europe, northern Africa, Asia Minor, and Northwest Asia (Figure 130).

In literature, indicated from France (Parenti, 1965); Switzerland: Zurich (Herrich-Schäffer, 1853–1855); northern and central Italy (Milliere, 1885; Petersen, 1957b, 1962); Spain: Aragon (Petersen, 1957b), Teruela (Petersen, 1967), Castille (Caradja, 1920), northern Spain (Spuler, 1910, as *Tinea turatiella* Mill.); Morocco (Zerny, 1935, as *Tinea turatiella* Mill.); Turkey (Petersen, 1959c); Afghanistan: Kabul

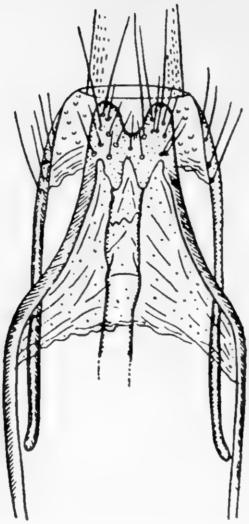


Figure 147. Genitalia of female *Ateliotum petrinellum* H.-S. (from Petersen, 1957b).

(Petersen, 1973, as *A. petrinellum orientale* Pet.).

Material examined. 10 males.

Southern Europe. Southeastern France, Bize, six males (collection of Caradja, Bucharest) as *Dismasia petrinella* H.-S.; Digne, one male June–July, 1901 (collection of Caradja, Bucharest, as *Tinea turatiella* Mill.). Spain, Murasia, two males May 28, 1965 (collection of Institute of Zoology, Academy of Sciences of the USSR); Castille, Cuenca, one male June, 1906 (Korb, collection of Caradja, Bucharest, as *T. turatiella* Mill.).

The occurrence of this species within the limits of the Soviet Union is possible (but not in Trans-Caucasus).

Biology. A Mediterranean species which prefers dry places and has adapted to elevated areas. Moths emerge from end of May to end of 228 August. In southeastern France moths were caught at the end of June at an elevation of 900 m, and in Italy in Apenni one male was caught at the end of July at an elevation of 1,500 to 2,000 m (Petersen, (1962). In the lower regions of Italy moths were found from June 20 to August 2 (Parenti, 1965). Moths were found in Spain in different regions. In the environs of Hellin two males were caught at an elevation of 577 m on May 25, 1927 and in Madrid at about the same elevation in mid-June; in Murasia, two males were caught at an elevation of 944 to 1,579 m on May 25, 1927, and in Albarracin one male found at an elevation of 1,162 m in June, 1924 (Petersen, 1960b). In Catalonia moths were caught on August 20,

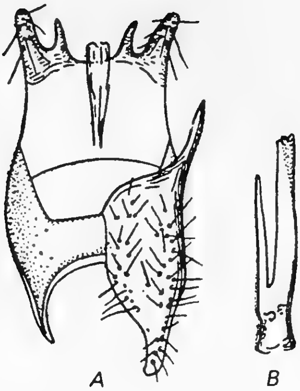


Figure 148. Male genitalia of *Ateliotum arabicum* Pet.

A—general appearance (ventral view); B—aedoeagus (from Petersen, 1961).

and in Albarracin between August 18 and 22, 1960 (Petersen, 1964). In Aragon moths flew to light at the end of June to the beginning of July (Zerny, 1927). In Turkey, in the region of Pontes, a few specimens were caught August 30. In Afghanistan, 18 to 22 km east of Kabul, at an elevation of 1,650 to 1,700 m, seven males were caught between June 5 and 25, which were described by Petersen as subspecies *A. petrinellum orientale* Pet. (Petersen, 1973).

Most probably this species produces two generations per year.

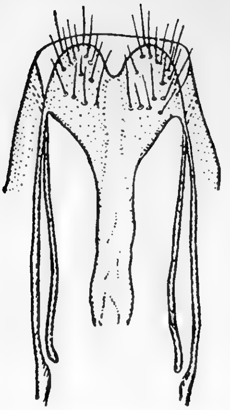
6. **Ateliotum arabicum** Pet. (Figures 130; 131; 148; 149)

Petersen, 1961a; 65; 1963c: 180; 1966: 27, 29.

External characters of imago. Pubescence of head light chocolate-brown, with whitish to light gray tinge. Thorax and tegulae light gray. Span of forewings 10 to 16 mm.

Forewings light cinnamon-white with scattered groups of dark brown scales. Fringe almost white. Hind wings light in color, lustrous, with light brown fringe.

Male genitalia (Figure 148, A). Valvae from base to midpoint with almost parallel margins; thereafter lower margin curves sharply toward apex and valva near apex narows and elongates; length of valvae more than 2.5 width; valvae without sclerotized processes and spinescent 229 armature. Uncus in dorsal view with wide-set lobes, with one highly sclerotized process at base. Aedoeagus small, equal to or slightly longer than valvae; from about one-third its length a slender sclerotized appendage originates, which does not reach apex of aedoeagus (Figure 148, B). Vinculum broad, with two widely separated processes.



228 Figure 149. Female genitalia of *Ateliotum arabicum* Pet. (from Petersen, 1963c).

Female genitalia (Figure 149). Vaginal plate broad, with notch on posterior margin, and entirely covered with long bristles. Abdominal branch of anterior apophysis almost straight. Terminus of duct of bursa copulatrix broad, with constrictions.

Comparison. In general appearance and structure of male genitalia this species is close to *A. petrinellum* H.-S. and *A. insulare* Rbl., but differs from former in presence of longer processes on uncus lobes and from latter in simple valvae without armature. It is readily distinguished from both species by long appendage originating almost from base of aedoeagus. In female genitalia it differs from *A. petrinellum* H.-S. in almost straight abdominal branch of anterior apophysis and presence of notch on posterior margin of vaginal plate.

No specimens examined by me.

Distribution. Iran, Afghanistan, and southern Arabia (Yemen) (Figure 130).

In literature, indicated from Iran: Baluchistan (Petersen, 1966); eastern Afghanistan: Sarobi (Petersen, 1963c): Yemen (Petersen, 1961a).

The occurrence of this species is possible within the limits of the Soviet Union, primarily in the southern regions of Central Asia.

Biology. Desert xerophilous species. In Baluchistan two males were found in December, 1937 (Petersen, 1966). East of Kabul (Sarobi) two males and three females were caught from May 30 to September 27, 1961 (Petersen, 1963c). In Yemen, Sańa region, one male was caught on January 31, 1938 (Petersen, 1961a).

7. **Ateliotum insulare** Rbl. (Figures 130; 131; 150–154)

Rebel, 1896; 125–126 (*Dysmasia*); Staudinger and Rebel, 1901: II, 241 (*Dysmasia*); Caradja, 1920: 172 (*Dysmasia*); Petersen, 1957b: 561–562; 1959c: 158; 1960b: 207.

External characters of imago. Head covered with light ash-gray hairs, on occiput with weak brown tinge. Pubescence of frons covers basal segment of antennae. Labial palpi long, length almost twice diameter of eyes, thick, and covered with long brush of cinnamon-gray scales, length of which almost equal to middle segment of palpi and hence the brush perceptibly extends beyond apex of 3rd segment; 3rd segment of labial palpi subulate, in basal third brown, in terminal part light-colored, and protrudes horizontally in relation to brush of bristles of 2nd segment.

Thorax and tegulae light gray on upper side. Span of wings in male 13 mm. Length of forewings 3.66 times, of hind wings 3.25 times width; hind fringe slightly shorter than alar width.

Forewings appear cinnamon-powder-gray because of uniform dense dark brown granulation. Granulation denser in fold and also forms three spots of irregular shape, which in most cases are not well defined; first spot located in first third but closer to posterior margin, and other two spots in distal two-thirds of wing (Figure 150). Base of forewing darkened, with seven to eight streaks along anterior margin; rectangular spot, not always sharply demarcated, located in region of fringe. Matte 230 dark spots discernible against uniform background of fringe. Hind wings fairly dark gray with distinct violet sheen; fringe cinnamon-gray.

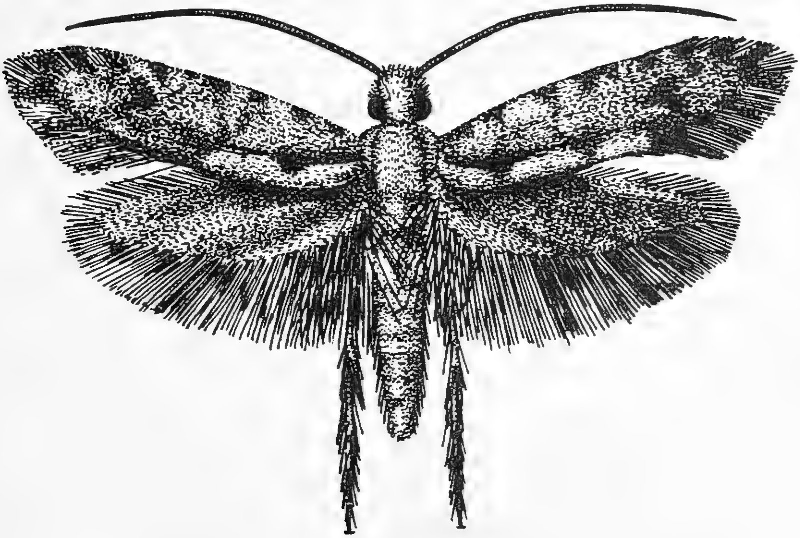
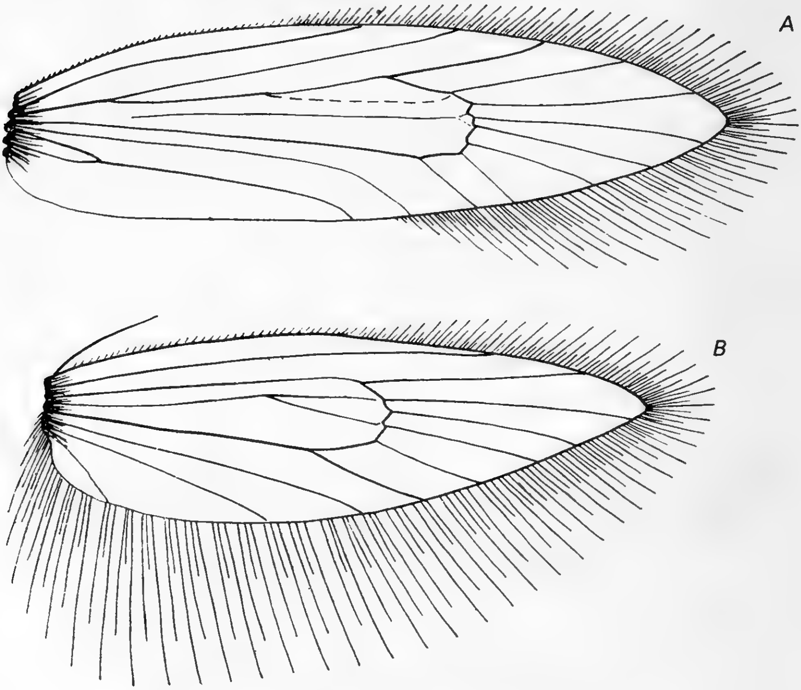


Figure 150. *Ateliotum insulare* Rbl., male. Tenerife (drawn by T.A. Temkina).

Under surface of all wings dark gray with dark violet sheen.

In forewing (Figure 151, A) distance between bases of R_1 and R_2 four times greater than distance between bases of R_2 and R_3. Terminus of R_5 only slightly farther from alar apex than terminus of M_1. Base of branch M_3 distinctly closer to base of Cu_1 than to base of M_2. Distances between bases of Cu_1 and Cu_2 two-thirds distance between R_2 and R_3. Fork of A_{2-3} two-fifths of common trunk. In hind wing (Figure 151, B) anterior margin convex in middle. Terminus of R situated three to four times farther from alar apex than terminus of M_1. Distance between bases of Cu_1 and Cu_2 four times greater than distance between bases of M_3 and Cu_1. All three anal veins developed.



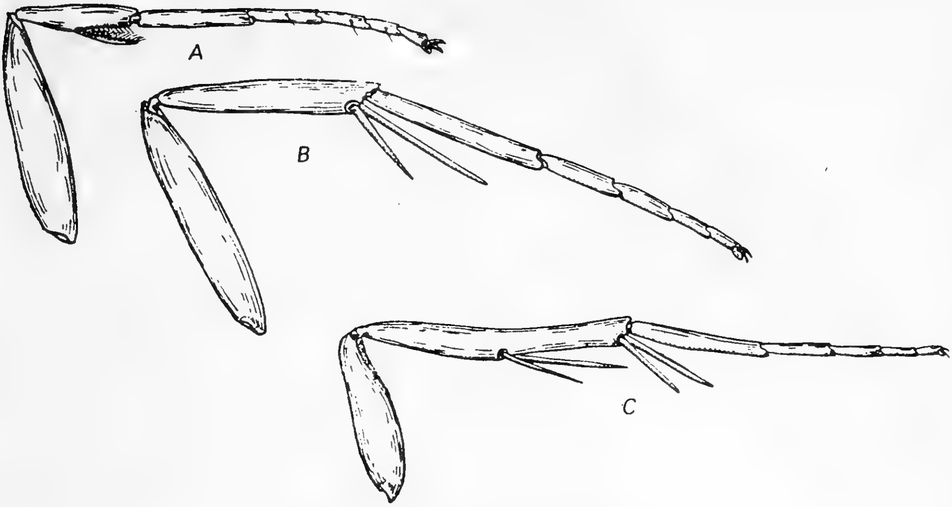
231 Figure 151. Venation of wings of *Ateliotum insulare* Rbl.

A—forewing; B—hind wing.

Preparation No. 42, male. Tenerife.

Fore- and middle legs cinnamon-gray, with light-colored bands at ends of tibiae and tarsal segments. Pubescence of hind legs light gray. Anterior tibiae almost equal in length to 1st tarsal segments. Structure and armature of legs as shown in Figure 152.

Abdomen light gray; anal tuft uniform ash-gray.

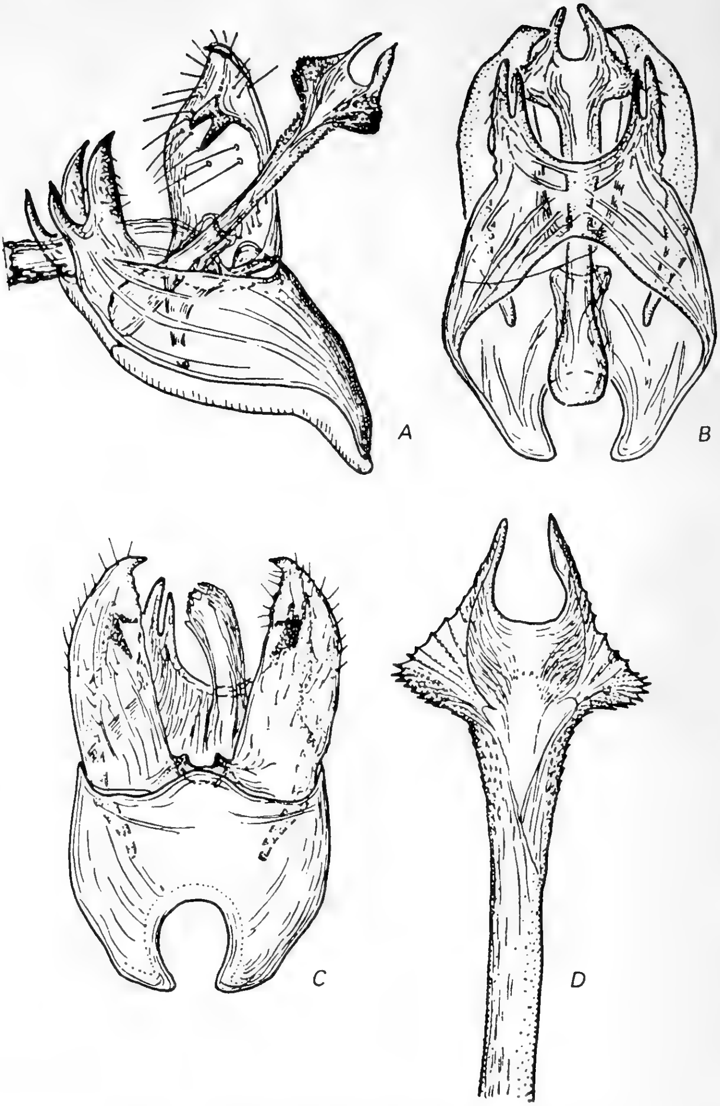


231 Figure 152. Legs of *Ateliotum insulare* Rbl.
A—foreleg; B—middle leg; C—hind leg.
Preparation No. 42, male. Tenerife.

Male genitalia (Figure 153, A). Valvae with pointed and incurved apex; length more than twice width; in apical half two large blunt dentate spines situated on longitudinal fold, which originate from common base and are directed toward base of valva; upper tooth shorter than lower one (Figure 153, A, C); lobate process originates from base of valva. Uncus in lateral view broad and pointed; each lobe on upper side with strong, pointed, cornuate process (Figure 153, A, B); in ventral view lobes of uncus widely separate. Aedoeagus long, slender, 1.5 times longer than valvae; apex broad and bifurcates into two wide-set lobes, which are covered with minute spinules (Figure 153, D). Vinculum with deep U-shaped notch in middle of anterior margin, so that two separate obtuse ends form. Tegumen with shallow notch in middle.

232 *Female genitalia* (Figure 154). Posterior margin of vaginal plate with deep notch so that lobes well developed. Lobes of vaginal plate double, their outer margins covered with bristles. Abdominal branch of anterior apophysis slightly bent. Ostium bursa slightly sclerotized.

Comparison. In general appearance this species closely resembles *A. consfusum* Pet. and *A. arabicum* Pet., but is readily distinguished on the basis of male genitalia: valvae on inner side with two strong dentate
233 spines; uncus short, each lobe on upper side with thick, acute process; apex of aedoeagus divided into two alate lobes; aedoeagus itself straight, long, slender; notch on vinculum deep, but does not reach its midpoint. In female genitalia, lobes of vaginal plate doubled.



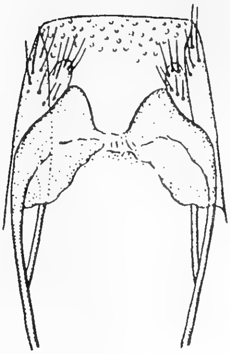
231 Figure 153. Genitalia of male *Ateliotum insulare* Rbl.

A—general appearance (lateral view); B—same (dorsal view); C—same (ventral view); D—apex of aedoeagus (higher magnification).

Preparation No. 42, male. Tenerife (collection of Caradja, Bucharest).

Distribution. Spain. Canary Islands and islands of the Mediterranean Sea (Figure 13).

Rebel (1896) indicated that two males were caught in Orotova,



232 Figure 154. Region of vaginal plate in female *Ateliotum insulare* Rbl. (from Petersen, 1960b).

Tenerife on April 18 and 19, 1895 by Hedemann. In Spain (Chiclana) one male caught on May 3 (Petersen, 1959c) and from Barcelona two males and three females in August, 1956 (Petersen, 1960b). From Sicily one male known (Petersen, 1957b).

Material examined. 1 male.

Canary Islands. Tenerife Island, Orotova, one male, holotypus, April 19, 1895 (Hedemann, collection of Caradja, Bucharest), identified by Rebel as *Dysmasia insularis* Rbl. Specimen with two original labels: one small (6.0 mm × 3.5 mm), yellowish-gray, with inscription in black ink "Orotova Tenerife 19. IV. 95"; other light-colored label larger in size (10.0 mm × 5.5 mm), with inscription in red ink "*Dysmasia Insularis* Rbl. 95. Type".

8. **Ateliotum confusum** Pet. (Figures 130; 131; 155)

Petersen, 1966: 25–27.

External characters of imago. Color of head and its appendages not known. Span of forewings 12.5 mm. Forewings yellowish-whitish (cream color) with dark brown spots, as in other species of the genus, but without definite pattern.

Venation of wings and structure of legs not known.

Male genitalia (Figure 155). Valvae short, triangular in shape, with obtuse apex; length twice width; large tooth situated before apex (Figure 155, B); base of valva without locate process. Uncus in lateral view broad, each lobe with one thick process; in ventral view lobes wide-set (Figure 155, A). Aedoeagus more than 1.5 times length of valvae slightly bent near tip, which is covered with minute spinules (Figure 155, C). Vinculum with deep U-shaped notch in middle of anterior margin; two pointed ends well developed.

Female. Not known.

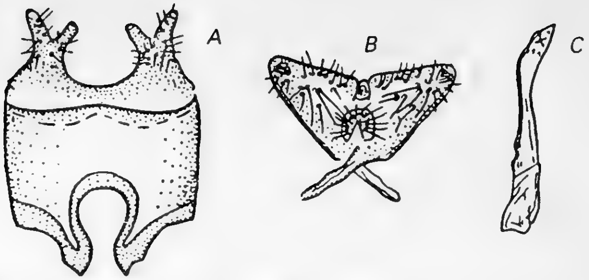


Figure 155. Genitalia of male *Ateliotum confusum* Pet. (from Petersen, 1966).

A—uncus and vinculum (ventral view); B—valvae; C—aedoeagus.

Comparison. On the basis of structure of male genitalia this species is close to *A. insulare* Rbl., but differs in short valvae, curved aedoeagus, and vinculum with deeper notch reaching its midpoint.

No specimens examined by me.

Distribution. Iran (Figure 130).

Iran, Fars, one male, type specimen, caught at height of 200 m on June 5, 1937 (Petersen, 1966).

Biology. Not known.

8. Genus *Eremicola* Ams.

Amsel, 1935a; 214; Petersen, 1957b; 562.

Type species. Eremicola semitica Ams., 1935.

In general appearance close to *Ateliotum* Zll.

Imago. On the basis of the first description and drawing published by Amsel (1935a), the following diagnosis of the genus is possible.

Pubescence of head whitish. Wings span in male 10 mm. Basic color of forewings whitish to ash with pattern in form of streaks and speckles.

Venation of forewings (Figure 156, A): R_1 terminates on alar margin almost at level of origin of branch R_2 from cell. M_2 and M_3 originate from common point. In hind wings (Figure 156, B) *Sc* terminates on anterior margin exactly at its midpoint. M_1 and M_2 located on long stem, which originates almost from same point as branch of *R*. A_1. terminates on posterior margin of wing before its midpoint. M_2 and M_3 at base located on short stem. Radiocubital cell almost three-fifths length of wing.

Distribution. Palestine (Figure 30).

Biology. Not known.

Comparison. In general type of venation this species is close to *Ateliotum* Zll., but differs in these respects: In forewings M_2 and M_3 originate from common point; in hind wings *Sc* terminates on anterior margin at exactly its midpoint and M_1 and M_2 located on long stem.

Genus consists of one species. *E. semitica* Ams.

1. **Eremicola semitica** Ams. (Figures 30 and 156)

Amsel, 1935a: 214–215; Petersen, 1957b: 562.

External characters of imago. Pubescence of head typical of genus. Labial palpi directed forward and pubescent with protruding scales on all sides; palpi on upper and inner side white, on lower side blackish. First antennal segment whitish, on upper side speckled with black dots; 2nd segment whitish-gray, without pattern.

Thorax and tegulae whitish-gray; tegulae on upper side with black scales forming triangle.

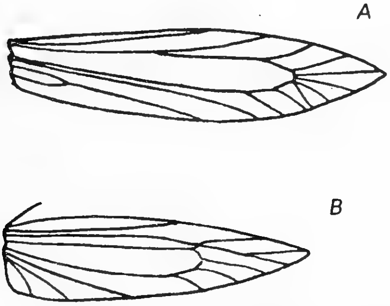


Figure 156. Venation of wings *Eremicola semitica* Ams. (from Amsel, 1935a).

A—forewing; B—hind wing.

Forewing whitish with dark markings. Short, broad, whitish streak located near base of anterior margin. Broken diffused stripe of dark 235 scales located almost in middle of wing. Dark streaks located along outer margin form interrupted streak that continues onto fringe. Few yellowish-brown scales located in middle of wing. Fringe whitish with brownish-black interrupted streak in middle and dark scales at apex. Hind wings uniformly whitish-gray. Fringe light-colored, without pattern. Under surface of both pairs of wings dark, without pattern.

Comparison. In general appearance, as indicated by Petersen (1957b), resembles a species of genus *Ateliotum* Zll. However, the specimen examined had no abdomen and hence the genitalia of this species are not known.

No specimens examined by me.

Distribution. Palestine. One male caught south of the Dead Sea between March 15 and 27, 1933 (Amsel, 1935a) (Figure 30.)

Biology. Not known.

IV. Tribe MYRMECOZELINI Zag.

Zagulyaev, 1958: 920; 1968a: 219–220; Căpuşe, 1971: 234; — Perissomasticinae Gozmàny, 1965d: 117, type genus *Perissomastix* Warren and Rothschild, 1905: 33; Gozmàny and Vàri, 1973: 88–89; — Myrmecozelinae Gozmàny and Vàri, 1973: 125–126, type genus *Myrmecozela* Zeller, 1852.

Type genus. *Myrmecozela* Zll., 1852

Imago. Head covered with relatively short hairs which protrude in all directions. Galea and maxillary palpi developed in *Episcardia* Rag. and *Myrmecozela* Zll. (Figures 3, B, and 4, B). However, in several members of *Catabola* Durr. and *Cinnerethica* Ams. galea are absent. Antennae thick, smooth, with broad 1st segment with crest of long bristles; antennae usually equal to two-thirds to three-fourths length of forewing, rarely equal to, but in some members of *Catabola* Durr. longer than forewings.

Thorax and tegulae vary in color from white to dark brown, sometimes with violet or bronze hue. Span of forewings in most species from 13 to 30 mm. However, in some species, especially in *Catabola* Durr. and *Cinnerethica* Ams., males are small, from 7 to 11 mm. Fore- and hind wings elongated, usually with acute apex. Hind wings may be narrower than forewings (*Catabola* Durr.), equal to, or broader than forewings, in members of other genera.

Forewings and fringe uniformly white to yellowish-brown or cinnamon-ash-gray, without sharply developed pattern.

In forewings (Figures 7, D and 157, A) radial veins well developed in most members, usually widely separated at base and terminate on anterior margin; R_3 reduced only in isolated species of *Catabola* Durr. In many members of the tribe R_4 and R_5 stalked, and terminus of Cu_1 located near level of outer margin of radiocubital cell or slightly beyond it. In hind wings (Figures 8, D and 157, B) terminus of A_1 located at level of radiocubital cell, rarely somewhat before it.

Anterior tibiae in most members of *Catabola* Durr. and *Myrmecozela* Zll. without epiphyses (Figures 9, D and 183, A). Median pair of spurs of hind tibiae located before or middle of tibia. Ends of tarsal segments with three spinules, rarely without spinules (*Catabola* Durr.).

Terminus of abdomen in males with cluster of androconial scales, in females with sacs of silken hairs (Figure 13, B).

236 *Male genitalia*. In most members broad and compact (Figures 14, B, C, and 159). Valvae variable—from narrow and digitate (*Catabola*

Durr.) to broad and more or less rectangular (*Myrmecozela* Zll. and *Cinnerethica* Ams.; Figure 15, A); or valvae complex, consisting of poorly sclerotized abdominal and highly sclerotized dorsal lobes as observed in most members of *Episcardia* Rag. Sclerotized cord of valvae not developed (Figure 15, B). Uncus consists of two isolated and more or less widely separated lobes or cords, or lobes may fuse near apex (*Myrmecozela* Zll.). Gnathos absent. Aedoeagus slender, long, and arcuate (Figure 17, B), or short and thick, and in some members with narrow tip (*Episcardia* Rag.). Vinculum and tegumen may form a broad ring (*Episcardia* Rag., *Catabola* Durr.), or vinculum narrow as in members of other genera. Saccus very short and trough-shaped, or absent.

Female genitalia. Variable in structure (Figure 19, B, C). Vaginal plate may be entire in form of broad shield with various small processes or lobes (*Episcardia* Rag., *Catabola* Durr.), or it may be absent but a distinct pigmentation of membrane discernible (*Myrmecozela* Zll.). Duct of bursa copulatrix in most species without incrustation and only in some members of *Episcardia* Rag. with highly sclerotized armature (Figure 18, D–F). Bursa copulatrix either without signa (*Episcardia* Rag.), or with virgate signa (*Myrmecozela* Zll.). Anterior apophyses bifurcate and only in *Myrmecozela* Zll. simple. Posterior apophyses do not reach segment VII or slightly included in it.

Larva (Figures 21, 22, B). In most species mature larvae dirty white and about 15 mm long. Epicranial suture larger than frons. Setae IV to VI present on prestigmal plate of prothorax (Figure 21, B). Hook crochets on prolegs simple (Figure 22, B).

Biology. Species adapted to open landscapes: steppes, deserts. In the forests of Europe they occur in large glades and in fringes of forests. Moths emerge in spring, beginning of summer, and during autumn. In southern regions moths found in January–March. Time of emergence coincides with time of maximum humidity. Females lay eggs in small heaps on dead plant parts, stones, or forest litter. Eggs covered with silken fluff, which not only masks them, but also protects them from desiccation and direct solar rays. Larvae associated with dead parts of herbaceous plants and live in silken galleries in the turf of grasses. Certain species have been found in old anthills, nests of bumblebees, and termitaria. At the time of summer drought larvae probably enter dispause, which may continue for half the year or more. Species produce two to three generations per year.

Life history and behavior of most species not known.

Distribution (Figure 29). The area of distribution of this tribe in the Palearctic covers Europe (except Polar regions), Caucasus, Kazakhstan, Central Asia, northern Africa, Asia Minor, and Northwest Asia. Iran, Afghanistan, Pakistan and India extend it beyond the limits of the Palearctic. A few species and small endemic genera are known from the Nearctic. In other regions members of the tribe are most abundant in the Ethiopian region, and only very few described from the Neotropical and Australian regions.

Most of the members concentrate in the savannas of Equatorial Africa, providing a basis for assuming the presence of fairly ancient
237 centers of formation of the fauna of Myrmecozelini Zag. here.

On the basis of a series of characters, Myrmecozelini Zag. occupies a central position among other tribes of the subfamily and represents the richest group of species.

The type of venation, presence of androconial bundles at the apex of the male abdomen, and presence of sacs with silken fluff and signa in the bursa copulatrix of females, brings Myrmecozelini close to Hapsiferini Zag. It is also close to Rhodobatini Zag. and Cephimallotini Zag. in the absence of gnathos in the male genitalia. A series of individual structural peculiarities, including well-developed sacs with silken fluff in segment VII of females, indicate the known associations of Myrmecozelini Zag. with Ateliotini Zag. Thus from a phylogenetic point of view Myrmecozelini Zag. displays individual relations with all the tribes of the subfamily.

The generic composition of the tribe throughout the world still needs verification. The fauna of Myrmecozelini Zag. from the Palearctic includes five genera, of which three are represented in the fauna of the Soviet Union: *Episcardia* Rag., *Catabola* Durr., and *Myrmecozela* Zll. The other two genera (*Cinnerethica* Ams. known from Northwest Asia, and *Perissomastix* War. and Roth.) are distributed mainly in Equatorial Africa and only isolated species have been reported from the African Mediterranean. The last genus is not considered in the present book.

In terms of phylogeny the tribe represents a natural, but not monophyletic, group. Three major directions of morphological divergence are apparent. The first direction includes genus *Episcardia* Rag., the second *Catabola* Durr. and *Perissomastix* War. and Roth., and the third *Myrmecozela* Zll. and *Cinnerethica* Ams. In primitiveness of several characters they exhibit direct links, but these trends differ notably in specialized individuals. Most probably the latter species provided the basis of separation of some genera into an independent subfamily, for example *Perissomastix* War. and Roth. into Perissomasticinae (Gozmàny, 1965d, 1968), or genus *Episcardia* Rag. into a new tribe Episcardiini Cǎp. (Cǎpuşe, 1971). Separation of these genera from tribe Myrmecozelini Zag. lacks sufficient basis, however, as was mentioned in Part I of the present book (see section "Classification and Phylogeny"). Hence I have retained genera *Episcardia* Rag. and *Perissomas-*

tix War. and Roth. in tribe Myrmecozelini Zag.

The phylogenetic relations of the genera are depicted in Figure 34. Genera *Myrmecozela* Zll. and *Cinnerethica* Ams. are close to each other not only through a series of external characters, but also in structure of male genitalia: rectangular valvae, long and arcuate aedoeagus, narrow vinculum, and broad, very short saccus. Most probably these genera had a common ancestor. The genera *Catabola* Durr. and *Perissomastix* War. and Roth. (the latter includes 51 species, of which 49 are associated with savannas of Equatorial Africa) are close on the basis of characters of venation and male genitalia. Separation of these genera took place relatively recently, which is indicated by their notable similarity. Most probably an independent branch separated early from the common ancestor of these two genera, which gave rise to present-day *Episcardia* Rag. This is also indicated by the retention of certain peculiarities such as presence of widely separated uncus lobes and strong broad vinculum in males, and well-developed sclerotized lobes of the vaginal plate in females. At the same time the three large spinules at the ends of the tarsal segments suggest the relation of this genus with the branch *Myrmecozela* Zll. and *Cinnerethica* Ams. Thus in terms of phylogeny *Episcardia* Rag. has an individual relation with every genus of the tribe. The retention of certain primitive properties (hind wings equal in width to forewings or broader, presence of three anal veins and 238 medial cells in hind wings, etc.) permit us to consider *Episcardia* Rag. one of the most archaic genera of tribe Myrmecozelini Zag. known from the Palearctic. From the non-Palearctic members of Tineidae a few Indian and about 30 African genera should be included in the tribe Myrmecozelini Zag., that were mostly placed by Gozmàny in the subfamilies Perissomasticinae (8 genera) and Myrmecozelinae (18 genera), as well as certain genera of Siloscinae and Tinissinae (Gozmàny and Vàri, 1973).

Key to Genera of Tribe Myrmecozelini Zag. on the Basis of External Characters

1 (2). Anterior tibiae with epiphyses. .... 9. **Episcardia** Rag. (p. 308).

2 (1). Anterior tibiae without epiphyses.

3 (4). Ends of tarsal segments without spinules; radial cell in forewings absent; hind wings with terminal of branch A_1 located at level of origin of branch Cu_2 from cell. .... 10. **Catabola** Durr. (p. 344).

4 (3). Ends of tarsal segments with three spinules; radial cell present in forewings; hind wings with terminal of branch A_1 located at level of outer margin of radiocubital cell.

5 (6). In forewings distance between bases of R_2 and R_3 large and

almost equal to distance between bases of Cu_1 and Cu_2; R_5 terminates at alar apex. .... 12. **Cinnerethica** Ams. (p. 498).
6 (5). In forewings distance between bases of R_2 and R_3 small, one-fifth to one-third distance between Cu_1 and Cu_2; R_2 terminates on anterior alar margin before alar apex. .... 11. **Myrmecozela** Zll. (p. 394).

Key to Genera of Tribe Myrmecozelini Zag. on the Basis of Male Genitalia

1 (4). Aedoeagus long, slender, arcuate; vinculum narrow.
2 (3). Outer margin of valvae with deep notch. .... 12. **Cinnerethica** Ams.(p. 498).
3 (2). Outer margin of valvae entire, with small dentate process. .... 13. **Myrmecozela** Zll. (p. 394).
4 (1). Aedoeagus short, more or less straight, with broad base and narrow apex; vinculum broad.
5 (6). Valvae complex and consist of dorsal and ventral lobes. ....9. **Episcardia** Rag. (p. 308).
6 (5). Valvae simple, narrow. .... 10. **Catabola** Durr. (p. 344).

Key to Genera of Tribe Myrmecozelini Zag. on the Basis of Female Genitalia[18]

1 (4). Vaginal plate well developed, entire or divided into highly sclerotized shieldlike lobes.
2 (3). Vaginal plate in form of broad shield and not divided into lobes. .... 9. **Episcardia** Rag. (p. 308).
239 3 (2). Vaginal plate in form of narrow shield and divided into lobes. .... 10. **Catabola** Durr. (p. 344).
4 (1). Vaginal plate not developted; pigmented membrane covered with thin bristles present instead. .... 11. **Myrmecozela** Zll. (p. 394).

9. Genus *Episcardia* Rag.

Ragnot, 1895: CV (*Psecadia*); Staudinger and Rebel, 1901: II, 253; Amsel, 1951b: 139; Petersen, 1957b: 571; 1959b: 564–565; Zagulyaev, 1964b: 680, 685–691; 1966a: 158–163; Căpuşe, 1971: 233; Gozmàny and Vàri, 1973: 109–110.

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[18] Females of genus *Cinnerethica* Ams. are not known and hence could not be included in the key.

Type species. Psecadia lardatella Led., 1858.

Violet luster and relatively broad wings, as well as distinct tuft at the end of abdomen, distinguish these moths from other members of the tribe.

Imago. Pubescence of head more or less light in color, yellowish-straw, yellowish-brown, or bright rusty-red. Pilifers well developed and usually with a long brush or colored bristles (Figure 3, B). Galea slender, very delicate, and short. Maxillary palpi almost equal to labial palpi or slightly longer, five-segmented; 4th segment small, slightly longer than 5th; 5th segment highly expanded. Labial palpi short; 3rd segment shorter or longer than 2nd. Antennae equal to two-thirds to six-sevenths length of wing, covered with short bristles.

Thorax and tegulae pure white to brown or with violet tones. Span of forewings reaches 30 mm. Length of forewing about 3.5 times, of hind wing 3.0 times width; usually hind wings equal to or slightly broader than forewings. Fringe of hind wings usually short, constituting one-third to one-half alar width; rarely long and equal to three-fourths alar width. Forewings monochromatic, in some species silvery-white and in others brown with violet sheen or speckled with dark blue scales. Hind wings usually yellowish-ash-gray; fringe may be lighter or in some cases darker than wings.

In forewings (Figure 157, A) Sc terminates on alar margin before level of radiocubital cell, and R_1 beyond level of its apex. Terminus of R_5 almost on alar apex or on anterior margin much before it. All radial and medial veins originate from cell. Distance between Cu_1 and Cu_2 only slightly less than distance between R_2 and R_3. Fork of A_{2-3} one-fourth to one-third length of common trunk, which terminates on posterior margin of wing almost at level of origin of Cu_2 from cell. Medial cell not present. In hind wings (Figure 157, B) terminus of Sc equidistant from alar apex and apex of radiocubital cell, or slightly closer to alar apex. Termina of R and M_1 equidistant from alar apex or terminus of R at a greater distance from apex than terminus of M_1. Radiocubital cell closed; medial cell developed.

Legs uniformly yellowish or cinnamon-gray, without distinct rings at ends of tarsal segments. Tibiae of forelegs with epiphyses and almost twice shorter than femora (Figure 158, A). Middle tibiae slightly longer than femora (Figure 158, B). Median pair of spurs of hind tibiae located almost in middle of tibia except in *E. violacella* Rbl., where spurs situated at two-fifths length of tibia (Figure 158, C). Tarsal segments covered with long dense, and closely adhering spinescent scales 240 and spinules. Ends of tarsal segments with three long spinules (Figure 158, A–C).

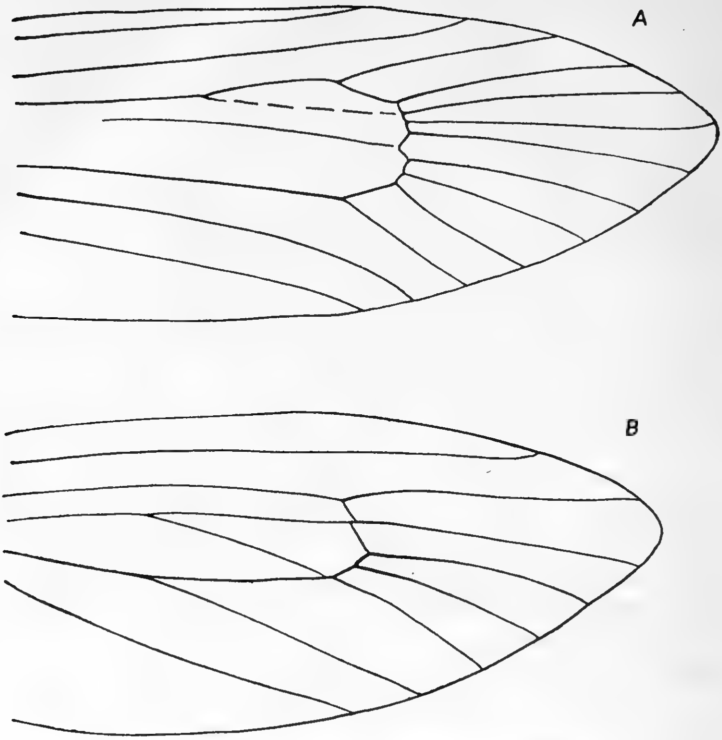
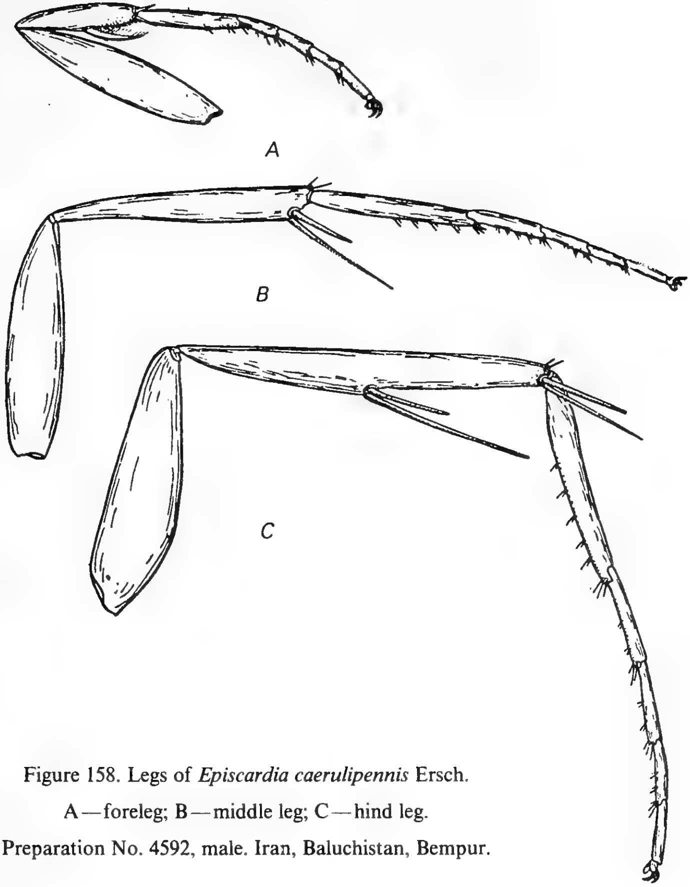


Figure 157. Venation of wings of *Episcardia lardatella* Led.
A—forewing; B—hind wing.
Preparation No. 9941, female. Syria.

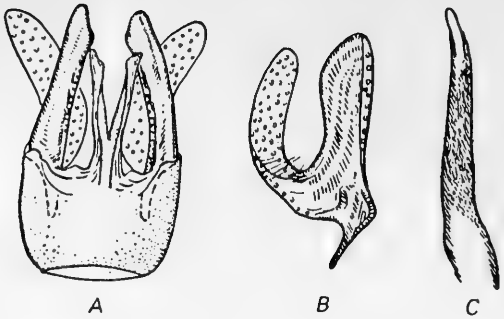
Abdomen yellowish-gray, light cinnamon-gray. Anal tuft and clusters of anal scales well developed and usually differ in color from abdomen. Posterior margin of sternite VII in female notched.

Male genitalia (Figures 14, B and 159, A). Valvae in most species complex, with two sharply demarcated sections; in lateral view lower or ventral section poorly sclerotized and more or less uniformly covered with bristles; other section (basal part), dorsal or upper portion highly sclerotized, variable in shape, and usually not covered with bristles (Figures 15, B and 159, B). Uncus consists of two long and apically highly sclerotized straight or curved cords. Aedoeagus small, often short, with narrow with pointed apex; in some species (*E. violacella* Pet.) with sclerotized tooth near apex (Figure 159, C). Vinculum and tegumen broad; sometimes (*E. pygmaeana* Pet.) vinculum with deep notch at both anterior and posterior margins. Saccus not developed.



241 Figure 158. Legs of *Episcardia caerulipennis* Ersch.
A—foreleg; B—middle leg; C—hind leg.
Preparation No. 4592, male. Iran, Baluchistan, Bempur.

Female genitalia (Figures 19, B and 165). Fairly similar in all species examined. Vaginal plate not divided into lobes, covers ostium bursae; anterior margin of plate may be convex or extend forward in form of an appendage. Prevaginal plate absent or poorly developed and 241 noticeable in form of thickening in basal half of vaginal plate. Part of lateral sides of vaginal plate as well as tergite densely covered with very minute acicular spinules. Terminus of duct of bursa copulatrix dilated and pigmented. In most species duct of bursa copulatrix immediately before entry into bursa with complex sclerotized inclusions of variable shape (Figure 18, D–F). Corpus bursae in most species without sclerotized structures. Anterior apophyses may reach anterior margin of segment VI. Posterior apophyses included in segment VII. Ovipositor about 2.0 to 2.5 times than sternite VII (from anterior margin to beginning of notch).



242 Figure 159. Genitalia of male *Episcardia violacella* Rbl.
A—general appearance (ventral view); B—valva; C—aedoeagus (from Petersen, 1957b).

Biology. Larvae feed on residue of grasses, old turf, etc. In other words, they are steppe and semidesert detritophages.

Palearctic species are not similar in response to certain environmental factors. On the one hand, they are xerophils of the Mediterranean region (*E. lardatella* Led., *E. violacella* Rbl.), associated with steppes and semideserts with feather grass, milk vetch, wormwood, and several trees and evergreen shrubs, constituting a maguis-type population. On the other hand, they are xerophils of Central Asia, Iran, and Afghanistan (*E. violacea* Chr., *E. luteola* Pet., *E. pygmaeana* Pet., and *E. caerulipennis* Ersch.) confined to desert populations. 242 Desert and semidesert regions are characterized by winters of abundant precipitation and long droughts during the summer. Xerophytic formations of these deserts consist of saxauls, kendym, cherkez, tamarisk, desert acacia, ephedra, wormwood, feather grass, milk vetch, saltwort, and various ephemerals.

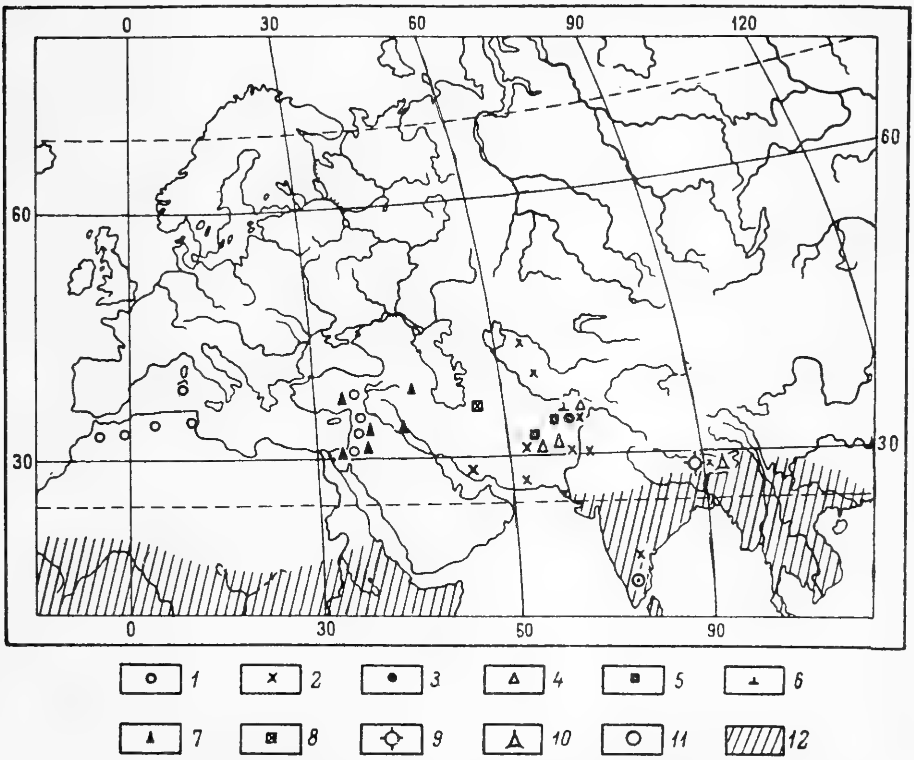
Among the non-Palearctic species, only two are mesophils. These are *E. darjeelingella* Zag. and *E. caradjella* Zag. which, no doubt, live in drier nitches (burrow, cave, or nest), although they also live in humid Himalayan forests. In the latter the larvae probably feed not only on decomposing grasses but also rotting wood.

The remaining non-Palearctic species are xerophils of the tropics and associated with savannas of the Deccan Plateau and East Africa. These regions are characterized by alternation of dry and humid periods; in some places drought continues for seven to eight months, and rains occur during the hottest period. The savannas boast xerophytic formations, with large turfy grasses with rough blades and several trees and shrubs: baobab, palms, sumach, acacia, spurge, aloe, and a large number of thorny shrubs which sometimes form dry forests.

The time of emergence of most species coincides with the humid period, often with the time of maximum humidity. This is readily established by comparing the months in which moths are caught with the periods of drought and rains.[19]

Probably during drought the larvae enter diapause, which may continue for half a year or more.

Distribution (Figure 160). Of the 60 known species, 6 are listed in the fauna of the Palearctic, of which only 2—*Episcardia violacella* Rbl. and *E. caerulipennis* Ersch.—are found in the territory of the Soviet Union (Trans-Caucasus, southern Kazakhstan, and Central Asia.) The total area of distribution in the Palearctic covers the western Mediterranean (mainly African part), Trans-Caucasus, Asia Minor, West Asia, southern Kazakhstan, Central Asia, Iran, Afghanistan, and Pakistan; continuing south and southwest it includes India, i.e., moves beyond



243 Figure 160. Distribution of species of genus *Episcardia* Rag.

1—*E. lardatella* Led.; 2—*E. caerulipennis* Ersch; 3—*E. pygmaeana* Pet.; 4—*E. luteola* Pet.; 5—*E. paghmanella* Pet.; 6—*E. splendens* Pet.; 7—*E. violacella* Rbl.; 8—*E. violacea* Chr.; 9—*E. darjeelingella* Zag.; 10—*E. caradjella* Zag.; 11—*E. hindostanica* Zag.; 12—area of distribution of tropical species.

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[19] See Table of Climatic Elements (Ivanov, 1948).

the limits of the Palearctic. It may be assumed that some Palearctic species occur in Trans-Caucasus and Central Asia.

It should be noted that the distribution of some species is currently discontinuous. For example, the major part of the range of *E. caerulipennis* Ersch. covers Central Asia, extending into southern Kazakhstan as well as Iran and Afghanistan; the remainder is located in India in the Deccan Plateau and in Darjeeling.

From India four other species of this genus are known: *E. hindostanica* Zag. from the Deccan Plateau; *E. caradjella* Zag. and *E. darjeelingella* Zag. from Darjeeling, where *E. caerulipennis* Ersch. is also found; and *E. subochaceella* Wlsm. which, in addition to India and Sri Lanka, is also known from Southeast Asia. Four species have also been recorded in the Philippines: *E. cymopelta* Meyr., *E. eurycera* Diak., *E. platyntis* Meyr., and *E. purpurascens* Diak. Quite possibly some species of this Indo-Malayan group will be detected in the Soviet Central Asian region in the near future.

However, the greater majority of species—22 species of *Episcardia* Rag.—is found in the Ethiopian region, particularly in the tropics and subtropics of eastern and southern Africa. At the same time this genus has not been recorded in the Australian and American continents. Hence one can speak of the presence of a rather ancient African center of origin for the genus *Episcardia* Rag. Apparently it spread from eastern Africa through Arabia on the one hand, to the Mediterranean and Central Asia where, most probably, the center of species formation of Palearctic members of the genus located, and on the other hand into India. In Darjeeling, in the Himalayas at a height of 2,200 m, three species of moths have been recorded. In the opinion of botanists the boundary between two different flora passes through Darjeeling: in the east Malayan elements predominate, and in the west a significant penetration of African floral types has been recorded (Campbell, 1948: 208). It is quite possible that these moths spread in the same manner as the flora.

Comparison. A series of characters, especially of the genitalia (short and relatively straight aedoeagus; bilobate uncus in males and absence 244 of signa in the bursa copulatrix of females) brings this genus close to *Catabola* Durr. However, *Episcardia* Rag. is readily distinguished from the former and other genera of the tribe by the presence of epiphyses on the anterior tibiae, bilobate valvae in males, and complex sclerotized structures in the duct of the bursa copulatrix in females.

Phylogenetically the genus represents an independent and very archaic branch of the tribe, which has preserved several primitive characters, but is nonetheless highly specialized (see characters of the tribe).

Separation of genus *Episcardia* Rag. into an independent nominative tribe, as proposed by Căpuşe (1971) lacks sufficient basis. A large series of characters (type of wing venation, structure of male genitalia—broad vinculum, short aedoeagus, absence of gnathos) and type of female genitalia (highly developed vaginal plate) permit the retention of this genus in tribe Myrmecozelini Zag.

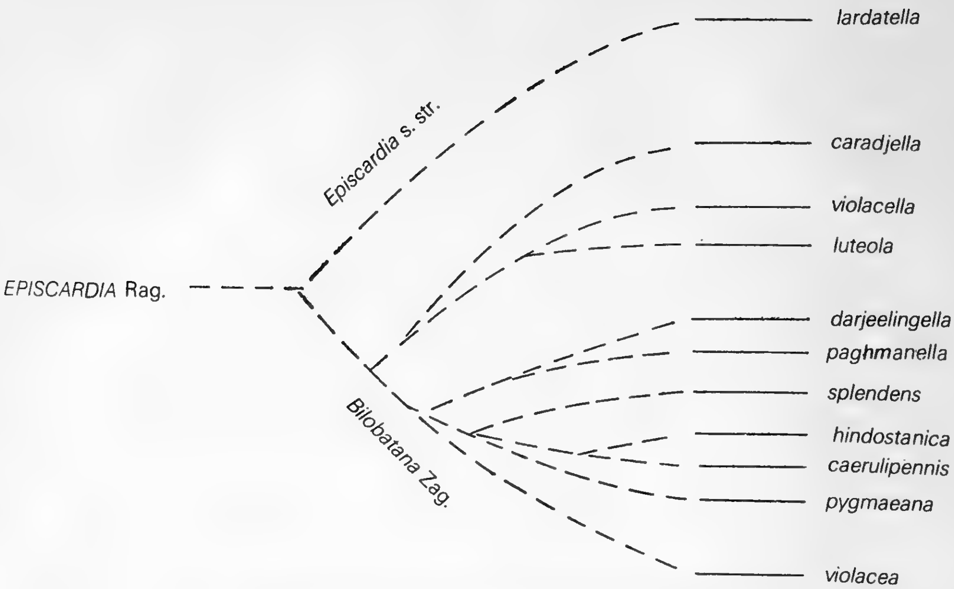
Among the non-Palearctic forms, the genus *Episcardia* Rag. is close to the endemic tropical African genera *Sphallesthasis* Gozm. (31 species), *Cylicobathra* Meyr. (3 species), and possibly the monotypic genus *Phalloscardia* Gozm. (Gozmàny and Vàri, 1973).

To date 39 species have been assigned to the genus *Episcardia* Rag.; only 8 are included in the present book: *E. lardatella* Led., *E. caerulipennis* Ersch., *E. pygmaeana* Pet., *E. luteola* Pet., *E. paghmanella* Pet., *E. splendens* Pet., *E. violacella* Rbl., and *E. violacea* Chr.; the last species is only tentatively included by me in this genus. The remaining species (31), including the three species recently described by me from India—*E. caradjella* Zag. *E. darjeelingella* Zag. (Zagulyaev, 1964b) and *E. hindostanica* Zag. (Zagulyaev, 1966a)—are tropical in nature and only some most probably occur in southern regions of the Palearctic.

On the basis of external appearance, color, and structure of genitalia, the Palearctic species of the genus may be included in subgenera: *Episcardia* Rag. (s. str.) with one species *E. lardatella* Led., and *Bilobatana* Zag. subgen. n. with the other seven—*E. caerulipennis* Ersch., *E. pygmaeana* Pet., *E. luteola* Pet., *E. paghmanella* Pet., *E. splendens* Pet., *E. violacella* Rbl., and *E. violacea* Chr.

The phylogenetic relations of the subgenera and species within the genus are depicted in Figure 161. The subgenus *Episcardia* Rag. is distinguished from *Bilobatana* Zag., subgen. n. by the white color of its forewings, thorax, and tegulae, and its simple (undivided) valvae. In the subgenus *Bilobatana* Zag., subgen. n. *E. caerulipennis* Ersch. on the basis of structure of the basal part of the valvae is close to *E. pygmaeana* Pet., *E. splendens* Pet., and *E. paghmanella* Pet. The last species, moreover, is close to *E. caerulipennis* Ersch. through the structure of its vaginal and prevaginal plates, but the armature of the duct of the bursa copulatrix brings it closer to *E. luteola* Pet. Possibly, *E. violacea* Chr. is close to this group of species. Species *E. luteola* Pet. and *E. violacella* Rbl. are close by reason of the peculiarities of their uncus and aedoeagus.

Of the non-Palearctic species, especially the Indian ones, which may be included in the subgenus *Bilobatana* Zag., subgen. n., *Episcardia hindostanica* Zag. qualifies through the nature of wing venation, structure of vaginal plate, and armature of the duct of the bursa copulatrix.



247 Figure 161. Phylogenetic links between species of genus *Episcardia* Rag.

This subgenus also includes *E. darjeelingella* Zag. which, on the basis of a broad vinculum and highly developed branches of the uncus, is close to *E. paghmanella* Pet. The type of structure of the vaginal plate, armature of the ostium bursae, and absence of sclerotized structures in the duct of the bursa copulatrix bring *E. caradjella* Zag. close to *E. violacella* Rbl.

245

Key to Species of Genus Episcardia Rag. on the Basis of External Characters[20]

1 (2). Wings snow-white (subgenus *Episcardia* Rag. s. str.) .... 1. **E. lardatella** Led.
2 (1). Wings cinnamon-gray (subgenus *Bilobatana* Zag., subgen. n.).
3 (4). In hind wings bases of M_3 and Cu_1 wide-set. .... 7. **E. violacella** Rbl.
4 (3). In hind wings bases of M_3 and Cu_1 originate from same point ... . 2. **E. caerulipennis** Ersch.

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[20] Extant specimens of the species *E. pygmaeana* Pet., *E. luteola* Pet., *E. violacea* Chr., *E. paghmanella* Pet., and *E. splendens* Pet. are not known to me and hence not included in the key.

Key to Species of Genus Episcardia Rag. on the Basis of Male Genitalia[21]

1 (2). Valvae in lateral view broad, convex, with narrow apex, and one slight blunt tubercle on anterior part of lower margin, uniformly poorly sclerotized, and abundantly covered with bristles (subgenus *Episcardia* Rag. s. str.) .... 1. **E. lardatella** Led.

2 (1). Valvae long and narrow, or complex, with two sharply demarcated sections; in lateral view one section (dorsal or upper by position) always highly sclerotized and sharply distinguished by shape; the other section (ventral or lower) usually in form of an elongated lobe and only slightly sclerotized (subgenus *Bilobatana* zag., subgen. n.).

3 (10). Basal part of valva with a large appendage situated on dorsal side. Aedoeagus short, straight, slightly sclerotized, without sclerotized process below tip.

4 (5). Basal part of valva in form of long, slender, arcuate appendage, covering base of uncus on upper side .... 2. **E. caerulipennis** Ersch.

5 (4). Basal part of valva in form of short, thick, compact appendage, with blunt, digitate, subapical denticle, not covering base of uncus.

6 (7). Hind margin of vinculum (in ventral view) convex .... 6. **E. splendens** Pet.

7 (6). Hind margin of vinculum (in ventral view) with notch.

8 (9). Valva with well-defined cucullus and broad apex. ....3. **E. pygmaeana** Pet.

9 (8). Valva without cucullus and with elongated apex............. .... 5. **E. paghmanella** Pet.

10 (3). Basal part of valva massive and broad. Aedoeagus long, slightly curved, highly sclerotized, and with large dentate subapical process.

11 (12). Basal part of valva (located on upper side) equal in length and width to ventral or lower part. Aedoeagus almost straight, slender with digitate tooth on lateral side near apex.......... .... 7. **E. violacella** Rbl.

12 (11). Basal part of valva massive, compact, tubercular, and much shorter than ventral part. Aedoeagus S-shaped, very broad, with single short spine and long falcate pointed tip........... .... 4. **E. luteola** Pet.

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[21] Species *E. violacea* Chr. is not known to me and hence not included in the key.

246

Key to Species of Genus Episcardia Rag. on the Basis of Female Genitalia[22]

1 (2). Anterior margin of vaginal plate drawn out into long appendage; duct of bursa copulatrix without complex sclerotized structure. .... 7. **E. violacella** Rbl.

2 (1). Anterior margin of vaginal plate straight or concave; duct of bursa copulatrix with complex sclerotized structure.

3 (6). Posterior margin of vaginal plate with deep notch; duct of bursa copulatrix with two cornuate cords.

4 (5). Terminus of duct of bursa copulatrix broad and highly sclerotized; lobes of prevaginal plate not developed. .... 4. **E. luteola** Pet.

5 (4). End of duct of bursa copulatrix membranous; lobes of prevaginal plate wedge-shaped. .... 5. **E. paghmanella** Pet.

6 (3). Posterior margin of vaginal plate straight or with narrow notch. Duct of bursa copulatrix with two infundibular structures.

7 (8). Two unguiculate processes located between lobes of vaginal plate; terminus of duct of bursa copulatrix crimped .... 2. **E. caerulipennis** Ersch.

8 (7). Unguiculate processes absent between lobes of vaginal plate; terminus of duct of bursa copulatrix smooth. .... 1. **E. lardatella** Led.

Subgenus *Episcardia* Rag. (s. str)

Type species of subgenus. Episcardia lardatella Led., 1858.

Characterized by light coloration of forewings, dorsum, thorax, and tegulae, as well as peculiarities of genital structure: valvae simple, in lateral view broad, with narrow elongated apex, with blunt tubercle near anterior part of lower margin in basal half.

The subgenus consists of one species, *E. lardatella* Led.

1. **Episcardia (Episcardia) lardatella** Led. (Figures 3, B; 18, D; 19, B; 157; 160–165; Plate VIII, *6*)

Lederer, 1858: 151–152, Tab. 4, Fig. 11 (*Psecadia*); Stainton, 1867; 62 (*Psecadia* ?); Ragonot, 1895: CV (*Psecadia*); Staudinger and Rebel, 1901: II, 235; Caradja, 1920: 167; Reisser, 1933: 296; Amsel, 1935b: 273; Zerny, 1935: 154; Osthelder, 1936: 89; Amsel, 1951b: 139; Petersen,

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[22] Females of *E. pygmaeana* Pet., *E. violacea* Chr., and *E. splendens* Pet. are not known to me and hence could not be included in the key.

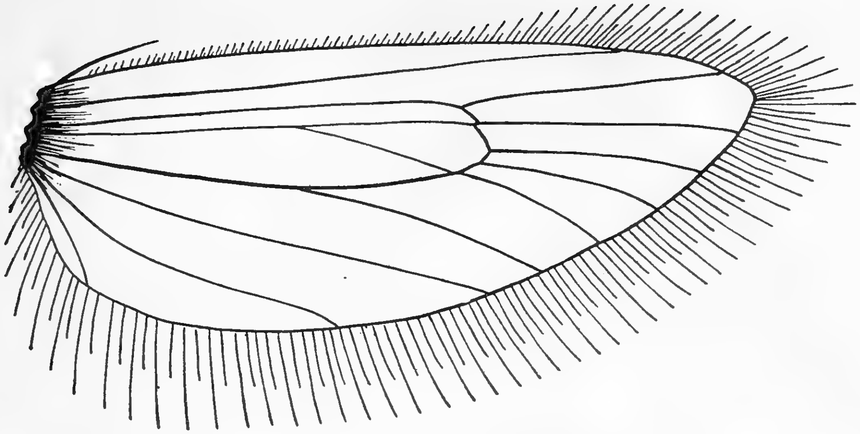

Figure 162. Venation of hind wing of *Episcardia lardatella* Led. Preparation No. 9941, female. Syria.

1957b: 571–572; 1959b: 564; Amsel, 1966: 128; Petersen, 1968: 55.

Biology. Stainton, 1867: 62 (*Psecadia* ?); Ragonot, 1895: CV (*Psecadia*); Reisser, 1933: 266; Amsel, 1951b: 139; Parenti, 1966: 291.

External characters of imago. Head covered with ocherous-yellow hairs. Maxillary and labial palpi small and with same bright coloration as head; 5th segment well developed and pyriform (Figure 3, B); 3rd segment of labial palpi slightly longer than 2nd; apex of 2nd segment with brush of bristles. Frons small, only slightly larger than vertical diameter of eyes. Antennae thick, long, almost equal to length of fore-
247 wing, uniformly light cinnamon-gray; only 1st segment light yellow, large and thick, without crest of bristles, its length 1.75 greater than width.

Thorax and tegulae silvery-white. Span of forewings in males 23 mm, in females 23 to 27 mm.

Forewings (Plate VIII, *6*) snow-white, with silvery hue. Hind wings light yellowish-gray or cream-colored with golden tinge. Fringe white. Under surface of forewings yellowish-ash-gray, of hind wings yellowish-gray, glossy. Fringe of both pairs of wings white.

248 In forewing (Figure 157, A) *Sc* terminates on alar margin at level of origin of branches of R_2 and Cu_2 from cell. Distance between bases of R_2 and R_3 one-seventh to one-sixth distance between R_1 and R_2, and one-third length of radial cell. R_5 terminates almost on alar apex. In hind wing (Figures 157, B and 162) *R* originates from cell at level of origin of Cu_1 from cell. Termina of *R* and M_1 equidistant from alar apex. Bases of M_3 and Cu_1 widely separated and distance between them almost equal to distance between bases of M_2 and M_3. A_1 terminates on alar margin at level of apex of radiocubital cell.

Legs yellowish-gray. Hind tibiae lighter in color than anterior and middle tibiae. Structure and armature of tibiae and first two segments of tarsi in hind legs typical of genus, as shown in Figure 163.

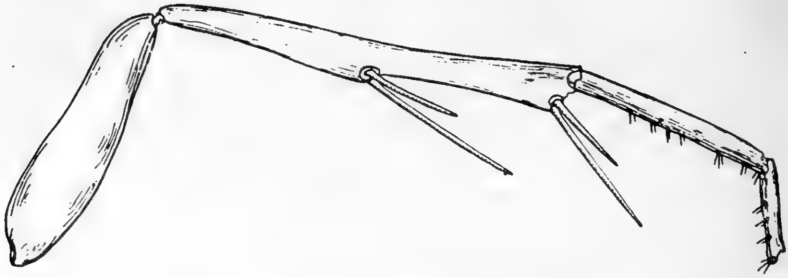

Figure 163. Hind leg of *Episcardia lardetella* Led. Preparation No. 9941, female. Syria.

Abdomen light cinnamon-gray. Cluster of anal scales large, musty white or light yellowish-ash.

Male genitalia (Figure 164). Valvae simple, uniformly lightly sclerotized and rather densely covered with bristles. Viewed from lower side, valvae with acute angles; in lateral view they are broad, convex in basal half, with narrow apex and one obtuse tubercular process approximately centered and slightly below anterior margin; base of anterior margin of valvae without process. Uncus in form of two covered intercrossing cords, outer half of which is highly sclerotized and pointed. Aedoeagus narrow, straight, almost equal in length to valvae, its base broad and dilated.

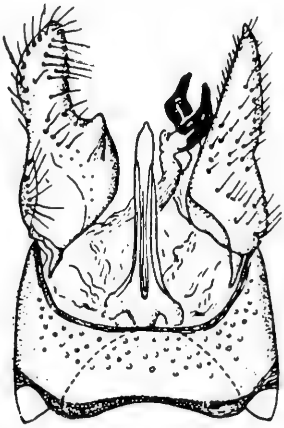

Figure 164. Genitalia of male *Episcardia lardatella* Led. (from Petersen, 1957b).

Female genitalia (Figures 18, D; 19, B; and 165). Vaginal plate with two obtuse and wide-set apices, at base of which six to eight long bristles are located. Anterior margin of vaginal plate highly concave. Terminus of duct of bursa copulatrix sclerotized and slightly broadened. Duct near entry into bursa associated with strong sclerotized structures resembling two funnels joined together by their shafts and placed at right angles so that duct enters one, while subterminal part of bursa 249 enveloped by the other (Figure 18, D). Bursa copulatrix an elongated sac located between segments IV and VII. Anterior apophyses reach anterior margin of segment VI; posterior appophyses large, fall short of midpoint of segment VII. Ovipositor thick and long, 2.5 times length of sternite VII.

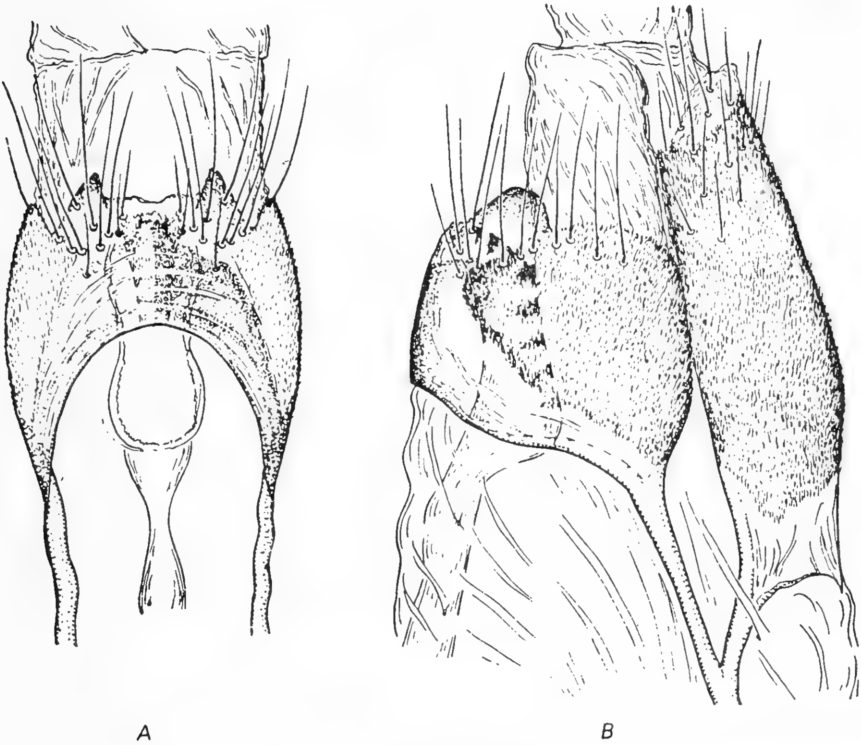

Figure 165. Region of vaginal plate of *Episcardia lardatella* Led.

A — ventral view; B — lateral view.

Preparation No. 9941, female. Syria.

Comparison. Readily distinguished from other species of the genus by snow-white forewings with silvery sheen, and peculiarities of venation and genital structure. R_5 in forewings terminates almost on alar apex; in hind wings bases of M_3 and Cu_1 wide-set. Valvae in male without processes at base of anterior margin; uncus in form of long, acute intercrossing cords. Posterior margin of vaginal plate in female with two protuberances with semicircular notch in anterior margin; duct at entry into bursa with two sclerotized funnels joined together by their shafts at a right angle.

Distribution. Area of distribution of this species covers the western and eastern Mediterranean and the semidesert regions of West Asia. Moths have been found on Sardinia, in northern Africa, Syria, Lebanon, Israel, and Turkey. Members of this species may also occur in Trans-Caucasus and Central Asia (Figure 160).

In literature, reported from Sardinia (Amsel, 1951b); Morocco (Reisser, 1933; Amsel, 1966); Great Atlas Mountain (Zerny, 1935); Algeria, Tunisia (Parenti, 1965); Turkey: Malatia, Antioch, Marach
250 (Petersen, 1968); Syria, Lebanon, Beirut (Lederer, 1858; Stainton, 1867; Ragonot, 1895); Palestine (Caradja, 1920); Tel Aviv (Amsel, 1935b, 1951b); Jerusalem (Osthelder, 1936); valley of Jordan River (Petersen, 1957b).

Material examined. 3 females.

Turkey. Marach, 700 to 900 m above m.s.l., two females in September, 1929 (Einh. Slr.).

Syria, one female.

Biology. Mediterranean species confined to steppe and semidesert formations, including feather grasses, milk vetches, wormwoods, and maquis.

Moths emerge from April to September, usually at an elevation of 1,000 m. Thus in different regions of Turkey, moths were collected from May to August at elevations ranging from 780 to 1,100 m (Petersen, 1968). In the Jordan River valley one male was found in May (Petersen, 1957b), and in Tel Aviv region one male on May 19 and one male on August 21 (Amsel, 1935b, 1951b). In the environs of Jerusalem moths were caught in May and August (Osthelder, 1936) and on April 1 in the region of Jericho (Amsel, 1935b).

Larvae feed on grassy detritus and live in tubular galleries in the soil. However, as indicated by Ragonot (1895) they possibly break down the horns of various animals in Africa.

Subgenus *Bilobatana* Zagulajev,* subgen. n.

Type species of subgenus. Episcardia caerulipennis Ersch., 1874.

Forewings, thorax and tegulae dark or they may be brown,

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*Spelling of author's name in taxonomic divisions is sometimes at variance with text because the Israeli orthography was used in this translation—General Editor.

yellowish-gray, or brownish-blue. Valvae in male genitalia with two well-demarcated sections: main or upper section in lateral view highly sclerotized, variable in shape, and covered with short thick bristles; ventral or lower section usually in form of an elongated and poorly sclerotized lobe covered with long piliform bristles.

Subgenus includes these seven species—*E. caerulipennis* Ersch., *E. pygmaeana* Pet., *E. luteola* Pet., *E. paghmanella* Pet., *E. splendens* Pet., *E. violacella* Rbl., and *E. violacea* Chr.—and three tropical species known from India—*E. hindostanica* Zag., *E. darjeelingella* Zag., and *E. caradjella* Zag.—described in earlier publications (Zagulyaev, 1964b, 1966a).

2. **Episcardia (Bilobatana) caerulipennis** Ersch. (Figures 14, B; 18, D–F; 158; 160; 161; 166–170; Plate VI, *5*)

Ershov, 1874a: 97 (Tinea); 1874b; 413 (*Tinea* ?); Staudinger and Rebel, 1901: II, 239 (*Tinea*); Petersen, 1957b: 572–573; Amsel, 1958: 560–561; 1959b: 36; Gozmàny, 1959: 347; Petersen, 1959b: 563; 1963c: 181–182; 1966: 25, 29; 1971: 270; 1973: 61–62, 69;—*indiella* Caradja, 1920; 171 (*Tineola*), syn. n.

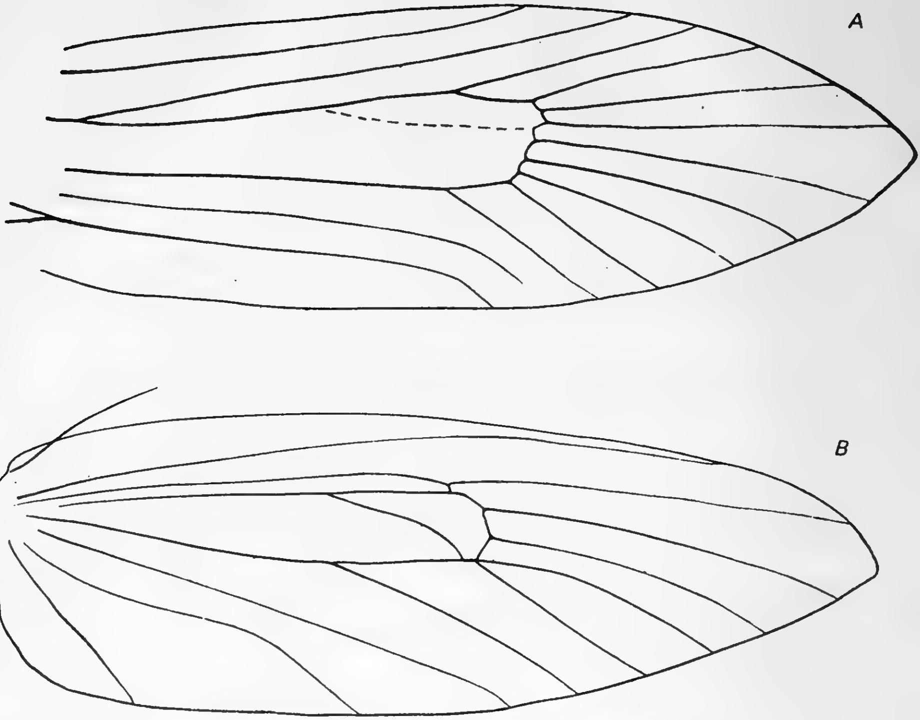
Biology. Ershov, 1874a: 97 (*Tinea*); Amsel, 1958: 560–561; Petersen, 1959b: 563.

