Lepidopterous Fauna of the USSR and Adjacent Countries

Editor

O.L. KRYZHANOVSKII

This book is the first compilation of papers devoted entirely to Lepidoptera published in the Soviet Union. It is dedicated *in memoriam* to one of the most highly regarded and influential Russian entomologists of his era: Professor Alexsandr Sergeevich Danilevskii (occasionally transliterated as Danilevski), who died in 1969 at the age of only fifty-eight.

The first article in this volume, appropriately, is a somewhat more detailed account of Danilevskii's life written by his former students V.I. Kuznetsov and M.I. Fal'kovich.

Most of the authors in the ten articles comprising this work had studied to some degree under Danilevskii. It is probably to Danilevskii's credit that these authors represent many of the leading Russian workers on Heterocera today. Throughout several of the sections, the influence of Danilevskii is observed, particularly in the careful attention to specific ecological associations, zoogeography, photoperiodism, and seasonality. Nowhere are these influences more apparent than in the articles by V.I. Kuznetsov, by far the major single contributor to the volume.

Lepidopterous Fauna of the USSR and Adjacent Countries

Lepidopterous Fauna of the USSR and Adjacent Countries

A Collection of Papers Dedicated to
Professor Alexsandr Sergeevich Danilevskii

collected by
O.L. Kryzhanovskii

DONALD R. DAVIS
Scientific Editor

Smithsonian Institution Libraries
and
The National Science Foundation
Washington, D.C.
1988

TT 81-52001

Cheshuekrylye Fauny SSSR i Sopredel'nykh Stran
Akademiya Nauk SSSR
Trudy Vsesoyuznogo E'ntomologicheskogo Obshchestva, Vol. 56

Nauka Publishers
Leningrad, 1973

Translated from the Russian by P.M. Rao
General Editor: Dr. V.S. Kothekar

Library of Congress Cataloging-in-Publication Data

Cheshuekrylye fauny SSSR i sopredel'nykh stran. English.
Lepidopterous fauna of the USSR and adjacent countries.

Translation of: Cheshuekrylye fauny SSSR i sopredel'nykh stran.
Original issued in v. 56 of: Trudy Vsesoi͡uznogo éntomologicheskogo obshchestva.
1. Lepidoptera—Soviet Union. 2. Danilevskiĭ, A.S. (Alexsandr Sergeevich), 1911–1969. 3. Insects—Soviet Union.
I. Danilevskiĭ, A.S. (Alexsandr Sergeevich), 1911–1969. II. Kryzhanovskiĭ, O.L. (Oleg Leonidovich), 1918– . III. Davis, Donald Ray. IV. Title.
QL555.S65C4713 1986 595.78'0947 87-600215

Translated and published for the Smithsonian Institution Libraries,
pursuant to an agreement with the National Science Foundation,
by Amerind Publishing Co. Pvt. Ltd.,
66 Janpath, New Delhi 110001

Phototypeset by The Word and printed at Pauls Press, New Delhi, India

Foreword to the English-language Edition

The Smithsonian Institution Libraries, in cooperation with the National Science Foundation, has sponsored the translation into English of this and hundreds of other scientific and scholarly studies since 1960. The program, funded with Special Foreign Currency under the provisions of P.L. 480, represents an investment in the dissemination of knowledge to which the Smithsonian Institution is dedicated.

This book is the first compilation of papers devoted entirely to Lepidoptera published in the Soviet Union. It is dedicated *in memoriam* to one of the most highly regarded and influential Russian entomologists of his era: Professor Alexsandr Sergeevich Danilevskii (occasionally transliterated as Danilevski), who died in 1969 at the age of only fifty-eight. An obituary of Danilevskii by A. Diakonoff has appeared in the *Journal of the Lepidopterists' Society* 24 (1): 70–72, 1970. The first article in this volume, appropriately, is a somewhat more detailed account of Danilevskii's life written by his former students V.I. Kuznetsov and M.I. Fal'kovich. Because this work already contains a preface by V.I. Kuznetsov which outlines the general contents, reference will be made here only to a few major articles and to the overall work in the context of Lepidoptera research in Russia at the time of its original publication in 1973.

Most of the authors in the ten articles comprising this work had studied to some degree under Danilevskii. It is probably to Danilevskii's credit that these authors represent many of the leading Russian workers on Heterocera today. Throughout several of the sections, the influence of Danilevskii is observed, particularly in the careful attention to specific ecological associations, zoogeography, photoperiodism, and seasonality. Nowhere are these influences more apparent than in the articles by V.I. Kuznetsov, by far the major single contributor to the volume. In addition to the preface and the biographical sketch which he co-authored, Kuznetsov also co-authored a revision of *Hemerophila* (with Danilevskii), a section with A.A. Stekol'nikov on relationships within the Tortricidae based on genital morphology, as well as the longest paper of all, a detailed biological account of the Tortricidae of the southeastern USSR. The latter includes a good summary of the seasonal life histories, diapausing stages, and habitat associations for a large number of torticine moths. The region covered is situated in the extreme southeastern USSR, primarily in the southern Amur and Primor'ye.

The paper by Kuznetsov and Stekol'nikov represents one of the first in a series of papers by these two authors on the higher classification of the Lepidoptera. As is true for the later papers, their evidence is weakened by dependency on a single major system, the adult copulatory apparatus. The major conclusions of this study, however, correspond to the generally accepted classification of the Tortricidae, wherein two subfamilies are recognized, Tortricinae and Olethreutinae. The former is much more heterogeneous, largely due to the inclusion of the supertribe Cochylidii as proposed by them. Kuznetsov and Stekol'nikov (*Acad. Sci. USSR,* pp. 51–96, 1984) have recently revised this phylogeny and included the Sparganothini in the supertribe Cochylidii along with the tribe Cochylini, which was considered the most plesiomorphic. Other changes were made, mostly at the tribal level, within both the supertribe Tortricidii and the subfamily Olethreutinae.

The paper by Zagulyaev (sometimes transliterated Zagulajev) summarizes his thoughts on the phylogeny of the Tineoidea. As a basis for determining family relationships within this superfamily, considerable emphasis, probably too much, was placed on the general life history of these moths. Zagulyaev's ideas have since been greatly modified by Nielsen (*Ent. Scand.*, 9: 279–296, 1978) who synonymized the Deuterotineidae under Eriocottidae and considered this family, not Acrolophidae, as the most primitive in the superfamily. The Acrolophidae are regarded currently as only a subfamily within the Tineidae, with mostly a few larval characters distinguishing it as a distinct taxon.

An interesting six-year study on the Coleophoridae of the Kyzylkum Desert is presented by M.I. Fal'kovich. Considerable biological information is included along with a rather elaborate key to the larval cases. As is true for most of the other papers in this volume, the text is well supported by excellent illustrations of the material.

Donald R. Davis, Curator
Department of Entomology
National Museum of Natural History
Smithsonian Institution
Washington, D.C.

Preface

The order Lepidoptera is known for a large number of species that damage cultivated plants and forests. The study of the lepidopteran fauna was initiated in the Soviet Union by E.A. Eversmann and N. Ershov, and continued by N.Ya. Kuznetsov, A.M. Gerasimov, N.N. Filip'ev, A.M. D'yakonov, I.V. Kozhanchikov, M.A. Ryabov, and A.S. Danilevskii. On the basis of material collected by Soviet researchers, hundreds of new species and several higher taxa were established. After an analysis of the excellent collection of the Institute of Zoology, Academy of Sciences of the USSR, systematic studies were undertaken of cutworm moths, borer moths, psychids, clothes moths, fruit moths, and several other groups. Biological control of the most important pests of agriculture and forestry was also developed.

Subsequently, the utilization of biologically important structural characters of the genital organs in species identification, led to the rapid development of taxonomy of the Lepidoptera. Faunistic studies of Lepidoptera covered the southern and eastern regions of the Soviet Union as well as adjacent countries. Significant new information was collected in the field of ecology, especially when field studies incorporated new methods of collection and mass rearing of Lepidoptera from larvae and preimaginal stages. Lepidopterists soon discovered new trends in the geographic, zonal, and ecological distribution and were able to draw generalizations regarding food relationships of Lepidoptera with certain plants. They also identified the seasonal cycles of these insects in the Asian part of the country.

In spite of the successes achieved, however, the level of study of Lepidoptera still remains poor in the Soviet Union. New species, often harmful, are constantly being discovered, and knowledge of the fauna of the Microfrenata group, especially leafmining moths in the Asian part of the Soviet Union, is very sketchy indeed. Insufficient knowledge of species identification and absence of modern handbooks on the taxonomy of many families of Lepidoptera have hindered the study of this group, so important from both a practical and theoretical point of view.

The present book is the first collection of papers on lepidopterology published in the Soviet Union. It presents major directions in studies on the morphology, taxonomy, and species composition of harmful Lepidoptera in the Soviet Union, and indicates guidelines for further studies of these aspects.

This volume is dedicated to the memory of the great scientist, Prof. Alexsandr Sergeevich Danilevskii, who notably advanced entomology in the Soviet Union. His experimental ecological studies on the problem of photoperiodicity and seasonal cyclic phenomena in insects opened new vistas for entomology. Eventually a theory of synchronization of the annual cycle of insects with climatic changes was proposed. A.S. Danilevskii was also a distinguished zoogeographer and taxonomist. He trained many lepidopterists and specialists in other groups of insects; most of the contributors to the present book were his students and disciples.

The book opens with an article on A.S. Danilevskii as a Lepidoptera taxonomist (V.I. Kuznetsov and M.I. Fal'kovich), followed by a review of harmful tortrice moths of the genus *Hemerophila* Hb. (A.S. Danilevskii and V.I. Kuznetsov). Three articles present generalizations based on studies of tortrices. The phylogenetic relationships of the tribes of the European fauna of this family are examined on the basis of the functional morphology of the genital organs (V.I. Kuznetsov and A.A. Stekol'nikov). The seasonal cycles and species composition of tortrice moths from the southern part of the Far East are analyzed (V.I. Kuznetsov). Yu.A. Kostyuk discusses some interesting new alpine species from Central Asia.

Three articles present the results of research on moth-like lepidopterans. The phylogenetic relationships of tineoids (A.K. Zagulyaev) and the taxonomic position of the family Gelechiidae in the new tribe, Teleiodini (V.I. Piskunov) are discussed, and keys given for casebearers reared from larvae in the Kyzyl-kum desert (M.I. Fal'kovich).

Results of studies on moths are summarized in the concluding articles of this volume. The taxonomic significance of the morphological characters in different taxa of the Lepidoptera of the Soviet Union is reviewed (M.A. Ryabov). Z.F. Klyuchko presents a zoogeographic analysis of moths of the steppe-forest reserves in the Ukraine.

V.I. Kuznetsov

Table of Contents

Alexsandr Sergeevich Danilevskii as a Lepidoptera Taxonomist

V.I. Kuznetsov and M.I. Fal'kovich

Alexsandr Sergeevich Danilevskii made a notable contribution to entomology in the Soviet Union and abroad. He was one of the most talented, brilliant, and erudite biologists of the twentieth century, a distinguished morphologist, taxonomist, ecologist, and physiologist. A.S. Danilevskii was also an expert on Lepidoptera and his knowledge in this field was encyclopedic.

A.S. Danilevskii revealed an interest in lepidopterology even in school. In college he specialized in the tortrice family and developed its taxonomy. More than 20 of his publications pertain to the taxonomy or faunistic studies of tortrices. His first paper (Danilevskii, 1947) described the pear moth, a dangerous pest of horticulture. During his life, A.S. Danilevskii identified several new taxa in the group of tortrices, an important but very difficult group to study: 1 subtribe, 4 genera, and more than 50 new species.

An important work on the taxonomy of tortrices by A.S. Danilevskii was his monograph on the fruit moths of the fauna of the Soviet Union (Danilevskii and Kuznetsov, 1968). In this book he utilized for the first time a functional analysis of the genital structures in the taxonomy of fruit moths, providing valuable data for understanding the phylogeny of this group. In addition to the traditional methods of taxonomy (morphological, zoogeographic, historical), A.S. Danilevskii incorporated ecological and physiological information in this monograph. The book received worldwide acclaim (Diakonoff, 1970; Popescu-Gorj, 1970).

A.S. Danilevskii delved deeply into an analysis of the family of tortrices (Glyphipterygidae) and laid the foundation for revision of the Palearctic fauna of one of its subfamilies, Choreutinae (Danilevskii, 1969b). One part of this study was incomplete at the time of his death and is published here for the first time (Danilevskii and Kuznetsov, 1973). Individual articles (Danilevskii, 1950, 1955) discussed the taxonomy of various moths: leafminers (Lithocolletidae), notch wings (Gelechiidae), and predators (Momphidae), as well as ethmiids (Ethmiidae), podborers (Pyralidae), carpsinids (Carposinidae), and beauty moths (Geometridae).

A.S. Danilevskii knew well the imaginal and preimaginal stages of lepidopterans and applied this knowledge widely in taxonomy. He studied the larvae of different orders of insects and prepared keys on the basis of larval stages (Danilevskii, 1957). In preparing the handbook written by A.M. Gerasimov (1952) on larvae of the insect fauna of the Soviet Union for publication, A.S. Danilevskii made significant additions to it. He also developed keys to the preimaginal stages of Lepidoptera, which are used in courses offered by universities today. In a critical review of works published by scientists abroad in which a special system of preimaginal stages, differing from the system of the imago was proposed, A.S. Danilevskii emphasized that the classification of larvae should be unique, natural, and incorporate all the peculiarities of ontogenesis. Only a gifted scientist could acquire such a deep multifaceted knowledge of the very large order of Lepidoptera, given the present level of development of its taxonomy.

The problems of Lepidoptera taxonomy were studied by A.S. Danilevskii in close relationship to other fauna. He was particularly attracted to the hill regions and, in spite of being engaged in ecological and physiological problems, carried out extensive studies on alpine fauna in inaccessible regions of the country—Dzhungarian and Zailiiskii Alatau (Kazakhstan) in 1957, Abkhazia (Georgia) in 1962, and Gissar range (Tadzhikistan) in 1966. In the last days of his life he was preparing for a routine visit to the Caucasus.

An expert on nature, A.S. Danilevskii had an unusual talent for discovering new biological and faunal organisms. He contributed valuable material to the collection of the Institute of Zoology, Academy of Sciences of the USSR which, unfortunately, has only been partially analyzed and published. Nonetheless, A.S. Danilevskii was tireless in the preservation and augmentation of such collections in the Soviet Union. He found time to identify material received from numerous areas and to determine its placement in the basic collection. He undertook in particular the transfer of type specimens of every species described from the Soviet Union to the Institute of Zoology, Academy of Sciences of the USSR. Boundless energy was spent on the establishment and supplementation of the first major collection of larvae in this country.

The taxonomic descriptions prepared by A.S. Danilevskii are characterized by delicate and exceptional enrichment with important diagnostic or evolutionary characters. Secondary morphological details were used by him only when their functions might warrant analysis in the future. A.S. Danilevskii attached great importance to proper scientific drawings, considering a depiction of morphological peculiarities the basis for characterization of a species. That is why he set high standards for figures or illustrations. A gifted artist-painter himself, he prepared most of the illustrations for his taxonomic publications. They are distinguished by simplicity, professional skill, and scientific authenticity, so much so that explanations are almost redundant. His drawings of winter moths are particularly laudable (Danilevskii, 1969a).

Alexsandr Sergeevich instilled in his students a deep appreciation for an analytical and theoretical approach to the field of taxonomy and its practical application. He devoted many years to the training of specialists in various fields of theoretical and applied entomology. His merits as a teacher have already been reviewed and lauded (Belozerov et al., 1969; Polyanskii, 1972); we simply wish to mention here that many taxonomists in the Soviet Union belong to the school of A.S. Danilevskii. His talent as a leader and seer enabled him to select students with aptitude in the field of entomology, who would benefit most from his scientific zeal. Under his initiative and unflagging encouragement, lepidopterology became a firmly established science in the Soviet Union.

A.S. Danilevskii strove for a practical application of his theoretical generalizations. As a scientist, he demanded the best not only from others but from himself.

By and large A.S. Danilevskii was highly critical of his own writings, revising them in minute detail to ensure maximum precision and authenticity. Hence he is respected as an authority in taxonomy both in the Soviet Union and in many countries throughout the world.

REFERENCES

Belozerov, V.N., N.I. Goryshin, K.F. Geisnits and E.F. Martynova. 1969. Alexsandr Sergeevich Danilevskii (1911–1969). *Zool. Zhurn.*, 48, 11, 1753–1754.

Danilevskii, A.S. 1947. Novyi vid plodozhorki, vredyashchei grushe v evropeiskoi chasti SSSR (A new species of fruit moth damaging pear in the European part of the USSR). *Dokl. Akad. Nauk SSSR*, vol. 58, pp. 1555–1556.

Danilevskii, A.S. 1950. Novyi rod i vid khishchnoi moli, pitayushchei chervetsami *Coccidiphila gerasimovi* Danilevskii, gen. n. et sp. n. (Lepidoptera) [*Coccidiphila gerasimovi* Danilevskii, gen. n. and sp. n. (Lepidoptera), a predatory moth feeding on coccids]. *Entom. Obozr.*, vol. 31, pp. 47–53.

Danilevskii, A.S. 1955. Novye vidy nizshikh cheshuekrylykh (Lepidoptera, Microheterocera), vredyashchie drevesnym i kustarnikovym porodam v Srednei Azii (New species of lower Lepidoptera, Microheterocera, damaging trees and shrubs in Central Asia). *Entom. Obozr.*, vol. 34, pp. 108–123.

Danilevskii, A.S. 1957. Opredelitel'naya tablista otryadov nasekomykh po lichinkam starshikh stadii (Key to insect orders on the basis of larvae of later stages). In: *Opred. Klassov i Otryadov Nazemnykh Chlenistonogikh.* Izd. AN SSSR, Leningrad, pp. 67–90.

Danilevskii, A.S. 1969a. Dva novykh zamechatel'nykh vida zimnikh labochek iz nystyn Srednei Azii—*Dasyethmia hiemalis*, gen. et sp. n. (Lepidoptera, Ethmiidae) i *Cheimoptena pennigera* gen. et sp. n. (Lepidoptera, Geometridae) [Two new attractive species of winter moths from Central Asian deserts—*Dasyethmia hiemalis* gen. and sp. n. (Lepidoptera, Ethmiidae) and *Cheimoptena pennigera*, gen. and sp. n. (Lepidoptera, Geometridae)]. *Entom. Obozr.*, 48, 1, 176–191.

Danilevskii, A.S. 1969b. Novye vidy mole-listovertok (Lepidoptera, Glyphipterygidae) fauny SSSR [New species of tortrices (Lepidoptera, Glyphipterygidae) in the fauna of the USSR]. *Entom. Obozr.*, 48, 4, 919–932.

Danilevskii, A.S. and V.I. Kuznetsov. 1968. Listovertki (Tortricidae). Triba plodozhorki (Laspeyresiini) [Tortrices (Tortricidae). Tribe of fruit moths (Laspeyresiini)]. In: *Fauna SSSR. Nasekomye Cheshuekrylye*, vol. 1, new ser., 98. Nauka, Leningrad, 636 pp.

Danilevskii, A.S. and V.I. Kuznetsov. 1973. Obzor molelistovertok roda *Hemerophila* Hb. (Lepidoptera, Glyphipterygidae) fauny SSSR [Review of tortrices of the genus *Hemerophila* Hb. (Lepidoptera, Glyphipterygidae) in the fauna of the USSR]. Present volume, pp. 8–24.

Diakonoff, A.N. 1970. Fruit borers, Laspeyresiini by A.S. Danilevskii and V.I. Kuznetsov in *Fauna of the USSR, Insecta, Lepidoptera,* vol. 1, 635 pp., *Entomologische Berichten*, vol. 30, pp. 147–148.

Gerasimov, A.M. 1952. Gusenitsy (Larvae). *Fauna SSSR. Nasekomye Cheshuekrylye*, I, 2, new ser., 56. Izd. AN SSSR, Moscow-Leningrad, 338 pp.

Polyanskii, Yu.I. 1972. Alexsandr Sergeevich Danilevskii. In:

Problemy Fotoperiodizma i Diapauzy Nasekomykh. Izd. Leningrad. Un-ta, Leningrad, pp. 3–14.

Popescu-Gorj, A. 1970. A.S. Danilevskii and V.I. Kuznetsov. *Fauna SSSR*, ser. noua, 98, *Insecta Lepidoptera*, V, 1, *Tortricidae, Tribul Laspeyresiini*. "Nauka," Leningrad, 1968, 636 pp., *Stud. Cercet. Biol., Ser. Zool.*, 22, 2, 145–146.

Review of the Tortrices of *Hemerophila* Hb. (Lepidoptera, Glyphipterygidae) in the Fauna of the USSR

A.S. Danilevskii and V.I. Kuznetsov

The genus *Hemerophila* Hb. includes tortrices that are injurious to both horticulture and forestry. The fauna of this genus in the Soviet Union comprised only three species until just recently. A.S. Danilevskii in his revision of the Palearctic members of Choreutinae discovered two additional species, earlier confused with *H. pariana* L., in the collection of the Institute of Zoology, Academy of Sciences of the USSR.

This article contains information on the identification and distribution of tortrices of the genus *Hemerophila* Hb. in the Soviet Union. A.S. Danilevskii identified the material, described the new species, drew most of the genitalia drawings, and developed the keys. V.I. Kuznetsov completed the writing of the manuscript, genitalia drawings and prepared the article for publication. The illustrations of these moths were drawn by the artist I.N. Khitarova.

The type specimens of the new species described below are preserved in the collection of the Institute of Zoology, Academy of Sciences of the USSR.

Genus Hemerophila Hb., 1806

Type species: *Tortrix pariana* L.

Wings broad, with complete venation. Pattern on forewing without metallic spots. Pattern more or less transverse, consisting of two indistinct light-colored medial stripes; outer stripe often broader and diffused. Fimbria along outer margin with two small notches.

In hind wing, vein *R* merges into alar apex, M_3 and Cu_1 with short stem. Color usually monochromatic (in *H. nemorana* Hb. with yellowish spots).

Antennae of male ciliate, but cilia shorter than in *Antophila* Hw. Palpi thick, covered with more or less protruding but short scales.

Male genitalia: Tegumen comparatively short, narrow, arcuate. Socii long. Gnathos absent. Aedeagus almost always straight, tubular, without cornuta on curved part. Fultura simple, sometimes with keel. Valves oval, with strigose ridges contiguous along upper and lower margins and divergent near outer margin.

Female genitalia: Ostium opens at base of sclerotized funnel near posterior margin of genital plate. Duct of copulatory pouch thin, slightly sinuous. Signum in form of concave plate or disk.

Key to the Species of the Genus Hemerophila Hb. Based on Male Genitalia

1 (2). Strigose cover of valves forms continuous border throughout margin .... **H. pariana** L.

2 (1). Strigose cover of valves does not form continuous border, interrupted near outer margin, and in two parts in upper region of valve and sacculus.

3 (4). Outer margin of valves truncated below apex; upper strigose ridge highly raised more distal to this margin .... **H. nemorana** Hb.

4 (3). Outer margin of valves not truncated below apex; upper strigose ridge not raised distal to this margin.

5 (6). Fultura without broad keel. Aedeagus with highly sclerotized distal appendage, minutely dentate along upper margin .... **H. diana** Hb.

6 (5). Fultura with highly raised broad keel. Aedeagus without distal appendage along upper margin.

7 (8). Aedeagus attenuate, about equal to valve in length .... **H. ussuriensis** Danil., sp. n.

8 (7). Aedeagus not attenuate distally, much shorter than valve .... **H. montana** Danil., sp. n.

Key to the Species of the Genus Hemerophila Hb. Based on Female Genitalia

1 (2). Ostium covered with lamelliform process of genital plate; latter with sclerotized fold along anterior margin .... **H. diana** Hb.

2 (1). Ostium not covered with lamelliform process of genital plate; latter without sclerotized fold along anterior margin.

3 (4). Genital plate with unusually deep notch, reaching almost to anterior margin .... **H. montana** Danil., sp. n.

4 (3). Genital plate more or less trapezoidal, with infundibular depression near posterior margin.

5 (6). Duct of copulatory pouch with isolated sclerotized region .... **H. nemorana** Hb.

6 (5). Duct of copulatory pouch membranous throughout its length. .... **H. pariana** L.

Hemerophila nemorana Hb.

External appearance of moth (Figure 1): Wingspan 12.5 to 16.0 mm. Forewing broad, with very convex costal margin. Outer margin of wing with two distinct notches. Basic coloration not uniform, brownish to chocolate-brown with admixture of black and whitish scales. Basal area indistinctly bordered by slightly curved inner whitish transverse belt formed by white ends of chocolate-brown scales. Outer whitish transverse stripe also indistinct; commencing in middle of costal margin with white spot, converts into broad whitish stripe that bends almost at a right angle in region of middle cell. Middle area often with diffused black spots. In distal area whitish scales sometimes form two indistinct dark transverse lines that run parallel to transverse stripe. Brownish-black fimbria darker along costal margin of wing; scales with white apices at place of notches in outer margin.

Hind wing broad, chocolate-brown to brown. Differs from that in other Palearctic species of the genus in wide triangular, longitudinal

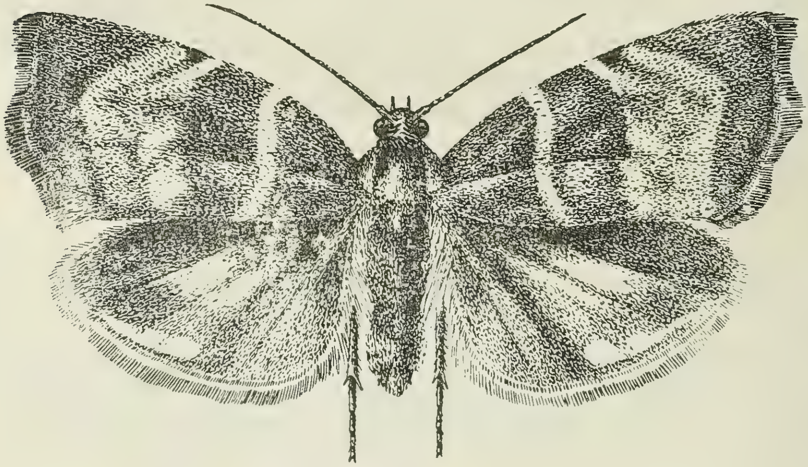


Figure 1. *Hemerophila nemorana* Hb.

yellow patch in region of medial trunk and veins *M* and *Cu*. Narrow band of basic color separates transverse bright orange marginal stripe in M_3–Cu_2 region, particularly distinct in lower part of wing.

Male genitalia (Figure 2): Valve with notch in outer margin below apex, so that upper strigose ridge notably raised more distal to this margin. Upper ridge shorter than lower one. Aedeagus long, thin, upcurved at apex. Fultura without keel.

Female genitalia (Figure 3): Genital plate trapezoidal, simple in form and structure. Ostium opening at bottom of slightly sclerotized funnel (of vaginal sinus) concealed by genital plate. Ductus bursae with two sclerites, one short and located near ostium, the other closer to anterior margin of genital plate. Both sclerites trough-shaped on outer wall of duct of copulatory pouch. Signa irregularly rhomboidal.

Material: France: "Douelle," July 12, 1927 (collection of Lomme) 1 male; Corsica, June, 1849 (Mann) 1 male; 1 female. Italy: Florence, 1846 (Mann) 1 male; Livorno, 1846 (Mann) 1 male; Tuscany, 1846 (Mann) 1 female; Lombardy (Turati) 1 male and 1 female. Yugoslavia: Rieka (formerly Fiume), May–June, 1849 (Mann) 2 females; Horvatia, June, 1849 (Mann) 1 male; Split, May, 1850 (Mann) 1 male. Turkey: Amasia, 1 female. Iran: Pehlevi (formerly Astrabad), June 5, 1905 (Filippovich) 2 females.

Ukraine: Crimea (Danilov) 1 male. Dagestan: Derbent, larvae on fig, July 17, 1931, October 6–7, 1930 (Ryabov) 2 males and 2 females;

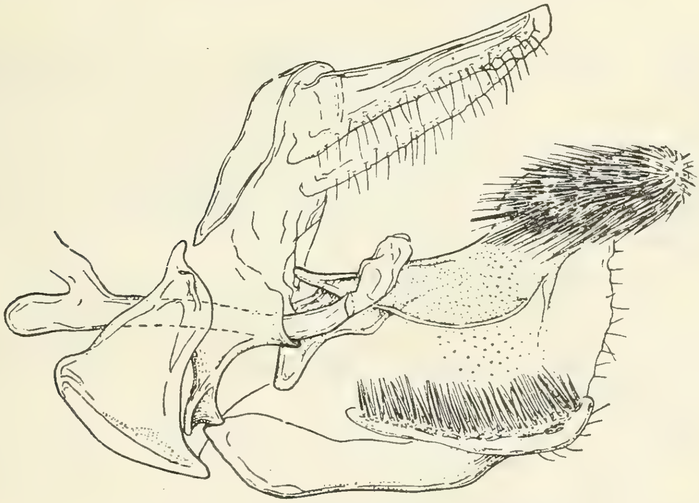


Figure 2. *Hemerophila nemorana* Hb., male, genitalia. Georgia, environs of Batumi.

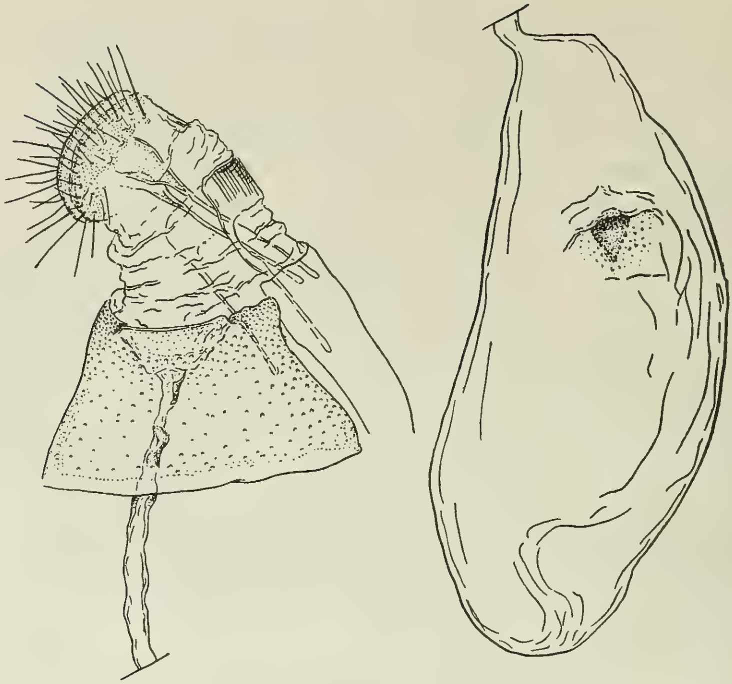


Figure 3. *Hemerophila nemorana* Hb., female, genitalia. Georgia, environs of Batumi.

Belidzhi, August 15, 1926 (Ryabov), 2 males and 1 female. Georgia: Lagodekh, August 10 (22), 1885 (Mlokosevich) 1 male; July 27 (August 9), 1880 (collection of Romanov), 1 male; Sukhumi, June 20, 1962 (Danilevskii) 1 male; August 18 (30), 1884 (Christoph) 1 male; environs of Batumi, Kakhoberi, July 7, 1958 (Stolyarov) 3 males and 1 female. Azerbaidzhan: Khanlar (erstwhile Elenendorf) (collection of Romanov) 1 female. Armenia: Leichik, July 7 (19), 1881 (Christoph) 1 female. Turkmenia: Kara-Kala, Larvae on fig and at light, May 5–28, June 16, and July 9–28, 1952 (Kuznetsov) 8 males and 5 females; June 1–8, 1962 (Krasil'mikova) 2 males and 1 female. Uzbekistan: Kitab, August 18, 1926 (Gerasimov) 1 male; Bukhara, July 4 and August 25, 1928 (Gerasimov) 4 males and 2 females.

Biology: Larvae develop on upper side of leaves of *Ficus carica* under thin silky cover. Damage leaves in spring by boring holes in them. In summer and autumn, in addition to leaves, also damage fruit by cutting outer surface or mining inside.

Hemerophila diana Hb.

External appearance of moth: Wingspan 13 to 16 mm. Forewing fairly narrow and long, with straight costal margin. Outer margin of wing almost even, notches of fimbria very weak. Basic coloration not uniform, blackish-brown with admixture of chocolate-brown scales. Basal area indistinctly bordered by diffused grayish-white stripe. Stripe intercepted by transverse sinuous black line distinct only in dorsal part of wing. Broad outer transverse stripe formed by admixture of brown, white, and olive-green scales, intercepted in costal margin of wing by transverse black streaks. Two black spots prominent on costal margin of wing in middle area and in region of fold. Outer field dark, especially along border with light-colored stripe. Fimbria brown, with black line along base.

Hind wing monochromatic brown, slightly darker in outer half.

Male genitalia (Figure 4): Valves oval. Upper strigose ridge only slightly longer than lower one. Apex of aedeagus with long sclerotized distal appendage formed by its right wall. Appendage minutely serrated along upper margin. Fultura tubular, with small distal appendage connected to aedeagus.

Female genitalia (Figure 5): Genital plate complex in structure, with sclerotized fold along anterior margin, lamelliform projection covering ostium, and crescent-shaped notch on posterior margin. Duct

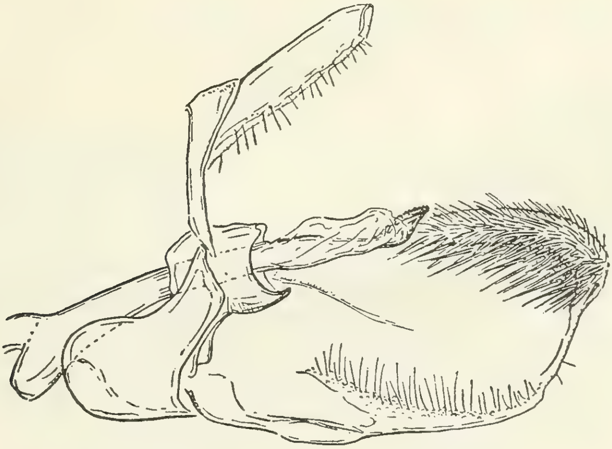


Figure 4. *Hemerophila diana* Hb., male, genitalia. Lower reaches of Yenisey, mouth of Angutikhe River.

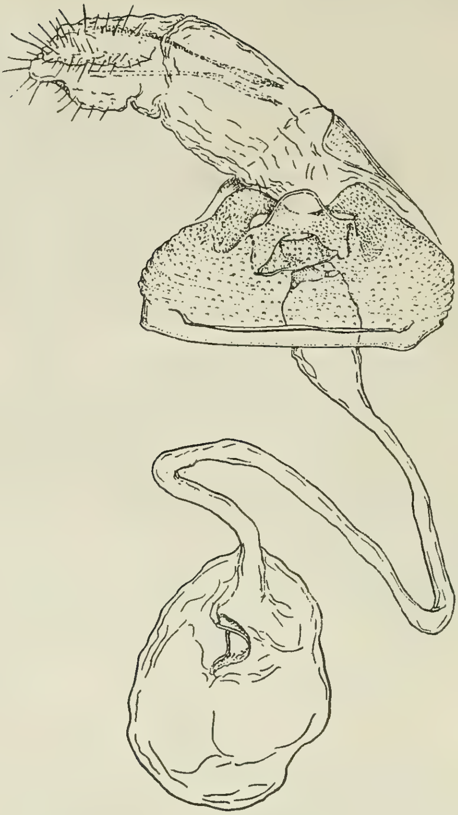


Figure 5. *Hemerophila diana* Hb., female, genitalia.
Dzhungarian Alatau, Topolevka.

of copulatory pouch broad near ostium; wall with triangular sclerite. Signa convex, rhomboidal.

Material: "Germany" (collection of Romanov) 1 male. Austria: "Seefelder," August–September, 1874 (collection of Wocke) 4 males and 3 females.

Khibiny: basin of Lake Vudyavr, August 13–14, 1931; September 2–17, 1932 (Fridolin) 3 males and 2 females. Karelia: Petrozavodsk (Günther) 3 males; Yalguba (Günther) 1 female; Solovets Islands, August 28, 1932 (Kishkin) 1 male. Komarovo, May 10, 1954; July 24–August 23, 1954 (Kozhanchikov) 4 males and 4 females. Sestroretsk, July 9–August 7, 1917 (Filip'ev) 1 male and 1 female. Environs of Leningrad, July 27, 1917 (Meberg); July 19–August 2, 1916 (Filip'ev) 3 males and 2 females. Environs of Petergof, Lopukhinka, July 17–August 5, 1908 (Bianci) 4 males and 1 female. Luga, July 16, 1953 (Fal'kovich). Environs of Pskov, July 14–18, 1907 (Chistovskii) 2 males. Novgorod District, Torbino, July 2–26, 1915; July 24–31, 1916 (Filip'ev) 6 males and 5 females. Latvia (Livonia) (Linig) 3 females. Vologda District, Tot'ma, September 30, 1935 (Barovskii) 1 male. Environs of Vitebsk, Korolevo, July–August, 1894 (Birulya) 1 male. Environs of Moscow, Grebnevo, July 22–27, 1915 (Chetverikov) 14 males and 10 females. Kazan (Eversmann) 2 males and 3 females. Bashkirian forest reserve, 50 km southeast of Uzyan, July 24–29, 1937 (Filip'ev) 4 males and 4 females. Kazakhstan: Dzhungarian Alatau, Topolevka, July 12, 1957 (Danilevskii and Kuznetsov) 1 female. Krasnoyarsk territory: Igarka, 1938 (Bogdanova) 1 female; Angutikha River, August 28, 1963 (Arens) 3 males and 2 females; Kavkazskoe, October 3, 1954 (Fal'kovich) 1 male. Environs of Minusinsk, July 29, 1924 (Filip'ev) 1 female. Tunkinskie Belki, July, 1925 (collection of Bang Haaz) 1 male. Khaman-Daban, Lazurskii range, August 16, 1965 (Rozhkov) 1 male. Environs of Yakutia, Arangastakh, August 23, 1926 (Ivanov) 1 female. Vitim, August 4 (16), 1888 (Hertz) 1 male. Primorsk territory, July 13, 1926 (D'yakonov and Filip'ev) 1 female.

Biology: Larvae develop on upper side of birch leaves.

Hemerophila pariana L.

External appearance of moth (Figure 6): Wingspan 10 to 13 mm. Forewing moderately broad, with convex costal margin. Outer margin

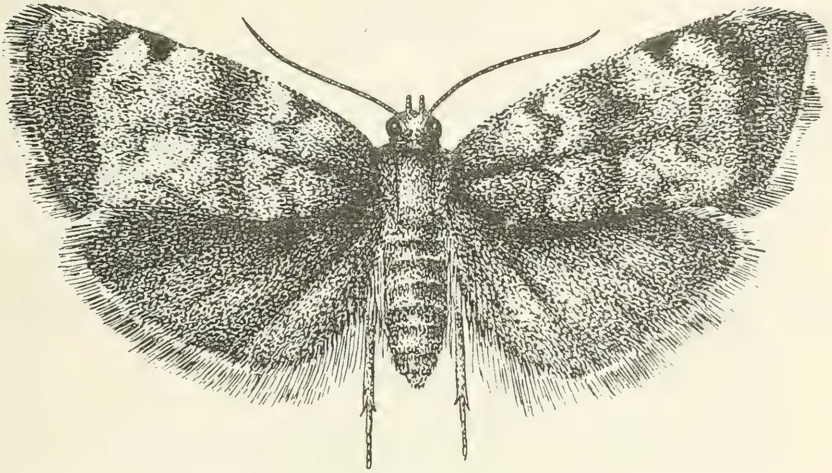


Figure 6. *Hemerophila pariana* L.

with two weak notches. Basic coloration of wings not uniform, brownish to chocolate-brown with admixture of black and whitish scales. Basal area bordered by indistinct whitish inner belt, intercepted in middle by sinuous black line. Broad outer whitish transverse stripe formed by admixture of chocolate-brown and whitish scales. Stripe intercepted by indistinct sinuous transverse black line, more distinct in costal margin of wing. Outer brown-colored area darker than middle one. Border between fields with black scales. Fimbria brown; scales with white edge at place of notches in outer margin.

Hind wing monochromatic brown, slightly darker in outer half.

Male genitalia (Figure 7): Valves broad, oval. Strigose ridge continuous along all margins, except basal. Aedeagus straight, tubular.

Female genitalia (Figure 8, B): Genital plate trapezoidal, simple in shape and structure. Ostium opening at base of sclerotized cyathiform funnel concealed by genital plate. Duct of copulatory pouch highly membranous. Signa irregularly rhomboidal.

Material: Algeria: Diskra, 1 male. Austria (collection of Ershov) 1 male. Federal Republic of Germany: Bavaria (collection of Wocke) 1 male; Frankfurt am Main (collection of Ershov) 1 male and 1 female. Poland: Oborniki-Slenske, June 29, 1875 (Zeller) 1 male; October 2, 1859 and October 14, 1866 (Wocke) 4 males and 3 females; Brotslav, larvae on hawthorn, June, 1875; September, 1849 (Wocke) 2 females; environs of Warsaw, Pomiekhovo, September 16 (18), 1901. Hungary: "Bozen," July 12, 1902, 1 female.

Environs of Leningrad, Sosnovka, Larvae, August 14–20, 1953 (Kozhanchikov) 2 males and 3 females. Old Petergof, September,

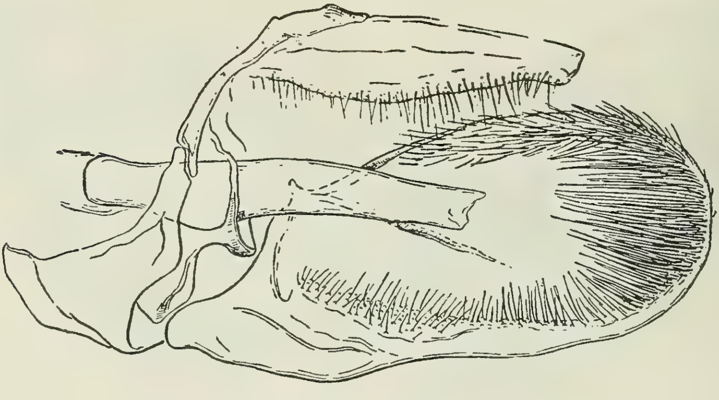


Figure 7. *Hemerophila pariana* L., male, genitalia. Environs of Leningrad, Sablino.

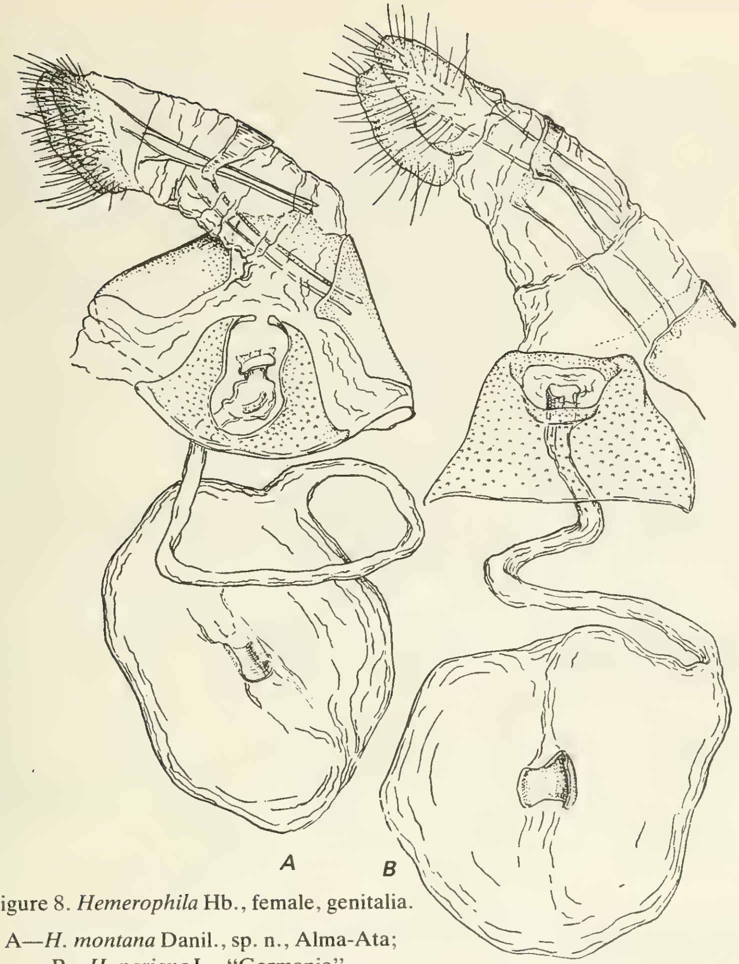


Figure 8. *Hemerophila* Hb., female, genitalia.

A—*H. montana* Danil., sp. n., Alma-Ata;
B—*H. pariana* L., "Germania".

1925 (Dutova) 3 males and 3 females. Pushkin, larvae, September 30, 1922 (Suikhina) 1 male and 1 female. Sablino, July 5, 1922 (Bianci) 1 male. Environs of Pskov, 1907 (Chistovskii) 1 male; June 25 (July 7), 1896 (Kuznetsov) 1 female. Environs of Moscow, Grebnevo, September 20, 1915 (Chetverikov) 1 female. Vladimir, August 10–29, 1934 (Chetverikov) 4 males and 2 females. Voronezh forest reserve, Galich'ya Mountain, June 23, 1938 (Golitsyn) 1 male. Belgorod District, Borisovka, June 7–20, 1950 (Danilevskii) 3 males and 1 female. Ukraine: environs of Mirgorod, Yares'ki, June 29, 1934 and August 16, 1925 (Fabricius) 2 males and 2 females; environs of Kiev, Pochtovaya Vita, September 1, 1963 (Kostyuk) 1 male; Crimea, Bel'bek, June 11, 1909 (Pliginskii) 2 males. Taganrog (Alferaki)

2 males and 1 female. Novocherkassk, larvae, May 28 and July 22, 1920 (collection of Filip'ev) 2 males. Dagestan: Makhachkala, pupae, June 23-29 and October 29, 1933 (Ryabov) 3 males and 2 females. Mashuk, June 22, 1937 (Ryabov) 1 female. Georgia: Sukhumi, August 17, 1956, 1 female; Tsinandali, April 4 (16), 1913 (Demokidov) 1 female; Manglisi, July 29, 1881 (Christoph) 1 female; Borzhomi, July 9, 1880 (collection of Romanov) 1 male and 2 females; Lagodekh, July 29, 1885 (Mlokosevich) 1 female. Kemerovo District, Toz, June 2, 1956 (Fal'kovich) 1 male. Kyakhta, larvae on apple, August 1–5, 1952 (Kolmakova) 4 males and 3 females. Tunkinskie Belki, July, 1925 (collection of Bang Haaz) 1 female. Khamar Daban, Bystraya River, August 11, 1955 (Rozhkov) 2 males and 2 females. Environs of Irkutsk, April 24, 1916; August 2, 1915 (Myl'nikov) 1 male and 1 female; April 20, 1915 (Rodionov) 2 males and 1 female. Kultuk, September 4, 1930 (Florov) 1 male. Buryat: Ulan-Ude, June 7, 1952; June 15, 1950; September 3, 1951 (Kolmakova) 4 males and 2 females. Sakhalin: Khol'msk, June 3, 1967 (Loktin) 1 male; Yuzhno-Sakhalinsk, August 20, 1967 (Kuznetsov) 1 female; environs of Novoaleksandrovsk, August 19, 1967 (Zabello, Kuznetsov, Shokareva) 2 males and 1 female. Kuril Islands: Kunashir, environs of Sernovodsk, June 16–July 23, 1967, larvae on ranetka apple, August 12–13, 1967 (Kuznetsov) 4 males and 3 females.

Biology: Larvae develop on fruits of Rosaceae, but more often on apple, pear, and hawthorn. Live on upper side of leaves under silky cover, which slightly hardens leaves along midrib. In some regions they severely damage leaves.

Hemerophila ussuriensis Danilevskii, sp. n.

External appearance of moth: Wingspan 12 to 13.5 mm. Forewing broader than in *H. pariana* L., with convex costal margin, and fimbria of outer margin with two distinct notches. Basic color grayish-brown, middle area chocolate-brown to brown. Basal area bordered by sinuous black line, distinct throughout its length. Middle area broad, lighter in color than distal area, and separated for the most part by an indistinct and diffused transverse blackish line. In region of medial veins in distal area, diffused bluish spot prominent in some specimens. Individual bluish scales also scattered in outer field along black line separating it from middle area.

Hind wing monochromatic grayish-brown; fimbria dark brown throughout its length.

Male genitalia (Figure 9): Valves oval. Upper strigose ridge with spinescent chaetae along lower margin and, unlike *H. pariana* L.,

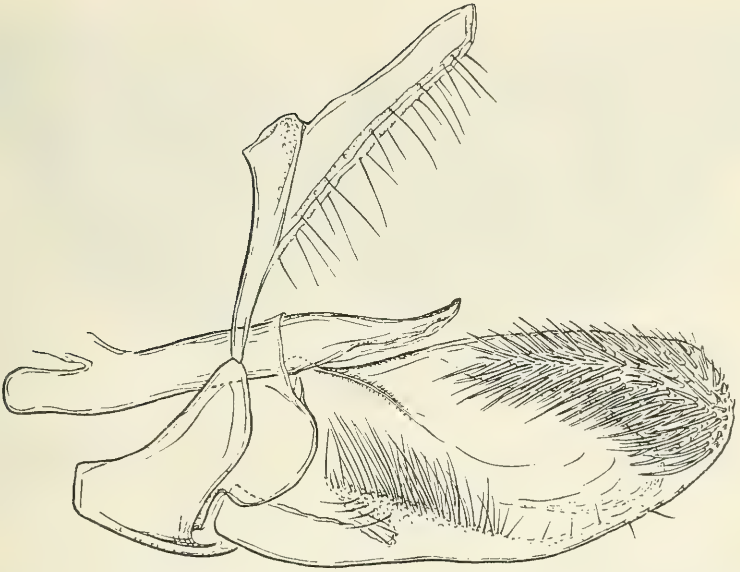


Figure 9. *Hemerophila ussuriensis* Danil., sp. n., holotype, male, genitalia. Primorsk, Vinogradovo.

separated from lower ridge. Aedeagus distally thin, about equal in length to valves. Fultura with highly raised keel.

Material: Holotype labeled: "Vinogradovo, Ussurian border, August 7, 1929 (D'yakonov, Filip'ev)" 1 male.

Paratypes: Primorsk territory: Vinogradovo, May 16 and July 3–20, 1929 (D'yakonov and Filip'ev) 4 males and 3 females.

Ussuriisk, larvae on apple, September 7, 1931 (Tokareva) 1 female. Suchan, origin of Sitsa River, May 25, 1928 (Kurentsov) 1 male; Yakovlevka, July 17–19 and September 2–10, 1926 (D'yakonov and Filip'ev) 2 males and 4 females.

Biology: Larvae develop on apple leaves.

Hemerophila montana Danilevskii, sp. n.

External appearance of moth: Wingspan 12 to 14 mm. Forewing narrower than in *H. pariana* L., fimbria of outer margin without distinct notches, and alar margin evenly serrated (Figure 10). Basic color gray with whitish granulation. Basal area bordered by oblique but straight black line, which disappears in region of median cell. Middle area with large white granulation, forming two broad diffused light gray transverse stripes. Inner transverse stripe usually narrower than outer stripe. Latter bordered by blackish line interrupted in middle and

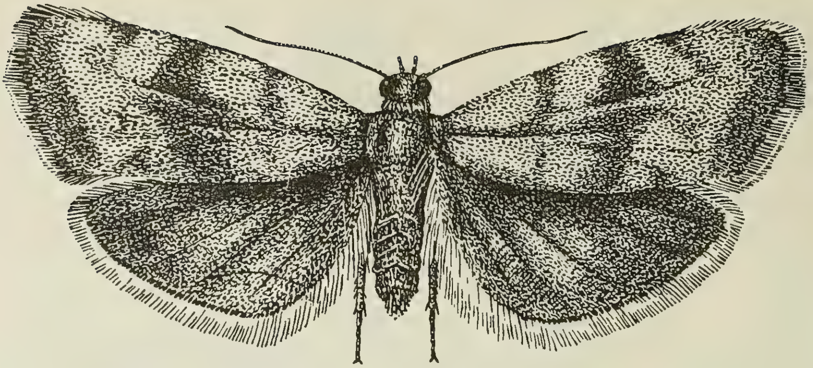


Figure 10. *Hemerophila montana* Danil.

always isolated from outer field. This area consists of two stripes of almost equal width: stripe adjoining black line light gray with whitish granulation, and other stripe adjoining fimbria dark brown. Scales of fimbria under alar apex and opposite tornal angle edged in white.