External characters of imago. Head covered with bright yellowish-straw or canary-yellow hairs. Maxillary palpi very stout due to dense cover of yellowish-brown scales. Labial palpi small, yellowish-brown. Frons small so that distance between eyes less than vertical diameter of eyes. Antennae uniformly yellowish-straw, long, almost equal to five-sixths to six-sevenths length of wing.

252 Thorax and tegulae dark brown with bluish and bronze hue. Span of forewings in males 16 to 30 mm, in females 17 to 23 mm.

Forewings without pattern, dark brown, with dense violet-blue granulation or light brownish-ash granulation with bronze glaze. Fringe same color as wing, or with slightly grayish-brown tinge. Hind wings yellowish-ash with golden-bronze sheen in male and violet sheen in female. Their fringe light yellow, golden. Under surface of all wings yellowish-gray with mild bronze or violet hue (Plate VI, *5*).

In forewing (Figure 166, A) *Sc* terminates on alar margin at level of origin of branches of R_1 and R_2 from cell. Distance between bases of R_2 and R_3 one-fourth to one-fifth distance between R_1 and R_2 and two-fifths length of radial cell. Terminus of R_5 almost twice closer to alar apex than terminus of M_1. In hind wing (Figure 166, B) *R* originates
253 from cell before level of origin of branch of Cu_1 from cell and terminus of *R* at slightly greater the distance from alar apex than terminus of M_1.



251 Figure 166. Venation of wings of *Episcardia caerulipennis* Ersch.

A — forewing; B — hind wing.

Preparation No. 4592, male. Iran, Baluchistan, Bempur.

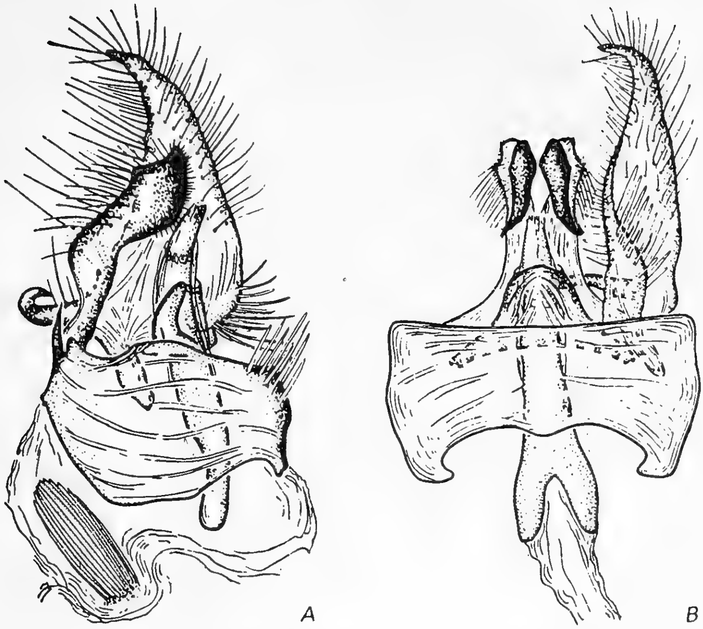
M_3 and Cu_1 originate from same point. A_1 terminates on alar margin immediately beyond level of apex of radiocubital cell.

Fore- and middle legs yellowish-gray, hind legs light yellowish-ash with oily sheen, without light rings at apices of segments. Structure of legs and their armature as shown in Figure 158.

Abdomen ocherous-yellow. Anal bristles large, dark.

Male genitalia (Figures 14, B and 167). Valvae triangular with elongated acute and slightly curved apex (Figure 167, A). Base of costal margin with long, arcuate, pointed, and highly chitinized appendage encircling base of uncus on dorsal side (Figure 14, B). Uncus in form of perpendicular, protruding lobes, with highly sclerotized lower margins; margin of lobes compact and partially overlap each other. Aedoeagus slightly longer than valva, slightly sclerotized, and in lateral view S-shaped; in ventral view base broad and bifurcate (Figure 167, B).

Female genitalia (Figures 168 to 170). Lateral processes of vaginal



251 Figure 167. Genitalia of male *Episcardia caerulipennis* Ersch.

A—lateral view; B—ventral view.

Preparation No. 4592, male. Iran, Baluchistan, Bempur.

plate wide-set, their apical half densely covered with minute hairs, and posterior margin with very long bristles. Two highly sclerotized, pointed, falcate processes situated between lobes. Terminus of duct of bursa copulatrix broad and crimped. Duct itself short and broad;
254 with complex of sclerotized structures and inclusions (Figures 18, E, F and 170, E) before entry into bursa copulatrix. Bursa copulatrix large elongated sac located in segments VII to V: apical half of pouch consists of fairly dense chitin and small groove-shaped fold (Figures 168, A and 170, D). Anterior apophyses almost reach midpoint of segment VI; posterior apophyses reach first third of segment VII. Ovipositor twice length of segment VII.

Comparison. This species is close to *Episcardia pygmaeana* Pet. but distinguished by the following characters: Large size of moths and dark blue color of wings and tegulae. In forewings terminus of R_5 twice closer to alar apex than terminus of M_1; in hind wings M_3 and Cu_1 originate from single point. In male genitalia basal part of valva in form of long, slender, and arcuate appendage covering upper part of base of uncus; lower section of valvae elongated, with pointed apex;

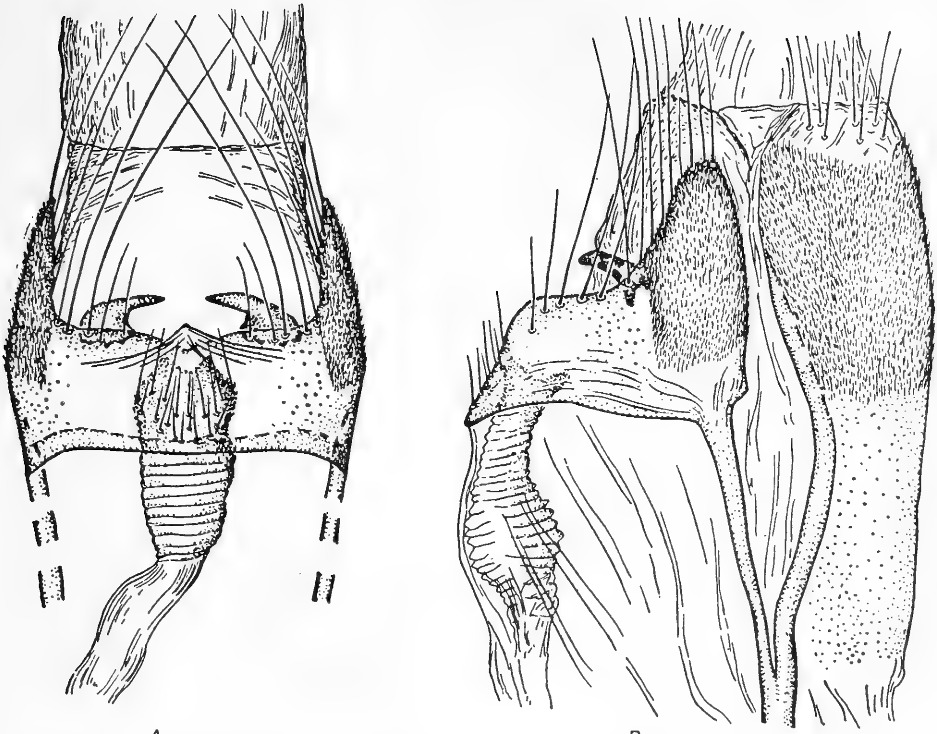
252 Figure 168. Female genitalia of *Episcardia caerulipennis* Ersch.

A—general appearance; B—sclerotization of margin of bursa copulatrix (higher magnification).

Preparation No. 4592, female. Iran, Baluchistan, Bempur.

aedoeagus short, straight, without armature near tip.

As can be seen from the first description, Ershov had one rather damaged male specimen with broken antennae. This specimen had a wing span of 30 mm and wings uniformly dark blue; forewings with 255 glaze and gray fringe; hind wings and fringe gray with purple luster. Under surface of all wings yellowish-gray. Thorax dark blue and legs ocherous-yellow. Male caught on May 31 in the Zeravshan valley between Jori and Daschti-Kasi.



253 Figure 169. Region of vaginal plate of *Episcardia caerulipennis* Ersch.

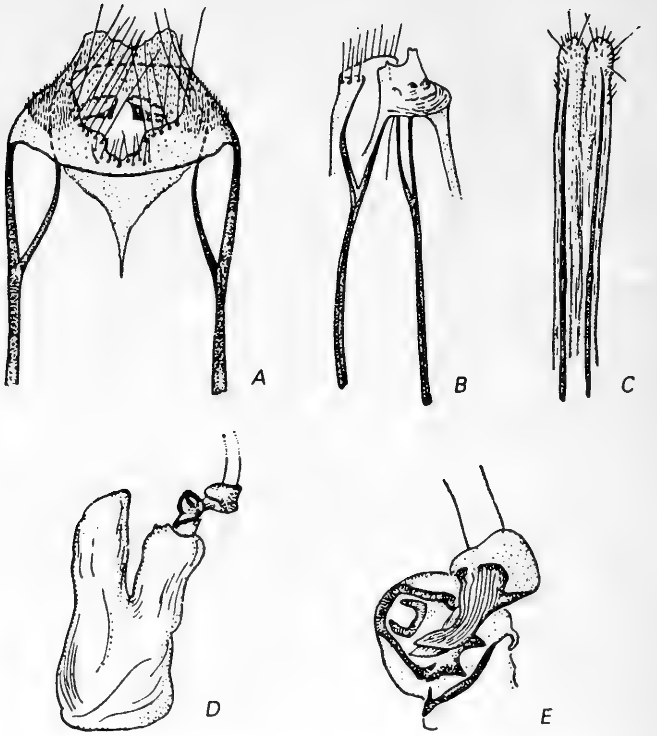
A — ventral view; B — lateral view.

Preparation No. 4592, male. Iran, Baluchistan, Bempur.

Specimens of this species were found in the collections of the Institute of Zoology of the Academy of Sciences of the USSR (Leningrad) and Museum of Moscow University (Moscow). I have designated the specimen from Iran (male caught April 28, 1901) as the neotype (collection of Zarudnyi). This specimen is very similar to the one described by Ershov.

I examined the type specimens (two males) of *Tineola indiella* Car. from the collection of Caradja in Bucharest and found them to be *Episcardia caerulipennis* Ersch. Genitalia of these males are slightly larger, as also the moths themselves, and their valvae possess a more elongated apex.

Distribution. The distribution of this species is discontinuous and extends beyond the limits of the Palearctic. The greater part of the range covers Kazakhstan, Central Asia, Iran, Afghanistan and Pakistan, and the remainder is located in India in the Deccan Plateau and Darjeeling (Figure 160).



254 Figure 170. Female genitalia of *Episcardia caerulipennis* Ersch.

A — region of vaginal plate (ventral view); B — same (lateral view); C — terminal segment of ovipositor with anal papillae; D — bursa copulatrix with beginning of duct; E — complex of sclerotized structures in duct of bursa copulatrix (from Petersen, 1963c).

Reported in the literature, from Central Asia, Zeravshan valley between Jori and Daschti-Kasi (Ershov, 1874a); Iran in Fars Province and Baluchistan (Petersen, 1957b; Amsel, 1959b); Afghanistan, Kabul (Petersen, 1973); Deravshan, Kandahar and Sarobi regions (Petersen, 1959b, 1963); Pakistan, 20 km north of Quetta (Petersen, 1971).

Material examined. 5 males and 2 females.

Kazakhstan. 160 km west of Kyzyl-Orda, one female June 2, 1966 (Pastukhov).

Southeastern Iran. Baluchistan, Bempur region one male, neotypus, April 28 and one female April 27, 1901 (Zarudnyi). Type specimen provided with label of 19.0 mm × 8.0 mm in size with inscription "Chaashen, Sargad, Bempur, Southeast of Persia, Zarudnyi, April 28 01." Neotype, gen. preparation. No. 4592, male.

Northeastern India. Darjeeling (border of Nepal and Bhutan), two males (collection of Caradja as types of *Tineola indiella* Car.). Type specimen with following original labels: dark blue label (7.0 mm × 3.5 mm) with inscription in black ink "Darjel. Möll."; large light-colored label (13.0 mm × 4.0 mm) with inscription in black ink "*Tineola* sp. ign. 221 Sn".

South India. Hyderabad Suid, two males (collection of Caradja, *Monopis pallidicornis* Wlsm.)

Biology. Xerophilous, montane, Indo-Afghanistan species restricted to deserts and semidesert formations.

Moths emerge from end of April to June as well as from July – August to October. Ershov collected one male in Zeravshan valley (Central Asia) on May 31 (Ershov, 1874a).

In Iran, near Tschabahar, in Baluchistan, moths were collected between December 16 and 27, 1937 (Amsel, 1958; Petersen, 1966), and in Bempur region on April 27 and 28. In Nakhu and Iranshav regions moths were collected from March 1 to 26, and in Sangum region five males and one female were collected at an altitude of 1,650 m from June 4 to 13 (Amsel, 1959b).

In eastern Afghanistan, Nuristan region, two females were collected at an altitude of 1,800 m from July 12 to 17; 20 males were collected in different places in the environs of Kabul at an altitude of 1,900 to 2,300 m between May 23 and July 26 (Petersen, 1973). In Sarobi region, 10 males were collected at an altitude of 1,100 m on July 3, and 17 males and 11 females collected from May 7 to October 12, 1961; in Kamdesh region, one male was collected in August, 1956; in Kamdahar region three females were collected by Amsel at an altitude of 1,000 m on May 10 and 23, 1957 (Petersen, 1959b, 1963c).

In West Pakistan, Quetta region, one male was collected by Kasy on May 14, 1965 at an altitude of 1,900 m (Petersen, 1971).

Larvae probably live in silken tunnels constructed in the soil among 256 roots of perennial grasses. They feed on plant residue. However the possibility of moths living in rodent burrows cannot be excluded, with larvae developing in the litter.

3. **Episcardia (Bilobatana) pygmaeana** (Figures 160; 161; 171)

Petersen, 1959b: 564–565; 1973: 64, 69.

External characters of imago. Pubescence of head yellowish-chocolate-brown. Span of forewings 9.0 mm, and forewings dark chocolate-brown, lustrous.

Male genitalia (Figure 171, A, B). Valvae bilobate, consisting of lower and dorsal parts. Lower lobe initially very narrow, then broadens, its outer margin rounded; lobe covered with long bristles. Dorsal part of valvae in form of highly sclerotized triangular process with slightly curved protruding digitate tooth near apex, which does not cover base of uncus on upper side. Uncus represented by two poorly sclerotized appendages ventrally arched and with long bristles. Aedoeagus very short, thick, broad at base, but tapers gradually into an acute tip beyond genital pore. Anellus consists of two tubercles with obtuse apices. Vinculum broad, with small notch in middle posterior margin; anterior margin with broad deep notch. Tegumen straight on posterior side, with deep notch on anterior side.

Female. Not known.

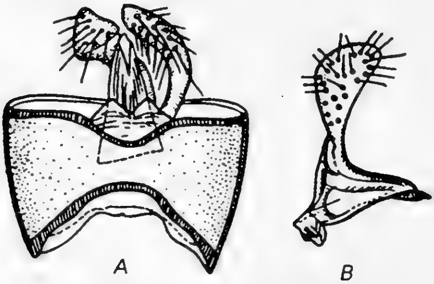


Figure 171. Genitalia of male *Episcardia pygmaeana* Pet.

A—general view (ventral side); B—separated valva (lateral view, outer side) (from Petersen 1959a).

Eastern Afghanistan, Sarobi.

Comparison. Species close to *Episcardia caerulipennis* Ersch., but differs in smaller size and dark cinnamon-brown wings, as well as structure of male genitalia: appendages of uncus poorly sclerotized, aedoeagus short and thick, vinculum with notches along anterior and posterior margins; dorsal part of valva in form of short and compact structure, with obtuse digitate tooth near apex, and lower part of valva with highly broadened apex.

No specimens examined by me.

Distribution. Eastern Afghanistan, Sarobi, Baricot (Figure 160).

The presence of *E. pygmaeana* in subtropical parts of Central Asia (within the limits of Kopet Dag and environs of Bairam-Ali) is possible.

Biology. Indo-Afghanistan xerophilous species of tropical origin associated with dry deserts or semideserts. One male was collected in Sarobi at 1,100 m on July 3, 1956; 25 km north of Baricot two females were found on a stoney slope at an altitude of 1,800 m between July 12 to 17, 1963 (Petersen, 1973).

4. **Episcardia (Bilobatana) luteola** Pet. (Figures 160; 161; 172)

Petersen, 1959b: 563; 1963c: 182–183, Figure 4; 1973: 62, 69; —*similis* Gozmàny, 1959: 348–349, Figure 5 (*Sphallesthasis*); —*gracilis* Gozmàny, 1959: 350, Figure 4 (*Sphallesthasis*).

External characters of imago. Pubescence of head light brown, golden-yellow. Antennae almost equal in length to forewings, yellowish. Span of forewings in males 11 to 16 mm, in females 12 to 17 mm. Thorax and tegulae black.

Forewings dirty brown, golden-yellow, lustrous, with honey-colored hue. Base of anterior margin blackish over one-third length. Fringe yellow, glossy. Hind wings yellowish-gray, slightly glossy.

Male genitalia (Figure 172, A, B). Valvae bilobate; lower part slender and basal part thick and highly biconvex. Uncus in form of thick protuberances touching each other and with protruding, ribbon-shaped, twisted, and highly sclerotized pointed process covered with sparse bristles. Aedoeagus highly sclerotized, slightly S-shaped, broad 258 at base, and at tip with falcate, pointed sclerotized process (Figure 172, C).

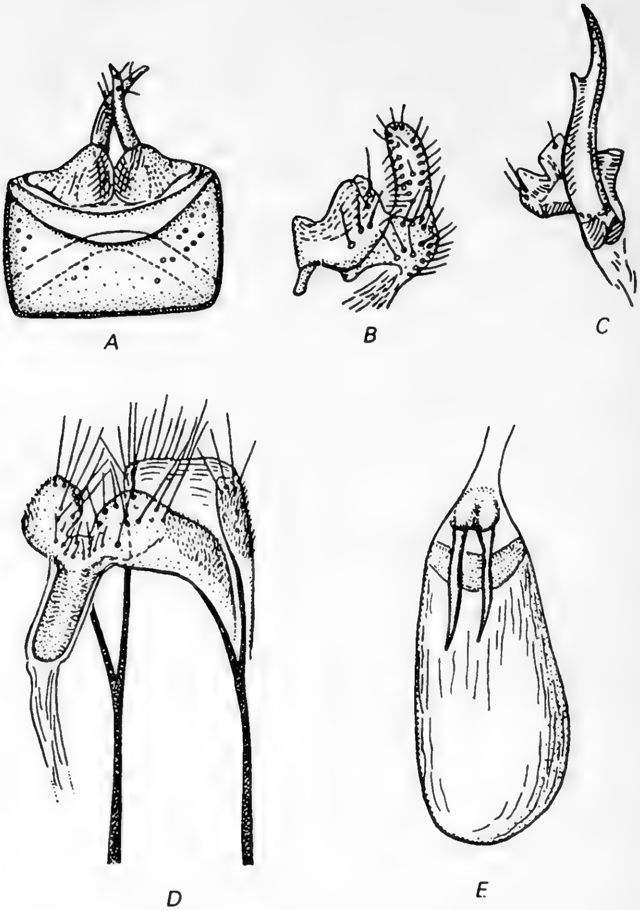
Female genitalia (Figure 172, D). Vaginal plate broad, its posterior margin with deep broad notch. Terminus of duct of bursa copulatrix broad and highly sclerotized. At entry into pouch, duct with two long, cornuate, pointed appendages directed into bursa (Figure 172, E). Bursa copulatrix with pigmented rim.

Comparison. This species is close to *Episcardia pygmaeana* Pet. and *E. violacella* Rbl., but distinguished by dorsal part of valva, which is massive, with protuberances, but much shorter than ventral part. Aedoeagus S-shaped and armed at apex. Female genitalia characterized by presence of deep notch in vaginal plate, thick sclerotized duct of bursa copulatrix, and two long pointed cords which continue deep into pouch.

No specimens examined by me.

Distribution. Afghanistan. Also indicated from Sarobi, Kabul region, Panjao, and Nuristan, as well as Kandahar and Kotkai (Petersen, 1973). Its occurrence in the Soviet Union in the southern regions of Central Asia is quite possible (Figure 160).

Biology. Xerophilous montane Indo-Afghanistan species. Moths collected at an altitude of 1,000 to 2,500 m. Emergence of moths continues for a long period and hence they are found from April to October. Thus in Sarobi two males were caught by Amsel on June 28, 1956, and six males and two females collected between May 7 and October 12, 1961. In Tangiharukh region (east of Kabul) at an altitude of 1,600 m, two males were collected April 24, 1961; in Panjao one



257 Figure 172. Genitalia of *Episcardia luteola* Pet.

Male: A—vinculum and uncus (ventral view); B—valva (lateral view); C—aedoeagus and anellus (from Petersen, 1959b).

Female: D—region of vaginal plate; E—bursa copulatrix (from Petersen, 1963c).

Eastern Afghanistan, Sarobi, 1,100 m.

female at an altitude of 2,500 m June 28, 1961; and in Nuristan three males at an altitude of 1,200 m May 7, 1953. Eight males were found on stony slopes and in passes at an altitude of 1,650 to 2,100 m in the environs of Kabul from June 5 to July 30 in different areas (Petersen, 1973). This species produces two generations per year.

5. **Episcardia (Bilobatana) paghmanella** Pet. (Figures 160; 161; 173)

Petersen, 1873; 64, 69, Figures 21–25.

External characters of imago. Pubescence of head light rust; antennae clay-yellow. Span of forewings 12 to 17 mm; forewings uniformly light brown, lustrous, with weak darkening only in middle of costal margin. Hind wings light-colored, lustrous, iridescent.

Male genitalia (Figure 173, A). Valvae unilobate (Figure 173, B), very broad (length twice width), with sharply tapering and pointed apex bearing four spines; base of anterior margin of valvae with sclerotized tooth. Uncus (Figure 173, A) with two lateral, highly sclerotized (almost black) cornuate lobes. Aedoeagus (Figure 173, C) short, broad, with oblique tip with a few very small spinules, and falcate appendage at base. Anellus barely developed. Vinculum very broad; in middle of posterior margin with saddle-shaped notch.

Female genitalia (Figure 173, D, E). Lobes of vaginal plate small, triangular, and widely separated. On right and left side of ostium bursa one conical outgrowth of prevaginal plate located (Figure 173, D). At entry into bursa, duct with two long sclerotized appendages encircled by a ring directed toward pouch (Figure 173, E). Anterior apophyses bifurcate.

259 *Comparison.* On the basis of color and genitalia of male, close to *Episcardia caerulipennis* Ersch., and *E. splendens* Pet., but differs from them in broad triangular valva with spines at apex and almost straight aedoeagus with oblique tip. On the basis of female genitalia, close to *E. luteola* Pet., *E. caerulipennis* Ersch., and *E. hindostanica* Zag., but readily distinguished on the basis of wedge-shaped lobes of prevaginal plate and different type of armature of duct of bursa copulatrix. Several characters of the male and female genitalia as well as external appearance pertmit the inclusion of the species in subgenus *Bilobatana* Zag. and bring it closer to *Episcardia caerulipennis* Ersch. (Figure 161).

No specimens examined by me.

Distribution. Afghanistan (Figure 160).

Indicated from Kabul, Salang, and Kotkai (Petersen, 1973). Its occurrence quite possible in Turkmenia and Uzbekistan.

Biology. Xerophilous montane Afghanistan species. Moths collected in June–July. Thus on the inner slopes in the environs of Kabul one male was collected July 5, 1963 and one female June 29, 1965 at an altitude of 2,300 m. In the Salang pass (2,100 m) one male and one female were collected between July 5 and 11, 1966. One male was collected in southeastern Afghanistan in Kotkai region at an altitude of 2,350 m between July 14 and 23, 1966 (Petersen, 1973). This species probably produces two generations per year. Life history not studied.

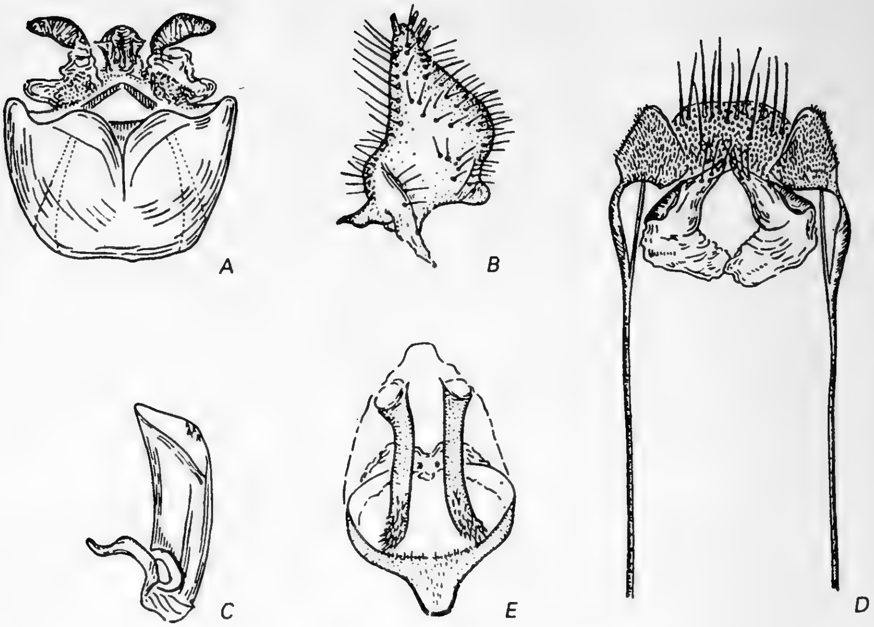


Figure 173. Genitalia of *Episcardia paghmanella* Pet.
Male: A—general appearance (ventral view); B—valva (viewed from inner side); C—aedoeagus.

Female: D—region of vaginal plate, E—complex of sclerotized structures in duct of bursa copulatrix. (from Petersen, 1973).

Eastern Afghanistan, environs of Kabul.

260 6. **Episcardia (Bilobatana) splendens** Pet. (Figures 160; 161; 174)

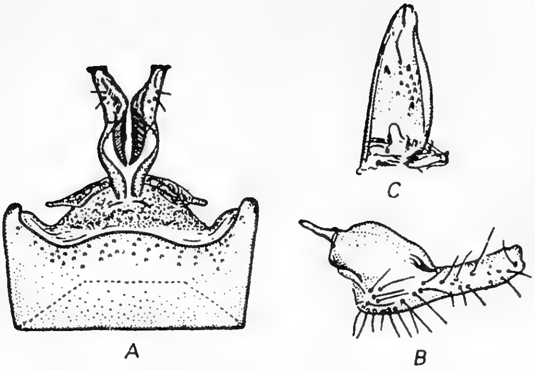
Petersen, 1973: 63–64, 69, Figs. 18–20.

External characters of imago. Pubescence of head light brown. Antennae light yellow and equal to nine-tenths length of forewing. Span of forewings 18 mm. Forewings and fringe uniformly brown; hind wings slightly darker than forewings but with lighter-colored fringe.

Male genitalia (Figure 174, A). Valvae very broad at base, then taper sharply into narrow digitate appendage (Figure 174, B). Uncus (Figure 174, A) consists of elongated, highly sclerotized lobes, which are close-set at base. Aedoeagus (Figure 174, C) short, broad, with obtuse conical tip, with numerous minute spinules in middle region. Anellus barely developed. Vinculum broad, with dilatation in middle part of posterior margin.

Female. Not known.

Comparison. On the basis of color and structure of male genitalia



260 Figure 174. Male genitalia of *Episcardia splendens* Pet.

A—general appearance (ventral view); B—valva (from inner side); C—aedoeagus (from Petersen, 1973).

Eastern Afghanistan, environs of Kabul.

(elongated uncus lobes and broad vinculum), close to *Episcardia caerulipennis* Ersch. and *E. pygmaeana* Pet., but differs in digitate apical part of valva and presence of spinules in middle part of aedoeagus. Based on the genitalia of males, *E. splendens* can be considered a connecting link between *E. pygmaeana* Pet. and *E. caerulipennis* Ersch. and *E. hindostanica* Zag. (Figure 161).

No specimens examined by me.

Distribution. Afghanistan: Kabul (Figure 160).

Biology. Montane endemic of Afghanistan fauna. Single male collected at Paghman range, 30 km northwest of Kabul, between June 3 and 5, 1965, at an altitude of 2,500 m (Petersen, 1973). Mode of life not studied.

7. **Episcardia (Bilobatana) violacella** Rbl. (Figures 15, B; 159–161; 175–180

Rebel, 1893: 42–43 (*Tinea*); Staudinger and Rebel, 1901: II, 239 (*Tinea*); Zerny, 1934: 27 (*Tinea*); Osthelder, 1936: 89 (*Tinea*); Petersen, 1957b: 573–574, Figs. 224, 225; 1959b: 565; 1968: 55; —*fuscoviolacella* Ragonot, 1895: CV (*Tineola*); Freiher, 1897: 189 (*Tinea*); Staudinger and Rebel, 1901: II, 239 (*Tinea*); Caradja, 1920: 170 (*Tinea*); 1934: 184 (*Tinea*); Zerny, 1934: 27 (*Tinea*); Osthelder, 1936: 89–90; —*luteocapitella* Amsel, 1935c: 313–314 (*Tinea*).

External characters of imago. Head covered with bright rusty-red hairs. Labial palpi brown; terminal segment obtuse and equal to half

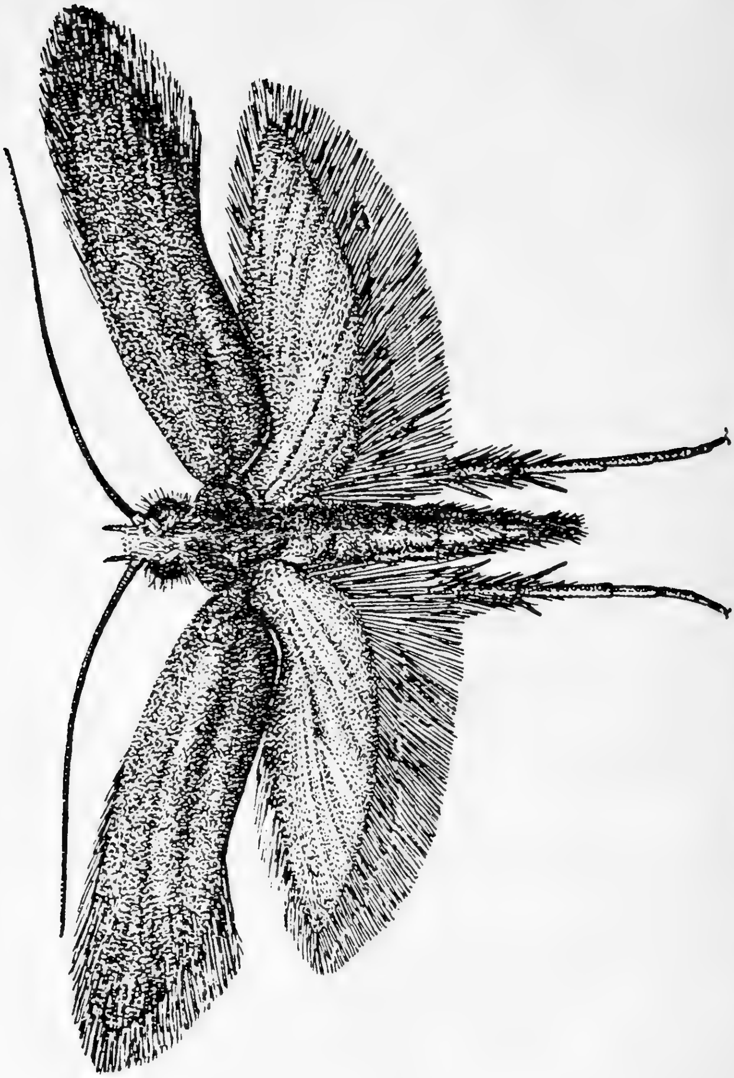


Figure 175. *Episcardia violacella* Rbl., male (drawn by T.A. Temkina).

length of 2nd segment; 2nd segment with tuft of bristles at apex; Maxillary palpi curved and barely visible. Antennae of male reach five-sixth length of forewing, light-brown; flattened basal segment dark brown.

261 Thorax and tegulae covered with dark violet brown scales. Thorax on lower side cinnamon-gray. Span of wings in male 19 mm, but specimens with wing span of 18 to 22 mm are also known. Forewings broad, with bright pointed apex; however appear obtuse and rounded because of broad fringe. Hind wings with rounded apex; fringe equal to three-fourths width of wing.

Forewings brown; alar margin before fringe dark brown and covered with dark violet-brown scales (Figure 175). Pattern completely absent. Wings with distinct oily sheen. Fringe broad, cinnamon-gray, covered at base with brown scales. Hind wings cinnamon-gray; anterior margin with vivid purplish-violet luster. Fringe cinnamon-gray, with diffused line passing through midpoint. Under surface of wings and fringe dark cinnamon-gray. Radiocubital cell of fore- and hind wings with violet sheen.

In forewing (Figure 176, A) Sc terminates on alar margin before level of origin of R_2 and Cu_2 from cell. Distance between bases of R_2 and R_3 one-third distance between bases of R_1 and R_2, and also one-third length of radial cell. R_5 terminates almost at alar apex. In hind wing (Figure 176, B) R originates from cell at level of Cu_1 and its terminal and that of M_1 equidistant from alar apex. Base of M_3 slightly closer to M_2 than to Cu_1. A_1 terminates on alar margin much before level of apex of radiocubital cell.

263 Legs cinnamon-gray, slightly lustrous. Hind tibiae covered with short hairs. Armature of tibiae and tarsal segments of fore- and hind legs as shown in Figure 176, C, D.

Abdomen flattened, on dorsal surface cinnamon-gray, and each segment with gray band along lateral side. Ventral surface of abdomen lighter in color than dorsal surface. Short anal brush present at end of abdomen.

Male genitalia (Figures 15, B; 159; and 177). Valvae bilobate, with very characteristic structure. Lobate appendage originating from base of valvae, dark brown, chitinized, and in lateral view same length or
264 slightly longer than thin-walled lower lobe (Figure 15, B). Uncus consists of long lobes located on common base. Aedoeagus shorter than valvae, narrow, with slender, backwardly directed, sclerotized pointed apex and broad base.

Female genitalia (Figures 178 to 180). Posterior margin of vaginal plate smooth; anterior margin drawn out into long cord. Duct of bursa copulatrix at entry into bursa without complex sclerotized structures.

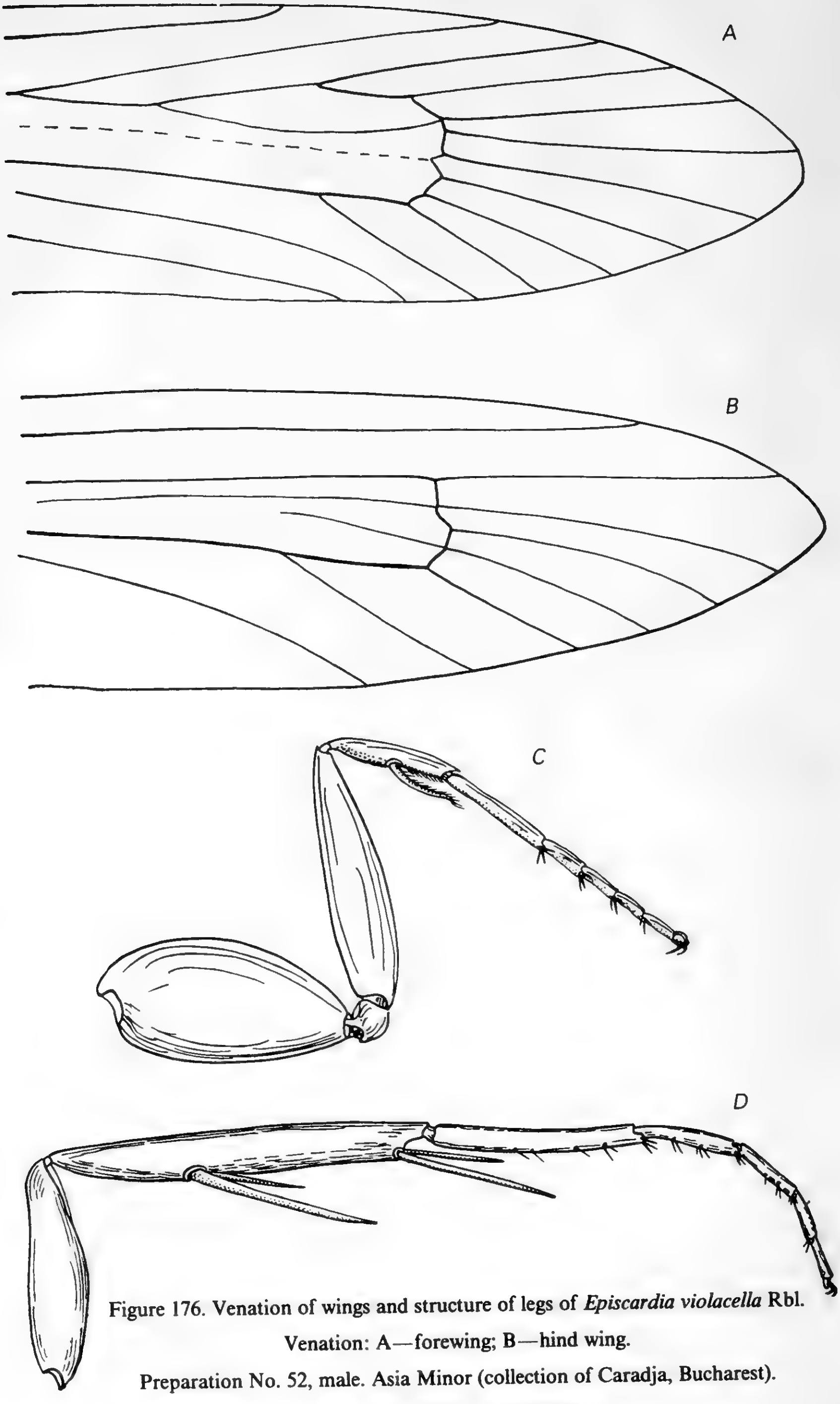


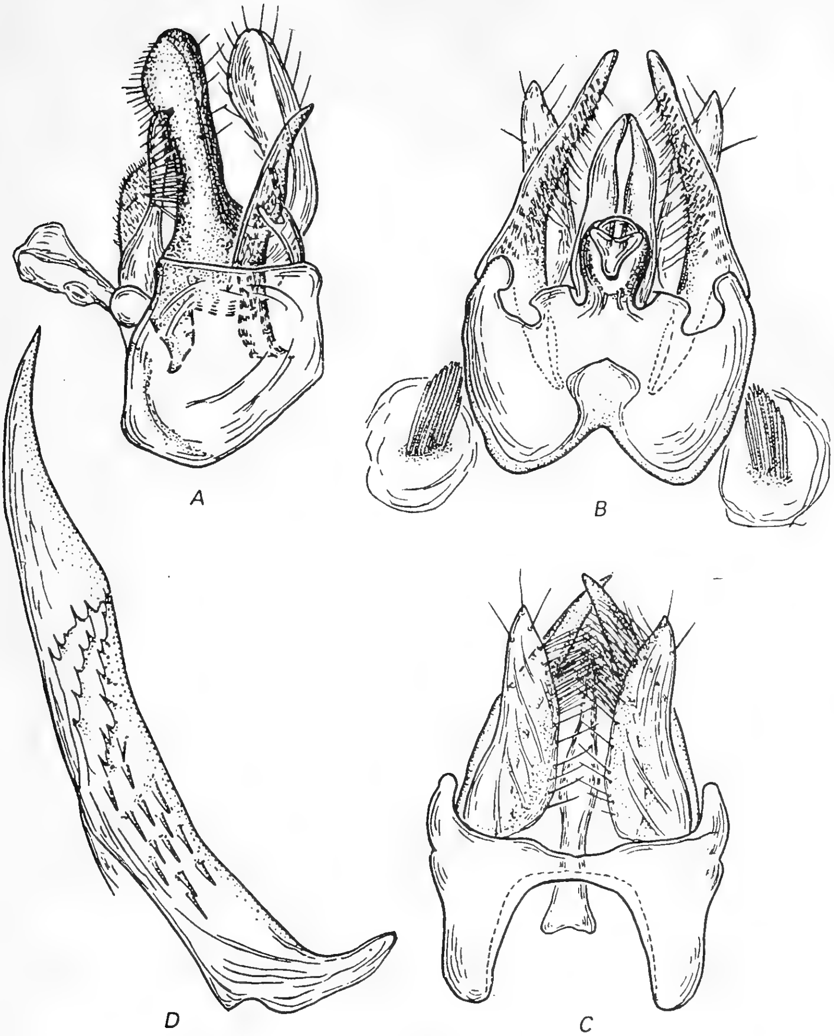
Figure 176. Venation of wings and structure of legs of *Episcardia violacella* Rbl.

Venation: A—forewing; B—hind wing.

Preparation No. 52, male. Asia Minor (collection of Caradja, Bucharest).

Legs: C—foreleg; D—hind leg.

Preparation No. 11–46, female. Trans-Caucasus, Ordubad.



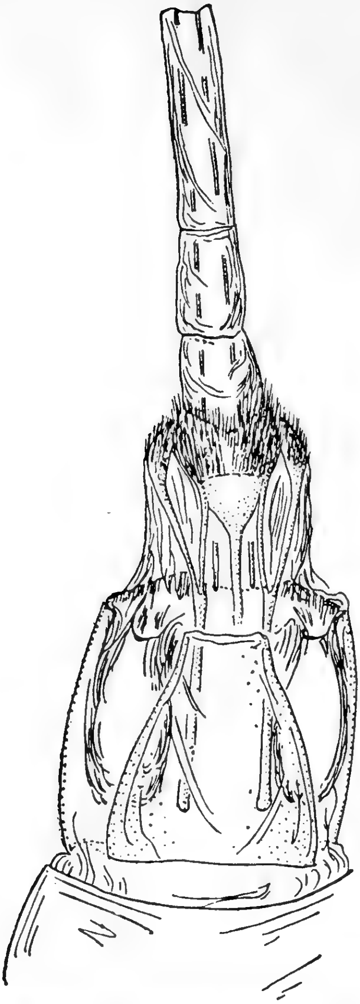
263 Figure 177. Genitalia of male *Episcardia violacella* Rbl.

A—lateral view; B—dorsal view; C—ventral view; D—aedoeagus (high magnification).

Preparation No. 52. Asia Minor (collection of Caradja, Bucharest.)

Bursa copulatrix also without signa. Anterior apophyses bifurcate.

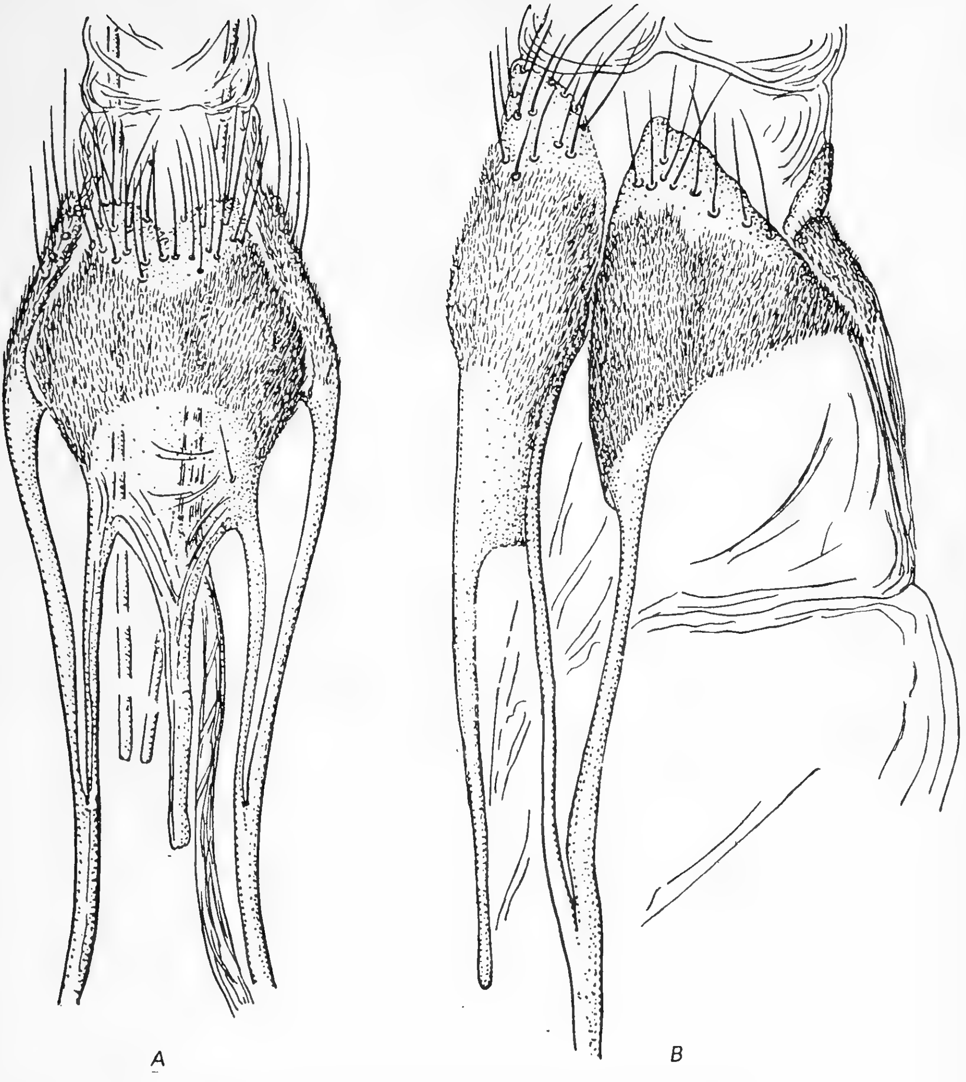
Comparison. Species close to *Episcardia luteola* Pet.; however, rusty-red pubescence of head, which contrasts sharply with uniform ash-brown forewings and dark violet hind wings, readily distinguishes this species from *E. luteola* Pet. and other members of the genus. In hind wings base of M_3 at a greater distance from base of Cu_1 and much



264 Figure 178. Female genitalia of *Episcardia violacella* Rbl. General appearance. Preparation No. 11046, female. Trans-Caucasus, Ordubad.

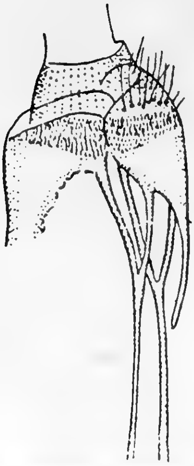
closer to base of M_2. Lobate process arising from base of valvae similar in origin to falcate appendage arising from base of costa in *E. caerulipennis* Ersch. In female genitalia vaginal plate with long, drawn out anterior margin. Duct of bursa copulatrix without sclerotized structures.

In the original description for *Tinea luteocapitella* Ams. (Amsel, 1935c), it was indicated that the head and frons are bright yellow. Labial palpi relatively straight, covered with compact brown scales. Antennae



265 Figure 179. Region of vaginal plate of *Episcardia violacella* Rbl.
A — ventral view; B — lateral view (higher magnification).
Preparation No. 11046, female. Trans-Caucasus, Ordubad.

consist of long, slender segments, smooth, and equal to three-fourths to four-fifths length of forewing. Moths very large; wingspan 18 to 22 mm. Forewings without pattern, matte brown. Hind wings same color as forewings, but covered with sparse scales and therefore somewhat transparent.



266 Figure 180. Genitalia of female *Episcardia violacella* Rbl. (from Petersen, 1957b). Syria.

Amsel considered this species close to *Ceratophaga infuscatella* Joan. (*Tinea*), noting that it differs only in absence of interruption in inner margin of hind wings.

Ragonot (1895) in his description of *Tineola fuscoviolacella* indicated that coloration, size, and shape are very similar to *Episcardia violacella* Rbl.; however he also noted certain differences such as somewhat longer wings and presence of dark line on fringe.

Zerny (1934) compared the five males of *Tinea fuscoviolacell* Rag. with him (which have mistakenly been named *Tinea fuscoviridella* Rag.) with the type and paratypes of *Episcardia violacella* Rbl. (*Tinea*), and found no notable differences except for smaller size, somewhat lighter coloration, and better flight capacity compared to the type of specimen. The absence of differences between these species was also pointed out by Osthelder (1935).

265 Petersen (1957b) studied·the species described by Ragonot and Amsel and after comparing their genitalia with that of the type of specimen, declared *Tinea fuscoviolacella* Rag. and *T. luteocapitella* Ams. synonyms of *Episcardia violacella* Rbl. I examined one male of *Tinea fuscoviolacella* Rag. from the collection of Caradja (Bucharest) and confirm its identity with *Episcardia violacella* Rbl.

Distribution. Trans-Caucasus, Asia Minor, and West Asia: Turkey, Lebanon, Syria, Israel, Iraq (Figure 160).

In literature, indicated from Turkey, Marash (Osthelder, 1935); Güllek (Rebel, 1893; Petersen 1957b); Lebanon, Beirut (*Tinea fuscoviolacella* Rag., Caradja, 1920; Zerny, 1934); Syria, Akbes (*Tineola fuscovio-*

266 *lacella* Rag., Ragonot, 1895; Freiher, 1897); Palestine, Jerusalem (*Tinea luteocapitella* Ams., Amsel, 1935c; Osthelder, 1936); Iraq (Mesopotamia) (Petersen, 1957b).

Material examined. 1 male and 2 females.

Trans-Caucases, near Ordubad, two females July 2, 1957, on light (Zagulyaev).

Asia Minor, Akshehir, one male. Specimen with original label: "Akshehir 18 VI 34 Fr. Wagner" (collection of Caradja, Bucharest).

Biology. Eastern Mediterranean species confined to steppe and semidesert habitats. Two females caught in Trans-Caucasus in the beginning of July near Ordubad at night in a stony semidesert, at a height of 900 m near Araks in Darasham ravine. In Southern Turkey moths emerge from May to August (Osthelder, 1936). In Syria, Damascus region, one male was caught June 2 to 3 (Petersen, 1968). Amsel caught moths on May 18 and 23 and June 1, and considered them common in Palestine (Amsel, 1935c). In northern Lebanon moths were found in May–June at a height of 1,800 m (Zerny, 1934).

8. **Episcardia (Bilobatana) violacea** Chr.

Christoph, 1888, 312 (*Euplocamus*); Staudinger and Rebel, 1901: II, 235 (*Euplocamus*); Petersen, 1957b: 575.

External characters of imago. From the first description it appears that the head is covered with brownish hairs. Labial palpi brownish-yellow; terminal segment almost dependent. Antennae long, brownish-yellow; 1st segment short and thick.

Thorax toward front partly violet, with steely hue. Wing span 27 mm.

Abdomen brownish-yellow

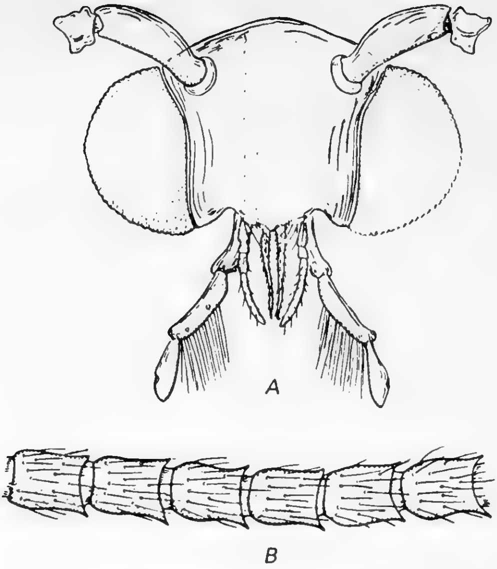
No specimens examined by me.

Comparison. Petersen (1957b) provisionally included this species in genus *Episcardia* Rag. on the basis of the violet luster of its forewings and thorax, and dependent terminal segment of labial palpi. Possibly, this species is close to *E. caerulipennis* Ersch. or even identical to it. However this matter cannot be resolved as the type specimen was not studied.

Distribution. Northern Iran (Figure 160).

The only specimen, female, known from northern Iran (Achahrud) was collected in June. Its occurrence within the limits of the Soviet Union is possible, primarily in the southern regions of Central Asia and Trans-Caucasus.

Biology. Xerophilous species, possibly of tropical origin, restricted to desert and semidesert formations.



267 Figure 181. Head of *Catabola agenjoi* Pet.

A—general appearance of head; B—middle segments of antenna (higher magnification).

10. Genus *Catabola* Durr.

Durrant, 1913: 142; Petersen, 1957b: 563–564; 1960b: 209; 1963b: 168–173; Gozmàny and Petersen, 1964: 625–626; Gozmàny, 1966: 61–62; 1967: 30–45; —*Crassicornella* Agenjo, 1952: 67, type *C. crassicornella* Agenjo; 1952: 67, nec Zeller, 1847b (Spain); —*Tineomorpha* Amsel, 1956: 28, type *Tinea hirundinea* Meyrick, 1928b: 239 (Morocco); *Praelongicera* Amsel, 1956: 29, type *Tinea palaestinella* Amsel, 1955: 63 (Palestine): —*Aphrodoxa* Gozmàny, 1959: 345–346, type *A. astarte* Gozmàny, 1959: 346 (Afghanistan).

267 *Type species: Tineola biskraella* Rbl., 1901.

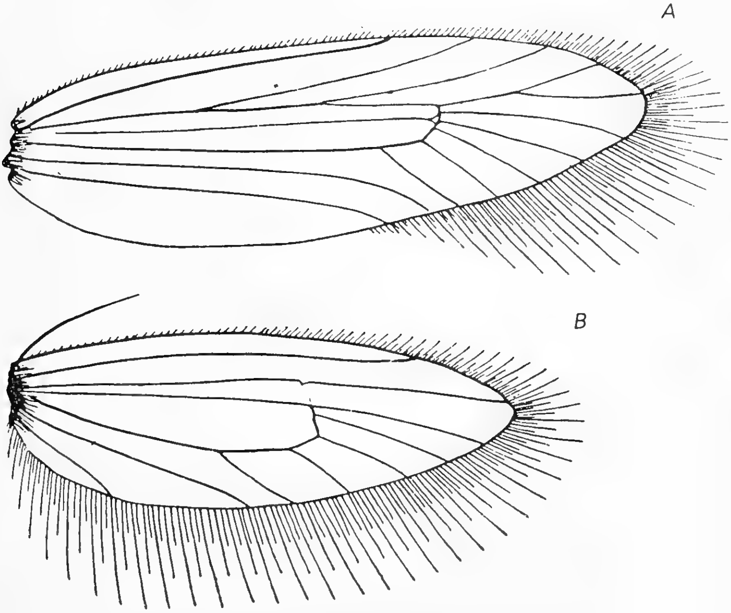
Moths of this genus similar to members of *Episcardia* Rag. and *Myrmecozela* Zll. in yellowish-brown, broad, oval wings.

Imago. Pubescence of head yellowish, with brown tones and admixture of gray and black. Pilifers small. Galea in many species absent; maxillary palpi small (Figure 181, A). Labial palpi normally developed; 3rd segment large and may be equal to 2nd. Frons usually less than vertical diameter of eyes and only in some species significantly broader. Antennae robust in most species and slightly shorter than length of forewings, rarely equal or slightly larger (subgenus *Crassicornella* Ag.);

structure of middle segments as shown in Figure 181, B.

Thorax and tegulae yellowish to cinnamon-gray, in some species with brownish or violet hue. Span of forewings 7.0 to 23.0 mm. Length of forewing and hind wing three to four times width; usually hind wings three-fourths to four-fifths length of forewings. Fringe of hind wings one-half to four-fifths width, or in some species one-fourth to one-third greater than width. Color of forewings in most species more or less uniform, from clay-yellow to cinnamon-ash. Basal fourth or third of costal margin with blackish or dark brown granulation. Hind wings light yellowish-ash-gray, light cinnamon-gray, brownish, usually translucent, with golden luster. Fringe darker than basic background color of wing.

In forewings (Figure 182, A) *Sc* terminates in middle of anterior margin of wing, rarely beyond it. Terminus of R_1 located beyond level of outer margin of radiocubital cell, rarely at same level. In some species R_3 absent. In most members R_4 and R_5 stalked and terminus of R_5 on anterior margin or at alar apex. Distance between bases of Cu_1 and Cu_2 can be slightly more or less than distance between bases of R_2 and R_3 (if R_3 present) and always one-third to one-half distance between bases of R_2 and common trunk of R_{4-5}. Fork of A_{2-3} not usually present; if present, always smaller than common trunk, which terminates on



268 Figure 182. Venation of wings of *Catabola biskraella* Rbl.

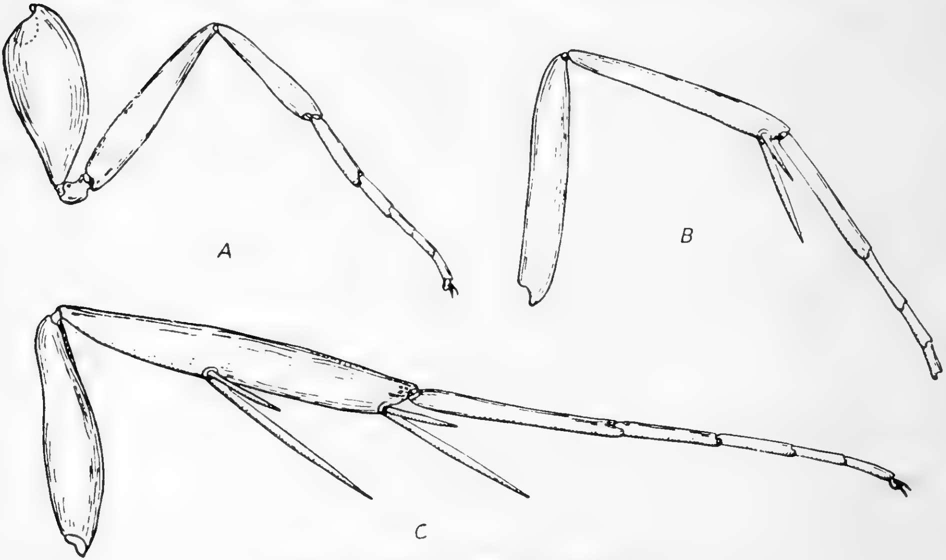
A—forewing; B—hind wing.

posterior alar margin at level of origin of Cu_2 from cell. In hind wings (Figure 182, B) *Sc* terminates on anterior margin at two-thirds to seven-ninths its length. Terminus of *R* almost reaches alar apex. M_3 in some species reduced. Radiocubital cell in some species open and M_1 not connected by cross-vein with radial trunk. Medial cell not developed.

Legs monochromatic yellowish-cinnamon, brownish, without light-268 colored rings at ends of tibiae and tarsal segments. Anterior tibiae in many members without epiphyses, one-half to two-thirds (Figure 183, A) length of femora, and middle tibiae slightly shorter than femora (Figure 183, B). Median pair of spurs of hind tibiae located before midpoint of tibiae (Figure 183, C), rarely immediately beyond its midpoint (Figure 196, B). Tarsal segments of all legs without spinules at ends or in some members with three spinules; in addition tibiae and tarsi compactly covered with spinescent scales.

Abdomen yellowish-brown, clay-yellow, with brighter color at anal end.

Male genitalia (Figures 188 to 190). Valvae simple, broad at base, but elongated toward apex, becoming narrow and digitate; length together with pedicel 3.5 to 9.0 times more than width of middle part. Uncus usually with two well-developed lobes, which are smooth in members of subgenus *Catabola* Durr., or with strong falcate process on dorsal side, as in species of subgenera *Crassicornella* Ag. and *Praelongicera* Ams. Aedoeagus usually not longer than valvae and in some



269

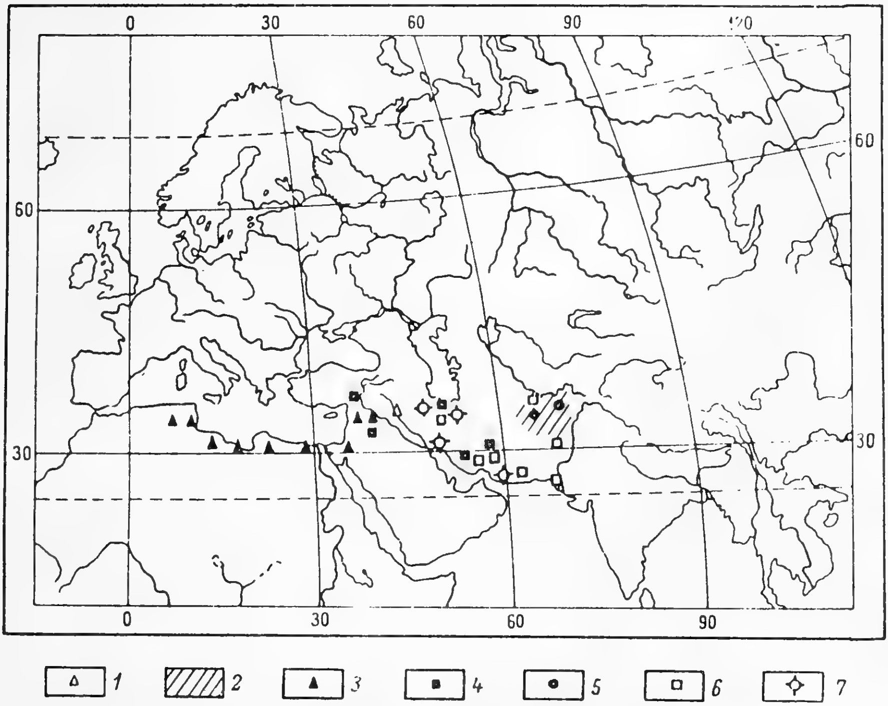
Figure 183. Legs of *Catabola biskraella* Rbl.

A — foreleg; B — middle leg; C — hind leg.

species one-third their length (Figure 17, C, D). Tegumen and vinculum broad. Vinculum in dorsal view either with notch or tubercle along posterior margin. Saccus in most species not developed.

Female genitalia (Figure 201)[23]. Vaginal plate at base entire, its lobes widely separated and densely covered with slender spinules. Prevaginal plate usually not present. Tergal plate of segment VIII broad or in form of two widely separated lobes covered with bristles. Terminus of duct of bursa copulatrix membranous and poorly defined. Duct of bursa copulatrix either with complex sclerotized structures in first third, or simple, without inclusions. Bursa copulatrix without sclerotized inclusions. Anterior apophyses with long abdominal and dorsal branches.

269 *Biology*. Xerophilous, warmth-loving species, confined to open landscapes. Species live in hilly steppes, semideserts, and in subtropical and tropical regions in stony deserts and savannas. Moths usually



270 Figure 184. Distribution of species of *Catabola* Durr.

1 — *C. cornuta* Pet.; 2 — *C. sarobiella* Pet.; 3 — *C. biskraella* Rbl.; 4 — *C. wiltshirella* Pet.; 5 — *C. amseli* Pet.; 6 — *C. peterseni* Ams.; 7 — *C. flava* Pet.

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[23] It should be noted that females are not known for most species.

emerge in spring to beginning of summer, as well as in autumn. Many species live at altitudes of more than 1,000 m. Larvae mostly develop in silken galleries constructed in turf and other perennial grasses. They feed on dead plant parts, including roots. It has been proposed that the larvae of some species live in nests of social Hymenoptera. Identification of the Hymenoptera with which species of *Catabola* Durr. are associated would be interesting, as would the establishment of correlation in distribution of host and moth species, since a definite relation should exist in this case.

Most species produce two generations per year.

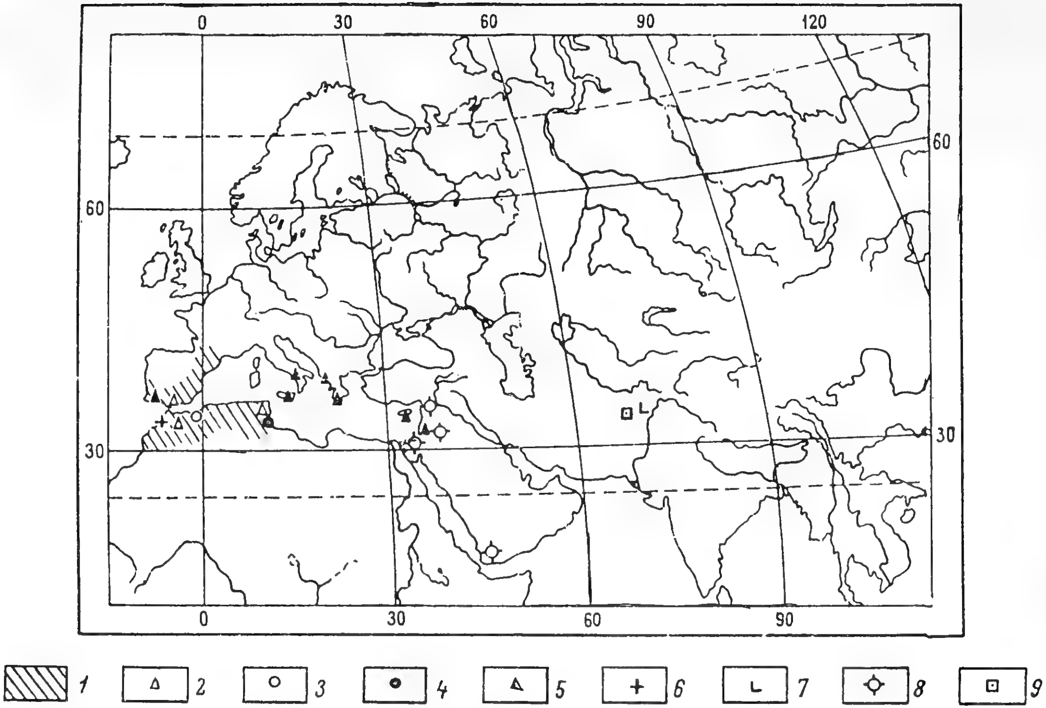
Distribution. The genus includes 16 Palearctic species, none of which is presently found outside the limits of the Palearctic (Figures 29, 184, 185). The range of these species covers the European and African Mediterranean, Asia Minor, West Asia, Iran, Afghanistan, and Pakistan.

No species of this genus has been found so far in the Soviet Union. However, many members known from northern Iran and Afghanistan might well occur in Trans-Caucasus and southern Central Asia. Centers of distribution of the genus described to date are located in the southern part of the Iberian Peninsula, the great Atlas mountains, Asian Mediterranean, and mountains of Iran and Afghanistan. Species of this genus are confined mainly to hilly regions.

Non-Palearctic members of the genus are distributed in southeast Africa and India, but species composition has not been fully analyzed and those identified require verification.

Comparison. In terms of these characters—anterior tibiae one-half to two-thirds length of femora, relatively broad vinculum and wide-set uncus lobes in male genitalia, and sclerotized vaginal plate in female
270 genitalia—the genus *Catabola* belongs to the tribe Myrmecozelini Zag., but forms an independent branch close to *Episcardia* Rag. This tempted Gozmàny and Petersen (1964) to consider *Catabola* Durr. a synonym of *Perissomastix* War. and Roth. Further studies by Gozmàny (1966, 1967) on the African members of Tineidae revealed that of the 46 species of *Perissomastix* War. and Roth., 44 are known from the Ethiopian region and only 2 found in the Palearctic (one species in Egypt and one in Syria).

It is known that the genus *Catabola* Durr. is distinctly characterized, in addition to male genitalia, by characters of venation, armature of legs, and other features. A detailed study of these characters in members of *Perissomastix* War. and Roth., especially the type species (*P. nigriceps* War. and Roth. from Equatorial Africa) would reveal that it is premature to combine these genera. My study of some species of *Perissomastix* War. and Roth. showed that venation of wings and location of



271 Figure 185. Distribution of species of the genus *Catabola* Durr.

1—*C. agenjoi* Pet.; 2—*C. zernyi* Pet.; 3—*C. atlantis* Zag., sp. n.; 4—*C. bifurcatella* Pet.; 5—*C. crassicornella* Zll.; 6—*C. hirundinea* Meyr.; 7—*C. obscura* Pet.; 8—*C. palaestinella* Ams.; 9—*C. afghana* Pet.

spines on the legs differ from members of *Catabola* Durr. Hence I cannot agree with the opinion of Gozmàny and Petersen, and have retained *Catabola* Durr. as an independent genus.

Species of genus *Catabola* Durr. can be distinguished from each other on the basis of external characters. Notable differences in genital structure make species identification rapid and reliable.

271 In view of the fact that females are not known for most species, identification of species and their groupings into subgenera is based on male genitalia, especially the structure and shape of the uncus, aedoeagus and valvae.

At present the genus *Catabola* Durr. includes 16 species of moths, which are grouped into 4 subgenera.

The first subgenus, *Catabola* Durr., s. str., with type species *Tineola biskraella* Rbl., includes seven species: *Catabola cornuta* Pet., *C. sarobiella* Pet., *C. biskraella* Rbl., *C. wiltshirella* Pet., *C. amseli* Pet., *C. peterseni* Ams., and *C. flava* Pet.

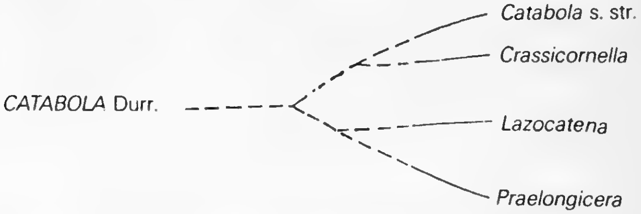


Figure 186. Phylogenetic relations of subgenera of genus *Catabola* Durr.

272 The second subgenus, *Crassicornella* Ag., with type *Catabola agenjoi* Pet., comprises six species: *C. agenjoi* Pet., *C. zernyi* Pet., *C. atlantis* Zag., sp. n., *C. bifurcatella* Pet., *C. crassicornella* Zll., and *C. hirundinea* Meyr.

The third subgenus, *Lazocatena* Gozm., consists of just one species, *Catabola obscura* Pet.

The fourth subgenus, *Praelongicera* Ams., with type *Catabola palaestinella* Ams., includes two species: *C. palaestinella* Ams. and *C. afghana* Pet.

The phylogenetic relations of these subgenera are depicted in Figure 186. Subgenera *Catabola* Durr., s. str. and *Crassicornella* Ag. are close to each other in structure of the uncus (deeply divided into two lobes), while the other two subgenera—*Lazocatena* Gozm. and *Praelongicera* Ams.—are linked by a similar, compact, almost undivided uncus. The structure of the valvae and aedoeagus of *Lozacatena* Gozm. brings this subgenus close to *Crassicornella* Ag., as well as to *Praelongicera* Ams.

Key to Subgenera of the Genus Catabola Durr. on the Basis of External Characters[24]

1 (2). In forewings and hind wings vein M_3 absent; in hind wings M_1 and M_2 connate .... 4. **Praelongicera** Ams.
2 (1). In forewings and hind wings vein M_3 developed; in hind wings M_1 and M_2 widely separated.
3 (4). In forewings all radial veins developed; in hind wings terminus of *Sc* more than five times closer to apex of radiocubital cell than to alar apex .... 2. **Crassicornella** Ag.
4 (3). In forewings R_3 absent; in hind wings terminus of *Sc* located almost equidistant from apex of radiocubital cell and alar apex, or closer to the latter .... 1. **Catabola** Durr., s. str.

Key to Subgenera of Genus Catabola Durr. on the Basis of Male Genitalia[25]

1 (4). Uncus with two long parallel or divergent lobes.
2 (3). Lobes of uncus more or less parallel and with small, poorly developed dorsal tubercle, or with lateral downwardly directed spine; in some species costal margin of lobes highly sclerotized .... 1. **Catabola** Durr., s. str.
3 (2). Lobes of uncus diverge from base at an angle; dorsal surface with one large, backwardly directed, and highly sclerotized tooth; costal margin of lobes not thickened and poorly sclerotized .... 2. **Crassicornella** Ag.
4 (1). Uncus compact, with fused or short lobes.
5 (6). Apex of uncus divided by constriction; upper and lower sides of uncus with two hooks each; valvae without spines .... 3. **Lazocatena** Gozm.
6 (5). Apex of uncus not divided; dorsal side of uncus with two cornuate hooks; valvae with spine on inner side .... 4. **Praelongicera** Ams.

273

1. Subgenus *Catabola* Durr., s. str.

Durrant, 1913: 142.

Type species of subgenus. Tineola biskraella Rbl., 1901.

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[24] Venation of wings of species of subgenus *Lazocatena* Gozm. is not known and hence it could not be included in the key.

[25] Females of most species of *Catabola* Durr. are not known and hence key on the basis of female genitalia not provided.

Thorax and tegulae yellowish-brown. Span of forewings 15 to 22 mm. Usually, length of forewing more than three times, of hind wings almost three times more than width; fringe of hind wing equal to about half alar width.

In forewings (Figure 182, A) R_3 absent. R_4 and R_5 stalked. In hind wings (Figure 182, B) Sc equal to three-fourths to four-fifths alar length. M_1 and M_2 close-set at base; M_3 developed. Radiocubital cell equal to three-fifths length of wing.

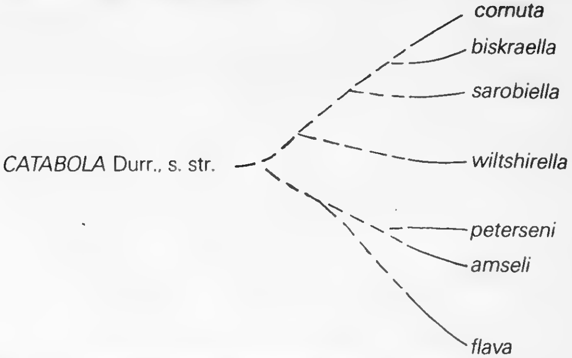

Figure 187. Phylogenetic relations of species of subgenus *Catabola* s. str.

Median pair of spurs of hind tibiae located before midpoint of tibia. Ends of tarsal segments without spinules. Structure of legs as shown in Figure 183.

In male genitalia (Figures 188 and 189) uncus consists of two free, more or less smooth lobes, without highly sclerotized structures on dorsal side.

Females not known for most species.

At present the subgenus includes seven species: *C. cornuta* Pet., *C. sarobiella* Pet., *C. biskraella* Rbl., *C. wiltshirella* Pet., *C. flava* Pet., *C. amseli* Pet., and *C. peterseni* Ams.

The phylogenetic relations of these species are depicted in Figure 187. The species *C. cornuta* Pet., *C. biskraella* Rbl., and *C. sarobiella* Pet. constitute a group because of the strong falcate spine on the aedoeagus; *C. wiltshirella* Pet., could also be included in this group. *C. amseli* Pet., *C. peterseni* Ams., and *C. flava* Pet. constitute another group since the aedoeagus has only one or a few minute teeth.

Key to Species of Subgenus Catabola Durr. (s. str.) on the Basis of Male Genitalia[26]

1 (12). Dorsal margin of uncus lobe slender, poorly sclerotized.

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[26] A key to species on the basis of external characters is difficult to prepare because of the considerable similarity in structure. Females of most species are not known.

274 2 (5). Lobes of uncus with sclerotized hooks or tubercles in middle or at base of dorsal side.

3 (4). Lobes of uncus with sclerotized hook in middle of dorsal side; apical region of aedoeagus with small spinescent hooks along sides .... 2. C. (s. str.) **sarobiella** Pet.

4 (3). Lobes of uncus with two large tubercles at base of dorsal side; apical region of aedoeagus on dorsal side with broad digitate appendage .... 4. C. (s. str.) **wiltshirella** Pet.