Hind wing dark gray, lighter in region of cell; fimbria light gray with dark marginal line.

Male genitalia (Figure 11): Valves distally attenuate. Upper strigose ridge almost twice longer than lower. Aedeagus distinctly shorter than valves, not distally attenuate, but with dent near apex of right wall. Fultura with broad keel.

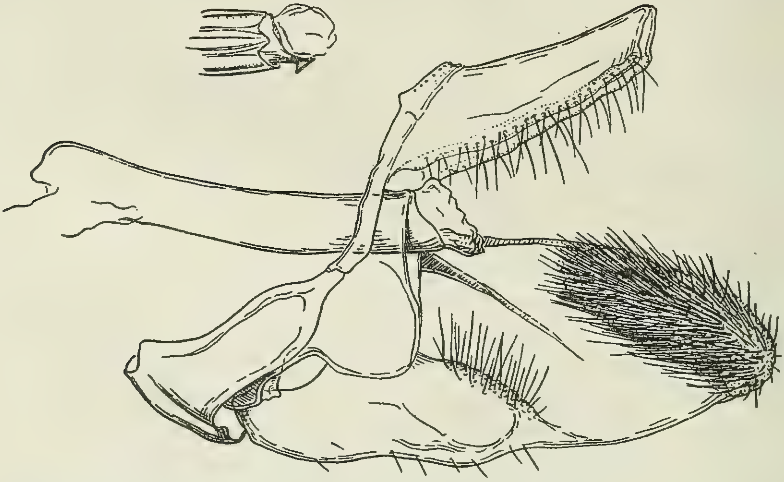


Figure 11. *Hemerophila montana* Danil., sp. n., paratype, male, genitalia. Alma-Ata.

Female genitalia (Figure 8, A): Genital plate with deep notch on back side, almost reaching anterior margin. Duct of bursa copulatrix narrow but distinctly broadens near ostium. Signa rectangular, trough-shaped.

Material: Holotype labeled: "Kirg. SSR, June 10, 1932, T. Arkhangel'sk," 1 male.

Paratypes: Kirgizia: June 10, 1932 (T. Arkhangel'sk) 1 female. Tadzhikistan, Gissar range, 3 km from Gusharov, larvae on shadbush (Amelanchier), June 18, 1969, 1 male. Kondara ravine, Takob, larvae on apple, June 7, 1955 (Baeva) 4 males and 1 female. Kazakhstan: Zailiiskii Alatau, Talgar, larvae on birch, August 4–10, 1938 (Gerasimov) 2 males; left Talgar, May 9, 1957 (Fal'kovich) 1 female; environs of Alma-Ata forest reserve, larvae on birch, August 18, 1937 (Samoilovech).

Biology: Larvae develop on fruits of Rosaceae and on birch.

Phylogenetic Relationships in the Family Tortricidae (Lepidoptera) Based on Studies of the Functional Morphology of the Genital Organs

V.I. Kuznetsov and A.A. Stekol'nikov

The tortrices are morphologically and biologically a rather well-distinguished group of Lepidoptera of the suborder Frenata. This group was separated by taxonomists long ago in developing the scheme of classification of the order Lepidoptera (Stephens, 1829; Guenée, 1845; Heinemann, 1863).

European tortrices were first separated on the basis of morphology by Lederer (1859), who used wing venation, secondary sexual characters, and some external morphological characters in distinguishing this group. A total understanding of this group was provided by Meyrick (1895), who divided the group into three families—Epiblemidae, Phaloniidae, and Tortricidae. Although Rebel (Staudinger and Rebel, 1901) later combined these taxa into a single family, Kennel (1908–1921) in his work on Palearctic Tortricidae retained the division of the group, recognizing three subfamilies (Tortricinae, Phaloniinae, and Olethreutinae) which correspond in general to the groups suggested by Meyrick.

Pierce and Metcalfe (1922), on the basis of fresh collections, initiated the regrouping of tortrices on the basis of structure of the copulatory apparatus. This process of perfecting taxonomy by utilizing the biologically important structural characters of the genitalia continues even today. The first taxonomic scheme of tortrices in the world fauna was proposed relatively recently (Diakonoff, 1961). D'yakonov*

---

*The spelling of author names is sometimes at variance within the text, taxonomic divisions, and bibliography, since the Israeli orthography has been followed in this translation—General Editor.

did not retain the status of the family Phaloniidae, and interpreted Tortricinae and Olethreutinae as subfamilies of Tortricidae. Subsequently, Cochylidae (= Phaloniidae) was considered an independent family by all taxonomists.

The perfection of the system led to the division of subfamilies into tribes or subtribes. Pierce and Metcalfe (1922) divided the family into groups (Archipsidii, Peroneidii, and Cnephasidii) which closely coincide with the present tribes of Archipini, Tortricini, and Cnephasiini of the subfamily Tortricinae (Obraztsov, 1954–1957). Under the subfamily Olethreutinae, in addition to the earlier established tribes Eucosmini and Laspeyresiini (Heinrich, 1923), Fal'kovich (1962) also separated the tribes Eudemini, Bactrini, and Lobesiini. In spite of this well-known simplification, the position of several genera in the present systems of Tortricidae has remained controversial, the distinctions between higher taxonomic units are often inadequate, the morphology of preimaginal stages of tortrices has been poorly analyzed, and the incorporation of these stages in systematics extremely difficult due to adaptive modifications and parallelisms. The classification and phylogeny of tortrices in these systems are based more on taxonomic "intuition" and hence do not reflect a morphofunctional analysis of their characters.

A relatively new stage in the assessment of the phylogenetic significance of the sclerotized structure commenced with a special analysis of the muscles and principles of their function in the genitalia, which ensure the effectiveness of the latter in the reproduction of individual species. Evolutionary changes in the position of muscles and their functions are associated with a corresponding repositioning of the sclerite. Thus the structure of the muscles reveals important characters not noted by earlier taxonomists. Such a study was initiated by A.S. Danilevskii. An analysis of the morphology of muscles and principles of their function in the tribes Archipini and Laspeyresiini (Danilevskii and Kuznetsov, 1968) demonstrated the value of morphofunctional studies for phylogeny. Subsequently, A.S. Danilevskii proposed that such an analysis be applied to higher taxa of the family, but he died before he could do so.

The present article continues the research begun by A.S. Danilevskii on the functional morphology of the genitalia of tortrices for the purpose of assessing the phylogenetic relationships between the tribes of European tortrices. Since no significant and direct changes in the genital apparatus have been found in females compared to males, this review pertains mainly to the latter.

The material for this study was collected during 1970 and 1971 in the forest reserves (Belgorod District), in the environs of Leningrad (Komarovo, Old Petergof, Luga), and in Armenia (Tsav). A total of 28 species from 26 genera of 10 tribes were studied.

We are deeply grateful to M.I. Fal'kovich (Leningrad) for his assistance in this work and to V.V. Pustovarov (Erevan) who provided the material.

GENERAL SCHEME OF FUNCTION OF THE MALE GENITALIA

In the suborder Frenata a general scheme of function of the genital structures can be delineated, even though it is subject to rather variable modifications.

The general principle of function of the male genitalia in Lepidoptera relates to the placement of the uncus on sternite VIII of the female, with subsequent fixation of this sternite between the uncus and gnathos. Additional fixation of the position of the copulating male is provided by the valves, which grip the sides of the abdominal end of the female. This type of copulation is widely seen in Frenata. The archaic members of Cossidae constitute a good example and, possibly, are phylogenetically close to the family Tortricidae, sharing common roots with it.

Initially, the genital apparatus of male lepidopterans relied on a relatively large number of muscles. According to Hannemann (1957), in *Micropteryx calthella* L. 14 pairs of muscles are present, and in Frenata 8 pairs (Forbes, 1939; Stekol'nikov, 1965). There are 4 to 7 pairs of muscles in the genitalia of tortrices. A subsequent reduction or complete disappearance of several muscles is found in very advanced groups of Frenata. The maximum number of muscles in segment IX is 3 pairs, of which 2 appear to be the result of the division of a primary single pair. In very advanced groups an even greater reduction of genitalia is seen, expressed in the reduction or disappearance of certain muscles and notable development of the remaining muscles. However, in spite of the similarity in genital muscles, comparative data on taxa at the family level provides excellent information for the taxonomist for phylogenetic and taxonomic analysis.

The muscles in the male genital apparatus are listed below together with their place of attachment and the functions performed by them. Functional criteria have been used in naming the muscles.

1. Depressors of uncus (m_1). Present in every species in which the uncus is developed. On contraction, they release the uncus which either rotates, joins the tegumen, or bends, sometimes at 180°. The

depressors of the uncus are fairly constant in position, and attached to the anterior margin of the tegumen and the lower side of the uncus base. A distinct direct relationship exists between the extent of sclerotization of the uncus and the development of its depressors. The presence or location of these muscles is of less taxonomic importance than the mutual adaptation of the shape and function of the uncus and the sclerites of the female genitalia.

2. Retractors of anal cone. These muscles pull the anal cone inward, effect its rotations, and compress the diaphragm. Their position and function are quite constant in Frenata, and hence their taxonomic importance is minimal. These muscles will not be discussed hereafter.

3. Tergal extensors of valves (m_2). Although the function of these muscles is not always sufficiently clear, their participation in the movement of the valves is not disputable. The tergal extensors of the valves extend from the lateral part of the tegumen downward, toward the basal appendage of the valves or toward the diaphragm near this appendage. The basal appendage is an invaginated section of the outer wall of the upper margin of the valve and functions as an apodeme for muscle attachment. The development of the tergal extensors varies from very large to totally reduced.

4. Sternal extensors of valves (m_3). These are attached to the fultura and sacculus of the valve. Often the place of their attachment is displaced from the valve to the vinculum. In the first case the valves open as a direct result of muscle contraction; in the second case the valves move due to the movement of the fultura per se. On contraction of the extensors the upper part of the fultura is pulled inward, while the lower part moves outward due to the constant turgor inside the insect. The pressure causes the valves to open since their bases are close to each other and connected through the fultura (Stekol'nikov, 1967a). Comparative morphological data for various groups of lepidopterans permits us to consider the direct opening of the valves a primary trait, and the attachment of the sternal extensors to the valves more primitive than their attachment to the vinculum (Stekol'nikov, 1967b).

5. Tergal flexors of valves (m_4). These extend from the tegumen, near its joint with the vinculum, toward the basal appendage of the valve or the transtilla. Contraction of the tergal flexors moves the valve. These muscles are usually developed, except in those rare cases where the valves lose their mobility. Forbes (1939) wrongly interpreted these muscles as the extensors of the valves and also misconstrued the function of the sternal extensors of these valves.

6. Intervalvular muscles. Located inside the valve. Such muscles

were absent, however, in all the tortricid moths examined by us. The intervalvular muscles bend the valve or induce movement of the mobile harpes.

7. Protractors of aedeagus (m_5). These mostly extend from the basal process of the aedeagus (coecum penis) to the clasper or to the vinculum. In the first case contraction of the muscles not only moves the aedeagus but also the valves. Thus this fifth pair of muscles are the ones which serve the valve. Attachment of the protractors of the aedeagus to the valve may be considered a primary condition for Lepidoptera, since it is characteristic of least specialized groups (Stekol'nikov, 1967a, 1967b). Shifting of the aedeagus protractors to the vinculum is a secondary phenomenon and observed in more specialized forms.

8. Retractors of aedeagus (m_6). Extend from the vinculum or saccus (if it is developed) to the central part of the aedeagus, behind the entrance of the ductus ejaculatorius into the penis. Contrary to the protractors of the aedeagus, the location of the retractors is fairly constant. Changes lead either to a greater or lesser degree of their development, or their fusion into a single unpaired muscle. In most cases the muscles extruding and retracting the aedeagus after copulation are better developed than the other muscles.

9. Retractor of vesica. Located inside the cecum of the aedeagus. This muscle is not shown in the diagrams.

FUNCTIONAL MORPHOLOGY OF THE MALE GENITALIA IN SPECIES OF THE SUBFAMILY TORTRICINAE

Tribe Cochylini: *Agapeta hamana* L. Species close to type species of the genus *Agapeta* Hb. This genus and two others examined below, *Eupoecilia* Stph. and *Aethes* Billb., are usually included in the family Cochylidae. Although the sclerite structures of the male genitalia in *A. hamana* L. (Figures 1 and 2) are highly modified, the muscles in terms of function as well as location differ little from those of other species of the subfamily Tortricinae. The absence of depressors of the uncus (m_1) is not an important difference. Such a reduction occurs parallelly and independently in many tribes of tortricids.

As mentioned, the valves in *A. hamana* are highly modified (Figure 1, A) and morphologically differentiated into three distinct parts. The lower part (sacculus) is sclerotized and extends along the vinculum; the central part is likewise sclerotized and bears two strong falcate appendages on its outer wall; the dorsal part of the outer wall (cucullus) is in the form of a soft lobe covered with numerous setae. In spite

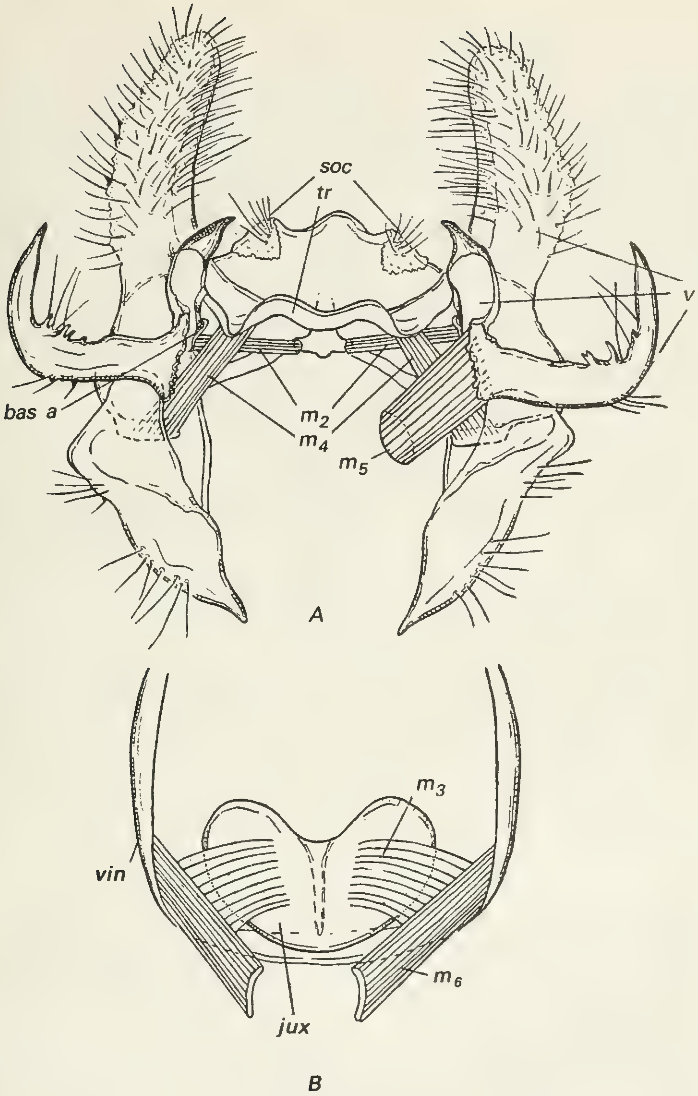


Figure 1. *Agapeta hamana* L., male, genitalia.

A—posterior view (aedeagus and vinculum removed); B—fultura, inner view.

Legend for Figures 1 to 13.

bas a—basal appendage of valve; bas p—basal process of aedeagus; bas d—basal depression of valve; v—valve; vin—vinculum (sternite IX); gnath—gnathos; caul—caulis; crn—cornuta; cuc—cucullus; m$_1$–m$_6$ muscles: m$_1$—depressor of uncus, m$_2$—tergal extensor of valve, m$_3$—sternal extensor of valve, m$_4$—tergal flexor of valve, m$_5$—protractor of aedeagus, m$_6$—retractor of aedeagus; scl—sacculus; soc—socia; teg—tegumen (tergite IX); tr—transtilla; unc—uncus; ed—aedeagus; jux—juxta.

of such a sharp morphological differentiation, the valves function as a single unit.

The sternal extensors of the valves extend from the juxta to the vinculum (Figure 1, B). The tergal extensors of the valves (m_2) extend from the middle part of the base of the tegumen toward the basal appendage, and directly move the valves (Figure 1, A). The exceptionally strong flexors of the valves (m_4) extend from the tegumen to the lateral part of the transtilla. Additional flexors of the valves, namely, the protractors of the aedeagus (m_5), approach the outer wall of the central sclerotized part of the valve, corresponding to its basal region. Although the valves are highly modified in structure, their position on the vinculum (broad between bases) is fairly primitive.

The aedeagus is less modified than the valve (Figure 2) and performs the definite function in *A. hamana* L. of initially holding the female, and an additional function of mutual positioning of the copulating insects. The aedeagus carries a tooth on the distal end that is bent downward (Figure 2, A). When the aedeagus is bent, the tooth reaches the falcate process of the juxta which is directed upward (Figure 2, B). Thus the aedeagus-juxta system is analogous to the uncus-gnathos system in which the principle of pincers is employed. The juxta is a broad rounded plate with a falcate median process connected by a mobile narrow membrane to the caulis, which is fused with the aedeagus. This "joint" of the juxta ensures the swing of the aedeagus in a vertical plane. The tilt of the aedeagus ensures the extension of the protractors (m_5) from the cecum of the aedeagus to

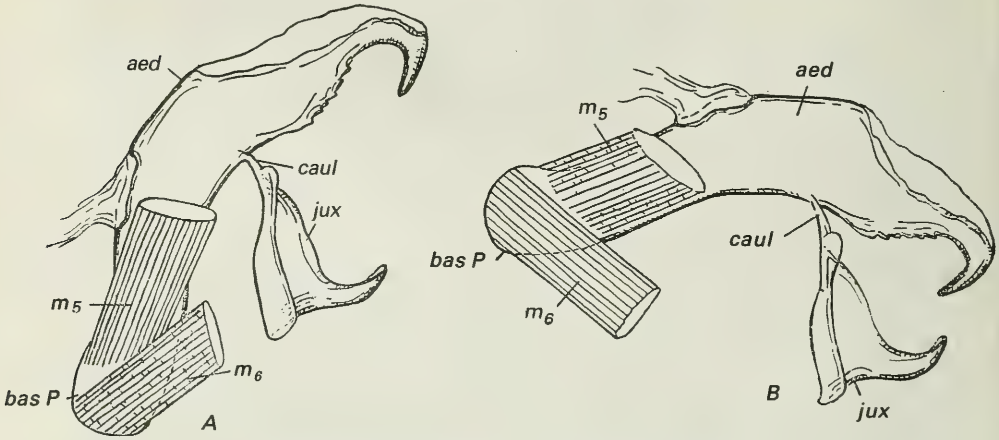


Figure 2. *Agapeta hamana* L., position of aedeagus.

A—on contraction of the retractors; B—on contraction of the protractors.

the valves. The retractors of the aedeagus (m_6) also originate from the cecum and are attached to the vinculum.

After fixation of the female genitalia through the hook-up of the aedeagus and juxta, movement of the vesica in the sex duct of the female takes place. The aedeagus is not inserted into the duct; its function is simply the fixation of the mutual positioning of the copulating insects.

Eupoecilia angustana Hb. is a member of a genus very close to the generic type of the tribe Cochylis Tr. The valves of this species, unlike those of *A. hamana* L., are simple and lamelliform; however, the transtilla is well developed. The flexors of the valves (m_4) are attached to the transtilla as in the previous species. The tergal extensors of the valves (m_2) are attached to the median appendage on the anterior margin of the tegumen. Their second part is attached somewhere in the region of the transformation of the transtilla into the upper margin of the valve (the attachment could not be pinpointed more precisely). If the depressors of the uncus (m_1) are reduced in *A. hamana* L., in *E. angustana* Hb. they are well developed and form a lining for the entire inner surface of the tegumen (Figure 3, A). On contraction of the depressors, the distal part of the tegumen bends transversely together with the socii, drops downward, and attaches to the sclerotized median process of the transtilla. The margin of the sternite of segment VIII in the female is fixed between the socii and transtilla; as in *A. hamana* L., this sternite is compressed between the aedeagus and the process of the juxta.

The aedeagus is very massive and almost entirely couched in the abdomen. The caulis is rudimentary, while the juxta is lamelliform and broad (Figure 3, B). As in *A. hamana* L., the vesica is inserted in the sex duct of the female *E. angustana* Hb. In this species the vesica is covered with a large number of spines for additional fixation of the position of the copulating partners. The aedeagus is capable of only minimal movement in a vertical plane because of the atrophy of the caulis and enlargement of the cecum of the aedeagus. The muscles serving the aedeagus occupy the typical position for Frenata (Figure 3, B). The protractors of the aedeagus (m_5) are attached to the base of the massive cecum, and its retractors (m_6) originate slightly behind the entrance to the ductus ejaculatorius. The long slender protractors of the aedeagus are attached to the vinculum and partly to the basal region of the valves. The sternal extensors (m_3) of the valves are similar to those of *A. hamana* L., and connect the broad juxta with the saccus.

Thus the organization of the genitalia of *E. angustana* Hb. reveals a

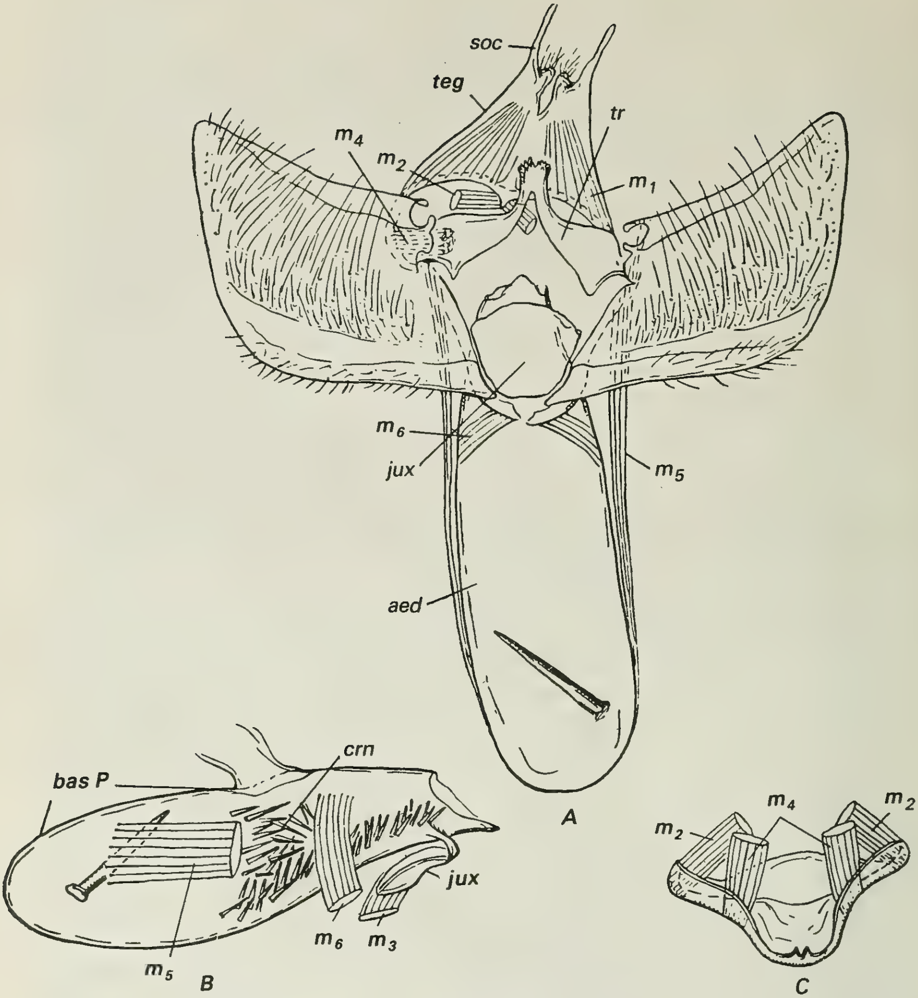


Figure 3. Cochylini, male, genitalia.

A—*Eupoecilia angustana* Hb., rear view; B—*E. angustana* Hb., aedeagus and its muscles; C—*Aethes kindermanniana* Tr., transtilla and its muscles.

greater number of primitive traits than in *A. hamana*. Archaic characters are the well-developed depressors of the uncus, lack of articulation of the valves, nature of the structure of the aedeagus and peculiarities of the attachment of the muscles to it, presence of maximum number of muscles in the male genitalia of tortricids, and wide space between the bases of the valves.

In spite of the differences in function of the copulatory apparatus of the male, the nature of the articulation of the fultura with the aedeagus, working of the vesica, structure of the transtilla, and the attachment of the muscles are similar in the two species.

Aethes kindermanniana Tr. differs significantly from the type species of the genus *Aethes* Billb. The muscles of the male genitalia of *A. kindermanniana* Tr. are similar to those of the species of Cochylini described above, but differ in some details. The depressors of the uncus are reduced. In distinction from *A. hamana* L., in *A. kindermanniana* Tr. not only do the flexors (m_4) extend toward the transtilla (Figure 3, C), but also the tergal extensors of the valves (m_2). The aedeagus is extremely complex. Its retractors and protractors, in distinction from the muscles of the other two species of Cochylini, are attached to the end of the cecum. These muscles ensure a greater mobility of the aedeagus because of the nature of the joint between the copulatory organ and the developed caulis. The caulis also has a mobile joint with the aedeagus and juxta. Such a double joint in the aedeagus—fultura system ensures considerable movement of the short but highly sclerotized trilobate aedeagus along the arch backward and downward.