5 (2). Lobes of uncus on dorsal side smooth, slender, without tubercles and spinescent processes.

6 (9). Aedoeagus with strong broad hook near apex on dorsal side.

7 (8). Hook on aedoeagus located at level of apex of aedoeagus .... 1. C (s. str.) **cornuta** Pet.

8 (7). Hook on aedoeagus located somewhat below apex of aedoeagus .... 3. C. (s. str.) **biskraella** Rbl.

9 (6). Aedoeagus with one or a few small teeth near apex.

10 (11). Aedoeagus broadens notably near apex and with two small obtuse teeth near apex; apex itself drawn out, forms narrow curved tube .... 7. C. (s. str.) **flava** Pet.

11 (10). Aedoeagus does not broaden near apex and with one small spine; apex of aedoeagus obliquely truncated................ .... 5. C. (s. str.) **amseli** Pet.

12 (1). Dorsal margin of lobes of uncus thick and highly sclerotized. .... 6. C. (s. str.) **peterseni** Ams.

1. **Catabola** (s. str.) **cornuta** Pet. (Figures 184; 187; 188)

Petersen, 1959a: 70–71; 1963b: 170.

External characters of imago. Pubescence of head cinnamon-brown. Antennae long and thick. Span of forewings 20 mm. Forewings very light to dark brown with various tinges.

Male genitalia (Figure 188). Valvae broad almost up to midpoint, then tapered toward apex; length of valvae together with pedicel almost 3.75 times greater than broad middle part. Uncus consists of two elongated lobes without processes and sclerotized structures. Aedoeagus three-fourths length of valvae, with broad apex, and falcate, highly sclerotized appendage on dorsal side, located at same level as apex of aedoeagus. Tegumen and vinculum fused into broad, strong ring.

Female. Not known.

Comparison. On the basis of coloration and robust antennae, as well as type of genitalia, this species is close to *Catabola biskraella* Rbl., which is known from Algeria and Palestine. However, it differs from this and other species in characters of the genitalia: Lobes of uncus

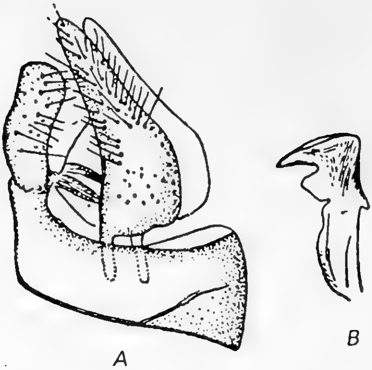

Figure 188. Male genitalia of *Catabola cornuta* Pet.
A—general appearance, B—apex of aedoeagus (from Petersen, 1959a).

smooth, without processes and spines; aedoeagus on dorsal side with spinescent appendage, which forms flat surface along with apex of aedoeagus.

275 No specimens examined by me.

Distribution. Iraq (Figure 184).

Species currently known only from mountains of Kurdistan in the environs of Erbirl (Haj Omran, Shaqlawa) (Petersen, 1959a).

Biology. Xerophilous desert species.

Moths were collected in eastern Iraq in June, 1953 (Petersen, 1959a).

2. **Catabola** (s. str.) **sarobiella** Pet. (Figures 184; 187; 189)

Petersen, 1959b; 561; 1963b: 169; 1963c: 180, 1973: 64, 69 (*Perissomastrix*); —*nuristanica* Gozmàny, 1959: 344–345.

External characters of imago. Pubescence of head cinnamon-black or coffee-cinnamon. Antennae almost equal to alar length, light yellow, golden.

Thorax and tegulae cinnamon-brown. Wing span in male usually 15 to 18 mm, but in some specimen reaches 21 mm.

Forewings light gray, silken, lustrous; in some specimens cinnamon-brown and darker near anterior margin, lightening toward posterior margin. Blackish stripe extends along costal margin over two-thirds its length from base. Fringe cinnamon-gray with silken luster. Hind wings yellowish-gray.

Male genitalia (Figure 189, A). Valvae smooth, straight, simple, tapering gradually toward apex; length 4.5 times width in broadest part. Uncus in lateral view with two broad lobes, each with small sclerotized tooth on dorsal side. Aedoeagus short, robust, almost two-fifths length

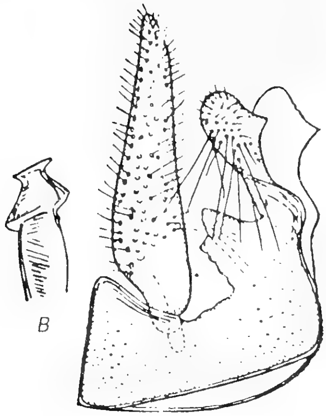

Figure 189. Male genitalia of *Catabola sarobiella* Pet.

A — general appearance; B — apex of aedoeagus (from Petersen, 1959a).

Afghanistan, Sarobi.

of valvae; in lateral view apex of aedoeagus shaped like an amphora (Figure 189, B), with well-defined spinescent protuberances along sides. Tegumen and vinculum broad and fused into strong ring.

Female. Not known.

Comparison. On the basis of external characters—color, absence of pattern, and structure of head—close to *Catabola sarobiella** Pet., but as indicated by Petersen (1959b) differs in broad uncus lobes with tooth on dorsal side, and shape of apex of aedoeagus.

No specimens examined by me.

Distribution. Eastern and northeastern Afghanistan (Figure 184).

Within the limits of the demarcated area, in literature indicated from Nuristan region, Sarobi (Petersen, 1959b) and Tangicaruh (Petersen, 1963c), as well as Bashgultal and Kunartal (Gozmàny, 1959). Species recently recorded in the environs of Kabul (Petersen, 1973).

Biology. Xerophilous montane species. Moths collected in stony desert from beginning of April to July.

276 In the environs of Kabul nine males were collected at an altitude of 1,900 m between May 20 and 29, 1965, and two males at an altitude of 2,200 m between June 29 and July 8, 1963 (Petersen, 1973). Five males were found in Sarobi region at an altitude of 1,100 m between June 23 and July 3, 1956 by Amsel (Petersen, 1959b), and some collected again

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*An obvious error in the original. From the key given on p. 443 it is clear that *Catabola wiltshirella* Pet. is meant — General Editor.

at the same place on May 7 and 8, 1961; in Tangicaruh region two males were collected on April 24, 1961; (Petersen, 1963c). Gozmàny received material from Kunartal where moths were collected at an altitude of 900 m from April 3 to May 24, as well as from Bashgultal where they were collected at an altitude of 1,200 m on May 7, 1953 (Gozmàny). The species produces two generations per year.

3. **Catabola** (s. str.) **biskraella** Rbl. (Figures 182–184; 187; 190)

Rebel, 1901: 181–182 (*Tineola*); Staudinger and Rebel, 1901: II, 240 (*Tineola*); Caradja, 1920: 171 (*Tineola*); Turati, 1927: 344; Amsel, 1955: 7; Petersen, 1957b: 564–565; 1959c: 158–159; Amsel, 1959a: 70–71; 1961; 60; Petersen, 1963b: 170; Gozmàny and Petersen, 1964: 626–628; Parenti, 1965: 311; Petersen, 1968: 55 (*Perissomastix*); —*abscondita* Gozmàny, 1960: 111.

External characters of imago. Pubescence of head dark cinnamon-brown with brownish hue. Labial palpi clay-yellow. Antennae equal to nine-tenths length of forewings; they are clay-yellow, with basal segment broad and flattened and segments of flagellum broad.

Thorax and tegulae light cinnamon-gray with violet hue. Span of forewings in males 17.5 to 19.0 mm. Length of forewings slightly more than three times width; length of hind wings almost three times width; length of fringe in latter equal to half alar width.

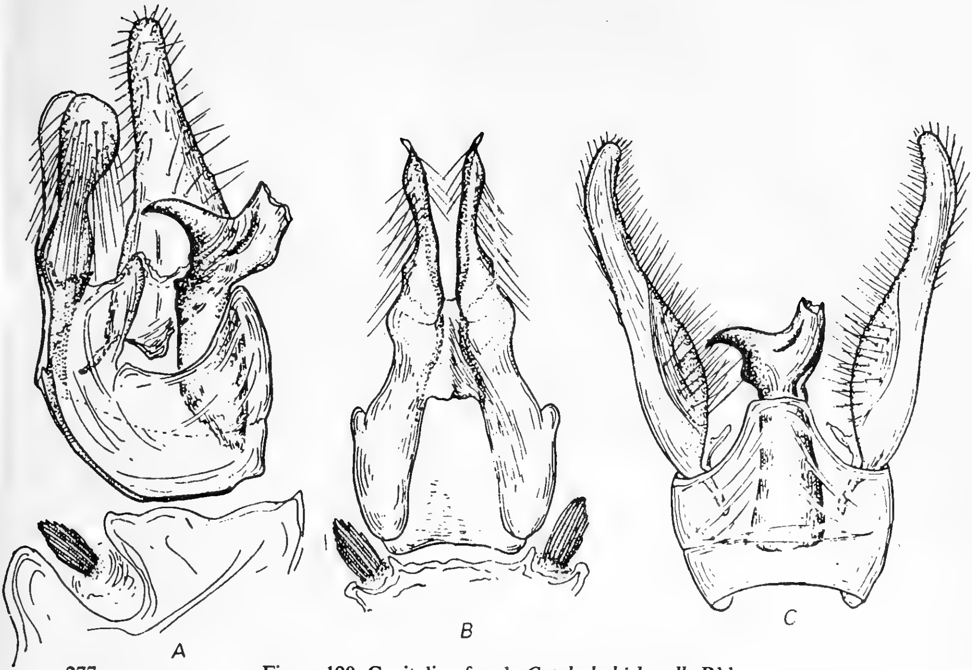
Forewings clay-yellow, cinnamon-ash, with slight violet sheen. In specimens from Palestine, as indicated by Petersen (1957b), color darker. Fringe of wings light-colored. Hind wings light yellowish-gray with clay-yellow, glossy fringe. Under surface of wings paler than upper surface.

In forewings (Figure 182, A) base of R_2 equidistant from bases of R_1 and common trunk of R_{4-5}. Distance between bases of M_3 and Cu_1 half distance between bases of Cu_1 and Cu_2. Terminus of A_1 on alar margin almost at level of origin of Cu_1 from cell. In hind wing (Figure 182, B) M_1 slightly closer to M_2 than R. Distance between bases of Cu_1 and Cu_2 twice greater than distance between bases of M_3 and Cu_1. A_1 terminates on posterior alar margin before its midpoint.

Legs monochromatic clay-yellow, without pattern. Structure of legs as shown in Figure 183.

Abdomen clay-yellow, more yellowish near anal end.

Male genitalia (Figure 190, A–C). Valvae broad at base and tapered gradually toward rounded apex; length almost five times greater than width of middle part; margins and inner surface of valvae covered with short bristles. Uncus in lateral view in form of two lobes, which are narrow in the middle and expanded and rounded at apices; lobes



277 Figure 190. Genitalia of male *Catabola biskraella* Rbl.

A — general appearance (lateral view); B — same (dorsal view); C — same (ventral view). Preparation No. 24, male. Tunisia (collection of Caradja, Bucharest).

covered with brush of long bristles. In dorsal view lobes of uncus close-set at base, diverge toward apex, and without sclerotized processes. Aedoeagus about four-fifths length of valvae, stout, with apex that appears broken and has a strong falcate subapical spine, apex of which directed inward. Vinculum with large broad process along posterior margin; tegumen with deep trapezoidal notch.

Female. Not known.

Comparison. Close to *Catabola cornuta* Pet. and *C. sarobiella* Pet., but readily distinguished from both and other species by dark pubes-
277 cence of head and cinnamon-brown color of wings, as well as structure of genitalia: valvae narrow; uncus lobes narrow in middle; process on aedoeagus located slightly below its apex. The separation of the species *C. abscondita* Gozm. from *C. biskraella* Rbl., as indicated by Gozmàny (1960) by the different shape of valvae, longer end of aedoeagus, sinuate uncus, etc. of the former species, is based on an incorrect orientation and distortion of parts of the genitalia under the cover slip.

Distribution. Northern Africa, Algeria, Tunisia, Libya, Egypt; West Asia: Palestine (Figure 184).

Also indicated from Algeria: Biskra, two males (Rebel, 1901); Tunisia: Gafsa (Petersen, 1963b); Libya: El Dabra (Petersen, 1957c); Tripoli (Gozmàny, 1960; Parenti, 1965); Israel: Tel Aviv; Syria (Petersen, 1968).

Material examined. 2 males.

North Africa. Tunisia, Gafsa, one male (collection of Caradja, identified as *Tineola vittatella* Chrét.). This specimen is one of the two identified as *Tineola vittatella* Chrét., and bears the original rectangular label (9.0 mm × 5.0 mm) with an inscription in black ink "Gafsa".

West Asia. Palestine, Düna, one male July 23, 1930 (Amsel).

Biology. North African, widely distributed species but rarely found, which has penetrated into West Asia.

Moths were collected from April to September. In Algeria, Biskra 278 region, they were found in May. In Libya, Giarabub desert, one typical specimen was collected in July (Turati, 1927). In Palestine, Tel Aviv, one male collected on May 19, 1930, and in other regions one male April 7, two males July 23–24, and one male September 17, 1930. In Syria, Damascus region, ten males were collected from May 16 to June 4, 1961 (Petersen, 1968). In Libya, Tripoli, two males were caught in May, one male in June, and two males from August 26 to September 20 (Parenti, 1965). The species produces two generations per year.

4. **Catabola** (s. str.) **wiltshirella** Pet. (Figures 184; 187; 191)

Petersen, 1964a: 115–116; 1966: 25, 29; 1968: 55 (*Perissomastix*); 1971: 270 (*Perissomastix*).

External characters of imago. Pubescence of head coffee-brown. Forewings, dark clay-cinnamon. Hind wings light yellowish-gray, glossy.

Male genitalia (Figure 191, A). Valvae elongated; length four times width of middle part; lower margin of valva anterior to midpoint highly convex, while upper part correspondingly concave. Lobes of uncus rounded at apex, at base of dorsal side with two tubercles. Aedoeagus short, compact; dorsal side of thickened and expanded apex with broad, thick, digitate process (Figure 191, B, C).

Female. Not known.

Comparison. In general appearance and color almost indistinguishable from *Catabola amseli* Pet., *C. flava* Pet., and *C. peterseni* Ams. However, genitalia readily distinguish this species: lower margin of valva convex, dorsal side of uncus lobes with two tubercles, aedoeagus apex with expanded digitate process. In these respects the species is closer to *C. sarobiella* Pet.

No specimens examined by me.

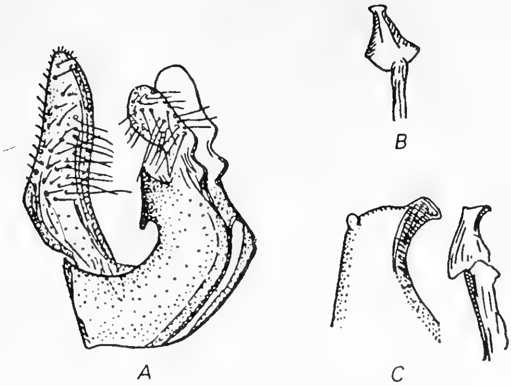


Figure 191. Male genitalia of *Catabola wiltshirella* Pet.

A—general appearance (lateral view); B—aedoeagus; C—apex of aedoeagus (higher magnification) (from Petersen, 1964a). Iran.

Distribution. Turkey, Syria Iran (Figure 184).

In literature, reported from Turkey: Marash (Petersen, 1968); Syria; Iran: Fars Province (Shiraz); Hamadan; Kirman (Petersen, 1964a).

Biology. Xerophilous species. Moths collected from May to August. Thus, in Turkey, Marash region, two males were collected in June (Petersen, 1968). In Iran, Shiraz region, 11 males were collected at an altitude of 1,600 m April 15 to 24, 1937, and 1 male May 23, 1940; 23 males were collected by Kasy between June 7 and 15, 1963 and on May 28, 1966, north of Teheran at an altitude of 2,000 m (Petersen, 1971). In Hamadan one male was found June 19, 1938, and in Kirman region one male August 7, 1950, (Petersen, 1964, 1966). This species produces two generations per year. Occurrence of moths possible in Trans-Caucasus.

5. **Catabola** (s. str.) **amseli** Pet. (Figures 184; 187; 192)

Petersen, 1959b: 561; 1963c: 181; 1973: 64–65, 69 (*Perissomastix*); —*mimetica* Gozmàny, 1959: 347 (*Episcardia*).

279 *External characters of imago.* Pubescence of head cinnamon-gray. Antennae yellowish and equal to wings in length. Thorax light yellowish-cinnamon. Span of forewings 15 to 18 mm.

Forewings light gray, light yellowish-cinnamon with oily sheen. Darker line extends along anterior margin of wing almost over two-thirds proximal part. Hind wings light gray, transparent.

Abdomen light yellowish-cinnamon.

Male genitalia (Figure 192, A–C). Valvae rather broad, tapered gradually toward apex; length 4.5 times width of basal half of valvae; costal margin in basal half slightly concave. Uncus with two simple lobes slightly compressed in dorsoventral direction; teeth and spinescent processes not present in lobes. Aedoeagus short, broad at base, its length only 1.5 times greater than width at base and one-third to two-fifths valva together with pedicel. Apex of aedoeagus straight or obliquely truncated; one small subapical spinule located on lateral side; size of spinule variable, but it is always present. Vinculum in ventral view very broad, almost half of valvae.

Female genitalia (Figure 192, D–E). Lobes of vaginal plate narrow, widely separated, and densely covered with minute spinules; posterior margin of lobes with long bristles. Ostium bursae in form of broad ring with slightly sclerotized walls. Duct of bursa copulatrix without sclerotized structures. Anterior apophyses bifurcate; dorsal branches connected with lobes of tergal plate covered with spinules. Posterior apophyses anterior to anal papillae, with process covered with bristles. Anal papillae large, sclerotized, densely laden with fine, separate, long erect bristles.

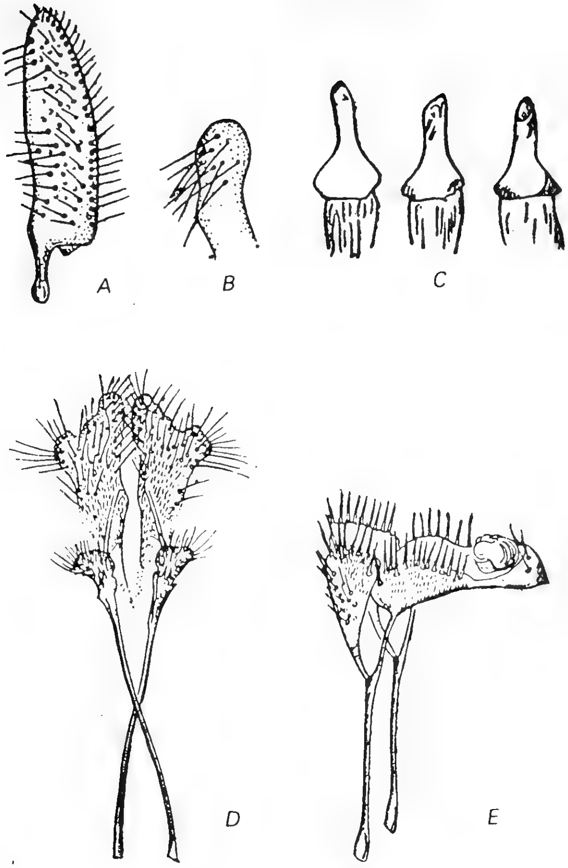
280 *Comparison*. In general structure close to *Catabola peterseni* Ams., *C. flava* Pet., and *C. biskraella* Rbl. However, readily distinguished from them and other species by simple uncus lobes, tapering and straight apex of aedoeagus with one subapical tooth, and in female genitalia by absence of sclerotized structures in duct of bursa copulatrix.

No specimens examined by me.

Distribution. Eastern and northeastern Afghanistan.

Within the limits of the demarcated area, reported in literature from Kabul (Petersen, 1973), Gulbahar and Sarobi (Petersen, 1959b, 1963a) (Figure 184).

Biology. Xerophilous Central Asian montane species. Moths emerge from end of May to October. In Gulbahar region several females were caught at an altitude of 1,700 m, and in Sarobi at an altitude of 1,100 m. Moths also collected in wormwood steppe at an altitude of 600 m along the Gulbahar-Sarobi road (Petersen, 1959b). In Sarobi region male moths were collected from May 30 to October 9, 1961 (Petersen, 1963c). On the montane plateau in the environs of Kabul numerous males and two females were collected in different areas from June 5 to August 9 (Petersen, 1973). This species produces two generations per year.



279 Figure 192. Genitalia of *Catabola amseli* Pet.

Male: A—valva; B—uncus lobe; C—aedoeagus (from Petersen, 1959b).

Female: D—posterior apophyses and anal papillae; E—region of vaginal plates (from Petersen, 1973).

Afghanistan.

6. **Catabola** (s. str.) **peterseni** Ams. (Figures 184; 187; 193)

Amsel, 1959b: 37–38; Petersen, 1959b: 562; 1963b: 170; 1963c: 181; 1964a: ;112; 1966: 25, 29; 1971: 270 (*Perissomastix*); 1973: 64, 69 (*Perissomastix*); —*astarte* Gozmány, 1959: 346 (*Aphrodoxa*).

External characters of imago. Pubescence of head dark cinnamon-brown, cinnamon-black. Thorax and tegulae cinnamon-brown. Span of wings of 15 to 22 mm. Forewings light cinnamon-brown, highly lustrous, with darker costal margin and dark stripe which continues from wing base to two-thirds its length. Fringe light grayish-yellow. Hind wings very light-colored, transparent ash-gray.

Abdomen cinnamon-gray.

Male genitalia (Figure 193). Valvae long, narrow; length 5.5 times width in middle part (Figure 193, A, B). Lobes of uncus in lateral view equal to two-thirds length of valvae; they are not rounded and lower margin obliquely truncated; dorsal margin highly thickened and sclerotized. Aedoeagus almost half length of valvae, with two barely perceptible teeth at apex; base of aedoeagus highly dilated (Figure 193, C). Tegumen short and broad.

Female. Not known.

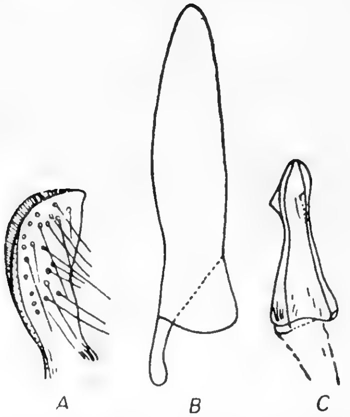


Figure 193. Male genitalia of *Catabola peterseni* Ams.

A—uncus lobe; B—valva; C—aedoeagus (from Petersen, 1960a). Iran.

Comparison. Close to *Catabola amseli* Pet. and *C. flava* Pet., but differs from both and other species in lighter coloration and deep luster. Most dependably identified on the basis of genitalia: aedoeagus half length of valvae and with minute teeth at apex; dorsal margin of uncus lobes thickneed and sclerotized, lower margin obliquely truncated.

281 No specimens examined by me.

Distribution. Southeastern Iran, northeastern Afghanistan, Pakistan (Figure 184).

Literature reports these places of occurrence: Iran: Larestan, Iranshar, Kirman region (Amsel, 1959b); Baluchistan (Petersen, 1966). Afghanistan: Nuristan (Bashgul-Tal) (Petersen, 1963c). Kandahar (Petersen, 1973). Pakistan: environs of Karachi (Petersen, 1964a), 20 km south of Quetta (Petersen, 1971).

Biology. Xerophilous species. Moths emerge in March, June, and October. In Iran, Muristan region, one male found at an altitude of 200 m in September, 1937 (Petersen, 1966). In Iranshar region, males were collected at an altitude of 800 m from March 11 to 18, 1954; south of Kirman in Anbar-Abad, at an altitude of 900 m from April 21 to 30, 1956 among outgrowths of tamarisk and blackthorn (Amsel, 1959b); in Baluchistan two males were collected in December, 1937 (Petersen, 1966). In the environs of Kandahar and Barikot seven males were collected at an altitude of 1,650 to 2,000 m from May 20 to July 8 (Petersen, 1973). In Kamdesh region one male was collected October 8, 1956 (Petersen, 1959b). In Nuristan (Bashgul-Tal) two males were collected at an altitude of 1,100 to 1,200 m from May 6 to 11, 1953 Gozmàny 1959; Petersen, 1963c); in Kutiau region moths were collected at an altitude of 1,550 m May 14, 1953 (Gozmàny, 1959). In Pakistan, environs of Karachi, three males were collected between February 23 and March 9, 1961 (Petersen, 1964a) and in Quetta region one male was found by Kasy at an altitude of 1,900 m May 1965 (Petersen, 1971).

7. **Catabola** (s. str.) **flava** Pet. (Figures 184; 187; 194)

Petersen, 1960a: 2–3; 1963b: 170; 1964a: 115, 120; 1966: 25, 29; 1971: 270 (*Perissomastix*).

External characters of imago. Pubescence of head cinnamon-brown. Span of forewings 17 mm. Forewings clay-yellow.

Male genitalia (Figure 194, A). Valvae broad and tapered slightly only toward apex; length almost 3.5 times width of basal part. Uncus in form of two long, simple, depressed lobes, without lateral processes; apices of lobes almost flat; lower margin of lobes in basal half concave; dorsal margin with small angular protuberance at base. Aedoeagus compact, highly sclerotized, distinctly shorter than valvae, broad near apex, and with two obtuse teeth located one behind the other; apex of aedoeagus drawn out into narrow curved tube (Figure 194, B).

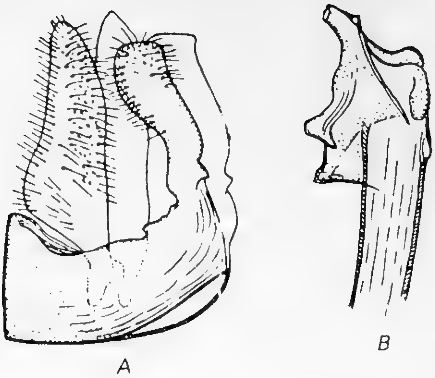
Female. Not known.

Comparison. On the basis of a series of characters close to *Catabola amseli* Pet. and *C. peterseni* Ams., but readily distinguished from them
282 by simple elongated lobes of uncus, notable widening of subapical region of aedoeagus with two teeth, and elongated, tubular curved tip.

No specimens examined by me.

Distribution. Iran, Iraq (Figure 184).

In Iran known from regions southeast of Teheran (Petersen, 1971),



281 Figure 194. Male genitalia of *Catabola flava* Pet.

A—general appearance (lateral view); B—apex of aedoeagus (higher magnification) (from Petersen, 1960a).

Iran.

as well as from Khuzistan, Shadegan (Petersen, 1960a), and Baluchistan (Petersen, 1966). Also indicated from Iraq (Petersen, 1971).

Biology. Xerophilous species. Moths collected from the beginning of April to June and in October. About 80 km southeast of Teheran two males were found by Kasy on June 17, 1963 (Petersen, 1971); in Shadegan region one male was collected between April 1 and 10, 1956 (Petersen, 1960a), and thereafter six males from May 11 to 22 and on October 16, 1950. In the southern desert (Bahrein, Sakhir Ali) moths were collected in April, on October 27, 1959, and October 4. 1961 (Petersen, 1964a). In Baluchistan two males were collected at an altitude of 2,500 m between April 29 and May 15, 1937 (Petersen, 1966).

Most probably this species produces two generations per year.

2. Subgenus *Crassicornella* Ag.

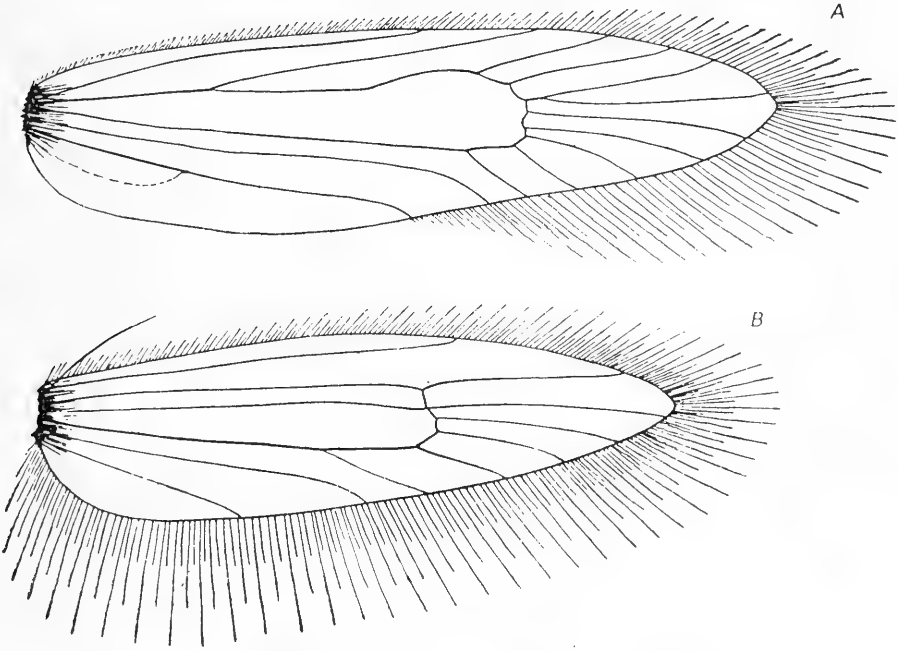
Agenjo, 1952: 67; Petersen, 1963b: 171–172; —*Tineomorpha* Amsel, 1956: 28; —*Petersenia* Gozmàny, 1960: 113.

Type species of subgenus. Catabola agenjoi Pet., 1957.

Thorax and tegulae yellowish ash-gray or cinnamon-gray, lustrous, in some species dark cinnamon-brown with violet hue; tegulae darker than thorax. Wingspan 10 to 23 mm. Length of forewing 3.66 to 4.0
284 times, of hind wing 3.5 to 4.5 times width; hind wing three-fourths to four-fifths length of forewing. Fringe of hind wing three-fourths to five-

sixths width of wing, or slightly (over one-third) greater than alar width.

In forewings (Figure 195, A) all branches of radius continue separately outside cell and terminate on anterior margin of wing, or R_4 and R_5 located on short stem (*C. hirundinea* Meyr. and *C. agenjoi* Pet.). In hind wings (Figure 195, B) *Sc* equal to two-thirds alar length. M_1 and M_2 wide-set at base; M_3 developed. Radiocubital cell extends beyond midpoint of wing and is equal to four-sevenths its length.



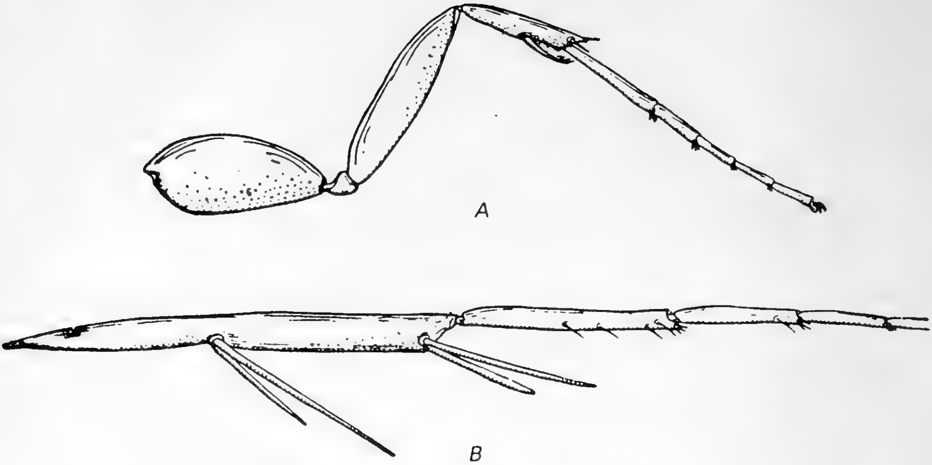
282 Figure 195. Venation of wings of *Catabola agenjoi* Pet.

A—forewing; B—hind wing.

Preparation No 10346, male. Great Atlas.

Median pair of spurs on hind tibiae located slightly before middle of tibia or immediately beyond its midpoint (*C. hirundinea* Meyr.). End of tarsal segments with three spinules. Middle legs as shown in Figure 196.

In male genitalia (Figures 197 and 198) uncus consists of two free lobes (Figure 197); each lobe in lateral view with acute falcate dorsal process and elongated digitate lower lobe; in ventral view lobes broad, with two dorsal cornuate processes, which may be obtuse and slightly curved or long and falciform, depending on preparation. Shape and structure of aedoeagus as shown in Figure 198.



283 Figure 196. Legs of *Catabola agenjoi* Pet.

A—foreleg; B—hind leg.

Preparation No. 10346, male. Great Atlas.

Female. Not known for most species.

Subgenus includes six species: *C. agenjoi* Pet., *C. zernyi* Pet., *C. atlantis* Zag., sp. n. *C. bifurcatella* Pet., *C. crassicornella* Zll., and *C. hirundinea* Meyr. Based on structure of aedoeagus, these species can be divided into two groups, the relations of which are shown in Figure 199. *C. bifurcatella* Pet., with apex of aedoeagus bifurcated, occupies an intermediate position between these groups.

285 *Key to Species of Subgenus Crassicornella Ag. on the Basis of External Characters*[27]

1 (6). In forewing R_4 and R_5 stalked or connate.
2 (3). Wingspan of moths less than 16 mm. .... 8. **C. (C). agenjoi** Pet.
3 (2). Wingspan of moths more than 18 mm.
4 (5). In forewings termina of R_5 and M_1 equidistant from alar apex. .... 10. **C. (C.) atlantis** Zag., sp. n.
5 (4). In forewings terminus of R_5 two to three times closer to alar apex than terminus of M_1 .... 13. **C. (C.) hirundinea** Meyr.
6 (1). In forewings R_4 and R_5 widely separate at base.
7 (8). In forewings common trunk of A_{2-3} 1.33 times longer than free branches; in hind wings distance between bases of Cu_1 and Cu_2

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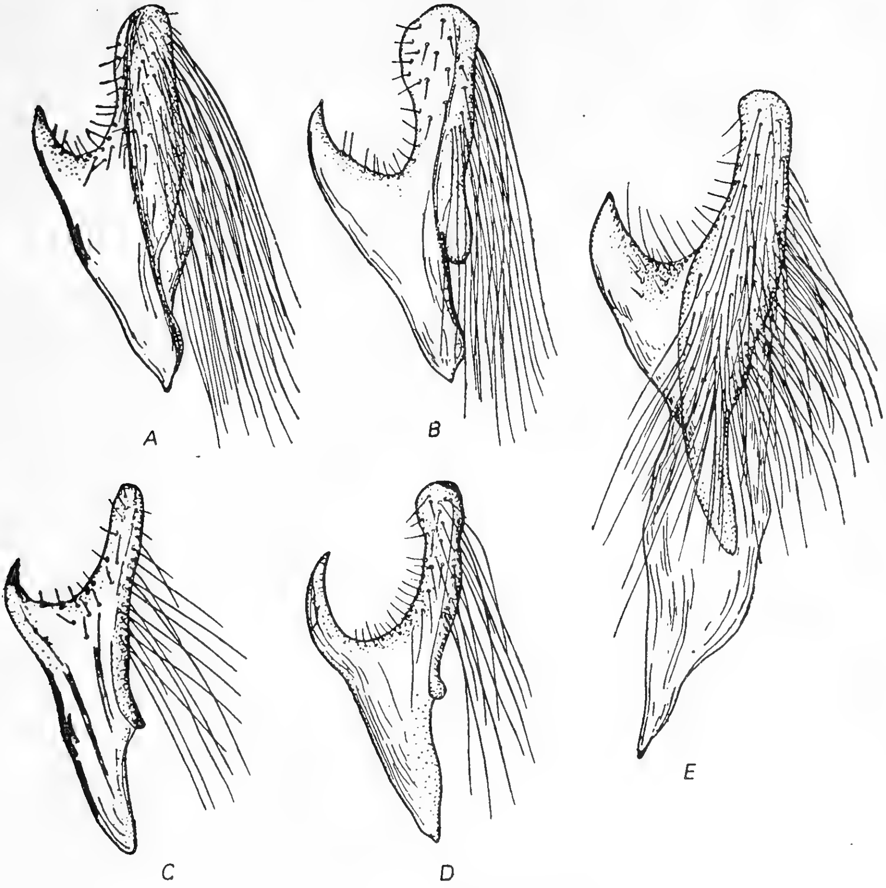
[27] External characters of *Catabola bifurcatella* Pet. unknown to me and hence it could not be included in the key.



283 Figure 197. Shape and structure of uncus.

A—*Catabola zernyi* Pet., B—*C. agenjoi* Pet., C—*C. hirundinea* Meyr.; D—*C. crassicornella* Zll.; E—*C. atlantis* Zag., sp. n.

twice distance between bases of M_3 and Cu_1.................. .... 9. **C. (C.) zernyi** Pet.

8 (7). In forewings common trunk of A_{2-3} twice longer than free branches; in hind wings distance between bases of Cu_1 and Cu_2 four times distance between bases of M_3 and Cu_1. ....12. **C. (C.) crassicornella** Zll.

Key to Species of Subgenus Crassicornella Ag. on the Basis of Male Genitalia[28]

1 (4). Aedoeagus in lateral view broad for one-third to two-thirds its

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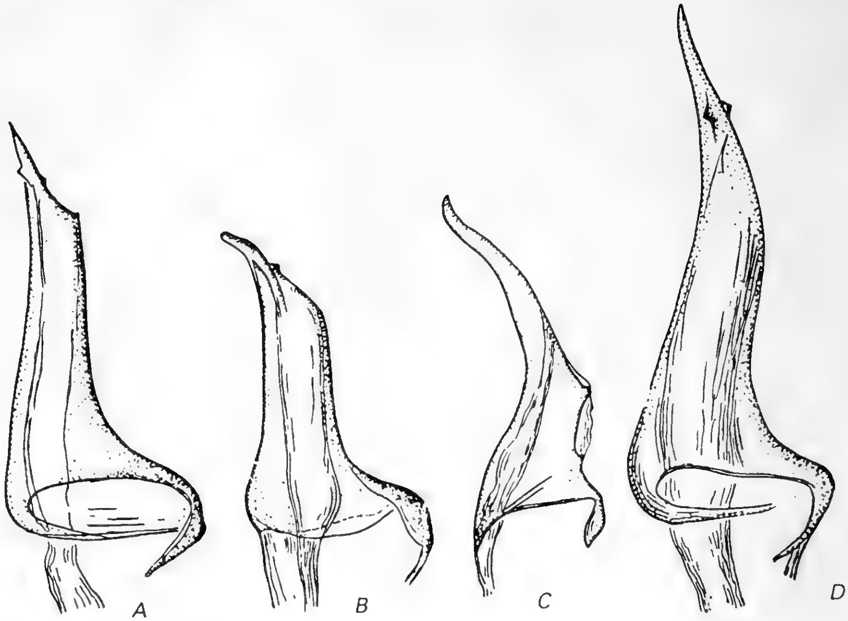
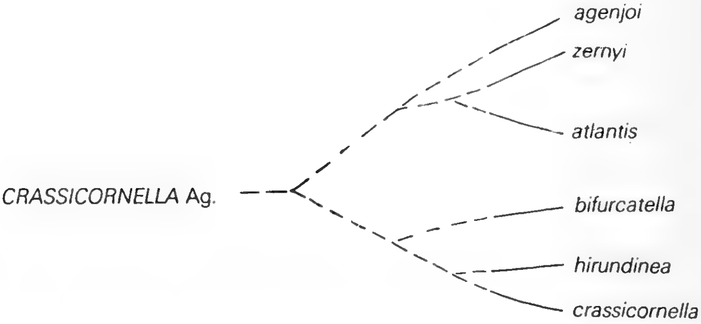
[28] Key to species on the basis of female genitalia not given since females are not known for most species.



284 Figure 198. Shape and strucutre of aedoeagus

A — *Catabola zernyi* Pet., B — *C. agenjoi* Pet.; C — *C. hirundinea* Meyr.; D — *C. atlantis* Zag., sp. n.



285 Figure 199. Phylogenetic relations of species of subgenus *Crassicornella* Ag. of genus *Catabola* Durr.

length; thereafter tapers sharply and geniculate.

2 (3). Aedoeagus broad over two-thirds its length; thereafter tapered and angled; slender apical part equal to or shorter than base. .... 12. **C. (C.) crassicornella** Zll.

3 (2). Aedoeagus over one-third its length; thereafter tapered and angled; slender apical part almost twice size of base. .... 13. **C. (C.) hirundinea** Meyr.

4 (1). Aedoeagus in lateral view tapered gradually toward apex and only sometimes curved near apex.

286 5 (6). Apex of aedoeagus bifurcate with two slender, acicular cords. .... 11. **C. (C.) bifurcatella** Pet.

6 (5). Apex of aedoeagus not bifurcate.

7 (10). Aedoeagus with acute apex; length 2.0 to 2.5 times width at base.

8 (9). Aedoeagus twice longer than width at base; dorsal process of uncus does not reach midpoint of lower lobe................ .... 9. **C. (C.) zernyi** Pet.

9 (8). Aedoeagus 2.5 times longer than width at base; dorsal process of uncus almost reaches midpoint of lower lobe. .... 10. **C. (C.) atlantis** Zag., sp. n.

10 (7). Aedoeagus with elongated or obtuse apex; length 1.50 to 1.66 width at base. .... 8. **C. (C.) agenjoi** Pet.

8. **Catabola (Crassicornella) agenjoi** Pet. (Figures 181; 185; 195; 196; 197, B; 198, B; 199–201)

Petersen, 1957b; 568–569; Gozmàny, 1960: 111; Petersen, 1960b 209–210; 1961b: 529; 1963a: 6; 1963b: 172; 1964b: 396–398; —*crassicornella* Agenjo, 1952: 67 (*Crassicornella,* nec Zll.); —*incerta* Gozmàny, 1960: 114–115 (*Episcardia* ?).

External characters of imago. Pubescence of head on frons light yellow, on occiput dark cinnamon-brown, forming a structure resembling a collar. Galeae short, light-colored, reaching midpoint of 2nd segment on labial palpi (Figure 181, A). Maxillary palpi small, filiform, with very long terminal segment. Labial palpi small, pendulous, light-colored on inner side, dark cinnamon-brown on outer side, lustrous; 2nd segment one-fourth larger than terminal, on outer side at end with tuft of short bristles, on lower and inner sides with dense tuft of scaly bristles. Frons equal to or slightly larger than vertical diameter of eyes. Antennae shorter than forewings, smooth, light cinnamon-ash, lustrous; basal segment broad, light yellow; structure of flagellum as shown in Figure 181, B.

Thorax and tegulae on upper side yellowish-ash with golden sheen; tegulae on front side dark cinnamon-brown. Span of forewings in males 10 to 16 mm. Length of forewings 3.75 times, of hind wings 3.50 times width; fringe of hind wing equal to three-fourths alar width.

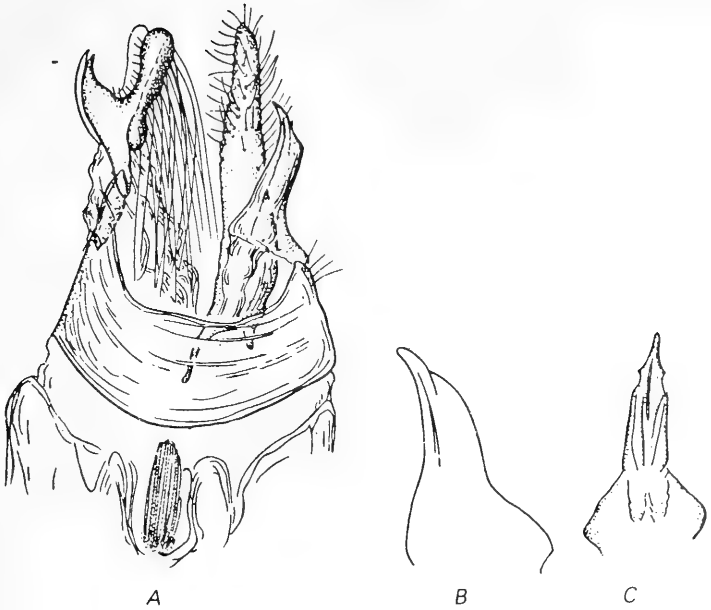
Forewings cinnamon-gray, lustrous; basal quarter of costal margin dark cinnamon-brown with violet hue. Specimen from Greece darker. Hind wings yellowish-ash-gray with golden sheen and darker fringe. Under surface of both wings cinnamon-yellow with grayish granulation and oily sheen.

In forewings (Figure 195, A) distance between bases of R_1 and R_2. seven to eight times greater than distance between bases of R_2 and R_3. R_4 and R_5 stalked. Terminus of R_5 two to three times closer to alar apex than terminus of M_1. Base of M_2 much closer to M_3 than to M_1. Distance between Cu_1 and Cu_2 1.5 times distance between bases of R_2 and R_3. Common stem of A_{2-3} over one-third times greater than free branches. In hind wing (Figure 195, B) terminus of R three to four times farther from alar apex than terminus of M_1. Base of M_2 more or less equidistant from bases of M_1 and M_3. Distance between bases of Cu_1 and Cu_2 three to four times greater than distance between bases of M_3 and Cu_1. A_3 absent.

Fore- and middle legs dark cinnamon-brown; hind legs yellowish-
287 gray, lustrous. Median pair of spurs of hind tibiae located before midpoint of tibia (Figure 196, B); 1st tarsal segment with four additional acicular spinules arranged beyond midpoint of segment; 2nd tarsal segment with one additional acicular spinule behind terminal part. Tarsal claws cinnamon-brown.

Male genitalia (Figure 200, A). Valvae very narrow, digitate, with pointed apex; length 6.50 times width in middle part, and 2.75 times posterior margin of vinculum. Dorsal process of uncus large, falcate, reaching beyond midpoint of lower lobe; latter with tuft of long piliform bristles, which reach beyond base of uncus (Figure 197, B). Aedoeagus less than five-elevenths length of valva; in lateral view broad basal part of aedoeagus two-thirds to three-fifths of its total length (Figures 198, B and 200, B, C); width of expanded part of aedoeagus one-fourth its length; apex of aedoeagus tapers sharply, but blunt; in ventral view apical part of aedoeagus rhomboid. Tegumen in dorsal view with weak notch.

Female genitalia (Figure 210). Gozmàny (1960) briefly described the female of a new species (*incerta* Gozm.) and tentatively included it in genus *Episcardia*. Petersen (1963b) studied this specimen and considered it a female of *Catabola agenjoi* Pet. I have not seen a female of this species and hence produce here the description given by Gozmany. Vaginal plate broad, but short; lobes with short bristles on outer margin. Ostium bursa narrow, highly sclerotized. Duct of bursa copulatrix narrow and very long, almost three times longer than anterior apophyses; after first third of its length has beaded sclerotized structure
288 with long and short teeth along posterior margin, resembling a crown. Bursa copulatrix very small, without signa. In anterior apophyses



287 Figure 200. Genitalia of male *Catabola agenjoi* Pet.

A—general appearance. Preparation No. 10346, male. Great Atlas.

B—aedoeagus (lateral view); C—same (ventral view, higher magnification) (from Petersen, 1957b).

common stem 2.5 times longer than abdominal branch. However, as indicated by Petersen (1964b), armature of duct of bursa copulatrix, in addition to sclerotized ring, also with one strong spine, and common stem of anterior apophyses equal to its ventral branches (Figure 201, C).

Comparison. Based on genitalia of males close to *Catabola zernyi* Pet., but readily distinguished by long falcate dorsal process of uncus, which reaches midpoint of lower lobe; aedoeagus five-elevenths length of valvae; broad basal part of aedoeagus three-fifths to two-thirds its total length.

Distribution. Spain, northern Africa. Apparently, dispersal of the species took place from Morocco through Gibraltar into Spain (Figure 185).

In literature, indicated from Spain: Aragon (Albarracin), Madrid, Mursia (Alberca), Andalusia (Grenada), Chiclana; in northern Africa, from Tangier (Morocco), Algeria (Constantine), Tunisia, and Lambez (Petersen, 1957b, 1961b).

Material examined. 2 males.

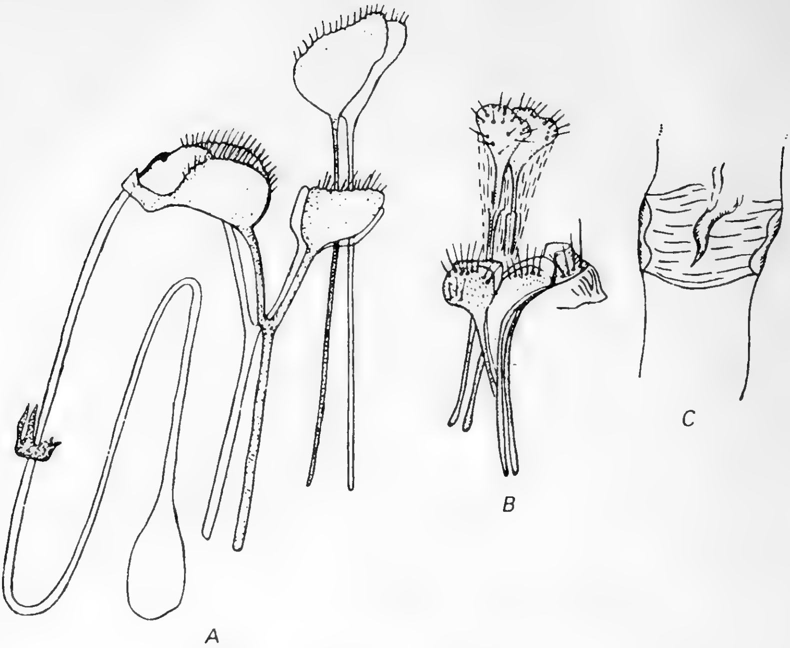


Figure 201. Genitalia of female *Catabola agenjoi* Pet.

A—general appearance (from Gozmàny, 1960, *Episcardia incerta* Gozm.); B—general appearance; C—armature of duct of bursa copulatrix (higher magnification) (from Petersen, 1964b).

Northwest Africa. Great Atlas mountains (Timesmout), 1,900 to 2,000 m, two males August 16, 1930 (Le Cenf).

Biology. Xerophilous northern African species, which penetrated Spain via Gibraltar up to Albarracin and Aragon.

Moths emerge from April to August. In Spain, Chiclana region, moths collected on May 8; in Cercedilla Province one male collected at
289 an altitude of 1,481 m on July 25, 1957; in Albarracin moths noted at an altitude of 1,162 m from June 22 to 30, 1924 (Petersen, 1957b). In Mursia Province (Sierra Espuna) three males were collected at an altitude of 944 to 1,579 m in the beginning of August. In Gibraltar moths were found from April to June. In Tunisia one male was collected on May 28 (Petersen, 1961b). In the Great Atlas mountains (Timesmout) two males were found at an altitude of 1,900 to 2,000 m on August 16, 1930.

Life history of larvae not known. Most probably they live in nests of social insects, for example, termites, ants, or bumblebees.

9. **Catabola (Crassicornella) zernyi** Pet. (Figures 16, E; 17, C; 185; 197, A; 198, A; 199; 202; 203)

Petersen, 1957b: 568; Gozmàny, 1960: 111; Petersen, 1963b: 172; —*hirundinea* Zerny, 1935: 155 (*Tineola,* nec Meyr.); —*perplexa* Gozmàny, 1960: 113 (*Petersenia*).

External characters of imago. Pubescence of head light yellow, cream-colored, on vertex more cinnamon-brown. Frons narrow, about two-thirds vertical diameter of eyes. Antennae slender, smooth, filiform, light cinnamon-gray, equal to or slightly greater in length than forewings; basal segment highly broadened.

Thorax and tegulae on dorsal side cinnamon-gray, lustrous; tegulae on front side dark cinnamon-brown. Wingspan in males 16 to 23 mm. Length of forewing, 3.66 times, of hind wing 3.75 times width; fringe of hind wings five-sixths alar width.

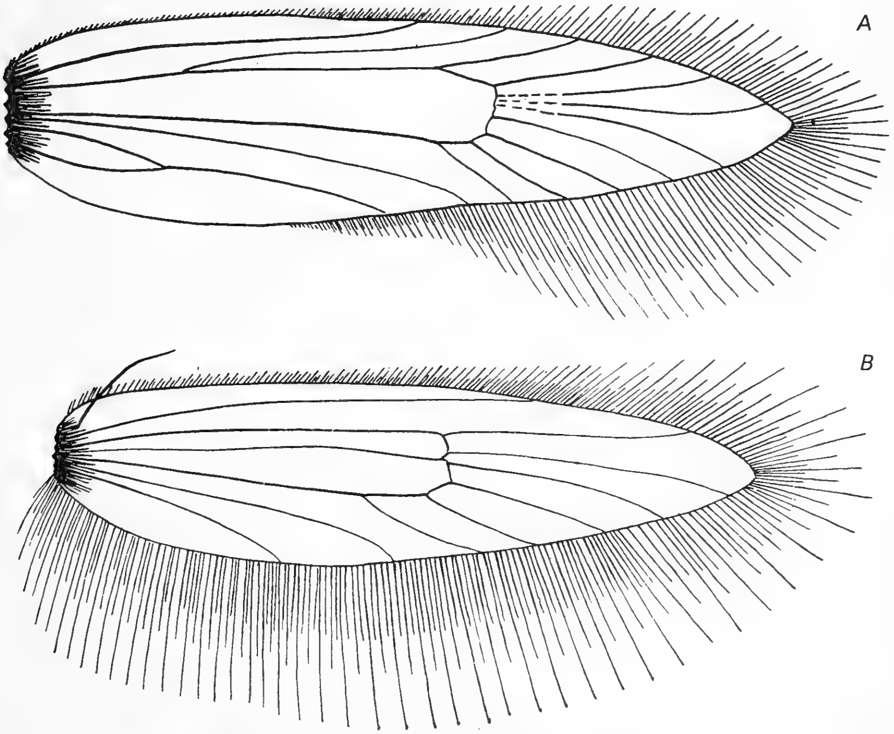


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Figure 202. Venation of wings of *Catabola zernyi* Pet.

A—forewing; B—hind wing.

Preparation No. 5423, male.
Spain.

Forewings dark cinnamon-brown, with light violet sheen; basal quarter of costal margin with dark granulations. Fringe yellowish-gray. Hind wings light grayish-cinnamon and slightly lighter than forewings, translucent, with golden glaze. Lower side of forewings dark cinnamon-brown with gray granulation and lighter-colored fringe along outer margin; hind wings lighter than forewings, with yellowish-gray fringe.

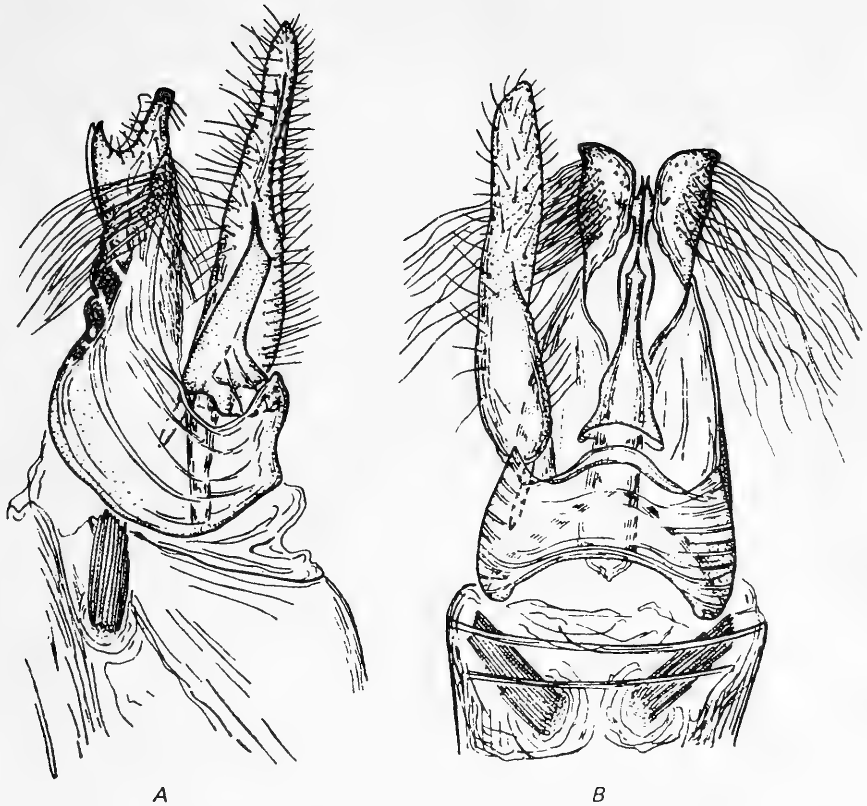
In forewing (Figure 202, A) distance between bases of R_1 and R_2 four to five times greater than distance between bases of R_2 and R_3. R_4 and R_5 free. Terminus of R_5 2.0 to 2.5 times closer to alar apex than terminus of M_1. Base of M_2 slightly closer to base of M_1 than M_3. Distance between bases of Cu_1 and Cu_2 one-half to two-thirds distance between R_2 and R_3. Common trunk of A_{2-3} 1.33 times longer than free branches. In hind wing (Figure 202, B) terminus of branch R 2.5 times farther from alar apex than terminus of M_1. Base of M_2 two to three times to M_1 than to M_3. Distance between bases of Cu_1 and Cu_2 twice distance between bases of M_3 and Cu_1. A_3 not discernible.

Fore- and middle legs cinnamon-gray, without light-colored bands; hind legs light cinnamon-ash. All legs lustrous. Tarsal claws blackish.

Male genitalia (Figure 203, A). Valvae narrow, long, digitate, taper gradually toward apex, with conical, poorly developed apex and small fold from midpoint of lower margin. Length of valvae more than 6.0 times width in middle part at level of base of fold, and 3.25 times posterior margin of vinculum. Uncus (Figure 197, A) in lateral view saddle-shaped, with small, falcate, pointed dorsal process, which does not reach midpoint of lower lobe; in ventral view apex rounded with small obtuse process (Figure 16, E); lower lobe base, and lateral sides with very long, piliform bristles, which extend beyond base of uncus, or their
290 length (in ventral view) four to five times greater than width of lobes (Figure 203, B). Aedoeagus almost half length of valvae; in lateral view basal third of broad part less than half of total length (Figure 17, C); thereafter aedoeagus narrows sharply so that width in middle part one-sixth of length; near tip, aedoeagus again narrows sharply into elongated peg-shaped apex; in ventral view somewhat rhomboid below apex. Tegumen in dorsal view with small notch which reaches anterior third.

Female. Not known.

Comparison. Based on genitalia, close to *Catabola agenjoi* Pet. and *C. atlantis* Zag., but readily distinguished from both and other species by longer valvae, lower margin of which 3.25 times greater than lower margin of vinculum; dorsal process of uncus does not reach midpoint of lower lobe; aedoeagus half length of valvae; apex of aedoeagus with more or less parallel margins and very narrow, slender, pointed tip;



291 Figure 203. General appearance of male genitalia of *Catabola zernyi* Pet.

A — lateral view; B — ventral view.

Preparation No. 5423, male.
Spain.

broad base of aedoeagus, which is less than half total length; and tegumen in dorsal view with small notch equal to one-third its length.

Distribution. Spain; Morroco, Atlas mountains (Figure 185).

291 In literature, reported from Morocco, Atlas Mountains (Tachdirt) (Petersen, 1957b); Tenfecht and Sinis regions (Gozmàny, 1960); and Tunisia (Draham) (Gozmàny, 1960).

Material examined. 2 males.

Spain. Mursia, one male. Morocco. Great Atlas Mountains (Goundafa), 1,200 m, one male between June 15 and 20, 1933 (Zernyi), identified in collection as *Tineola hirundinea* Meyr.

Biology. Xerophilous species. Moths collected in the Atlas Mountains at an altitude of 2,200 to 2,700 m in Tachdirt region; one male between July 2 and 10, 1933 (leg. Zerny) (Petersen, 1957b); Gozmàny (1960) states that moths were found at an altitude of 900 to 1,300 m on the plateau during the dry season; one male flew to light on May 6, 1927. In Tunisia (Draham) two males were collected on September 12 and November 26, 1913 (Gozmàny, 1960).

10. **Catabola (Crassicornella) atlantis** Zagulajev, sp. n. (Figures 185; 197, E; 198, D; 199; 204; 205)

External characters of imago. Pubescence of head light yellow, on occiput and antennae with a few cinnamon-brown scales. Labial palpi on outer side dark cinnamon-brown, on inner side light cinnamon-292 brown, lustrous; 2nd segment on lower and lateral sides with individual protruding dark bristles. Frons narrow, less than vertical diameter of eyes. Antennae smooth, light yellowish-gray, equal in length to fore-

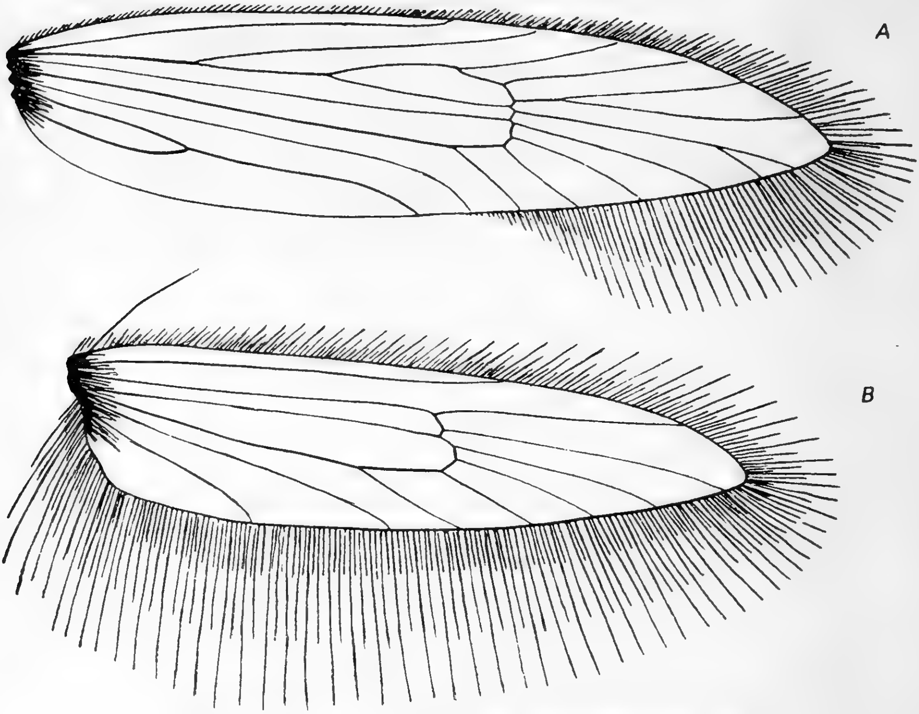


Figure 204. Venation of wings of *Catabola atlantis* Zag., sp. n.

A — forewing; B — hind wing.

Preparation No. 11045, male.
Great Atlas.

wing; lst segment broad and darker.

Thorax and tegulae dark cinnamon-brown with violet tinge. Span of forewings in male 21 mm. Length of forewing and hind wing four times greater than width and hind wing narrower than forewing; length of fringe of hind wing more than alar width.

Forewings dark cinnamon-brown with violet-blue tinge and gold granulation. Basal half of fringe cinnamon-gray, outer half ash. Hind wings light brownish-ash. Basal half of fringe light cinnamon-brown, outer half ash-gray. Under surface of all wings cinnamon-brown; fringe light cinnamon-ash, lustrous.

In forewing (Figure 204, A) distance between bases of R_1 and R_2 five to six times greater than distance between bases of R_2 and R_3. Branches R_4 and R_5 located on short stem. Termina of R_5 and M_1 equidistant from alar apex. Base of M_2 equidistant from bases of M_1 and M_3. Common trunk of A_{2-3} 1.25 times larger than free branches. In
293 hind wing (Figure 204, B) terminus of branch R 3.0 to 3.5 times farther from alar apex than M_1. Base of M_2 closer to M_3 than M_1. Distance between bases of Cu_1 and Cu_2 four times greater than between bases of M_3 and Cu_1.

Fore- and middle legs cinnamon-gray with violet hue; hind legs gray. Tarsal claws cinnamon-red.

Male genitalia (Figure 205, B). Valvae narrow, long, digitate, with almost parallel margins, and conical, weakly pointed apex, without subapical fold on ventral margin. Length of valvae nine times width in middle part, and three times more than posterior margin of vinculum. Uncus in lateral view (Figure 197, E) saddle-shaped with falcate, pointed dorsal process, which does not reach midpoint of lower lobe; in ventral view curved, with acute process at tip (Figure 205, B); bristles of lower lobe extend beyond base of uncus and their length in ventral view four to five times greater than width of lobe. Aedoeagus (Figure 198, D) five-elevenths length of valvae, with elongated and gradually tapering tip (without prominent projection). In lateral view broad base of aedoeagus two-fifths its total length; in ventral view aedoeagus with two small spines below apex located opposite each other laterally. Tegumen in dorsal view with small notch.

Female. Not known.

Comparison. In general appearance and structure of genitalia close
294 to *Catabola zernyi* Pet. Readily distinguished from it and other species of the genus by larger size, dark cinnamon-brown thorax, and tegulae and forewings with violet and bluish hue. In forewing R_4 and R_5 shortly stalked; distance between bases of Cu_1 and Cu_2 equal to distance between bases of R_2 and R_3. In male genitalia valvae narrow, digitate, with parallel margins, their length nine times width in middle part.

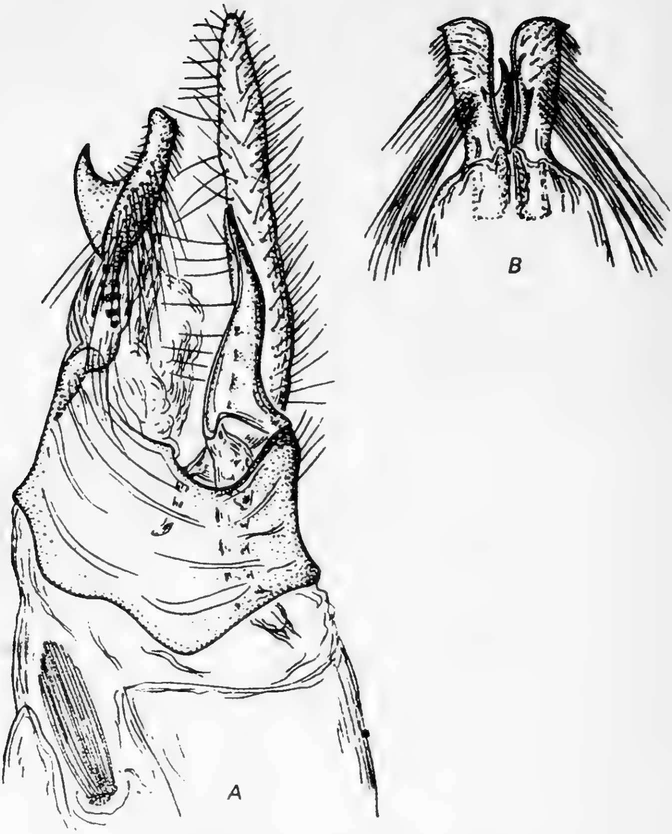


Figure 205. Genitalia of male *Catabola atlantis* Zag., sp. n.
A—overall appearance (lateral view): B—uncus (dorsal view).
Preparation No. 11045, male.
Great Atlas.

Aedoeagus five-elevenths length of valvae, with elongated and gradually tapering apex.

Distribution. Northwest Africa: Morocco (Figure 185).

Material examined. 1 male.

Morocco. Atlas Mountains, Tachdirt, 2,200 to 2,900 m, one male holotype between July 11 and 19, 1933 (Zerny), identified as *Tineola hirundinea* Meyr. Type specimen with original label with inscription "Marokko, Gr. Atlas, Tachdirt, 2,200–2,900 m, 11–19 July 33, Zerny". identification label with inscription "*Tineola hirundinea* Meyr"; and standard red label with inscription on face "Holotypus, *Catabola atlantis* Zag., sp. n." and on back side "gen. preparation. No. 11045, male

Koll. Zool. Inst. Leningrad."

Biology. Alpine species; moths emerge in July.

Biology not studied.

11. **Catabola (Crassicornella) bifurcatella** Pet. (Figures 185; 199; 206)

Petersen, 1957b: 569, Fig. 218; 1963b: 171.

External characters of imago. Pubescence of head light cinnamon-brown. Wingspan 12 mm. Forewings dark gray to cinnamon-brown, lustrous. Hind wings light-colored, lustrous.

Male genitalia (Figure 206). Valvae very long and slender. Uncus with very long dorsal spines. Aedoeagus broad at base, bifurcates beyond midpoint into two long, slender, peg-like apicies.

294 Figure 206. Isolated aedoeagus of *Catabola bifurcatella* Pet. (from Petersen, 1957b).

Female. Not known.

Comparison. In general appearance resembles *Catabola agenjoi* Pet. In terms of structure of uncus and straight aedoeagus close to *C. crassicornella* Zll. Readily distinguished from both by double-tipped aedoeagus.

No specimens examined by me.

Distribution. Tunisia, one male May 28 (Figure 185).

Biology. Not known.

12. **Catabola (Crassicornella) crassicornella** Zll. (Figures 17, D; 185; 197, D; 199; 207–210, Plate VII, *4*)

Zeller, 1847b: 818 (*Tinea*); 1852: 168 (*Tinea*); Stainton, 1869: 15 (*Tinea*); Christoph, 1876: 226 (*Tineola*); Staudinger, 1881: 115

(*Tineola*); Staudinger and Rebel, 1901: II, 240 (*Tineola*); Caradja, 1920: 170–171 (*Tineola*); Zerny, 1927: 485 (*Tineola*); 1934: 27 (*Tineola*); 1935: 155 (*Tineola*); Klimesch, 1942: 393, Figure 35 (*Tineola*); Amsel, 1956: 28–29 (*Tinea*): Petersen, 1957b: 566–567; 1961b: 530; 1962: 206; 1963a: 6; 1963b: 171; 1964b; 394–398; Parenti, 1965: 311: 1966: 290; —*marianii* Turati, 1931: 151 (*Tineola*); Amsel, 1956: 28–29, Tabl. 4, Fig. 10 (*Tineomorpha*).

External characters of imago. Pubescence of head light cinnamon-brown, yellow-gray. Labial palpi cinnamon-brown. Antennae light chocolate-brown to gray, lustrous. Basal segment of antennae on lower side broadens slightly.

295 Thorax and tegulae on upper side cinnamon-gray; tegulae in front with dark granulation. Span of forewings 10 to 13 mm. Length of forewings 3.75 times, of hind wings 4.0 times greater than width; length of fringe of hind wing one-third more than its width.

Forewings (Plate VII, *4*) cinnamon-gray, lustrous; Greek specimens darker. Basal part of costal margin with dark granulation. Hind wings same color as forewings. Under surface of all wings cinnamon-gray with oily sheen.

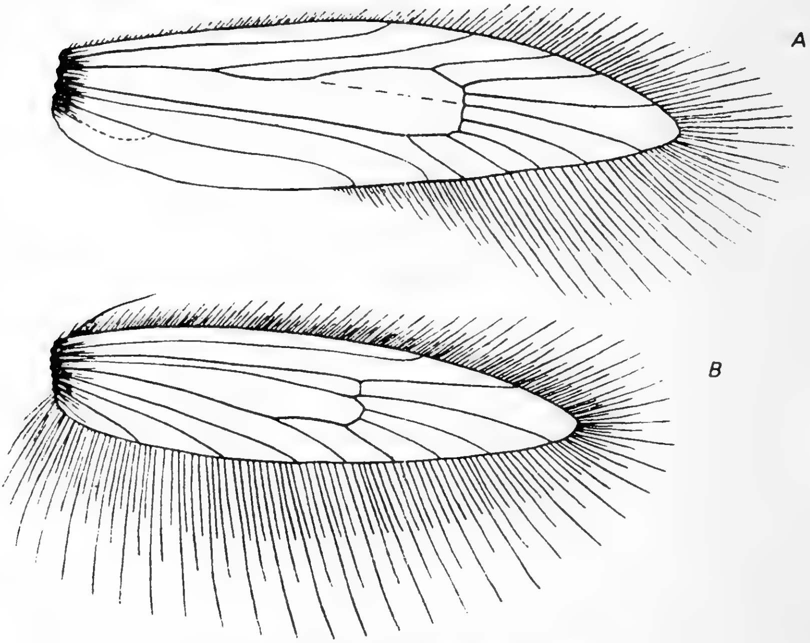


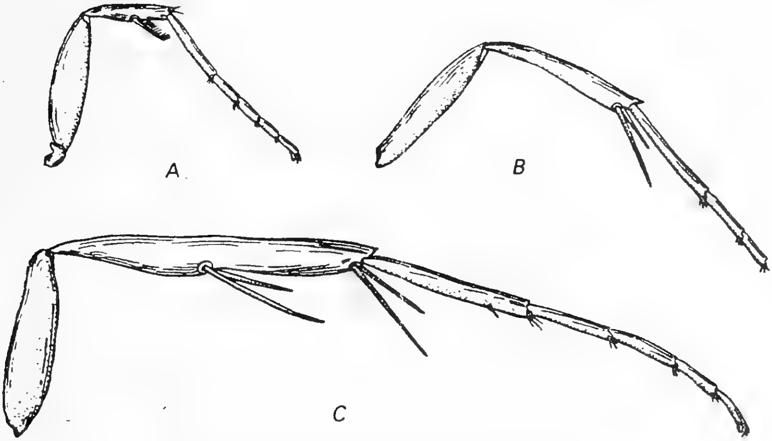
Figure 207. Venation of *Catabola crassicornella* Zll.

A—forewing, B—hind wing.

Preparation No. 10349, male.
Spain.

Venation of forewing (Figure 207, A). Distance between bases of R_1 and R_2 five to six times greater than distance between bases of R_2 and R_3. R_4 and R_5 free. Termina of R_5 and M_1 equidistant from apex, or terminus of R_5 much closer to it than M_1. Base of M_2 slightly closer to M_3 than to M_1. Distance between bases of Cu_1 and Cu_2 almost equal to distance between R_2 and R_3. Common trunk of A_{2-3} twice longer than free branches. In hind wings (Figure 207, B) terminus of R more than twice distance from alar apex than M_1. Base of M_2 equidistant from bases of M_1 and M_3. Distance between bases of Cu_1 and Cu_2 four times greater than distance between bases of M_3 and Cu_1. All three anal veins well developed.

Legs cinnamon-gray, lustrous. Structure of legs as shown in Figure 208.



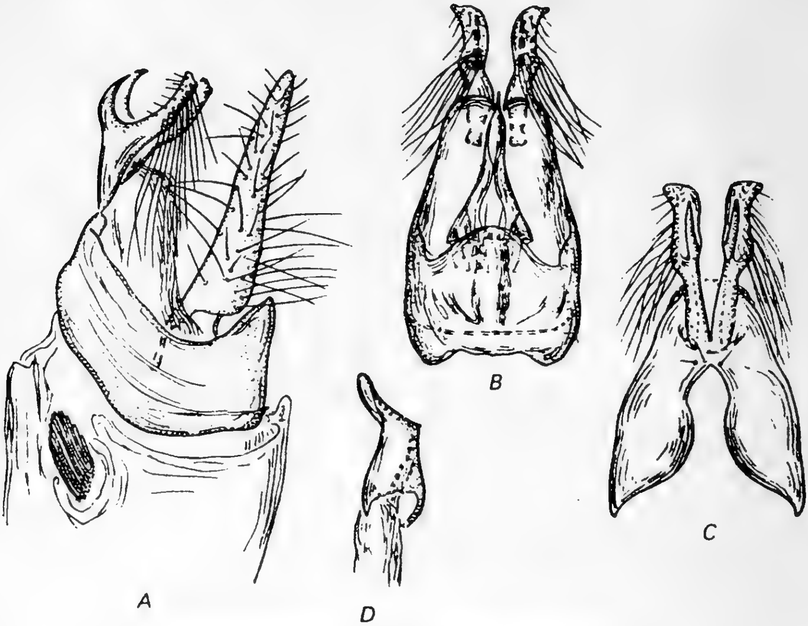
296 Figure 208. Legs of *Catabola crassicornella* Zll.

A—foreleg; B—middle leg; C—hind leg.

Preparation No. 10349, male.
Spain.