The flexors of the valves (m_3), described in the species mentioned above, extend from the juxta to the vinculum. In the male genitalia of *A. kindermanniana* Tr. the aedeagus per se serves as an additional attachment mechanism and is inserted in the sex duct of the female.

Tribe Archipini. *Archips rosana* L. (Figure 4): This species is very similar to the type species of the genus *Archips* Hb., which serves as the type genus for the tribe. The functions of the genital appendages of *A. rosana* L. differ little from the general pattern of Frenata.

The tergal complex of the appendages includes a broad tegumen, long and curved uncus, and well-developed gnathos. On contraction of the strong depressors, the uncus drops down, reaching the upcurved gnathos, thereby effecting the attachment of the posterior margin of sternite VIII in the female abdomen.

The valves are slightly sclerotized, lobate, and have a strong chitinous shaft on the inner wall. This shaft is the only supporting element of the valve during fixation of the female abdomen. The basal region of the valves is connected with the transtilla, to which the short tergal flexors (m_4), which may move the valves, continue from the tegumen. The protractors of the aedeagus (m_5), attached at the base of the outer wall of the valve, serve as additional flexors, and partially transform into the vinculum. The partial shift of their place of attachment to the vinculum is determined by a distinct membranization of a large area on

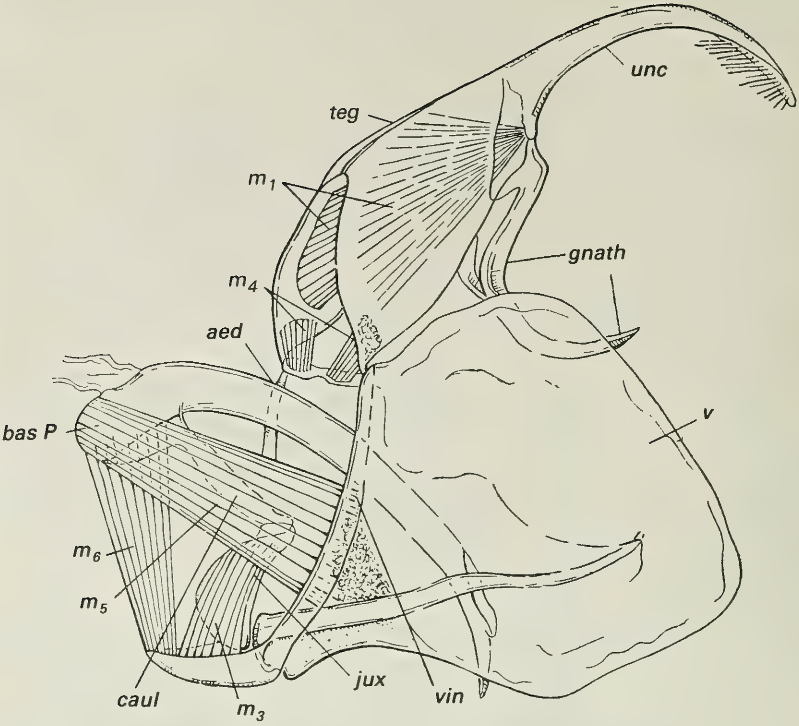


Figure 4. *Archips rosana* L., male, genitalia. Lateral view.

the surface of the valve and the almost total fusion of the valves with the vinculum, without loss of their mobility in relation to abdominal sternite IX.

The tergal extensors of the valves (m_2), the fixing elements in Cochylini, are reduced here. The valves are moved only by the sternal extensors (m_3), which extend from the juxta to the vinculum. On pulling the apex of the juxta inward and downward, a definite pressure develops at the joint of the base of the juxta with the valves, effecting the opening of the latter.

The structure of the fultura is complex compared to the general pattern. The caulis is large, elongated, and attached to the juxta like a ball bearing. At the same time, the connection of the caulis with the aedeagus is fairly strong and devoid of any special joint, which greatly restricts its swing in the caulis. On contraction of the protractors of the aedeagus (m_5), movement of the aedeagus together with the fultura

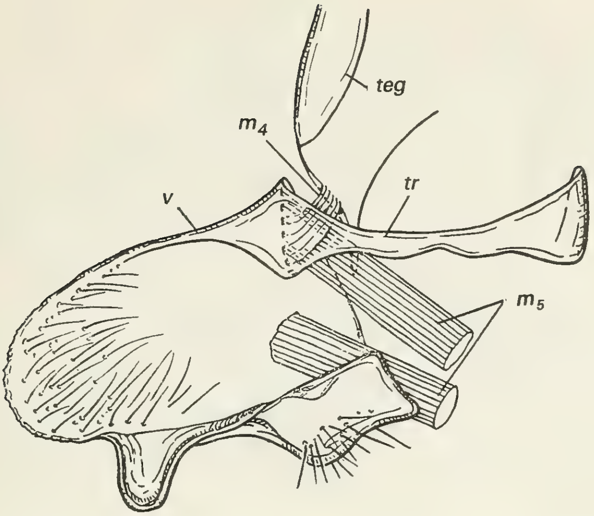


Figure 5. *Philedonides prodromana* Hb., valve, transtilla, and part of tegumen.

takes place due to an increase in the angle between the caulis and the juxta.

The retractors, like the protractors of the aedeagus, are attached to the developed cecum. The change in the place of attachment of the retractors of the aedeagus to its proximal part, on the cecum, is the result of a change in the function of the aedeagus—fultura system, i.e., the aedeagus after copulation is not pulled in a straight line with the anellus, but in the form of an arc and together with the fultura.

For the most part the genital apparatus of *A. rosana* L. does not differ functionally from the general pattern described above, but displays specificity in the functioning of the aedeagus. A similar morpho-functional picture has been established for other tortricids of the genus *Archips* Hb.—*A. podana* Scop., *A. crataegana* Hb., and *Choristoneura sorbiana* Hb., in spite of the fact that the latter species has a developed socia. Of the five members of the tribe Archipini examined, the type species of the genus *Philedonides* Obr. (*P. prodromana* Hb.) differs slightly (Figure 5). The protractors of the aedeagus (m_3) in this species are divided into two pairs of individual muscles. One pair maintains the usual attachment on the valves, while the place of attachment of the second pair moves onto the transtilla. In all other aspects the genital muscles of *P. prodromana* Hb. are similar to those of the other species examined in this tribe.

Tribe Cnephasiini. *Exapate congelatella* Cl. (Figure 6): Type species of the genus *Exapate* Hb. This genus is very close to the type genus of the tribe. The male genitalia of *E. congelatella* Cl. do not differ essentially from those of members of the tribe Archipini described above. The uncus and gnathos are developed. The depressors of the uncus (m_1) are attached to the base of the socia and press the uncus to the gnathos on contraction. The tergal flexors of the valves (m_4) originate not from the sides of the transtilla but its middle. The sternal extensors of the valves (m_3) originate in the form of broad bundles from the juxta and extend to the vinculum. Unlike *A. rosana* L., in *E. congelatella* Cl. the caulis is significantly reduced.

The cecum of the aedeagus is compressed laterally and broad platforms located on it for the attachment of the highly voluminous protractors of the aedeagus (m_5). As in the previous species, the protractors of the aedeagus extend toward the valves and are attached in the basal region. The retractors of the aedeagus (m_6) are quite weak and extend in the form of two narrow belts toward the vinculum.

Tribe Tortricini. *Tortrix viridana* L. (Figure 7): Type species of the type genus of the tribe. It differs significantly from other species examined in the subfamily.

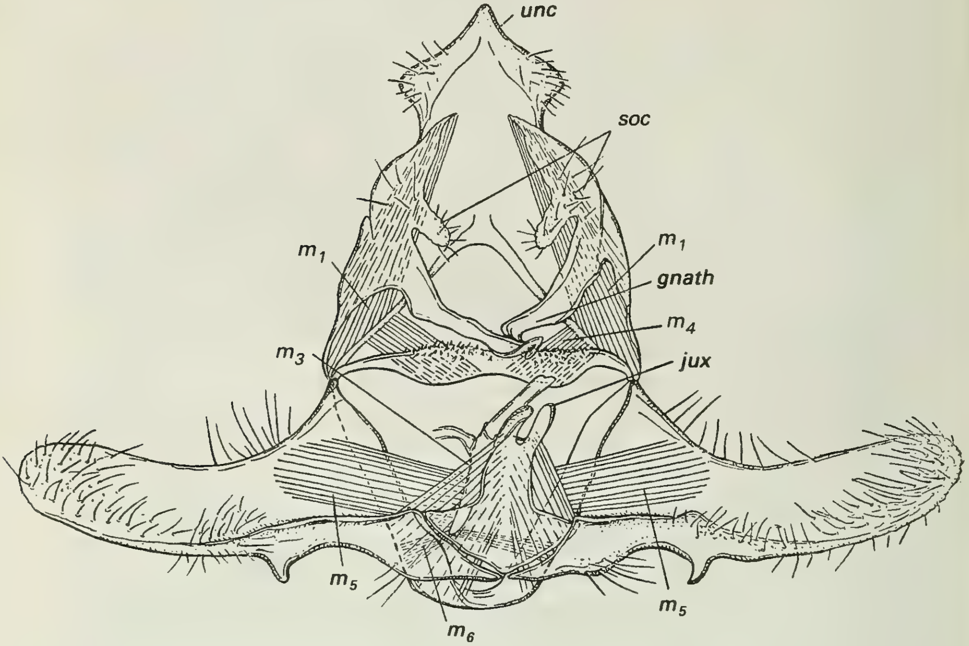


Figure 6. *Exapate congelatella* Cl., male, genitalia. Rear view.

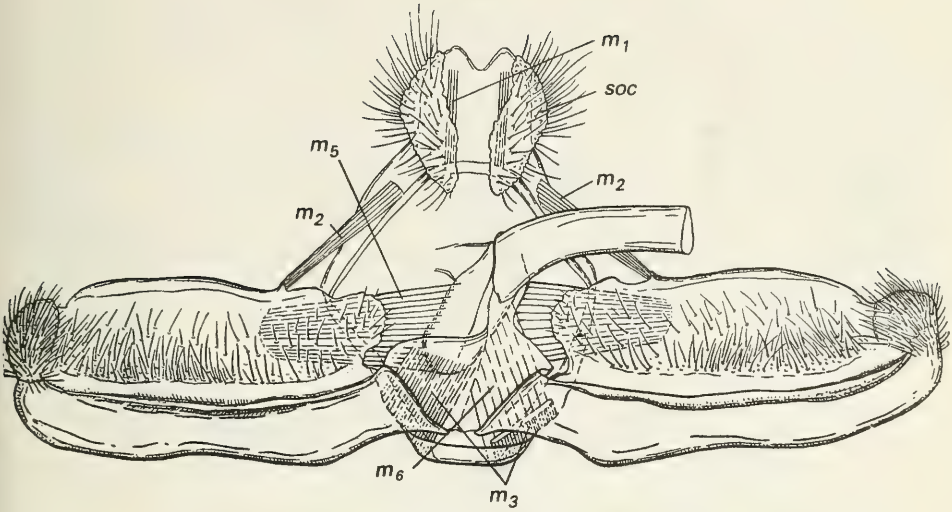


Figure 7. *Tortrix viridana* L., male, genitalia. Rear view.

In spite of the reduction of the uncus, its depressors (m_1) are preserved but extremely weak. On contraction, these muscles bend the tegumen slightly, facilitating the tactile function of the socia.

The valves are fairly simple in structure, with a small basal appendage, toward which the muscles m_2 extend from the tegumen and function as flexors of the valves. The other muscles around the valves do not exist in this tergal complex. Although the muscles m_2 serve as flexors, they are not homologous with the tergal flexors (m_4) of Archipini, which keep the tegumen with the transtilla.

The reduction of the muscles m_4 in *T. viridana* L. can be explained by the loss of the transtilla and the changeover of function of the flexors of the valves to m_2. Thus the tergal flexors of the valves in Archipini and Cnephasiini on the one hand, and in Tortricini on the other, are not homologous structures.

The central part of the inner wall of the valves is poorly sclerotized; membranization of this wall is essential because of the relatively deep submersion of the strong protractors of the aedeagus (m_5) in the valve. This is also observed in *E. congelatella* Cl. (Figure 6). In all the species examined earlier the protractors of the aedeagus are not submerged in the valves, but attached on the wall near the joint of the valve with the vinculum. The "work" of the valves in fixing the female is effected by the sclerotized sacculus.

The retractors of the aedeagus extend from the cecum penis to the vinculum. The fultura has a well-developed juxta and reduced caulis. The main structure of the fultura is similar to that of *E. congelatella* Cl. The broad sternal extensors of the valves (m_3) extend from the juxta to the vinculum.

The structure of the muscles in *Acleris variegana* Den. and Schiff. is similar. Here the weak, sclerotized, narrow transtilla is still preserved, but the muscles m_4 reduced, and fixation accomplished by m_2.

In *T. viridana* L. and *A. variegana* Den. and Schiff. the role of the valves in the fixation of the female is greater. Such a mechanism of interaction between the genital appendages of the male and female is exceptionally well developed in most advanced groups of Olethreutinae.

FUNCTIONAL MORPHOLOGY OF THE MALE GENITALIA IN SPECIES OF SUBFAMILY OLETHREUTINAE

Tribe Olethreutini. *Olethreutes arcuella* Cl. (Figures 8 and 9, A): Type species of the type genus of the subfamily Olethreutinae. The muscles of the male genitalia in *O. arcuella* Cl. are distinguished from those of members of the subfamily Tortricinae by loss of the extensors of the valves, which extend from the juxta (m_3). Furthermore, the place of attachment of the protractors of the aedeagus (m_5) shifts from it to the caulis and the other end of these muscles penetrates the highly sclerotized sacculi and are attached to their walls. Because of the exceptional development of the protractors of the aedeagus and their deep submersion in the valves, the inner wall of the valve is truncated at the base and its notch on the upper side covered by a well-demarcated thin membrane, forming the so-called basal pit. A large number of spines and setae are located on the inner surface of the cucullus, which provide a more stable contact between the male and female genitalia before copulation, while some form a crest between the scales on the female abdomen. This crest is commonly found among Lepidoptera. The basal working surface of the valve, the ventral surface, is highly sclerotized, and a rectangular projection located on it, with a large spine and tuft to coarse hard setae. All these structures significantly assist in the fixation of the female abdomen.

The basal appendage of the valve is shaped like an equal-armed lever toward which the flexors and tergal extensors of the valves extend from the tegumen (m_4 and m_2). On contraction of one of these muscles, rotation of the appendage and concomitant opening or movement of the valves takes place, depending on whether the tergal extensors or the flexors of the valves are contracted.

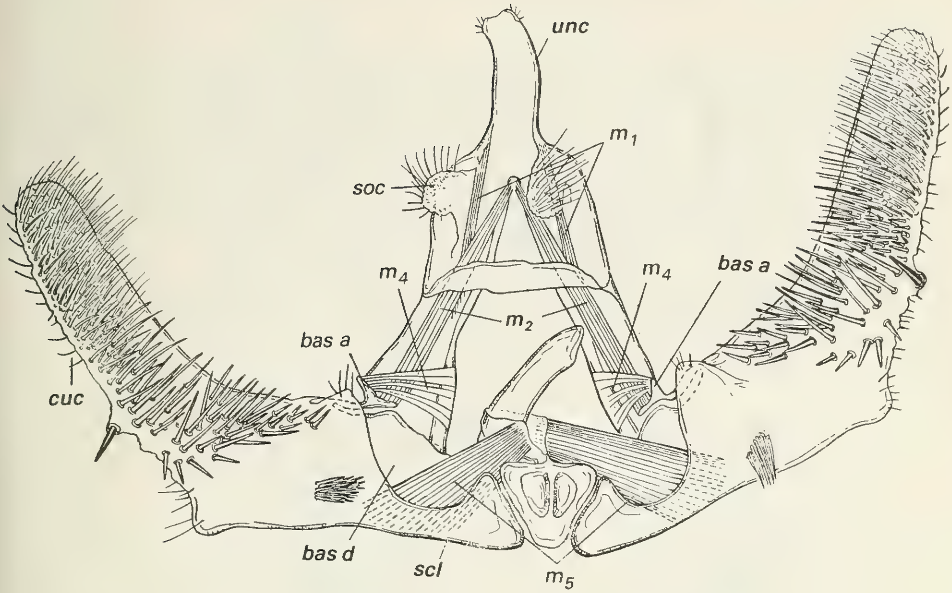


Figure 8. *Olethreutes arcuella* Cl., male, genitalia. Rear view.

The uncus and gnathos are poorly developed, the latter in the form of a sclerotized plate. The depressors of the uncus (m_1) extend up to its basal part near the socia.

The structure of the fultura is extremely characteristic, and consists of a compact sclerotized juxta and large narrow caulis (Figure 9, A). The joint between the juxta, caulis, and aedeagus is absent. The fusion of the fultura with the aedeagus is needed for the simultaneous tilt of the aedeagus and fultura. With such a function of the aedeagus, its appendage (coecum penis) lost its significance as the apodeme of the muscles moving the copulatory organs and became reduced.

The mechanism of copulation in *O. arcuella* Cl. differs little from the ancestral pattern. The uncus occupies sternite VIII of the female and is compressed to the gnathos, thereafter performing the fixation of the female abdomen by the valves with the simultaneous insertion of the penis into the duct of the bursa copulatrix.

The other two species examined, *Hedya pruniana* Hb. and *Phiaris lacunana* Den. and Schiff., from well-delineated genera, differ from *O. arcuella* only in degree of development of the uncus and its depressors (m_1). The uncus in *H. pruniana* Hb. is very poorly developed and its depressors fairly isolated. In *P. lacunana* Den. and Schiff. (Figure

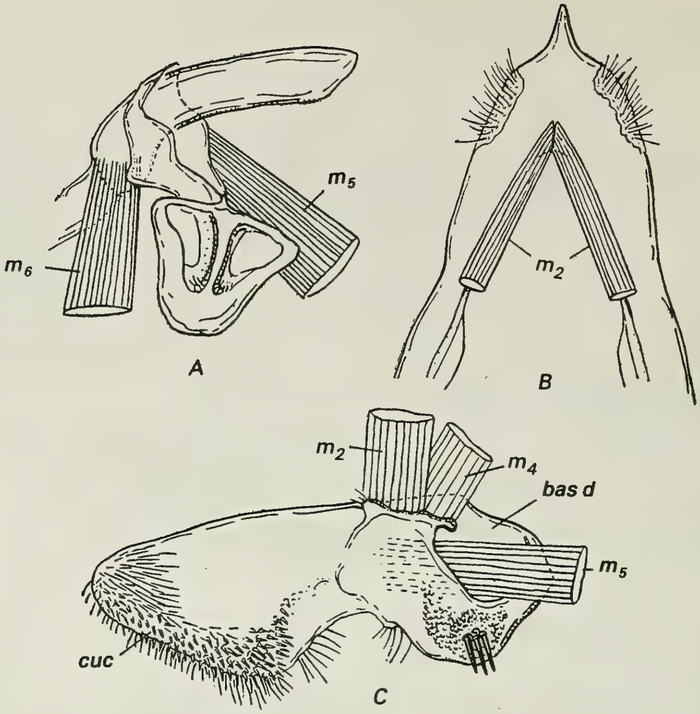


Figure 9. Olethreutinae, male, genitalia.

A—*Olethreutes arcuella* Cl., aedeagus and its muscles; B—*Phiaris lacunana* Den. and Schiff., tegumen; C—*Bactra lanceolana* Hb., valve and its muscles.

9, B) these muscles disappear and the uncus remains a weak membranous appendage.

Tribe Eudemini. *Eudemis profundana* F.: Characteristic species of the type genus of this tribe. On the basis of structure of the skeleton and muscles of the genitalia, the species is close to *O. arcuella* Cl. (Figure 8), but differs in reduction of the uncus and its depressors (m_1). Furthermore, in *E. profundana* F. the protractors of the aedeagus (m_6) are more deeply submerged in the valve, reaching its midpoint.

Tribe Bactrini. *Bactra lanceolana* (Figure 9, C): Type species of the type genus of the tribe. The genitalia of *B. lanceolana* Hb. are also similar to the copulatory apparatus of *O. arcuella* Cl. The tergal complex of the genital sclerites is well developed. The tergal extensors (m_2) and flexors of the valves (m_4) reach the basal appendage; the latter, however, is still not morphologically developed to the same degree as in *O. arcuella* Cl.

Tribe Eucosmini. *Epiblema foenella* L. (Figure 10, A): Type species of the genus *Epiblema*, which is very similar to the type genus of the tribe. It differs from *O. arcuella* Cl. in deeper submersion of the protractors of the aedeagus into the valves and broader place of attachment. Furthermore, the protractors of the aedeagus (m_5) are completely shifted to the caulis. The place of attachment of the retractors of the aedeagus (m_6) is still the base of the aedeagus and sternite IX.

The tergal complex of the sternite of the genital apparatus is subject to some reduction: the uncus is condensed and slightly sclerotized,

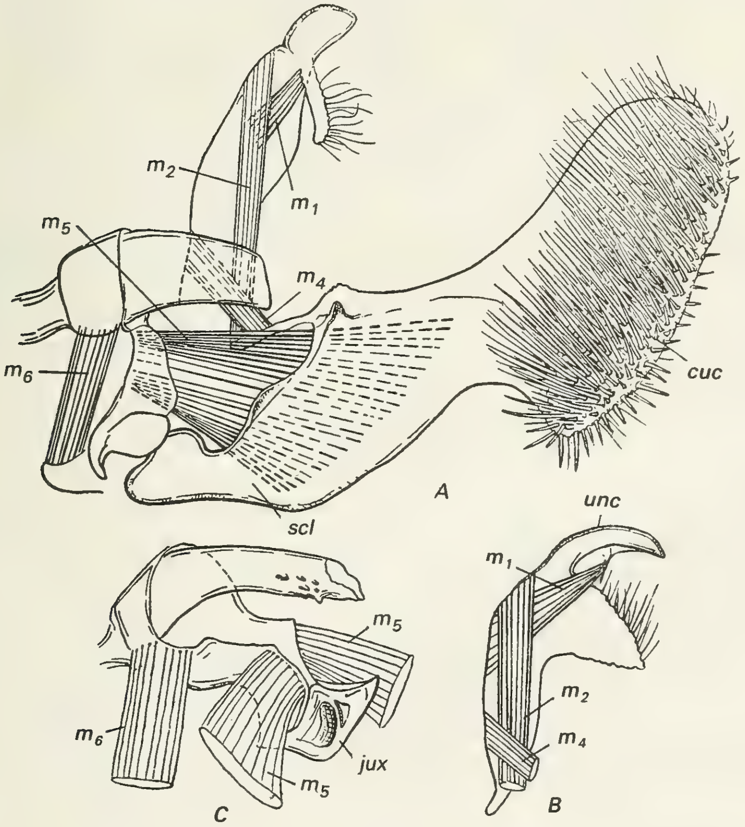


Figure 10. Eucosmini, male, genitalia.

A—*Epiblema foenella* L., lateral view; B—*Epinotia crenana* Hb., tergal appendage; C—*Thiodia citrana* Hb., aedeagus and its muscles.

the depressors of the uncus (m_1) small and attached to the base of the socia, and the gnathos totally eliminated.

The role of the valves in fixing the position of the female is often greater in *E. foenella* L. than in the species examined earlier. Consequently the valves are better differentiated than in Olethreutini. A well-developed cucullus with a dense brush of strong setae is present, with the setae directed toward one side. The muscles facilitating movement of the valves (m_2 and m_4) are also well developed.

In the other five species examined in the tribe Eucosmini variation in the degree of development of the tergal appendages of the genitalia and their muscles is seen. In the member of the type genus of the tribe—*Eucosma fulvana* Stph.—and tortricids of allied genera (*Notocelia cynosbatella* L. and *Petrova resinella* L.), the structure and function of the genitalia are exactly the same as in *E. foenella* L. However, in *Epinotia crenana* Hb. of a more archaic genus, the uncus and the depressors reaching it (m_1) are much better developed (Figure 10, B).

Thiodia citrana Hb. (Figure 10, C) exhibits a tendency toward reduction. In this species the depressors of the uncus (m_1) are completely lost in spite of the fact that the appendage itself has been preserved in the form of a rudiment, and the protractors of the aedeagus (m_5) originate from the lower part of the caulis. Furthermore, the retractors of the aedeagus (m_6) have also shifted partially to the caulis.

Tribe Ancylidini. *Eucosmomorpha albersana* Hb. (Figure 11, A): Type species of the genus, usually included in the tribe Laspeyresiini (Obraztsov, 1954–1957; Hannemann, 1961). The protractors of the aedeagus (m_5) in this species, like those in *T. citrana* Hb. (Eucosmini), are attached to the lower part of the elongated caulis. The juxta is reduced. However, the second place of attachment of the protractors differs somewhat compared to the species examined earlier. The given muscles penetrate deeper into the valve and are attached near its collar. Consequently the basal pit is very distinct indeed. The uncus and its depressors are totally atrophied.

The position of the flexors (m_4) and tergal extensors of the valves (m_2) does not differ from other members of Olethreutinae. The same structure and function have also been established for the member of the type genus of the tribe Ancylidini—*Ancylis badiana* Den. and Schiff. (Figure 11, B). Fixation of the female by the male of this species is accomplished only by the valves, without the participation of other appendages.

Tribe Laspeyresiini. *Laspeyresia pomonella* L. (Figure 12): Characteristic member of the type genus of the tribe. The male genitalia are similar to the copulatory apparatus of Ancylidini but exhibit several

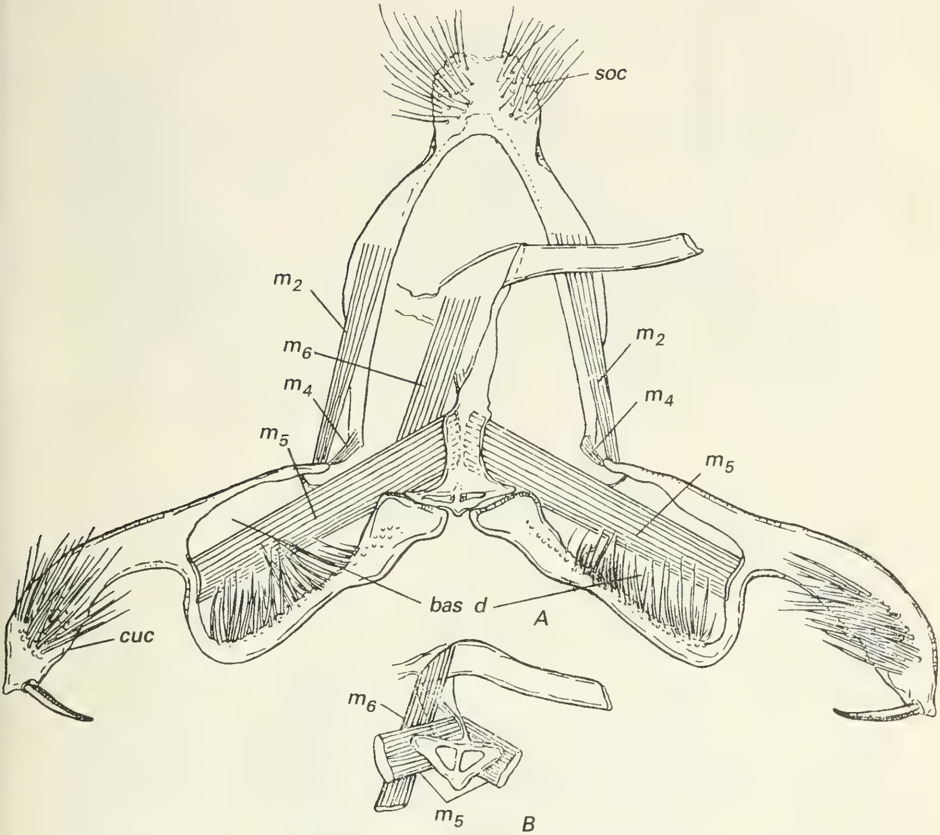


Figure 11. Ancylidini, male, genitalia.

A—*Eucosmomorpha albersana* Hb.; B—*Ancylis badiana* Den. and Schiff., aedeagus and fultura with muscles.

simplifications. The tegumen is reduced to a narrow and slightly sclerotized stripe. The valves have a basal pit in which the strong protractors of the aedeagus (m_5) originate from the caulis and extend up to the cucullus of the valves. The position of the retractors of the aedeagus (m_6), tergal flexors, and extensors of the valves (m_4 and m_2) is analogous to that in Eucosmini and Ancylidini.

Other members (*Grapholitha fissana* Fröl. and *Dichrorampha plumbana* Sc.) of different subtribes do not differ essentially from *L. pomonella* L. in nature of the genital appendages, position of the muscles (Figure 13), and their functions.

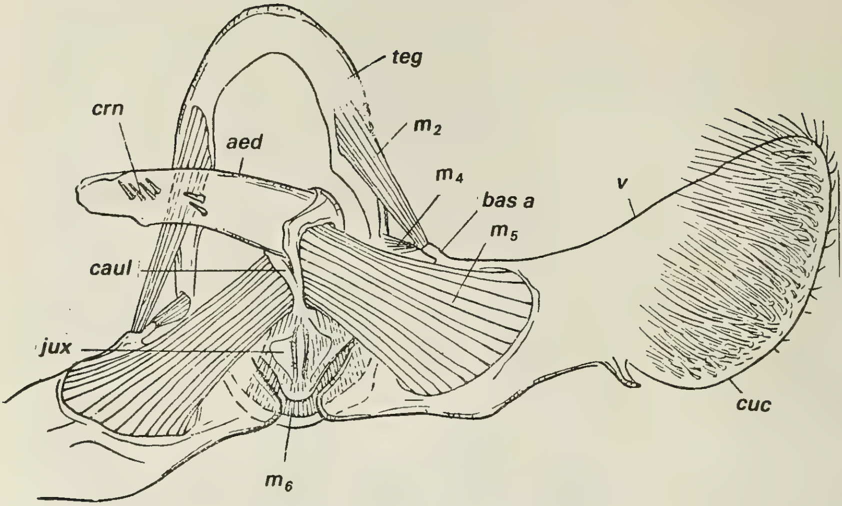


Figure 12. *Laspeyresia pomenella* L., male, genitalia. Rear view.

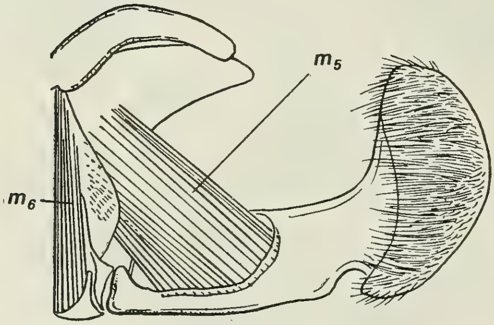


Figure 13. *Dichrorampha plumbana* Sc., male, genitalia. Lateral view.

PHYLOGENETIC RELATIONSHIPS BETWEEN TAXONOMIC GROUPS OF EUROPEAN TORTRICES

The importance of various characters used in the taxonomy and phylogeny of tortrices is not equal. If the family Tortricidae is distinguished by the general principles of structure in all stages, with a reduction in the range of taxon peculiarities of external morphology, then the larvae lose their phylogenetic significance since these characters are almost always adaptive to living conditions, highly elastic, and under conditions of a changed mode of life subject to considerable modification. Some of the morphological characters used in the classification of larvae could probably appear as secondary traits: for example, the anal crest, the two-tiered crown of tarsal claws, etc. As a result, peculiarities in similarity can appear convergently in unrelated groups, which confuses phylogenetic associations. Similar convergent changes are observed in the structure of the pupae. Venation and adaptive coloration may be used in identification and phylogeny only in a narrow taxonomic range—from genus to species.

For the taxonomy and phylogeny of taxa at the level of tribe, the most important characters are those of the imaginal stage associated with sexual functions. The most valuable of these are the peculiarities of muscle structure of the genitalia and principles of their function. These characters enabled us to solve several controversial questions in the taxonomy and phylogeny of larger taxa of tortrices.

Phylogenetic Relationships between Subfamilies

The genera studied fall readily into two groups in a series of morphological and functional characters. These groups correspond to the subfamilies Tortricinae and Olethreutinae.

In all the tribes of the subfamily Tortricinae the usual structure of the aedeagus of lower Lepidoptera has been preserved. The copulatory apparatus has a unique process (the basal appendage of the aedeagus) which serves as an apodeme for the protractors and retractors of the aedeagus (m_5, m_6). The place of attachment of the retractors of the aedeagus at its base is typical for the family Tortricidae, and is associated with the functioning of this organ. In the subfamily Tortricinae the aedeagus is immobile or slightly mobile in relation to the caulis. The degree of development of the latter is rather variable in different tribes of the subfamily. The caulis is joined to the juxta through a ball-bearing structure, and the aedeagus along with the caulis is able to move in an arc downward around the apex of the juxta.

The other peculiarity of the subfamily Tortricinae can be considered the presence of a transtilla, which connects the upper corners of the valves. The flexors of the valves, homologous to true tergal flexors (m_4), or extensors (m_2), reach the transtilla. Both pairs of muscles are present in Cochylini. The functional, and sometimes morphological, reduction of the tergal extensors of the valves in Tortricinae is associated with the presence of sternal extensors which move the valves. All these muscles facilitate movement of the valves irrespective of the position of the aedeagus.

In the process of fixing the position of the female during copulation, generally the uncus and gnathos or other appendages participate together with the valves. In such cases the valves are mobile and lamelliform. If, however, differentiation of individual sections of the valves is observed (sometimes quite significant), such occurs in different tribes through entirely different methods. Since the uncus continues to play an important functional role during copulation, its depressors (m_1) are well developed. Consequently the muscles of Tortricinae are quite similar to the common Frenata-type within the subfamily. A complete set of muscles is preserved in less specialized forms, except for the intervalvular muscles, which are absent in all tortrices.

In Olethreutinae, concomitant with a notable functional and morphological rearrangement of the male genitalia, important differences from Tortricinae are evident in the nature of the relationship of the lower fultura with the aedeagus and in their function. The aedeagus and fultura lack articulation and immobility is likewise seen in the jointless caulis and juxta. Hence the fultura and aedeagus function as a single unit. The place of attachment of the protractors of the aedeagus shifts to the caulis, and the cecum of the aedeagus disappears. Thus the fultura is converted into an apodeme for the attachment of muscles responsible for the movement of the aedeagus. Accordingly, a complex system of crests appears on the caulis, to which the protractors of the aedeagus are attached.

The second peculiarity of the genitalia of the subfamily Olethreutinae is the unique structure of the valves and, in particular, the presence of a basal pit, which is extremely characteristic of these tortrices. The presence of a basal pit on the valve is functionally related to the function of the aedeagus and the shape of the distal part of the valve and the presence of a cucullus with a tuft of strong setae. On bending the fultura, the protractors of the aedeagus together with the copulatory apparatus move almost at a right angle in relation to the surface of the valve. In such a position of the muscles the inner surface of the valve should be membranous. The presence of a collar in which sclerotization provides normal movement of the attachment apparatus of the cucullus prevents, however, the development of a membrane throughout the length of the valve (as happens in Tortricini). The membranous field in the place of attachment of the protractors of the aedeagus is sharply demarcated by the sclerotized parts of the valve, i.e., the basal pit.

The unique function of aedeagus in Olethreutinae has also led to a reduction of the sternal extensors of the valves, which are always present in Tortricinae. Contraction of the retractors of the aedeagus pulls them inward together with the apex of the fultura. Accordingly, the pressure developing in the joint of the juxta with the valves moves the latter. In this case the retractors of the aedeagus additionally function as extensors of the valves and the true sternal extensors, which extend in Tortricinae from the vinculum to the juxta, disappear in Olethreutinae.

Finally, in Olethreutinae both pairs of tergal muscles are always present, which account for the movement of the valve irrespective of the position of the aedeagus. These are the tergal extensors and tergal flexors of the valves (m_2, m_4). Among the members of Tortricinae both pairs of muscles are present only in the genitalia of Cochylini, but then the flexors of the valves (m_4) are always attached to the transtilla, which is absent in Olethreutinae.

The specific function of the aedeagus and associated modifications have ensured the notable simplification of the male genitalia. Because of the greater integration of the aedeagus-valve system and intensification of function of the fixing mechanism of the valves, the tergal complex of the appendages becomes specialized irrespective of the ongoing process of reduction in different tribes.

The structure of the genitalia of the female of Olethreutinae also exhibits significant morphological simplification—a reduction of the sclerotized cones connecting the bases of the apophyses of abdominal segment VIII with the preostial sclerite.

It is clear from the above that the subfamilies Tortricinae and Olethreutinae represent groups which diverged long ago and evolved in different directions. That Olethreutinae constitute a primitive group among tortrices (Meyrick, 1911; Powell, 1964) is not confirmed. To accept this postulation one must assume the separation of a complex copulatory apparatus with characters common for females of more primitive members than tortrices, as well as phylogenetically more advanced from a clearly secondary simplified type of genitalia. There is greater support for considering Olethreutinae the most specialized of all the Holarctic subfamilies of tortrices (Heinrich, 1917, 1923; Pierce and Metcalfe, 1922; Danilevskii and Kuznetsov, 1968).

Phylogenetic Relationships between Tribes of Subfamily Tortricinae and Position of Cochylini in the System of Tortrices

This large Holarctic group with the type genus *Cochylis* Tr. differs from other tortrices in the absence of vein A_1 in the forewings, loss of gnathos, and structure of the bursa copulatrix in females. Based on these characters the taxon has been considered by most researchers after Meyrick (1927) an independent family, Cochylidae. Nevertheless, on the basis of structure and function of the male genitalia, these lepidopterans are indisputably included in the family Tortricidae. These features are primarily the structure and function of the aedeagus and fultura, very similar to that seen in the subfamily Tortricinae, as well as the reduction of the intervalvular muscles.

The caulis in Cochylini is fused with the aedeagus but retains its mobility in relation to the juxta. Marked reduction of the caulis is observed in some genera, and the aedeagus is broadly attached directly to the juxta. However, in *Aethes* Billb., like in *Archips* Hb., the caulis is equal in length to the juxta, and the aedeagus moves during copulation due to the rotation of the caulis on the juxta as on a point of support. The similarity in the specific function of the aedeagus between *Aethes* Billb. and *Archips* Hb. undoubtedly indicates a close relationship between Cochylini and other members of Tortricinae.

The other morphofunctional peculiarities of the genitalia in Cochylini either indicate the relative primitivity of the group, or the nature of partial modifications, which vary in the tribe. The male genitalia of Cochylini possesses the maximum number of muscles in tortrices. In other members of Tortricinae a reduction of either m_2 or m_4 is observed (the tergal muscles serving the valves).

Due to the reduction of the gnathos and uncus, a fairly sharp secondary specialization of the remaining sclerite takes place. The additional function of the female genitalia is performed by the copulatory apparatus with its various appendages or strong cornuti on the vesica. In some groups the uncus and gnathos are functionally replaced by the socia and median process of the transtilla (*Eupoecilia* Stph.) or by the projection of the aedeagus and the process of the juxta (*Agapeta* Hb.).

Similarly, differences in the fixation of the female appendages by the male genitalia in this tribe indicate a poor taxonomic analysis of this group, but never contradict the inclusion of Cochylini in the subfamily Tortricinae.

On the basis of shape and also pattern of wings, Cochylini are undeniably similar to Tortricinae. In the primitive group, which has retained the uncus (genus *Hysterosia* Stph.), a costal fold is present in some species, which is typical only of tortrices. The females of Cochylini preserve the unique attachment of the preostial sclerite with the apophyses of abdominal segment VIII, a feature typical of Tortricinae.

The entire complex of characters typical of tortricid moths is expressed in the larvae (Swatschek, 1958) and pupae (Razowski, 1970). The structure of the cremaster of Cochylini is highly similar to that of Cnephasiini. It is very short and broad as in *Cnephasia* Curt., but carries two, four (*Hysterosia* Stph.), or more spines (in *Stenodes* Hb. up to eight) on the dorsal side. These spines vary in size but their placement is not individual by nature, which indicates negligible phylogenetic significance for the differences noted. The falcate setae on segment X of the pupae of Cochylini are located on larger raised spots than in *Cnephasia* Curt., but even this difference is hardly significant.

There are also genera which occupy an intermediate position between Cochylini and Tortricinae. For example, in *Eulia* Hb. a rudimentary vein A_1 is preserved in the forewings and the gnathos well developed—features typical of Tortricinae, while in terms of structure of the valves, their muscles, and spinules on the surface of the bursa copulatrix, this genus is close to Cochylini.

It should be noted that the disappearance of vein A_1 and the presence of a large number of spinules on the walls of the bursa copulatrix of Cochylini are characters with minimal phylogenetic significance. Reduction of A_1 takes place in all tortrices and only a rudimentary vein retained. The spinules on the bursa copulatrix usually concentrate near the mouth of the seminal duct, and arise independently in different tribes of tortrices. They are often present with the developed signa and, apparently, can take on the function of interaction with spermatophores. Since the vesica of the aedeagus in Cochylini, bearing numerous cornuti, penetrates deep into the sex duct of the female, the spinules covering the surface of the bursa copulatrix possibly also perform the function of support.

Since the morphological shift in the structure of the imago, larva, and pupa of Cochylini does not have great phylogenetic significance and the close affinity of the group with Tortricinae is indisputable, we are returning it to the family Tortricidae, lowering the taxonomic rank to supertribe Cochylidii (Figure 14). In Europe this supertribe is represented by the only tribe, Cochylini, and its place in the system of Tortricidae becomes clearer. Cochylini constitutes a tribe of the subfamily Tortricinae which has retained a very primitive muscular structure that differs slightly from the ancestral structure of Frenata. This archaic nature is expressed in the retention of tergal extensors (m_2) as well as tergal flexors of the valves (m_4); other tribes of the subfamily have lost either one or the other of these pairs of muscles. Furthermore, the sternal extensors of the valves (m_3) are preserved. Such a generalization of muscles is caused by the morphological specialization of the genital skeleton. The process of simplification also involves the larvae of Cochylini, which lead a hidden mode of life inside plant tissues, primarily herbaceous plants. The divergence of the primary members of Cochylini apparently began long ago since in the closely related group from Baltic amber (*Prophalonia* Rbl.), vein A_1 is already absent in the forewings (Rebel, 1935).

The tribes Cnephasiini and Archipini are morphofunctionally very similar to each other, differing from Cochylini in exactly the same direction, and close to each other phylogenetically. Both tribes have preserved the generalized skeleton of the male genitalia but lost the flexors of the valves (m_4). The type genera and genera close to them are particularly similar to each other—*Archips* Hb., *Choristoneura* Ld., *Exapate* Hb., *Cnephasia* Curt. In the tribe Archipini, genera with an archaic bilobate uncus are present, whereas in Cnephasiini the attachment of the protractors (m_5) to the middle part of the basal region of the valves has been preserved, which is typical of goat moths (Cossidae).

Although in both tribes the uncus and gnathos continue to play an important role in fixation during copulation, the lobate valves of Cnephasiini have become complex by sclerotization of the lower margin, on which the typical appendage covered with spinules is located. The signa of the female Cnephasiini lack long blades. The larvae of this tribe are miners initially and hence secondary changes appear in their chaetotaxy; one seta in group VII is lost on the mesothorax and seta IIIa moves more toward the dorsal side or the dorsal-cranial setae III (Swatschek, 1958). The cremaster is reduced in the pupae. In some genera (*Epicnephasia* Danil.) vein A_1 in the forewings is reduced in a different manner than in Archipini; its distal rather than basal part disappears (Danilevskii, 1963). Archipini has maintained its cosmopolitan distribution, while Cnephasiini is distributed only in the temperate belt of the northern hemisphere.

All these peculiarities of specialization enable us to consider Cnephasiini a phylogenetically more advanced tribe compared to Archipini.

The tribe Tortricini, among the most generalized genera, is similar to Archipini. In the tropical members of *Apotoforma* Raz. and *Pareboda* Raz. the uncus and gnathos have been retained, which indicates the existence of a common type of structure and function of the male genitalia for the subfamily. However, in the Holarctic genera *Tortrix* L. and *Acleris* Hb., the function of these appendages in the process of fixation of the female is transferred to the valves. Maximal reduction is seen in the type genus of the tribe, *Tortrix* L., in which the transtilla is secondarily eliminated. In spite of the extreme reduction of the tergal complex of the genitalia, the mechanism of valve movement is typical of the subfamily and three pairs of muscles of the ventral complex (m_3, m_5, and m_6) completely preserved in Tortricini. The changeover to the fixation of the female exclusively by the valves led to the loss of the primary flexors of the valves (m_4), which resulted in a deeper submersion of the strong aedeagus protractors (m_5) in the valves. As a result, membranization of the inner walls of the valves took place and the muscles m_2 began functioning as flexors of the valves. In this process in *Acleris* Hb. the place of attachment of the muscles m_2 shifted to the basal appendage of the valves even with a fully developed transtilla.

Thus the morphofunctional simplification of the male genitalia in Tortricini proceeded in a different direction than in Archipini and Cnephasiini.

The females of Tortricini are characterized by simplification of the signa. If in the South Asian genera *Trophocosta* Raz. and *Sclerodisca* Raz. (Razowski, 1966) the signa are still preserved in the form of coarse invaginations, in Palearctic members they have the shape of flattened plates.

Although the development of larvae of Tortricini takes place in rolled leaves, as in Archipini their preimaginal stages are morphologically simplified. One seta in group VII on abdominal segment VII disappears in the larvae and the cremaster is reduced in the pupae (Danilevskii and Kuznetsov, 1968). Thus Tortricini represents one of the specialized groups of the subfamily (i.e., has no close phylogenetic affinity with Archipini), which evolved from the archaic trunk in the direction of simplification of the sclerite structures of the genitalia and muscles. However, these changes took place in an essentially different manner than in the subfamily Olethreutinae.

Unfortunately, we had no opportunity to study the genus *Sparganothis* Hb., which differs from all tortrices in unfused lobes of the male gnathos. Considering this character, the functional significance of which remains unclear, although it can be considered an uncus of the archaic pairing of the genital appendages, some researchers (Obraztsov, 1958–1968; Hanneman, 1961) consider this supergeneric group, with the type genus *Sparganothis* Hb., an independent subfamily; other specialists (Swatschek, 1958) include it under the tribe Archipini. Since on the basis of all the other peculiarities of the genital skeleton and biology, *Sparganothis* Hb. is a typical member of Tortricinae, we have retained this supergeneric group in the subfamily examined here, maintaining its status of supertribe. This supertribe is represented in Europe by the tribe Sparganothini.

Phylogenetic Relationships between Tribes of Subfamily Olethreutinae

The six tribes of the subfamily Olethreutinae examined, on the basis of structure of the vesica of the aedeagus, basal appendage of the valve in males, and shape of the signa in females, can be combined under two supertribes—Olethreutidii and Eucosmidii (Figure 14).

In all the tribes of Olethreutidii the muscles m_2 and m_4 are attached to the basal appendages of the valves, which often have the shape of a lever, and the vesica of the aedeagus is armed with fixed cornuti. The signa are cyathiform or rounded-lamelliform and compressed, but devoid of blades.

In the male of Eucosmidii the muscles m_2 and m_4 originate from virgate or falcate basal appendages, and the vesica of the aedeagus usually has tufts of caducous spines that vary in shape. Abdominal sternite VII is often modified in the female and the signa acquire

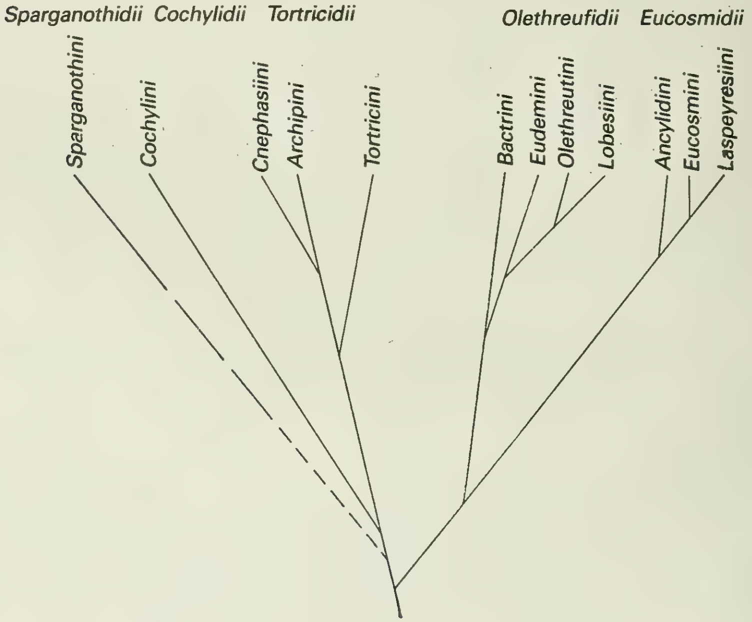


Figure 14. Scheme of relationships between European members of Tortricidae.

blades and a single knife-shaped cornuta or a round spinescent base. In the forewing of Eucosmidii, as a result of the displacement of the subcostal metallic lustrous lines, in the outer field, above the tornal corner, a typical element for the supertribe has formed, namely, the "mirror". All these peculiarities are secondary in origin and enable us to consider the supertribe Eucosmidii phylogenetically more advanced.

The four tribes of Olethreutidii represented in Europe are clearly differentiated on the basis of structure of the androconial apparatus (Fal'kovich, 1962) and the type of pattern on the forewing. These tribes are quite similar in the morphological structure of the male genitalia.

The archaic properties in the structure of every stage of the genitalia are mixed in Olethreutini. Primitive characters have been maintained even in the European members. The skeleton of the male genitalia in the type genus (*Olethreutes* Hb.) differs notably from the ancestral scheme for the family, albeit the shallow basal pit is narrowly developed and the basal appendage of the aedeagus condensed. The protractors of the aedeagus (m_5) are even less deeply submerged in the valves. The male genitalia of the other genera studied differ largely from the genitalia of *Olethreutes* Hb., albeit weakening of the tergal complex of the sclerite is observed in some cases. As a result of reduction of the uncus and gnathos, the depressors of the uncus (m_1) sometimes disappear entirely (*Phiaris* Hb.).

The female of archaic genera (*Hedya* Hb., *Proschistis* Meyr.) retains the initial number of two signa for the family. The secondary sex structures of the male of Olethreutini consist of two components—glands in the dorsal side of the hind wing and tibial brushes. A series of primitive characters is seen in the larvae and pupae. In the larvae setae I and III on abdominal segment IX are usually arranged on different scutella, two setae are permanently retained in group VII, reduction of the anal crest is rarely observed, and the orbital region of the head protrudes at an angle. A straight and long cremaster is preserved in the pupae, as in Tortricinae, together with spinules on tergite IX.

The mesophilic tribe Olethreutini is similar to Bactrini. The male genitalia of the type genus *Bactra* Stph. differ from the genitalia of *Olethreutes* Hb. only in shape of the basal appendage of the valves. The base of this small sclerite is broad and, consequently, the shoulders of the lever formed by them very short. However, one of the signa is lost in the female Bactrini, the sterigma reduced, and the olfactory apparatus absent in the male. In the larvae living in stem and root tissues of moisture-loving herbaceous plants, the scutella of setae

I and III are fused on abdominal segment IX. These distinct reductions apparently took place long ago and provide no basis for considering this tribe closely related to Olethreutini.

The links between Olethreutini and Eudemini are closer. Simplification of the tergal complex of the male genitalia in the type genus of the tribe (*Eudemis* Hb.) led to a reduction of the uncus and its depressors (m_1); however, the protractors of the aedeagus (m_5) are more deeply submerged in the valves. The tropical fauna of this tribe, which has spread to Australia and Southeast Asia, includes genera in which the archaic organization of the copulatory apparatus is preserved. The female of Eudemini is close to the female of Olethreutini in structure of the massive ostial sclerites—the sterigma and signa. On the basis of larvae, *Eudemis* Hb. is so close to *Olethreutes* Hb. that these genera are sometimes combined into one (Swatschek, 1958). Although the close phylogenetic affinity of these tribes is not disputable, nevertheless the archaic type of androconial structure of Olethreutini in the form of pubescent tufts along the sides of the abdominal segments is quite distinct from the androconial apparatus of Olethreutini and provides no basis for combining them.