Genitalia of male (Figure 209, A). Valvae narrow, with slightly pointed apex and broad base, without fold on inner side. Length of valvae 6.5 times width in middle part, and 2.0 times greater than posterior margin of vinculum. Dorsal process of uncus long, falciform, with
297 acute tip that extends beyond midpoint of lower lobe (Figure 197, D); lower lobe more or less straight with obliquely truncated or rounded apex, with long thick bristles on sides which reach base of uncus or (viewed from lower side) are three to four times greater in length than width of lobes (Figure 209, B). Aedoeagus (Figures 17, D and 209, D) half length of valvae; viewed from lateral side with geniculate bend,

broad base, and narrow, elongated apex, which is shorter than basal part. Vinculum with broad protuberance on posterior margin. Tegumen viewed from top with deep notch equal to two thirds its length (Figure 209, C).



296 Figure 209. Genitalia of male *Catabola crassicornella* Zll.

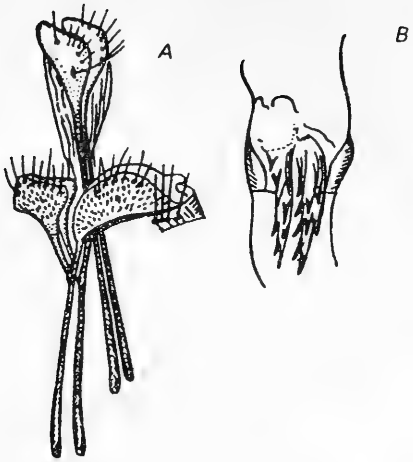
A — general appearance (lateral view); B — same (ventral view); C — uncus and tegumen (dorsal view); D — aedoeagus.

Preparation No. 10349, male.
Spain.

Female genitalia (Figure 210). Lobes of vaginal plate highly convex, with two small tubercles between them. Duct of bursa copulatrix with sclerotized ring, carrying two spinescent appendages covered with teeth. Common trunk of anterior apophyses three to four times greater than ventral branches.

Comparison. In external appearance and structure of genitalia similar to *Catabola hirundinea* Meyr., but readily distinguished from it because lower side of valvae only twice longer than lower margin of vinculum; aedoeagus half length of valvae, with geniculate bend and fairly thick, elongated tip, which is shorter than basal part; dorsal process of uncus long, falciform. Tegumen in dorsal view with deep notch equal to two-thirds its length.

Distribution. Western and eastern Mediterranean (Figure 185).



297 Figure 210. Genitalia of female *Catabola crassicornella* Zll.

A — general appearance (lateral view); B — armature of duct of bursa copulatrix (higher magnification) (from Petersen, 1964b).

In literature, reported for Spain: Andalusia (Parenti, 1965); central Italy (Parenti, 1965); Sicily, Palermo (Stainton, 1869; Parenti, 1966); Balkans: Albania (Petersen, 1963a); Greece and Peloponnesus and Crete Islands (Zeller, 1852); northern Lebanon (Caradja, 1920).

Material examined. 3 males.

Western Europe. Spain. Andalusia, one male, 1881 (identified in collection of Staudinger as *Tineola crassicornella* Zll., No. 449), gen. preparation. No. 10349, male. Sicily, two males, 1858 (Wocke).

Biology. Xerophilous Mediterranean species.

Moths, usually males, emerge from April to August at sunset. In Italy, Neapol region, found in April 29 (Zeller, 1852); in Sicily, Palermo, moths were collected at the end of May, July, and in August; in Casteldacia one male caught on June 20, 1928. In Syracuse, moths were collected from May 19 to June 7 among steppe grasses and flowers (Stainton, 1869); one female on April 23, and one male on July 10. In Greece two males were collected in May, at Peloponnesus; 11 males were found at an altitude of 600 m from June 11 to July 14, 1959 (Petersen, 1962). In Albania 35 males flew to light from May 14 to 27, 1961 (Petersen, 1963a). Zerny (1927) collected moths at light in Spain
298 (Andalusia) from end of June to beginning of July. In northern Lebanon one male was collected at an altitude of 1,400 m between June 21 and 28, 1931 (Petersen, 1962).

Larvae live in nests of social Hymenoptera; distribution of the latter in Eurasia much broader than moths, and hence one may assume that the regulatory factor in the distribution of moths is not the occurrence of host nests, but probably a complex of abiotic conditions.

13. **Catabola (Crassicornella) hirundinea** Meyr. (Figures 185; 197, C; 198, C; 199; 211–213)

Meyrick, 1928b: 239 (*Tinea*); Amsel, 27–29, Tab. 4. Figs. 12–13 (*Tineomorpha*); Petersen, 1957b: 567–568, Fig. 215; 1963b: 171, Fig 8.

External characters of imago. Pubescence of head straw-yellow, pale yellow, ocherous-white. Labial palpi lilac-gray. Antennae slightly longer than forewings, ocherous-white.

Thorax and tegulae dark, purple-gray. Wingspan in male 18 to 20 mm. Length of forewing 4.0 times, of hind wing 4.5 times greater than width; fringe of hind wing equal to its width.

Forewings dark cinnamon-brown or purple-gray; some specimens with violet or honey-colored luster. Fringe grayish-white. Hind wings light gray, lustrous; fringe light gray.

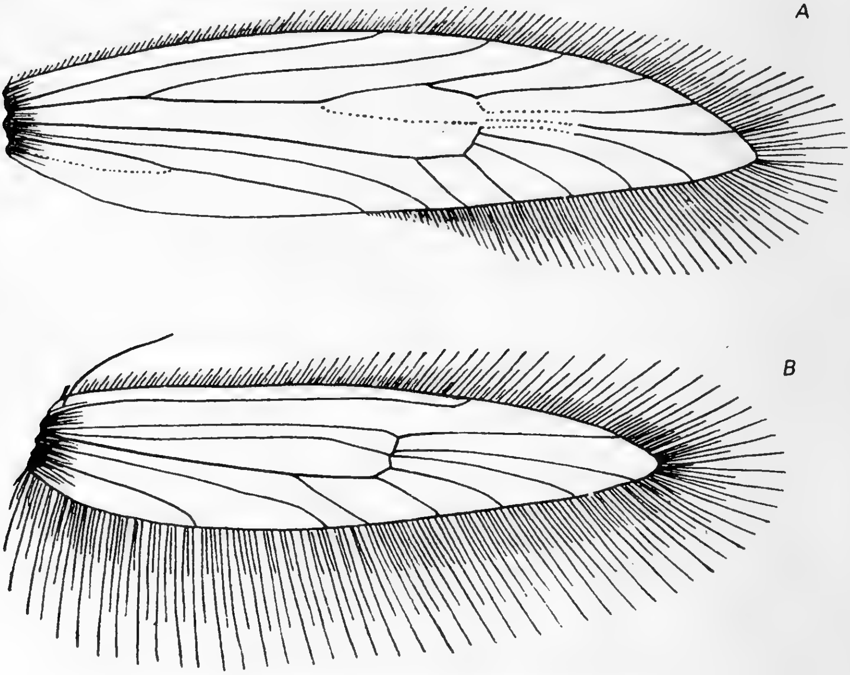
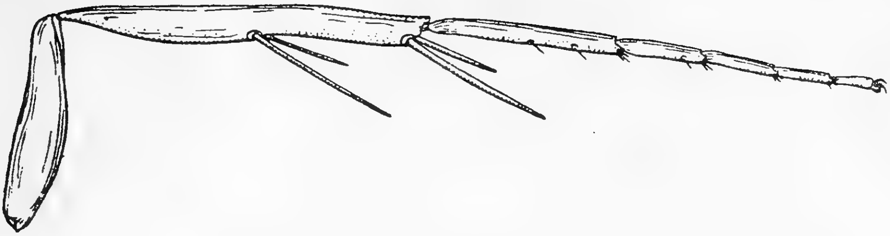


Figure 211. Venation of wings of *Catabola hirundinea* Meyr.

A—forewing; B—hind wing.

Preparation No. 10345, male.
Great Atlas.



299 Figure 212. Hind leg of *Catabola hirundinea* Meyr.
Preparation No. 10345, male.
Great Atlas.

In forewing (Figure 211, A) distance between bases of R_1 and R_2 five to six times greater than distance between bases of R_2 and R_3. R_4 and R_5 shortly stalked or connate. Terminus of R_5 two to three times 299 closer to alar apex than terminus of M_1. Distance between bases of Cu_1 and Cu_2 equal to or slightly less than distance between bases of R_2 and R_3. Common trunk of A_{2-3} slightly (one-fifth to one-seventh longer than free branches. In hind wing (Figure 211, B) terminus of branch R almost twice distance from alar apex than terminus of M_1. Base of M_2 may be either closer to base of M_1 or to M_3. Distance between bases of Cu_1 and Cu_2 four to five times greater than distance between bases of M_3 and Cu_1.

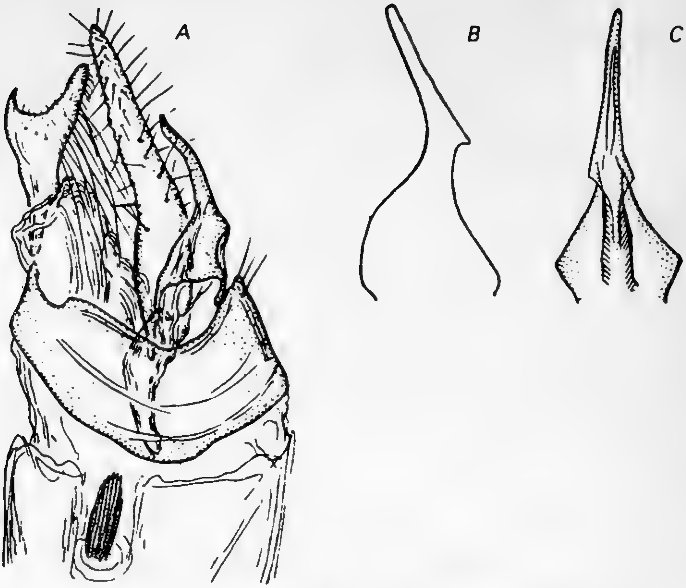
Legs yellowish-cinnamon. Median pair of spurs of hind tibiae located immediately beyond midpoint of tibia. Structure of hind legs as shown in Figure 212.

Male genitalia (Figure 213, A). Valvae narrow, without processes and folds on inner side. Length of valvae 7.0 to 8.0 times width in middle part and almost 2.5 times greater than posterior margin of vinculum. Dorsal process of uncus small, does not reach midpoint of lower 300 lobe, acute (Figure 197, C); lower lobe elongated, with drawn out rounded apex; sides of lower lobe with long, stout, acicular bristles forming sparse brush, and reaching base of uncus. Aedoeagus (Figures 198, C and 213, B, C) more than half length of valvae and about one-third longer than lower margin of vinculum; in lateral view with slight constriction before midpoint, so that slender apical part longer or equal to broad basal part. Vinculum with broad protuberance on posterior margin.

Female. Not known.

Comparison. In general appearance and genital structure resembles *Catabola crassicornella* Zll., but readily distinguished by structure and shape of aedoeagus; aedoeagus narrow and slender, its apical slender part longer than or equal to basal part.

Distribution. Northwest Africa: Morocco, Atlas Mountains (Figure 185).



299 Figure 213. Male genitalia of *Catabola hirundinea* Meyr.

A — general appearance.

Preparation No. 10345, male.
Great Atlas.

B — aedoeagus (lateral view); C — same (ventral view, higher magnification)
(from Petersen, 1957b).

Material examined. 1 male.

Morocco. Great Atlas Mountains (Reraya), one male (Alluand).

Biology. Xerophilous species. Moths emerge from end of April to end of June. In Atlas Mountains, Morocco, collected from June 4 to 27 (Amsel, 1956). Meyrick (1928b) reported a collection of 39 males at light from April 30 to May 23 at altitudes ranging from 900 to 2,000 m.

3. Subgenus *Lazocatena* Gozm.

Gozmàny, 1959: 350.

Type species of subgenus. Catabola obscura Pet., 1959.

Thorax and tegulae cinnamon-gray. Span of forewings 16 mm. Venation not known.

Male genitalia (Figure 214). Valvae without processes and spinescent inclusions. Uncus with lobes fused in basal half, with apices separated by constriction; dorsal side of lobes with strong teeth.

This subgenus was separated on the basis of the unusual structure

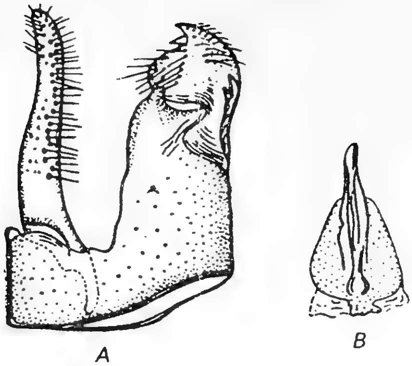


Figure 214. Male genitalia of *Catabola obscura* Pet.

A—general appearance (lateral view); B—aedoeagus (from Petersen, 1959b).

of the uncus lobes and the highly dilated aedoeagus. In a series of characters it occupies an intermediate position between subgenus *Crassicornella* Ag. and *Praelongicera* Ams., but is closer to the latter.

The subgenus includes one species. *C. obscura* Pet.

14. **Catabola (Lazocatena) obscura** Pet. (Figures 185; 186; 214)

Petersen, 1959b: 560, Figure 2; 1963b: 172; —*mira* Gozmány, 1959: 351.

External characters of imago. Pubescence of head cinnamon-black. Forewings matte yellowish-cinnamon-brown; anterior margin with broad darkening.

Male genitalia (Figure 214, A). Valvae narrow and long so that width in middle part one-eighth of length of costal margin including 301 pedicel. Uncus in lateral view broad, with dependent lobate appendage, and serrations on lower side; dorsal side of lobes with two highly sclerotized teeth. Aedoeagus short, with dilated base, and almost half length of valvae including pedicel (Figure 214, B). Tegumen long and broad, fused with broad, well developed vinculum.

Female. Not known.

Comparison. Species similar to members of subgenus *Praelongicera* Ams., but differs in cinnamon-black pubescence of head as well as structure of uncus (decumbent lobe with spines and teeth), and broad tegumen and vinculum.

No specimens examined by me.

Distribution. Eastern and northeastern Afghanistan (Figure 185).

In the original description it was indicated that one male, holotype, was found at Sarobi at an altitude of 1,100 m on June 28, 1956

(Petersen, 1959b) and one male in Nuristan (Kamu) at an altitude of 1,500 m on April 26, 1953 (Gozmàny, 1959).

Biology. Not known.

4. Subgenus *Praelongicera* Ams.

Amsel, 1956: 29–30; Petersen, 1963b: 172–173.

Type species of subgenus. Catabola palaestinella Ams., 1956.

Thorax and tegulae light cinnamon-brown with grayish granulation. Wingspan 7 to 10 mm. Length of forewings 3.50 times, of hind wings 3.66 to 4.0 times width. Hind wings about two-thirds width of forewings. Fringe of hind wings one-fourth to one-third greater than width.

In forewings (Figure 215, A) basal half of radial trunk between R_1 and R_2 may not be developed, and radiocubital cell open. All branches of radius developed. R_4 and R_5 stalked, which is relatively well defined. M_3 (not M_2 as reported by Amsel, 1956), absent. In hind wings (Figure 215, B) Sc equal to two-thirds alar length. M_1 and M_2 connate; M_3 absent. Radiocubital cell open on upper and outer sides and equal to two-thirds alar length.

Structure of legs in species of this subgenus not known.

Male genitalia (Figure 216). Uncus with lobes fused at base and small notch at apex.

Female. Known only for *Catabola afghana* Pet.

This subgenus includes two species: *Catabola palaestinella* Ams. and *C. afghana* Pet.

Key to Species of Subgenus Praelongicera Ams. on the Basis of Male Genitalia[29]

1 (2) Valvae with cornuate tooth at apex; dorsal lobe of uncus apically bent, falcate; aedoeagus with tooth at apex (Figure 216, C) .... 15. **C. (P.) palaestinella** Ams.

2 (1). Valvae with tooth located one-third distance from apex; dorsal lobes of uncus fused at apex; aedoeagus without tooth at apex (Figure 217, A, B) .... 16. **C. (P.) afghana** Pet.

302 15. **Catabola (Praelongicera) palaestinella** Ams. (Figures 185; 215; 216)

Amsel, 1956: 29–30 (*Praelongicera*); Petersen, 1957b: 570. Figs. 219–220; 1959c: 159; 1961a: 65; 1962: 206; 1968: 55 (*Perissomastix*).

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[29] Key to species on the basis of external characters is difficult because of considerable similarity in structure. Female known only in one species.

External characters of imago. Pubescence of head dark cinnamon-gray. Labial palpi light gray, lustrous. Wingspan 10 mm. Length of hind wings four times width. Forewings without pattern, light grayish-cinnamon-brown, lustrous. Basal third of costal margin blackish. Hind wings almost same color as forewings, lustrous.

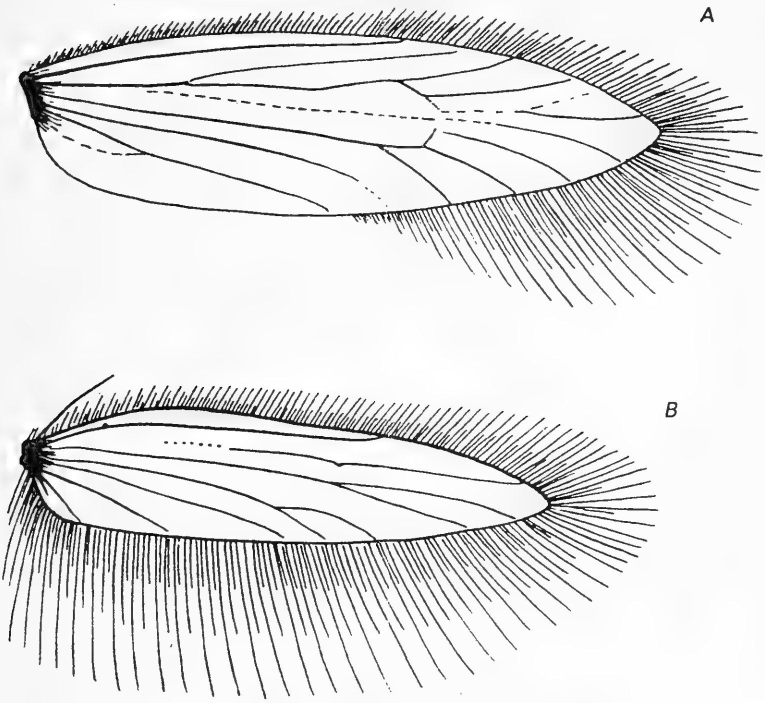


Figure 215. Venation of wings of *Catabola palaestinella* Ams.

A—forewing; B—hind wing.

Preparation No. 159, male. Lebanon, Beirut
(collection of Caradja, Bucharest).

Venation of forewings and hind wings (Figure 215) given in description of subgenus.

Male genitalia (Figure 216, A). Valvae elongated, with almost parallel upper and lower margins, and obtusely rounded apex; width in middle part one sixth to one-fifth costal margin including pedicel of valvae; valvae with highly sclerotized spinescent appendage below apex (Figure 216, D), which Petersen labeled the "sacculus" (Petersen, 1957b). Uncus in lateral view narrow, without process on dorsal side; in ventral view (Figure 216, B, E) lower lobes broad and covered with long slender bristles; dorsal lobes fused at base and only at apex more or less unguiculate. Aedoeagus dilated at base (Figure 216, C, F); thereafter sides parallel and become rounded only at apex, where highly sclerotized 303 cornuate appendage occurs; aedoeagus slightly (one-fifth) shorter in length than valvae (excluding pedicel).

Female. Not known.

Comparison. In external appearance somewhat resembles *Catabola crassicornella* Zll., but differs in venation: absence of M_3 in forewings and forked veins in hind wings. In genital structure close to *C. afghana* 304 Pet., but readily distinguished by narrow valvae with almost parallel sides, unguiculate dorsal lobes of uncus, and cornuate appendage at apex of aedoeagus.

Distribution. West Asia: Palestine, Syria, Lebanon. northwest Arabia, Aden (Figure 185).

In literature, reported from Jerusalem, Tel Aviv (Amsel, 1955); Ain-Karim, one male June 1, 1930 (Petersen, 1959c); Beirut (Petersen, 1957b). Western Aden (Dhala Port), one male September 14, 1937 (Petersen, 1961a).

Material examined. 1 male.

Lebanon. Beirut, one male (gen. preparation No. 159, male det. A. Zagulajev, collection of Caradja, Bucharest).

Biology. Xerophilous eastern Mediterranean species.

In western Asia moths were collected from beginning of May to end of June and thereafter in mid-September. In Syria, near Damascus, 44 males were collected from June 2 to 8, 1961 (Petersen, 1968). In Jerusalem six males were collected from June 1 to 28, 1930 (Petersen, 1959c); Beirut region one male collected May 10, 1930 (Petersen, 1957b); Tel Aviv, one male May 19, 1930 from sand dunes (Amsel, 1956). In northern Lebanon (Becharre) one male was collected at an altitude of 1,400 m between June 21 and 28, 1931 (Petersen, 1962); Beirut region three males found June 9, 1961 (Petersen, 1968). Discovery of a few moths in the southern part of the Arabian Peninsula (Aden region) is interesting; they were collected September 14, 1937 (Petersen, 1961a).

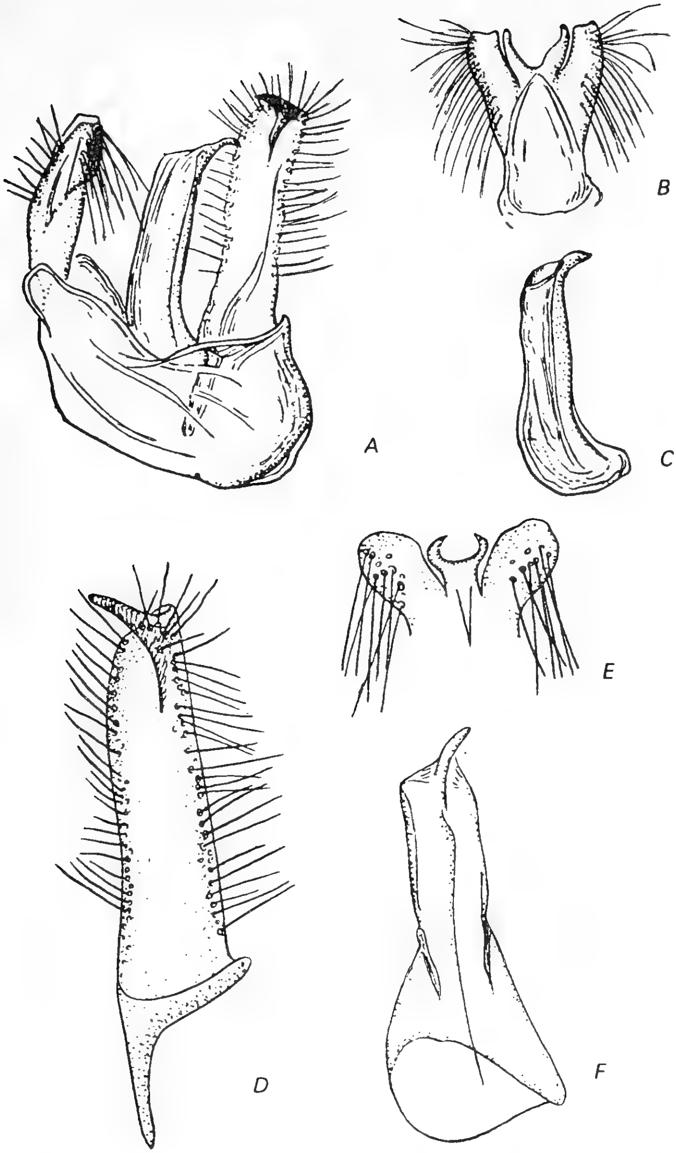
It appears likely that this species produces three generations per year.

16. **Catabola (Praelongicera) afghana** Pet. (Figures 185; 217)

Petersen, 1959b: 562–563, Fig. 6; 1963b: 172–173; 1963c: 181.

External characters of imago. Pubescence of head cinnamon-brown or reddish-cinnamon. Wingspan 7 to 10 mm. Forewings cinnamon-gray, lustrous.

Male genitalia (Figure 217, A). Valvae narrow, slightly upcurved; width in middle part almost one-seventh of costal margin together with pedicel of valvae; about one-third down from apex on inner side of



303 Figure 216. Genitalia of male *Catabola palaestinella* Ams.

A — general appearance (lateral view); B — uncus; C — aedoeagus.

Preparation No. 159, male. Lebanon, Beirut (collection of Caradja, Bucharest).

D—right valva; E—uncus (ventral view); F—aedoeagus (lateral view) (from Petersen, 1957b).

valvae, a highly sclerotized, obtuse, spinescent process occurs (Figure 217, B). Uncus compact; dorsal part fused with ventral part, with small notch at apex. Aedoeagus four-fifths length of costal margin of valvae (excluding pedicel), with broad base, highly sclerotized tip, but without processes.

Female genitalia (Figure 217, C, D). Lobes of vaginal plate narrow, densely covered with minute spinules and a series of long strong bristles; ostium bursae located along its posterior margin under small saddle-shaped prevaginal plate. Duct of bursa copulatrix, before entering bursa, without sclerotized structures. Anterior apophyses bifurcate; dorsal branches fused with small lobes of tergal plate; posterior margin of latter densely covered with spinules and bristles. Posterior apophyses with process covered with short setae and situated anterior to anal papillae. Anal papillae small, hard, very broad, with falcate apex; papillae densely covered with bristles.

Comparison. Close to *Catabola palaestinella* Ams., but differs in presence of spine on valvae, which is located distant from apex; fused lobes of uncus; and smooth, spineless apex of aedoeagus. This is the only species in subgenus *Praelongicera* Ams. in which a female is known. The saddle-shaped prevaginal plate and absence of sclerotized
305 structures in duct of bursa copulatrix readily distinguish the female of this species from those of other members of the genus.

No specimens examined by me.

Distribution. Eastern and Northeastern Afghanistan (Figure 185).

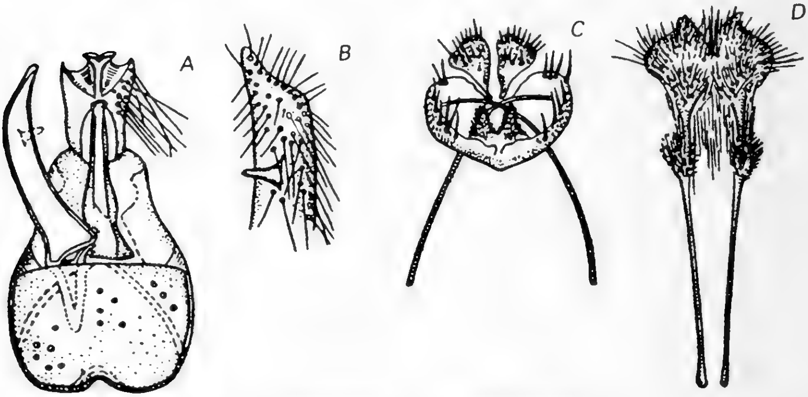


Figure 217. Male genitalia of *Catabola afghana* Pet.

A — general appearance (ventral view); B — apex of valva (higher magnification) (A and B from Petersen, 1959c).

Female: C — region of vaginal plate with anterior apophyses; D — anal papillae and posterior apophyses (C and D from Petersen, 1973).

In literature, indicated from environs of Kabul (Petersen, 1973), Sarobi (Petersen, 1959b), and Nuristan (Petersen, 1963c).

Biology. Montane xerophilous species.

The moths were collected in northeastern Afghanistan from April to August inclusively. In Bashgul-Tal one male was collected on April 9, 1953, and in Nuristan (Kutian) some found at an altitude of 1,550 m on May 14, 1953 (Petersen, 1953c); Sarobi, males found at an altitude of 1,100 m on July 3, 1956 (Petersen, 1959b). Numerous males were collected in various years on the hilly plateau in the environs of Kabul, at an altitude of 1,800 to 2,100 m, from early June to mid-August. The only female was found by Kasy in Nuristan (25 km north of Barikot) between July 12 and 17, 1963 at an altitude of 1,800 m (Petersen, 1973).

This species produces two or three generations per year.

11. Genus *Myrmecozela* Zll.

Zeller, 1852: 103; Meyrick, 1895: 782; Staudinger and Rebel, 1901: II, 240; Spuler, 1910: II, 463; Zerny, 1927: 486; Petersen, 1957b: 575; 1960b: 210–212; 1965b: 108–111; 1965c: 180; Căpuşe, 1968: 143–144; Zagulyaev, 1969: 17–18; Gozmàny and Vàri, 1973: 126; —*Promasia* Chrétien, 1905: 257, type *P. ataxella* Chrétien, 1905: 258–259 (S-Frankreich Spanien); —*Proctolopha* Rebel, 1915: 56, type *P. parnassiella* Rebel, 1915: 56 (Griechenland).

Type species. Tinea ochraceella Tgstr., 1848.

Pale coloration, predominantly yellowish tones, distinguishes these species from other members of the subfamily and brings genus *Myrmecozela* Zll. close to *Catabola* Durr.

Imago. Pubescence of head light yellowish-ocher to light orange
306 with an admixture of gray. Pilifers not present. Galea long, but not longer than labial palpi (Figure 4, B). Maxillary palpi four-segmented, very short, and do not reach end of lst segment of labial palpi. Labial palpi long and protrude forward and somewhat upward; they are usually distinctly visible in front of frons in dorsal view; 3rd segment two to three times shorter than 2nd. Antennae usually equal to two-thirds to three-fourths, rarely one-half of forewing; nature of pubescence on middle segments as shown in Figures 6, A, B and 218. Frons reduced and its width less or slightly greater than vertical diameter of eyes.

Thorax and tegulae from yellowish to orangish with large admixture of ash-gray or brown. Span of forewings 13 to 27 mm. Length of forewings 3.50 to 4.25 times width; length of hind wings 2.75 to 3.0 times width and equal to or slightly broader than forewing. Fringe of hind wings equal to one-half to three-fourths alar width. Forewings and

Figure 218. Structure of middle antennal segments of *Myrmecozela ochraceella* Tgstr.

Preparation No. 4030, male.
Finland.

their fringe uniformly colored, from yellowish or brownish to yellowish-orange with brownish or grayish granulation. Hind wings light yellow, translucent, often iridescent; fringe usually slightly darker than wing.

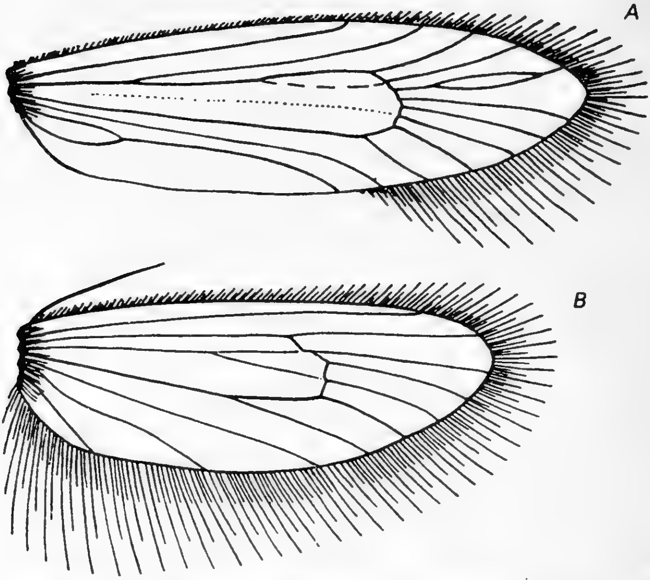


Figure 219. Venation of wings of *Myrmecozela ochraceella* Tgstr.

A—forewing; B—hind wing.

Preparation No. 4030, male.
Finland.

In forewings (Figures 7, D and 219, A) *Sc* terminates on anterior margin immediately beyond its midpoint. Terminus of R_1 located at level of apex of radiocubital cell or beyond it. Termina of R_5 and M_1 almost equidistant from alar apex or terminus of R_5 considerably nearer to it than terminus of M_1. In most species all radial and medial veins 307 originate separately from cell; rarely R_4 and R_5 located on common stem. Distance between bases of Cu_1 and Cu_2 much greater than distance between R_2 and R_3 and this distance about one-fourth to two-fifths length of radial cell. Basal branches of A_{2-3} small, one-third to one-half length of common trunk, which terminates on posterior margin of wing before level of origin of Cu_2 from cell. Radial cell developed; medial cell absent in most species. In hind wings (Figures 8, D and 219, B) *Sc* terminates on alar margin at three-fourths to five-sixths its length. *R* terminates on anterior alar margin before its apex. M_1 and M_2 very close-set at base. Radiocubital cell closed. Medial cell developed [*sic*].

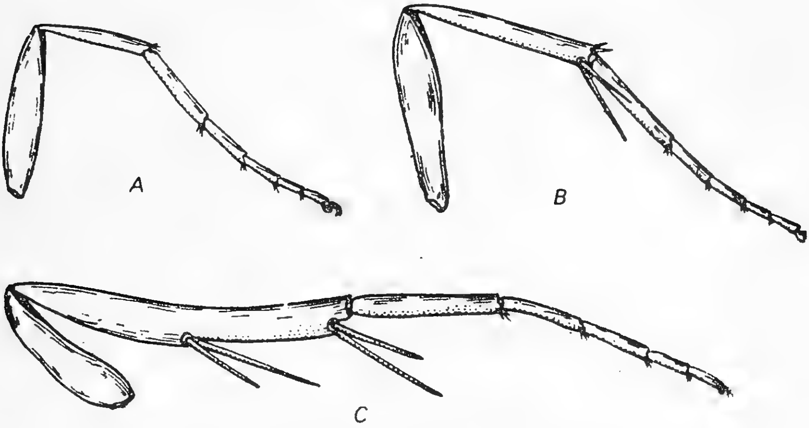


Figure 220. Legs of *Myrmecozela ochraceella* Tgstr.

A—foreleg; B—middle leg; C—hind leg.

Preparation No. 4030, male.
Finland.

Legs from yellowish-gray, yellowish-cinnamon to cinnamon-brown, usually lustrous; in most species without sharp light-colored bands at ends of tibiae and tarsal segments. Foretibiae without epiphyses, two-thirds length of femora (Figures 9, D and 220, A). Middle tibiae equal to femora in length (Figures 10, D and 220 B). Median pair of spurs of hind tibiae located in middle of tibia (Figures 11, D and 220, C). End of tarsal segments with three spines.

Abdomen yellowish-gray or brownish. Terminus of abdomen with tufts of silken hairs covering genitalia; in addition, males with crown of protruding scales. In females posterior margin of sternite with deep broad notch, margins of which are covered with long piliform scales (Figure 13, A).

Male genitalia (Figures 14, C and 229). Valvae broad, massive, almost rectangular, with 2 to 10 spines along outer margin; sclerotized lobe at base of posterior margin of valvae (Figures 15, A and 221) usually convex, covered with short bristles, and may carry small margi-

nal spines; length of valvae without pedicel 1.5 to 3.0 times width in narrowest part. Uncus in lateral view usually bent, with rounded or pointed apex, and membranous inner margin (Figure 229, A); two tubercular appendages, one on each side at base, with bristles (Figure
308 16, C); in ventral view uncus resembles elongated triangle with an acute apex. Aedoeagus about 3.0 to 4.5 times longer than uncus, slender, in form of broad arc, with spinescent appendage at base on lower side (Figures 17, B and 229, B). Sclerotized apex of aedoeagus may be smooth or with various structures (Figure 17, G). Membranous apical part of aedoeagus may be without sclerotized inclusions or carry different types of armature. Tegumen narrow. Vinculum narrow. Saccus in lateral view narrow and short, two-fifths to one-half length of uncus; in ventral view appears broad and short.

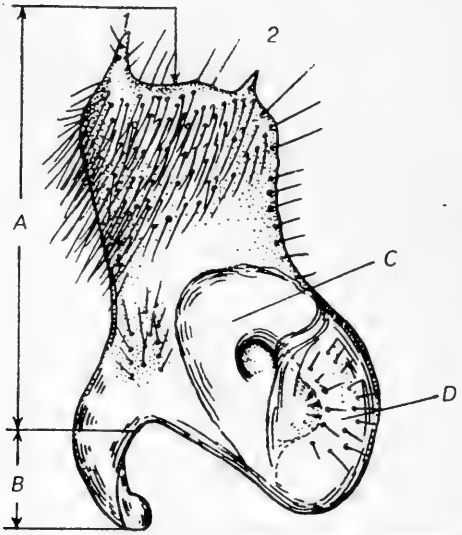


Figure 221. Diagram of various parts of valva of *Myrmecozela ochraceella* Tgstr.

A—length of valva; B—length of pedicel (transtilla); C—light-colored field; D—basal sclerotized lobe; 1 and 2—number of teeth.

Female genitalia (Figures 19, C and 233, A). Uniform in structure, displaying very slight differences from species to species. A distinct, sclerotized vaginal plate not present; replaced by darkening of membrane with longitudinal interruption in middle; membrane covered with longitudinal grooves and small slender bristles on sides. Prevaginal plate absent. Long, narrow, and highly sclerotized longitudinal tergal plate (vestige of tergite VIII) always present on dorsal side (Figure 20, A). Ostium bursae situated far beyond vaginal plate [*sic*] or often in notch of posterior margin of sternite VII (Figure 233, B). Terminus of duct of bursa copulatrix infundibular or cyathiform, and may be membranous or highly sclerotized. Duct without sclerotized structures and short, so that bursa located in segments VII to IV. Bursa copulatrix with signum in form of long sclerotized rod with spinules (Figures 20, D and 233, C). Anterior apophyses not bifurcate and do not reach segment VI or included in it. Ovipositor about two to three times longer than sternite VII.

Larvae (Figures 21 and 22, B). Larvae medium in size and dirty white with light-colored shields on abdominal segments (Figure 21, A). Head and prothoracic shields dark. Parietal suture on head about one-third longer than frontal triangle (Figure 21, B). Ocelli up to three on each side. Crochets of prolegs with 29 to 34 hooks (Figure 22, B). All three setae on prestigmal shield of prothorax developed.

Biology. A great majority of the members of this genus are steppe, semidesert, and desert species (Plate V). Only a few species are found in well-lit sparse forests (Plates I, III).

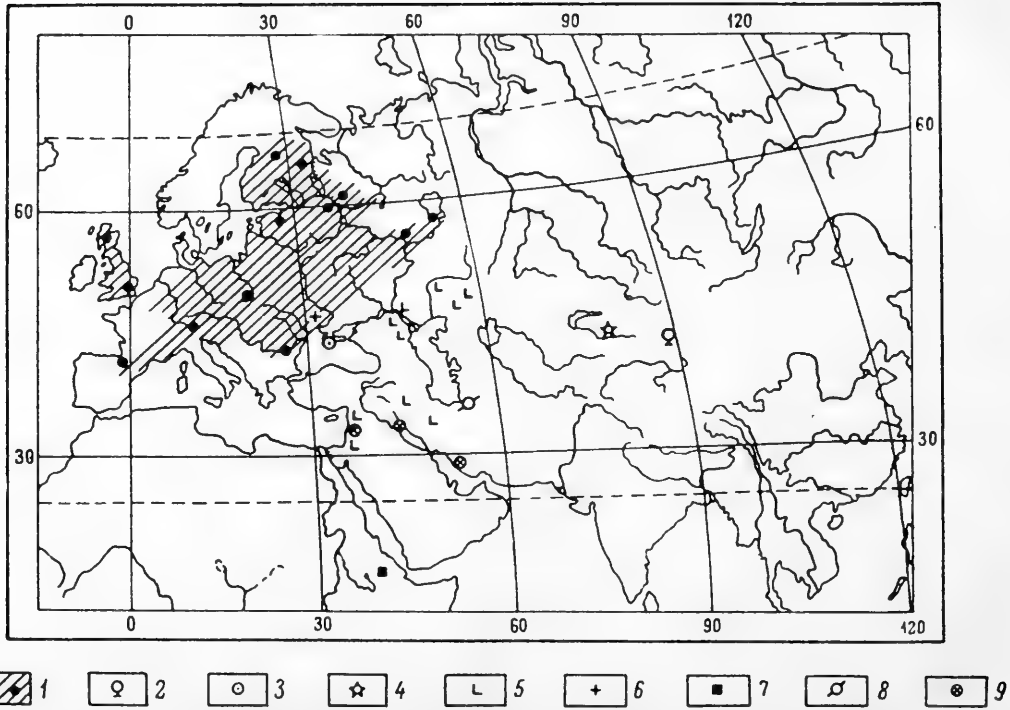
Male moths readily fly to light, while females are less mobile and in most forms remain on the ground; hence they are rarely collected. Females, even dead ones, retain a large mass of silken fluff in sacs of segment VII, which is so delicate that it breaks off at the slightest touch. This fluff is used to cover the eggs laid by the female at the base
309 of plants, on dry stems, or even on hard soil.

Development of eggs, depending on temperature, continues for 10 to 14 days. Larvae emerging from eggs move into the soil. They live in silken galleries constructed in turfy grasses, mounds of grass litter, and steppe litter; some live in anthills and feed on decomposing residue of herbaceous plants. However, during the development of some species in anthills the possibility cannot be excluded of the larvae eating mold-covered residue of animal origin (Zagulyaev, 1969).

Mature larvae hibernate and can be found either in late autumn or early spring. Before pupation, they prepare a tubular tunnel directed toward the surface, broaden it, and then pupate.

Many species produce two generations per year.

Distribution (Figures 29 and 222 to 225). The genus *Myrmecozela* Zll. includes 48 species with similar coloration, which are only reliably differentiated by their genital structure. Most of these species (32) are distributed in the Palearctic; outside the limits of the Soviet Union 17 species are known. Their Palearctic distribution occupies a large territory—almost all of Europe (excluding Scandinavia), south of western Siberia to Trans-Baikal, including northern Mongolia as well as Kazakhstan and places in Central Asia. Southward the range of this
311 genus covers northern Africa, countries adjoining the eastern coast of



309 Figure 222. Distribution of species of genus *Myrmecozela* Zll.

1—*M. ochraceela* Tgstr.; 2—*M. dzhungarica* Zag.; 3—*M. taurella* Zag.; 4—*M. heptapotamica* Zag.; 5—*M. lutosella* Ev.; 6—*M. pontica* Zag.; 7—*M. isopsamma* Meyr.; 8—*M. gigantea* Chr.; 9—*M. insignis* Ams.

the Mediterranean, as well as localities in Iran, Iraq, and Afghanistan. In East Asia, including Primor'e, occurrence of members of genus *Myrmecozela* has not been confirmed.

Maximum species diversity is found in the mountains of southern Europe (Spain)—eight species, and the Caucasus—eight species. In addition, centers of evolution within the Palearctic members of this genus are also quite distinct in the western and eastern Mediterranean.

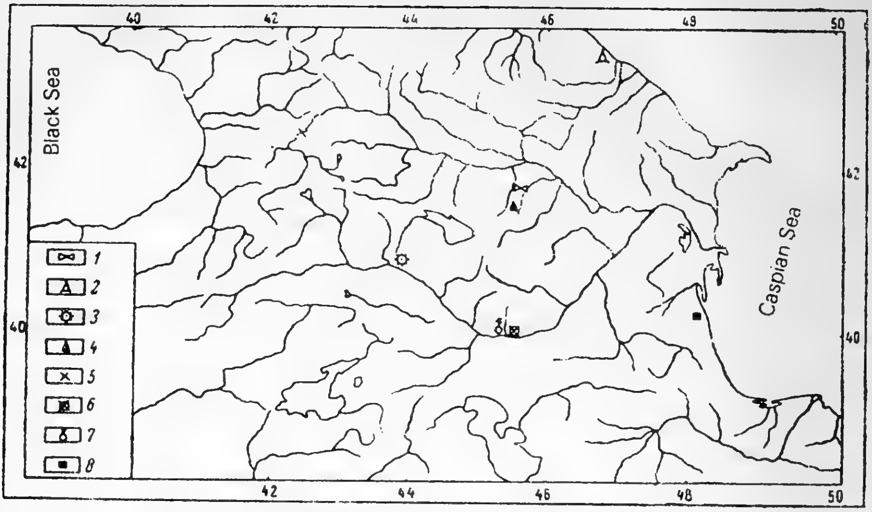
It is difficult to judge the distribution of the species of this genus outside the Palearctic since most of the species listed from other continents and the tropics as *Myrmecozela* Zll. actually belong to other genera. Members of this genus have been reported from North America (Florida)—one species; Africa—six, including eastern Africa—two; South Africa—five; India—four; New Guinea—one; and South America—five. Members of this genus have not been reported from Australia.

Comparison. On the basis of such characters as development of an additional cell in the forewings, location of A_1 in the hind wings, and presence of three spines at the end of the tarsal segments, as well as a narrow vinculum and arcuate, slender aedoeagus in the male genitalia, *Myrmecozela* Zll. is close to the monotypic genus *Cinnerethica* Ams. This indicates their monophyletic origin and differences in peculiarities of venation in the forewings and structure of valvae and uncus in the male genitalia, suggest their recent divergence.

Genera *Myrmecozela* Zll. and *Cinnerethica* Ams. would seem to represent an independent branch which has retained such primitive
312 characters as broad hind wings with a medial trunk. The morphological specializations shown in the reduction of the epiphyses on the anterior tibiae and gnathos in the genitalia of males permit one to consider this branch intermediate between *Catabola* Durr. and *Perissomastix* War. and Roth. on the one hand, and *Episcardia* Rag. on the other, and associates it closer to the first branch.

The intrageneric taxonomy of the genus *Myrmecozela* Zll. is difficult. This large genus represents a natural but not monophyletic group. It includes several well delineated groups and morphologically isolated individual species. Having analyzed the structure of the male genitalia, venation, and other external characters of 32 Palearctic species, I detected four major directions of morphological divergence whereby the subgenera *Myrmecozela* Zll. (s. str.), *Flavida* Zag., subgen. n., *Duclana* Zag., subgen. n., and *Promasia* Chrét. and a group of species (for which the taxonomic position is still not clear) could be identified. The extreme and most specialized forms of these subgenera differ notably, but the primitive types exhibit direct links in external characters.

1. Subgenus *Myrmecozela* Zll., s. str. with type *Tinea ochraceella*



310 Figure 223. Distribution of species of genus *Myrmecozela* Zll.

1 — *M. carabachica* Zag.; 2 — *M. rjabovi* Zag.; 3 — *M. armeniaca* Zag.; 4 — *M. gajndzhiella* Zag.; 5 — *M. imeretica* Zag.; 6 — *M. ordubasis* Zag.; 7 — *M. asariella* Zag.; 8 — *M. hyrcanella* Zag.

Tgstr. includes four species: *Myrmecozela ochraceella* Tgstr., *M. dzhungarica* Zag., *M. taurella* Zag., and *M. heptapotamica* Zag.

2. Subgenus *Flavida* Zag., subgen. n. with type *Tinea lutosella* Ev. comprises 17 species: *Myrmecozela lutosella* Ev., *M. pontica* Zag., *M. isopsamma* Meyr., *M. gigantea* Chr., *M. insignis* Ams., *M. carabachica* Zag., *M. rjabovi* Zag., *M. armeniaca* Zag., *M. kasachstanica* Zag., *M. stepicola* Zag., *M. mongolica* Pet., *M. saule* Zag., *M. gajndzhiella* Zag., *M. imeretica* Zag., *M. dubasis* Zag., *M. asariella* Zag., and *M. hyrcanella* Zag.

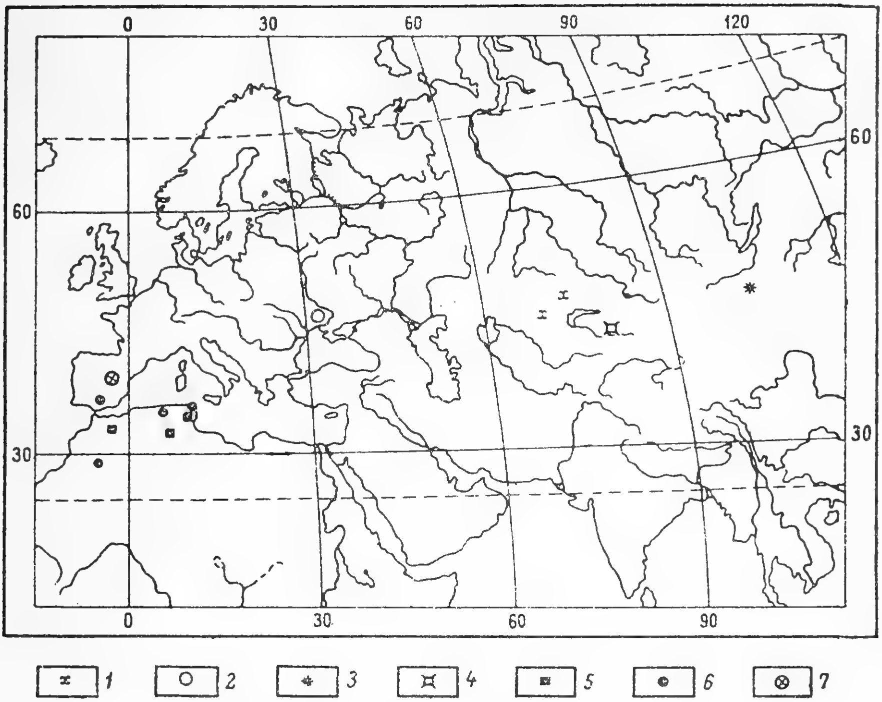
3. Subgenus *Dulcana* Zag., subgen. n. with type *Myrmecozela diacona* Wlsm. consists of three species: *M. diacona* Wlsm., *M. lambesseella* Rbl., and *M. cuencella* Car.

4. Subgenus *Promasia* Chrét. with type *P. ataxella* Chrét. includes five species: *Myrmecozela ataxella* Chrét., *M. hispanella* Zag., *M. parnassiella* Rbl., *M. sordidella* Car., and *M. deserticola* Wlsm.

Species for which the taxonomic position is not clear constitute a separate group, namely, *M. chneouri* Luc., *M. pallidella* Luc., and *M. romeii* Trti.

The phylogenetic relations of the subgenera in the genus are depicted in Figure 226. Characters of venation, armature of legs, and structure of male genitalia formed the basis of this scheme.

The small subgenus *Myrmecozela* Zll. includes several closely

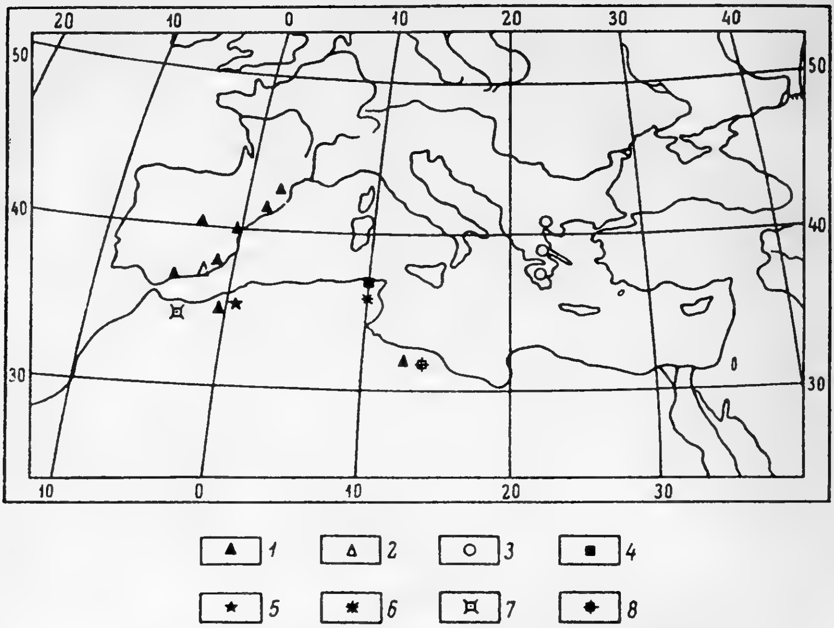


310 Figure 224. Distribution of species of genus *Myrmecozela* Zll.

1 — *M. kasachstanica* Zag.; 2 — *M. stepicola* Zag.; 3 — *M. mongolica* Pet.; 4 — *M. saule* Zag.; 5 — *M. diacona* Wlsm.; 6 — *M. lambessella* Rbl.; 7 — *M. cuencella* Car.

related species distributed in forestless regions of Europe and eastern Kazakhstan. This group is characterized by the retention of some prim- 313 itive characters, for example a fairly thick membrane, that completely surrounds the acicular apex of the aedoeagus. This structure makes it possible not only to distinguish *Myrmecozela* Zll. from the subgenera *Flavida* Zag., subgen. n. and *Dulcana* Zag., subgen. n., but also to consider it the most archaic. Links between this subgenus and other subgenera can be traced through the species *Myrmecozela dzhungarica* Zag. and *M. heptapotamica* Zag., mainly in the venation of the forewings (R_4 and R_5 widely separated at base).

Subgenus *Flavida* Zag., subgen. n. contains the largest number of Palearctic species and is characterized by greater heterogeneity than the other subgenera. On the basis of the costal margin of the valvae, this subgenus can be divided into two (unequal size) groups. Occupying an intermediate position, the subgenus is close in one respect to subgenus *Myrmecozela* Zll., s. str., and in another to *Dulcana* Zag., subgen. n. This proximity can be seen in the structure of venation, arma-



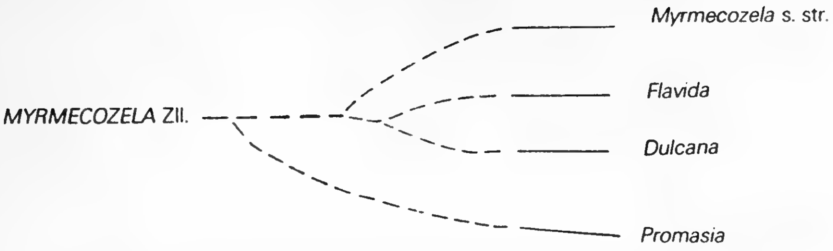
311 Figure 225. Distribution of species of genus *Myrmecozela* Zll.

1—*M. ataxella* Chrét.; 2—*M. hispanella* Zag.; 3—*M. parnassiella* Rbl.; 4—*M. sordidella* Car.; 5—*M. deserticola* Wlsm.; 6—*M. chneouri* Luc.; 7—*M. pallidella* Luc.; 8—*M. romeii* Trti.

ture of legs, and structure of male and female genitalia. However, this subgenus is characterized by a fairly unique trend in the evolution of a sclerotized, acicular apex at the aedoeagus, which pierces the membranous structure. This specialized character, or synapomorphy, is also seen in members of *Dulcana* Zag., subgen. n.; thus one may consider these two subgenera phylogenetically the closest.

The subgenus *Dulcana* Zag., subgen. n., on the basis of such morphological peculiarities as development of serrated margin of the sclerotized apex of the aedoeagus, represents a separate independent branch. This isolation is further confirmed by the distribution of its species; all three species are known only from the western Mediterranean region (Spain, Morocco, Algeria, and Tunisia). The venation of the forewings (R_4 and R_5 widely separated at base) and structure of the male genitalia (sclerotized apex of aedoeagus always longer than membranous part and jutting outward) reflects the close affinities of *Dulcana* Zag., subgen. n. and subgenus *Flavida* Zag., subgen. n.

All three subgenera examined, on the basis of morphological characters, including venation of forewings (location of R_4 and R_5) and male genitalia (shape of costal margin of valvae and apices), are not



312 Figure 226. Phylogenetic relations of subgenera of genus *Myrmecozela* Zll.

only close to each other, but are just the opposite to the more morphologically specialized subgenus *Promasia* Chrét.

The subgenus *Promasia* Chrét. represents a small independent branch which includes exclusively Mediterranean species, four of which are distributed in the western Mediterranean region (Spain, Morocco, Algeria, Tunisia, and Libya) and one in the eastern Mediterranean (Greece). Although the subgenus occupies an independent position on the basis of several morphological characters in relation to the other subgenera, its proximity to the genus *Myrmecozela* Zll. is indisputable. Phylogenetically the subgenus represents the most primitive branch of the genus and has retained several archaic characters.

Key to Subgenera of Genus Myrmecozela Zll. *on the Basis of Male Genitalia*[30]

1 (2). Middle part of costal margin of valvae highly convex; apical part concave. .... 4. **Promasia** Chrét.

314 2 (1). Middle part of costal margin of valvae concave, rarely straight; apical part convex.

3 (4). Sclerotized apex aedoeagus encircled by membrane. .... 1. **Myrmecozela** Zll., s. str.

4 (3). Sclerotized apex of aedoeagus extends above membrane on outer side.

5 (6). Sclerotized apex of aedoeagus acicular or peg-shaped with smooth margins. .... 2. **Flavida** Zag., subgen. n.

6 (5). Sclerotized apex of aedoeagus in form of thick obtuse appendage, with pubescent or serrated margin.................... .... 3. **Dulcana** Zag., subgen. n.

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[30] Considerable similarity in external characters and female genitalia makes it difficult to construct corresponding keys for identification.

1. Subgenus *Myrmecozela* Zll., s. str.

Zeller, 1852: 103.

Type species of subgenus. Tinea ochraceella Tgstr., 1847.

Antennae equal to two-thirds length of forewings. Hind wings equal to or slightly broader than forewings. Fringe of hind wing two-thirds to three-fourths alar width. In forewings R_4 and R_5 stalked or widely separated at base.

In male genitalia, middle part of costal margin of valvae concave; apical part convex. Sclerotized apex of aedoeagus acicular and always encircled by membrane (Figure 227).

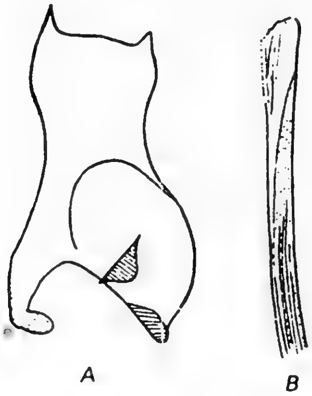
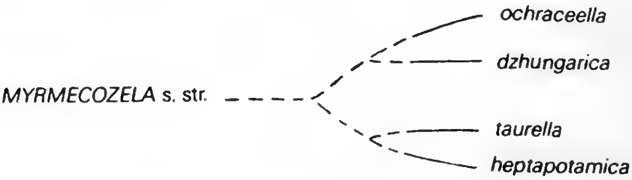


Figure 227. Male genitalia of *Myrmecozela ochraceella* Tgstr.
A—valva; B—apex of aedoeagus (from Petersen, 1957b).

In female genitalia signa of bursa copulatrix two-thirds to three-fourths length of sternite VII (Figure 233).

The subgenus includes four species: *Myrmecozela ochraceella* Tgstr., *M. dzhungarica* Zag., *M. taurella* Zag., and *M. heptapotamica* Zag.

Phylogenetic links of species in the subgenus are depicted in Figure 228. The scheme is based on the peculiarities of the venational structure of the forewings and male genitalia.



315 Figure 228. Phylogenetic relations of species in subgenus *Myrmecozela*, s. str.

Key to Species of Subgenus Myrmecozela Zll. s. str. on the Basis of External Characters

1 (4). In forewings terminus of R_1 located at level of outer margin of radiocubital cell.

2 (3). In forewings R_4 and R_5 widely separated at base; radial cell two-thirds distance between bases of R_1 and R_2. . . . . 4. **M.** (s. str.) **heptapotamica** Zag.

3 (2). In forewings R_4 and R_5 connate; radial cell less than half distance between bases of R_1 and R_2 . . . 3. **M.** (s. str.) **taurella** Zag.

4 (1). In forewings terminus of R_1 located at level of outer margin of radiocubital cell.

5 (6). In forewings R_4 and R_5 on stem; radial cell more than half distance bases of R_1 and R_2. . . . . . . 2. **M.** (s. str.) **ochraceella** Tgstr.

315 6 (5). In forewings R_4 and R_5 widely separated at base; radial cell three-sevenths distance between bases of R_1 and R_2. . . . . 2. **M.** (s. str.) **dzhungarica** Zag.

Key to Species of Subgenus Myrmecozela Zll. s. str. on the Basis of Male Genitalia

1 (4). Acicular apex of aedoeagus straight.

2 (3). Membranous apical part of aedoeagus without sclerotized structures. . . . . 1. **M.** (s. str.) **ochraceella** Tgstr.

3 (2). Membranous apical part of aedoeagus with sclerotized inclusions in form of two acicular bristles. . . . . 2. **M.** (s. str.) **dzhungarica** Zag.

4 (1). Acicular apex of aedoeagus bends at sharp angle.

5 (6). Uncus in lateral view with elongated, pointed apex; membranous apical part of aedoeagus smooth, without sclerotized structures. . . . . 4. **M.** (s. str.) **heptapotamica** Zag.

6 (5). Uncus in lateral view with broad rounded apex; membranous apical part of aedoeagus with sclerotized inclusions in form of transverse striations. . . . . 3. **M.** (s. str.) **taurella** Zag.

Key to Species of Subgenus Myrmecozela Zll. s. str. on the Basis of Female Genitalia[31]

1 (2). Anterior apophyses do not reach segment VI; posterior apophyses do not reach segment VII. Bursa copulatrix located in segment VII and partially VI. . . 1. **M.** (s. str.) **ochraceella** Tgstr.

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[31] Females of species *Myrmecozela* (s. str.) *taurella* Zag. and *M.* (s. str.) *heptapotamica* Zag. are not known.

2 (1). Anterior apophyses included in segment VI; posterior apophyses reach midpoint of segment VII. Bursa copulatrix located in segments VI and V. .... 2. **M.** (s. str.) **dzhungarica** Zag.

1. **Myrmecozela** (s. str.) **ochraceella** Tgstr. (Figures 4, B; 15, A; 16, C; 218–222; 227–230, Plates I and VII, *5*).

Tengström, 1847: 111 (*Tinea*); Zeller, 1852: 176–177; Herrich-Schäffer, 1853–1855, V, Tab. 265, Fig. 270; Stainton, 1859: 294 (*Tinea*); Walker, 1863: 486; Ershov and Fil'd, 1870: 180; Nolcken, 1871: 188–489; Ershov, 1880–1881: 217; Bang-Haas, 1881: 198; Walsingham, 316 1891: 517; Rebel, 1892: 529; Walsingham, 1897: 166; Staudinger and Rebel, 1901: II, 240; Disque, 1908: 145; Krulikovskii, 1909a: 247; 1909b: 271; Spuler, 1910: II, 463; Chrétien, 1915: 373 (Amydria); Caradja, 1920: 172; Wolff and Krausse, 1922: 238; Petersen, 1924: 559; Zerny, 1927: 486; Meyrick, 1928a: 820; Hering, 1932: 30; Rebel, 1934: 138; Pierce and Metcalfe, 1935: 103; Zerny, 1935: 156; Gerasimov, 1948: 938; Petersen, 1957b: 577; 1960b: 212; Căpuşe, 1963: 383; Petersen, 1963d: 412; 1964b: 398; 1965b: 108–109; 1965c: 180–181.

Biology. Zeller, 1852: 176–177; Stainton, 1859: 294; Ershov, 1871: XV; Rebel, 1892: 529; Kavrigin, 1894: 27, 52; Disque, 1908: 145; Krulikovskii, 1909a: 247; Kuznetsov, 1913: 448; Wolf and Krausse, 1922: 238; Zerny, 1927: 486; Klimesch, 1961: 770; Zagulyaev, 1969: 18; Krogerus et al., 1971; 29.

External characters of imago. Head and labial palpi pubescent with yellowish-ocher hairs. Structure of head and its appendages as shown in Figure 4, B. Width of frons more than vertical diameter of eyes. Antennae cinnamon-gray; basal segment yellowish-orange; structure of middle segments as shown in Figure 218.

Thorax and tegulae on dorsal side yellowish-ocher; tegulae toward front darker. Span of forewings in males 13 to 16 mm, in female 13 to 15 mm. Length of forewings 3.25 times, of hind wings 2.75 times width, and width of hind wing equal to forewing. Fringe of hind wing two-thirds alar width.

Forewings (Plate VII, *5*) light ocherous-yellow with oily sheen; anterior margin near root dark. Fringe with ash-gray tinge. Hind wings light yellowish-ash-gray with poor sheen. Under surface of all wings yellowish-ash-gray with oily sheen.

In forewings (Figure 219, A) R_2 and R_3 widely separated at base; distance more than one between bases of R_3 and R_{4-5}. R_4 and R_5 shortly stalked, thereafter diverse, and in some specimens again fuse before termination on alar margin. Terminus of common stem of R_{4-5} and terminus of M_1 equidistant from alar apex. Distance between bases of

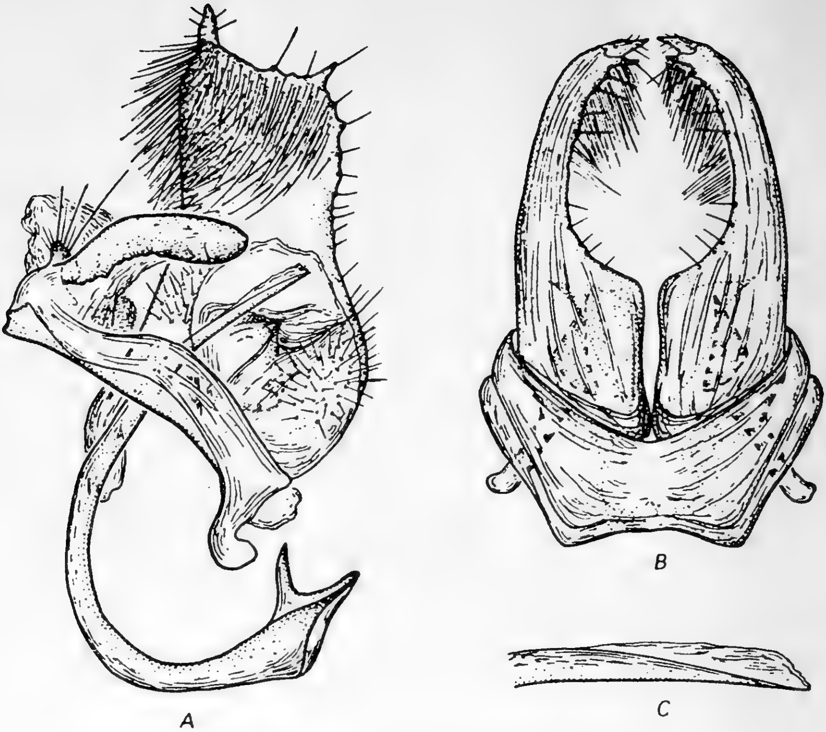
M_1 and M_2 large and equal to distance between M_2 and M_3. Distance between bases of M_3 and Cu_1 one-third to one-half distance between bases of Cu_1 and Cu_2; latter about two-sevenths to one third length of radial cell. In hind wing (Figure 219, B) terminus of Sc 1.5 times closer to alar apex than to base of R_1. Terminus of M_1 two to three times closer to alar apex than terminus of R. Distance between bases of Cu_1 and Cu_2 five to six times more than distance between bases of M_3 and Cu_1, and much shorter than medial cell. A_2 terminates on alar margin before level of origin of branch of Cu_2 from cell.

Fore- and middle legs cinnamon-ash-gray with barely perceptible light-colored rings at ends of tarsal segments. Hind legs straw-ash-gray, lustrous. Structure and armature or legs as shown in Figure 220.

Male genitalia (Figure 229, A, B). Costal margin of valvae with deep notch in middle; tooth near apex stout and long. Lower outer corner with one large tubercle; in some specimens small tooth visible before apex of posterior margin. Length of valvae more than 2.5 times greater than width in narrow part. Basal lobe of posterior margin of valvae up to two-fifths length of posterior margin of valva (Figures 15, A and 221). Uncus in lateral view broad, geniculate before midpoint, with rounded and completely sclerotized apex; almost twice (1.80) longer than tegumen; membrane on lower side of uncus originates almost from midpoint. Tubercular appendages in dorsal view small, each with three long and four to six short bristles (Figure 16, C). Aedoeagus about 3.75 times longer than uncus, and 7.0 times longer than saccus; on inner side
317 highly sclerotized. Apex of aedoeagus acicular, without spinules in membranous part (Figure 229, C). Saccus in ventral view with concave anterior and posterior margins; in lateral view free end of saccus falcate; saccus equal to or slightly longer than tegumen.

Female genitalia (Figure 230). Terminus of duct of bursa copulatrix infundibular, membranous, and difficult to distinguish. Duct of bursa copulatrix short, about one-fifth to one-fourth length of sternite VII. Corpus bursae large, long, and located mostly in segment VII. Signum narrow and straight, with narrower end directed toward duct. Anterior apophyses do not reach segment VI.

Comparison. In general appearance this species is close to *Myrmecozela dzhungarica* Zag., but distinguished by several characters. In the forewing R_2 and R_3 widely separated at base, and R_4 and R_5 on short stalk. Valvae narrow, with small constrictions along costal margin and posterior margin; lower outer corner with one large tooth. Uncus broad, geniculate, with rounded sclerotized apex. Aedoeagus about 3.75 times longer than uncus; saccus in lateral view with falcate free end. In female
318 genitalia terminus of duct of bursa copulatrix without bristles; signa peg-shaped.



317 Figure 229. Male genitalia of *Myrmecozela ochraceella* Tgstr.

A—general appearance (lateral view); B—same (ventral view); C—apex of aedoeagus (high magnification).

Preparation No. 4030, male.
Finland

Larvae whitish-yellow with reddish-cinnamon head.

Distribution (Figure 222). European part of the USSR and Western Europe, predominantly northern and central regions.

In literature, reported from Arkhangel'sk, Olonets, and Sankt-Peterburg Provinces (Ershov and Fil'd, 1870); Baltic region: Estonia (Petersen, 1924); Vyatsk Province: Lazarevka village (Krulikovskii, 1909a); Kazan (Krulikovskii, 1909b). Also recorded from Finland (Zeller, 1852; Krogerus et al., 1971); England (Stainton, 1859); Denmark, Norway, and Sweden (Krogerus et al., 1971); southern Tirol Alps (Rebel, 1892). Petersen's report (1964b) about the occurrence of two males and two females in the hilly region of Spain at an elevation of 1,000 m provides a basis for very critically examining the distribution of this species and its exclusive confinement to northern regions of Europe. A detailed study of

Figure 230. Region of vaginal plate and segment VII of *Myrmecozela ochraceella* Tgstr.
Preparation No. 10010, female.
Finland.

Spanish specimens is likewise essential.

Material examined. 14 males and 10 females.

Finland (Fennia), three males (collection of Ershov); one male and one female, 1870 (collection of Wocke); one female, July (collection of Hedemann); ten males and eight females, July (Old Academy collection).

Biology. European forest species; in the south found in mountains of the subalpine zone. Moths emerge in May and July as well as August–September, usually in well-lit mixed and pine forests near old ant colonies and standing dead wood (Plate I), sometimes on peat beds (Kavrigin, 1894).

In Finland moths were found on July 24 in an anthill constructed by *Formica congerens* (Zeller, 1852; Bang-Haas, 1881). In England and Scotland moths were collected in July near anthills (Stainton, 1859). In Kazan region one female was collected at end of May (Krulikovskii, 1909b). Kuznetsov (1913) reported moths from August to October in anthills of *Formica rufa*. Rebel (1892) indicated that this species is not rare in the Alps (southern Tirol), and it was collected there on July 21 and 22, 1891. Two males and two females were reportedly collected in the hilly regions of Spain (Albarracin) on July 27, 1959 at an elevation of 1,000 m (Petersen, 1964b).

Larvae live in heaps of old dead wood, or anthills including those constructed by *Formica rufa* (Petersen, 1963d). They construct silken galleries in which particles of anthill material are interwoven. Larvae
319 feed on mold-covered residue of plant and, probably, animal origin (Zagulyaev, 1969). Mature larvae can usually be found in early spring and late autumn. Pupation takes place in broadened tunnels near the soil surface. This species usually produces a single generation per year, but in the south two generations per year.

2. **Myrmecozela** (s. str.) **dzhungarica** Zag. (Figures 222; 228; and 231–233)

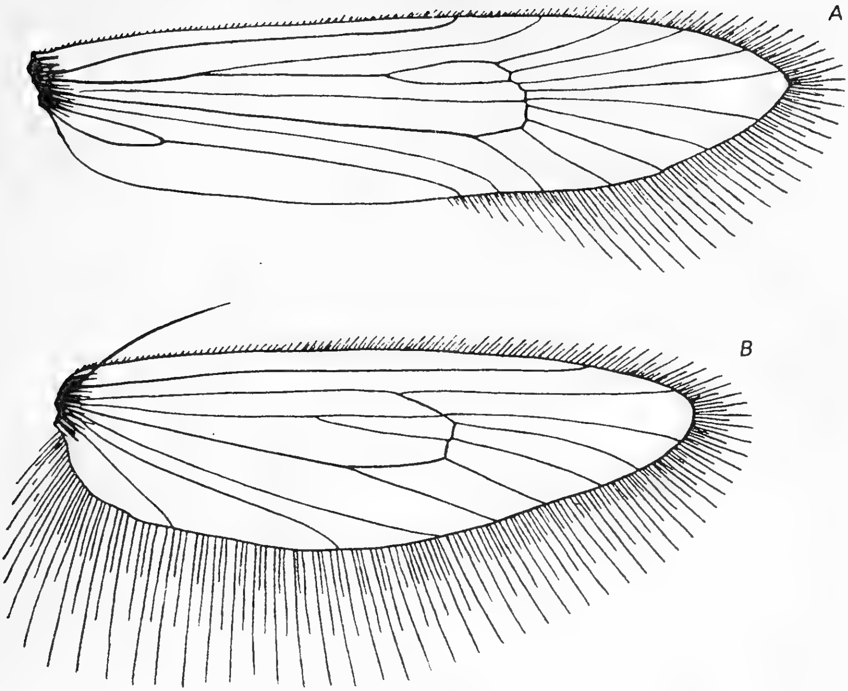
Zagulyaev, 1971b: 420–422.

External characters of imago. Head covered with light yellowish-ash-gray hairs. Labial palpi yellowish-gray. Antennae yellowish-gray, light cinnamon-brown. Frons slightly larger than vertical diameter of eyes.

Thorax and tegulae light yellowish-ash-gray. Span of forewings in males and females 14 to 16 mm. Length of forewing four times, of hind wing slightly more than three times width; hind wings slightly broader than forewing. Fringe of hind wing about three-fourths alar width.

Forewings of males light yellowish-ash-gray with brownish-orange granulation in basal half and brownish-cinnamon in outer half of wing. Fringe of wing slightly lighter in color than basic shade of wing. Hind wings light yellow, translucent, iridescent; fringe slightly darker than wing. Under surface of forewings yellowish-brown, of hind wings light yellowish-ash-gray.

320 In forewing (Figure 231, A) distance between bases of R_2 and R_3 equal to or slightly greater than distance between R_3 and R_4. R_4 and R_5



319 Figure 231. Venation of wings of *Myrmecozela dzhungarica* Zag.

A—forewing; B—hind wing.

Preparation No. 28, male. Kuldja (collection of Caradja, Bucharest).

widely separated at base and R_5 terminates almost on alar apex. M_1 and M_2 very close-set at base. Distance between bases of M_3 and Cu_1 one-fourth to one-third distance between Cu_1 and Cu_2, and later less than two-fifths length of radial cell. In hind wing (Figure 231, B) terminus of Sc 1.5 times closer to alar apex than to base of R. Termina of R and M_1 equidistant from alar apex. Base ofM_1 two to three times closer to M_2 than to R; distance between bases of Cu_1 and Cu_2 four times distance between M_3 and Cu_1 and much less than length of medial cell. A_2 terminates on alar margin proximal to level of origin of Cu_2 from cell.

Fore- and middle legs brownish-gray; hind legs yellowish-ash-gray.

Male genitalia (Figure 232, A). Valvae with curved costal margin, concave in front of midpoint and convex behind it; outer margin of valvae always almost flat, with one long tooth near apex. Lower outer corner with three equal-sized and more or less equidistant teeth, or middle tooth slightly closer to upper one. Length of valvae twice width

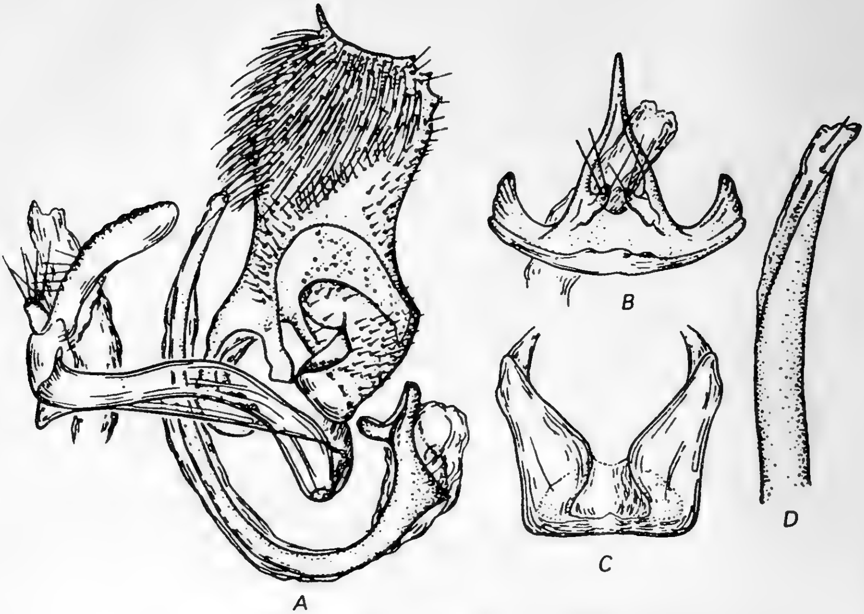


Figure 232. Male genitalia of *Myrmecozela dzhungarica* Zag.

A—general appearance (lateral view); B—uncus (dorsal view); C—saccus (ventral view); D—apex of aedoeagus (high magnification).

Preparation No. 28, male. Kuldja (collection of Caradja, Bucharest).

of narrow part. Basal sclerotized lobe of posterior margin of valvae reaches one-third length of valva. Light-colored field of valvae small and does not reach its midpoint. Uncus in lateral view broad, slightly curved, with rounded apex, about 1.5 times longer than tegumen, with two distinct tubercular appendages at base (Figure 232, B). Aedoeagus three times longer than uncus, arcuate, with broad base and short 321 obtuse spinescent appendage at base; apex of aedoeagus enveloped by membrane with two acicular bristles (Figure 232, D). Saccus in ventral view with rectangular anterior margin and deep notch in middle of posterior margin (Figure 232, C).

Female genitalia (Figure 233). Terminus of duct of bursa copulatrix infundibular, membranous, with three to four very small acicular bristles along sides. Duct slender, about equal to two-thirds length of sternite VII. Bursa copulatrix located in segments VI to IV; signum boat-shaped. Anterior apophyses included in segment VI; posterior apophyses reach segment VII or included in it.

Comparison. Close to *Myrmecozela ochraceella* Tgstr., but differs

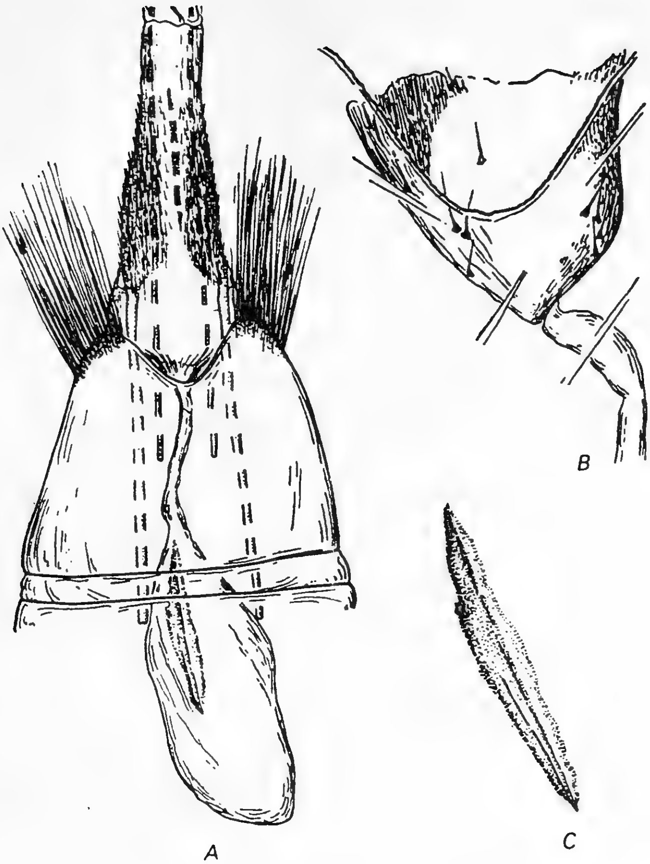


Figure 233. Female genitalia of *Myrmecozela dzhungarica* Zag.
A—general appearance; B—ostium bursa (high magnification); C—isolated signum.
Preparation No. 28, female. Kuldja (collection of Caradja, Bucharest).

in several characters. In forewings bases of R_2 and R_3 close-set; R_4 and R_5 widely separated at base. In hind wings terminus of *Sc* 1.5 times closer to alar apex than to base of *R*; distance between bases of Cu_1 and Cu_2 less than length of medial cell. In male genitalia valvae with one tooth at apex of outer margin and three equal-sized teeth near lower corner; aedoeagus three times longer than uncus, its apex without spines. In female genitalia terminus of duct of bursa copulatrix infundibular, membranous, with three to four very minute acicular bristles; signum of bursa copulatrix broad.

Specimens of this species were found in the collection of Caradja

(Bucharest) among a large series of males and females of *M. lutosella* Ev.

Distribution. Northwestern China, Tien-Shan (Figure 222).

Material examined. 2 males and 1 female.

Northwestern China, Cinzyan, Kuldja, one male, holotype, gen. preparation. No. 28; one male and one female taken as paratypes. All three specimens with original printed label "Kuldscha Thian oc. coll. Carad." Type and paratypes preserved in collection of Caradja in the Museum of Natural History in Bucharest.

Occurrence of *M. dzhungarica* possible in southeastern Kazakhstan, Alma-Ata region, and Kirgizia.

Biology. Not known.

3. **Myrmecozela** (s. str.) **taurella** Zag. (Figures 17, *3*; 222; 228; 234; 235)

Zagulyaev, 1971b; 422–423.

External characters of imago. Head and frons with ash-grayish-yellow hairs; pubescence on vertex matte yellowish-orange. Labial palpi yellowish-brown. Antennae cinnamon-gray, smooth. Frons broad, larger than vertical diameter of eyes.

Thorax and tegulae light cinnamon-ash-gray with brownish tinge.

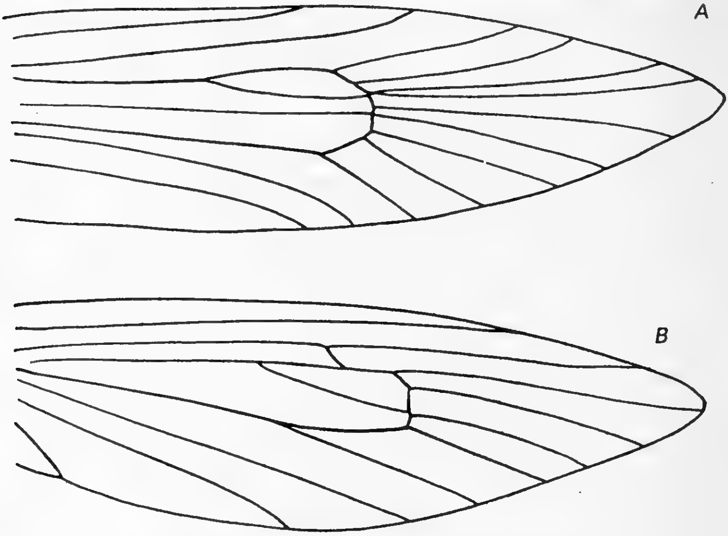


Figure 234. Venation of wings of *Myrmecozela taurella* Zag.

A—forwing; B—hind wing.

Preparation No. 5419, male.
Crimea.

Span of forewings in males 14 to 15 mm. Length of forewings 4.0 times, of hind wings 3.5 times width. Width of hind wings equal to that of forewings. Fringe of hind wings equal to two-thirds alar width.

Forewings yellowish-gray with brownish tinge, without pattern. 323 Hind wings light gray with golden tinge; fringe more yellowish. Under surface of forewings light cinnamon-gray, of hind wings yellowish-gray, lustrous.

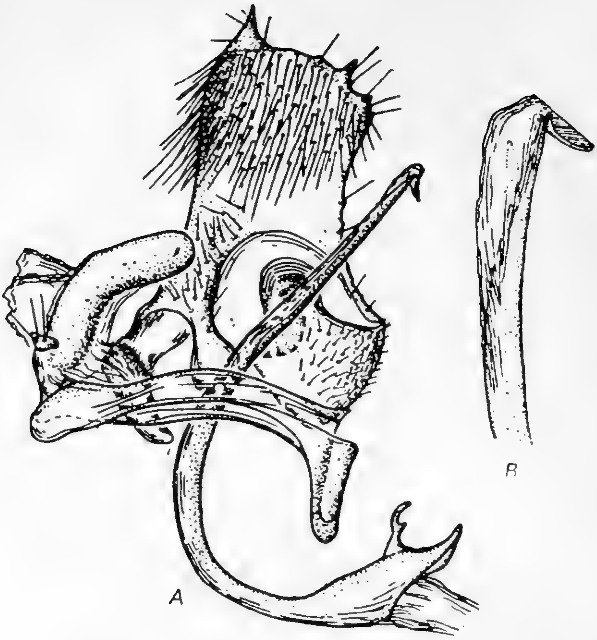
In forewings (Figure 234, A) bases of R_2 and R_3 widely separated so that distance between them 1.5 times distance between bases of R_3 and R_4. R_4 and R_5 connate. Terminus of R_5 twice closer to alar apex than terminus of M_1. M_1 and M_2 very close-set at base. Distance between bases of M_3 and Cu_1 short, one-fifth to one-fourth distance between bases of Cu_1 and Cu_2; latter two-sevenths of radial cell. In hind wings (Figure 234, B) terminus of Sc equidistant from alar apex and base of R. M_1 terminates on alar apex. Distance between bases of Cu_1 and Cu_2 10 to 12 times greater than distance between M_3 and Cu_1 and much less than medial cell. A_2 terminates on alar margin almost at level of origin of branch Cu_2 from cell.

Fore- and middle legs yellowish-cinnamon, hind legs yellowish-ash-gray.

Male genitalia (Figure 235, A). Valvae with slightly raised costal margin in front of apex. Tooth near apex broadly triangular. Lower outer corner with three teeth; lower with two short, very close-set teeth located on common base. Length of valvae almost twice width in narrow part. Basal sclerotized lobe of posterior margin of valvae reaches first third of posterior margin of valvae. Light-colored field of valvae small and does not reach midpoint of valva. Uncus geniculate, with highly sclerotized apex, and almost twice longer than tegumen; membrane on lower side of uncus does not reach its apex. Tubercular appendages at base of uncus small, triangular, with three very short bristles, length of which about one-fourth length of uncus. Aedoeagus four times longer than uncus; apical region with poorly sclerotized spine. Membranous apical part of aedoeagus with parallel striations and small, poorly sclerotized spine (Figures 17, *3* and 235, B). Base of aedoeagus unguiculate and inner appendage with additional tooth. Saccus in lateral view straight, narrow, with flat posterior margin; saccus same length as tegumen.

Female. Not known.

324 *Comparison.* In general appearance and coloration of wings this species is similar to *Myrmecozela lutosella* Ev.; on the basis of other morphological characters it is close to *M. heptapotamica* Zag., but somewhat smaller in size and without wing pattern. This species is also distinguished by other characters, such as in forewing, bases of R_2 and



323 Figure 235. Male genitalia of *Myrmecozela taurella* Zag.

A — general appearance (lateral view); B — apex of aedoeagus (high magnification).

Preparation No. 5419, male.
Crimea.

R_3 widely separated; R_4 and R_5 connate; radial cell 3.5 times larger than distance between bases of Cu_1 and Cu_2. In hind wing terminus of *Sc* equidistant from alar apex and base of *R*; base of M_3 two to three times closer to base of Cu_1 than M_2. In male genitalia uncus geniculate, with broad sclerotized apex; unguiculate base of aedoeagus with additional tooth.

This species was named after the region of its occurrence in Crimea (Tauria).

Distribution. Crimea (Figure 222).

Material examined. 1 male.

Crimea. Chatyr-Dag, one male, holotype, July 14, 1914 (Pliginski); preparation of genitalia No. 5419.

Biology. Not known.

4. **Myrmecozela** (s. str.) **heptapotamica** Zag. (Figures 222; 228; 236; 237)

Zagulyaev, 1971b: 423–424.

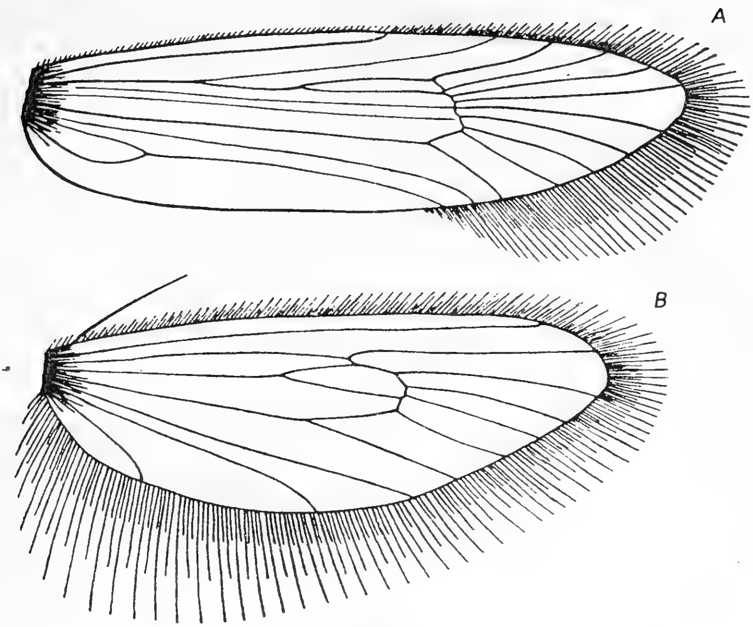


Figure 236. Venation of wings *Myrmecozela heptapotamica* Zag.

A — forewing; B — hind wing.

Preparation No. 10042, male.
Semirech'e.

External characters of imago. Pubescence on frons and occiput light yellow, on vertex and antennal base yellowish-ocher, brownish. Labial palpi on upper and inner sides light yellow, on lower and outer sides light brown. Frons small, smaller than vertical diameter of eyes. Antennae yellowish-ash-gray; 1st segment brownish-ocher with long protruding bristles of same color.

325 Thorax and tegulae on dorsal side brownish-ocher; tegulae toward front more cinnamon-colored. Span of forewings of male 19 mm. Length of forewings 3.66 times, of hind wings almost 2.0 times width; latter slightly broader than forewings. Fringe of hind wing two-thirds alar width.

Forewings yellowish-brown. Pattern barely evident, in form of few dark diffused spots: one at apex of radiocubital cell and two on fold of anal vein, which may be continuous along fold. Fringe same color as wings, but slightly lighter, with distinct darker transverse lines. Hind wings light yellowish-ash-gray, more yellow along outer margin, translucent, fringe light yellow. Under surface of forewings and their fringe light yellowish to cinnamon, of hind wings light yellowish-ash-gray with more yellowish fringe.

In forewing (Figure 236, A) distance between bases of R_2 and R_3 almost twice distance between R_3 and R_4. Distance between bases of R_4 and R_5 almost same as between bases of R_3 and R_4, and R_5 and M_1. R_5 terminates almost on alar apex. Distance between bases of M_1 and M_2 slightly less than distance between M_2 and M_3. Distance between bases of M_3 and Cu_1 one-eighth to one-sixth distance between bases of Cu_1 and Cu_2; latter one-fourth length of radial cell. In hind wings (Figure 236, B) Sc more than twice closer to alar apex than to base of R. Terminus of M_1 slightly closer to alar apex than terminus of R. Base of M_1 about three times closer to base of M_2 than to base of R. Distance between bases of Cu_1 and Cu_2 five to six times greater than distance between M_3 and Cu_1, and slightly less than length of medial cell. A_2 terminates on posterior alar margin at level of origin of Cu_2 from cell.

Fore- and middle legs cinnamon-brown; ends of tibiae and tarsal segments with barely perceptible light-colored rings. Hind legs light yellowish-ash-gray.

Male genitalia (Figure 237, A). Costal margin of valvae concave in basal half and with convex angle in front of apex. Apical tooth in form of broad triangle. Outer margin straight, with two wide-set slender teeth, which are highly inclined inward. Length of the valvae 1.75 times greater than width in narrow part. Basal sclerotized lobe of posterior margin of valvae two-fifths length of valva. Light-colored field does not reach midpoint of valva. Uncus in lateral view narrow, wedge-shaped, slightly curved and slightly larger (by one-fourth) than tegumen; membrane originates from uncus slightly beyond its midpoint. Aedoeagus 4.5 times longer than uncus, highly arcuate, with slender acicular apex
326 curved at an angle (Figure 237, B); sclerotized inclusions not present in apical membrane; base of aedoeagus usual in structure with unguiculate formation at end. Saccus in lateral view broad, with process at base and at end; much longer than tegumen.

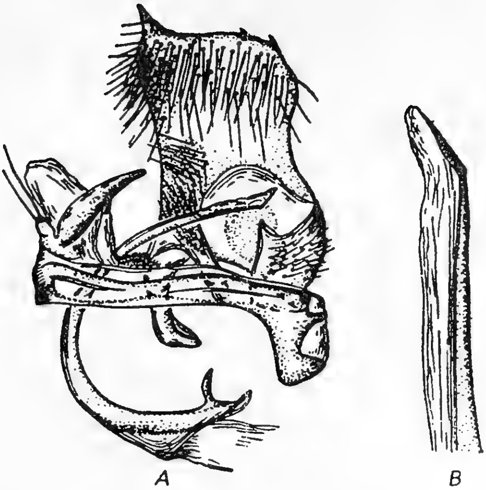
Female. Not known.

Comparison. Species close to *Myrmecozela taurella* Zag., but differs in yellowish-brown coloration of wings, with three diffused spots — one at apex of radiocubital cell and two on fold of anal vein — as well as other details of venation. It is readily distinguished from all other species of the genus by structure of the genitalia, especially the narrow, short, wedge-shaped uncus and acicular apex of aedoeagus.

Distribution (Figure 222). Kazakhstan, possibly Central Asia.

Material examined. 1 male.

Southeastern Kazakhstan. Semirech'e, Panfilov (Dzharkent), one



325 Figure 237. Male genitalia of *Myrmecozela heptapotamica* Zag.
A — general appearance (lateral view); B — apex of aedoeagus (high magnification).
Preparation No. 10042, male.
Semirech'e.

male, holotype, 1915 (Ryukbeil'), gen. preparation. No. 10042, male.

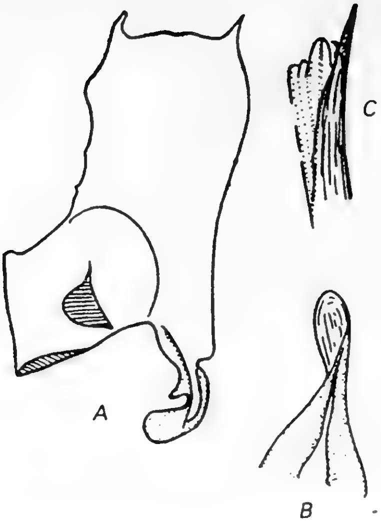
Biology. Not known.

2. Subgenus *Flavida* Zag., subgen. n.

Type species of subgenus. Tinea lutosella Ev., 1844. Length of antennae in most species two-thirds to three-fourths length of forewing. Hind wings often slightly broader than forewings, rarely equal. Fringe of hind wings one-half to two-thirds width of wing. In forewings R_4 and R_5 free, and in most species widely separated at base.

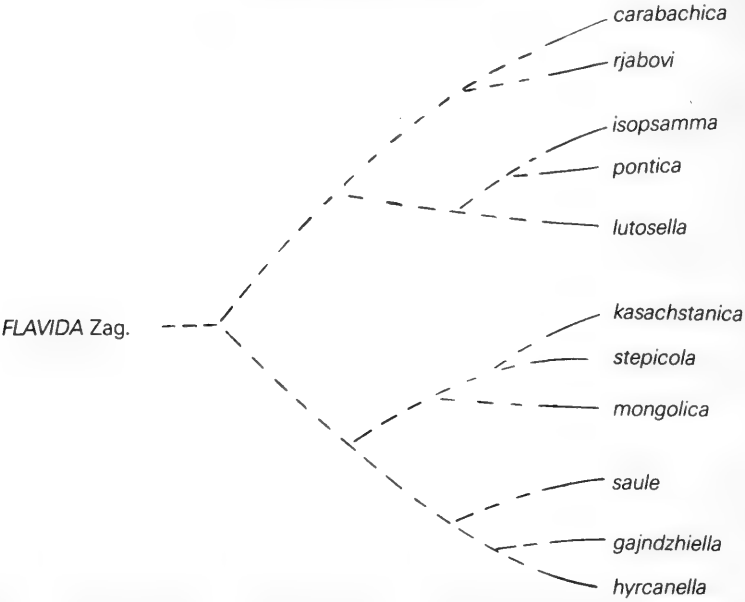
In male genitalia (Figure 238) middle part of costal margin of valva concave, in some species straight, but apical part always convex; sclerotized apex of aedoeagus pointed, peg-shaped, but always with smooth margins; apex of aedoeagus extends beyond membrane (Figure 238, C).

Subgenus includes 17 species. *Myrmecozela lutosella* Ev., *M. pontica* Zag., *M. isopsamma* Meyr., *M. gigantea* Chr., *M. insignis* Ams., *M. carabachica* Zag., *M. rjabovi* Zag., *M. armeniaca* Zag., *M. kasachstanica* Zag., *M. stepicola* Zag., *M. mongolica* Pet., *M. saule* Zag., *M. gajndzhiella* Zag., *M. imeretica* Zag., *M. ordubasis* Zag., *M. asariella* Zag., and *M. hyrcanella* Zag.



326 Figure 238. Male genitalia of *Myrmecozela lutosella* Ev.

A—valva; B—apex of uncus; C—apex of aedoeagus (high magnification) (from Petersen, 1957b).



327 Figure 239. Phylogenetic relations of species in subgenus *Flavida* Zag., subgen. n. of genus *Myrmecozela* Zll.

Species *Myrmecozela gigantea* Chr., *M. insignis* Ams., *M. imeretica* Zag., *M. ordubasis* Zag., *M. asariella* Zag., and *M. armeniaca* Zag., have not been included in this phylogenetic scheme because males are not known.

Phylogenetic relations of species in this subgenus are depicted in Figure 239. Scheme is based on the peculiarities of venation and structure of the male genitalia. Species for which males are not known have not been included.

The species included in this scheme on the basis of shape of costal margin of valvae can be divided into two large groups. One group includes *M. lutosella* Ev., *M. pontica* Zag., *M. isopsamma* Meyr., *M.*
327 *carabachica* Zag., and *M. rjabovi* Zag., and is characterized by valvae with straight costal margin in basal half. In the other group, which includes the remaining species, valvae with concave costal margin in basal half. Species in each group can be divided into two subgroups on the basis of the structure of aedoeagus apex. A characteristic feature of species *M. kasachstanica* Zag., *M. stepicola* Zag., and *M. mongolica* Zag. is an additional tooth or spine on the apex of the aedoeagus; species of the other subgroup—*M. saule* Zag., *M. gajndzhiella* Zag., and *M. hyrcanella* Zag.—lack additional armature at the apex of the aedoeagus.

Key to Species of Subgenus Flavida Zag., on the Basis of Male Genitalia[32]

1 (10). Costal margin of valvae straight proximal to midpoint or in middle part.

2 (5). Acicular apex of aedoeagus with additional spine or membranous part of apex of aedoeagus with bristles (examined under high magnification).

3 (4). Membranous part of apex of aedoeagus with bristles; acicular apex of aedoeagus without spine .... 10. **M. (F.) carabachica** Zag.

4 (3). Membranous part of apex of aedoeagus without bristles; acicular tip of aedoeagus with spine........11. **M. (F.) rjabovi** Zag.

328 5 (2). Acicular apex of aedoeagus without additional spine; membranous part of apex of aedoeagus without bristles.

6 (7). Length of valvae twice width in narrow part; total length of uncus and tegumen almost equal to width of narrow part of valvae. .... 7. **M. (F.) isopsamma** Meyr.

7 (6). Length of valvae 1.66 to 1.75 times width in narrow part; total length of uncus and tegumen 1.25 times more than width of narrow part of valvae.

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[32] The great similarity in external characters makes it difficult to prepare a key for the identification of species. Males of *Myrmecozela gigantea* Chr., *M. insignis* Ams., *M. imeretica* Zag., *M. ordubasis* Zag., *M. asariella* Zag., and *M. armeniaca* Zag. are not known and not included in the key. A key based on female genitalia is not presented because of nonavailability of females of most species.

8 (9). Tegumen three times larger than uncus; light-colored field of valvae does not reach its midpoint. . . . 5. **M. (F.) lutosella** Ev.

9 (8). Tegumen 2.5 times larger than uncus; light-colored field of valvae reaches its midpoint . . . . 6. **M. (F.) pontica** Zag.

10 (1). Costal margin of valvae concave proximal to midpoint or middle part.

11 (16). Acicular apex of aedoeagus with additional spine of tooth.

12 (15). Length of valvae 1.50 to 1.66 times more than width of narrowest middle part.

13 (14). Aedoeagus 3.66 times longer than uncus and 8.0 times longer than saccus. . . . . 13. **M. (F.) kasachstanica** Zag.

14 (13) Aedoeagus three times longer than uncus and six times longer than saccus . . . . 14. **M. (F). stepicola** Zag.

15 (12). Length of valvae 2.5 times more than width of narrowest middle part. . . . . 15. **M. (F.) mongolica** Pet.

16 (11). Acicular apex of aedoeagus without additional spine or tooth.

17 (18). Membranous part of apex of aedoeagus with bristles (examined under higher magnification) . . . . . . 16. **M. (F.) saule** Zag.

18 (17). Membranous apical part of apex of aedoeagus without bristles.

19 (20). Valvae with well-developed cucullus; aedoeagus 3.75 times longer than uncus and 6.0 times longer than saccus . . . . 17. **M. (F.) gajndzhiella** Zag.

20 (19). Valvae without cucullus; aedoeagus four times longer than uncus and seven times longer than saccus . . . . 21. **M. (F.) hyrcanella** Zag.

5. **Myrmecozela (Flavida) lutosella** Ev. (Figures 6, B; 7, D; 8, D; 20, A, D; 222; 238–241; Plates III and VII, *6*)

Eversmann, 1844: 535 (*Tinea*); Herrich-Schäffer, 1853–1855: V, 81, Fig. 341 (*Tineola*); Seebold, 1898: 309; Staudinger and Rebel, 1901: II, 240 (*Tineola*); Spuler, 1910: II, 462 (*Tineola*); Filip'ev, 1915: 222–224; Zerny, 1927: 486 (*Tineola*); Schwingenschuss, 1930: 31; Obraztsov, 1936: 32; Agenjo, 1952: 64; Petersen, 1957b: 577–578; 1960b: 211; 1965: 110.

External characters of imago. Pubescence of head yellowish-ash-gray with slight brownish tinge. Brush of labial palpi yellowish-brown, matte. Antennae light yellowish-ash-gray (Figure 6, B). Basal segment brownish with 14 to 16 long light-colored bristles, length of which almost twice diameter of segment. Frons in male narrow and distinctly smaller than vertical diameter of eye, in female broad and equal to or much larger than vertical diameter of eye.

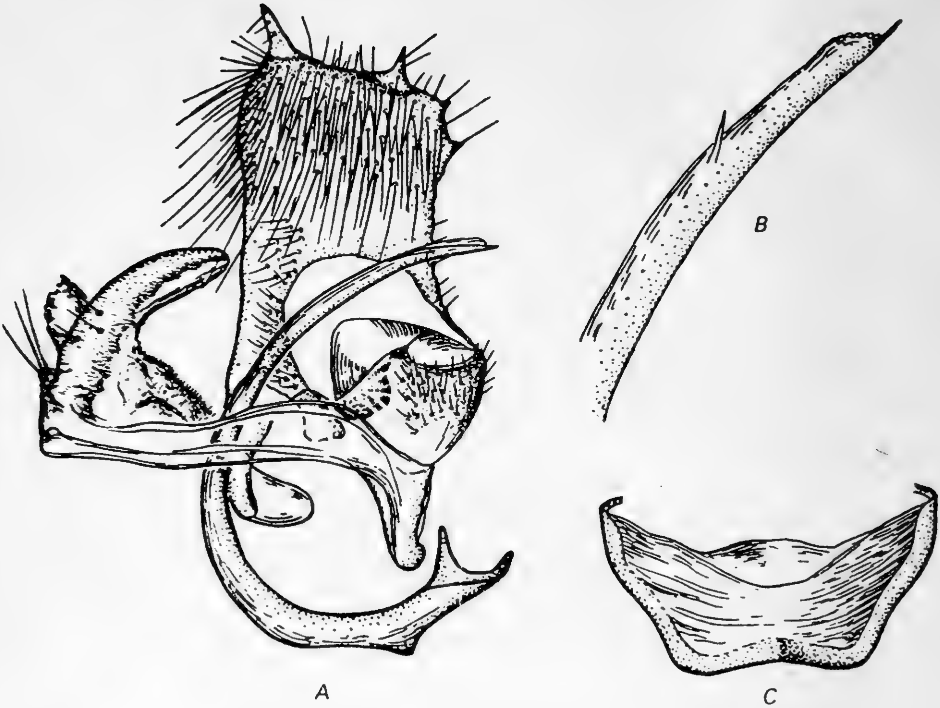
Thorax and tegulae yellowish-ocher. Span of forewings in males 16 to 20 mm, in females 21 to 23 mm. Length of forewings almost four times, of hind wings three times width; width of hind wings almost equal to forewings; fringe of hind wings equal to two-thirds alar width.

329 Forewings (Plate VII, *6*) dull yellowish-ash-gray with brownish granulation. In males color slightly darker because of denser brown granulation and scattered cinnamon-brown scales. Fringe of wings same color as wings. Hind wings and fringe light ash-gray, translucent, iridescent. Lower side of forewings yellowish-cinnamon-brown with oily sheen and light-colored fringe. Hind wings and fringe light yellowish-gray.

In forewing (Figure 7, D) bases of R_2 and R_3 very close-set, so that distance between bases several times less than between R_3 and R_4. R_4 and R_5 may be connate. Termina of R_5 and M_1 equidistant from alar apex or R_5 slightly closer; these veins are widely separated at base. M_1 and M_2 close-set at base. Distance between bases of Cu_1 and Cu_2 two-fifths length of radial cell. Basal fork of A_{2-3} almost twice shorter than common trunk. Radial cell half distance between bases of R_1 and R_2. In hind wing (Figure 8, D) terminus of *Sc* about 1.5 times closer to alar apex than radiocubital cell. M_1 terminates almost on alar apex. Base of M_3 equidistant from M_2 and Cu_1. Distance between bases of Cu_1 and Cu_2 six to eight times greater than distance between M_3 and Cu_1 and almost equal to length of medial cell. A_2 terminates on alar margin almost at level of origin of Cu_2 from cell.

Fore- and middle legs light cinnamon with brownish tinge. Hind legs light yellowish with oily sheen.

330 *Male genitalia* (Figures 238 and 240, A). Valvae with slightly convex costal margin in front of apex and straight margin in basal half. Tooth near apex long. Lower outer corner with three wide-set teeth; middle tooth smaller than others and slightly closer to posterior margin. Length of valvae almost 1.75 times width in narrow part. Basal sclerotized lobe of posterior margin of valvae reaches first third of posterior margin of valva. Light-colored field of valvae small and does not reach midpoint of valva. Uncus arcuate and tapers slightly toward apex so that sclerotized part with pointed end; membrane on lower side of uncus originates from apex of uncus. Tubercular appendages at base of uncus small, each with three short bristles equal to about two-fifths length of uncus. Aedoeagus 3.5 times longer than uncus; apically with slightly sclerotized spine (Figure 240, B). Membranous part of apex of aedoeagus without sclerotized structures. Base of aedoeagus unguiculate. Saccus in ventral view very broad, with slightly curved posterior and anterior margins (Figure 240, C); in lateral view end of saccus slightly curved.



329 Figure 240. Male genitalia of *Myrmecozela lutosella* Ev.

A — general appearance (lateral view); B — apex of aedoeagus (higher magnification); C — saccus (ventral view).

Preparation No. 10008, male. Orenburg district, Spassk.

Female genitalia (Figure 241). Tergal plate of segment VIII long, 1.66 times longer than width of segment at level of origin of anterior apophyses (Figure 20, A). Terminus of duct of bursa copulatrix infundibular, membranous, and difficult to distinguish in preparations. Duct of bursa copulatrix slender and very short, almost equal to one-third of sternite VII. Bursa copulatrix large, long, and located mainly in segment VII. Signum narrow, straight, three-fourths length of sternite VII measured from notch of posterior margin of segment; examined under higher magnification, it is triangular and densely covered with minute scalelike spines (Figure 20, D). Anterior apophyses included in segment VI.

Comparison. Close to *Myrmecozela pontica* Zag., but distinguished by the following characters: in forewing R_2 and R_3 very close-set at base; R_4 and R_5 connate; termina of R_5 and M_1 almost equidistant from

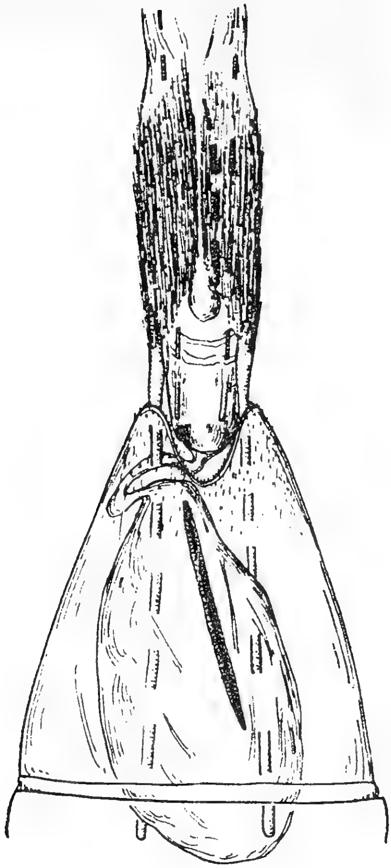


Figure 241. Female genitalia of *Myrmecozela lutosella* Ev.

Preparation No. 10008, female. Orenburg district, Spassk.

alar apex; radial cell half distance between bases of R_1 and R_2. In hind wing M_1 terminates almost on alar apex. In male genitalia valvae 331 broad, with long apical tooth, and three teeth of different sizes near lower outer corner; uncus arcuate, with pointed sclerotized apex; aedoeagus 3.5 times length of uncus. In female genitalia signum of bursa copulatrix narrow, straight, virgate.

Distribution (Figure 222). European part of the USSR, as well as Syria, Palestine, Iran, and southwestern Iraq (Petersen, 1965b).

Literature reports the occurrence of *M. lutosella* Ev. in Spain (Seebold, 1898; Zerny, 1927; Schwingenschuss, 1930; Agenjo, 1952), but this applies to *M. ataxella* Chrét., described in 1905, which is similar to *M. lutosella* Ev. in coloration.

Material examined. 15 males and 4 females.

European part of the USSR. Spassk in Orenburg District, one male, lectotype, May 29 (Eversmann), gen. preparation No. 10008, male. Type specimen with original labels: one old rectangular (4.0 mm × 5.0 mm) yellowish-gray slip marked in black ink "Spask Eor."; second label an elongated rectangle (2.5 mm × 5.0 mm) with inscription "29 May"; one female May 29 (Eversmann) with two original old labels: one larger (4.0 mm × 7.0 mm) with inscription, "Schrenk 1 Kai"; second smaller (4.0 mm × 5.0 mm) with inscription "29. V"; Krasnoarmeisk (Sarepta), two males May 22, 1879 (Christoph); one male (Erschov); three males, 1868 (Wocke); Spassk, Orenburg District, one male (Eversmann) with one original label of old yellowish paper (19.0 mm × 6.0 mm) and inscription in black ink "*lutosella* Ever. WSd 341."; second label smaller (5.5 mm × 2.5 mm) with "29 f."; Astrachan', Astrachan' sanctuary, one male June 25, 1964 (Pisarev).

Southern Ural. Guberli, five males and two females June 1, 4, 22 and 28, 1891; one female June 20, 1892 (Christoph); Kuzha demarcated area, tugai of Emba River, one male May 21, 1908 (Borodin).

Biology. East European steppe species, also found in open areas of West Asia. Moths live in diverse steppe grass (Plate III, A). Moths found from middle of May to end of June. Thus moths were collected in the Caspian steppes between May 22 and June 28.

Biology. Not known.

6. **Myrmecozela (Flavida) pontica** Zag. (Figures 222; 239; 242; 243)

Zagulyaev, 1971b: 424–425.

External characters of imago. Pubescence of head from light yellow on frons to dark orange on vertex, with darker clumps at base of antennae. Brush of bristles on 2nd segment of labial palpi light cinnamon with brownish tinge. Frons smaller than vertical diameter of eyes. Antennae light cinnamon-gray, equal to half length of forewing; basal segment rusty-cinnamon with protruding brownish bristles.

Thorax and tegulae on dorsal side yellowish-orange; tegulae in front cinnamon-brown. Span of forewings in males 22 mm. Length of forewings 3.75 times width; hind wings almost equal to forewings in width; fringe of hind wings about half alar width.

Forewings yellowish-orange, with brown granulation, and markings of cinnamon-black scales. Basal third of anterior margin dark; apical part with three to four small spots, one of which located at apex of wing. Along outer margin, upto level of apex of radiocubital cell, five more or less distinctly developed dark spots occur, and six to eight spots along posterior margin, of which three to four may fuse into dark stripe. Small spots visible in basal fourth of wing along radial trunk as well as at apex of radiocubital cell. About midpoint of wing, but closer to posterior 332 margin, a very large dark spot located; two to five small spots also located near base of wing along anal vein. Fringe light yellow with two longitudinal rows of dark scales. Hind wings light yellowish-ash-gray with oily sheen. Fringe golden. Under surface of forewings yellowish-gray with brown granulation, of hind wings light yellowish-ash-gray with darker fringe.

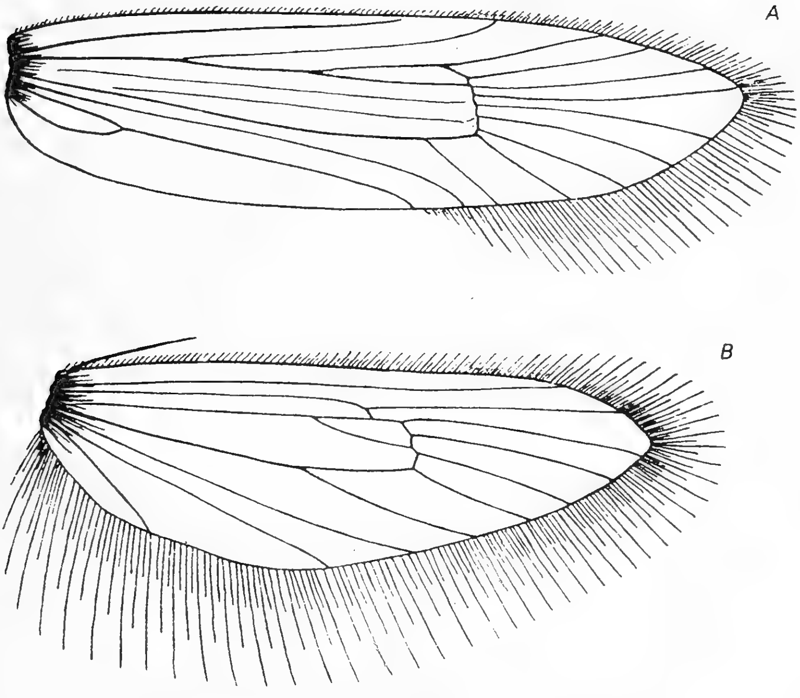


Figure 242. Venation of wings of *Myrmecozela pontica* Zag.

A—forewing; B—hind wing.

Preparation No. 10040, male. Southern Ukraine.

In forewing (Figure 242, A) distance between bases of R_2 and R_3 two to three times the distance between R_3 and R_4. R_4 and R_5 widely separated at base and terminate almost on alar apex. R_5 and M_1 widely separated at base. Distance between bases of Cu_1 and Cu_2 one-third length of radial cell. Basal fork [of A_{2-3}—General Editor] two-fifths common trunk. Radial cell four-sevenths distance between bases of R_1 and R_2. In hind wing (Figure 242, B) distance between terminus of Sc and alar apex half distance between terminus of Sc and base of R. Terminus of M_1 2.0 to 2.5 times closer to alar apex than terminus of R.

Base of M_3 equidistant from M_2 and Cu_1: base of M_2 almost equidistant from bases of M_1 and M_3. Distance between bases of Cu_1 and Cu_2 seven times more than distance between M_3 and Cu_1 and slightly more than length of medial cell. A_2 terminates on alar margin slightly beyond level of origin of branch Cu_2 from cell.

Forelegs cinnamon-brown, with barely perceptible light-colored bands at ends of tibiae and tarsal segments. Middle and hind legs light yellow.

333 *Male genitalia* (Figure 243). Valvae with almost straight costal margin, curved only in front of apex; outer margin of valvae flat, with one upcurved tooth near apex; lower outer corner with three teeth, of which middle tooth located at base of upper one. Length of valvae 1.66 times width in narrow part. Basal sclerotized lobe of posterior margin of valvae reaches two-fifths length of posterior margin of valve. Light-colored field of valvae reaches midpoint. Uncus in lateral view uniform in width, arcuate, with rounded apex; membranous fold extends two-thirds length of uncus; each tubercle at base of uncus with three bristles almost reaching midpoint of uncus. Aedoeagus more than three times longer than uncus and six times longer than tegumen; broad base of aedoeagus with digitate appendage on inner side; apex of aedoeagus acicular, extending notably beyond membranous part. Saccus of usual structure.

Female. Not known.

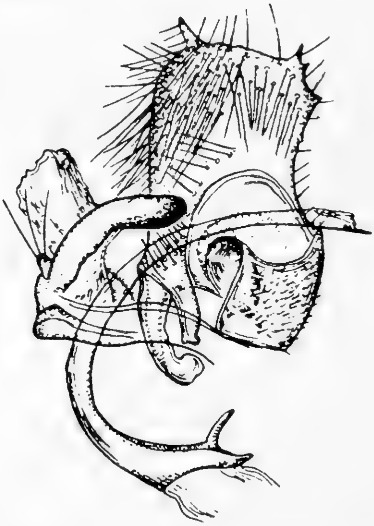


Figure 243. General appearance of male genitalia of *Myrmecozela pontica* Zag.

Preparation No. 10040, male. Southern Ukraine.

Comparison. In external appearance, venation, and structure of male genitalia, this species is close to *Myrmecozela lutosella* Ev. and *M. isopsamma* Meyr. However, it differs from both and other species of the genus in the yellowish-orange forewings with relatively dark markings in form of minute dark spots and one large spot located on anal vein. This species is further distinguished by the following characters. In the forewings the distance between bases of R_2 and R_3 more than distance between R_3 and R_4. In the male genitalia this species has a straighter costal margin in valvae and an apical tooth located differently; uncus geniculate; aedoeagus with protruding acicular tip and digitate appendage at base.

Distribution. Southern regions of the European part of the USSR (Figure 222).

Material examined. 1 male.

Ukraine. Nikolaev region, Semenovka village, one male, holotypus, June 18, 1929 (Obraztsov), preparation of genitalia No. 10040, male.

Biology. South European steppe species. Biology not studied.

7. **Myrmecozela (Flavida) isopsamma** Meyr. (Figures 222; 239; and 244)

Meyrick, 1920: 97; Gozmàny, 1965a: 277; Gozmàny and Vàri, 1973: 126–127; —*favens* Meyrick, 1917: 87 (part.); —*pelochlora* Meyrick, 1920: 100 (*Tineola*); —*philoptica* Meyrick, 1931: 93; —*ethiopica* Gozmàny, 1960: 113–114 (part.)

External characters of imago. Head, antennae, thorax, and tegulae dark ocher. Span of forewings in male 21 to 24 mm. Forewings dark ocher with slight gray granulation, without pattern. Fringe same color as wings. Hind wings dark cinnamon-gray, fringe ocher.

334 *Male genitalia* (Figure 244). Valvae with costal margin highly convex anterior to apex and straight in basal half (Figure 244, A); lower outer corner with two wide-set teeth. Length of valvae three times width in narrow part. Basal sclerotized lobe of posterior margin of valvae reaches first third of posterior margin of valva. Light-colored field on valvae reaches midpoint. Uncus in dorsal view with elongated, pointed apex (Figure 244, C). Aedoeagus very long, more than six times length of uncus, and more than four times width of valva in its narrow part. Base of aedoeagus wedge-shaped; apex acicular; membranous apical part without sclerotized structures (Figure 244, B).

Female genitalia. Only one female known from South Africa, described as *M. favens* Meyr. (Meyrick, 1917). The illustration of the genitalia provided by Gozmany and Vàri (1973) is quite sketchy with insufficient details to permit presentation of characters.

Comparison. In general appearance close to *Myrmecozela lutosella*

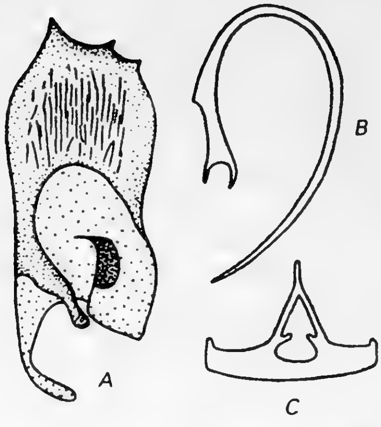


Figure 244. Male genitalia of *Myrmecozela isopsamma* Meyr.

A—valva; B—aedoeagus; C—uncus (dorsal view) (from Gozmàny, 1965a).

Ev., but distinguished by darker color. In genital structure, this species somewhat resembles *M. pontica* Zag., but differs in valvae; in *M. isopsamma*, the costal margin anterior to apex of valvae highly raised, lower outer corners with two teeth, light-colored field reaches midpoint, and aedoeagus more than four times width of valva in its narrow part.

No specimens examined by me.

Distribution. Africa: Ethiopia (Figure 222), South Africa.

In literature, reported from Ethiopia (Tshertsher) Gozmàny, 1960, as *M. ethiopica* Gozm.); Kenya (Nairobi, Molo), (Gozmàny and Vàri, 1973, as *M. philoptica* Meyr., *Tineola pelochlora* Meyr.); South Africa (Natal), (Gozmàny and Vàri, 1973, as *Myrmecozela favens* Meyr.).

Biology. Montane xerophilous species. Moths found mostly during autumn-winter-spring period. In Ethiopia collected from October to middle of March and only a few specimens caught in June (Gozmàny, 1960). In Kenya, Molo region, moths were collected from beginning of November to mid-February, at an elevation of 2,400 to 2,700 m (Gozmàny and Vàri, 1973). This species produces two or three generations per year. During the dry season larvae probably enter summer diapause.

8. **Myrmecozela (Flavida) gigantea** Chr. (Figure 222)

Christoph, 1873: 49–50 (*Tineola*); Staudinger and Rebel, 1901: II, 240 (*Tineola*); — *lutosella* ssp. *gigantea* Chr., Petersen, 1957b: 578–579; 1965b: 110–111; 1966: 29.

External characters of imago. Pubescence of head ocherous-yellow.

335 Thorax and tegulae ocherous-yellow. Wing span in males 20 to 27 mm or, as indicated by Petersen (1957b) 25 to 27 mm.

Forewings dull ocherous-yellow, without pattern, only veins granulated with darker color and therefore well defined; color darker near anterior margin of wing proximal to apex; posterior margin and fringe lighter than general tone and appear pure ocherous-hellow. Hind wings yellowish-gray; along outer and posterior margin ocherous-yellow with broader dark veins. Under surface of all wings dark gray; alar margins and fringes ocherous-yellow.

Hind tibiae along outer margin pubescent, with long hairs.

Female. As reported by Petersen (1957b), very similar to *M. lutosella* Ev.

Comparison. Species close to *Myrmecozela lutosella* Ev., but distinguished from most other species by absence of dark spots along anterior and outer margins, as well as on fold of anal region and fringe. Petersen (1957b) examined the specimens collected by Christoph, which are preserved in the collection of Staudinger, and studied the genitalia of three males and one female from northern Iran (Schakuh, Asterabad). He found that they do not differ from *M. lutosella* Ev. on the basis of genitalia; they differ only in larger size and absence of wing ornamentation. Petersen considered specimens labeled *M. gigantea* Chr. a race of *M. lutosella* Ev. Without a study of the types I cannot agree with Petersen and maintain the independent status of species for *M. gigantea* Chr.

No specimens examined by me.

Distribution. Northern Iran (Figure 222).

In literature, indicated from northern Iran (Hadschyabad) (Christoph, 1873).

The occurrence of *M. (F.) gigantea* Chr. within the limits of the Soviet Union is quite possible, especially in Turkmenia.

Biology. Moths, as reported by Christoph (1873), fly early morning in May, before sunrise, on barren slopes of mountains.

9. **Myrmecozela (Flavida) insignis** Ams. (Figure 222)

Amsel, 1935c: 315: Petersen, 1957b: 578; 1964a: 116; 1966: 29; 1968: 55; —*stichograpta* Meyrick, 1936: 54 (*Cronodoxa*); Amsel, 1940: 55 (*Cronodoxa*); —*diacona* Ams. (=*Cronodoxa stichograpta* Meyr.), Amsel, 1949: 323; 1955: 7.

External characters of imago. Pubescence of head whitish-ocher, light or dark cinnamon. Labial palpi protrude from dense, compact gray or cinnamon scales. Last segment does not protrude.

Thorax light grayish-cinnamon-brown. Tegulae short, dark gray, in distal half whitish-ocher. Wingspan 20 to 24 mm. Forewings elongated, with slightly curved anterior margin and obtuse apex; outer margin obliquely rounded.

Forewings light grayish-cinnamon-brown, with one well-defined dot at apex of radiocubital cell and many minute spots, especially near anterior and inner margins and in fold. Very subdued dark spots arranged in middle of alar fold. Veins with gray granulation. Fringe of forewings whitish-ocher, granulation gray or light or dark cinnamon-brown, and more or less forms distinct lines. Hind wings light gray with border of indistinct dark spots that continue toward apex. Fringe very light-colored, sometimes with slender line at base. Under surface of wings with lustrous spots near border, which are more pronounced near anterior and inner margins.

336 Abdomen light gray.

Male genitalia. Petersen (1957b) studied the structure of the genitalia and found no differences from *M. lutosella* Ev.

Comparison. Close to *Myrmecozela lutosella* Ev., but differs in light grayish-cinnamon-brown coloration of wings and well-defined dark spot. Amsel (1935c) in his description declared the species unique and close only to *M. diacona* Wlsm. Petersen (1968) considered this spices a synonym of *M. centrogramma* Meyr. (*Psephologa*) and a subspecies of *M. lutosella* Ev. However, Petersen provided no descriptions of either the external structure of peculiarities of genitalia. On what basis, therefore, such significant combinations were made requires explanation. Having no opportunity to study the original material, I am retaining the independent species status of *M. insignis* Ams.

No specimens examined by me.

Distribution. West Asia (Figure 222).

In literature, reported from Palestine: Jericho, region of the Dead Sea (Amsel, 1935c); Iraq: Baghdad (Meyrick, 1936; Petersen, 1957b); Iran: Bushir (Petersen, 1964a).

Biology. Desert species. Moths emerge in February and March. For example, in Iran (Bushir) two males were caught February 12, 1951; Palestine (Jericho) moths were collected on February 22 (Amsel, 1935c); region of the Dead Sea, males caught in March; and one male caught near Baghdad on March 2, 1931.

10. **Myrmecozela (Flavida) carabachica** Zag. (Figures 223; 239; 245; 246)

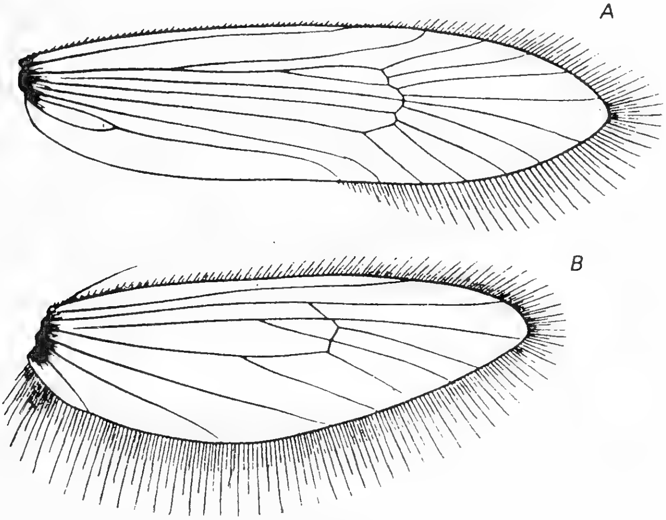
Zagulyaev, 1968b; 335–357.

External characters of imago. Head covered with dull lemon-yellow hairs, at vertex with brownish-orange hairs. Labial palpi on outer side yellowish-cinnamon-brown, on inner side light yellow. Antennae yellowish-ash-gray, lustrous. Width of frons equal to vertical diameter of eyes. .

Thorax and tegulae on upper side yellowish-cinnamon-brown, with slight ocherous granulation. Span of forewings in males 22.5 to 23.0 mm. Length of forewings 3.75 times, of hind wings almost 3.0 times width; hind wings slightly broader than forewings. Fringe of hind wings equal to half alar width.

Forewings dull yellowish-gray, densely granulated with brownish patches and spots. Spots at apex of radiocubital cell diffused and poorly developed; in fold along anal vein three to five diffused spots also located before midpoint of wing. Numerous minute dots of dark granulation occur along anterior and posterior alar surface between veins; hence veins resemble distinctly visible, light-colored stripes. Fringe of forewing yellowish-ash-gray. Hind wings light yellowish-ash-gray, translucent, with weak violet hue, iridescent; fringe light-colored. Under surface of forewings cinnamon-ash-gray with oily sheen; fringe much lighter than wings. Hind wings yellowish-gray, with weak violet hue and light-colored fringe.

In forewing (Figure 245, A) distance between bases of R_2 and R_3 equal to distance between bases of R_3 and R_4. R_4 and R_5 wide-set. Terminus of R_5 1.5 to 2.0 times closer to alar apex than terminus of



337 Figure 245. Venation of wings of *Myrmecozela carabachica* Zag.

A—forewing, B—hind wing.

Preparation No. 10046, male. Azerbaidzhan, Kirovabad.

M_1. Distance between bases of R_5 and M_1 equal to distance between bases of M_1 and M_2. Distance between bases of M_2 and M_3 three times greater than distance between bases of M_3 and Cu_1; latter one-eighth to one-sixth distance between bases of Cu_1 and Cu_2. Basal fork of A_{2-3} three-sevenths length of common trunk. Radial cell more than half distance between bases of R_1 and R_2, but more than three times greater than distance between bases of Cu_1 and Cu_2. In hind wing (Figure 245, B) terminus of Sc slightly closer to alar apex than to base of R. M_1 terminates on outer alar margin below its apex. Base of M_3 equidistant from base of M_2 and Cu_1. Distance between bases of Cu_1 and Cu_2 six times greater than distance between M_3 and Cu_1, and slightly more than length of medial cell. A_2 terminates on alar margin proximal to level of origin of branch Cu_2 from cell.

Fore- and middle legs rusty-cinnamon-brown, on inner side yellowish-ash-gray; ends of tibiae and tarsal segments with barely perceptible light-colored bands. Hind legs yellowish-ash-gray.

Male genitalia (Figure 246, A). Costal margin of valvae with shallow concavity in middle and weak convexity anterior to apex; outer margin of valvae straight, with elongate broad triangular tooth at apex; lower outer corner with one large and three small denticles. Valvae long, narrow; length almost twice (1.84) width in narrow part. Basal sclerotized lobe of posterior margin of valvae about one-third length of posterior margin of valva. Light-colored field of valva does not reach midpoint. Pedicel of valva five-ninths to three-fifths length of valva. Uncus in lateral view arcuate, with rounded, highly sclerotized apex; almost twice longer than tegumen; membranous fold originates 338 from uncus slightly beyond its midpoint; each tubercle at base of uncus with three bristles which reach midpoint of uncus; structure of uncus on dorsal side as shown in Figure 246, B. Aedoeagus 3.66 times longer than uncus and 6.50 times longer than tegumen; base broad with digitate appendage on inner side; apex of aedoeagus acicular. Membranous apical part of aedoeagus with three small bristles at tip (Figure 246, C). Saccus in lateral view straight, almost half length of uncus, but somewhat longer than tegumen.

Female. Not known.

Comparison. Close to *Myrmecozela rjabovi* Zag., but distinguished from it and other closely related species by dull yellowish-gray wings, dark granulation of surface of wing, and large number of scattered spots over wing surface. Male genitalia characterized by absence of cucullus on valva. Uncus in lateral view almost twice longer than tegumen.

Distribution. Caucasus, Trnas-Caucasus (Figure 223).

Material examined. 2 males.

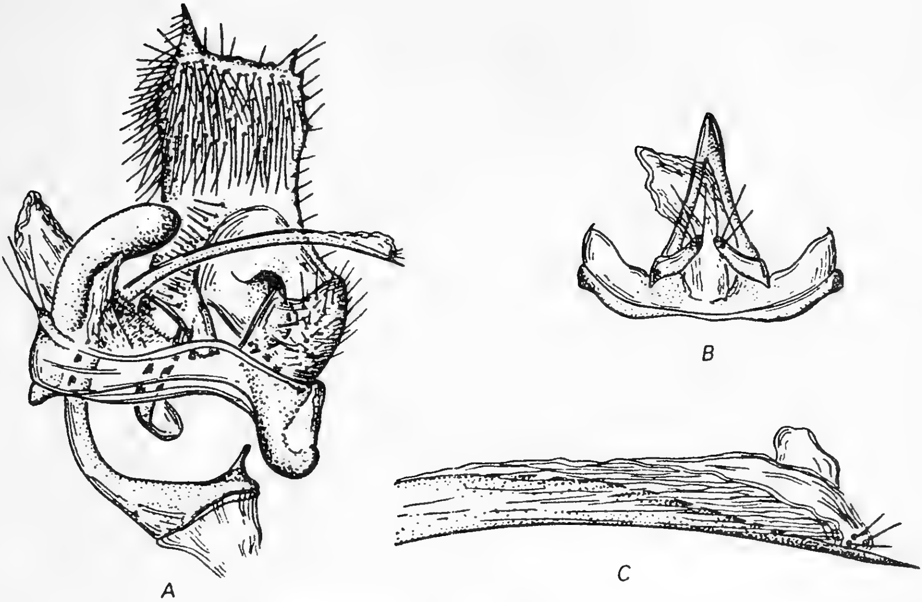


Figure 246. Male genitalia of *Myrmecozela carabachica* Zag.

A—general appearance (lateral view); B—uncus (dorsal view);
C—apex of aedoeagus (high magnification).

Preparation No. 10046, male. Azerbaidzhan, Kirovabad.

Trans-Caucasus. Azerbaidzhan, Kirovabad region, Khanlar (Helenondorf), two males, of which one from 1884, holotypus, gen. prep. No. 10045, male. Type specimen with original labels: small blue circular one and rectangular one with black border (10.5 mm × 6.5 mm), with inscription "Halendrf." male; on reverse side "*lutosella*". These labels and inscriptions were attached by Christoph. Paratype with two original labels: one rectangular yellowed old piece of papar (8.0 mm × 6.5 mm) with inscription "Helend. 1884"; other smaller (5.5 mm × 4.0 mm) reddish-violet paper with notation "82"; possibly these labels belong to Seebold.

Biology. Not known.

339 11. **Myrmecozela (Flavida) rjabovi** Zag. (Figures 223; 239; 247–249)

Zagulyaev, 1968b; 249–352.

External characters of imago. Pubescence of head light yellow, but rusty-ocher between antennae and vertex. Labial palpi on inner side light yellow, on outer side cinnamon-gray. Antennae yellowish-gray

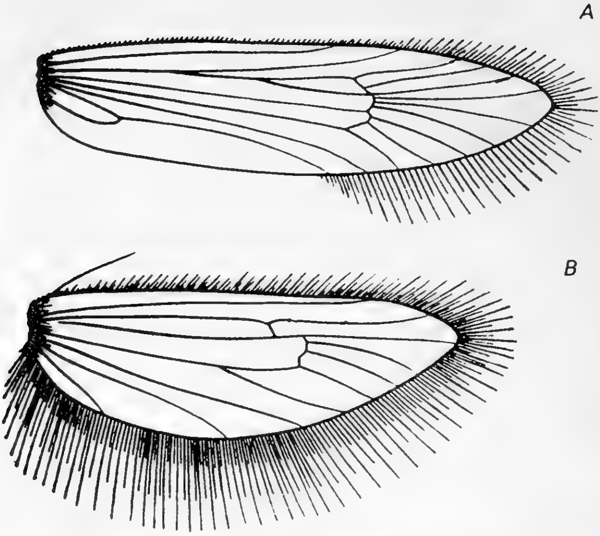


Figure 247. Venation of wings *Myrmecozela rjabovi* Zag.

A—forewing, B—hind wing.

Preparation No. 10056, male. Dagestan, Derbent.

with brownish tinge. Frons broader than vertical diameter of eyes.

Thorax and tegulae rusty-brown with ocherous tinge. Span of forewings in males 15 to 18 mm, in females 17 to 20 mm. Length of forewings four times, of hind wings almost three times greater than width. Hind wings broader than forewings; length of fringe two-thirds alar width.

Forewings in males dull yellowish-ash-gray with brownish granulation, without pattern; in females, wings lighter, pale yellowish-ash-gray Fringe same color as wings. Hind wings yellowish-gray, light ash-gray with golden luster; fringe with yellowish tinge, slightly lighter than wings. Under surface of forewings light cinnamon-brown, cinnamon-gray, yellowish-gray with golden luster. Hind wings and fringe yellowish-ash-gray, lustrous.

In forewings (Figure 247, A) bases of R_2 and R_3 widely separated and distance between them more than distance between bases of R_3 and R_4. Distance between bases of R_4 and R_5 about equal to distance between bases of R_5 and M_1 as well as M_1 and M_2. Terminus of R_5 1.5 times closer to alar apex than terminus of M_1. Distance between bases of M_3 and Cu_1 one-sixth to one-fourth distance between bases of Cu_1 and Cu_2. Basal fork of A_{2-3} three-sevenths length of common stem. 340 Radial cell three-fifths distance between bases of R_1 and R_2 but four times greater than distance between Cu_1 and Cu_2. In hind wings (Figure

247, B) terminus of *Sc* slightly closer to alar apex than to base of *R*. M_1 terminates on alar margin below its apex. Base of M_3 twice closer to base of M_2 than Cu_1. Distance between bases of Cu_1 and Cu_2 four times distance between bases of M_3 and Cu_1. A_2 terminates on alar margin at level of origin of Cu_2 from cell.

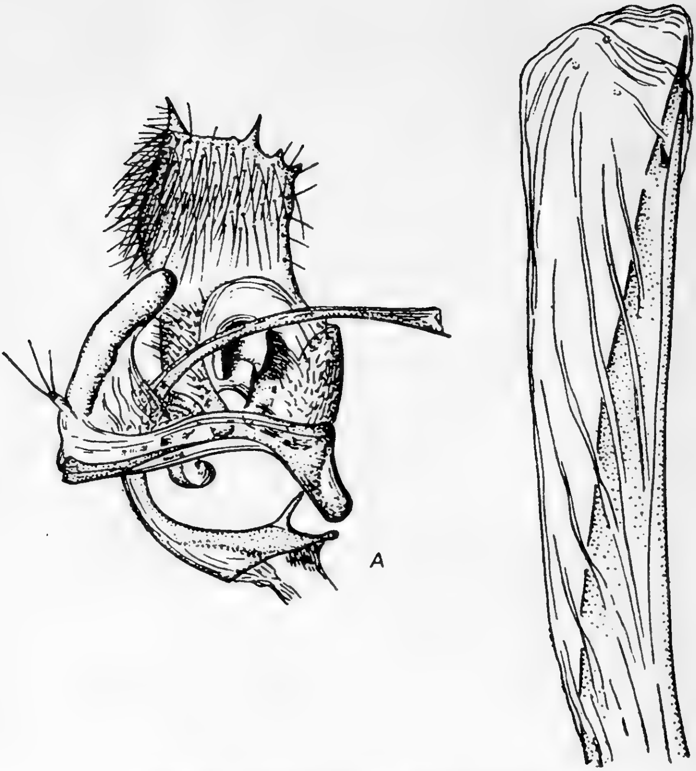
Fore- and middle legs cinnamon-gray, with very weak light-colored bands at ends of tibiae and tarsal segments. Hind legs light-colored, yellowish-ash-gray. Color of legs much lighter in females than in males.

Male genitalia (Figure 248, A). Valvae with highly convex costal margin in front of apex and straight margin in basal half; tooth near apex triangular and acute. Lower outer corner with three teeth. Length of valvae almost three times width in narrow part. Basal sclerotized lobe of posterior margin of valvae reaches two-fifths length of valva. Uncus slightly bent, with rounded, highly sclerotized apex; membrane on lower side of uncus originates slightly beyond its midpoint. Tubercular appendages at base of uncus with three short bristles about two-
341 fifths length of uncus. Aedoeagus three times longer than uncus and almost seven times longer than tegumen, with pointed, acicular tip. Membranous apical part with three bristles (Figure 248, B). Base of aedoeagus unguiculate. Saccus in lateral view straight and broad, three-fifths length of uncus, but much larger than tegumen.

Female genitalia (Figure 249). Tergal plate of segment VIII 1.5 times larger than width of segment at level of origin of anterior apophyses; terminus of duct of bursa copulatrix membranous, barely discernible in preparation. Duct of bursa short and broad. Bursa copulatrix long, very large, saccate; located at base of segment VII. Signum narrow, straight, equal in length to sternite VII measured from notch of posterior margin; armature of end of signum as shown in Figure 249, B. Anterior apophyses do not reach segment VI.

Comparison. In terms of wing coloration and absence of ornamentation this species is close to *Myrmecozela ochraceella* Tgstr., but distinctly darker and more matte. In terms of venational structure and genitalia this species is close to *M. carabachica* Zag., but distinguished by the following peculiarities. In male genitalia lower outer corner of valvae with three teeth; uncus with rounded and highly sclerotized apex. Aedoeagus three times longer than uncus and almost six times longer than saccus; membranous apical part with three bristles. Saccus three-fifths length of uncus, but longer than tegumen. In female genitalia tergal plate of segment VIII 1.5 times width of segment at level of origin of anterior apophyses; signum long and equal in length to sternite VII measured from notch in posterior margin.

This species has been named in honor of the famous lepidopterist from the Caucasus, Mikhail Alekseevich Ryabov.



340 Figure 248. Male genitalia of *Myrmecozela rjabovi* Zag.

A — general appearance (lateral view); B — apex of aedoeagus (high magnification).

Preparation No. 10056, male. Dagestan, Derbent.

Distribution. Caucasus (Figure 223).

342 *Material examined.* 4 males and 4 females.

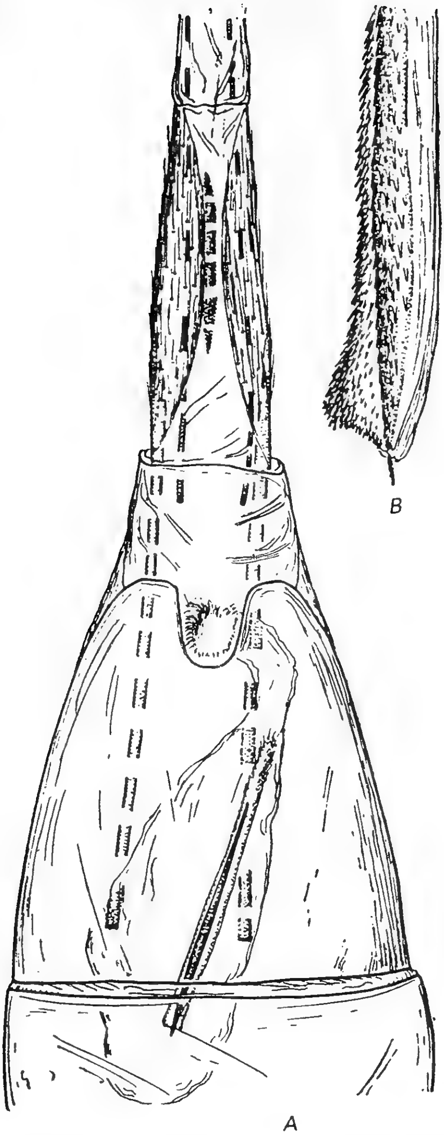
Caucasus. Dagestan, Derbent, one male June 21, holotypus, and one female June 28, 1929, allotypus (gen. prep. No. 10050, male female); three males and one female May 19 to 20; one female June 3, 1928; and one female June 10, 1931, paratypus (Ryabov).

Biology. Not known.

12. **Myrmecozela (Flavida) armeniaca** Zag. (Figures 223; 250; 251)

Zagulyaev, 1971c: 179–181: 1972d: 353.

External characters of imago. Pubescence of head pale yellowish-ocher. Labial palpi on outer side light brownish, on inner side with



341 Figure 249. Female genitalia of *Myrmecozela rjabovi* Zag. A—general appearance; B—terminal part of signum (high magnification).

Preparation No. 10057, female. Dagestan, Derbent.

whitish tinge. Antennae cinnamon-ash-gray, lustrous; 1st segment brownish-ocher with crest of light-colored cilia, which overhang eyes.

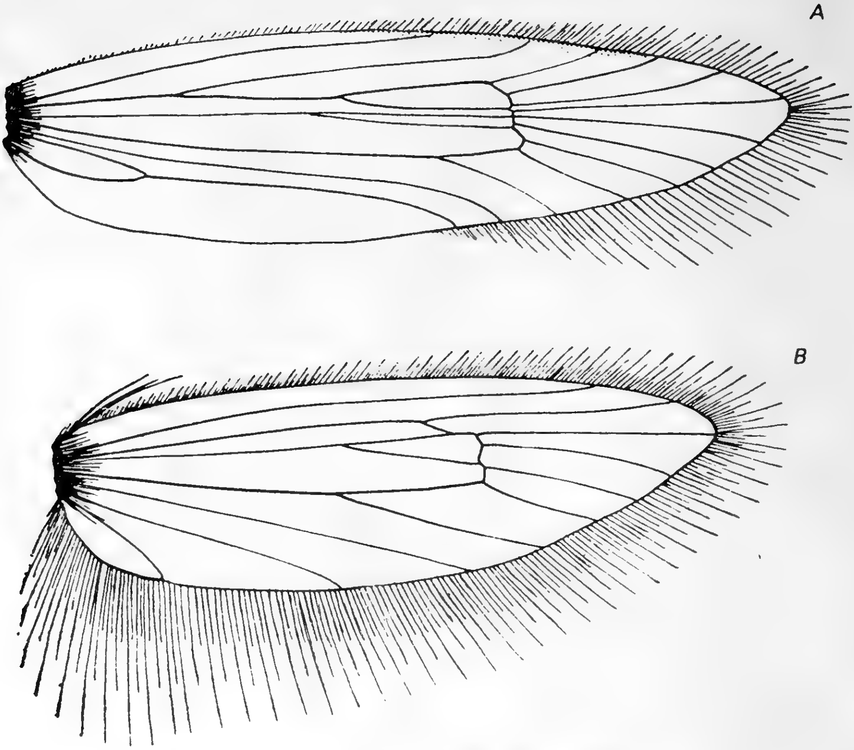


Figure 250. Venation of wings of *Myrmecozela armeniaca* Zag.

A—forewing; B—hind wing.

Preparation No. 10059, female. Trans-Caucasus, Erevan.

Frons broad, much broader than vertical diameter of eyes.

Thorax and tegulae dull brownish-ocher. Span of forewings in females 19.5 mm. Length of forewings 3.66 times, of hind wings, slightly more than 3.0 times width. Hind wings equal in width to forewings; fringe equal to two-thirds width of wing.

Forewings dull yellowish-ocher with denser granulation at apex of radiocubital cell and end of anal fold. Well-developed markings in form of dark blackish spots or streaks absent. Hind wings yellowish-ash-gray with golden luster; fringe lighter than wings. Under surface of forewings
343 brownish, of hind wings yellowish-ash-gray; fringes lighter than wings; wings and fringes with golden sheen.

In forewing (Figure 250, A) distance between bases of R_2 and R_3 1.5 to 2.0 times greater than distance between R_3 and R_4. Distance between bases of R_4 and R_5 almost equal to distance between R_5 and M_1. Terminus of R_5 about three times closer to alar apex than terminus of M_1.

Distance between bases of Cu_1 and Cu_2 almost half length of radial cell. Basal fork of A_{2-3} almost half the common stem. Radial cell about half distance between bases of R_1 and R_2. In hind wing (Figure 250, B) terminus of Sc slightly closer to alar apex than to base of R. M_1 terminates on alar apex. Base of M_1 four to five times closer to base of M_2 than to base of R. Distance between bases of Cu_1 and Cu_2 8 to 10 times distance between bases of M_3 and Cu_1, and equal or slightly greater than length of medial cell. A_2 terminates on alar margin at level of origin of branch Cu_2 from cell.

Fore- and middle legs light cinnamon-ash-gray with brownish granulation; ends of tibiae and tarsal segments with weak light-colored stripes. Hind legs light yellowish-ash-gray.

Male. Not known.

Female genitalia (Figure 251, A, B). Length of tergal plate of segment VIII 1.5 times longer than width of segment at level of origin of anterior apophyses. Duct of bursa copulatrix short and bursa itself 344 located in segment VII. Signum narrow, straight, almost equal in length to sternite VII measured from notch in posterior margin. Armature of posterior end of signum as shown in Figure 251, C. Anterior apophyses do not reach segment VI.

Comparison. Yellowish-ocher forewings without ornamentation bring this species closer to *Myrmecozela rjabovi* Zag. However, it is distinguished by details of venation: radial cell in forewing almost twice distance between bases of Cu_1 and Cu_2; in hind wing M_1 terminates on alar apex; distance between bases of Cu_1 and Cu_2 8 to 10 times distance between bases of M_3 and Cu_1, and equal or slightly more than medial cell. Quite obviously, venation of hind wings of this species very close to *M. ordubasis* Zag. In terms of female genitalia *M. armeniaca* Zag. is close to *M. rjabovi* Zag. Tergal plate of segment VIII 1.5 times longer than width of segment at level of origin of anterior apophyses; signum equal to length of sternite VII measured from notch in posterior margin.

Distribution. Trans-Caucasus (Figure 223).

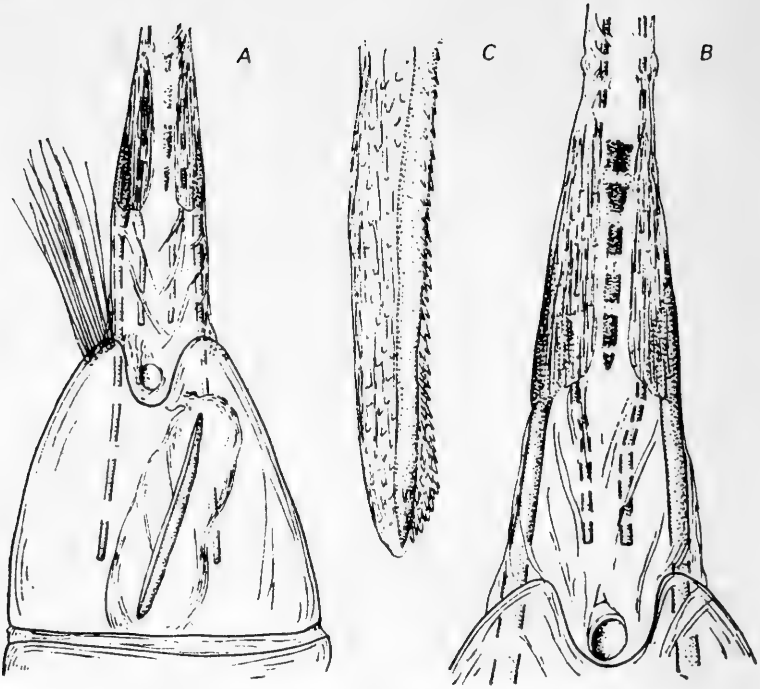
Material examined. 1 female.