The tribe Lobesiini diverged from Olethreutini. Although the males of *Lobesia* Gn. have a single- and double-segmented olfactory apparatus, its glandular pockets are located along the sides of the fused first and second segments of the abdomen, and not on the wings as in Olethreutini. The evolution of the genitalia in Lobesiini proceeded along the line of simplification: the uncus disappeared, the gnathos became membranous, the socia atrophied, being retained rarely in the form of mobile plates. In the larvae of Lobesiini, because of their hidden mode of life some shields fused and the chaetotaxy reduced: in group VII on abdominal segment VII only two setae remain, and the group of setae I and III fused on abdominal segment IX.

Among the three tribes of the supertribe Eucosmidii, the group of genera close to *Ancylis* Hb. is more isolated than the rest. The position of these genera in the system of Olethreutinae is controversial. Usually (Obraztsov, 1958–1968; Hannemann, 1961) *Ancylis* is included under Eucosmini, and *Eucosmomorpha* Obr. under Laspeyresiini. Morphofunctional analysis showed that in structure of the genitalia and muscles of males, these genera are very similar and differ significantly from typical members of Olethreutinae in the shift of the protractors of the aedeagus (m_5) to the lower part of the long caulis and a reduction of the juxta. In the females of these and some other genera (*Enarmonodes* Danil. and Kuznetsov, *Semnostola* Diak.), the signa are unique in shape, represented in the form of a plate which to one degree or another is compressed along the longitudinal axis into the cavity of the bursa copulatrix. These peculiarities are not typical of other groups of Tortricidae and enable us to support the opinion of Pierce and Metcalfe (1922) that the series of genera close to *Ancylis* Hb. should be separated in the tribe Ancylidini. Although in the genera of Ancylidini studied by us the tergal complex of the male is reduced, this group is more primitive in organization than tortrices with a developed uncus (*Enarmonia* Hb.).

On the basis of structure of the preimaginal stages, the tribe occupies an intermediate position between Olethreutidii and Eucosmini. The pupae of *Eucosmomorpha* Obr. and *Enarmonia* Hb. have a well-developed cremaster and have retained spines on abdominal segment X, while in the larvae of *Ancylis* Hb. setae I and II of segment IX are arranged on separate scutella, which is typical of Olethreutini. However, on the basis of structure of the male genitalia, all the Palearctic members of Ancylidini are close to Eucosmini, since they do not have a gnathos, the uncus is usually absent, the basal pit developed, and the aedeagus armed with a brush of caducous cornuti. In this connection Ancylidini must be considered one of the specialized tribes manifesting ancestral characters of Olethreutinae in the preimaginal stages, but undoubtedly closely related to Eucosmini.

The tribe Eucosmini in its initial structure and function of the genitalia is very close to Olethreutidii. The males of morphologically primitive genera (*Epinotia* Hb., etc.) have a developed uncus and flexible pubescent socii; however, the gnathos, like the independent sclerotized appendage, is present only in some tropical members (*Peridaedala* Meyr.). In the process of evolution the uncus was often modified, reduced, or entirely lost. Simultaneously, the depressors of the uncus (m_1) reduced. With the weakening of the tergal complex of the genitalia, fixation of the female is mainly accomplished by the valves, which already have a well-isolated cucullus with a dense brush of strong setae and a large basal pit, and the strong protractors of the aedeagus (m_5) penetrate deep into the latter. The place of attachment of these muscles shifts from the aedeagus to the caulis. In the process, as the cucullus takes on its major function of fixation, modification of sternite VII in the female increases for purposes of copulation. One sees a tendency for the ostium to shift to the region of this sternite. Thus simplification in relation to Olethreutini appears in Eucosmini together with specialization of the genital apparatus and its function.

The phenomenon of simplification is also expressed in the preimaginal stages of Eucosmini. The cremaster disappears in the pupae and is functionally replaced by a crest of spines and falcate setae. In the larvae setae I and III are located on a common pinnaculum on abdominal segment IX.

The properties of specialization and reduction of the genital apparatus are expressed maximally in the tribe Laspeyresiini. In the male, due to the loss of the uncus and gnathos, and in most cases also the socii, the depressors of the uncus (m_1) are absent. The tegumen is largely reduced. The valve is also simplified, but specialized as a result of the separation of the cucullus and development of the basal pit, which includes the highly protruding aedeagus. The ostium in the female is shifted in the region of abdominal sternite VII, and the latter often shifted and sclerotized. In the subtribe Dichroramphae the sclerotized ring around the ostium is compactly fused with the posterior margin of sternite VII. On the basis of position of the protractors of the aedeagus (m_5), tergal flexors and extensors of the valves (m_4 and m_2), in the principal properties of structure of the genital skeleton of males and females, and in the principles of their function, Laspeyresiini is very similar to the specialized Eucosmini, but differs in greater simplification. These tribes are brought closer together by the similarity in setae I and III on abdominal segment IX of the larvae, which are located on a common pinnaculum and similarity in the direction of evolution of the outer structures. On the basis of structure of the pupae, Laspeyresiini is not distinguishable from Eucosmini. All this indicates the close affinity of these tribes, but Laspeyresiini must be considered a more specialized and higher group in the subfamily Olethreutinae.

CONCLUSIONS

1. On the basis of the functional and morphological characters of the male genitalia, the European tortrices (Tortricidae) are distinctly divided into two subfamilies—Tortricinae and Olethreutinae.

2. Subfamily Tortricinae is a rather heterogeneous group which, however, exhibits a general principle of connection of the aedeagus with the fultura, and the presence of a ball-bearing joint between the caulis and the juxta. On the basis of genital function, the tribes, supertribes, and even some genera can be characterized within the subfamily.

3. The peculiarities of function of the aedeagus and valvular muscles together with other characters of imaginal and preimaginal stages, indicate the indisputable affinity of Cochylidae with the subfamily Tortricinae. Analysis of the genital muscles and function of the

appendages revealed a significant archaic nature and the relative isolation of this group; it has therefore been given the status of a supertribe, Cochylidii. In Europe this supertribe is represented by the tribe Cochylini.

4. The nominal supertribe Tortricidii is represented in Europe by three tribes. Cnephasiini and Archipini display a significant similarity in structure and function of the genitalia, while Tortricini differs significantly on the basis of peculiarities of muscles. The tergal extensors (m_2) are reduced in Cnephasiini and Archipini, and the tergal flexors of the valves (m_4) preserved, while in Tortricini these flexors disappear and their function is taken over by the tergal extensors (m_2). The other morphological and biological characters of the moths and larvae of the supertribe support the conclusion regarding the morphological specialization of Tortricini.

5. The subfamily Olethreutinae is very stable in organization and function of the genitalia. Hence using insignificant differences to establish phylogenetic relationships between the tribes is difficult. However, on the basis of morphology of the imaginal and preimaginal stages, the subfamily is divisible into two supertribes—Olethreutidii and Eucosmidii.

6. The supertribe Olethreutidii is represented in Europe by four tribes—Bactrini, Eudemini, Olethreutini, and Lobesiini, the last two of which are phylogenetically very close.

7. The supertribe Eucosmidii is characterized by the tendency toward displacement of the place of attachment of the protractors of the aedeagus (m_5) to the base of the caulis, distinct formation of the basal pit due to the deeper penetration of these muscles in the valves, and the significant isolation of the cucullus. The supertribe consists of three tribes—Ancylidini, Eucosmini, and Laspeyresiini. The reduction processes of some appendages of the genitalia occurring in all three tribes of the subfamily Olethreutinae are more distinctly expressed in Laspeyresiini.

8. The notable rearrangement in structure and function of the genitalia in Olethreutinae is secondary and indicates a tendency toward nonspecialization in this subfamily compared to Tortricinae.

9. An analysis of the male genitalia confirmed the possible use of the peculiarities of the functional morphology of the copulatory apparatus in studying taxa of the status of family or tribe.

REFERENCES

Danilevskii, A.S. 1963. Novye vidy listovertok (Lepidoptera, Tortricidae) palearkticheskoi fauny [New species of tortrices (Lepidoptera, Tortricidae) of the Palearctic fauna]. *Entom. Obozr.*, 42, 1, 164–177.

Danilevskii, A.S. and V.I. Kuznetsov. 1968. Listovertki (Tortricidae). Triba plodozhorki (Laspeyresiini) [Tortrices (Tortricidae). Tribe of fruit moths (Laspeyresiini)]. *Fauna SSSR. Nasekomye Cheshekrylye*. Nauka, Moscow-Leningrad, vol. 1, new ser., 98, 636 pp.

Diakonoff, A. 1961. Taxonomy of the higher groups of the Tortricoidea. *Verhandl. XI Intern. Kongr. Entom.* Wien, vol. 1, pp. 124–126.

Fal'kovich, M.I. 1962. Primenenie vtorichnopolovykh priznakov v sistematike podsemeistva Olethreutinae (Lepidoptera, Tortricidae) [Use of secondary sex characters in the taxonomy of the subfamily Olethreutinae (Lepidoptera, Tortricidae)]. *Entom. Obozr.*, 41, 4, 878–885.

Forbes, W.T.M. 1939. The muscles of the lepidopteran male genitalia, *Ann. Entom. Soc. America*, 32, 1, 10.

Guenée, A. 1845. Essai sur une nouvelle classification des Microlepidoptères, *Ann. Soc. Entom., France*, 2, 3, 105–192, 297–344.

Hannemann, H.J. 1957. Die mannlichen Terminalia von *Micropterus calthella* L. (Lep., Micropterygidae), *Dtsch. Entom. Z.*, 4, 3–4, 209–222.

Hannemann, H.J. 1961. Kleinschmetterlinge oder Microlepidoptera. I. Die Wickler (s. str.) (Tortricidae). *Die Tierwelt Deutschlands*. Jena, vol. 48, pp. 1–233.

Hannemann, H.J. 1964. Kleinschmetterlinge oder Microlepidoptera. II. Die Wickler (s. 1.) (Cochylidae and Carposinidae). *Die Tierwelt Deutschlands*. Jena, vol. 50, pp. 1–78.

Heinemann, H. 1863. *Die Schmetterlinge Deutschlands und der Schweiz*. 2. Abt. *Kleinschmetterlinge*, 1, 1. *Die Wickler*. Braunschweig, pp. 1–248 + 33.

Heinrich, C. 1917. A note on the tortricid genitalia, *Proc. Entom. Soc. Wash.*, 19, 1–4, 137–138.

Heinrich, C. 1923. Revision of the North American moths of the subfamily Eucosminae of the family Olethreutidae, *U. S. Nat. Mus., Bull.*, vol. 123, pp. 1–296.

Kennel, J. 1908–1921. *Die palaearktischen Tortriciden. Zoologica BRO*. Stuttgart, 21, 54, 1–742.

Lederer, J. 1859. Classification der europäischen Tortriciden, *Wien. Entom. Monatsschr.*, vol. 3, pp. 118–126, 141–155, 241–255, 273–288, 328–346, 366–389.

Meyrick, E. 1895. *A Handbook of British Lepidoptera*. London, 843 pp.

Meyrick, E. 1911. Revision of Australian Tortricina, *Proc. Linn. Soc. New South Wales*, vol. 36, pp. 224–303.

Meyrick, E. 1927. *A Revised Handbook of British Lepidoptera*. London, 914 pp.

Obraztsov, N. 1954–1957. Die Gattungen der palaearktischen Tortricidae. I. Allgemeine Aufteilung der Familie und Unterfamilien Tortricinae und Sparganothinae, *Tijdschr. Entom.*, 1954, 97, 3, 141–231; 1955, 98, 3, 147–228; 1956, 99, 3, 107–154; 1957, 100, 3, 309–347.

Obraztsov, N. 1958–1968. Die Gattungen der palaearktischen Tortricidae. II. Die Unterfamilie Olethreutinae, *Tijdschr. Entom.*, 1958, 101, 3–4, 229–261; 1959, 102, 2, 175–215; 1960, 103, 1–2, 111–143; 1961, 104, 5, 51–70; 1964, 107, 1, 1–48; 1967, 110, 4, 65–88; 1968, 111, 1, 1–48.

Pierce, F.N. and J.W. Metcalfe. 1922. *The Genitalia of the British Tortricidae*. Oundle, Northans, 101 pp.

Powell, J.A. 1964. Biological and taxonomic studies on Tortricine moths, with reference to the species in California, *Univ. California Publ. Entom.*, vol. 32, pp. 1–317.

Razowski, J. 1966. *World Fauna of the Tortricini* (*Lepidoptera, Tortricidae*). Krakow, 576 pp.

Razowski, J. 1970. *Cochylidae. Microlepidoptera Palaearctica*. Wien, vol. 3, pp. xiv + 1–528.

Rebel, H. 1935. Bernstein-Lepidopteren, *Iris*, vol. 49, pp. 162–186.

Staudinger, O. and H. Rebel. 1901. *Catalog der Lepidopteren des Palaearctischen Faunengebietes*. Berlin, vol. 2, 368 pp.

Stekol'nikov, A.A. 1965. Funktsional'naya morfologiya kopylyativnogo apparata nekotorykh cheshuekrylykh (Lepidoptera) (Functional morphology of the copulatory organs of some Lepidoptera). *Entom. Obozr.*, 44, 2, 258–271.

Stekol'nikov, A.A. 1967a. Filogeneticheskie svyazi unutri Rhopalocera na osnove funktsional'noi morfologii genital'nogo apparata (Phylogenetic relationship within Rhopalocera on the basis of functional morphology of the genital organs). *Entom. Obozr.*, 46, 1, 3–24.

Stekol'nikov, A.A. 1967b. Funktsional'naya morfologiya kopulyativnogo apparata arkhaichnykh cheshuekrylykh i obshchie napravleniya evolyutsii genitalii Lepidoptera (Functional morphology of the copulatory organs in archaic lepidopterans and general trends in the evolution of the genitalia of Lepidoptera). *Entom. Obozr.*, 46, 3, 670–689.

Stephens, J.F. 1829. *A Systematic Catalogue of British Insects.* London, vol. 2, 388 pp.

Swatschek, B. 1958. *Die Larvalsystematik der Wickler* (*Tortricidae und Carposinidae*). Berlin, 269 pp.

Leaf-rollers (Lepidoptera, Tortricidae) of the Southern Part of the Soviet Far East and Their Seasonal Cycles

V.I. Kuznetsov

For the development of agriculture and sylviculture a multifaceted study of the ecological relationships between insect fauna and environmental conditions is particularly relevant. An analysis of such relationships proved very interesting in the southern regions of the Far East located on the boundary between two large zoogeographic subregions—the circumboreal and Manchurian. These territories differ notably in their historical development, giving rise to a unique and complex ecological situation in the southern part of the Far East. Its uniqueness lies in the retention of a derivative—tertiary monsoon—oceanic climate and relict vegetation, especially in southern Primor'e and the southern Kuril Islands, and enables me to consider these regions refuges of Tertiary and Upper Cretaceous flora. The geography of the vegetation and the Amur basin and adjacent ocean islands is in many ways determined by the action of water and air phenomena of the Pacific Ocean on these territories.

The universally distributed family of tortrices (Lepidoptera. Tortricidae) was selected for this taxonomic study. Prior to 1958 these insects were poorly studied in the Far East. Only a few articles were available in literature, pertaining to new descriptions of Amur-Ussurian species, or revisions of individual genera (Christoph, 1881; Snellen, 1883; Kennel, 1900, 1901; Caradja, 1916, 1926; Filip'ev, 1930a, b; 1931; Kuznetsov, 1950, 1956b). Not a single tortrice was known from the Kuril Islands and the fauna of Sakhalin was represented by isolated specimens in the collection of the Institute of Zoology, Academy of Sciences of the USSR.

The study of tortrices from the Far East notably advanced under the leadership of A.S. Danilevskii. He identified areas of distribution, reexamined the taxonomic position of many harmful species, and

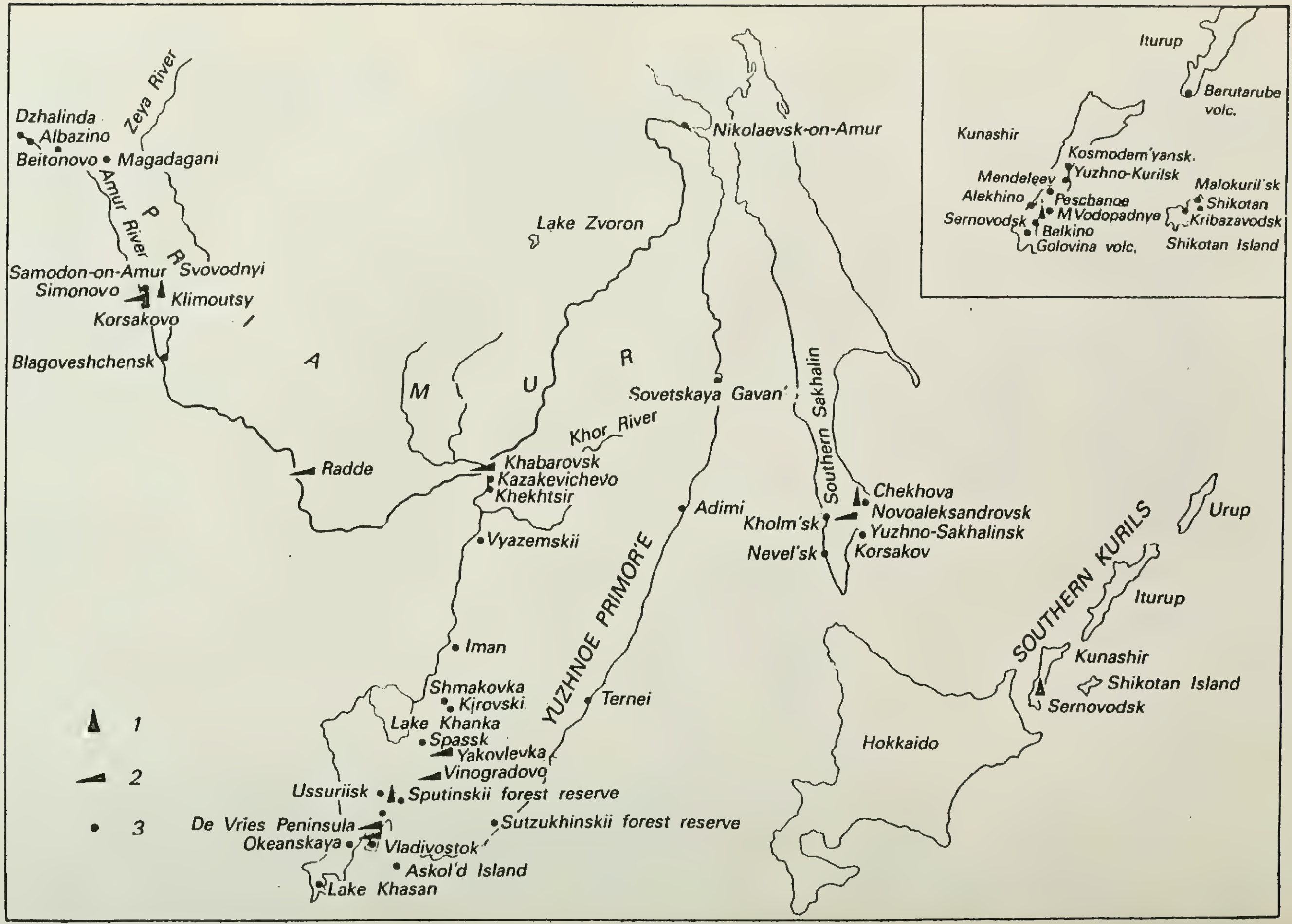

Dzhalinda
Albazino
Beitonovo
Magadagani
Zeya River
Amur River
P
R
Samodon-on-Amur
Svovodnyi
Simonovo
Klimoutsy
Korsakovo
Blagoveshchensk
A
M
U
R
Lake Zvoron
Nikolaevsk-on-Amur
Sovetskaya Gavan'
Southern Sakhalin
Khor River
Radde
Khabarovsk
Kazakevichevo
Khekhtsir
Vyazemskii
Adimi
Chekhova
Novoaleksandrovsk
Kholm'sk
Yuzhno-Sakhalinsk
Nevel'sk
Korsakov
YUZHNOE PRIMOR'E
Iman
Shmakovka
Kirovski
Lake Khanka
Spassk
Yakovlevka
Vinogradovo
Ternei
Ussuriisk
Sputinskii forest reserve
De Vries Peninsula
Sutzukhinskii forest reserve
Okeanskaya
Vladivostok
Askol'd Island
Lake Khasan
Hokkaido
SOUTHERN KURILS
Urup
Iturup
Kunashir
Shikotan Island
Sernovodsk
1
2
3
Iturup
Berutarube volc.
Kunashir
Kosmodem'yansk.
Yuzhno-Kurilsk
Mendeleev
Malokuril'sk
Alekhino
Peschanoe
Shikotan
Sernovodsk
M Vodopadnye
Kribazavodsk
Belkino
Golovina volc.
Shikotan Island

Figure 1. Areas of study.

1—stations; 2—collection points of other researchers; 3—other important collection points.

described several new harmful fruit moths (Danilevskii, 1955 1958, 1960, 1963; Danilevskii and Kuznetsov, 1968). From 1958 the study of tortrices intensified under his initiative and extended to all the major regions of the Far East in conjunction with geobotanical studies. In 1958 the first biocenotic study of the relationship of tortrices was undertaken at Klimoutsy Station of the Amur Complex Expedition of the Council for the Study of Productive Forces under the aegis of the Academy of Sciences of the USSR. Ultimately, this study not only detailed the fauna of the Upper Amur, but also the characteristics of its spatial distribution in different biocenoses up to plant associations, as well as the peculiarities of phenology of Amur tortrices and their cycles of development (Kuznetsov, 1962c, 1966b, 1967, 1972a).

The material from southern Primor'e was analyzed over a period of time (Kuznetsov, 1960a, 1962a, b, 1964a, b, c, 1966a, 1969b, 1970a; Fal'kovich, 1960, 1962a, b, c, 1965, 1966a, b, c, 1968b, 1970a; Filip'ev, 1962); the Kuril Islands (Kuzentsov, 1968a, 1969a, 1971a, 1972b), Sakhalin (Kuznetsov, 1970b). The faunistic studies in adjoining territories were not uniform. Isolated information on the fauna of Japan began to appear in the second half of the nineteenth century (Mostchulsky, 1866; Butler, 1879; Walsingham, 1900; Matsumura, 1931). Studies suddenly intensified with the publication of an iconograph of 260 Japanese tortrices (Issiki, 1957). Numerous articles appeared giving new descriptions, lists of fauna, and revisions of several genera (Oku, 1956, 1957, 1961, 1963a, b, 1964a, b, 1965, 1966, 1967, 1968; Amsel, 1960; Yasuda, 1962, 1965a, b; Kawabe, 1963a, b, c, 1964a, b, 1965a, b, 1966, 1968, 1968a, b, 1970a, b, 1971, 1972a, b; Razowski and Yasuda, 1964; Tateyama and Oku, 1967; Razowski, 1968). These studies showed that Issiki's iconograph contained several incorrect identifications and included less than half the fauna of Japan, which even today is far from total identification.

A few isolated reports are available on the fauna of China (Caradja, 1925, 1927, 1928, 1931, 1939a, b, c; Caradja and Meyrick, 1934, 1935, 1936, 1937–1938). Additional data is presented in monographs on the Palearctic (Razowski, 1966, 1970) and tropical tortrices (Clarke, 1958), and in a few more recent articles (Razowski, 1964a, b; Kuznetsov, 1971b, 1972c, 1973).

The poor level of study and the great economic significance of tortrices motivated the present study, which attempts a generalization of the faunal material, its distribution, seasonal cycles, and food associations in the southern part of the Far East. Work continued from 1958 through 1971. The personal collections and observations of field stations in four southern regions of the Far East (Figure 1) are presented: upper Priamur (mixed forests in the environs of Klimoutsy, 40 km west of Svobodnyi, 1958), southern Primor'e (Mount Taiga station, 20 km east of Ussuriisk, 1966), southern Sakhalin (Plant Protection station in the environs of Novoaleksandrovsk, 1967), and the southern Kurils (mixed forests between Sernovodsk and Alekhino on Kunashir Island, 1967). All the collections of the Institute of Zoology, Academy of Sciences of the USSR on tortrices from the following stations of other researchers were analyzed.

Priamur: Simonovo, 75 km west of Svobodnyi, 1959 (M.I. Fal'kovich); Khabarovsk, 1959 (G.G. Shel'deshov).

Southern Primor'e: Yakovlevka, 70 km east of Spassk, 1926 (A.M. D'yakonov and N.M. Filip'ev); Vinogradovo, 90 km east of Spassk, 1929 (A.M. D'yakonov and N.N. Filip'ev); Okeanskaya, Biological Station, 20 km north of Vladivostok, 1963 (I.L. Sukhareva and M.I. Fal'kovich); De Vries Peninsula, ornithological observation point, 35 km north of Vladivostok, 1959–1964 (A.I. Kurentsov and M.A. Omel'ko).

Southern Sakhalin: Novoaleksandrovsk, 1967-1968 (Yu.A. Loktin), 1970 (V.P. Ermolaev).

Collections of many entomologists have also been incorporated, which were transferred from various places in the Far East to the Institute of Zoology, Academy of Sciences of the USSR for identification or storage [L. A. Anufriev, P.K. Gribanov, M.A. Doroknina, V.M. Ermolenko, V.F. Efremov, T.M. Zabello, A.K. Zagulyaev, K.B. Zinov'eva (Borisova), M.A. Kashcheev, I.M. Kerzhner, Yu.A. Kostyak, G.O. Krivolutskaya, L.S. Kulikov (Sytenko), V.N. Lyubarskaya, S.A. Shabliovskii, A.V. Tsvetaev, G.I. Yurchenko, and others]. I am deeply grateful to all these persons for providing material and consultation.

The collection analyzed thus included almost 35,000 specimens. They were identified by comparing the micropreparations of the genitalia of Far East tortrices with preparations of the genitalia of types. In the absence or nonaccessibility of type material, I had to limit myself to a comparison based on keys rather than type specimens. Comparison was based on the excellent collection of Palearctic tortrices in the Institute of Zoology, Academy of Sciences (Leningrad) of the USSR and the collection of Chinese tortrices in the G. Antipa Museum of Natural History (Bucharest). All the Far East material of A. Caradja (collections of M. Korb from 1905 to 1907 from Priamur) were analyzed in Bucharest. The identification and distribution of some species was verified in the museums of other countries and I am sincerely grateful to mv colleagues abroad: H. Hannemann (Berlin), A.

D'yakonov (Leiden), T. Oku (Sapporo), A. Popescu-Gorj (Bucharest), and I. Razowski (Krakow).

MAIN TYPES OF SEASONAL CYCLES OF TORTRICES OF THE FAR EAST

A study of the seasonal cycles of tortrices, taking into account the taxonomic position of the species, their geography, distribution, and food associations is not only of theoretical value, but of practical significance in forecasting the periods of pest emergence in nature. However, among the important adaptations of lepidopterans to seasonal changes of climate is their capacity to withstand unfavorable seasons of the year for development by undergoing diapause, which varies in length and stability. Diapause, by discontinuing the process of active development, creates a phenological cycle and influences the distribution of ontogenetic stages throughout the annual seasons. The system of seasonal adaptation with polycyclic development can cover several generations: monocyclic development—a single generation, and development over several years—only a part of ontogenesis (Danilevskii et al., 1970).

In the Far East a single diapause is a typical characteristic of almost all species of tortrices except *Archips ingentana* Chr. Like the seasonal adaptation of insects, it can appear at any stage of ontogenesis but is strictly specific for a given species. Within a family a tendency toward certain types of diapause is evident in definite taxonomic groups, for example, the imaginal and embryonic groups of Tortricini, and the larval stages of Archipini. At the same time, even within a single genus, winter diapause may be discontinued at different stages of development, whereas it is often restricted to certain stages in species of unrelated taxa. It is clear that winter diapause in a particular stage of ontogeny is determined not only by the taxonomic position of a species, but is the basis of species—specific cycles of development arising as ecological adaptations.

The period of active development of a single generation of strictly monocyclic and perennial diapausing tortrices is essentially disrupted by one diapause. From the example of Rosana tortrices (*Archips rosana* L.) it has been shown that such species respond neutrally to photoperiods of any duration (Danilevskii, 1961), since in them the diapause commences at a definite stage in each generation in view of organic requirements. In polyphagous species, such an adaptation was probably the result of the effect of temperature. The obligate diapause in species in which the larvae reveal a narrow specialization in food plants and have adapted to the definite and relatively short period of development of such food plants, evolved under the influence of the food factor. In this context, *Grapholitha rosana* Danil. is illustrative, which is highly adapted to different species of sweet briar. The period when the fruits of this briar are suitable for larval consumption is comparatively short, and in the absence of other food plants, only one generation of Rosana tortrices develops.

But the winter diapause fluctuates in polycyclic tortrices and is regulated by response to photoperiodicity and temperature (Dickson, 1949; Kuznetsov, 1955; Danilevskii, 1961; Shel'deshova, 1967; Ankersmit, 1968; Danilevskii and Kuznetsov, 1968; Danilevskii and Kuznetsov, 1968). The main factor regulating the appearance of diapause in facultative polyphagous tortrices is the seasonal change in length of day. They are characterized as a long-day type and respond to the photoperiod. Under conditions of a long day (more than 16 hours of light) diapause does not appear, or is observed only in isolated specimens, and hence several generations develop. Under conditions of a short day, development of most individuals is discontinued by diapause. This response is subject to geographic factors (Shel'deshova, 1965; Honma, 1966). Northern populations respond poorly to day length, and in most larvae diapause appears under the conditions of any photoperiod. In southern forms, given conditions of a long day, development takes place continually. The threshold day length is reduced in the southern population compared to the more northern population. The photoperiodic parameters depend on temperature and an increase in temperature stimulates diapause less (Figure 2). The threshold photoperiod response depends on quality of food.

Long treatment with low temperature is not essential for terminating diapause. It was found that the photoperiod can not only induce diapause but also terminate it. By the action of a long day, it is possible to stimulate the response of diapausing larvae of *Adoxophyes orana* F.R. (Ankersmit, 1968), *Laspeyresia pomonella* L. (Russ, 1966), *Grapholitha funebrana cerasivora* Mtsm., *G. inopinata* Heinr., *G. rosana* Danil., and *Spilonota albicana* Motsch. in autumn (Danilevskii and Shel'deshova, 1968). Probably, photoperiodic reactivation is a typical property of most polycyclic species with a pronymphal or larval diapause.

From 1966 to 1967 in southern Primor'e and the southern Kuril Islands, in the seasonal cycles of Manchurian monocyclic tortrices, in addition to the winter diapause, another delay in development was noted for the first time, namely, the summer–monsoon diapause or

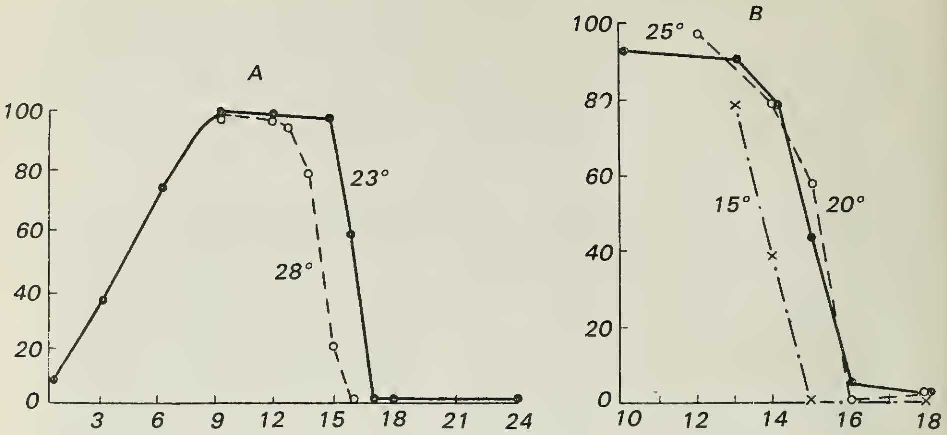


Figure 2. Dependence of onset of diapause on day length and temperature.

A—*Pandemis heparana* Den. and Schiff. (from Mani, 1968); B—*Adoxophyes orana* F.R. (from Ankersmit, 1968).

Ordinate—percentage of larvae in diapause; abscissa—photoperiod, hours.

estivation (Kuznetsov, 1968a, 1971a). It was also noted at several stages of ontogenesis. Although the distribution of summer diapause and its ecological significance still remain insufficiently studied, nevertheless it can be stated that the distribution of diapause over the stages of development and months of the year determine the synchronization of the major stages of development of monocyclic tortrices with their food plants. Unlike the winter diapause, estivation of monocyclic tortrices can be regulated by photoperiod conditions.

The presence of a summer diapause in the life cycle leads to a situation wherein at the time of intense monsoon fog and rains in the Kurils, from mid-June to mid-August, a large number of monocyclic tortrices species are dormant. For the successful development of estivating larvae and pupae, abundant moisture is required; under low moisture conditions they die. Hence it can be assumed that the summer diapause of Manchurian tortrices is limited to the alternation of humid and dry periods of the year (Kuznetsov, 1971b), although it is usually considered an adaptation to high summer temperatures (Masaki, 1957, 1958).

The material accumulated enabled us to define a regional phenological system which, in general, encompasses the entire variability in the cycles of development of tortrices in the Far East. These cycles can be categorized under 26 types, differing in ratio of dormant and active stages during the months of the year, seasonal dimorphism, and other peculiarities. The complexity of the phenological system indicates a wide utilization of the time factor by members of the family Tortricidae.

The review of the cycles of development of the Far East tortrices was done in the order of displacement of the hibernating stages in a season, commencing with the imago. Since the data is insufficient for a quantitative assessment of the predominance of different cycles in the fauna of the Far East, the phenological system must be delineated with only individual examples. Each cycle is characterized, in addition to number and brief description, by a phenological formula. The symbols of this formula are used in both the text and the Table that follows.

Seasonal Cycles of Monocyclic Tortrices

1. (+).— ⊕ ○ (+). Sexually mature moths diapause in winter. Their flight in spring is observed up to mid-June, and additional feeding and oviposition take place. All the preimaginal stages develop in summer without estivation. From August onward, flight resumes and continues until the moths enter hibernation.

This cycle of development in the Far East, as well as throughout the Palearctic is characteristic of many species of *Acleris* Hb.: *A. apiciana* Hb., *A. logiana* Cl., *A. cristana* Den. and Schiff., *A. hastiana* L., *A. similis* Fil., *A. emargana* F., *A. tripunctana* Hb., *A. umbrana* Hb., and others. *A. fimbriana* Thnb. develops in this manner in the zone of one generation.

2. 1 (+).— ⊕ ○ (+). Eggs and larvae develop in June–July. Contrary to the previous cycle, the development of pubescence in pronymphs is discontinued by estivation in August. Hence pupation takes place later—at the end of August to the beginning of September. Flight is observed from September until the moths enter hibernation. Such a cycle of development found in *Acleris hispidana* Chr. in the Kurils.

3. 1(?)— ⊕ (○ + (?). Hibernating stage not known, but supposedly imago. Larvae develop in July. Estivation of pupae occurs in August. Flight of moths in September–October. Such a cycle of development noted in *Acleris salicicola* Kuzn. in the Kurils.

4. 1 (○) +.— ○ (○). Pupae diapause in winter. Flight of moths in June–July. Preimaginal stages develop in summer without estivation. This cycle is maintained throughout the Palearctic in *Capua favillaceana* Hb. and, most probably, also in *Propiromorpha rhodophana*

EFFECT OF CYCLES OF DEVELOPMENT ON THE PHENOLOGICAL STATUS OF TORTRICES

S. No.	Species and region of the Far East	Hibernating stage	VI			VII			VIII			IX		
			Decades											
			1	2	3	1	2	3	1	2	3	1	2	3
1	*Acleris apiciana* Hb. Sernovodsk	(+)	+ +	+ + ·	· · –	– –	– –	– –	– –	– – ⊕ ⊕ ○	– – ⊕ ⊕ ○ ○	– ⊕ ⊕ ○ ○ +	⊕ ○ ○ + +	+
2	*A. hispidana* Chr. Sernovodsk	(+)				–	– –	– – ⊕	⊕ ⊕	⊕ ⊕	⊕ ⊕ ○	○ ○ +	+ +	+
3	*A. salicicola* Kuzn. Sernovodsk	(?)						–	– –	– –	– – ○	– ○ (○ (○	(○ (○	○ ○ +
4	*Capua favillaceana* Hb. Ussuriisk	(○)	+ + · ·	+ + · · – –	+ – –	– –	– –	– –	– –	– –				
5	*Laspeyresia maackiana* Dan. Khabarov (from Lyubarskaya, 1964)	(○̇)	(○̇) (○̇)	(○̇) (○̇)	(○̇) (○̇)	(○̇) (○̇)	(○̇) (○̇)	(○̇) (○̇) ○	(○̇) ○ ○ +	+ · · –	– –	– –	– – ⊕ ⊕ ○	○ (○̇)

Table continued

S. No.	Species and region of the Far East	Hibernating stage	VI						VII						VIII						IX					
			Decades																							
			1		2		3		1		2		3		1		2		3		1		2		3	
6	*Pammene orientana* Kuzn. Klimoutsy	(⊕)	○ +	○ +	○ +	+ ·	+ · —	· —	—	—	—	—	—	—	—	—	—	—	—	—	— ⊕	— ⊕	— ⊕	— (⊕)	— (⊕)	— (⊕)
7	*Laspeyresia glandicolana* Danil. Ussuriisk	(⊕̇)	(⊕̇)	(⊕̇)	(⊕̇)	(⊕̇)	(⊕̇)	(⊕̇)	(⊕̇)	(⊕̇)	(⊕̇)	(⊕̇)	(⊕̇) ○	(⊕̇) ○	○	○ +	+	+	+ ·	+ · —	—	—	—	—	—	— ⊕
8	*Endothenia menthivora* Oku Sapporo (from Oku, 1963a)	(5)	(○	(○	(○	(○	(○	(○ ○	(○ ○ +	(○ ○ +	○ +	+ ·	+ · —	+ · —	+ · —	+ · —	+ · —	—	—	—	—	—	—	—	—	—
9	*Eulia ministrana* L. Ussuriisk	(5)	+	+ ·	+ ·	+ · —	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10	*Notocelia cynosbatella* L. Novoaleksandrovsk	(4)	— ⊕	⊕ ○	○	+	+	+	+ ·	+ · —	+ · —	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table continued

S. No.	Species and region of the Far East	Hibernating stage	VI						VII						VIII						IX					
			Decades																							
			1		2		3		1		2		3		1		2		3		1		2		3	
11	*Hedya dimidiana* Cl. Sernovodsk	*(3—4)*	— ⊕	— ⊕	— ⊕ ○	○	○	○	○ +	○ + ·	+ · —	+ · —	—	—	—	—	—	—	—	—	—	—	—	—	—	—
12	*Pseudohedya retracta* Flkv. Ussuriisk	(—)	— ⊕	— ⊕ ○	⊕ ○	⊕ ○ (○	○ (○	(○	(○	(○	(○	(○ ○	(○ ○	○ +	+	+										
13	*Pandemis dumetana* Tr. Sernovodsk	(2)	—	—	—	—	—	—	—	—	—	— ⊕	— ⊕ ○	— ⊕ ○ +	— ⊕ ○ +	○ + ·	+ ·	+ · —								
14	*Sparganothis pilleriana* Den. and Sch. Sernovodsk	*(1)*				—	—	—	—	—	—	— ⊕ ○	— ⊕ ○	— ⊕ ○ +	⊕ ○ +	○ +	+	+								
15	*Epinotia salicicolana* Kuzn. Sernovodsk	(?)	—	—	—	—	— (⊕	— (⊕	(⊕	(⊕	(⊕	(⊕	(⊕	(⊕	(⊕ ○	(⊕ ○	○	○	○ +	○ +	+	+	+			

S. No.	Species and region of the Far East	Hibernating stage	VI			VII			VIII			IX		
			Decades											
			1	2	3	1	2	3	1	2	3	1	2	3
16	*E. brunnichiana* L. Sernovodsk	(.)	— —	— —	— —	— —	— —							
					→	⊕ ⊕	⊕ ⊕	⊕						
						○	○ ○	○ ○						
								+	+ +	+				
					→	(⊕ (⊕	(⊕ (⊕							
							○	○ ○	○ ○					
									+	+ +	+			
17	*Archips fuscocupreana* Wlsgm. Sernovodsk	(;)				— —	— —	— —						
								○ ○	○ ○					
								+ +	+ +					
									· ·	(. (;				
18	*Epinotia rasdolnyana* Chr. Sernovodsk	(?)	— —	— —	— —	— —	— —	— —						
							⊕ ⊕	⊕ ⊕						
							(○	(○ (○	(○ (○	(○ (○	(○ (○	(○ (○	(○	
												○	○ ○	○
											+	+ +	+ +	+ +
19	*Barbara fulgens* Kuzn. Bely R. basin	(○)	(○) (○)	(○) (○)	(○) (○)	(○) (○)	(○) (○)	(○) (○)	(○) (○)	(○) (○)	(○) (○)	(○) (○)	(○) (○)	(○) (○
			+ +											
			·	· ·										
				— —	— —	— —	— —	— —						
								⊕ ⊕						
								○ ○	○ ○	○ ○	○ ○	○ ○	○ ○	
20	*Petrova resinella* L. Klimoutsy	(—)	— —	— —	— —	— —	— —	— —	— —	— —	— —	—		
												(⊕) (⊕)	(⊕) (⊕)	(⊕)
		(⊕)	+ +	+ +	+									

S. No.	Species and region of the Far East	Hibernating stage	VI			VII			VIII			IX		
			Decades											
			1	2	3	1	2	3	1	2	3	1	2	3
21	*Acleris perfundana* Kuzn. Ussuriisk	(+)	—	— —	— — ⊕ ⊕ ○ ○	⊕ ○ ○ ϕ ϕ	ϕ ϕ	ϕ					+	+ +
22	*A. comariana* Z. environs of Vladivostok	(+)		+	+ +	+ +	+ +				+	+ +	+ +	+ +
23	*Hedya atropunctana* Zett. Southern Primor'e	(○)	+ +	+			+	+ +	+ +	+ +				
24	*Spilonota albicana* Motsch. Ussuriisk	(⊕)	+ +	+ +	+		+	+ +	+ +	+				
25	*Pandemis heparana* Den. and Sch. Ussuriisk	(2—4) –	— — ⊕	— — ⊕ ⊕ ○ ○ +	— — ⊕ ⊕ ○ ○ + +	— ⊕ ○ ○ + +	+ +	+ +	+	+ +	+ +	+ +	+	
26	*Rhopobota naevana* Hb. Ussuriisk	(.)	— — ⊕ ⊕ ○ ○ + +	— — ⊕ ⊕ ○ ○ + +	— — ⊕ ⊕ ○ ○ + + — —	⊕ ○ ○ + + — —	+ + — —	+	+ +	+ +	+ +	+ +		

1 — one generation per year (monocyclic development)
1/2 — part of ontogenesis in a year (perennial cycle)
2 — two generations per year (polycyclic; more precisely, bicyclic development)
( ) — winter diapause

(') — winter diapause continues up to summer
(,) — winter diapause commences from midsummer
(— summer diapause or estivation
+ — imago
ϕ — seasonal dimorphism of imago

⊙ — egg
⊕ — pronymph
○ — pupae
— — larva
(2) — larva of instar II
? — stage not determined

H.-S. *Petrova perangustana* Snell., *Hedya atropunctana* Zett., and *Lobesia reliquana* Hb. develop in this manner in the zone of one generation.

5. 1 (O) +. — ⊕ (O). This cycle differs from the previous one in that the winter diapause is not discontinued in spring. Hence the period of moth flight is shifted to July–August. All the preimaginal stages develop in autumn, and diapausing pupae remain in hibernation. This cycle is characteristic of *Laspeyresia maackiana* Danil. and *Pseudargyrotoza conwagana aeratana* Kenn.

6. 1 (⊕) O+.—(+). Pronymphs diapause in winter. They pupate in summer. Flight of moths in May–June. Eggs and larvae develop in summer, without estivation, until they enter hibernation in autumn. This cycle has been recorded throughout the Palearctic for many species of *Ancylis* Hb., *Grapholitha* Tr., *Epinotia* Hb., *Pammene* Hb., *Laspeyresia* Hb., and other members of the supertribe Eucosmidii. The following may be cited as examples:

Syndemis musculana Hb.
Blastesthia posticana Zett.
Epinotia bilunana Hw.
E. pygmaeana Hb.
Ancylis lactana F.
A. comptana Fröl.
A. selenana Gn.

Grapholitha orobana Tr.
G. caecana Schläg.
G. jungiella L.
Laspeyresia illutana H.-S.
L. corollana Hb.
L. cosmophorana Tr.
and others

On the basis of phenological periods, the seasonal cycles of the above species are the same in the Far East as in Europe. A few East Asian species may be added to this group: *Epinotia pinicola* Kuzn., *Grapholitha inopinana* Heinr., *Pammene orientana* Kuzn., and others. In the zone of single generation *Grapholitha delineana* Wlkr., *G. scintillana* Chr., G. *funebrana cerasivora* Mtsm., and others develop in this manner.

7. 1 (⊕). O +.— (⊕). This cycle differs from the preceding one in the longer winter diapause of the pronymphs. Their pupation takes place only in mid-summer. The first moth flight occurs in the second half of July–August. Eggs and larvae develop in autumn until the pronymphs enter hibernation. The described cycle is characteristic of *Leguminivora glycinivorella* Mtsm., *Laspeyresia glandicolana* Danil., *L. acerivora* Danil., *L. ermolenkoi* Danil., and, most probably, some eastern species of the genus *Eucosma* Hb.

8. 1 (5)— ⊕ (O +. (5). Larvae of the last instar diapause in winter. They do not feed in spring, but move to the soil surface and pupate.

Pupae estivate until July. First flight in July. Eggs and larvae develop in autumn until they enter hibernation. Such a cycle of development has been reported in Japan for *Endothenia menthivora* Oku (Oku, 1963a) and, judging from the summer periods. is also observed in this species in southern Priomor'e.

9. 1 (*5*)— ⊕ ○ +. —(*5*). Larvae of the last instar diapause in winter, resuming feeding in spring. They pupate in June. First flight of moths occurs in June–July. Eggs and larvae develop in spring, without estivation, until they enter hibernation in autumn. This cycle of development has been described for *Laspeyresia laricicolana* Kuzn., and *Eulia ministrana* L.; in Europe it is known for *Laspeyresia pactolana* Z.

10. 1 (*4*)— ⊕ ○ +. —(*4*). Larvae of instar IV diapause in winter before molting into V-instars which resume feeding in spring. They pupate at the end of May–June. Flight of moths continues from mid-June to July end. Larvae continue development in autumn until they enter hibernation. This cycle of development has been noted for *Notocelia cynosbatella* L., and also for *Archips breviplicana* Wlsgm.

11. 1 (*3*—*4*)— ⊕ ○ +.—(*3*—4). III- or IV-instars diapause in winter and resume feeding in spring. Pupation occurs from mid-June to July end. Larvae and pupal stages develop without estivation. Flight of moths and oviposition commences in July. Larvae hatching in autumn develop until they enter hibernation. This cycle of development is characteristic throughout the Palearctic for *Hedya dimidiana* Cl., *Notocelia rosaecolana* Dbld.; and in the Far East additionally for *Orthotaenia secunda* Flkv. In the zone of one generation *Spilonota ocellana* F., *Pandemis cerasana* Hb., and others develop in this manner.

12. 1 (—)— ⊕ (○ +.—(—). Middle instars diapause in winter and resume feeding in spring. Pupation concludes in mid-June. Pupal stage discontinued by estivation and the first flight of moths therefore begins only in mid-July and continues up to mid-August. This type of development has been noted in southern Primor'e for *Pseudohedya retracta* Flkv. and *Hedya semiassana* Kenn., and in the southern Kurils for *H. vicinana* Rag.

13. 1(*2*—3)—⊕○+.—(*2*—3). II-instars develop in summer without estivation. Flight of moths occurs at end July–August. Oviposition and development of larvae takes place in August–September until they enter hibernation. This cycle of development has been noted for *Ptycholoma lecheana circumclusana* Chr., *Pandemis dumetana* Tr., *Archips oporana similis* Butl., and others. *Adoxophyes orana* F.R.

Pandemis heparana Den. and Schiff., and others develop in the same manner in the zone of one generation.

14. 1 (*1*)—⊕ ○ +. (1). I-instars, which are not feeding, diapause during winter in cocoons. They resume feeding in spring. Larvae and pupal stages develop without estivation. Flight of moths occurs at the end of summer or during autumn. Larvae emerging in autumn enter hibernation without feeding. This cycle of development is characteristic in the Far East for *Sparganothis pilleriana* Den. and Schiff. and *Cnephasia alternella cinereipalpana* Raz.

15. 1 (?)—⊕ ○ +. (?). Primarily larvae or eggs diapause in winter. These stages develop in spring, but larvae stop feeding at the beginning of summer, and pronymphs estivate for a long time. They pupate at end July–August. Flight of moths occurs in August–September, *Epinotia salicicolana* Kuzn. and *E. exquisitana* Chr. develop in this manner in the southern Kurils.

16. 1 (.) .— ⊕ ○ (.). Larvae in the early stages of egg development diapause in winter. They emerge in spring and, like the pupae, develop with estivation up to August–September, when oviposition takes place. Eggs remain in hibernation. This cycle is characteristic in Priamur for *Zeiraphera diniana* Gn., *Z. rufimitrana* H.-S., *Epinotia stroemiana* F., *E. solandriana* L., *E. brunnichiana* L. Partial estivation of pronymphs occurs in some of these species in the Kurils.

17. 1 (;)— ⊕ ○ +(;). This cycle differs from the preceding one in that flight and oviposition are shifted to earlier periods. Egg development stops in summer and resumes only after hibernation. This cycle has been recorded in *Acleris paradiseana* Wlsgm., *Archips fuscocupreana* Wlsgm., *A. viola* Flkv., *A. dichotoma* Flkv., *Tortrix sinapina* Butl., and others.

18. 1 (?)— ⊕ (○ + (?). Primarily eggs diapause in winter. Larvae develop in spring and the beginning of summer up to the period of monsoon rains and fog. Development of pupae discontinued in July–August by long estivation. Flight of moths occurs in August–September. Imagoes are not found in spring. This cycle of development has been recorded in the Kurils, southern Sakhalin, and southern Primor'e for a large series of species from the Manchurian group. The following species may be cited as examples:

Croesia askoldana Chr.
Epinotia rasdolnyana Chr.
E. maculosa Kuzn.
E. coryli Kuzn.
Zeiraphera viridinea Flkv.
Z. demutata Wlsgm.
Z. corpulentana Kenn.
Z. subcorticana Snell. and others

Seasonal Cycles of Perennially Diapausing Tortrices

19. 1/2 (○) (○ (○) or 1/3 (○) (○ (○)
(○) + .— ⊕(○) (○) (○ (○)
(○) + .— ⊕(○)

Diapausing pupae hibernate. Their diapause continues for two or three years. It terminates in spring and the first flight of moths occurs in May–June. Larvae and eggs develop without estivation. This cycle of development has been recorded for *Petrova fulgens* Kuzn.

20. 1/2 (—)—(⊕)
(⊕) ○ + .— (−)

Larvae of III-instar and older diapause in winter. Pronymphs pupate in spring, and larvae of middle age resume feeding and hibernate again at the pronymph stage. They develop in spring without estivation. First flight in spring. This cycle is known throughout the Palearctic for *Enarmonia formosana* Scop., *Petrova resinella* L., and *Lespeyresia zebeana* Sax.

Seasonal Cycles of Polycyclic Tortrices

21. 2 (+) .— ⊕○ . ⊕○ (+). Moths diapause in winter. Additional feeding and oviposition take place only in spring. Imagoes of second generation distinguished by their color from moths of hibernated generation. In the Far East this cycle of development has been reported in *Acleris ulmicola* Meyr., *A. affinatana* Snell., and *A. perfundana* Kuzn.