Trans-Caucasus. Armenia, Erevan, zoo, one female May 19, 1957, holotype; preparation of genitalia No. 10059, female (Zagulyaev).

Biology. Xerophilous species. Specimen collected during day on a sunny stony slope of a ravine with sparse grassy vegetation.

13. **Myrmecozela (Flavida) kasachstanica** Zag. (Figures 224; 239; 252; 253)

Zagulyaev, 1972c; 14–15.



343 Figure 251. Female genitalia of *Myrmecozela armeniaca* Zag.

A — general appearance; B — region of vaginal plate; C — teminal portion of signum (high magnification).

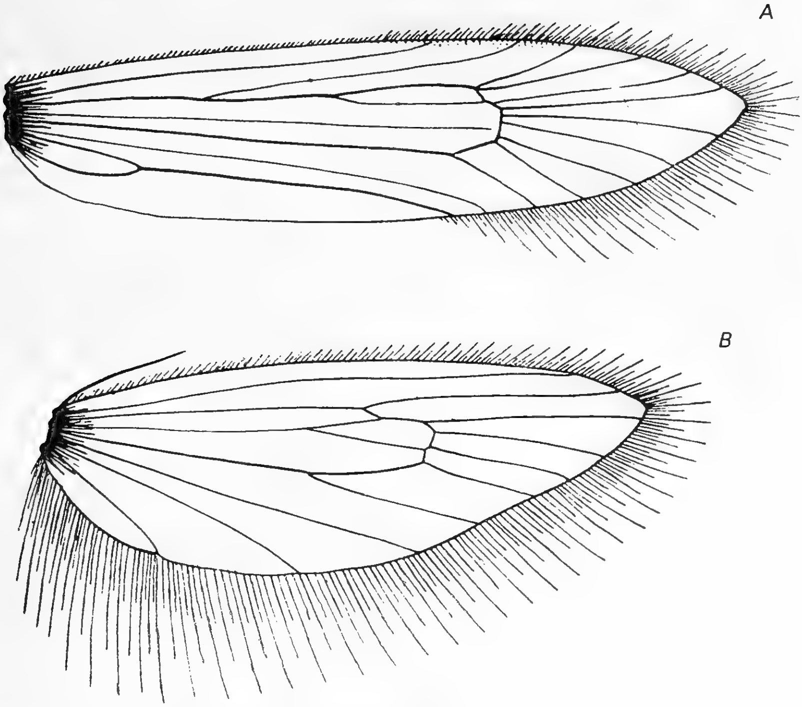
Preparation No. 10059, female. Trans-Caucasus, Erevan.

External characters of imago. Pubescence of head pale yellowish-ash-gray, brownish on vertex. Labial palpi yellowish-brown. Frons almost equal to vertical diameter of eyes. Antennae light cinnamon-ash, basal segment brownish.

Thorax and tegulae light cinnamon-brown. Span of forewings in males 18 to 19 mm. Length of forewings four times width; hind wings almost three times width; hind wings broader than forewings; length of fringe of hind wings three-fifths alar width.

Forewings yellowish-ash-gray with light brownish granulation; concentration of cinnamon-brown scales along outer margin of anal fold and four to five small streaks along posterior margin. Fringe slightly lighter than basic ground color of forewings. Hind wings light yellowish-ash-gray with silvery sheen; fringe more yellowish. Under surface of forewings light cinnamon-yellow with oily sheen; hind wings yellowish-gray with silvery luster, fringe golden-yellow.

In forewing (Figure 252, A) R_2 and R_3 connate. Distance between



345 Figure 252. Venation of wings of *Myrmecozela kasachstania* Zag.

A—forewing; B—hind wing.

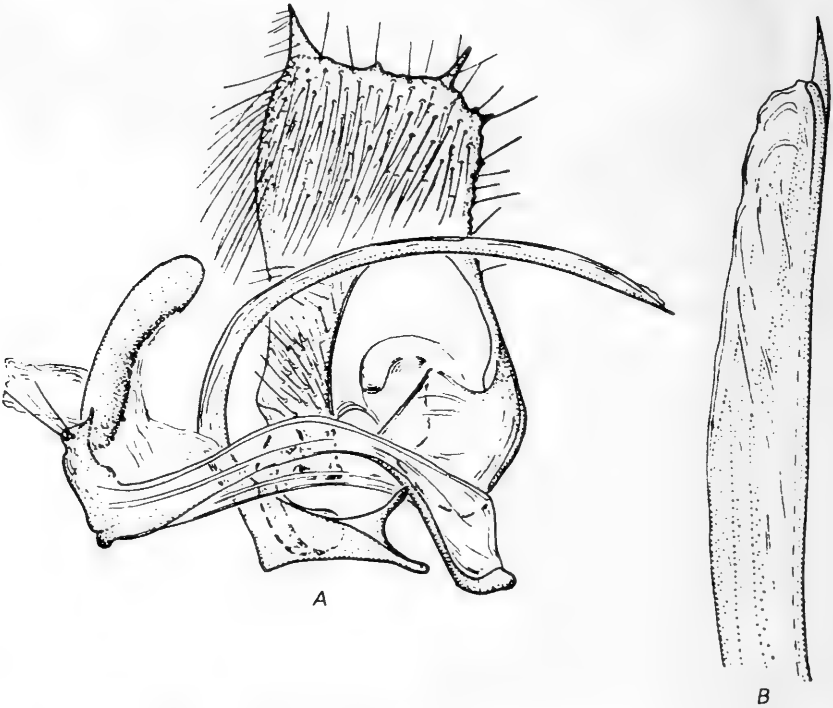
Preparation No. 10060, male. Kazakhstan, Karaganda.

bases of R_4 and R_5 one-third to one-half distance between R_3 and R_4 and equal to distance between R_5 and M_1. R_5 terminates on alar margin much closer to alar apex than M_1. Distance between base of Cu_1 and Cu_2 two-sevenths length of radial cell; latter about half distance between bases of R_1 and R_2. Basal fork [of A_{2-3}—General Editor] four-ninths of common trunk. In hind wings (Figure 252, B) terminus of *Sc* 2.5 times closer to alar apex than to base of *R*. Terminus of M_1 two to three times closer to alar apex than terminus of *R*. Base of M_1 three to four times closer to base of M_2 than to base of *R*. Distance between bases of Cu_1 and Cu_2 six to seven times distance between M_3 and Cu_1, and equal
345 to length of medial cell. A_2 terminates on posterior margin of wing at level of origin of Cu_2 from cell.

Fore- and middle legs brownish-cinnamon with light-colored bands at ends of tibiae and tarsal segments. Hind legs yellowish-ash-gray.

Male genitalia (Figure 253, A). Costal margin of valvae broadly convex in front of apex; tooth near apex broad, triangular. Lower outer corner with two teeth. Length of valvae 1.66 times width of narrow part. Basal sclerotized lobe of posterior margin of valvae equal to two-fifths length of posterior margin of valva. Uncus in lateral view broad, almost straight, with rounded sclerotized apex; 1.66 times longer than tegumen; membrane on lower side of uncus originates from subapical part of uncus. Tubercular appendages at base of uncus small, with three short bristle two-fifths length of uncus. Aedoeagus 3.66 times longer than uncus and 8.0 times longer than saccus, with prominent spine-shaped tip; apical membranous part of aedoeagus with short obtuse spine (Figure 253, B). Base of aedoeagus with broad fork at end. Saccus broad and less than half length of uncus.

Female. Not known.



346 Figure 253. Male genitalia of *Myrmecozela kasachstanica* Zag.

A — general appearance (lateral view); B — apex of aedoeagus (high magnification).

Preparation No. 10060, male. Kazakhstan, Karaganda.

Comparison. In coloration this species is close to *Myrmecozela stepicola* Zag. and *M. saule* Zag., but differs from both in details of vena-

346 tion and structure of genitalia: aedoeagus eight times longer than saccus, membranous apical part with additional spine; saccus shorter than tegumen and less than half length of uncus.

Distribution. Kazakhstan (Figure 224).

Material examined. 2 males.

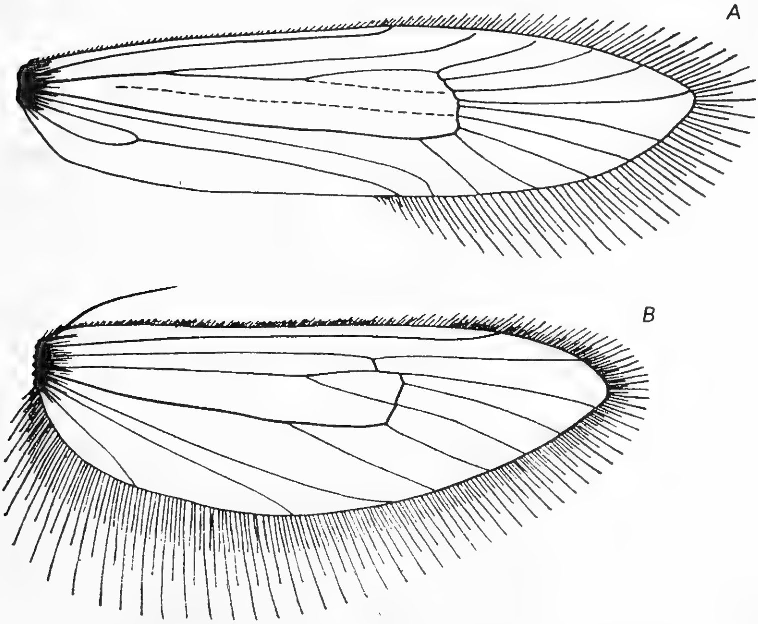
Kazakhstan. Schuche'e-Barmashi, Kokchetava District, one male July 5, 1928 (I. Filip'ev); St. Zhana Arka of Karaganda District, one male July 17, 1958, holotypes (Zagulyaev); preparation of genitalia No. 10060, male.

Biology. Steppe species living in open habitats. Moths emerge in July. I collected one males in the daytime on a dry sunny slope of a spur of Koksingir range.

14. **Myrmecozela (Flavida) stepicola** Zag. (Figures 224; 239; 254; 255)

Zagulyaev, 1972c: 15–17.

External characters of imago. Head pubescent; hairs light yellowish with slight ocherous tinge. Pubescence of labial palpi yellowish-cinnamon at base and cinnamon-brownish in outer half. Frons narrow,



347 Figure 254. Venation of wings of *Myrmecozela stepicola* Zag.

A—forewing; B—hind wing.

Preparation No. 10039, male. Southern Ukraine.

less than vertical diameter of eyes. Antennae smooth, cinnamon-ash-gray.

Thorax and tegulae light yellowish-ash-gray with brownish granulation. Span of forewings of males 21 mm. Length of forewings four times width; hind wings three times width. Hind wings distinctly broader than forewings; fringe of hind wing one-half to three-fifths alar width.

347 Forewings yellowish-ash-gray, speckled with brownish markings which are fairly distinct in form of vague dark cinnamon spots, which are diffused and scattered over alar surface. Basal third of forewings dark cinnamon-brown; apex of radiocubital cell with dark spot; large number of dark spots clustered in anal fold. Fringe light yellow with brownish specks. Hind wings light yellowish-ash-gray with fringe of same color. Under surface of forewings yellowish-gray, of hind wings light yellowish-ash-gray.

In forewings (Figure 254, A) distance between bases of R_2 and R_3 two-thirds distance between bases of R_3 and R_4. R_4 and R_5 widely separated at base and distance between them twice greater than between R_5 and M_1. Terminus of R_5 almost at alar apex. Distance between bases of Cu_1 and Cu_2 one-fourth length of radial cell. Basal fork of A_{2-3} one-half common stem. Radial cell half distance between bases of R_1 and R_2. In hind wings (Figure 254, B) terminus of Sc equidistant from alar apex and base of R. Terminus of M_1 twice closer to alar apex than terminus of R. Base of M_1 1.5 to 2.0 times closer to M_2 than to R; base of M_2 twice closer to M_1 than to base of M_3. Distance between bases of Cu_1 and Cu_2 almost five times distance between bases of M_3 and Cu_1, and more than length of medial cell. A_2 terminates on alar margin at level of origin of Cu_2 from cell.

348 Fore- and middle legs cinnamon-gray; hind legs yellowish-ash-gray. Ends of tibiae and tarsal segments without light-colored bands.

Male genitalia (Figure 255, A). Valvae with curved costal margin; concave before midpoint and convex beyond it; outer margin of valvae straight, with one long tooth near apex. Lower outer corner with three more or less distinct teeth; middle tooth slightly closer to upper one. Length of valvae 1.6 times width in narrow part. Basal sclerotized lobe of posterior margin of valvae reaches two-fifths length of valva. Light-colored field of valva does not reach midpoint. Uncus in lateral view more or less uniform in width, arcuate, with rounded apex; membranous fold originates almost from apex of uncus; tubercles at base of uncus with three bristles each, which do not reach midpoint of uncus (Figure 255, B). Aedoeagus three times longer than uncus and six times longer than saccus, with wide base typical of genus and short, acute, spinescent appendage; apex of aedoeagus acicular and distinctly protrudes through membranous part (Figure 255, C). Saccus in lateral view oblong, almost

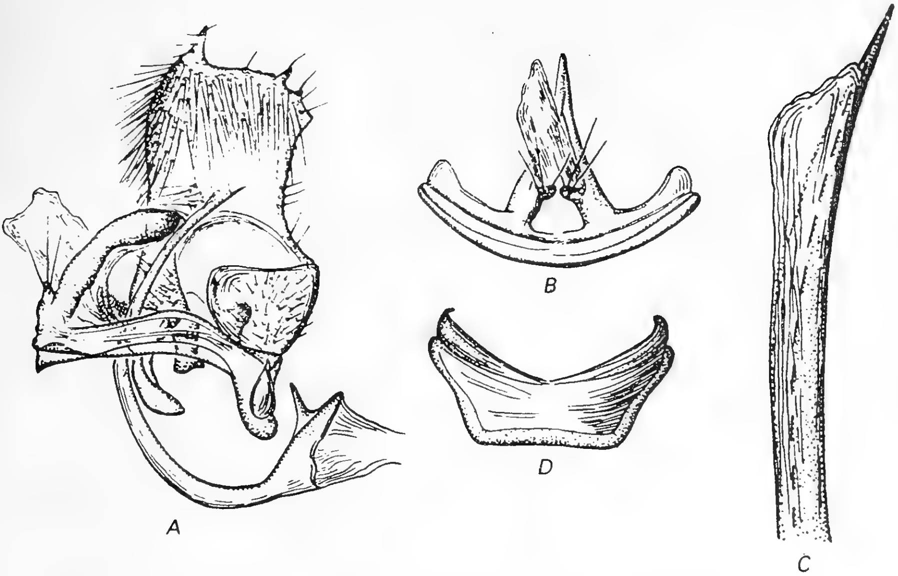


Figure 255. Male genitalia of *Myrmecozela stepicola* Zag.

A—general appearance (lateral veiw); B—uncus (dorsal view); C—apex of aedoeagus (high magnification); D—saccus (ventral view).

Preparation No. 10039, male. Southern Ukraine.

half length of uncus, with rounded tip; in ventral view with straight anterior margin (Figure 255, D).

Female. Not known.

Comparison. In general appearance, coloration and diffused markings on forewings, and structure of genitalia, this species is close to *Myrmecozela kasachstanica* Zag. It differs from the latter and other species of the subgenus in the abundance of dark cinnamon-colored spots on forewings and details of venation: R_2 and R_3 widely separated at base; basal fork of A_{2-3} half the common trunk; in hind wings, terminus of Sc 349 equidistant from alar apex and base of R. In the male genitalia it differs in possessing shorter valvae, inversion of basal sclerotized lobe of posterior margin of valva, which is displaced toward base of valva, and arcuate uncus.

Distribution. Southern regions of the European part of the USSR (Figure 224).

Material examined. 1 male.

Ukraine. Nikolaev, Semenovka village, one male, holotype, June 26, 1930 (Obraztsov). Preparation of genitalia No. 10039, male.

Biology. Southern steppe species. Biology not studied.

15. **Myrmecozela (Flavida) mongolica** Pet. (Figures 224; 239; 256)

Petersen, 1965b: 107–108, 111; Zagulyaev, 1971a: 686.

External characters of imago. Pubescence of head straw-yellow. 2nd segment of labial palpi covered in dense compact scales; 3rd segment barely perceptible.

Thorax and tegulae straw-yellow. Span of forewings of males 17.5 mm., of females 20.5 mm.

Forewings straw-yellow, granulated, with numerous cinnamon-colored scales which are barely visible to the naked eye; without pattern. Hind wings whitish-gray, lustrous.

Male genitalia (Figure 256, A). Valvae with concave costal margin near midpoint and convex margin near apex. Outer margin of valvae smooth, with two teeth, one on apex of costal margin and the other on distal end of lower margin. Length of valvae 2.5 times width of middle narrow part. Basal sclerotized lobe of posterior margin of valvae extends about one-third length of valva. Light-colored field of valva reaches midpoint. Uncus in lateral view with sharply tapering and highly sclerotized apex; tubercles at base of uncus with fairly distinct bristles. Aedoeagus six times longer than uncus and seven times longer than saccus, with broad bifurcate base typical of genus; apex of aedoeagus conical, highly sclerotized, with spine at base (Figure 256, B). Saccus slightly shorter than uncus.

Female genitalia. As in *M. lutosella* Ev.

Comparison. In general appearance close to *Myrmecozela lutosella* Ev., but distinguished from it and other species by peculiarities of genitalia: length of valvae 2.5 times width of narrow middle part; aedoeagus six times longer than uncus, sclerotized apex with additional spine and not covered with membrane.

No specimens examined by me.

350 *Distribution.* Mongolia (Figure 224).

Petersen states that one male and one female were collected at light in central Mongolia, 26 km east of Somon Lun, at an elevation of 1,180 m on July 3, 1964, in wormwood steppe (Petersen, 1965b).

The occurrence of *M.* (*F.*) *mongolica* Pet. is possible within the limits of the Soviet Union, particularly in Baltic and Trans-Baikal steppes.

Biology. Not studied.

16. **Myrmecozela (Flavida) saule** Zag. (Figures 224; 239; 257–260)

Zagulyaev, 1972c: 17–18.

External characters of imago. Pubescence on frons light yellow, on vertex and especially between antennae brownish-orange. Labial palpi

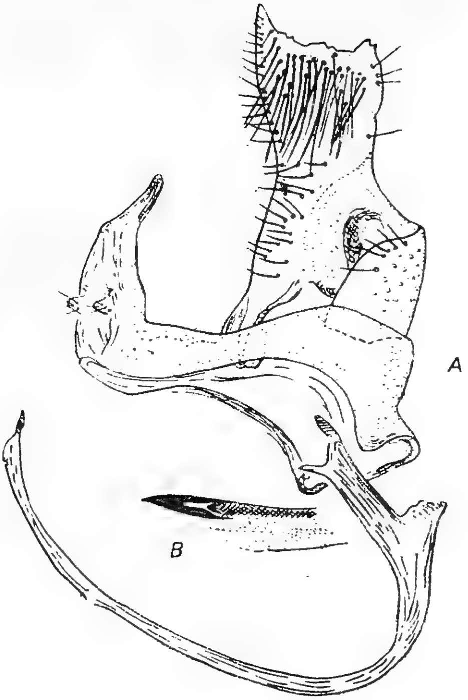


Figure 256. Male genitalia of *Myrmecozela mongolica* Pet.

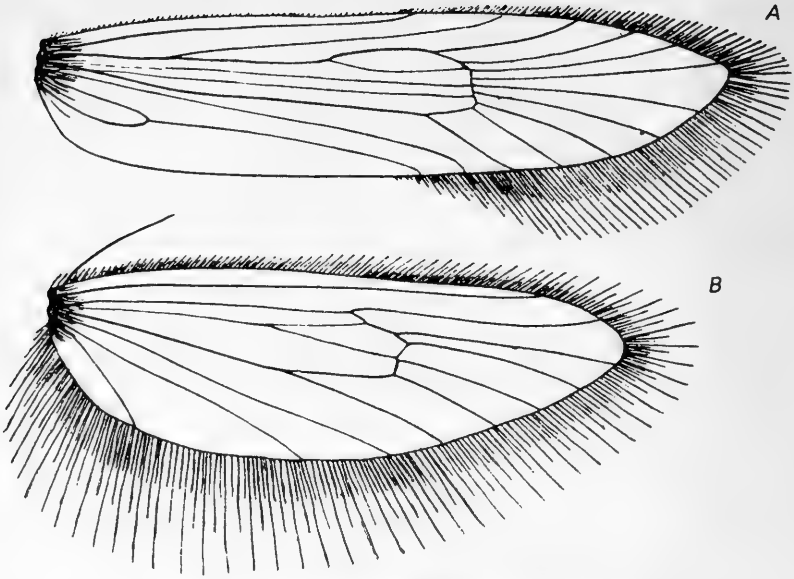
A—general appearance (lateral view); B—apex of aedoeagus (from Petersen, 1965).

on upper side whitish-yellow, on outer side brownish. Antennae yellowish-ash-gray. Frons narrow, much narrower than vertical diameter of eyes.

Thorax and tegulae on dorsal side yellowish-brown; tegulae toward front brownish-orange. Span of forewings in male 22 mm. Length of forewings 4.25 times width; length of hind wings 3.0 times width and broader than forewings; length of fringe two-thirds alar width.

Forewings light yellow with brownish granulation, which is especially dense at base of anterior margin, in radiocubital cell, outer part of wing, and in fold along anal vein. Pattern consists of six to eight diffused cinnamon-brown spots, well defined along fold of anal vein. Fringe straw-yellow with brownish granulation. Hind wings light yellowish-ash-gray, lustrous, translucent. Fringe same color as wing but 351 with more vivid yellowish-golden tinge. Under surface of forewings cinnamon-brown with light-colored, yellowish fringe. Hind wings light yellowish, silvery, with yellow or golden fringe.

In forewings (Figure 257, A) distance between bases of R_2 and R_3



350 Figure 257. Venation of wings of *Myrmecozela saule* Zag

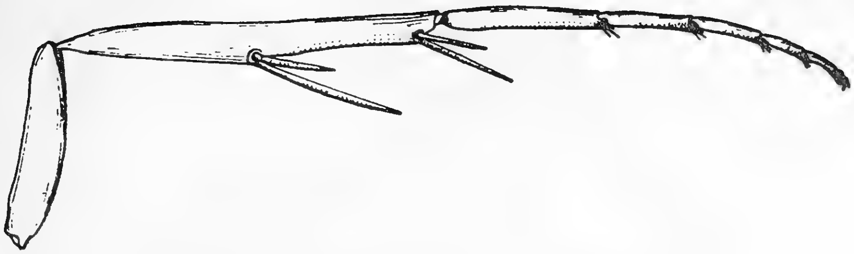
A — forewing; B — hind wing.

Preparation No. 10043, male. Semirech'e, Dzharkent.

twice the distance between bases of R_3 and R_4. R_4 and R_5 widely separated at base and distance between them equal to distance between bases of R_3 and R_4 or R_5 and M_1; R_5 terminates almost at alar apex. Distance between bases of Cu_1 and Cu_2 one-third length of radial cell; latter almost half distance between bases of R_1 and R_2. Base of Cu_2 located almost at same level as base of R_2. Basal fork of A_{2+3} four-ninths the common trunk. In hind wing (Figure 257, B) terminus of *Sc* twice closer to alar apex than to terminus of *R*. Terminus of M_1 closer to alar apex than terminus of *R*. Base of M_3 slightly closer to base of Cu_1 than to base of M_2. Distance between bases of Cu_1 and Cu_2 seven to eight times greater than distance between M_3 and Cu_1, and distinctly less than length of medial cell. A_2 terminates on posterior margin of wing slightly beyond level of origin of branch Cu_2 from cell.

Fore- and middle legs cinnamon-brown, with light-colored tarsal segments. Hind legs yellowish-ash-gray; structure shown in Figure 258.

Male genitalia (Figure 259, A). Costal margin of valvae slightly concave in basal half and highly convex anterior to apex. Tooth near
352 apex slender and falcate. Lower outer corner with three teeth, of which lower two short and very close-set or somewhat spaced. Length of valvae 1.75 times width of narrow part. Basal sclerotized lobe of posterior



351 Figure 258. Structure of hind leg of *Myrmecozela saule* Zag. Preparation No. 10043, male. Semirech'e, Dzharkent.

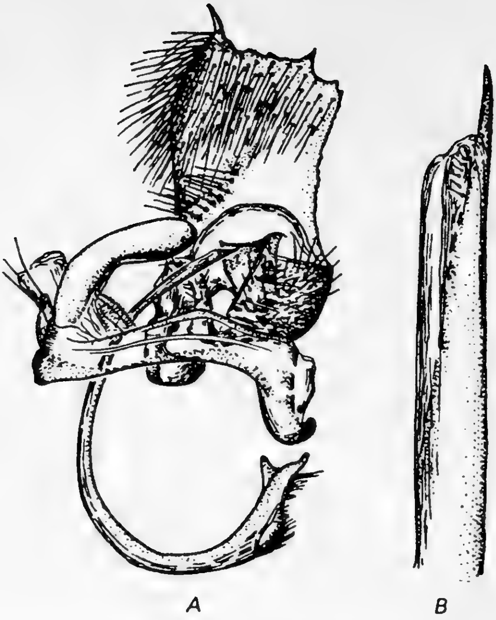
margin of valvae one-third length of posterior margin of valvae. Light-colored field does not reach midpoint of valvae. Uncus in lateral view broad, almost geniculate at middle, with rounded sclerotized apex, and almost twice longer than tegumen; membrane on lower side of uncus originates distinctly from subapical part of uncus. Tubercular appendages at base of uncus long, with three bristles each. Aedoeagus slightly more than 3.0 times length of uncus and 5.5 times longer than saccus, with projecting spinescent tip; apical membranous part of aedoeagus with very small acicular bristles (Figure 259, B); base of aedoeagus with short, obtuse, unguiculate appendages at end. Saccus almost at a right angle, with hook at end, and much longer than tegumen.

Female genitalia (Figure 260, A). Tergal plate of segment VIII narrow and short, its length less than width of segment at level of origin of anterior apophyses (Figure 260, B). Terminus of duct of bursa copulatrix slightly developed. Duct of bursa copulatrix stout, short, and does not exceed one-third length of sternite VII. Bursa copulatrix reaches segment V. Signum narrow, straight, and slightly smaller than length of sternite VII measured from notch in posterior margin. Anterior apophyses do not reach segment VI; base as shown in Figure 260, C.

353 *Comparison*. Species close to *Myrmecozela gajndzhiella* Zag., but distinguished by these characters: Distance between bases of Cu_1 and Cu_2 in forewings one-third length of radial cell; base of Cu_2 located almost at same level as base of R_2. In hind wings terminus of *Sc* twice closer to alar apex than to base of *R*. In male genitalia uncus geniculate, with rounded sclerotized apex, and almost twice larger than tegumen; aedoeagus slightly more than three times length of uncus, with acute protruding apex; membranous apical part of aedoeagus with very minute bristles. In female genitalia length of tergite VIII less than width of segment.

Distribution. Kazakhstan (Figure 224).

Material examined. 3 males and 7 females.



351 Figure 259. Male genitalia *Myrmecozela saule* Zag.

A—general appearance (lateral view); B—apex of aedoeagus (high magnification).

Preparation No. 10043, male. Semirech'e, Dzharkent.

Southern Kazakhstan. Panfilov (Dzharkent), two males and seven females in 1915 (Rukhbeil), of which one male, holotype, gen. prep. No. 10043; others: one male and seven females designated as paratypes; Topolevka, Sarkand region of Taldy-Kurgan District, one male June 17, 1957 (V. Kuznetsov).

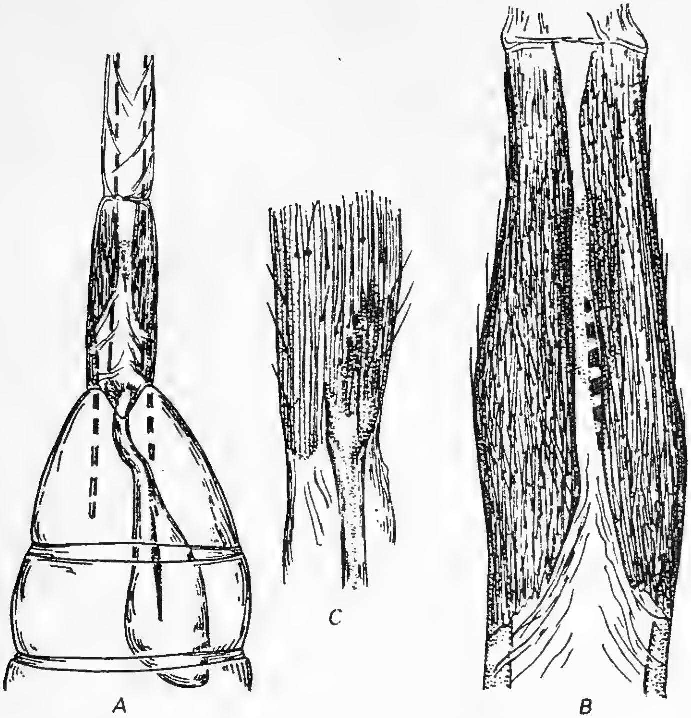
Biology. Not known.

17. **Myrmecozela (Flavida) gajndzhiella** Zag. (Figures 223; 239; 261; 262)

Zagulyaev, 1968b: 357–359.

External characters of imago. Pubescence of head yellowish-brown. Labial palpi on outer side cinnamon-brown, on inner side light cinnamon. Antennae cinnamon-ash-gray, lustrous: basal segment cinnamon-brown. Frons almost equal to vertical diameter of eyes.

Thorax and tegulae on upper side cinnamon-brown. Span of forewings of male 22 mm. Length of forewing almost four times width; hind wings almost three times greater than width; length of fringe of



352 Figure 260. Female genitalia of *Myrmecozela saule* Zag.

A—general appearance; B—region of vaginal plate; C—base of anterior apophyses.

Preparation No. 10043, female. Semirech'e. Dzharkent.

hind wings in middle half and near base two-thirds width of wing.

Forewings yellowish-ash-gray, creamy, with distinctly developed dark spots at apex of radiocubital cell and an oblong spot consisting of two to three smaller spots in fold along anal vein in front of midpoint of wing; four to five minute dots additionally situated along fold, but closer to base of wing. Larger grayish spots located along anterior margin proximal to alar apex and along outer margin. Region of radiocubital cell monochromatic, without mottling. Fringe of wings yellowish-brown. Hind wings yellowish-ash-gray, with slight violet hue translucent, iridescent; fringe yellowish. Under surface of forewings cinnamon-brown with slight violet hue and yellowish-orange fringe. Hind wings yellowish-gray with violet tinge and yellowish fringe.

In forewing (Figure 261, A) distance between bases of R_2 and R_3 two-thirds distance between bases of R_3 and R_4. Distance between bases of R_4 and R_5 same as that between bases of R_5 and M_1. Terminus of R_5

two to three times closer to alar apex than terminus of M_1. Distance
between bases of Cu_1 and Cu_2 two-fifths length of radial cell; latter
about half distance between bases of R_1 and R_2. Base of Cu_2 proximal
to base of R_2. Basal fork of A_{2-3} less than half that of common trunk.
In hind wing (Figure 261, B) terminus of Sc slightly closer to base of R
than to alar apex. M_1 terminates on outer alar margin below apex of
354 wing. Base of M_3 slightly closer to base of Cu_1 than to base of M_2.
Distance between bases of Cu_1 and Cu_2 six to seven times distance
between bases of M_3 and Cu_1. A_2 terminates on alar margin at level of
origin of Cu_2 from cell.

Fore- and middle legs cinnamon-brown on outer side, light yellowish-gray on inner side; ends of tibiae and tarsal segments with poorly developed light-colored rings. Hind legs yellowish-ash-gray with oily sheen.

Male genitala (Figure 262, A). Costal margin of valvae slightly concave in part anterior to middle and notably convex in front of apex so that distal region of costal margin of valva produced into a cucullus; outer margin of valva concave ventral to apical tooth; tooth slender. Lower outer corner with one long slender tooth and three very small denticles. Valvae narrow in middle so that length 1.80 times width. Basal sclerotized lobe of posterior margin of valva two-fifths length of posterior margin of valva. Light-colored field of valva does not reach midpoint. Pedicel of valva two-fifths length of valva. Uncus in lateral

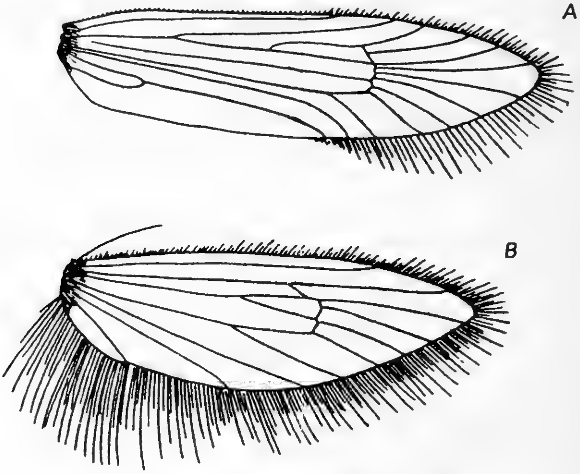


Figure 261. Venation of wings of *Myrmecozela gajndzhiella* Zag.

A—forewing; B—hind wing.

Preparation No. 10047, male. Trans-Caucasus, Kirovabad.

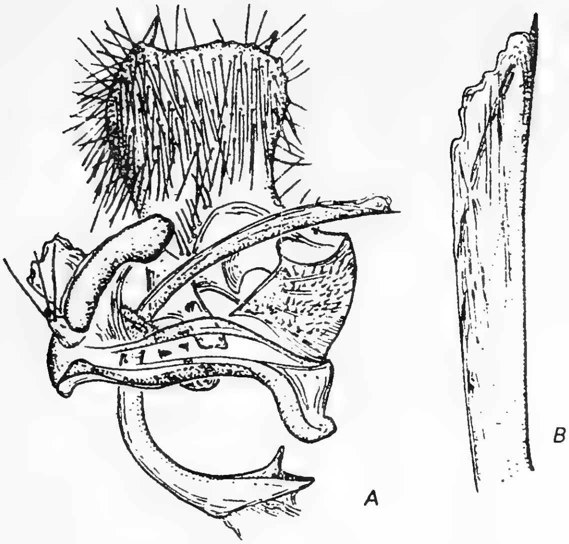


Figure 262. Male genitalia of *Myrmecozela gajndzhiella* Zag.

A—general appearance (lateral view); B—apex of aedoeagus (high magnification).

Preparation No. 10047, male. Trans-Caucasus, Kirovabad.

view slightly curved, with almost rounded, highly sclerotized apex, and 1.5 times longer than tegumen; membranous fold originates slightly beyond midpoint of uncus; each tubercle at base of uncus with three bristles reaching midpoint of uncus. Aedoeagus 3.75 times longer than uncus and 6.0 times longer than saccus. Base of aedoeagus narrow; process on inner side small, forming fork along with base; apex of aedoeagus acicular. Membranous apical part of aedoeagus without sclerotized structures (Figure 262, B). Saccus straight and broad with hook at end and almost equal to tegumen in length.

355 *Female.* Not known.

Comparison. Close to *Myrmecozela saule* Zag., but differs from it and other closely related species in creamish color of wings, absence of spots in field of radiocubital cell and basal half of forewing. In genitalia of male, differs in presence of clearly demarcated cucullus on valvae; short pedicel of valva, which is two-fifths length of valva, and long uncus (1.5 times length of tegumen).

Distribution. Caucasus, Trans-Caucasus (Figure 223).

Material examined. 1 male.

Trans-Caucasus. Azerbaidzhan, Kirovabad region, Khanler (Helenendorf), one male, holotype, gen. prep. No. 10047. Specimen with two original labels: one oblong (10.0 mm × 3.5 mm) with the inscription "Helend", the other small, rectangular (5.0 mm × 4.0 mm), reddish-lilac piece of paper with the note "81". Specimen identified as *Tineola lutosella* Ev.

Biology. Not known.

18. **Myrmecozela (Flavida) imeretica** Zag. (Figures 223; 263; 264)

Zagulyaev, 1927c: 18–19.

External characters of imago. Vestiture of frons light yellowish-ash-gray, with slight brownish tinge on occiput. Antennae yellowish-gray with ash-gray or whitish-gray tinge; 1st segment light brown. Frons broad, greater than vertical diamenter of eyes.

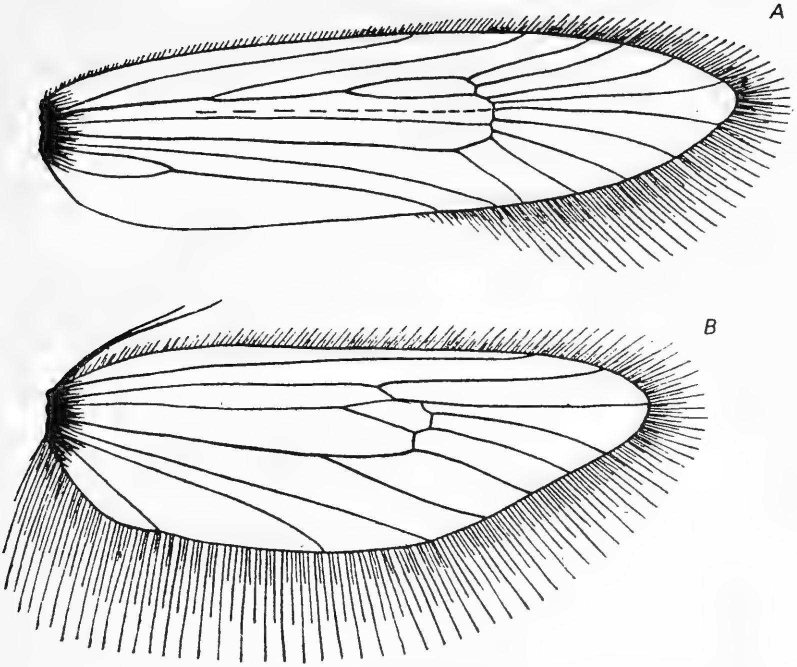
Thorax and tegulae light yellow. Span of forewings in female 20 356 mm. Length of forewing 3.75 times, of hind wings 3.0 times width; hind wings slightly broader than forewings and their fringe about half the width of wing.

Forewings yellowish-ash-gray with whitish granulation along anterior margin and dense brownish granulation over remaining alar field. Markings in form of dark cinnamon spots, dots, and streaks well developed. One small dot located at apex of radiocubital cell and another at alar apex. Diffused streaks located along outer margin in front of fringe. Vivid, large, oblong spot along anal fold in about middle of wing. Basal half of posterior margin of wing with four to six small diffused spots. Hind wings light yellowish-ash-gray, with darker granulation on veins, lustrous. Fringe lighter than wing with silken sheen. Under surface of forewings yellowish-cinnamon with golden luster; hind wings yellowish-gray, fringe light yellow. Wings and fringe lustrous.

In forewing (Figure 263, A) distance between bases of R_2 and R_3 less than distance between R_3 and R_4. Distance between bases of R_4 and R_5 almost equal to distance between R_5 and M_1. Termina of R_5 and M_1 equidistant from alar apex. Distance between bases of Cu_1 and Cu_2 two-sevenths to one-third length of radial cell; latter half the distance between bases of R_1 and R_2. Bases of Cu_2 proximal to level of base of R_2. Basal fork of A_{2-3} half the common trunk. In hind wing (Figure 357 263, B) terminus of Sc slightly closer to alar apex than to base of R. M_1 terminates at alar apex. Base of M_3 twice closer to base of M_2 than to Cu_1. Distance between bases of Cu_1 and Cu_2 3.5 times distance between bases of M_3 and Cu_1, and equal or slightly greater than length of medial cell. A_2 terminates on alar margin at level of origin of Cu_2 from cell.

Fore- and middle legs yellowish-gray; ends of tibiae and tarsal segments with weak light-colored bands. Hind legs light yellowish-ash-gray.

Male. Not known.



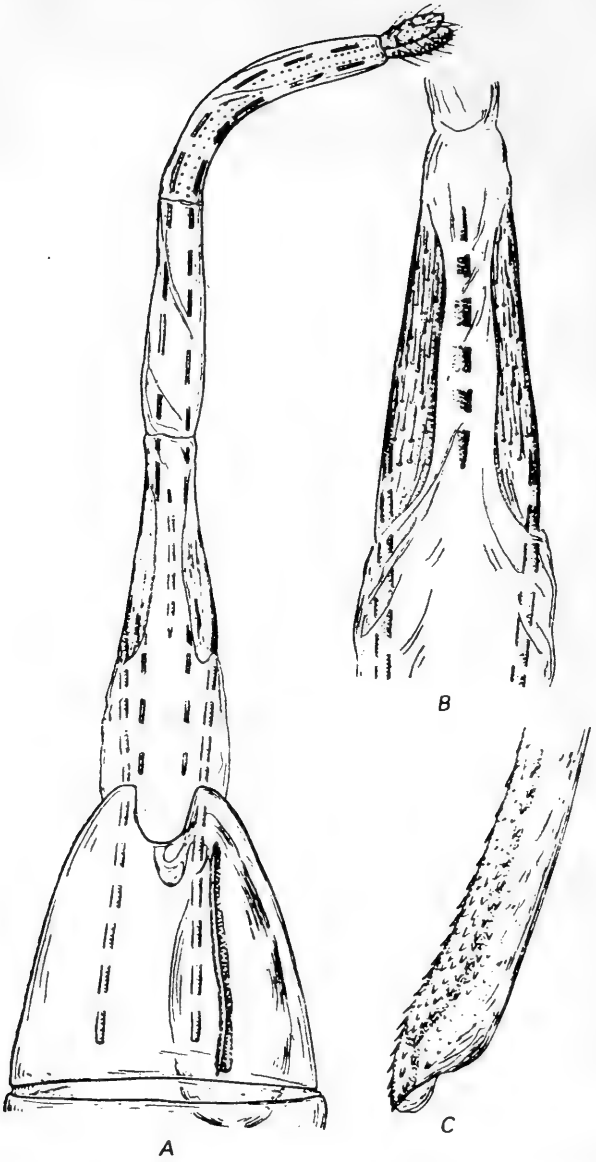
355 Figure 263. Venation of wings of *Myrmecozela imeretica* Zag.

A—forewing; B—hind wing.

Preparation No. 10055, female. Caucasus, Borzhomi.

Female genitalia (Figure 264, A). Tergal plate of segment VIII 1.5 times longer than width of segment at level of origin of anterior apophyses (Figure 264, B). Duct of bursa copulatrix narrow and bursa itself mostly located in segment VII. Signum more or less straight, equal in length to sternite VII measured from notch in posterior margin; armature of end of signum as shown in Figure 264, C. Anterior apophyses do not reach segment VI.

Comparison. On the basis of general appearance and pattern close to *Myrmecozela ordubasis* Zag. and *M. gajndzhiella* Zag., but distinguished by more yellowish-cream color and absence of dots along anterior margin. In venation and female genitalia close to *M. saule* Zag.; however, differs in these characters: In forewing distance between bases of R_2 and R_3 less than distance between R_3 and R_4; basal fork of A_{2-3} half the common trunk. In female genitalia tergal plate of segment VIII 1.5 times longer than width of segment at level of origin of anterior apophyses.



356 Figure 264. Female genitalia of *Myrmecozela imeretica* Zag.

A — general appearance; B — region of vaginal plate; C — terminal portion of signum (high magnification).

Preparation No. 10055, female. Caucasus, Borzhomi.

Distribution. Caucasus (Figure 223).

Material examined. 1 female.

Caucasus. Georgia, Borzhomi, one female June 1, 1962, holotype, gen. prep. No. 10055 (Zagulyaev).

Biology. Forest-steppe species confined to well-lit sparse pine forests, where it is found in glades. Moth collected on forest litter near small anthill in afternoon.

19. **Myrmecozela (Flavida) ordubasis** Zag. (Figures 223; 265; 266)

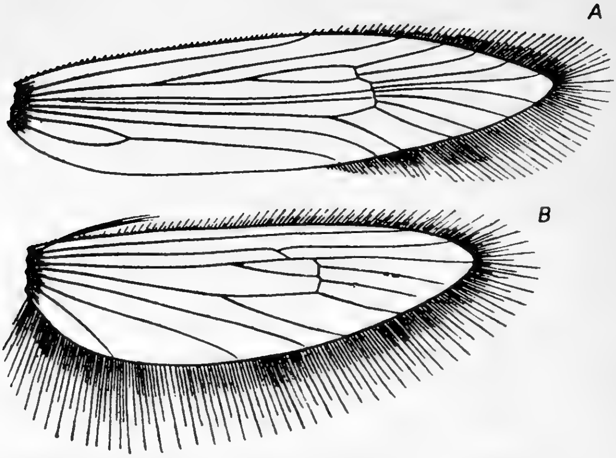
Zagulyaev, 1968b; 359–361.

External characters of imago. Pubescence of head light yellow; base of antennae with brownish tinge. Labial palpi on outer side light brownish. Antennae yellowish-gray with ash-gray or whitish-gray tinge, lustrous; lst segment light brown with ocherous granulation and crest of long cilia which overhang eyes; cilia 2.5 to 3.0 times longer than width of segment. Frons broad, larger than vertical diameter of eyes.

Thorax and tegulae yellowish-ash-gray with brownish-ocher granulation. Span of forewings in female 23 mm. Length of forewing 4.0 times width; hind wing 3.25 times width; hind wings slightly broader than forewings and their fringe two-thirds width of wing.

Forewing light cinnamon-ash-gray with whitish tinge along anterior margin. Ornamentation consists of distinct dark cinnamon dots, spots, and streaks. Anterior margin with five to six spots arranged beyond
358 midpoint; posterior and outer margin with 10 to 12 spots. Very large number of minute dark dots located between veins in outer region of wing. Fairly large diffused spot occurs at apex of radiocubital cell. Minute punctation also occurs along fold of anal vein, sometines merging into streaks. Fringe of wing light yellow. Hind wings light-yellowish-gray, with darker granulation on veins. Fringe lighter than wing and with silken sheen. Under surface of forewings light cinnamon-gray, of hind wings yellowish-ash-gray; fringe light-colored. Wings and fringe lustrous.

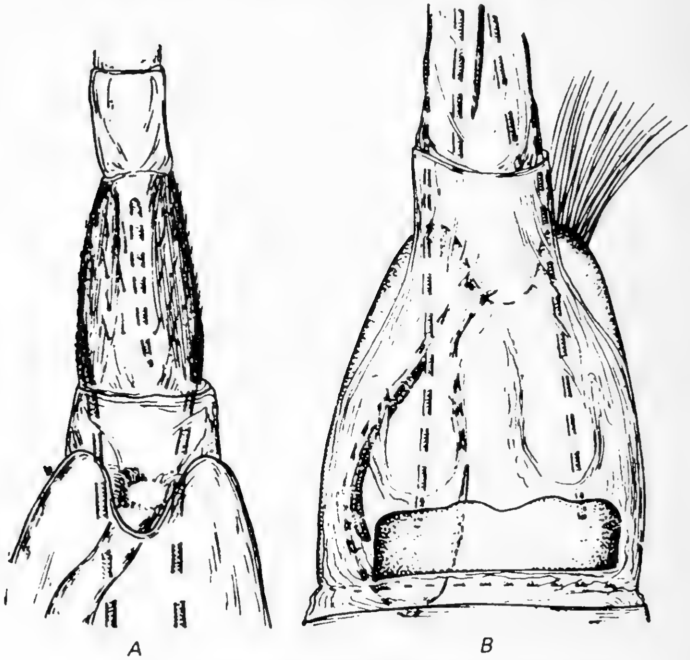
In forewings (Figure 265, A), distance between bases of R_2 and R_3 one-third to one-half distance between bases of R_3 and R_4. R_4 and R_5 widely separated at base. Terminus of R_5 1.5 times closer to alar apex than terminus of M_1. Distance between bases of Cu_1 and Cu_2 two-fifths radial cell; latter half distance between bases of R_1 and R_2. Basal fork of A_{2-3} almost half common trunk. In hind wings (Figure 265, B) terminus of Sc twice closer to alar apex than to base of R. M_1 terminates on alar apex. Base of M_3 equidistant from bases of M_2 and Cu_1. Distance between bases of Cu_1 and Cu_2 seven times greater than distance between M_3 and Cu_1 and slightly more than length of medial cell. A_1



358 Figure 265. Venation of wings of *Myrmecozela ordubasis* Zag.

A — forewing; B — hind wing.

Preparation No. 10044, female. Trans-Caucasus, Ordubad.



359 Figure 266. Female genitalia of *Myrmecozela ordubasis* Zag.

A — region of lobes of vaginal plate (ventral view); B — tergite of segment VIII.

Preparation No. 10044, female. Trans-Caucasus, Ordubad.

terminates on alar margin more proximal to level of origin of Cu_1 from cell; A_2 terminates almost at level of origin of Cu_2 from cell.

Legs yellowish-gray with oily sheen; ends of tibiae and tarsal segments without light-colored rings.

Male. Not known.

Female genitalia (Figure 266). Tergal plate of segment VIII long, one-third longer than width of segment at level of origin of anterior apophyses and five-sixths length of signum. Terminus of duct of bursa copulatrix poorly delineated. Duct of bursa copulatrix very short and located in segment VII. Anterior apophyses long, but do not reach segment VI. Bursa copulatrix located in segment VII; signum short, 359 curved two-thirds length of sternite VII measured from notch in posterior margin.

Comparison. Yellowish-ash-gray color of forewings with whitish granulation and well-developed pattern in form of large number of minute dark speckles distinguish this species from known members of genus *Myrmecozela* Zll., and bring it closer to *M. gajndzhiella* Zag. In venation of wings and structure of female genitalia species close to *M. saule* Zag., but differs in these peculiarities: In forewings bases of R_4 and R_5 and M_1 and M_2 equidistant; in hind wings bases of R and M_1 close-set and A_1 terminates on alar margin more proximal to level of origin of Cu_1 from cell. In female genitalia tergal plate of segment VIII one-third width of segment at level of origin of anterior apophyses.

Distribution. Caucasus. Trans-Caucasus (Figure 223).

Material examined. 1 female.

Trans-Caucasus. Azerbaidzhan, Ordubad region, one female, holotype, gen. prep. No. 10044, female. Type specimen with original label (5.0 mm × 5.0 mm) of old yellowed paper with red border and inscription in black ink "Ordub. Kub."

Biology. Not known.

20. **Myrmecozela (Flavida) asariella** Zag. (Figures 13, A; 223; 267; 268)

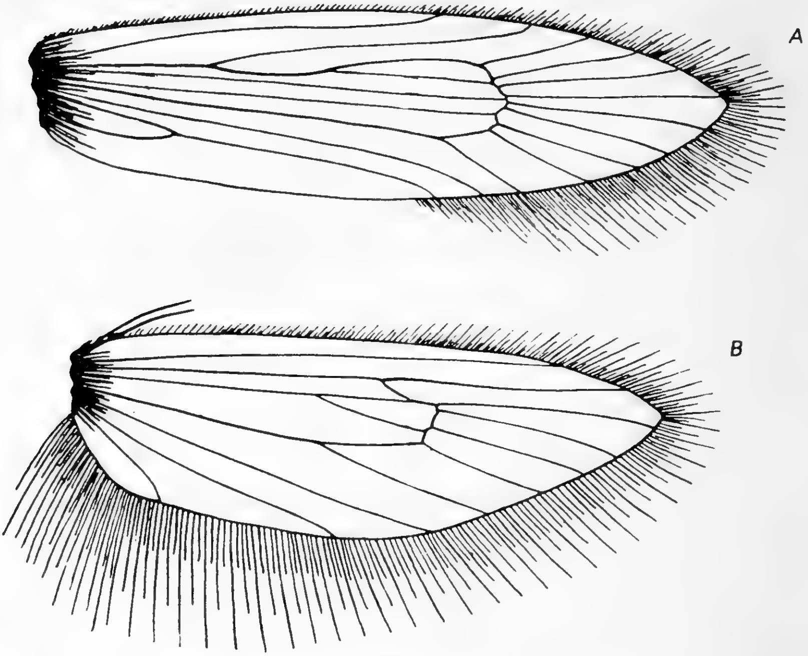
Zagulyaev, 1972c; 19–20; 1972d: 353–355.

External characters of imago. Pubescence of head light yellow, at 360 base of antennae with brownish tinge. Labial palpi on outer side light brownish. Antennae yellowish-gray, lustrous; lst segment light brown. Frons broad, equal to or slightly broader than vertical diameter of eyes.

Thorax and tegulae yellowish-brown. Span of forewing of female 19 mm. Length of forewings 3.5 times width; hind wings 3.0 times width; hind wings slightly broader than forewings and their fringe three-fifths alar width.

Forewing light yellowish-ash-gray with brownish granulation. Pattern in form of distinct dark cinnamon spots and streaks. Four spots located along anterior margin beyond its midpoint; 9 to 12 spots and minute streaks located along posterior and outer margins. Very large number of minute dots located between veins in outer region of wing. Small diffused spot occurs at apex of radiocubital cell. Fold of anal vein with four to six large dots and a very distinct oblong spot in middle of wing. Fringe whitish-yellow. Hind wings light yellowish-ash-gray, lustrous; fringe lighter than wing. Under surface of forewings and their fringe light cinnamon with golden luster; under surface of hind wings and their fringe yellowish-gray with silvery sheen.

In forewings (Figure 267, A) distance between bases of R_2 and R_3 two to three times greater than distance between R_3 and R_4. R_4 and R_5 widely separated at base. Terminus of R_5 three to four times closer to alar apex than terminus of M_1. Distance between base of Cu_1 and Cu_2 two-sevenths to one-third length of radial cell; latter three-fifths dis-
361 tance between bases of R_1 and R_2. Basal fork of A_{2-3} almost half the common trunk. In hind wings (Figure 267, B) terminus of Sc 1.5 times



360 Figure 267. Venation of wings of *Myrmecozela asariella* Zag.

A — forewing; B — hind wing.

Preparation No. 10061, female. Trans-Caucasus, Ordubad.

closer to alar apex than to base of R. M_1 terminates on outer margin of wing below apex. Bases of M_1 and M_2 very close-set. Base of M_3 equidistant from bases of M_2 and Cu_1. Distance between bases of Cu_1 and Cu_2 five to seven times distance between M_3 and Cu_1 and equal in length to medial cell. A_1 terminates on alar margin slightly beyond level of origin of Cu_1 from cell; A_2 terminates slightly beyond level of origin of Cu_2 from cell.

Fore-and middle legs light cinnamon-ash-gray; ends of tibiae and tarsal segments with light-colored bands. Hind legs light yellowish-ash-gray, lustrous.

Male. Not known.

Female genitalia (Figures 13, A and 268, A). Tergal plate of segment VIII very small, about equal to width of segment at level of origin of anterior apophyses and half length of signum. Anterior apophyses do not reach segment VI. Terminus of duct of bursa copulatrix poorly delineated, and duct itself very short. Bursa copulatrix located in segment VII; signum long, straight, and slightly (by one-eighth) shorter than sternite VII measured from notch in posterior margin, its structure as shown in Figure 268, B.

Comparison. In terms of coloration of forewings and their pattern, slightly similar to *Myrmecozela gajndzhiella* Zag. and *M. carabachica* Zag. Differs from them in more yellowish color, different number of spots and their arrangement, and venation: In forewing radial cell longer, terminus of common trunk of A_{2-3} at level of origin of Cu_2 from cell; in hind wing terminus of Sc 1.5 times closer to alar apex than to base of R, terminus of branch A_2 slightly beyond level of origin of Cu_2 from cell. Tergal plate of segment VIII in female genitalia almost equal to width of segment at level of origin of anterior apophyses and half length of signum; signum slightly (by one-eighth) shorter than sternite VII.

This species was named after a Trans-Caucasian tribe, Azari.

Distribution. Trans-Caucasus (Figure 223).

362 *Material examined.* 1 female.

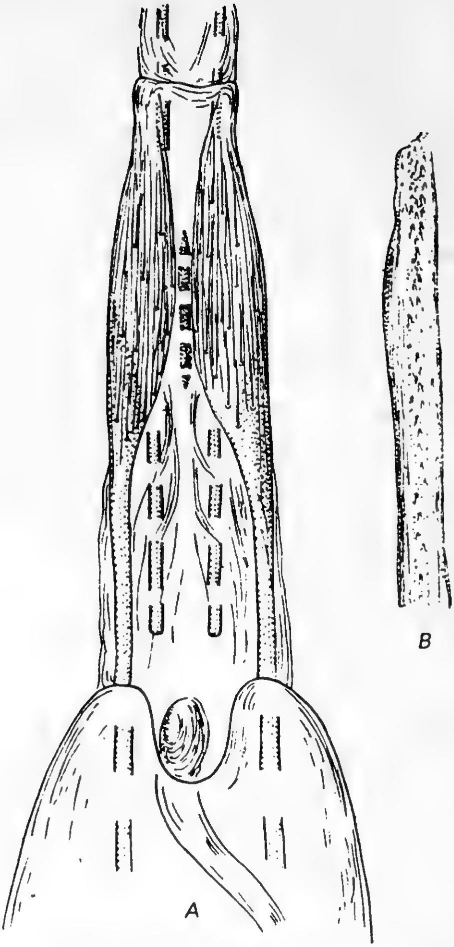
Trans-Caucasus. Azerbaidzhan, Nakhichevan region, Ordubad, May 7–8, 1957, holotypus (Zagulyaev); preparation of genitalia No. 10061, female. Specimen collected in rocky desert.

Biology. Not known.

21. **Myrmecozela (Flavida) hyrcanella** Zag. (Figures 223; 239; 269–271)

Zagulyaev, 1968b: 352–354.

External characters of imago. Pubescence of head light yellowish-ash-gray. Labial palpi with 2nd segment on upper and inner sides whitish-



361 Figure 268. Female genitalia of *Myrmecozela asariella* Zag.

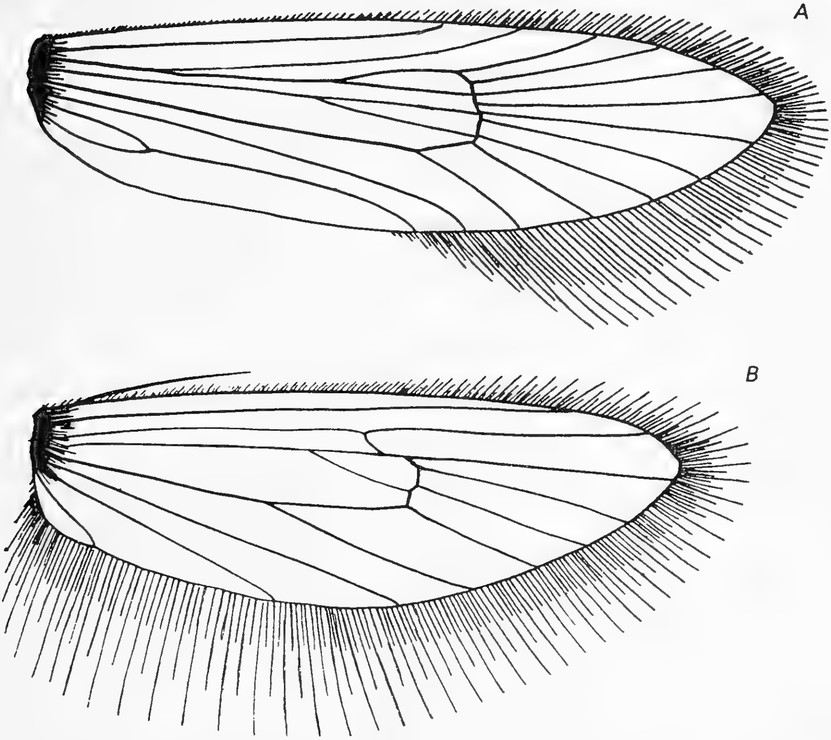
A—region of vaginal plate; B—terminal portion of signum (high magnification).

Preparation No. 10061, female. Trans-Caucasus, Ordubad.

yellow, on outer side light yellowish-ash-gray; dense brush of scales brownish, reaches tip of 3rd segment. Antennae smooth, yellowish-gray; basal segment broad, with long whitish-yellow bristles overhanging eyes. Frons narrow, less than vertical diameter of eyes.

Thorax and tegulae light yellowish-ash-gray. Span of forewings in male 23 mm. Length of forewings 3.5 times width; hind wings 3.0 times width; width of hind wings equal to width of forewings. Length of fringe of hind wing two-thirds width of wing.

Forewings light yellowish-ash-gray with ocherous or brownish granulation, without pattern. Veins and fold in anal region with denser 363 granulation and hence very distinct. Fringe whitish in basal half and brownish along outer margin. Hind wings whitish-gray, translucent, with slight yellowish granulation along outer and posterior margins. Under surface of forewings yellowish-gray with yellowish-ocher tinge along anterior margin and at apex. Fringe in basal half light yellow, in distal half brownish. Under surface of hind wings light yellowish to ash-gray with same color fringe.



362 Figure 269. Venation of wing of *Myrmecozela hyracella* Zag.

A—forewing; B—hind wing.

Preparation No. 5139, male. Trans-Caucasus, Talysh.

Forewings with (Figure 269, A) distance between bases of R_2 and R_3 large, and equal to or slightly more than distance between bases of R_3 and R_4. R_4 and R_5 widely separated at base. Terminus of R_5 located twice closer to alar apex than terminus of M_1. Distance between bases of Cu_1 and Cu_2 almost two-fifths length of radial cell; latter less than half distance between bases of R_1 and R_2. Basal fork of A_{2-3} half the common trunk. In hind wings (Figure 269, B) terminus of *Sc* more than 1.5 times closer to alar apex than to base of *R*. M_1 terminates almost at alar apex. Base of M_3 almost equidistant from bases of M_2 and Cu_1. Distance between bases of Cu_1 and Cu_2 about six times greater than distance between bases of M_3 and Cu_1, and much greater than length of medial cell. A_1 terminates on alar margin proximal to level of origin of Cu_1 from cell; A_2 terminates on alar margin almost at level of origin of Cu_1 from cell.

All legs yellowish-gray, without light-colored bands at ends of tibiae and tarsal segments. Structure and armature of hind leg as shown in Figure 270.

Figure 270. Hind leg of *Myrmecozela hyrcanella* Zag.

Preparation No. 5139, male. Trans-Caucasus, Talysh.

Male genitalia (Figure 271, A). Valvae with slightly convex costal margin in front of apex and slightly concave costal margin on basal half. Tooth near apex long, acute, and straight. Lower outer corner with one acute tooth. Length of valvae along costal margin three times width of its narrow part. Basal sclerotized lobe of posterior margin of valvae reaches two-fifths posterior margin of valva. Light-colored field does not reach midpoint of valvae. Uncus in lateral view broad, geniculate beyond midpoint, with rounded and completely sclerotized apex, and 1.5 times larger than tegumen; membrane on lower side of uncus originates almost from midpoint. Tubercular appendage at base of uncus with two short and one long bristle (Figure 271, C). Aedoeagus 4.0 times longer than uncus and 6.33 times longer than saccus, with protruding spinescent apex; apical membranous part of aedoeagus
364 without sclerotized structures (Figure 271, B); base of aedoeagus with broad fork at end. Saccus more or less straight and equal in length to tegumen (Figure 271, D).

Female. Not known.

Comparison. In general appearance, coloration, and absence of pattern in forewings close to *Myrmecozela orchraceella* Tgstr. and *M. lutosella* Ev., but differs in larger size. In venation and structure of male

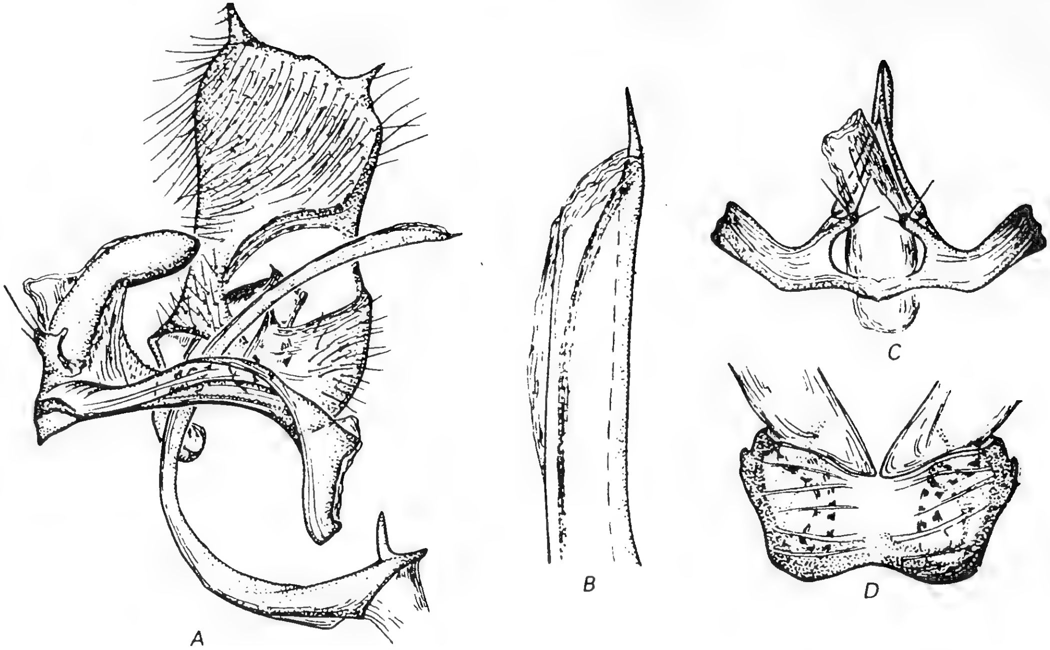


Figure 271. Male genitalia of *Myrmecozela Hyrcanella Zag.*

A — general appearance (lateral view); B — apex of aedoeagus (high magnification);
C — uncus (dorsal view); D — saccus (ventral view).

Preparation No. 5139, male. Trans-Caucasus, Talysh.

genitalia this species is close to *M. gajndzhiella* Zag., but distinguished by the fact that the distance between bases of R_2 and R_3 in forewings equal to or greater than distance between R_3 and R_4; also in male genitalia valvae long and narrow (length three times width).

Distribution. Trans-Caucasus, Talysh (Figure 223).

Material examined. 1 male.

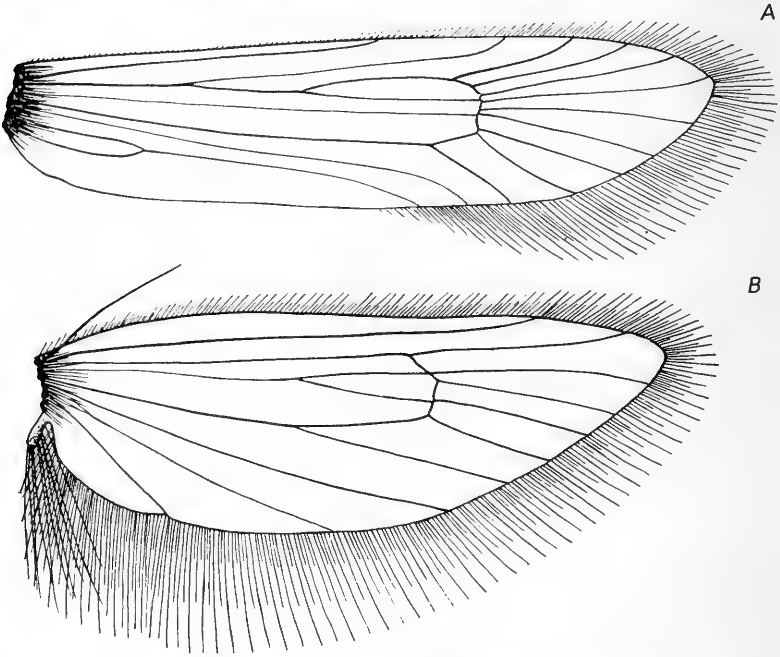
Trans-Caucasus. Azerbaidzhan, Talysh, one male, holotype, preparation of genitalia No. 5139 (collection of Ershov). Type specimen found among *M. lutosella* Ev. and bears original label on old browned paper (11.0 mm × 4.0 mm) with inscription in black ink "Hyrcania."

Biology. Not known.

3. Subgenus *Dulcana* Zagulajev, subgen. n.

Type species of subgenus. Myrmecozela diacona Wlsm., 1907.

Antennae one-half to two-thirds length of forewings. Hind wings broader than forewings. Fringe of hind wings one-half to two-thirds width of wing. In forewings R_4 and R_5 arise separately (Figure 272, A).



365 Figure 272. Venation of wings of *Myrmecozela diacona* Wlsm.

A—forewing; B—hind wing.

Preparation No. 37, male. Algeria (collection of Caradja, Bucharest).

365 In male genitalia middle part of costal margin of valvae concave or straight, apical part convex. Sclerotized apex of aedoeagus (Figure 17, G) resembles stout, obtuse appendage with sinuate or serrate margin and always protrudes outward from membrane (Figure 273).

The subgenus contains three species: *M. diacona* Wlsm., *M. lambessella* Rbl., and *M. cuencella* Car.

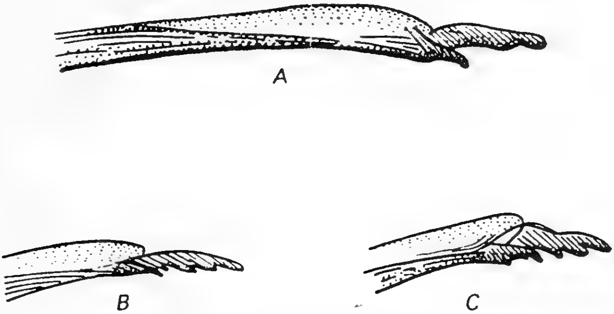
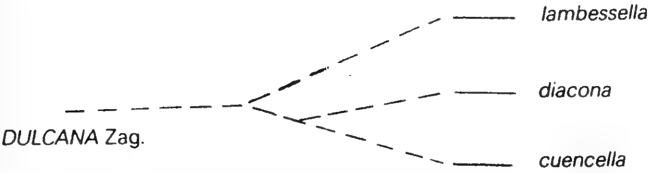


Figure 273. Apex of aedoeagus.
A—*Myrmecozela diacona* Wlsm.; B and C—*M. cuencella* Car.
(from Petersen, 1957b).

Phylogenetic relations of species in group depicted in Figure 274. Venation and structure of male genitalia formed the basis of this scheme.



366 Figure 274. Phylogenetic relations of species in subgenus *dulcana,* subgen. n. of genus *Myrmecozela* Zll.

Key to Species of Subgenus Dulcana Zag., subgen. n. on the Basis of External Characters

1 (2). In forewings basal fork of A_{2-3} three-sevenths length of common trunk; terminus of *Sc* in hind wings 1.5 times closer to alar apex than to base of *R*. .... 23. **M. (D.) lambessella** Rbl.

2 (1). In forewings basal fork of A_{2-3} half the length of common trunk; terminus of *Sc* in hind wings equidistant from alar apex and base of *R*.

3 (4). In forewings R_4 and R_5 widely separated at base; R_5 terminates

on alar apex. .... 22. **M. (D.) diacona** Wlsm.

4 (3). In forewings R_4 and R_5 close-set at base; R_5 terminates on anterior alar margin .... 24. **M. (D.) cuencella** Car.

Key to Species of Subgenus Dulcana Zag., subgen. n. on the Basis of Male Genitalia[33]

1 (2). Apex of aedoeagus serrate with three to four large teeth; apex of uncus in lateral view slightly rounded........................ .... 23. **M. (D.) lambessella** Rbl.

2 (1). Apex of aedoeagus with sinuate margin; apex of uncus pointed.

3 (4). Uncus in lateral view with pointed, elongated apex .... 22. **M. (D.) diacona** Wlsm.

4 (3). Uncus in lateral view with obliquely truncated, straight apex.... .... 24. **M. (D.) cuencella** Car.

22. **Myrmecozela (Dulcana) diacona** Wlsm. (Figures 6, A; 13, B; 21; 22, B; 224; 272; 273, A; 274–277; Plate VIII, *1*).

Walsingham, 1907a: 152–153; Caradja, 1920: 172 (*Promasia*); Amsel, 1940: 55–56; Petersen, 1957b: 580–581; Gozmàny, 1960: 114; Petersen, 1965b: 111.

External characters of imago. Head covered with pale ocherous hairs. Labial palpi cinnamon-ocher; 2nd segment with a coarse brush of scales; 3rd segment short and barely projects from under scales of 2nd segment. Antennae pale yellowish-cinnamon with ocherous tinge. Structure of middle segments of antennae as shown in Figure 6, A.

Thorax smooth, whitish-ocher. Span of forewings 22 to 23 mm; forewings oblong with rounded apex, and their length more than four 367 times width. Length of hind wings three times greater than width; they are broader than forewings, with drooping obtusely rounded apex. Fringe of hind wings half alar width.

Forewings (Plate VIII, *1*) pale, whitish-ocher, with more or less distinctly raised yellowish-cinnamon veins. Pattern indistinct, represented by a few unrelated spots of dark scales in middle part of posterior curvature of wing and sometimes a few blackish scales on anterior margin of cell near base. Pale yellowish-cinnamon spots occur; on hind wings below alar apex and along outer margin, at base of fringe; fringe pale pearl-gray, lustrous.

In forewing (Figure 272, A) bases of R_2 and R_3 widely separated and distance between them much greater than between bases of R_3 and

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[33] Since females are known only for *Myrmecozela diacona* Wlsm., it is not possible to construct an identification key on the basis of female genitalia.

R_4. Branches of R_4 and R_5 widely separated at base. Terminus of R_5 almost reaches alar apex. M_1 and M_2 very close-set at base. Distance between bases of M_3 and Cu_1 small, one-tenth to one-seventh distance between bases of Cu_1 and Cu_2. Basal fork of A_{2-3} half the common trunk. Radial cell two-thirds distance between bases of R_1 and R_2, but 3.5 times greater than distance between Cu_1 and Cu_2. In hind wing (Figure 272, B) terminus of Sc equidistant from alar apex and base of R. M_1 terminates on outer alar margin and located slightly closer to alar apex than terminus of R. Distance between bases of Cu_1 and Cu_2 eight to nine times more than distance between bases of M_3 and Cu_1, and equal to medial cell. A_2 terminates on alar margin slightly beyond level of origin of branch Cu_2 from cell.

Legs yellowish-cinnamon-ocher. Structure of fore- and hind legs as shown in Figure 275.

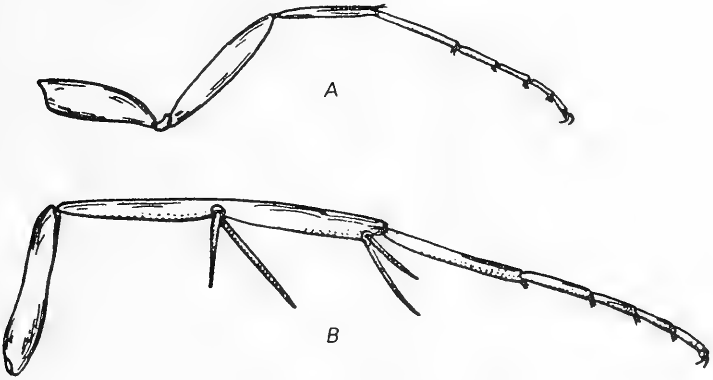

Figure 275. Legs of *Myrmecozela diacona* Wlsm.

A — anterior leg, B — hind leg.

Preparation No. 37, male. Algeria (collection of Caradja, Bucharest).

Male genitalia (Figure 276, A). Valvae up to midpoint with straight, and beyond midpoint with convex costal margin. Tooth near apex long and slender. Lower outer corner with two widely separated teeth. Length of valvae 2.5 times width in narrow part; basal sclerotized lobe of posterior margin of valvae almost reaches proximal third of posterior margin of valva. Light-colored field of valva does not reach mid-
368 point. Uncus in lateral view arcuate, with narrow, elongated, pointed apex; in dorsal view lobes widely separated at base (Figure 276, B); tubercular appendage at base of uncus conical, with three bristles — one long (not reaching midpoint of uncus) and two very short. Aedoeagus almost five times longer than uncus, with two elongated, sclerotized blunt tips — one long and slightly sinuous, other short and wedge-shaped

(Figures 273, A and 276, C). Base of aedoeagus with heel-like process, unguiculate. Saccus in ventral view broad with slightly concave anterior and posterior margins (Figure 276, D); end of saccus in lateral view bent.

Female genitalia (Figure 277, A). Terminus of duct of bursa copulatrix infundibular, sclerotized, covered with minute spinules, its posterior wall divided (Figure 277, B). Elongated tergal plate five-sevenths length of signum and two-fifths total length of margin of sternite VII. Duct poorly sclerotized, more or less straight, long, and reaches anterior margin of sternite VII or included in segment VI. Bursa copulatrix a narrow oblong sac located in segments V and VI. Signum long, longer than width* of segment VI. Anterior apophyses reach segment VI; posterior apophyses included in first fourth of segment VII (Figure 13, B).

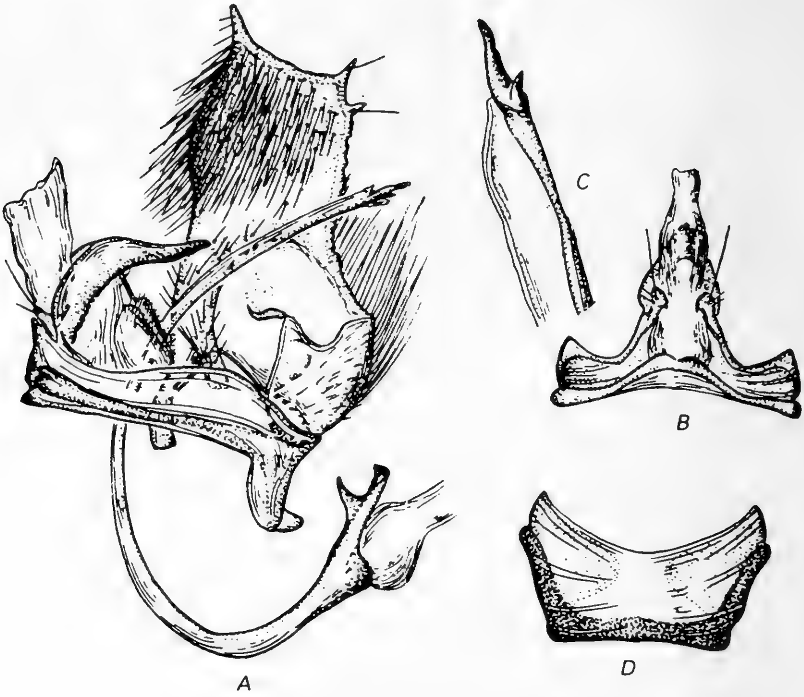

Figure 276. Male genitalia of *Myrmecozela diacona* Wlsm.

A—general appearance (lateral view); B—uncus (dorsal view); C—apex of aedoeagus (high magnification); D—saccus (ventral view).

Preparation No. 37, male. Algeria (collection of Caradja, Bucharest).

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*Error in Russian original; should read length of segment—General Editor.

Larvae. Mature larvae up to 18 mm long. Head and anterothoracic shields dark cinnamon, rest of body whitish, with curved yellowish shields (Figure 21, A, B). Crochets of first pair of prolegs with 31 to 32 hooks (Figure 22, B).

369 *Comparison.* Close to *Myrmecozela cuencella* Car., but differs from it and all other known members of the genus in larger size and details of venation and structure of genitalia. In forewings R_4 and R_5 widely separated at base; terminus of R_5 at alar apex. Lower outer margin of

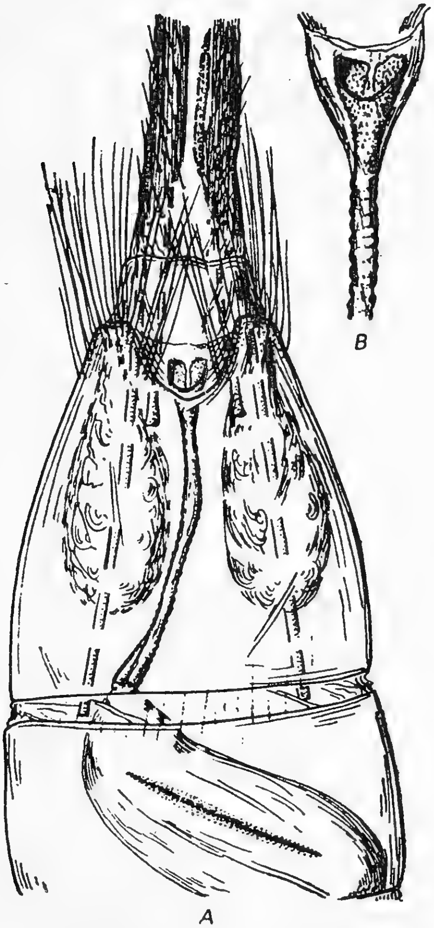


Figure 277. Female genitalia of *Myrmecozela diacona* Wlsm.

A—general appearance, B—ostium bursa and terminus of duct of bursa copulatrix.

Preparation No. 37, female. Algeria (collection of Caradja, Bucharest).

valvae with two widely separated teeth. Structure and shape of sclerotized apex of aedoeagus variable; uncus with elongated, pointed apex. In female genitalia terminus of duct and duct itself poorly sclerotized; duct long, straight, reaching segment VI; posterior apophyses included in segment VII.

Distribution. Northern Africa (Figure 224).

In literature, indicated from Algeria: Biskra and environs of Hammam-es Salahin (Walsingham, 1907a); region of Hassi Babah (Gozmàny, 1960); Morocco (Petersen, 1965b).

Material examined. 1 male and 2 females.

Algeria. Biskra, one male April 14 and one female (reared from larva) April 2, 1907 (Chrétien), from collection of Caradja, Bucharest. Preparation of genitalia No. 37, male and female.

Tunisia. Gafsa, one female.

Biology. Desert, spring species. Moths collected in large numbers at light from March to April. Walsingham (1907a) collected 45 specimens of this species during the following periods: March 20, 1895, March 1 to April 16, 1903, and January 31 to April 21, 1904. He mentions that most of the specimens collected were females. Females cover their eggs after oviposition with silken fluff.

Development and life history of larva of this species not known.

23. **Myrmecozela (Dulcana) lambessella** Rbl. (Figures 17, B, G; 224; 274; 278; 279)

Rebel, 1901: 185–186; Staudinger and Rebel, 1901: II, 241; Petersen, 1957b: 581; 1965b: 111.

External characters of imago. Head: frons covered with light yellow hairs and vertex with cinnamon-ocher hairs. Brush of 2nd segment of labial palpi light cinnamon-ocher, segment itself on upper and inner sides whitish; basal half of 3rd segment whitish, terminal half cinnamon-ocher. Antennae cinnamon-ash-gray, lustrous; basal segment on upper side and toward front cinnamon-ocher, on lower side with whitish granulation; bristles cinnamon-colored and 1.5 to 2.0 times longer than width of segment.

370 Thorax and tegulae light yolk-yellow. Span of forewings in males 20 to 25 mm, in females 20 mm. Length of forewings four times width; hind wings almost three times alar width; length of fringe of hind wings two-thirds alar width.

Forewings yolk-yellow or light golden-yellow, with one small cinnamon-colored spot in middle of outer margin of radiocubital cell. Fringe same color as wings. Hind wings dark cinnamon or dark gray, with translucent inner corner and ocherous-yellow fringe. Under surface

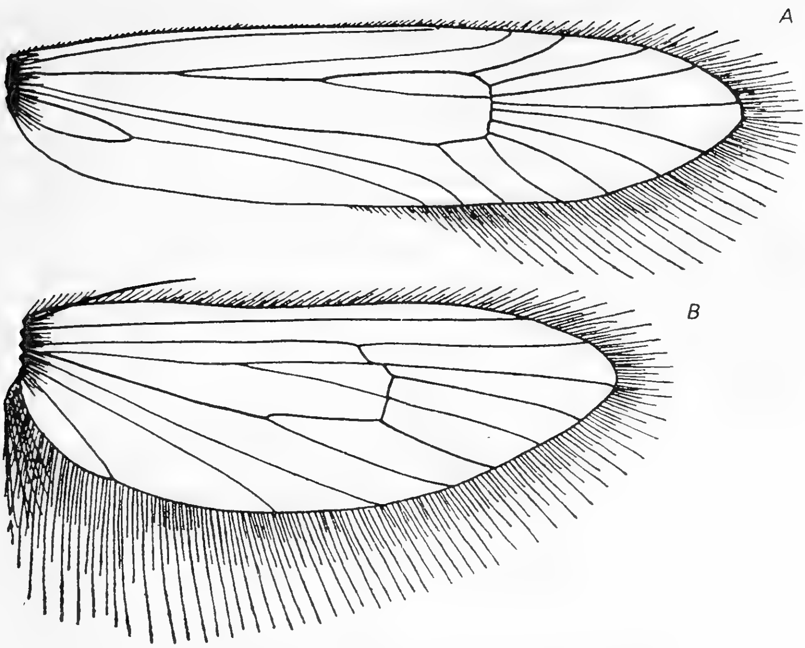


Figure 278. Venation of wings of *Myrmecozela lambessella* Rbl.

A—forewing; B—hind wing.

Preparation No. 10023, male. Algeria.

of forewings dark cinnamon with yellowish fringe, of hind wings ash-gray with light yellow fringe.

In forewing (Figure 278, A) bases of R_2 and R_3 widely separated so that distance between them 1.5 to 2.0 times greater than distance between bases of R_3 and R_4. R_4 and R_5 widely separated at base. Terminus of branch of R_5 many times closer to alar apex than terminus of M_1. Bases of M_1 and M_2 widely separated. Distance between bases of M_3 and Cu_1 one-eighth to one-third distance between bases of Cu_1 and Cu_2. Basal fork of A_{2-3} three-sevenths length of common trunk. Radial cell four-sevenths distance between R_1 and R_2, but three to four times larger than distance between bases of Cu_1 and Cu_2. In hind wings (Figure 278, B), terminus of Sc 1.5 times closer to alar apex than to base of R. M_1 terminates almost on alar margin. Distance between bases of Cu_1 and Cu_2 four to five times more than distance between M_3 and Cu_1, and somewhat shorter than length of medial cell. A_2 terminates on alar margin almost at level of origin of Cu_2 from cell.

371 Fore- and middle legs lustrous cinnamon-gray; hind legs light cinnamon-ash-gray with whitish granulation.

Male genitalia (Figures 17, B, G and 279, A). Costal and lower margins of valvae parallel or lower margin slightly concave; outer margin broad, more or less straight, with three teeth—one on upper and two on lower outer corner. Valvae short and broad, length about twice width; basal sclerotized lobe does not reach midpoint of valva; light-colored field of valvae large, extends beyond midpoint of valva. Uncus geniculate, with broad and highly sclerotized apex; membrane on lower side of uncus originates from about midpoint of uncus. Tubercular appendage at base of uncus small; bristles short and do not reach midpoint of uncus. Aedoeagus six times longer than uncus. Apex of aedoeagus with two spines—one long with four teeth along outer margin, and one short (Figures 17, G and 279, B). Saccus in lateral view straight, stout, with straight truncated end.

Female. Not known.

Comparison. Close to *Myrmecozela diacona* Wlsm. and *M. cuencella* Car., but readily distinguished from both and other species of the

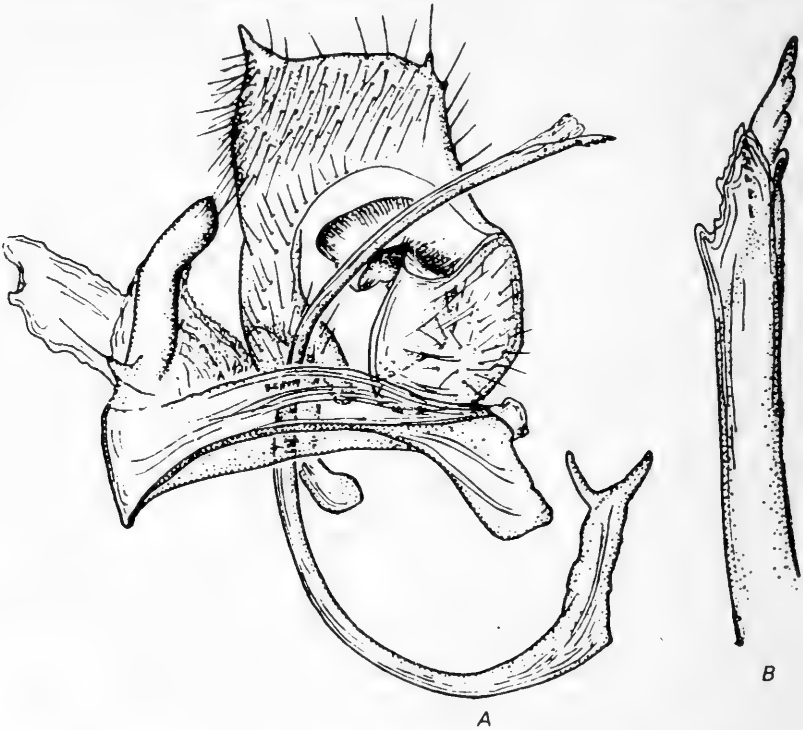


Figure 279. Male genitalia of *Myrmecozela lambessella* Rbl.

A—general appearance (lateral view); B—apex of aedoeagus (higher magnification).

Preparation No. 10023, male. Algeria.

subgenus by yolk-yellow color of forewings, absence of wing pattern, and venation: In hind wings terminus of *Sc* 1.5 times closer to alar apex than to base of *R*. Also distinguished by structure of male 372 genitalia: apex of aedoeagus serrate, with three to four large obtuse teeth; apex of uncus in lateral view rounded; valvae very broad, robust.

Distribution. Southern Spain (Petersen, 1965b), Algeria, Tunisia (Figure 224).

Material examined. 6 males.

Algeria, one male; Lambese, one male; Mauritania, two males and two females in 1887 (collection of Wocke).

Biology. Not known.

24. **Myrmecozela (Dulcana) cuencella** Car. (Figures 14, C; 224; 273; B; 214; 280–282)

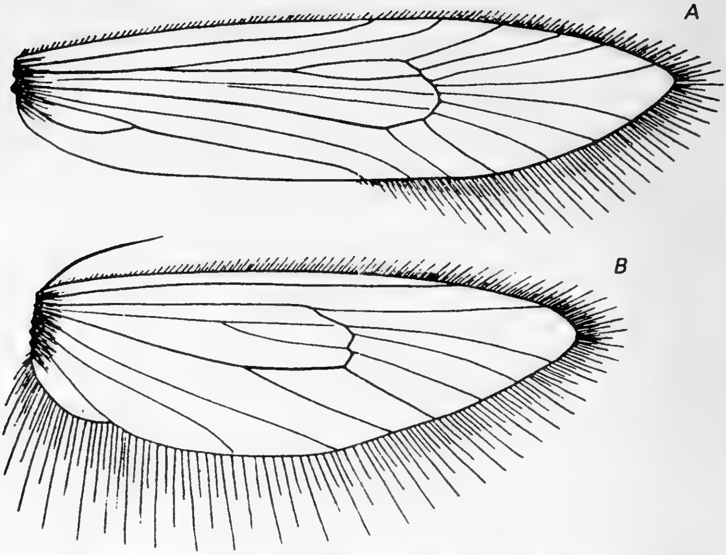
Caradja, 1920: 173 (*Eriocottis*); —*chellalalis* (Pet. nec Rbl.); Petersen, 1957a: 125–126 (*Fermocelina*) —*lambessella cuencella* ssp. Petersen, 1957b: 581–582; 1960b: 212; 1965b: 111.

External characters of imago. Pubescence of head and labial palpi bright rusty-yellow. In labial palpi with 2nd segment long sparsely arranged bristles; 3rd segment short, conical, and about one-fourth length of 2nd. Antennae yellowish-gray, with only ends of each segment light in color, with golden tinge. Frons distinctly broader than vertical diameter of eye.

Thorax and tegulae dirty yellow. Span of forewings in males 21 to 22 mm. Length of forewings four times width; hind wings three times width; hind wings broader than forewings. Fringe of hind wings half alar width.

Forewings cinnamon-dirty-yellow, without pattern, and densely granulated with darker color; fringe slightly lighter than general tone of wing. Hind wings light ash-gray with yellowish tinge, translucent, with darker fringe. Under surface of all wings yellowish-gray and lustrous.

In forewing (Figure 280, A) distance between bases of R_2 and R_3 almost equal to distance between bases of R_3 and R_4. R_4 and R_5 close-set at base. Terminus of R_5 2.5 times closer to alar apex than M_1. Distance between bases of M_3 and Cu_1 one-fifth to one-third distance between bases of Cu_1 and Cu_2. Basal fork of A_{2-3} half that of common trunk. Radial cell almost half the distance between bases of R_1 and R_2, but 3.5 times greater than distance between Cu_1 and Cu_2. In hind wing (Figure 280, B) terminus of *Sc* equidistant from alar apex and base of *R*. Terminus of M_1 slightly closer to alar apex than *R*. Distance between bases of Cu_1 and Cu_2 four to six times greater than distance between bases of M_3 and Cu_1, and less than medial cell. A_2 terminates



373 Figure 280. Venation of wings of *Myrmecozela cuencella* Car.

A—forewing; B—hind wing.

Preparation No. 90, male. Spain (collection of Caradja, Bucharest).

373 Figure 281. Armature of hind leg of *Myrmecozela cuencella* Car.

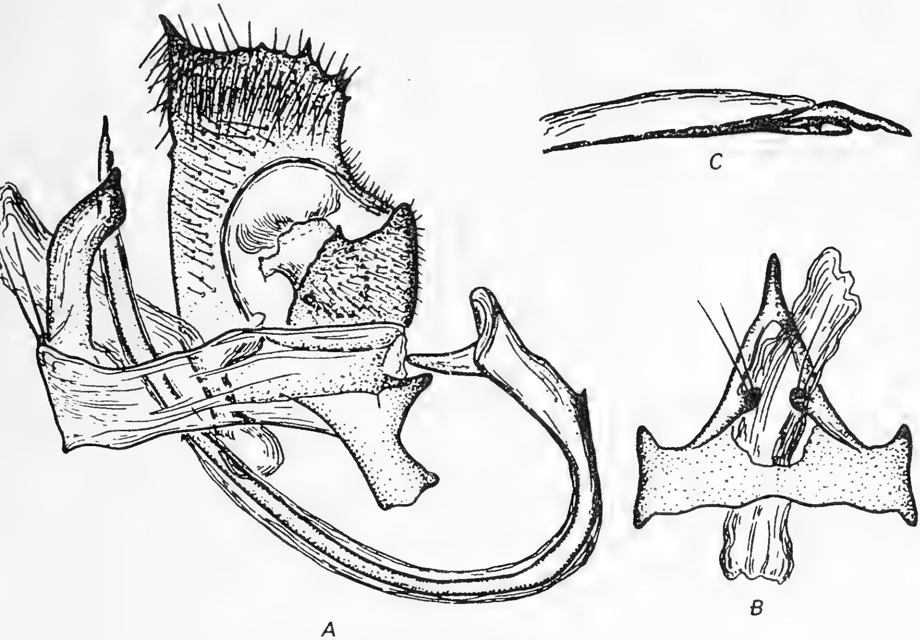
Preparation No. 90, male. Spain (collection of Caradja, Bucharest).

on alar margin proximal to level of origin of Cu_2 from cell.

Legs yellowish-cinnamon, lustrous, without light-colored bands at ends of tibiae and tarsal segments. Armature of hind legs as shown in Figure 281.

Male genitalia (Figures 14, C and 282, A). Valvae with straight costal margin and small tooth beyond midpoint; outer margin of valvae with ten teeth, five of which are better developed (Figure 282, A); basal sclerotized lobe of posterior margin of valvae with acute tooth which almost reaches midpoint of valva. Uncus in lateral view uniform in width, curved, with membranous protruding tube; in dorsal view triangular with acute apex (Figure 282, B). Aedoeagus long, 5.5 times longer than uncus, slender, arucate, and broad at base; base with spinescent 373 appendage. Apex of aedoeagus with two spines; longer one sinuate or obtusely serrrate on lower side (Figure 282, C). Saccus broad, with small protuberance in middle.

Female. Not known.



374 Figure 282. Male genitalia of *Myrmecozela cuencella* Car.

A — general appearance; B — uncus and tegumen (dorsal view); C — apex of aedoeagus (high magnification).

Preparation No. 90, male. Spain (collection of Caradja, Bucharest).

Comparison. Close to *Myrmecozela ochraceella* Tgstr. in coloration; in venation and structure of genitalia close to *M. diacona* Wlsm. Readily distinguished from both by these characters: Bases of R_4 and R_5 close-set in forewings; terminus of R_5 much closer to alar apex than M_1. Lower outer margin of valvae with five large teeth; apex of aedoeagus with two spines; uncus in lateral view with flat apex.

I examined one of the three males in the collection of Caradja from Cuenca, and concluded that this is a well defined spices, for which I have retained the name proposed by Caradja. Petersen (1957b) provided a brief description and diagram of the genitalia of a new subspecies, *M. lambessella cuencella* n. ssp. from Cuenca, which he found in a collection of Bang-Haas. On comparing his description with the material at my disposal, I established their similar identity. Hence the 374 subspecies described by Petersen should be considered a synonym of *M. cuencella* Car. Furthermore, my study revealed that Petersen's (1957a: 125–126) synonym of *Myrmecozela cuencella* Car. (*Eriocottis*) and *Fermocelina chellalis* Rbl. is erroneous. This was a casual mistake and would not have occurred had the type specimens been studied.

Distribution. Spain (Figure 224).

From the first description provided by Caradja (1920), it can be seen that three males were collected in Cuenca, Spain; in addition two males from the same locality were studied by Petersen (1957b), which he named *Myrmecozela lambessella cuencella* n. ssp.

Material examined. 1 male.

Spain. Cuenca, one male, holotype, gen. prep. No. 90, male (collection of Caradja, Bucharest). Type specimen provided with original label, a whitish rectangle (12.0 mm × 6.0 mm) with notation in black ink "Cuenca V. Korb." and labelled *Ericottis cuencella* Car.

Biology. Western Mediterranean species. Moths collected at an altitude of 936 m.

4. Subgenus *Promasia* Chrét.

Type species of subgenus. Promasia ataxella Chrét., 1905.

Length of antennae ranges from one-half to three-fourths length of forewing. Hind wings equal to or broader than forewings. Fringe of hind wings one-half to two-thirds alar width.

R_4 and R_5 on stem in forewing (Figure 283).

375 In male genitalia (Figure 284) middle part of costal margin of valvae highly convex, apical part concave. Sclerotized apex of aedoeagus does not protrude from membrane.

Subgenus includes five species: *Myrmecozela ataxella* Chrét., *M. hispanella* Zag., *M. parnassiella* Rbl., *M. sordidella* Car., and *M. deserticola* Wlsm.

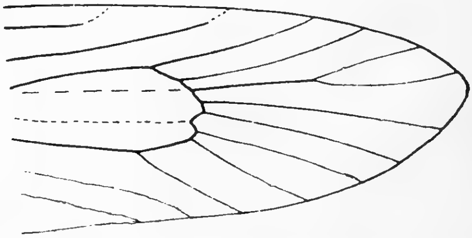


Figure 283. Venation of forewing of *Myrmecozela hispanella* Zag.

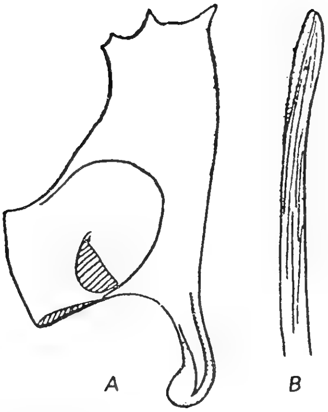


Figure 284. Male genitalia of *Myrmecozela ataxella* Chrét. A—valva; B—apex of aedoeagus (from Petersen, 1957b).

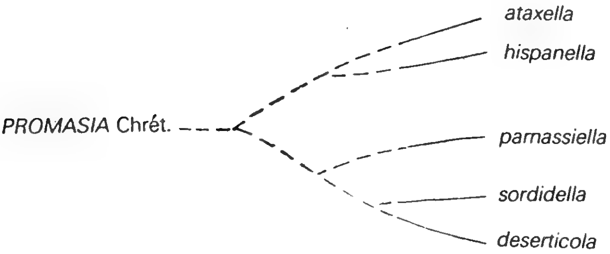


Figure 285. Phylogenetic relations between species of subgenus *Promasia* Chrét. of genus *Myrmecozela* Zll.

The phylogenetic relationships of the species of this subgenus are depicted in Figure 285. The scheme is based on venation and structure of genitalia of male.

Key to Species of Subgenus Promasia Chrét. on the Basis of External Characters[34]

1 (4). In forewings R_5 terminates on alar apex.
2 (3). In hind wings terminus of *Sc* equidistant from alar apex and base of *R*. .... 1. **M. (P.) ataxella** Chrét.
3 (2). In hind wings terminus of *Sc* located 1.5 times closer to alar

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[34] Venation in species *Myrmecozela Parnassiella* Rbl. and *M. deserticola* Wlsm. not known and hence these species could not be included in the Key.

apex than to base of R. . . . . 4. **M. (P.) sordidella** Car.
4 (1). In forewings terminus of R_5 2.0 to 2.5 times closer to alar apex than terminus of M_1 . . . . 2. **M. (P.) hispanella** Zag.

376 *Key to Species of Subgenus Promasia Chrét. on the Basis of Male Genitalia*[35]

1 (4). Sclerotized apex of aedoeagus slender, reaching apex of membranous part, and readily discernible through membrane; width of apical part of valvae about half the width of middle part.
2 (3). Valvae with convex costal margin; uncus arcuate; saccus in lateral view without process at base and longer than uncus. . . . . 1. **M. (P.) ataxella** Chrét.
3 (2). Valvae with almost straight costal margin; uncus straight; saccus in lateral view with rectangular process at base and shorter than uncus. . . . . 2. **M. (P.) hispanella** Zag.
4 (1). Sclerotized apex of aedoeagus does not reach apex of membranous part, and not discernible through membrane; width of apical part of valvae about two-thirds width of middle part. . . . . 3. **M. (P.) parnassiella** Rbl.

25. **Myrmecozela (Promasia) ataxella** Chrét. (Figures 19, C; 20, B; 225; 284–269; Plate VIII, *3*)

Chrétien, 1905: 258–259 (*Promasia*); Petersen, 1957b; 579–580 1960b; 211; 1961b; 529; 1964b; 398; 1965b: 109; Parenti, 1966: 291; Petersen, 1967: 357; —*lutosella* Ev. after Seebold, 1898; 309; Staudinger and Rebel, 1901: II, 240 part. (*Tineola*); Zerny, 1927: 486; Schwingenschuss, 1930: 31; Agenjo, 1952: 64.

External characters of imago. Pubescence of head light dirty yellow. In labial palpi 2nd segment densely covered with large yellowish-cinnamon or brownish scales and long protruding bristles of same color; 3rd segment small, conical, and distinctly lighter in color than 2nd. Antennae yellowish-cinnamon, with compactly compressed scales, without light-colored rings, and they are two-thirds to three-fourths length of forewing. Width of frons much less than vertical diameter of eyes.

Thorax and tegulae dirty yellow with brownish tinge. Span of forewings in male 17 mm to 20 mm, in female 21 to 23 mm. Length of forewings 3.5 times width; hind wings 3.0 times width; width of hind

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[35] Males of *Myrmecozela sordidella* Car. and *M. deserticola Wlsm.* are not known to me and hence are not included in the key. Female genitalia of most species also not known; hence a key on the basis of female genitalia is not provided.

wings equal to width of forewings. Fringe of hind wings half alar width.

Forewings (Plate VIII, *3*) uniform in color, pale ocherous-yellow or light dirty yellow, densely speckled with cinnamon and black dots arranged along anterior, outer, and posterior margins. Maculation particularly distinct in basal half along posterior margin and around radiocubital cell. Mottled pattern barely visible, especially in old specimens. Fringe light yellow with light-colored stripes in basal half and ocherous line beyond midpoint. Hind wings whitish-gray, light yellowish-ash-gray with light-colored stripes; wings in basal half translucent, lustrous. Fringe light yellowish, whitish, with golden tinge. Under surface of forewings yellowish-cinnamon with slight violet tinge; fringe lighter in color. Hind wings yellowish-ash-gray, with light-colored fringe.

377 In forewing (Figure 286, A) distance between bases of R_1 and R_2 eight to nine times greater than distance between bases of R_2 and R_3. R_4 and R_5 on short stalk; R_5 terminates almost on alar apex. Distance between bases of Cu_1 and Cu_2 two-fifths length of radial cell. Basal fork of A_{2-3} two-fifths the common trunk. Radial cell four-sevenths distance between bases of R_1 and R_2. In hind wing (Figure 286, B) terminus of *Sc* equidistant from alar apex and apex of radiocubital cell. Terminus

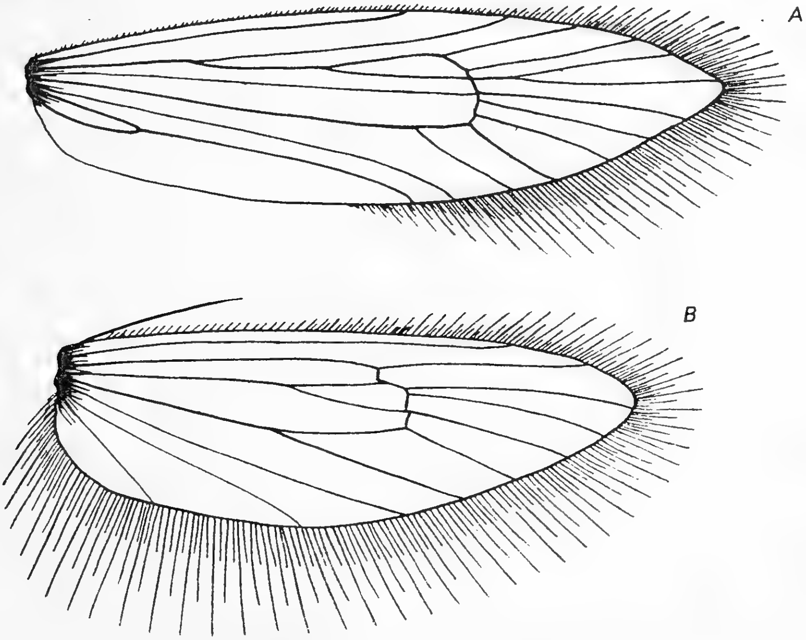


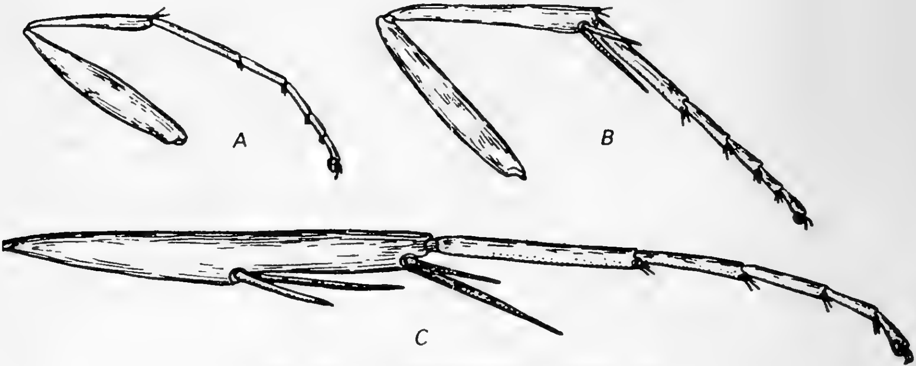
Figure 286. Venation of wing of *Myrmecozela ataxella* Chrét.

A—forewing, B—hind wing.

Preparation No. 91, male. Southern France (collection of Caradja, Bucharest).

of R five to six times farther from alar apex than M_1, which terminates almost on alar apex. Distance between bases of Cu_1 and Cu_2 about seven times more than distance between bases of M_3 and Cu_1, and slightly more than length of medial cell. A_2 terminates on alar margin beyond level of origin of Cu_2 from cell.

Fore- and middle legs cinnamon, with barely perceptible lighter-colored rings at ends of tarsal segments. Hind legs pale yellow. Structure and armature of legs as shown in Figure 287.



378 Figure 287. Legs of *Myrmecozela ataxella* Chrét.

A — foreleg; B — middle leg; C — hind leg.

Preparation No. 91, male. Southern France (collection of Caradja, Bucharest).

Abdomen grayish; terminates in light yellow tuft.

Male genitalia (Figures 284 and 288; A, B). Valvae with convex costal margin and three large teeth along outer margin. Distance between bases of first and second teeth slightly greater than distance between second and third teeth. Basal sclerotized lobe of posterior margin of valvae oblique and without teeth. Uncus in lateral view narrow, curved, tapering toward apex, and without membranous tube; in
379 dorsal view (Figure 288, C) in form of elongated, acute-angled triangle; dorsal lobes located about midlength of uncus. Apex of aedoeagus slender and pointed, without sclerotized structures (Figure 288, D). Saccus in lateral view appears narrow, with curved apex; broad in ventral view, with notch along anterior margin (Figure 288, B). Saccus two-elevenths length of aedoeagus and four-ninths length of costal margin of valvae.

Female genitalia. (Figures 19, C; 20, B; and 289). Terminus of duct of bursa copulatrix sclerotized, with deep notch. Longitudinal tergal plate about four-fifths to five-sixths length of signum and half the margin of sternite VII. Duct of bursa copulatrix relatively long, reaches

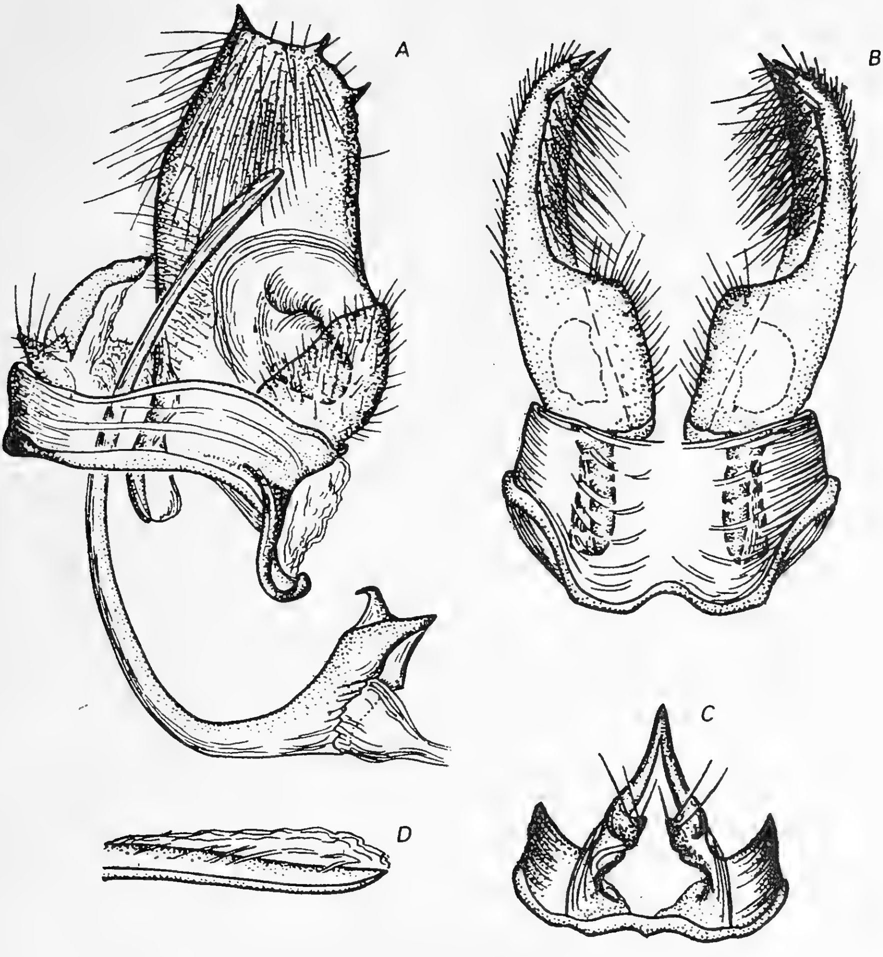


Figure 288. Male genitalia of *Myrmecozela ataxella* Chrét.

A—general appearance (lateral view); B—same (ventral view); C—uncus (dorsal view); D— apex of aedoeagus (high magnification).

Preparation No. 91, male. Southern France (collection of Caradja, Bucharest).

beginning of sternite VII. Bursa copulatrix located in segments IV to VII. Signum long, about equal in length to sternite VII measured from anterior margin up to notch in posterior margin, and twice greater than width of sternite VI. Anterior apophyses extend to four-fifths to five-sixths length of segment VII. Structure of terminus of ovipositor as shown in Figure 20, B.

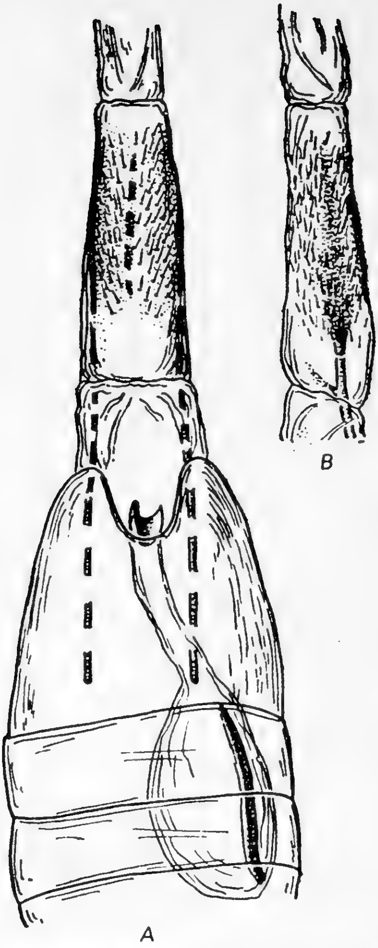


Figure 289. Female genitalia of *Myrmecozela ataxella* Chrét.

A—general appearance; B—terminal of anterior apophysis (lateral view, high magnification).

Preparation No. 91, female. Southern France (collection of Caradja, Bucharest).

Comparison. Externally, coloration of these moths slightly resembles *Myrmecozela lutosella* Ev. and *M. deserticola* Wlsm. In venation and structure of male genitalia species close to *M. hispanella* Zag., but differs in several characters. In venation of forewings R_5 terminates almost on alar apex; in hind wings M_1 terminates almost on alar apex; distance between bases of Cu_1 and Cu_2 more than length of medial cell. In male genitalia uncus arcuate; saccus in lateral view without process at base.

Before this species had been described some authors had indicated its presence in Spain under the name *M. lutosella* Ev. (Seebold, 1898; Staudinger and Rebel, 1901); the same mistake was also made by later authors who, most probably, were unaware of the description of *M. ataxella* Chrét. (Zerny, 1927; Schwingenschuss, 1930; Agenjo, 1952).

Eggs. Oval, slightly compressed on sides; surface of chorion with faint cellular structure. Externally whitish; sometimes with light yellow tinge, lustrous.

Larvae. Larvae on hatching from eggs milk-white with cinnamon-colored heads and thoracic shields. Mature larvae about 15 mm long; segments IV and VI distinctly broader than others, dirty white, translu-
380 cent. Head rust-colored. Mouth parts cinnamon; body covered with large whitish setae. Stigmal plate round and raised in form of caruncle with black dot in middle. Setae whitish. Legs small, light cinnamon in color; abdominal legs light with cinnamon-colored hooks.

Pupae. Yellowish, small, with smooth or slightly rugulose surface with folds. Termina of wings, legs, and antennae free. Abdominal segments with two rows of minute cinnamon-colored, acicular spinules, or acute denticles of variable size directed backward. Stigmata yellow, located in depressions. Terminal segment truncated, with rounded end; large teeth located at base of cremaster.

Distribution (Figure 225). Southern France, Spain, Algeria, and Libya.

In literature, reported from southern France: Bize, Spain: Murcia, Ildefonso (Petersen, 1957b); Alikante, Grenada, Madrid, Segovia, and Tervel (Petersen, 1960b); Malaga (Petersen, 1961b), Catalonia (Port Bou), Algeria (Chellala) (Petersen, 1964b); and Libya, Tripoli region.

Material examined. 1 male and 1 female.

Southern France. Bize, one male and one female June 6 (in collection of Caradja as *Promasia ataxella* Chrét.). Specimens with original labels: one small, squared (5.0 mm × 5.00 mm) with inscription in black ink "Bize 6.06"; second larger, rectangular (14.0 mm × 7.0 mm) with inscription "*Promasia ataxella*"; third label on checked paper (11.0 mm × 8.5 mm) with inscription "Cotype P. Chrétien".

Biology. Western Mediterranean species.

Moths emerge in May–June and August–November. In Spain found in low-lying regions from an elevation of 24 m (Alicante Province) to an elevation of 60 and 158 m, one male August, 1953 (Murcia Province), as well as in elevated areas in Madrid region at an altitude of 596 m, one male September 6, 1938, and near Grenada at an elevation of 689 m, one male and one female. Moths also collected at even higher localities: in Mursia Province at an elevation of 994 to 1,579 m one male and two females collected May, 1927; in Segovia Province at an elevation of 1,141 m, one female collected August 8; and in Tervel Province, one male at an elevation of 1,162 m (Petersen, 1960b). In Catalonia (Port Bou) one female collected between June 18 and July 1, 1963 (Petersen, 1964b). In Barcelona two males and one female collected in August (Petersen, 1967). In Libya, Tripoli region, three males found in September, one male and one female October 24 and 29, and one male November 1 (Parenti, 1966).

The female rotates her ovipositor before laying eggs, which releases bundles of silken fluff protruding from sacs. She then withdraws the ovipositor, catches the fluff and covers her eggs with it. Eggs are laid in small clutches on the ground, small pebbles, old leaves, and branches, but always under cover, and at the base of clumps of rosemary or oak (*kermes*). Larvae emerge 10 to 12 days later and immediately move into the upper soil layer. They are not selective about food and eat dry leaves, dead wood, moss, feathers and insect residue. Cases have been observed of larvae eating other moths. Chrétien (1905) indicated that larvae of *Penestoglossa dardoinella* Mill. placed in the same container with *Myrmecozela ataxella* Chret. were eaten by the latter species.

Larvae live in the upper layer of litter in covered silken tunnels to which particles of soil, pebbles, plant parts, and other detritus adhere. Silken fibers protrude from the ends of these tunnels and serve as "paths" in searching for food and returning to cover in case of danger. During development, larvae elongate and widen their galleries to pupate
381 in them. The duration of the pupal instar depends on temperature, but usually requires two weeks; at low temperatures pupation may be prolonged up to one month.

This species produces two generations per year. Duration of various stages of the life cycle of two generations are given below:

	First generation	*Second generation*
Imagoes	May–June	August–September
Development of eggs	10–12 days	15 days
Larvae	June–August	October–April
Pupae	15–20 days	20–30 days

26. **Myrmecozela (Promasia) hispanella** Zag. (Figures 9, D; 10, D; 11, D; 225; 283; 285; 290; 291; Plate VIII, *2*)

Zagulyaev, 1971b: 425–426; 1972d: 355–356.

External characters of imago. Pubescence of head light yellowish-ash-gray. In labial palpi 2nd segment covered with yellowish-gray scales; 3rd segment one-fourth to one-third length of 2nd segment and slightly lighter in color. Antennae yellowish-cinnamon with compactly compressed scales, without light-colored rings, and two-thirds length of forewings. Width of frons equal to or slightly greater than vertical diameter of eyes.

Thorax and tegulae on upper side yellowish-ash-gray; tegulae toward front cinnamon-colored. Span of forewings in males 15 to 16 mm. Length of forewings about four times width; hind wings three times greater than width; hind wings slightly broader than forewings. Fringe of hind wings two-thirds width of wing.

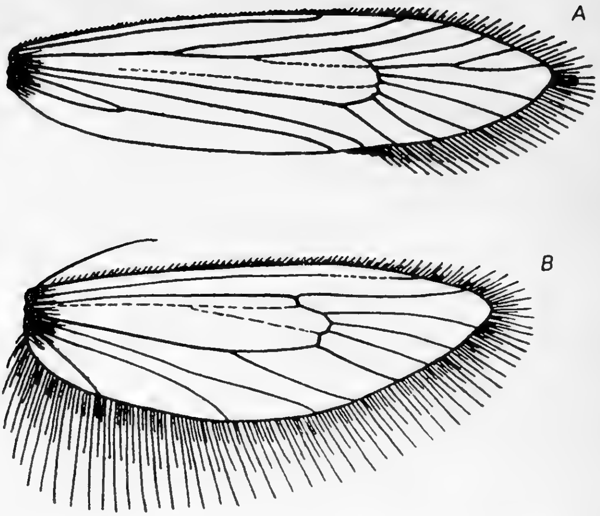
Forewings (Plate VIII, *2*) uniformly colored, light yellowish-ash-gray, slightly granulated with dark spots, especially around outer and posterior margins, with one relatively large spot proximal to midpoint of wing on anal fold (vein A_2), and small barely perceptible dot at apex of radiocubital cell. Fringe slightly lighter in color than wing. Hind wings light yellowish-ash-gray with lighter luster. Fringe somewhat darker than basic background of wing. Under surface of forewings light cinnamon-gray, of hind wings light yellowish-ash-gray; both wings lustrous.

In forewing (Figure 290, A) distance between bases of R_1 and R_2 five to six times greater than distance between R_2 and R_3. Terminus of R_5 2.0 to 2.5 times closer to alar apex than terminus of M_1. Distance between bases of Cu_1 and Cu_2 two-sevenths to one-third length of radial cell. Basal fork of A_{2-3} about half the common trunk. Radial cell two-thirds distance between bases of R_1 and R_2. In hind wing (Figure 290, B), terminus of Sc 1.5 times closer to alar apex than to apex of radiocubital cell. Terminus of R slightly (1.5 times) farther away from alar apex than M_1. Distance between bases of Cu_1 and Cu_2 about five times greater than distance between M_3 and Cu_1, but distinctly shorter than medial cell. A_2 terminates on alar margin slightly proximal to level of origin of Cu_2 from cell.

Legs light yellowish-cinnamon, lustrous, without distinct light-colored rings at ends of tarsal segments. Structure and armature of legs as shown in Figures 9, D; 10, D; and 11, D.

Abdomen yellowish-gray.

Male genitalia (Figure 291, A). Valvae with almost straight or slightly convex costal margin near apex and three large teeth along outer margin. Distance between bases of first and second teeth almost
382 twice more than distance between second and third teeth. Basal sclerotized lobe of posterior margin of valvae obliquely truncated and without teeth. Uncus in lateral view straight, narrow, with pointed apex and distinct membranous tube; base with two to three very long bristles on



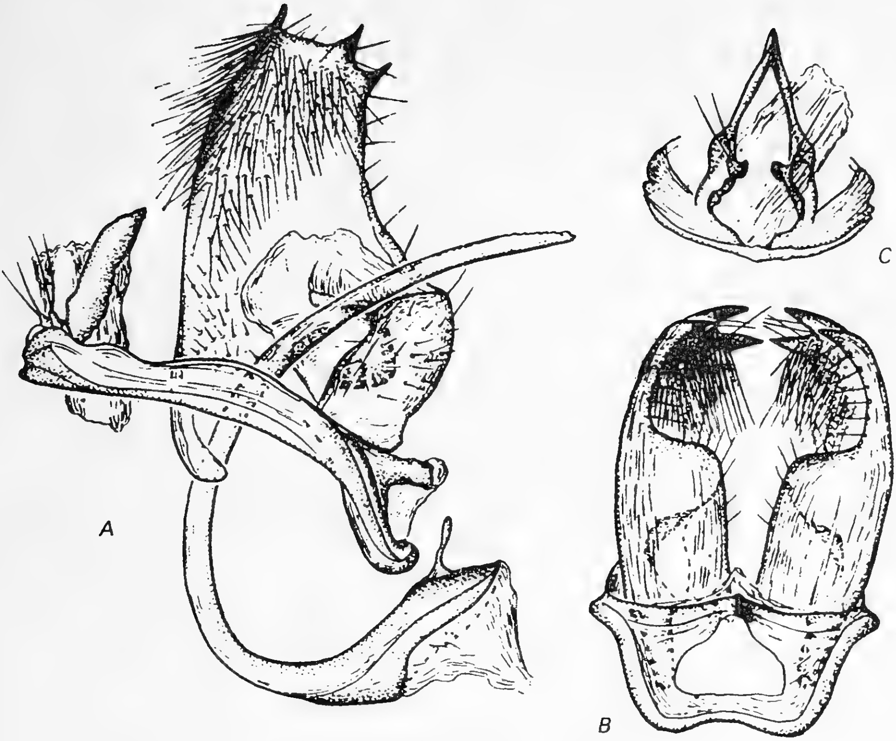
382 Figure 290. Venation of wings of *Myrmecozela hispanella* Zag.
A—forewing; B—hind wing.
Preparation No. 96, male. Spain (collection of Caradja, Bucharest.)

each side located on projections; in dorsal view, dorsal lobes of uncus situated closer to base than to apex (Figure 291, C). Aedoeagus more than six times longer than uncus. Sclerotized top of aedoeagus slender, pointed, its membranous part without sclerotized structures. Saccus in lateral view narrow, with curved apex, and long obtuse process which protrudes ventrally from base. Saccus one-eighth length of aedoeagus and one-third costal margin of valvae (Figure 291, A, B).

Female. Not known.

Comparison. In external appearance notably resembles *Myrmecozela ataxella* Chrét., but lighter in color and with only one distinctly developed spot on anal fold proximal to midpoint of wing, and barely discernible dot at apex of radiocubital cell. Also distinguished by peculiarities of venation. Terminus of R_5 in forewings distinctly anterior to alar apex; in hind wings M_1 terminates on outer margin of wing and is located some distance from alar apex; distance between bases of Cu_1 and Cu_2 shorter than medial cell. In male genitalia aedoeagus more than six times longer than uncus; uncus straight; saccus in lateral view with straight process at base.

In the collection of Caradja (Bucharest) this specimen bears the label "*Dueterotinea paradoxella* Stgr." After studying the original description by Staudinger (1859: 236) I concluded that this is a new species,



383 Figure 291. Male genitalia of *Myrmecozela hispanella* Zag.

A — general appearance (lateral view); B — same (ventral view); C — uncus (dorsal view). Preparation No. 96, male. Spain (collection of Caradja, Bucharest).

which differs from *D. paradoxella* Stgr. in absence of large blackish spot at end of radiocubital cell. I have named the new species *Myrmecozela hispanella.*

383 *Distribution.* Iberian Peninsula (Figure 225).

Material examined: 1 male.

Spain. Murcia, one male (collection of Caradja, Bucharest). Specimen identified by Caradja as *Deuterotinea paradoxella* Stgr. and with original label (6.0 mm × 13.0 mm) bearing notation in black ink "Murcia". After identification of the specimen I added a red-colored label with the inscription "Holotypus" and in black ink "*Myrmecozela hispanella* Zag., sp. n., male, Murcia". Preparation of the type genitalia is preserved as No. 96, male, in the Museum of Natural History in Bucharest.

Biology. Not known.

27. **Myrmecozela (Promasia) parnassiella** Rbl. (Figures 225; 285; 292)

Rebel, 1915: 56 (*Proctolopha*); Petersen, 1957b: 579; Gozmàny, 1960: 113; Petersen, 1962: 206; 1965b: 109; Klimesch, 1968: 185.

External characters of imago. Pubescence of head dirty cinnamon. Thorax and tegulae dark cinnamon. Wingspan 16 to 18 mm. Forewings light dirty cinnamon, lustrous, with numerous scattered darker scales and dark spot in anal fold and at apex of radiocubital cell.

Male genitalia (Figure 292). Valvae with straight costal margin, sharply concave near apex, so that width of middle part of valva greater than width near apex; three teeth along outer margin well developed (Figure 292, A). Distance between bases of first and second teeth twice distance between bases of second and third teeth. Basal sclerot- 384 ized lobe of posterior margin of valvae obliquely truncated and without tooth. Apex of uncus (Figure 292, B) in dorsal view resembles pointed dome of cone. Sclerotized apex of aedoeagus without sharp edges and appears rounded (Figure 292, C). Saccus not examined.

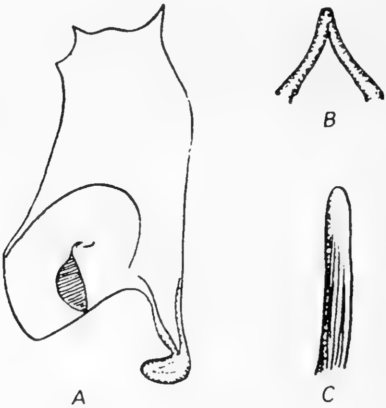


Figure 292. Male genitalia of *Myrmecozela parnassiella* Rbl.

A — valva; B — uncus; C — apex of aedoeagus (from Petersen, 1957b).

Female genitalia. Structure, as reported by Petersen (1957b), similar to that of *M. ochraceella* Tgstr.

Comparison. In terms of coloration and numerous dark spots and speckles this species is close to *Myrmecozela ataxella* Chrét. It is more reliably identified only on the basis of genitalia: apex of aedoeagus rounded, without sclerotized structures; width at apex of valvae two-thirds width of middle part of valva.

The species *M. parnassiella* Rbl. belongs to the genus *Myrmecozela* Zll. on the basis of external features and genitalia, and should not be isolated into a separate genus (*Proctolopha* Rbl.) as done by Rebel (1915). Petersen (1957b) also does not favor the transference of *M. parnassiella* Rbl. to separate genus.

No specimens examined by me.

Distribution. Balkans: Greece (Figure 225).

In the literature, reported from Macedonia, Dojran, Parnassus (Gozmany, 1960), and Peloponnesus (Petersen, 1962).

The occurrence of *M. parnassiella* in the southern regions of the European part of the USSR is possible.

Biology. Mediterranean species. Moths emerge in May–July. In Peloponnesus one male was collected May 6, 1959 (Petersen, 1962); Macedonia (Dojran) two males June 10, 1955; and Parnassus region one male and one female July, 1914 (Petersen, 1957b).

28. **Myrmecozela (Promasia) sordidella** Car. (Figures 225; 285; 293; 294)

Caradja, 1920: 172 (*Promasia*).

External characters of imago. Head covered with light yellowish-ash-gray hairs. Color of pubescence of labial palpi same color as head; 3rd segment two-fifths to one-third length of 2nd. Antennae about half length of forewings, rusty-ocher, cinnamon-colored, smooth. Frons narrow, less than vertical diameter of eyes.

Thorax and tegulae light cinnamon-gray, granulated with rusty-cinnamon scales. Wingspan in female 19 mm. Length of forewings 3.66, width; hind wings 2.75 width; hind wings distinctly broader than forewings. Length of fringe of hind wings about half alar width.

Forewings light brownish, with uneven cinnamon-gray granulation; latter denser in basal region of wing and on anal fold. Fringe lighter in color than wings and with slight dark cinnamon granulation. Hind wings light yellowish-ash-gray, darker near apex and along outer margin. Fringe same color as wings.

In forewing (Figure 293, A) distance between bases of R_1 and R_2 eight to nine times greater than distance between R_2 and R_3. R_5 terminates on alar apex. Distance between bases of Cu_1 and Cu_2 one-third to
385 two-fifths length of radial cell. Basal fork of A_{2-3} half the common trunk. Radial cell two-thirds distance between bases of R_1 and R_2. In hind wing (Figure 293, B) terminus of Sc 1.5 times closer to alar apex than to base of R. Terminus of M_1 twice closer to alar apex than R. Distance between bases of Cu_1 and Cu_2 about six times greater than distance between bases of M_3 and Cu_2, and slightly less than medial

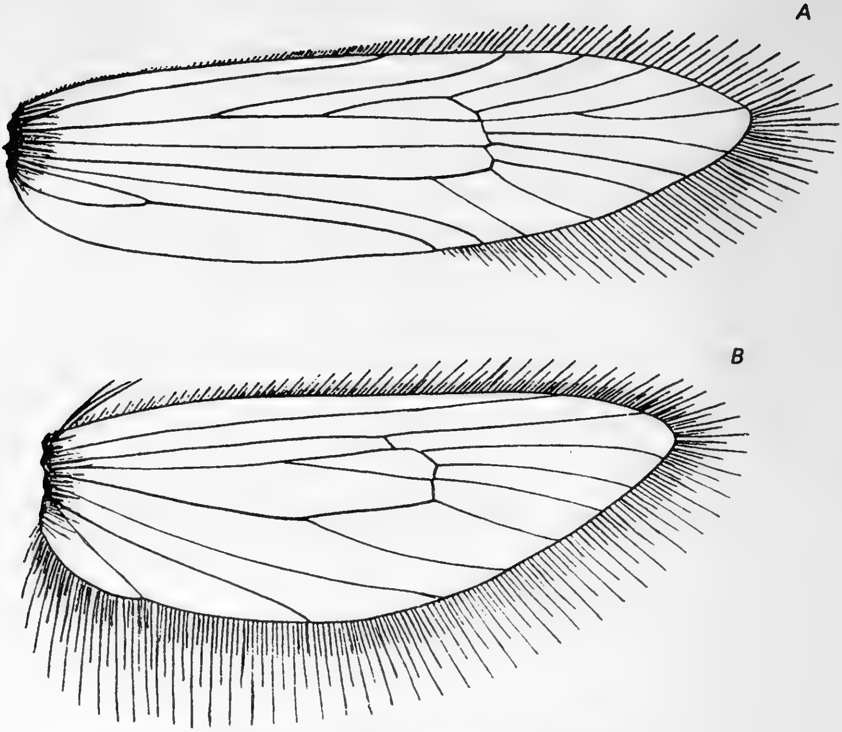


Figure 293. Venation of wings of *Myrmecozela sordidella* Car.

A—forewing; B—hind wing.

Preparation No. 101, female. Tunisia (collection of Caradja, Bucharest).

cell. A_2 terminates on alar margin almost at level of origin of Cu_2 from cell.

Legs dull yellowish-cinnamon, with sharp light-colored rings at ends of tarsal segments.

Abdomen light cinnamon-gray.

Male. Not known.

Female genitalia (Figure 294, A). Infundibular terminus of duct of bursa copulatrix sclerotized and consists of scaly plates; posterior wall divided (Figure 294, B). Longitudinal tergal plate two-thirds length of signum and one-third total length of margin of sternite VII. Duct of bursa copulatrix short, reaches midpoint of sternite VII. Bursa copulatrix located in segments VI and VII. Signum short, five-sevenths length of sternite VII measured from anterior margin up to notch in posterior margin, and equal in length to sternite VI. Anterior apophyses do not reach anterior margin of segment VII.

386 *Comparison.* On the basis of its light brownish coloration and cinnamon-gray granulation of forewings, this specimen closely resembles the one described by Caradja (1920) as *Promasia deserticola* ab. *sordidella* Chrét. (*Myrmecozela* Zll.) with dull coffee-brown coloration. It differs from *Myrmecozela deserticola* Wlsm. in which the wings are pale rusty to ocherous, with a few dark scales along anterior margin near base and at apex of radiocubital cell. This species is close to *M. hispanella* Zag. in wing venation. Radial cell in forewing is 2.5 times longer than distance between bases of Cu_1 and Cu_2. In hind wings terminus of *Sc* 1.5 times closer to alar apex than to base of *R*. This species

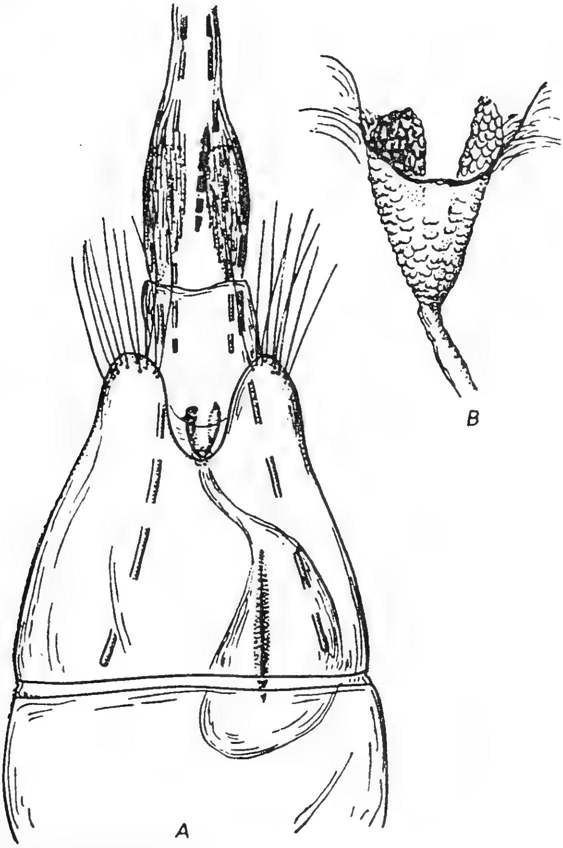


Figure 294. Female genitalia of *Myrmecozela sordidella* Car.

A—general appearance; B—Structure of ostium bursa (high magnification).

Preparation No. 101, female. Tunisia (collection of Caradja, Bucharest).

is close to *M. diacona* Wlsm. in structure of female genitalia, but differs from it and other species also, in the very short signum—half the total length of sternite VII and five-sevenths length of sternite from anterior margin to beginning of notch; furthermore, duct of bursa copulatrix short.

Distribution. Northern Africa (Figure 225).

Material examined. 2 females.

Tunisia. Gafsa, two females. Type specimen with original label (10.0 mm × 5.0 mm) with inscription "Gafsa" and standard red label with inscription: "Holotypus" and note "*Myrmecozela sordidella* Car., gen. prep. No. 101, female, Gafsa, det. A. Zagulajev." Type preserved in collection of Caradja (Museum of Natural History, Bucharest). Paratype. gen. prep. No. 161, female, Gafsa, det. A. Zagulajev at same locality.

Biology. Not known.

29. **Myrmecozela (Promasia) deserticola** Wlsm. (Figures 225; 285)

Walsingham, 1907a: 192–193; Caradja, 1920: 172 (*Promasia*); Petersen, 1957b: 582–583.

External characters of imago. Head covered with pale rusty-ocher scales. Labial palpi light yellowish-cinnamon with ocherous tinge; 3rd segment short. Antennae two-thirds length of forewing, rusty-ocher, and covered with short cilia.

Thorax pale rusty-ocher. Span of forewings in males 22 mm, in females 17 to 19 mm. Forewings oblong, almost oval, with slightly curved anterior margin. Hind wings broader than forewings; narrow 387 beyond midpont toward apex, and with slightly drooping, barely pointed apex.

Forewing pale rusty-ocher, with a few yellowish-cinnamon scales along anterior margin at alar base, and a few dark streaks at end of radiocubital cell. In middle part of anal fold of wing (almost midway along wing) a more or less dark spot occurs. A few clusters of dark scales also present between anterior margin of wing and upper margin of radiocubital cell, and a few dark scales along outer margin in front of fringe. Fringe lighter in color than basic background of wing, with slight dark granulation. Hind wings pale, lustrous, whitish-ocher. Fringe same color as wing.

Venation of wings not studied.

Legs pale rusty-ocher.

Abdomen yellowish-gray with brownish tinge.

Genitalia. Not studied.

Comparison. In general appearance this species resembles *Myrme-*

cozela sordidella Car. and partially resembles *M. discona* Wlsm., but is distinguished by distinctly curved anterior margin and presence of large spot midlength of wing in region of anal fold, absence of a terminal spot, and smaller size of wingspan (22 mm in male). Species also very similar to *M. ataxella* Chrét. Caradja (1920) obtained moths from Algeria, identified by Chretien as *M. ataxella* Chrét. Caradja believed that *M. deserticola* Wlsm. should not be separated as a species from *M. ataxella* Chrét. Petersen (1957b), however, notes that *M. deserticola* Wlsm. might possibly be a desert form of *M. ataxella* Chret.

No specimens examined by me.

Distribution. Algeria (Figure 225).

Three specimens recorded from Hamman-es Salahin region (Walsingham, 1907a).

Biology. Rarely found desert species. Moths emerge in autumn (October) but collections of this species in January are also known. Biology not studed.

Group of species of Undetermined Taxonomic Position

30. **Myrmecozela chnéouri** Luc. (Figure 225)

Lucas, 1942: 126; Petersen, 1957b: 582.

External characters of imago. In external appearance very close to *M. diacona* Wlsm., but smaller than this species. Wingspan 20 mm.

Without a study of the type specimen, it is difficult to provide characteristics and diagnostic features of this species.

No specimens examined by me.

Distribution. Tunisia: Sbeitla (Figure 225). A few specimens were collected in February, 1941.

31. **Myrmecozela pallidella** Luc. (Figure 225)

Lucas, 1933: 199; Petersen, 1957b: 583.

External characters of imago. In general appearance and color and pattern of wings, this species resembles *M. ataxella* Chrét. or *M. deserticola* Wlsm.

388 Without a study of the type specimen, it is not possible to provide characteristics, and diagnostic features of this species.

No specimens examined by me.

Distribution. Morocco: Oudjda (Figure 225).

Biology. Not known

32. **Myrmecozela romeii** Trti. (Figure 225)

Turati, 1930; 128; Petersen, 1957b: 583.

External characters of imago. Wing span 15 mm.

Only after a study of the type specimen, especially the genital structure, will the taxonomic affinity of this species become clear.

No specimens examined by me.

Distribution. Libya: Tripoli (Garian) (Figure 225).

Biology. Not known.

12. Genus *Cinnerethica* Ams.

Amsel, 1935c: 312, 316 (*Hapsiferoides*); Petersen, 1957b: 584, 1964a: 116; —*Hapsiferoides* Amsel, 1935c: 316 (type *H. judaica* Amsel, 1935c: 316).

Type species. Myrmecozela ? *optodes* Meyr., 1922.

By its uniformly yellowish wings and thorax this genus resembles *Myrmecozela* Zll. and *Catobola* Durr.

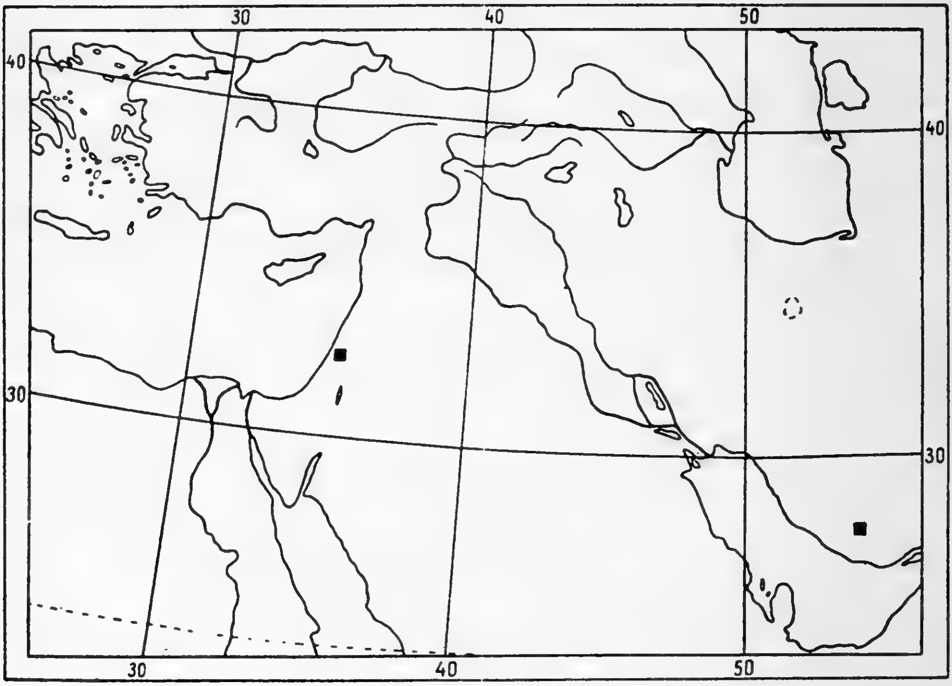


Figure 295. Distribution of *Cinnerethica optodes* Meyr.

Imago. Pubescence of head with yellowish tones. Maxillary palpi
389 and galea absent. Labial palpi long, project forward, slightly curved; 3rd segment short. Antennae three-fourths length of forewing.

Thorax yellowish-gray, with whitish granulation. Span of forewings 11 to 12 mm. Forewings yellowish-brown; hind wings darker, their fringe gray.

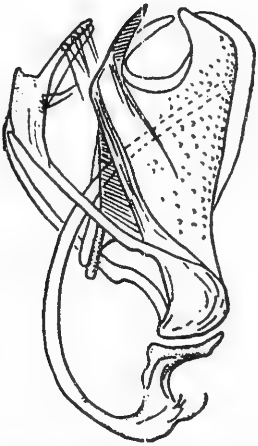
Costal margin of forewings slightly curved. All veins originate independently from cell. R_1 originates from cell near its base. R_5 terminates on alar apex. R_2 considerably removed from R_3, and also Cu_1 from Cu_2.

Median pair of spurs of hind tibiae originate from midpoint of tibia.

Abdomen yellowish-gray.

Male genitalia (Figure 296). Valvae simple, with deeply notched outer margin; length of valva, excluding pedicel, more than twice width in narrow part. Uncus in form of two widely separated narrow branches. Aedoeagus seven to eight times longer than uncus, slender, arcuate. Membranous apical part of aedoeagus without sclerotized inclusions. Tegumen broad at base, its lobes converting into two narrow armatures, which fuse with vinculum. Vinculum narrow, fused with short, broad, troughlike saccus.

Female. Not known.



390 Figure 296. Male genitalia of *Cinnerethica optodes* Meyr. (from Petersen, 1957b).

Biology. Not known.

Distribution. West Asia (Figures 29 and 295).

Comparison. On the basis of a series of characters *Cinnerethica* is close to *Myrmecozela* Zll. (see comparative notes of this genus). However, it is readily distinguished by the arrangement of R_2 and R_3 and terminus of R_5 in forewing, as well as by the deep broad notch in outer margin of valvae of male.

To date only one species of the genus is known: *C. optodes* Meyr.

1. **Cinnerethica optodes** Meyr. (Figures 295 and 296)

Meyrick, 1922: 591 (*Myrmecozela* ?); Petersen, 1957c: 582: 1961b: 529; 1964a: 116; 1966: 29; 1968: 56; —*tabghaella* Amsel, 1935c: 312; Petersen, 1957b: 584; —*judaica* Amsel, 1935c: 316 (*Hapsiferoides*).

External characters of imago. Color of pubescence of head yellowish-gray, granulation whitish. Labial palpi dark, middle segment densely covered with sparse scales and numerous bristles which project in all directions; hence 3rd segment barely visible under pubescence of 2nd segment. Antennae stout and smooth, uniformly pigmented, and without cilia.

Color of thorax and tegulae and wingspan given in diagnosis of the genus.

Forewings densely granulated with very minute cinnamon and whitish scales; fringe cinnamon with white granulation. Hind wings dark gray, dull purple, lustrous in basal half. Fringe of hind wing with light-colored streak at base. Under surface of both pairs of wings uniformly yellowish-gray.

Venation of wings given in diagnosis of the genus.

Male genitalia (Figure 296). Notch in outer margin of valvae deep and broad and about third length of valva. Lobes of uncus in lateral view smooth, without processes, with a few long bristles. Apex of aedoeagus acicular; base of aedoeagus with curved process. Saccus in lateral view with pointed apex.

Female. Not known.

390 *Comparison.* Male genitalia similar to *Myrmecozela* Zll., but readily distinguished from this species by deep notch in outer margin of valvae. Petersen (1964a) has noted the strong variability of the outer lobes of the valvae, especially the costal lobe, which may be narrow as in the specimen from Palestine, or broad as in specimens from western Iran.

No specimens examined by me.

Distribution. Palestine, Iran (Figure 295).

In literature, reported from Palestine: Tabgha, one male May 10, 1930; Haifa, one male in June (Meyrick, 1922); Jericho, one male April 11, 1930 (Amsel, 1935c). In Iran three males collected in Muk-Pas Province at an elevation of 2,160 mm (6,500 ft) on June 15, 1941 (Petersen, 1964a, 1968).

Biology. Not known.

Moths collected from April to mid-June on stony slopes covered with scant herbaceous vegetation. To date only males have been collected. Perhaps, females are less mobile and remain somewhere near the base of plants, near the site of their emergence from pupae.

V. Tribe HAPSIFERINI Zag.

Zagulyaev, 1968a: 219; Gozmàny, 1968: 326 (Hapsiferinae); Căpuşe, 1971: 231–232; Gozmàny and Vàri, 1973: 154–155 (Hapsiferinae).

Type genus. Hapsifera Zll., 1847.

Imago. Pubescence of head short and appears yellow because of protruding broad scales. Galea not present; maxillary palpi almost completely reduced (Figure 297, A). Antennae slender, filiform, without pubescence, with broad 1st segment with crest of long bristles (Figure 297, B); antennae usually three-fourths to four-fifths length of forewing.

Thorax and tegulae uniform, with yellowish-cinnamon tones, without pattern. Span of wings 12 to 29 mm. Both pairs of wings relatively broad, with more or less rounded apices. Hind wings equal in width or slightly broader than forewings.

Forewings light-colored, from dirty white usually to matte yellowish-gray or cinnamon, without sharply developed pattern, but with three to four irregular transverse rows of scale clusters protruding above light-colored wing surface.

In forewing (Figures 7, C and 298, A) all radial veins developed and R_5 terminates on alar apex. R_{3-5}, rarely R_{4-5}, stalked. Cu_1 and Cu_2 on short stalk, rarely widely separated. Terminus of Cu_2 far removed from level of outer margin of radiocubital cell. A_1 terminates on alar margin at level of apex of radiocubital cell or slightly beyond it.

Anterior tibiae without epiphyses (Figure 299, A). Median pair of spurs of hind tibiae located beyond midpoint of tibia. Ends of tarsal segments without spines (Figures 9, C; 10, C; and 299).

391 Terminus of abdomen in males with clusters of androconial scales, in females with sacs of silken hairs (Figure 13, C).

Male genitalia. Elongated, with fairly uniform structure (Figure 300). Valvae simple, highly elongated; sclerotized cord developed and protrudes from under vinculum (Figure 15, F). Uncus consists of two narror and comparatively small free lobes. Branches of gnathos developed (Figure 16, G). Aedoeagus shorter than valvae, more or less straight, broadened at base. Tegumen very broad, massive, vinculum narrow. Saccus very short.

Female genitalia similar in structure (Figure 301). Vaginal plate with slightly isolated lobes, which fuse with membrane and are densely covered with bristles (Figure 18, A). Duct of bursa copulatrix without incrustations; bursa copulatrix with signum in form of narrow plate or rod, covered with spinules (Figure 20, G). Anterior apophyses bifurcate. Posterior apophyses included in segment VII.

Pupae (Figures 23 to 25). Length of pupae not more than 15 mm. Head without frontal process (Figure 23, A). Wing covers broad, not reaching sternite V. Armature of tergite V of abdomen as shown in Figure 24. Cremaster short, broad, with two ridges and spinescent appendages (Figure 25).

Biology. Xerophilous species associated in the Palearctic with dry steppe regions and semideserts and in the non-Palearctic with savannas. Moths emerge from autumn to beginning of summer. Larvae live in silken galleries constructed in turf, primarily feeding on grassy detritus.

Distribution (Figure 30). Range of Hapsiferini Zag. poorly studied due to lack of clarity about generic composition; hence range cannot be delineated. In the Palearctic where six species of the genus *Hapsifera* Zll. have penetrated, the range is mainly associated with arid regions. However, many members of this genus and other genera of the tribe are associated with non-Palearctic regions, primarily Ethiopian and Indo-Malayan regions. Several species are also known from South America.

Evidence on the abundance of species and genera in tropical eastern Africa with primitive morphology provides evidence on the existence of ancient centers of origin for the modern fauna of the tribe Hapsiferini.

Comparison. Broad hind wings, fairly complete venation, presence of androconial clusters at end of abdomen of males, and presence of sacs with silken fluff and signum in females, closely associate this tribe with the Myrmecozelini Zag. The latter character, moreover, indicates its definite affinity with Ateliotini Zag. All the tribes possess similar life histories, eco-biological adaptations, and food specialization.

The morphological specialization manifest in several characters, particularly in a strong reduction of mouthparts in the imago (galea and maxillary palpi), as well as a distinct simplification of the structure of valvae in males, and poor sclerotization of lobes of the vaginal plate in females, sharply distinguish Hapsiferini Zag. from other tribes of the subfamily. Thus, although phylogenetically the tribe represents a separate branch by retaining such characters as a petiolate radius and a subuncus in the male genitlia, it is nevertheless a distinct tribe among the other tribes of the subfamily Myrmecozelinae. Elevation of the tribe Hapsiferini Zag. to the status of a subfamily, as proposed by Gozmàny (1968) and Capuşe (1971) does not appear warranted. The diagnosis proposed by these authors for the subfamily on the basis of morphological characters is almost completely accommodated within the characterization of tribe Hapsiferini Zag. provided by me (Zagulyaev, 1968a). 392

This means that the diagnosis of the new subfamily is based on characters below the level of the other accepted subfamilies of Tineidae, which provides a basis for keeping the status of tribe for Hapsiferni Zag. and retaining it in the subfamily Myrmecozelinae. However, a monographic study of non-Palearctic members would, most probably, create the necessary prerequisites for separating, some groups close to Hapsiferini Zag. into independent tribes, but not those proposed by Căpuşe: Protaphreutini Căp. and Semiolonchini Căp. (Căpuşe, 1971). In the first tribe Căpuşe included three monotypic genera found in Madagascar. One of them, *Chrysocrata* Gozm., was also included by him in the tribe Hapsiferini Zag., where it really belongs. The genus *Hilaroptera* Gozm. was included by Gozmàny at the time of its description under Scardiinae, to which it is much closer on the basis of genital structure than to Myrmecozelinae. The genus *Protaphreutis* Gozm. is close to *Hapsifera* Zll. The tribe Semeolonchini Căp. is represented by a single monotypic genus, *Semeoloncha* Gozm., which is very close to *Hapsifera* Zll. and included by me in the same tribe.

The generic composition of the tribe in terms of the world fauna is not clear; hence phylogentic links within the tribe have not been examined. In the Palearctic the tribe is represented by the genus *Hapsifera* Zll. (8 species), but the majority of species of this genus (28) are from Equatorial Africa alone, and 6 species from Southeast Asia. From the fauna of non-Palearctic regions, at present only 12 genera can be included in the tribe: the ancient and primitive genus *Scalidomia* Wlsm. (8 species), *Pitharcha* Meyr. (4 species), and *Dasyses* Durr. (10 species), which genera are mainly known from tropical Africa and partly from India; the primitive genus *Tiquadra* Walk. (17 species) included 5 species from Ethiopia and 12 species from neotropical regions. The tribe Hapsiferini Zag. further includes endemic genera *Hapsiferona* Gozm. (2 species) and *Cubitofusa* Gozm. (2 species), which are found in western and eastern Equatorial Africa, as well as monotypic genera *Semeoloncha* Gozm. and *Zygosignata* Gozm., respectively from west and east Africa. The genus *Paraptica* Meyr., described from South Africa, and 3 genera from Madagascar—*Callocosmeta* Gozm., *Ancystrocheira* Gozm., and *Chrysocratha* Gozm.—are also members of the tribe Hapsiferini Zag.

The non-Palearctic genera listed in this book have not been examined, but the genus *Hapsifera* Zll., members of which are found in the Palearctic and in the territory of the Soviet Union, has been analyzed in detail.

13. Genus *Hapsifera* Zll.

Zeller, 1847a: 33; Staudinger and Rebel, 1901; II, 234; Spuler, 1910:

II, 463; Petersen, 1958: 405–406; Zagulyaev 1968a: 219–220; Gozmàny, 1968; 326; Càpuşe, 1971: 231; Gozmàny and Vàri, 1973: 161-162 — *Euplocera* Ragonot, 1895: CIV, type *E. multiguttella* Ragonot, 1895: CIV (Syria); —*Pseudohapsifera* Amsel, 1935c: 315, type *P. jerichoella* Amsel, 1935c: 316; (Palestine); —*Ptochoglyptis* Meyrick, 1938: 27, type *P. asperula* Meyrick, 1938: 27 (Congo).

Type species. Hapsifera luridella Zll., 1847.

Slender transverse streaks on the wings with clusters of scales protruding above the wing surface, place members of this genus among other Palearctic members of Myrmecozelinae.

Imago. Head covered with coarse light gray or ash-gray scales, which are directed forward so that pubescence of frons appears more or 393 less compressed, but with scales on occiput ruffled. Only two small segments discernible in maxillary palpi (Figure 297, A). Labial palpi large, project far from frons; 2nd segment almost twice (1.66) longer than 3rd segment and with dense long brush of bristles which extend almost up to apex of 3rd segment; latter narrow and slender. Antennae smooth (Figure 297, B), yellowish-cinnamon-gray; in male not covered with cilia. Frons broad, usually 1.33 to 1.50 times greater than vertical diameter of eyes.

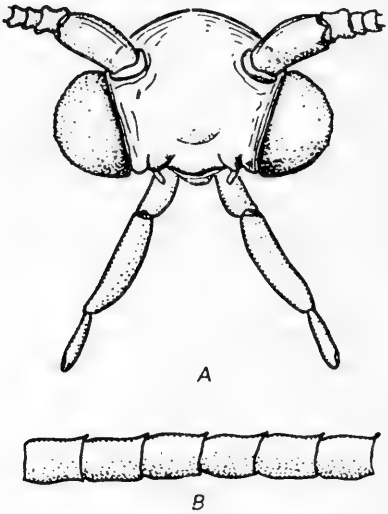


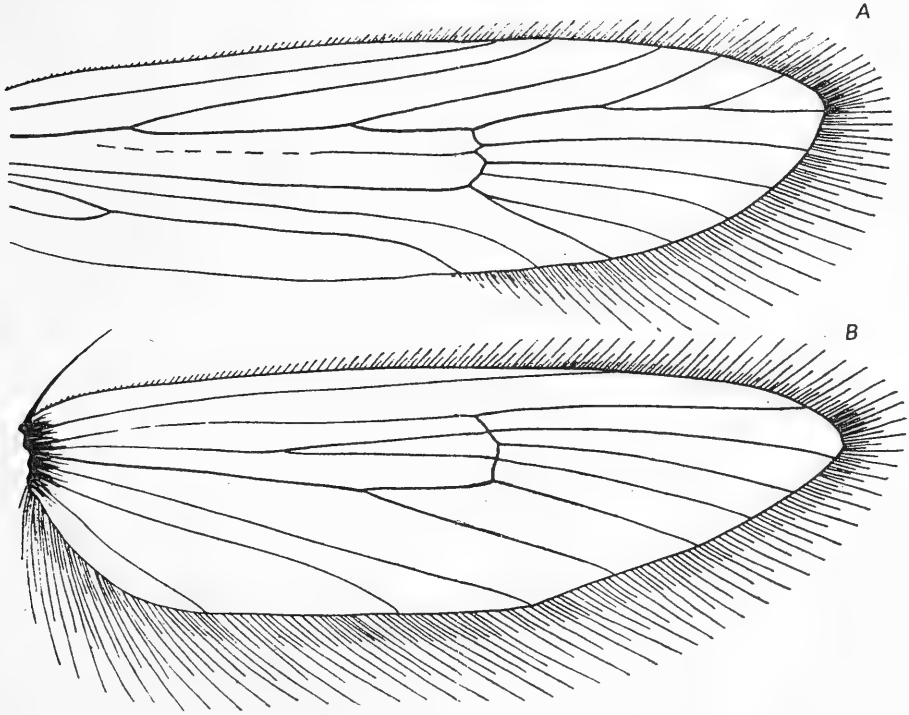
Figure 297. Head of *Hapsifera luridella* Zll.

A—general appearance; B—middle segments of antennae (high magnification).

Preparation No. 9946, male. Trans-Caucasus, Nakhichevan.

Thorax and tegulae yellowish or cinnamon with grayish tinge. Wing span in males 12 to 27 mm, in females 21 to 29 mm. Length of forewing 3.25 to 3.80 times greater than their width, of hind wings 3.0 to 3.25. Anterior margin of hind wing almost straight or slightly convex; outer margin slightly concave. Width of fringe one-half to three-fourths alar width.

Forewings may be whitish, yellowish, or light cinnamon-ash-gray with numerous dark, cinnamon-colored, minute transverse specks, particularly well developed in anterior margin. Entire surface of wing with cinnamon-colored granulation. Surface also with three to four irregular transverse rows of clusters of light-colored scales protruding above the wing, which darken on outer side to cinnamon-black. Wings of females slightly lighter in color than in males and may be light yellowish-ash-gray or dirty whitish-gray with darker elements in pattern. Hind wings yellowish-brown, cinnamon-brown, with dense granulation of darker color. Basal half of fringe similar to wings, outer half lighter in color. In some species hind wings and their fringe whitish.



394 Figure 298. Venation of wings of *Hapsifera luridella* Zll.

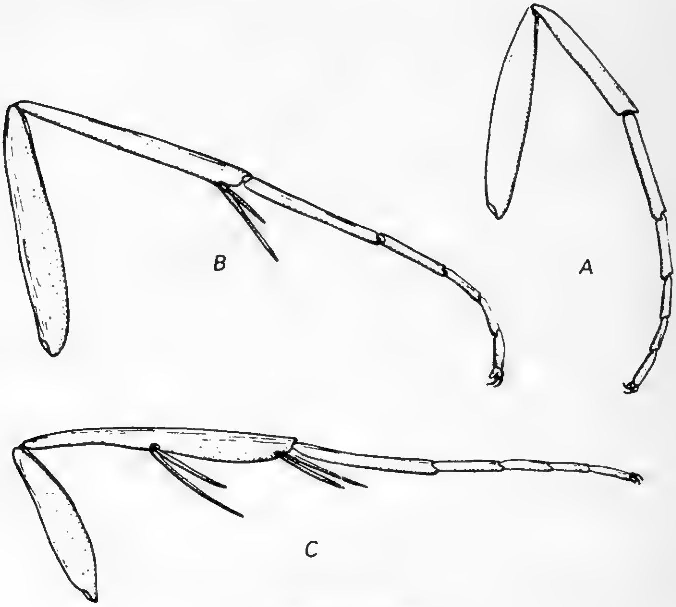
A—forewing; B—hind wing.

Preparation No. 9946, male. Trans-Caucasus, Nakhichevan.

In forewings (Figure 298, A) *Sc* terminates on alar margin at level of apex of radiocubital cell or much before it. R_5 terminates on alar apex. All three medial veins widely separated at base. Common trunk of A_{2-3} terminates on posterior margin of wing at level of outer margin of radiocubital cell or much before it. Medial trunk passing through cell well developed in most species; radial and medial cells absent.

In hind wings (Figure 298, B) *Sc* terminates on anterior margin of wing closer to alar apex or to apex of radiocubital cell. *R* terminates on anterior margin before alar apex. All three medial veins widely separated at base. A_2 terminates on alar margin almost at level of origin of Cu_2 from cell. Medial cell 1.5 to 2.0 times longer than distance between bases of Cu_1 and Cu_2.

Anterior tibia one-half to two-thirds length of femur, but longer than 1st tarsal segment (Figures 9, C and 299, A). Middle tibia equal to or significantly shorter than femur, but 1.66 times longer than 1st tarsal segment (Figures 10, C and 299, B). Hind tibia 1.5 to 2.0 times longer than femur (Figure 299, C).

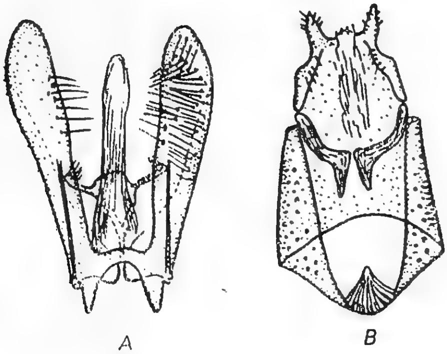


395 Figure 299. Legs.

A — foreleg of *Hapsifera luridella* Zll.; B — middle leg, same species; C—*H. maculata* Wlsm., hind leg.

394 *Male genitalia* (Figure 300). Valvae with rounded apex, without processes and lobes; apical part with dense brush of bristles. Uncus in lateral view long, with conically pointed apex; in ventral view with

widely separated pointed lobes. Branches of gnathos free, rarely connected to membrane, geniculate. Aedoeagus thick, more or less smooth, without sclerotized process, with obliquely tuncated tip. Saccus in lateral view narrow; in ventral view in form of broad triangular plate.



395 Figure 300. Male genitalia of *Hapsifera luridella* Zll.
A—valvae and aedoeagus; B—uncus, gnathos, and saccus (from Petersen, 1958).

Female genitalia (Figure 301). Lobes of vaginal plate long, without processes, and usually contingent posteriorly. Ostium bursa located under anterior margin of lobes of vaginal plate. Duct of bursa copulatrix slender and membranous. Signum of bursa copulatrix in form of slightly curved plate located in outer half of sac, giving rise to deep fold in its wall (Figure 20, G). Anterior apophyses reach first third of segment VII. Last segment of ovipositor densely pubescent, with thick bristles (Figures 20, C).

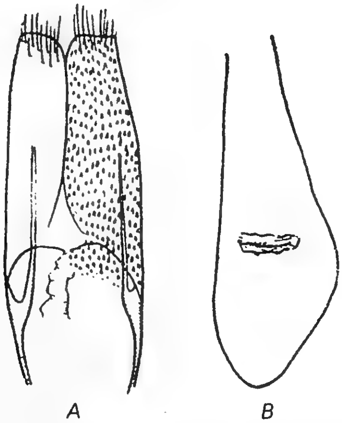


Figure 301. Female genitalia of *Hapsifera luridella* Zll.
A—region of vaginal plate; B—bursa copulatrix
(from Petersen, 1958).

Pupae. Size of pupa ranges from 12 to 15 mm. Cuticle slender, translucent, and from yellowish-cinnamon to dark cinnamon. Mesothorax deeply invaginated in metathorax (Figure 23, B). Wing covers reach alar apex. Hind legs do not reach beginning of segment VII (Figure 23, A). Abdominal tergites with rows of spinules: tergite II with
395 one posterior row of minute spinules; tergites III to VII with two rows of spines directed backward (Figure 24); tergites VIII and IX with one row of spines each. Segment X with two widely separated crests. Cremaster with biapical crests (Figure 25).

Biology. Almost all the Palearctic species of *Hapsifera* Zll. have adapted to life in sandy deserts where they congregate in concentrated areas in interridge depressions (Plate V). Others live in the submontane
396 belt or mountains, and only *H. barbata* Chr. is associated with forestless steppe regions. Moths are found from autumn to beginning of summer; only in hot dry periods (July–August) are they probably absent. Larvae live in soil in silken galleries constructed in the turf of grasses and among roots of ephemerals. Before pupation the larvae make a tunnel leading to the surface and transform its terminal part into a cylindrical cocoon (Figure 26, B).

Species produce two generations per year in Trans-Caucasus and Central Asia; in the African Mediterranean, Palestine, Arabia, and Afghanistan, they produce three to four generations per year.

The non-Palearctic members of the genus living in eastern and southern Africa are mostly associated with upland plateaus covered with savannas with a predominance of tall grasses. Others live in very sparse dry forests with an abundance of baobab, palm, tamarind, and some species of acacia. In South Africa species have been found on dry plateaus covered with turfy grasses, succulents (treelike euphorbia, aloe, acacia), lilies, and sago palms. Species described from India were found in savannas of the Deccan plateau.

The scanty information available about moth collection indicates that most were found on soil or flying among dry grass above the soil surface.

Life history of Palearctic and tropical species not studied.

Distribution (Figures 30 and 302). Range of genus in the Palearctic corresponds to the range of the tribe. Of the 40 species, 8 are known from
397 the Palearctic; in the territory of the Soviet Union only 2 species have been found (*Hapsifera luridella* Zll. and *H. barbata* Chr.), of which the former is found in southern regions of the European part, Caucasus, Kazakhstan, and Central Asia, and the latter in southern Primor'e. The entire range of the genus in the Palearctic is divided into two parts—western and eastern. The western part of the range covers the European and African Mediterranean, Asia Minor, West Asia, and Kazakhstan and Central Asia. The eastern part of the range includes southern Pri-

mor'e and Japan. Hence nearly all the Palearctic species (seven out of eight) are distributed in the territory of the Far East, which provides a basis for considering this arid region as the center of distribution of the Palearctic members of this genus.

Among the non-Palearctic regions, six species of *Hapsifera* Zll. are known from Southeast Asia, including India and Sri Lanka (4), Java (1—*H. acrogona* Meyr.), the Philippines, Luzon Island (1—*H. albescens* Diak.); from the Ethiopian region 28 species have been described, 20 from the savannas of eastern Africa, 12 from western Africa, and 5 from South Africa. Reports of species of *Hapsifera* Zll. for the Australian and American continents are not reliable.

The association of the major part of the genus with the tropical regions of Africa and Southeast Asia suggests the presence of ancient centers of origin of the genus *Hapsifera* Zll. in these territories. Penetration of individual East African elements into the Mediterranean and Indo-Malayan elements (Afghanistan and Central Asia) and into Japan and Primor'e created the prerequisites for the formation of centers for non-Palearctic members of this genus.

Comparison. In the forewings R_3, R_4, and R_5 stalked; Cu_1 and Cu_2 in many species stalked and only rarely are these veins widely separated; radial cell absent. On the basis of characters of the male genitalia such as broad tegumen, bilobed uncus, vinculum which narrows toward ventral side, short saccus, geniculate branches of gnathos, simple valvae without processes, connected at base with sclerotized cords that extend from base to midpoint or apex of valva, one can deduce the phylogenetic affinity of this genus with some tropical genera, mainly known from Equatorial and South Africa —*Dasyses* Durr., *Scalidomia* Wlsm., *Pitharcha* Meyr., etc. In the course of detailed studies of these genera some might possibly prove synonyms of *Hapsifera* Zll.

The great intraspecific variability in wingspan and coloration of some Palearctic species led to the erroneous description of several new species, as a result of which the total number of species in the Palearctic reached 14. The revision by Petersen (1958) established that most of the species described recently do not differ in any way from *H. luridella* Zll., which is widely distributed and varies notably not only in color and venation, but also in genital structure.

An analysis of the Palearctic species of this genus and a comparison of several specimens revealed that only six species can to any extent be reliably recognized by structural peculiarities and easily distinguished from each other: *H. luridella* Zll., *H. eburnea* Btl., *H. puncata* Pet., *H. maculata* Wlsm., *H. multiguttella* Rag., and *H. barbata* Chr. Probably two other species should be added: *H. baliopsamma* Meyr. and *H. asiatica* Ams. However, until a study of their type specimens,the question of the species status of the last two remains open.

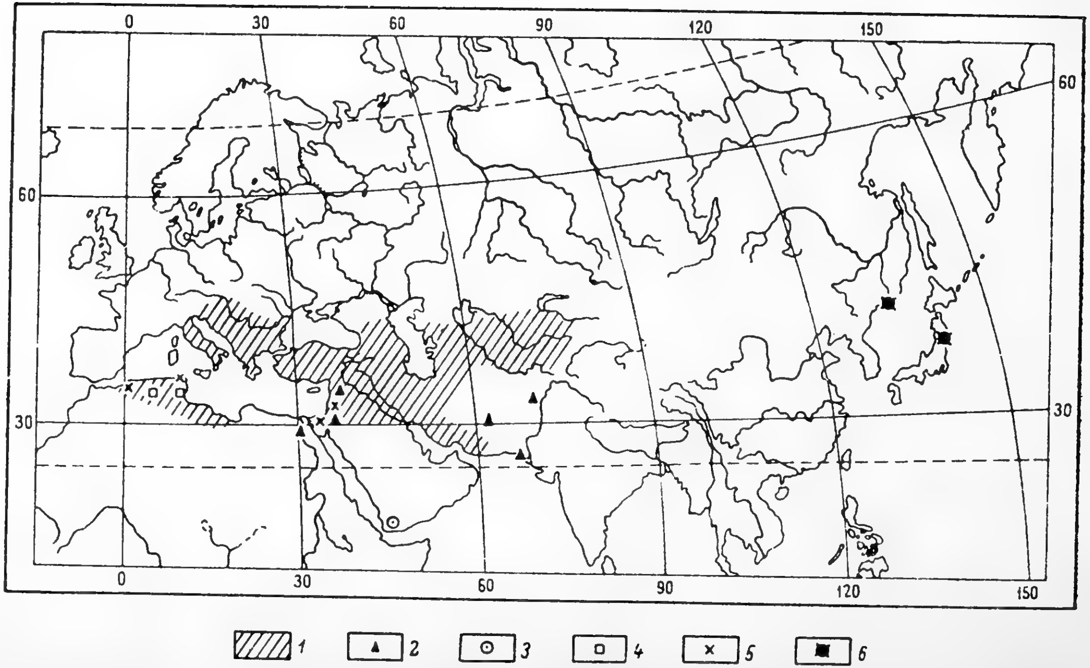


Figure 302. Distribution of species of *Hapsifera* Zll.

1—*H. luridella* Zll.; 2—*H. eburnea* Btl.; 3—*H. punctata* Pet.; 4—*H. maculata* Wlsm.; 5—*H. multiguttella* Rag.; 6—*H. barbata* Chr.

Hence I have included in the genus *Hapsifera* Zll. six of the eight species living in the Palearctic. The 34 species known from non-398 Palearctic regions have not been examined. Possibly some of the tropical species occur in the southern regions of the Palearctic.

The phylogenetic relationships of these six species are depicted in Figure 303. On the basis of wing venation and partly genital structure, the Palearctic species of the genus form two groups which, however, cannot be assigned the status of subgenus due to inadequate study of the type material. The first group includes *H. luridella* Zll. and *H. eburnea* Btl. They are combined into one group by venational peculiarities of the forewing (*Sc* terminates on anterior margin at level of apex of radiocubital cell; Cu_1 and Cu_2 stalked or, rarely, connate). Characters of venation permit one to separate the remaining four species into another group. In general appearance, wing pattern and genital structure, the species *H. punctata* Pet., *H. maculata* Wlsm., and *H. multiguttella* Rag. are close to each other. *H. barbata* Chr., although close to these three species, represents a different branch which has retained several archaic characters such as very long labial palpi and a sclerotized band between the dorsal branches of the anterior apophyses in the female genitalia. These peculiarities allow one to consider *H. barbata* Chr. as the most primitive of the Palearctic species.

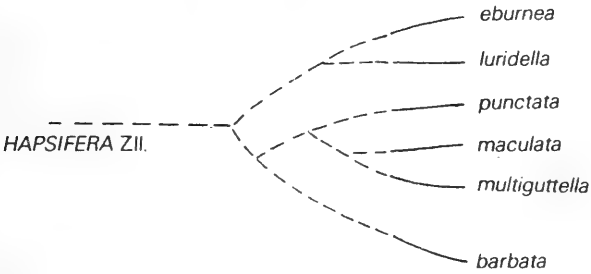


Figure 303. Phylogentic relations of the species of the genus *Hapsifera* Zll.

Key to Species of Genus Hapsifera Zll. *on the Basis of External Characters*[36]

1 (4). In forewings *Sc* terminates on anterior margin of wing at level of apex of radiocubital cell.

2 (3). In forewings M_3 closer to M_2 than to Cu_1, and common stalk of A_{2-3} terminates on alar margin proximal to level of outer margin of radiocubital cell; in hind wings distance between bases of *R*

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[36] External characters of *H. punctata* Pet. and *H. barbata* Chr. have been insufficiently studied and hence these species are not included in the key.

and M_1 one-sixth distance between Cu_1 and Cu_2, and A_2 terminates on alar margin at level of origin of Cu_2 from radiocubital cell. .... 1. **H. luridella** Zll.

3 (2). In forewings M_3 equidistant from M_2 and Cu_1, and common stalk of $A_{2\ 3}$ terminates on alar margin at level of outer margin of radiocubital cell; in hind wings distance between bases of R 399 and M_1 two-sevenths to one-third distance between bases of Cu_1 and Cu_2, and A_2 terminates on alar margin near to level of origin of Cu_2 from radiocubital cell.. .... 2. **H. eburnea** Btl.

4 (1). In forewings Sc terminates on anterior margin of wing near to level of apex of radiocubital cell.

5 (6). In forewings terminus of R_1 insignificantly (less than 1.5 times) closer to R_2 than to Sc. In hind legs 1st tarsal segment longer than distance between spurs of tibia. .... 4. **H. maculata** Wlsm.

6 (5). In forewings terminus of R_1 two to three times closer to R_2 than to Sc. In hind legs 1st tarsal segment equal to distance between spurs of tibia. .... 5. **H. multiguttella** Rag.

Key to Species of Genus Hapsifera Zll. *on the Basis of Male Genitalia*[37]

1 (4). Aedoeagus shorter than tergal margin of tegumen and uncus.

2 (3). Branches of gnathos in ventral view geniculate with formation of broad heel; small tubercle present between lobes of uncus; costal margin of valvae straight. .... 1. **H. luridella** Zll.

3 (2). Branches of gnathos in ventral view straight, narrow, without heel; tubercle not present between lobes of uncus; costal margin of valvae with projection in middle .... 3. **H. punctata** Pet.

4 (1). Aedoeagus longer than tergal margin of tegumen and uncus.

5 (6). Apex of branches of gnathos in lateral view directed outward .... 4. **H. maculata** Wlsm.

6 (5). Apex of branches of gnathos in lateral view directed inward, into genitalia.

7 (8). Branches of gnathos in ventral view wedge-shaped, in lateral view with rounded apex; saccus in ventral view with broad flat terminus. .... 5. **H. multiguttella** Rag.

8 (7). Branches of gnathos in ventral view narrow and long, in lateral

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[37] Male of *H. barbata* Chr. not known. Females not known for half of the species and hence an identification key on the basis of female genitalia is not possible.

view with wedge-shaped apex; saccus in ventral view with geniculate, pointed end. .... 2. **H. eburnea** Btl.

1. **Hapsifera luridella** Zll. (Figures 2; 7, C; 13, C; 15, F; 16, D, G; 18, A; 20, C, G; 23–25; 26, B; 297; 298; 299, A, B; 300–307; Plate VI, *6*)

Zeller, 1847a: 34; Herrich-Schäffer, 1853–1855; V, 82; Stainton, 1867: 59; Staudinger, 1880: 270; Ragonot, 1895: XCVI; Staudinger and Rebel, 1901: II, 234; Spuler, 1910: II, 463; Caradja, 1920: 166–167; Gerasimov, 1930: 45; Amsel, 1935b: 237; 1949: Tab. 10, Fig. 71; Petersen, 1958: 406–408; Amsel, 1959a: 72–73; Gozmàny, 1959: 351; Petersen, 1959b: 558–559; 1962: 205; 1963c: 179; Parenti, 1965: 314; 1966: 292; Căpuşe and Gogov, 1966: 81; Petersen, 1966: 28, 29; Soffner, 1967: 120; Klimesch, 1968: 186; Petersen, 1968: 65; Mirzayans and Kalali, 1970: 21; Petersen, 1971: 271; 1973: 68, 69.

External characters of imago. Pubescence of head yellowish-ash-gray with isolated clusters of dark cinnamon scales on occiput (Figure 2). Labial palpi directed straight forward, only last segment slightly raised upward. Palpi ash-gray with isolated dark cinnamon scales. 400 Antennae yellowish-gray, only basal segment with isolated cinnamon scales. Structure of head and its appendages as shown in Figure 297.

Thorax and tegulae light cinnamon-ash-gray with cinnamon-black scales. Span of forewings in males 18 to 27 mm, in females 21 to 29 mm. Length of forewings 3.75 times, of hind wings 3.0 times their width; fringe of hind wings half alar width.

Forewings of males (Figure 304; Plate VI, *6*) yellowish-ash-gray, light cinnamon-gray, with six to seven protruding clusters of scales; first cluster at alar base, second at one-fourth, third and fourth one below the other at one-third, fifth and sixth at apex of radiocubital cell, and seventh near alar apex. Hind wings, especially their fringe, on upper and lower sides dark cinnamon-gray. Color of females yellowish-gray with brownish tinge, with longer protruding clusters of scales on forewings.

In forewing (Figure 298, A) Sc terminates on anterior margin at level of apex of radiocubital cell. Terminus of R_1 almost twice closer to Sc than to R_2. In most specimens R_3, R_4, and R_5 stalked. Base of M_3 closer to M_2 than to Cu_1. Cu_1 and Cu_2 usually located on short stalk, rarely connate. In hind wing (Figure 298, B) distance between bases of R and M_1 one-sixth distance between Cu_1 and Cu_2.

Legs yellowish-gray. In hind legs 1st tarsal segment shorter than distances between spurs of tibia. Structure of legs as shown in Figure 299, A–B.

401 Abdomen yellowish-ash-gray.

Male genitalia (Figures 300 and 305, A). Genitalia in lateral view

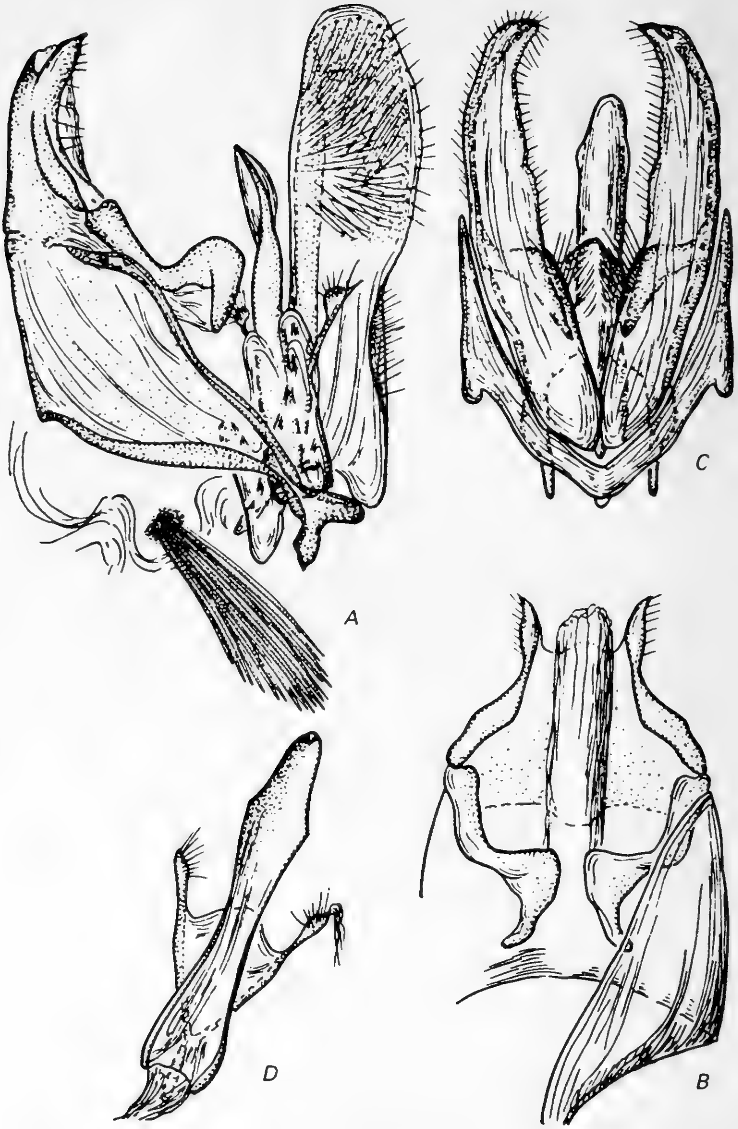
Figure 304. *Hapsifera luridella* Zll., male (drawn by T.A. Temkina.)

broad; distance between dorsal margin of tegumen and saccus equal to length of aedoeagus; dorsal margin of uncus and tegumen straight. Lower margin of valvae, anterior to midpoint, with small membrane; sclerotized cord broad, reaches apex of valva. Lobes of uncus long and slender, in ventral view with small tubercle located between them (Fig-
402 ure 305, B). Branches of gnathos in lateral view broad, in ventral view with elongated, narrow termina (Figure 305, B). Aedoeagus shorter than tergal margin of tegumen and uncus (Figure 305, D). Saccus in ventral view with wedge-shaped end (Figure 305, C). Lower margin of vinculum in lateral view arcuate anterior to tegumen.

Female genitalia (Figures 18, A; 20, G; 306; and 307). Lobes of vaginal plate as well as membrane around ostium bursa covered with minute spinules (Figure 307, A). Ostium bursa and terminal end of duct of bursa copulatrix not sclerotized (Figure 18, A). Abdominal branch of anterior apophyses poorly developed; dorsal branch straight and reaches midpoint of lobes (Figure 307, B). Signum in bursa copulatrix located transversely in bursa (Figure 20, G).

Pupae (Figures 23 to 25). Pupal shell slender, but strong, brownish-cinnamon; size of pupae 12 to 15 mm. Entire body covered with bristles, the arrangement of which can be used for identification. Structure of spinules on tergites variable (Figure 24, A–C): spinules of upper row in form of elongated cylinders with pointed, slightly bent apices; spinules of lower row short and in form of broad cylinders with flattened triangular apices. Sexual dimorphism well developed. Thus, pupae of female distinguished not only by larger size and short antennae, but also by smaller spinules on abdominal tergites (Figure 25, C–D). Male genital pore located near posterior margin of sternite IX, bordered by two well-developed ovate swellings. Female genital pore located near posterior margin of sternite VIII, surrounded by folds, grooves, and wrinkles of sternite IX. Opening of ovipositor located on border of sternites IX and X with two small spongy tubercles on either side. Crests and spines better developed on cremaster of males.

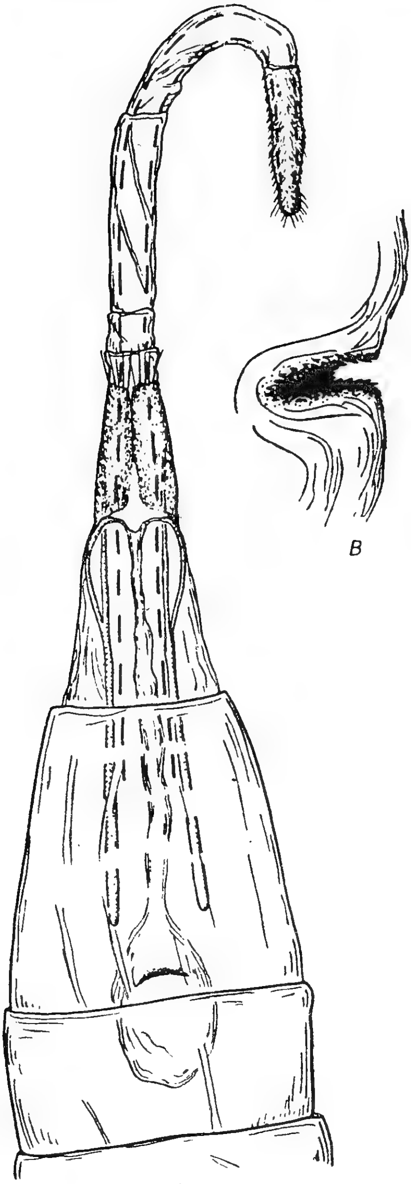
403 *Comparison.* The notable variability in size, color, venation (especially in forewings), and extensive range of *H. luridella* Zll. (from Tunisia through the Balkans and Asia Minor up to Caucasus, into Central Asia and Afghanistan) served as the basis for separating a group of atypical specimens from several others. However, on analysis of an extensive series of *H. luridella* from every single region and from different geographic localities revealed the absence of any relation between morphological changes and geographic regions. For example, in one region specimens with R_3, R_4, and R_5 stalked in forewing were found together with specimens in which these veins originate independently from the cell. This demonstrates the insufficient basis for separating part of the population into a new species.



401 Figure 305. Male genitalia of *Hapsifera luridella* Zll.

A—general appearance (lateral view); B—uncus and gnathos (ventral view); C—valvae and saccus (ventral view); D—aedoeagus (ventral view).

Preparation No. 9946, male. Trans-Caucasus, Nakhichevan.



402 Figure 306. Female genitalia of *Hapsifera luridella* Zll.

A—general appearance; B—signum in bursa copulatrix (lateral view, high magnification).

Preparation No. 11170, female. Caucasus, Lagodekhi.

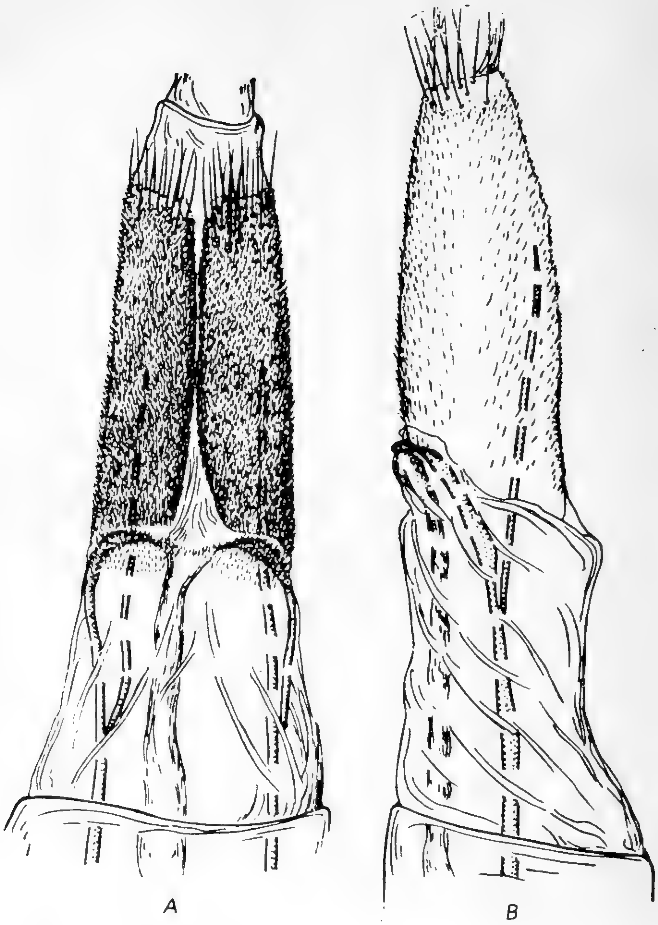


Figure 307. Region of vaginal plate of *Hapsifera luridella* Zll.

A—ventral view; B—lateral view.

Preparation No. 11170, female. Caucasus, Lagodekhi.

This species is close to *H. eburnea* Btl., but it can be readily distinguished by venational peculiarities: in hind wings the distance between bases of *R* and M_1 one-sixth distance between Cu_1 and Cu_2. Furthermore, in the male genitalia the sclerotized cord of the valva is 404 broad and extends up to the apex of the valva; the aedoeagus is shorter than tergal margin of tegumen and uncus. In the female genitalia the dorsal branches of anterior apophyses are straight and reach midpoint of lobes of vaginal plate.

Distribution. Caucasus and Trans-Caucasus, Kazakhstan, Uzbekistan, and other regions in southeastern Central Asia, as well as Italy, the Balkans, Asia Minor, West Asia, and northern Africa (Figure 302).

In literature, reported from central Italy (Parenti, 1965); Yugoslavia, Bulgaria (Căpuşe and Gogov, 1966; Klimesch, 1968); Islands of Crete and Cyprus (Petersen, 1962); Morocco and Tunisia (Petersen, 1958; Parenti, 1965); Libya (Parenti, 1966); Turkey, Lebanon, Syria, Israel, and Jordan (Petersen, 1958, 1968); Iran (Amsel, 1959a; Petersen, 1966, 1971); Iraq (Petersen, 1958); Afghanistan (Petersen, 1963c; 1973).

Material examined. 115 males and 31 females.

Georgia. Lagodekhi, one male (Mlokosevich), three males and one female June 1, 1961 (Zagulyaev); Chachuny, two males May 21, 1896 (Mlokosevich); El'dari, two males May 4, 1882 (Mlokosevich), three males May 9, 1961 (Zagulyaev); El'dari (Eiljar) one male June 25, 1896; Vashlovani, one male April 30, 1970, on light (Zagulyaev).

Armenia. Artashat, three males May 9, 17, and 28, 1955, at light (Zagulyaev).

Azerbaidzhan. Kirovabad region (Helendorf), three males (Christoph); Baku, Bil'gya three males May 30, 1964, at light (Zagulyaev); Nakhichevan, Dzhargy, two males and one female May 10, 1955, at sunset, and one male May 16, 1957, at light (Zagulyaev); Ordubad, one male May 30, 1881 (Christoph).

South Kazakhstan. Yangi-yul (St. Golodnaya Steppe), one male April 30, one female May 12, 1903 (Yakoysor); Serily demarcated area, one male June 8, 1957 (Ler); Karatau Range, 40 km east of Turkestan, one male May 28, 1966, on light (Pastukhov).

Central Asia. Russian Turkestan, one male between April 24 and May 14, 1870 (Ershov) and 1 male (Grum-Grzhimailo).

Uzbekistan. Region between Dzhingil'da and Aznek, five males between April 28 and May 8, 1965 (Zabello and Fal'kovich); one male May 11, 1967 (Fal'kovich); Nurata, one female May 20, 1966 (Pastukhov); Kammashi, three males May 16, 1931 (Gerasinov); Samarkand, three males between May 8 and 23, 1892 (Herz); 35 km west of Ursat'evskaya st., two males May 18, 1957; Termez, one male April 21, 1913 (Kirichenko).

Tadzhikistan. 43 km south of Gusar, two males and two females between April 6 and 16; five males and four females April 30; three males and two females May 1; 53 males and 16 females between May 5 and 13, 1926 (Gerasimov).

Turkey, one male (collection of Staudinger), one male (collection of Wocke); Kazikoporan, two males June 29, 1896 (Kenig); Brussa, one male in June, 1851 (Mann; collection of Wocke).

Iran (Persia), one male May 4, 1904 (Zarudnyi).

Mesopotamia. Baksak, one male and two females March 17, 1914 (Nesterov).

Biology. Semidesert and desert xerophilous species.

Moths emerge from March to end of June and August–September.

They usually fly (mostly males) at sunset low above the grass. Instances of moths flying to light are known, and that too in the early hours of the night. In Trans-Caucasus in the steppe region near Lagodekhi a few males were collected by me on May 9 at sunset, which were flying above the grass, and one male was caught in the Shirakskaya steppe on the evening of June 25. In Armenia, near Atashat, three males were attracted to light from May 9 to 28. In Azerbaidzhan, in Bil'gya in Baku, three males flew to light on May 30; the location was a sun-burnt wormwood steppe. In Uzbekistan on the southeastern slope of Kul'juktu, region between Dzhingil'da and Aznek, five males were caught from April 28 to May 8 in an argillaceous desert covered with *Astragalus* and ephemerals.

In western Tadzhikistan in the desert steppe south of Jusar, A.M. Gerasimov collected 66 males and 24 females between April 6 and May 30 (Gerasimov, 1930). In Libya one male was collected in April, one male May 17, and one male June 17 (Petersen, 1966). In Syria, Damascus region, one male was caught May 17–18, and one female June 6–7, and in Lebanon, Beirut region, six females May 11 (Petersen, 1968). In Bulgaria moths were collected at the end of May (Soffner, 1967) and in Jordan, in the valley of Jordan River, also in May and on August 2 (Petersen, 1958). In Iran, 80 km west of Teheran, one male was found 405 by Kasy June 2 (Petersen, 1971), and in Salehabad region moths were found on April 4. In Fars Province, six males and one female were found at an elevation of 1,000 m in March; moths were also collected in Baluchistan at an elevation of 1,800 m (Petersen, 1966). In Iraq, Baghdad region, moths were caught March 24 and April 2 to 13 (Amsel, 1959a). In eastern Afghanistan, Sarobi region, moths were found in wormwood steppes on May 7 to 10, June 27, August 23, and September 2 to 5 at an elevation of 1,200 to 1,600 m (Petersen, 1959b) and at 1,800 m on July 12 to 17 (Petersen, 1973).

The female probably lays about 300 eggs. The one I collected in Dzhagry region on May 10, 1955 laid 120 eggs; on dissection about 180 more were found inside the abdomen.

Larvae live in silken tubular galleries constructed in the turf of perennial plants. Often, after completing development in loose ground, the larva makes a tubular structure on the surface in the form of a small protruding cylinder, up to 5.0 cm long. Pupation takes place in a cylindrical cocoon (Figure 26, B) in the tube itself, or in a lateral branch.

This species possibly produces two generations per year.

2. **Hapsifera eburnea** Btl. (Figures 302; 303; 308; 309)

Butler, 1881: 623–624; Spuler, 1910: II, 463; Caradja, 1920: 167; Petersen, 1958: 408–409; 1959b: 559; 1963c: 179; 1964a: 112; 1968: 65;

—*palestinensis* Rebel, 1901: 179; Staudinger and Rebel, 1901: II, 234; Rebel, 1912: 91; Caradja, 1920: 167.

External characters of imago. Color of pubescence on head and structure of its appendages similar to those of *H. luridella* Zll. Antennae yellowish-gray.

Thorax and tegulae yellowish-ash-gray. Span of forewings in males 21 to 22 mm, in females 23 to 26 mm. Length of forewings 3.75 times, of hind wings 3.25 to 3.33 times their width; fringe of hind wings about half alar width.

Forewings whitish, their central and outer parts cream-white with dark cinnamon spots. Two to three spots located on anal fold, in addition to one spot in middle of cell and one between cell and alar apex. Clusters of scales more distinctly developed in male. Fringe in middle and near apex with dark speckles. Hind wing whitish-gray with pearly luster; fringe ash-gray. Under surface of all wings dirty white with golden luster.

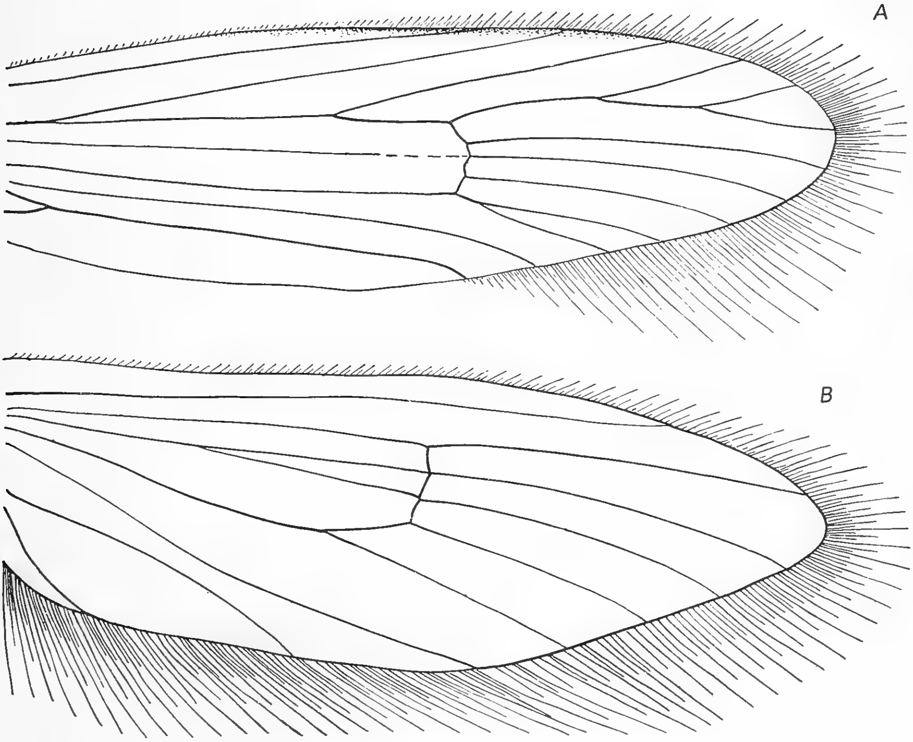


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Figure 308. Venation of wings of *Hapsifera eburnea* Btl.

A—forewing; B—hind wing.

Preparation No. 61, male. Palestine (collection of Caradja, Bucharest).

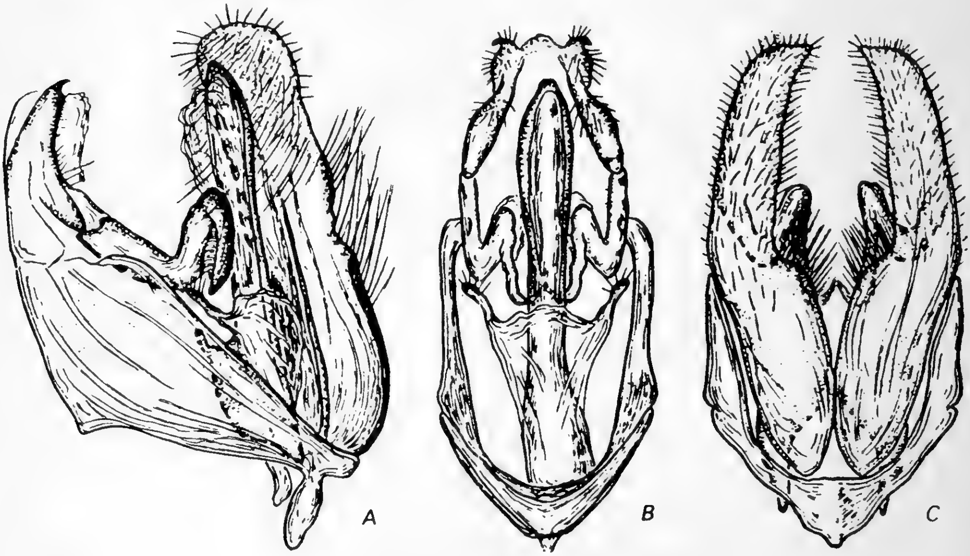
In forewing (Figure 308, A) Sc terminates on anterior margin at level of apex of radiocubital cell. Terminus of R_1 equidistant from Sc and R_2. R_3, R_4, and R_5 stalked; in some specimens R_4 located near alar apex or may even totally disappear. Base of M_3 equidistant from M_2 and Cu_1. Cu_1 and Cu_2 located on short stalk or connate. In hind wing (Figure 308, b) distance between bases of R and M_1 two-sevenths to one-third distance between Cu_1 and Cu_2.

Legs grayish with yellowish tinge. In hind legs 1st tarsal segment about equal to distance between spurs of tibia.

Abdomen dirty white.

Male genitalia (Figure 309, A). Genitalia in lateral view broad; distance between dorsal margin of tegumen and saccus two-thirds length of aedoeagus; dorsal margin of uncus and tegumen almost straight. Lower margin of valvae without doublure; sclerotized cord narrow, continues beyond midpoint of valvae. Lobes of uncus falcate, pointed at apex; in ventral view small tubercle visible between them and falcate apices projects rather sharply (Figure 309, B). Branches of gnathos in lateral view broad; in ventral view branches of lobes slender and pointed. 406 Aedoeagus longer than tergal margin of tegumen and uncus. Saccus in ventral view with wedge-shaped, pointed end (Figure 309, C). Lower margin of vinculum in lateral view almost straight or slightly curved, broad.

Female genitalia. Not known.



407 Figure 309. Male genitalia of *Hapsifera eburnea* Btl.

A—general appearance (lateral view); B—uncus and gnathos (ventral view); C—valvae and saccus (ventral view).

Preparation No. 61, male. Palestine (collection of Caradja, Bucharest).

Comparison. In general appearance close to *H. luridella* Zll., but differs in light whitish coloration, especially of hind wings. However, some specimens from Jerusalam have dark hind wings and only light-colored fringe.

Rebel (1901) in his description of *H. palaestinensis* Rbl. reported the capture of two specimens (male and female), which were labeled "Iordanthal, Mai 1897". I examined one male from the collection of Wocke, with a square yellow label, bordered in black, with the inscription "Palaest. 97. Stgr." Its light coloration, particularly the whitish hind wings and fringe completely accord with the description of *H. palaestinensis* Rbl., and thereby differ in coloration, as well as and structure, from *H. luridella* Zll. At the same time this specimen is almost identical with *H. eburnea* Btl., as a result of which *H. palaestinensis* Rbl. should be considered a synonym of *H. eburnea* Btl.

Petersen (1958, 1963c), after studying the notable variability in size and color of *H. luridella* Zll., concluded that *H. eburnea* Btl. is a color variant of *H. luridella* Zll.

In studying the venation and structure of genitalia of both species, I found significant differences. Thus the species under examination
407 differs from *H. luridella* Zll. in the following respects: distance between bases of R and M_1 of hind wings two-sevenths to one-third distance between Cu_1 and Cu_2; in male genitalia aedoeagus longer than tergal margin of tegumen and uncus, branches of gnathos in ventral view longer, etc. All these peculiarities indicate the status of *H. eburnea* Btl. as a distinct species.

Distribution. Lower Egypt, West Asia (Syria, Israel, Afghanistan, and Pakistan) (Figure 302).

In literature, reported from lower Egypt, Alexandria region (Rebel, 1912); Syria, Israel (Petersen, 1968); Jordan (Palestine) (Caradja, 1920); Afghanistan, Registan (Darweshan, Registan-Wuste) and Sarobi (Petersen, 1963c); Pakistan, Karachi region (Butler, 1881; Petersen, 1964a).

Material examined. 3 males.

Jordan (Palestine), one male in 1897 (collection of Wocke); valley of Jordan River (Iordanthal), two males in 1902 (collection of Caradja, Bucharest).

The occurrence of *H. eburnea* within the limits of the Soviet Union is quite possible, primarily in the southern regions of Central Asia.

Biology. Xerophilous desert species.

Moths were found from the end of April to May and in August–September.

In Alexandria region (Egypt) moths were collected on March 20, in April and on October 29 (Rebel, 1912). In Syria, Damascus region, two males and two females were collected May 21, 1961 (Petersen, 1968). In

Jordan (Palestine), region of the Dead Sea, moths were collected in March, May and beginning of August, 1897 and 1898 (Petersen, 1958). In southwestern Afghanistan, in the Registan desert, moths were found at an altitude of 500 m May 18, 1957 (Petersen, 1959b); southeast, near Sarobi, they were collected May 7 to 10 and September 2 to 5, 1961; in the spurs of Hindu Kush, valley of Arghandab River, and south in Darweshan, Registan desert, moths were found on May 20 and 24 (Petersen, 1963c). In Pakistan, near Karachi, moths were collected between February 23 and March 9, 1961 (Petersen, 1964a) and in July (Butler, 1881).

408 Larvae probably develop in silken galleries constructed in the turf of perennial plants.

In most regions this species produces two generations per year, and in southern Pakistan possibly three.

Life history of larvae not known.

3. **Hapsifera punctata** Pet. (Figures 302; 303; 310)

Petersen, 1961a: 63–64.

External characters of imago. Wingspan in males 18 to 19 mm. Forewings and fringe light ocher, speckled with cinnamon dots. Elevated clusters of scales not sharply developed. Hind wings lighter in color than forewings, lustrous, their fringe straw-yellow.

Male genitalia (Figure 310). Costal margin of valvae in middle with projection; lower margin with large doublure near base; sclerotized cord narrow and reaches midpoint of valvae. Lobes of uncus short, tubercle not present between them. Branches of gnathos in ventral view narrow, almost straight, slender, and pointed at end. Aedoeagus shorter than tergal margin of tegumen and uncus, broad throughout length, and anchor-shaped at tip. Anellus with bifurcate, highly sclerotized structure, and short lateral cords, which continue toward valvae. Vinculum in lateral view narrow; in ventral view with flat, obtuse, and short saccus.

Female. Not known.

Comparison. In general appearance and structure of genitalia this species is close to *H. maculata* Wlsm. and *H. multiguttella* Rag., but readily distinguished from both by light coloration and indistinctly developed elevated scales on forewings, as well as presence of projection on costal margin of valvae and long slender branches of gnathos.

No specimens examined by me.

Distribution. Yemen. Two males were found in the region of Huqqa, 12 miles north of San', January 31, 1938 (Petersen, 1961a) (Figure 302).

Biology. Not known.

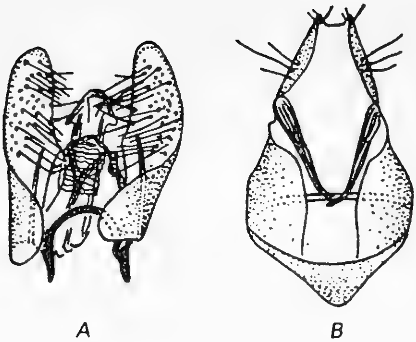


Figure 310. Male genitalia of *Hapsifera punctata* Pet.

A—valvae and aedoeagus (ventral view); B—uncus, gnathos, and saccus (ventral view) (from Petersen, 1961a).

4. **Hapsifera maculata** Wlsm. (Figures 8, C; 9, C; 10, C; 299, C; 302; 303; 311; 312)

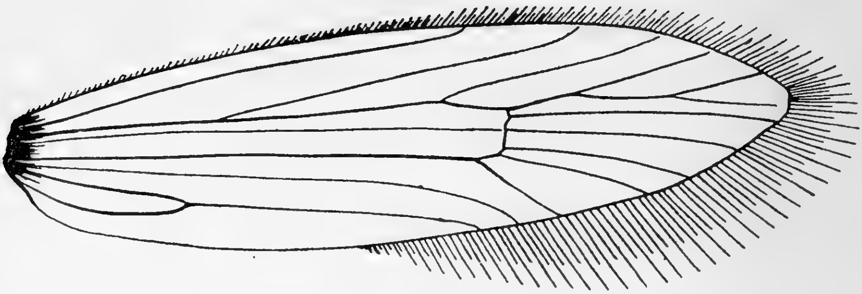
Walsingham, 1907a: 187–188 (*Euplocera*); Petersen, 1958: 412–413; 1961a: 64; 1968: 65.

External characters of imago. Pubescence of head more or less yellowish-gray, pale ocher, with brownish granulation. Labial palpi light brownish; basal half of 3rd segment lighter in color, and near apex blackish. Antennae dirty yellow or pale ocher.

Thorax and tegulae yellowish-ash-gray with brownish scales. Wingspan in males 14 to 15 mm. Length of forewings 3.75 times, of hind wings 3.25 times their width. Fringe of hind wing three-fifths width of wing.

Forewings light yellowish-ash-gray, pale ocher, granulated with dark cinnamon scales, forming spots of different shapes and sizes. Along anterior margin six to seven longitudinal streaks located. Diffused ring of dark scales located in middle of wing and spots seen at apex of radiocubital cell. Large dark spots located near alar apex. Near inner margin, about two-fifths its length, concentration of dark scales occurs. Fringe lighter in color than basic background of wing. Clusters of elevated scales on wing developed very poorly or absent. Hind wings ash-gray with ocherous tinge and golden sheen. Fringe yellowish-ash-gray with yellow luster. Under surface of all wings yellowish-gray.

In forewing (Figure 311) *Sc* terminates on anterior margin proximal to level of apex of radiocubital cell. Terminus of R_1 slightly closer to R_2 than to *Sc*. Branches of R_3, R_4 and R_5 stalked. Base of M_3 closer to Cu_1 than to M_2. Cu_1 and Cu_2 widely separated at base. A_1 terminates on



409 Figure 311. Venation of forewing of *Hapsifera maculata* Wlsm. Preparation No. 152, male. Biskra (collection of Caradja, Bucharest).

alar margin at level of outer margin of radiocubital cell. In hind wing (Figure 8, C) distance between bases of R and M_1 one-fifth to one-fourth distance between Cu_1 and Cu_2.

Legs pale ocher. In hind legs 1st tarsal segment longer than distance between spurs of tibia. Structure and armature of legs as shown in Figures 9, C; 10, C; and 299, C.

Abdomen pale ocher with denser gray granulation on dorsal surface.

Male genitalia (Figure 312, A). In lateral view genitalia broad; distance between dorsal margin of tegumen and saccus less than length of aedoeagus; dorsal margin of uncus and tegumen almost straight. Lower margin of valvae anterior to midpoint with projection; sclerotized cord of valvae narrow and reaches midpoint of valvae. Lobes of uncus slender; in ventral view small tubercle discernible between them (Figure 312, B). Branches of gnathos narrow, pointed, their apex directed outward. Aedoeagus longer than tergal margin of tegumen and uncus. Saccus in ventral view with wedge-shaped, pointed end (in Figure 312, B, end twisted). Lower margin of vinculum in lateral view more or less straight anterior to tegumen.

Female. Not known.

Comparison. This species is close to *H. punctata* Pet., but differs 410 from it and all other species of the genus in an almost complete absence of protruding clusters of scales on the forewings and wide-set Cu_1 and Cu_2, as well as structure of legs: tibiae of anterior legs half length of femora. In male genitalia aedoeagus longer than tergal margin of tegumen and uncus; apex of branches of gnathos in lateral view directed outward.

Petersen (1968) considers this species a synonym of *H. multiguttella* Rag. However, the structural peculiarities of the external characters and genitalia listed by me permit not only a distinction between these species, but also provide a basis for accepting *H. maculata* Wlsm. as a

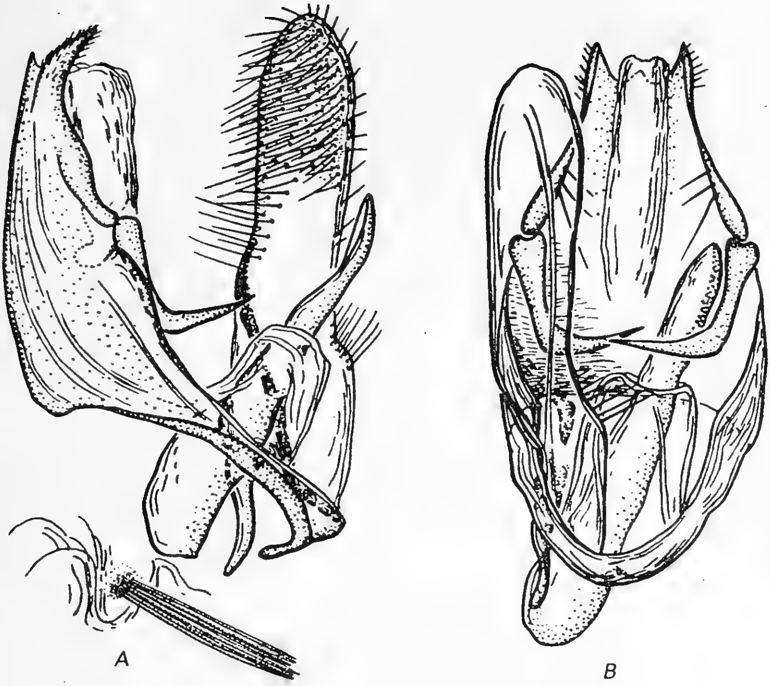


Figure 312. Male genitalia of *Hapsifera maculata* Wlsm.

A—lateral view; B—ventral view.

Preparation No. 152, male. Biskra (collection of Caradja, Bucharest).

distinct species. Studies of the intraspecific variability of both species will eventually decide the question of their validity.

Distribution. Algeria, Tunisia (Figure 302).

Type and two males were found in Algeria: El-Kantara, May 25, 1903 (Walsingham, 1907a).

Material examined. 2 males.

Algeria. Biskra, one male May 13, 1907 (Chrétien).

Tunisia. Gafsa, one male.

Both of the males examined are in the collection of Caradja in Bucharest.

Biology. Not known.

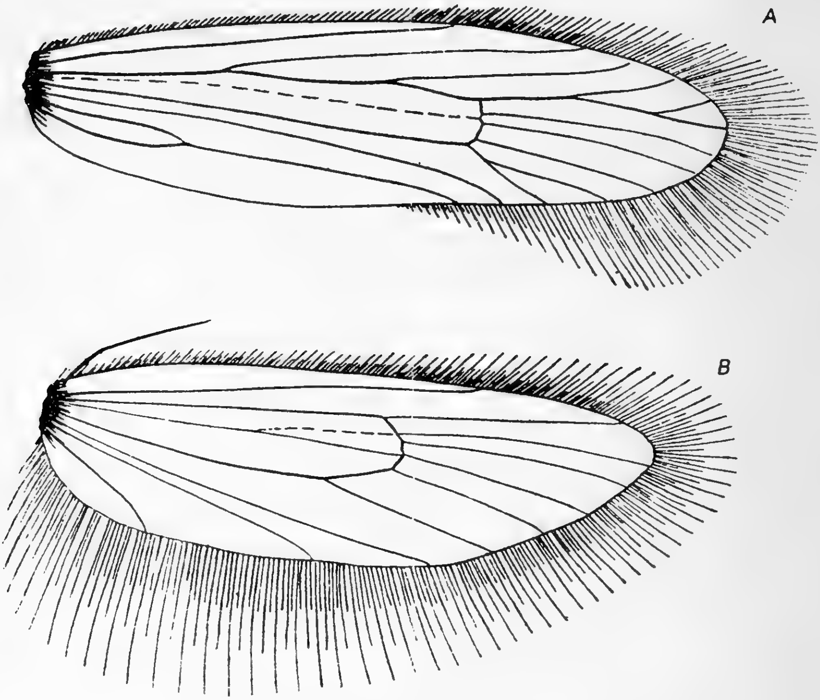
5. **Hapsifera multiguttella** Rag. (Figures 302; 303; 313–318)

Ragonot, 1895: CIV (*Euplocera*); Staudinger and Rebel, 1901: II, 234 (*Euplocera*); Petersen, 1958: 412; 1961b: 529; Gozmàny, 1965a: 290; Petersen, 1968: 65; —*jerichoella* Amsel, 1935c: 315 (*Pseudohapsifera*).

External characters of imago. Pubescence of head brownish. Labial palpi light cinnamon-gray; middle segment with compressed clusters of long scales, especially protruding on upper side; 3rd segment smooth, almost equal to 2nd. Antennae brownish with dark blackish rings.

Thorax and tegulae brownish. Span of forewings 12 to 13 mm. Length of forewings 3.80, of hind wings 3. 25 times their width; length of fringe of hind wings three-fourths width of wing.

Forewings light cinnamon, pale brown. Pattern indistinct. Cinnamon-black scales scattered over entire surface of wing. Forewings with reticulate design. Dark scales concentrate near discoidal fold and apex of cell, forming transverse band. Fringe light-colored with isolated dark scales. Hind wings deep gray, grayish-brown, almost transparent, with same colored fringe. Under surface of both wings and their fringe very light-colored.



411 Figure 313. Venation of wings of *Hapsifera multiguttella* Rag.

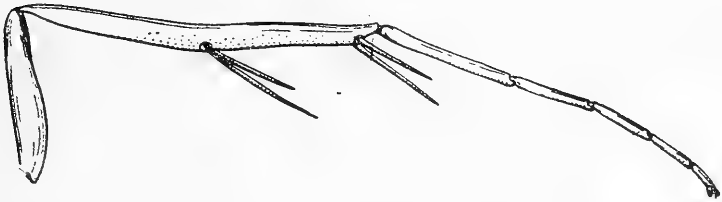
A—forewing; B—hind wing.

Preparation No. 11169, male. Beirut.

In forewing (Figure 313, A) *Sc* terminates on anterior margin near to level of apex of radiocubital cell. Terminus of R_1 almost three times closer to R_2 than to *Sc*. Branches of R_3, R_4, and R_5 stalked. Base of

M_3 almost twice closer to Cu_1 than to M_2. Cu_1 and Cu_2 either originate from radiocubital cell separately or shortly stalked. In hind wing (Figure 313, B) distance between bases of R and M_1 about one-third distance between Cu_1 and Cu_2.

Legs brownish. In hind legs (Figure 314) 1st tarsal segment equal to distance between spurs of tibia.



412 Figure 314. Hind legs of *Hapsifera multiguttella* Rag.
Preparation No. 11169, male. Beirut.

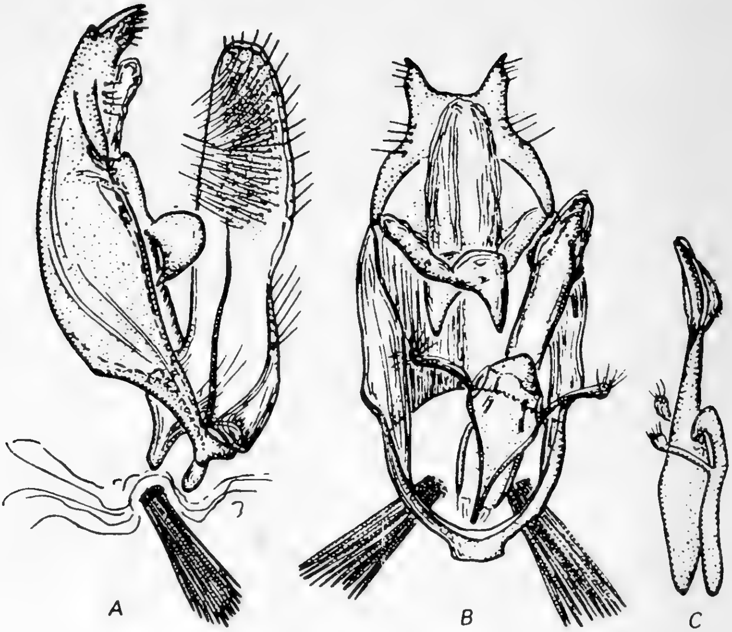
412 Abdomen yellowish-gray.

Male genitalia (Figures 315, A and 316). Genitalia in lateral view narrow; distance between dorsal margin of tegumen and saccus almost three-fifths of aedoeagus; dorsal margin of uncus and tegumen arcuate. Lower margin of valvae near base with large lobate membrane; sclerotized cord narrow and reaches midpoint of valvae. Lobes of uncus short, broad; in ventral view tubercle absent between them (Figure 315, B). Branches of gnathos in ventral view with broad, wedge-shaped ends directed inward. Aedoeagus longer than tergal margin of tegumen and uncus (Figure 315, C). Saccus in ventral view with broad, flat end. Lower margin of vinculum in lateral view concave and bent toward tegumen at an angle.

Female genitalia (Figures 317 and 318). Lobes of vaginal plate densely covered with spinules. End of duct of bursa copulatrix and ostium bursa slightly sclerotized and not covered with spinules. Abdominal
413 branches of anterior apophyses connected with each other (Figure 318, A); dorsal branches short and do not reach midpoint of lobes; broadened at end and slightly sclerotized. Signum in bursa copulatrix located on side of pouch (Figure 318, B).

Comparison. Close to *H. maculate* Wlsm., but differs in these peculiarities: In hind wing distance between R and M_1 one-third distance between Cu_1 and Cu_2. Male genitalia narrow; sclerotized cord of valvae narrow and reaches midpoint of valvae; latter with lobate membrane at base of lower margin; aedoeagus longer than tergal margin of tegumen and uncus. Dorsal branches of anterior apophyses in female genitalia broaden at end and do not reach midpoint of lobes of vaginal plate.

These characters permit me to confidently distinguish this species



412 Figure 315. Male genitalia of *Hapsifera multiguttella* Rag.

A—general appearance (lateral view); B—same (ventral view); C—isolated aedoeagus. Preparation No. 11169, male. Beirut.

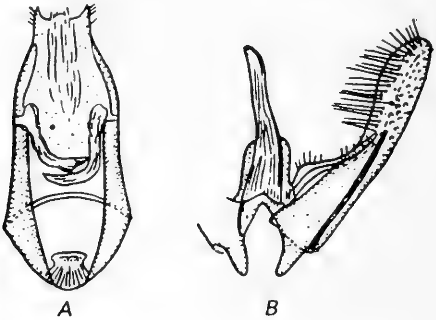


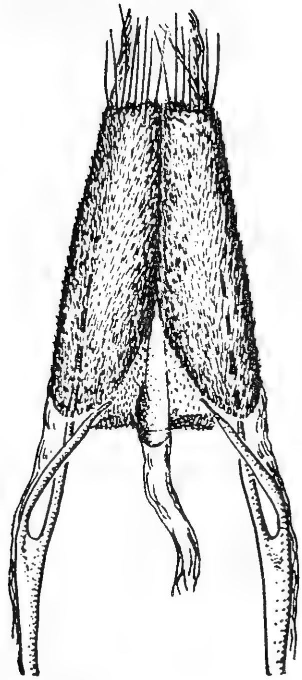
Figure 316. Male genitalia of *Hapsifera multiguttella* Rag.

A—uncus, gnathos, and saccus (ventral view); B—valvae and aedoeagus (ventral view).

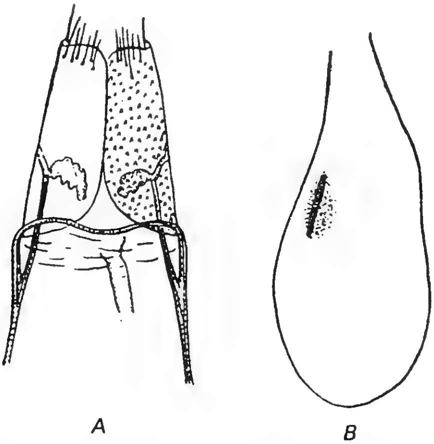
(from Petersen, 1958).

from *H. maculata* Wlsm. and provide a basis for considering both species relatively distinct.

Distribution. Algeria, Tunisia, West Asia; Lebanon, Syria, Jordan (Figure 302).



413 Figure 317. Region of vaginal plate of *Hapsifera multiguttella* Rag. Preparation No. 141, female. Beirut (collection of Caradja, Bucharest).



413 Figure 318. Female genitalia of *Hapsifera multiguttella* Rag. A—region of vaginal plate; B—bursa copulatrix (from Petersen, 1958).

In literature, reported from Algeria, Oran Province; Tunisia Bou-Hedma (Petersen, 1958); Jordan (Palestine) (Amsel, 1935c).

414 *Material examined.* 1 male.

Lebanon. Beirut, one male in 1879 (collection of Wocke).

Biology. Xerophilous desert species. Moths found in April–May and September. In Syria, Damascus region, one male was found between May 16 and 23, 1961, and in Lebanon one male on May 12, 1961 (Petersen, 1968). In Palestine males were collected on April 1, 1930 (Amsel, 1935c, as *Pseudohapsifera jerichoella* Ams.); in Tunisia, Bou-Hedma region, they were collected on September 2, 1929 (Petersen, 1958); in Algeria, El-Kantara, May 25, 1903 (Petersen, 1961b). This species produces two generations per year.

6. **Hapsifera barbata** Chr. (Figures 302; 303; 391)

Christoph, 1882: 432–433 (? *Morophaga*); Staudinger and Rebel, 1901: II, 235 (*Morophaga*); Durrant, 1903: 92 (*Dasyses*); Petersen, 1958: 411–412; —*cinereella* Caradja, 1926: 165.

External characters of imago. Head pubescent, with light gray hair. In labial palpi 2nd segment very long, cinnamon-gray, directed straight ahead, and covered with long dense brush of gray scales; 3rd segment located almost at right angles to 2nd and pointed, with whitish-gray base and cinnamon-black tip. Basal segment of antennae and first four segments light gray with cinnamon-black and reddish-gray granulation.

Thorax and tegulae light gray.

Wingspan in male 21 mm, in female 22 to 25 mm.

Forewings whitish-gray with light cinnamon-gray and cinnamon-black granulation. Pattern of reticulate dots and spots. Largest dark cinnamon spots located proximal and distal to midpoint of wing. These spots are formed by projecting scales. Fringe long, with seven alternate dark and light gray streaks. Hind wings yellowish-gray with darker veins. Fringe light yellowish-gray with two transverse irregular dark and light stripes. Under surface of all wings uniformly dark cinnamon-gray, with raised veins.

In forewing R_3 originates from cell independently, while R_4 and R_5 stalked; or R_3 connate with R_{4-5}. Cu_1 and Cu_2 originate separately from cell.

Legs reddish-silvery-gray. Hind tibiae with long grayish-brown hairs. Tarsal segments on outer side mostly dark cinnamon.

Abdomen yellowish-gray.

Male genitalia. Not known.

Female genitalia (Figure 319). Lobes of vaginal plate densely covered with minute spinules. Anterior apophyses connected above

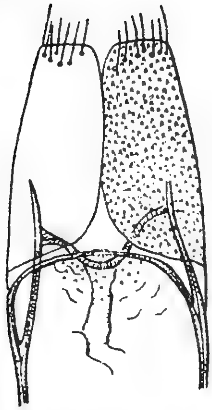


Figure 319. Region of vaginal plate of *Hapsifera barbata* Chr. (from Petersen, 1958).

ostium bursa; a band originates from free ends of dorsal branches which forms V-shaped transverse bridge. Ostium bursa slightly sclerotized and covered with minute spinules.

Comparison. In long labial palpi close to *H. multiguttella* Rag.; in wing pattern similar to *H. eburnea* Btl. and *H. luridella* Zll. Distin-
415 guished from all three by total ash-gray coloration. Differs from all other species of the genus in presence of V-shaped band between dorsal branches of anterior apophyses.

No specimens examined by me.

Distribution. Far East as well as Japan (Figure 302).

In literature, reported from Primor'e: Amur and Ascold Islands (Christoph, 1882), Sichuan (Caradja, as *H cinereela* Car.), as well as Japan, Kui-Shiu, Sago (Petersen, 1958).

Biology. Far East steppe species.

Moths collected near Sichuan (Sichuan coal mine) in latter half of August, 1925 (Caradja, 1926).

INDEX OF LATIN NAMES OF MOTHS AND OTHER LEPIDOPTERANS*[1]

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* Reproduced from the Russian original. Original Russian page numbers have been given in the left-hand margin of the English translation — General Editor

[1] Synonyms are given in italics. Pages with descriptions of the given form are indicated in bold print; pages containing illustrations have been marked with an asterisk.