22. 2 (+).—⊕○+.—⊕○ (+). This cycle differs from the preceding one in absence of seasonal dimorphism. It is characteristic of *Acleris comariana* Z. in southern Primor'e.

23. 2 (○) + .— ⊕○ +. ⊕ (○). Pupae diapause in winter. First flight of moths of first generation in June, of second generation in August–September. This cycle has been noted for *Hedya atropunctana* Zett.

24. 2 (⊕) ○ +.— ⊕○.— (⊕). Pronymphs diapause in winter and pupate in spring. First flight of moths of first generation from May to mid-June, of second generation from mid-July to mid-August. In the Far East this cycle of development has been found in *Spilonota albicana* Motsch., *Grapholitha funebrana cerasivora* Mtsm., and *G. delineana* Wlkr. in the zone of two generations.

25. 2 (—)—⊕○+.—⊕○+.—. (+). Larvae of II- to IV-instars diapause in winter, and resume feeding in spring. In the Palearctic this

cycle is known for *Pandemis heparana* Den. and Schiff., *P. cerasana* Hb., and *Adoxophyes orana* F.R.

26. 2(.)— ⊕○+.— ⊕○ + (.). Eggs diapause in winter. First flight of moths of first generation in June–July, of second generation August–September. In the Far East this cycle is known for *Rhopobota naevana* Hb.

The system of seasonal cycles of the Far East tortrices presented here, although perhaps not perfect, reflects the major variants of phenological seasonal patterns. Quite likely other cycles exist which occupy an intermediate position between those described here.

It is apparent from the data given above that cycles of development are subject to geographic change in definite directions. Polycyclism is lost in the northern population. If in southern Primor'e a few dozen widely distributed species are polycyclic permanently or facultatively in the Amur-Zeya Plateau, even in the relatively warm year of 1958 only *Acleris perfundana* Kuzn., *A. affinatana* Snell., *Bactra lacteana* Car., *Rhopobota naevana* Hb., *Argyrotaenia pulchellana* Hw., *Gypsonoma nitidulana* Z., *Ancylis mandarinana* Wlsgm., and *Grapholitha scintillana* Chr. could be included in this category. Polycyclism is definitely expressed in the Kurils only in *Acleris enitescens* Meyr., *A. affinatana* Snell., and *Rhopobota naevana* Hb.

The tendency toward loss of estivation in the western population compared to the eastern one is rather interesting. If a large number of Manchurian species estivate on Kunashir Island, and their estivation definitely facultative in some individuals of boreal tortrices of *Epinotia* Hb. (*E. solandriana* L., *E. brunnichiana* L., *E. signatana* Dougl.), in Priamur the summer delay in development was not recorded for boreal species and was reduced or absent in many Manchurian species.

ECOLOGICAL-FAUNISTIC REVIEW OF TORTRICES

On analyzing the material collected from southern regions of the Far East and reviewing literature for this territory, 558 tortrices species were found. Although the fauna of this territory is not wholly incorporated in this figure, nonetheless one may assume that the special composition of the tortrice family in the Far East has been fairly well covered. In the taxonomic review information on biology is given for each species, which was revealed from personal observations or given in the literature. Peculiarities of geographic variability and ecological and zonal adaptations are mentioned briefly. Areas of distribution have already been described (Kuznetsov, 1967, 1972b). For the

Holarctic, Trans-Palearctic, and other widely distributed tortrices, these areas are indicated in a generalized manner, but noted in greater detail for species of the Manchurian series. The spread of the Manchurian series into China was assessed on the basis of material in the G. Antipa Museum of Natural History (Bucharest). All cases of bicyclic development have been noted in particular; species for which the number of generations per year is not indicated, can be considered monocyclic in the territory of the Far East, even if they display polycyclic development in other regions.

The information obtained through observations in stations on the food plants of larvae, phenology, station-biocenotic adaptation, and occurrence is reported separately for each of the four geographic regions of the Far East; the material and names of collectors have also been listed (within parentheses). The year of collection is not given if the observations of different years yielded similar results. Dates are given in phenological order irrespective of year. Dates for original specimens with pre-Revolution labels are given in the new style (within parentheses). The supertribe Eucosmidii (except for Ancylidini) is not included in the list since complete phenological information on tortrices collected in the Far East has already been published (Danilevskii and Kuznetsov, 1968), and the material on borers reported in another book to be published shortly.

Literature on material from the Far East is referenced immediately after the species name. Information on the food plants of larvae, essential to an understanding of the peculiarities of distribution and biology of tortrices, was borrowed in some cases from European or Japanese literature.

To economize on space the following abbreviations for frequently occurring geographic place names and names of collectors have been used:

A	L.A. Anufriev
D	A.M. Diakonoff
E	V.M. Ermolenko
EV	V.P. Ermolaev
FCH	M.I. Fal'kovich
FV	N.N. Filip'ev
GTS	Taiga Mountain Station
K.	V.N. Kuznetsov
KR	A.I. Kurentsov
L	Yu.G. Lotkin
M	V.V. Mikhailov
N	E.P. Narchuk
O	M.A. Omel'ko
phen	phenology
PR	Priamur
S	N.L. Sukhareva
SHE	G.G. Shel'deshova
SHO	R. Shokareva
SK	Southern Kurils
SP	Southern Primor'e
SS	Southern Sakhalin
volc	volcano
Z	G.M. Zabello

The most important geographic points have been plotted on the map (Figure 1).

A complete revision of the taxonomy of tortrices was not the purpose of this study. However, a reexamination of information on the classification, nomenclature, and phylogenetic relationships of some taxa was unavoidable, because it was impossible without such to assess the volume of groups and the relationships and areas of distribution of many Far East tortrices. Reexamination was based on a reassessment of the characters of venation used in the taxonomy of Lepidoptera, together with drawings of the wings, structure of the copulatory organs of the imago, and the morphology of pupae and larvae. The genitalia of almost every species of Tortricidae from the fauna of the Far East, as well as hundreds of tortrices from the western regions of the Palearctic and China, were studied in the course of this work. The composition and status of various taxa, from subspecies to subfamilies, consequently changed.

The classification accepted in this study (see below) will not be discussed in detail since the relationships of the subfamilies and most of the tribes have been examined in a previous article (Kuznetsov and Stekol'nikov, 1973). Here it is only necessary to define the taxonomic position of the tribes Ceracini and Microcorsini.

Classification of Palearctic Tortrices (Tortricidae)

- Family Tortricidae Stph., 1829
  - Subfamily Tortricinae Stph., 1829
    - Supertribe Sparganothidii Wlsgm., 1913
      - Tribe Sparganothini Wlsgm., 1913
    - Supertribe Cochylidii Gn., 1845
      - Tribe Cochylini Gn., 1845
    - Supertribe Tortricidii Stph., 1829
      - Tribe Cnephasiini Stt., 1859
      - Tribe Archipini Pierce and Metc., 1922
      - Tribe Ceracini Swinh. and Cotes, 1889
      - Tribe Tortricini Stph., 1829
    - Supertribe Microcorsidii Kuzn., 1970
      - Tribe Microcorsini Kuzn., 1970
  - Subfamily Olethreutinae Wlsgm., 1897
    - Supertribe Olethreutidii Wlsgm., 1897
      - Tribe Bactrini Flkv., 1962
      - Tribe Eudemini Flkv., 1962
      - Tribe Olethreutini Wlsgm., 1897

Tribe Lobesiini Flkv., 1962
Supertribe Eucosmidii Heinr., 1923
Tribe Ancylidini Pierce and Metc., 1922
Tribe Eucosmini Heinr., 1923
Tribe Laspeyresiini Heinr., 1923

In the tribe Ceracini the uncus, gnathos, and transtilla are poorly differentiated, but the valves and articulation between the juxta and caulis have been preserved in the male (Yasuda, 1965a). In other words, the characteristic structure and function of the copulatory apparatus of the subfamily Tortricinae has been retained in Ceracini. The female genitalia are similar to those of Archipini and Tortricini, but the signum lacks a long blade, although it may be deeply inserted in the cavity of the bursa copulatrix (*Cerace* Wlkr.) and covered with minute spinules as in Tortricini. All this enables us to consider Ceracini one of the generalized tribes of the subfamily, which has retained links of affinity with Tortricini. The relict area of distribution of Ceracini, divided into isolated sections, is concentrated in Southeast Asia and indicates the ancient nature of its origin. In the process of evolution this group changed over to a diurnal mode of life, leading to a radical modification in pattern of forewings and some adaptation.

The tribe Microcorsini (Kuznetsov, 1970a), recently separated, differs from other tribes in two cornuate signa, modified valves with developed pulvinus, and a unique alate androconial apparatus on the hind wings between veins A_1 and A_2. A combination of generalized and specialized characters is distinctly expressed in the type genus of this tribe, *Microcorses* Wlsgm., including some features which are typical of the subfamily Olethreutinae: males without transtilla, and shape of signa resembles that of some members of Olethreutini and Eucosmini. However, the absence of a transtilla can be considered a secondary phenomenon, like the modification of the valves, especially since a similar process is observed in some genera of Tortricini.

At the same time the major characters typical of Microcorsini are distinctly expressed in Tortricinae: basal process of aedeagus present, and females retain connection of apophysis of segment VIII with the ostial region. All this enables us to include Microcorsini under the subfamily Tortricinae, even though its relationship with other Palearctic tribes is not fully understood because the preimaginal stages of these tortrices remain unknown.

Subfamily Tortricinae

Tribe Sparganothini

Sparganothis pilleriana Den. and Schiff.

Danilevskii, 1955: 67; Kuznetsov, 1967: 53; 1970b: 40.

Diapausing, nonfeeding larvae hibernate after hatching as I-instars in slender silky cocoons in ruptured bark of trees, root collars of herbaceous plants, and plant residue. Larvae polyphagous and commence to feed in open buds, thereafter in rolled leaves, flowers, and buds, which they cut. Develop on various plants of 16 botanical orders. In Japan cause severe damage to strawberries and flax, at some places also apple, gooseberry, soyabean, lucerne, clover, sugar beet, lilies, and dahlia (Oku). In forests recorded on wild *Artemisia* sp., *Larix* sp., *Oenothera* sp., *Chenopodium album, Filipendula kamtschatica, Fraxinus mandschurica, Juglans sieboldiana, Matteuca orientalis, Populus* sp., *Aralia elata, Erigeron annus,* and *Polygonatum maximowiczii.* Pupation at feeding sites. Flight mainly after sunset. Females lay eggs in groups of 75 to 100 on upper surface of leaves. Larvae hatching at end of July enter hibernation. Distribution: Holarctic (Forest zones and steppes).

PR—9 specimens. Svobodnyi (FCH) July 20, 1959. Korsakovo (FCH) August 7, 1959. Blagoveshchensk (Hedemann) July 11 (23), 1877. Evur River (KR) August 4–8, 1952. Larvae in orchards damage leaves, flowers, and ovaries of currant.

SP—132 specimens. Vyzemskii (Vorzov) July 13 (23), 1909. Yakovlevka (D, FV) July 13–29, 1926. Vinogradovo (D, FV) July 16–30, 1929. Environs of Ussuriisk: Suputinskii State Farm (Tokareva) ex 1., July 22–29, 1932; Baranovsk (S, FCH) ex 1., July 12, 1963; GTS (Z, K) July 12–August 12, 1966. Kangauz (FCH) July 7, 1963. Tigrovoi (KR) July 21, 1928. St. Ilya Momtai (V, FV) July 31, 1926. De Vries Peninsula (O) July 9, 1959, July 9-14, 1961, July 13–August 27, 1960, August 2, 1964; (KR) July 20–August 6, 1955. Okeanskaya (FCH) July 10–27, 1963. Environs of Vladivostok (Starokadomskii) July 26–28 (August 9–10), 1910. Larvae in orchards damage strawberry and raspberry, rarely plum (*Prunnus ussuriensis),* in fields damage soyabean, sunflower, *Lathyrus,* and clover. In oak forests damaged by felling, valleys, broad-leaved forests, along flat plains and slopes, and in outgrowths of shrubs near inhabited places they damage *Rubus crataegifolius.* Found singly on *Schizandra chinensis, Spiraea media, Lespedeza bicolor,* and *Arudinella* sp. Larvae congregate on *Trifolium hibridum, Artemisia* sp., and *Lathyrus* *davidi* in forest glades. Phen: Larvae May 20–July 5, pupation June 21–July 6, first flight July 4–16, flight period July 7–August 27, in environs of Vladivostok July 10–August 27, 1960, in Ussuriisk region (GTS) July 12–August 12, 1966.

SS—2 specimens. Kholmsk (EV). Larvae in gardens of strawberry July 15–23, pupation from July 24, first flight August 1–5, 1970.

SK—51 specimens. Kunashir: environs of Sernovodsk and Lake Glukhoe (Z, K) July 18–August 16, 1967; Lake Peschanoe (K) July 22, 1967. Larvae slightly damage open buds and leaves of sour cherry (*Cerasus kurilensis* and *C. sachalinensis)* during flowering and fruiting, as well as leaves of *Spiraea betulifolia, Padus ssiori,* and *Vitis kaempferi* in outgrowths of Rosaceae plants in mixed forests near the ocean.

Sparganothis rubicundana H.-S.

In Europe larvae on *Vaccinium myrtillus* (Hannemann, 1961). Area of distribution poorly studied: species known only from Europe.

SP—1 specimen. Kul'dur (Korovin) June 30, 1971.

Tribe Cochylini

Hysterosia Vulneratana Zett.

Caradja, 1916: 54; Razowski, 1970:99.

Distribution: Trans-Palearctic (forest zone).

PR—2 specimens. Radde (Korb) 1905.

Hysterosia sp.

Close to *H. pulvillana* H.-S. and its Far East vicarious species. Known only from southern Sikhote-Alin.

PR—1 specimen. Vinogradovo (D, FV) June 22, 1929.

Hysterosia inopiana Hw. (*excentricana* Ersch.)

Caradja, 1916: 55; Kuznetsov, 1967: 48; Razowski, 1970: 103.

In Europe larvae on roots of various *Artemisia* species (Swatschek, 1958). Distribution: Holarctic (forest zones and steppes).

PR—36 specimens. Klimoutsy (K) July 12–17, 1958 (Kerzhner) June 28, 1959; (FCH) July 31, 1959. Simonovo (FCH) July 25–29, 1959. Vlagoveshchensk (Hedemann). Radde and Kazakevichevo (Caradja, 1916). Evur River (KR) August 4, 1952. Commonly found at light, rarely in evening in black birch–oak–larch forests, wastelands, and inhabited places. Flight June 28–July 3.

SP—125 specimens. Vyazemskii (Borzov) June 20 (July 2)–July 10

(22) and August 8 (20), 1909. Kirovskii (M) August 8, 1970. Spassk (FCH) August 17, 1963. Yakovlevka (D. FV) June 13–July 10, 1926; (Zinov'eva) June 25–July 3, 1962. Vinogradovo (D, FV) July 3–5, 1929. Ussuriisk (Dul'keit) July 5–8, 1924. GTS (Z) July 3, 1966. Suputinskii forest reserve (KR) August 22, 1947. Upper reaches of Suputinka River (KR) July 12–15, 1933. Environs of Artem, Ugol'naya (A) July 11–18, 1960. Suchan (KR) June 30–July 12, 1928. Tigrovoi (KR) July 7–22, 1928. Source of Sitsa River (KR) July 14–25, 1928. Khualaza (KR) July 21, 1928. Suifun (Hedemann).* Okeanskaya (FCH) Jly 17, 1963. De Vries Peninsula (KR) July 5–8, 1955, August 16, 1957; (O) July 11–25, 1961, July 13–26, 1959, August 28, 1960. Kraskino (Gavronskii) August 20 (September 1), 1903. Common at light in inhabited places, abandoned lands, pastures, and roadsides. In mountains, up to height of 1,200 m. Two generations: flight June 12–July 26 and August 4–September 1.

Hysterosia pistinana Ersch. (*coreana* Wlsgm.)

Walsingham, 1900: 447; Kuznetsov, 1967; 48; Razowski, 1970: 106.

In Japan represented by the subspecies *albiscutella* Wlsgm.; larvae develop in bulbs and stems of *Lilium amatum* (Oku, 1967). Distribution: Eastern Palearctic (zones of forests and steppes).

Southern Siberia, east of Chu-Iliisk Mountains.

PR—27 specimens. Klimoutsy (Zinov'ev, K, S) June 3–19 and August 8, 1958; (FCH) June 5, 1959. Simonovo (FCH) June 1–8, 1959. Common in evening in warm black birch—oak—larch forests. Found singly in oak forests and shady black birch—oak—larch forests.

Mongolia, Northeast China, Korean Peninsula, Japan.

Stenodes jaculana Snell.

Snellen, 1883: 195, original description; Kennel, 1908–1921: 303; Kuznetsov, 1967: 48; Razowski, 1970: 131.

Distribution: Eastern Palearctic.

Southern Siberia (west up to Novosibirsk).

PR—18 specimens. Klimoutsy (S) August 2 and 12, 1958; (FCH) August 5, 1959. Simonovo (FCH) August 14, 1959. Korsakovo (FCH) August 3–7, 1959. Radde (Korb) 1905. Environs of Khabarovsk, Kazakevichevo (Korb) 1907. Singly along fringes of black birch—oak—larch forests, in wastelands, pastures, and inhabited places. Flight August 2–14.

SP—58 specimens. Adimi (Emel'yanov) July 23 (August 4), 1904.

---

*Dates sometimes omitted in Russian original—General Editor.

Vyazemskii (Borzov) July 23 (August 4)–July 31 (August 12), 1909; (SHE) August 12, 1959. Kirovskii (M) August 10, 1970. Spassk (FCH) August 17, 1963. Shmakovka (Savost'yanov) August 15, 1950. Yakovlevka (D, FV) August 4–7, 1929. Ussuriisk and GTS (Zinov'eva, N) August 7–11, 1962; (Z) August 10, 1967; (A) August 12, 1957; (Mishchenko) August 19, 1931. Suchan (KR) August 8–16, 1928. Tigrovoi (KR) August 15–19, 1928. Suifun (Hedemann). Okeanskaya (Zagulyaev) August 11–12, 1950. De Vries Peninsula (O) August 13, 1961, August 17, 1960, August 22–24, 1962. Environs of Vladivostok, Chernaya rivulet (Mol'trekht) August. Barabash (Gavronskii) July 16 (28), 1903. Zarech'e, in region of Pos'et wasteland (Srebyanskii) August 22, 1925. Common at light, in inhabited places, and in abandoned lands. Flight July 28–August 24.

Mongolia, China, Japan (Hokkaido, Honshu).

Stenodes fucatana Snell.

Snellen, 1883: 196, original description; Kennel, 1908–1921: 341; Razowski, 1970: 164.

Distribution: Eastern Palearctic (steppes and broad-leaved forests).

Southern Siberia, Kazakhstan, Ural region, Mongolia.

PR—2 specimens. Anosovo (Hedemann) June 15 (27), 1877.

Stenodes declivana Kenn.

Kennel, 1901: 243, original description; 1908–1921: 342; Razowski, 1970: 165.

PR—1 specimen. Pomneevka.

SS—1 specimen. Environs of Pravda (Kostyuk) July 25, 1971.

Stenodes triangulifera Kuzn.

Kuznetsov, 1966a: 201; Razowski, 1970: 164.

Distribution: 'Ussuriisk–China.

PR—4 specimens. Ussuriisk (FCH) June 27, 1959; GTS (K) June 27, 1966. Environs of Artem, Ugol'naya (A) June 26 and July 1,1961. Rarely at light and in inhabited places.

Northeast China.

Stenodes pallens Kuzn.

Kuznetsov,1966a: 202–204, original description; Razowski, 1970: 167.

Distribution: Ussuriisk–China.

SP—3 specimens. Adimi (Emel'yanov) June 14 (27) 1904. Okeanskaya (Zagulyaev) July 2, 1950.

China.

Stenodes hademanniana Snell. (*rectifascia* Fil.)

Snellen, 1883: 192, original description; Kuznetsov, 1967: 49; Razowski, 1970: 169.

Distribution: Eastern Palearctic (steppes and forest-steppes, broad-leaved forests).

Southern Siberia.

PR—2 specimens. Blagoveshchensk (Hedemann) June 27 (July 9) and July 7 (19), 1877.

SP—25 specimens. Yakovlevka (D, FV) June 26–August 8, 1926. Vinogradovo (D, FV) June 11, 1929. Environs of Ussuriisk, GTS (K), June 13–14, 1966; (Zinov'eva) August 7, 1962. Kangauz (FCH) June 25, 1963. Nakhodka (Emel'yanov) July 5 (17), 1916. De Vries Peninsula (O) July 11–16, 1961; (KR) August 4–6, 1955. Common in evening at light in outgrowths of shrubs and along fringes of oak forests, forest-steppes, hilly slopes. Flight June 11–August 8.

China.

Phalonidia curvistrigana Stt.

Razowski, 1970: 204.

In Europe larvae in flowers and seeds of *Solidago virgaurea, Prenanthes purpurea, Mycelis (Lactuca) muralis* (Razowski, 1970). On exiting, they pupate in cocoons. Distribution: Trans-Palearctic.

Western Europe.

SP—4 specimens. Vinogradovo (D, FV) August 1–2, 1929. Environs of Ussuriisk, July 25, 1966. De Vries Peninsula (O) August 17, 1960.

Phalonidia silvestris Kuzn.

Kuznetsov, 1966a: 198, original description; 1967: 48; Razowski, 1970: 205.

In Kuznetskii Alatau replaced by the close species *P. latifasciana* Raz. Kunashir specimen differs somewhat from mainland specimens on basis of male genitalia. Distribution: Manchuria.

PR—19 specimens. Magdagachi (Masyutana) July 8, 1963. Klimoutsy (K, S) July 6–26, 1958. Simonovo (FCH) July 25, 1959. Common in black birch–oak–larch forests; found singly in mixed grass wastelands near forests. Flight July 6–26.

SP—1 specimen. De Vries Peninsula (KR) July 25, 1955.

SS—3 specimens. Environs of Novoaleksandrovsk (EV) July 17, 1970. Chekhov peak (EV) July 20, 1970.

SK—76 specimens. Kunashir: Mendelaevo (K) July 19, 1967; Alekhino (E) August 13, 1965; environs of Sernovodsk (Z, K) July 5–August 13, 1967; Delkino (K) August 2, 1967; Cape Chetverikov (K) July 23, 1967; Peschanoe Island (K) July 22, 1967; Golovnina volc (K) August 2, 1967. Usually in evening in fir–yew–broad-leaved, spruce–fir, oak–fir–broad-leaved, alder, and oak forests; also in outgrowths of tall grasses. Rarely in stone–birch forests. Flight July 5–August 13.

Japan.

Phalonidia manniana F.R.

Filip'ev, 1940: 183; Kuznetsov, 1967: 48; Razowski, 1970: 207.

In Europe larvae in stems and branches of *Alisma plantagoaquatica* (Hannemann, 1964), and also in stems of *Mentha* and *Lucopis* (Klimesch, 1961). Distribution: Trans-Palearctic (forests and steppes).

PR—10 specimens. Klimoutsy (K) July 14–15, 1958. Simonovo (FCH) July 25, 1959. Environs of Blagoveshchensk (Efremov) July 7–14, 1965. Singly at light in floodplains and in marshy black birch–oak–larch forests.

SP—6 specimens. Yakovlevka (Zinov'eva) July 3, 1962. Upper reaches of Chanigov River (Zinov'eva) July 29, 1962. Vinogradovo (D, FV) July 3 and 20, 1929. Strugovka (Wolfson) July 26, 1933. De Vries Peninsula (KR) July 25, 1955. Singly at light and in inhabited places along floodplains.

Phalonidia zygota Raz.

Razowski, 1964a: 338, original description; 1970: 215; Kuznetsov, 1967: 48.

Distribution: Eastern Palearctic (forest zones).

Southern Siberia (Kuznetskii Alatau). Mongolia, Japan.

TR—16 specimens. Magdagachi (Masyutina) August 2, 1963. Klimoutsy (K, S) July 30–August 27, 1958. Simonovo (Kerzhner, FCH) July 26–August 14, 1959. Korsakovo (Zinov'ev, FCH) August 6–7, 1959. Radde (Razowski, 1964a). Singly at light and in evening in wastelands, steppe meadows, and steppe black birch–oak forests. Flight July 26–August 27.

SP—4 specimens. Yakovlevka (D, FV) August 10–22, 1926. Suifun (Hedemann). Singly at light and in inhabited places.

SK—1 specimen. Kunashir: environs of Sernovodsk, Cape Vodopadnyi (K) August 8, 1967. Mixed grass meadow on steep slopes of southern exposure near coastline.

Phalonidia fraterna Raz.

Razowski, 1970: 216, original description.

Known from Primor'e and southern Ussuriisk.

SP—3 specimens. Environs of Ussurriisk, GTS (K) June 9 and June 16, 1966. De Vries Peninsula (O) August 27, 1960. Askol'd (Razowski, 1970).

Phalonidia aliena Kuzn.

Kuznetsov, 1966: 200, original description; Razowski. 1970: 217.

Known only from Vladivostok.

SP—6 specimens. Okeanskaya (A) August 13–21, 1959; (FCH) August 20, 1963. Environs of Vladivostok, M. Sedansk River (A) August 14, 1959.

Phalonidia fulvimixta Fil.

Filip'ev, 1940: 181, original description; Razowski, 1970: 218.

Distribution: Ussuriisk–China.

SP—p specimens. Yakovlevka (D, FV) August 8, 1926. Vinogradovo (D, FC) August 1–7, 1929. Environs of Ussuriisk, GTS (Z) August 6, 1966. Suchan (KR) July 27–August 19, 1928. Source of Sitsa River (KR) July 25, 1928. Okeanskaya (Transhel') August 10, 1929. Singly in inhabited places. Flight July 25–August 19.

China.

Phalonidia chlorolitha Meyr. (*azyga* Meyr.)

Razowski, 1970: 218.

Distribution: Japan, Ussuriisk, China.

SP—41 specimens. Kirovskii (M) August 4, 1970. Yakovlevka (D, FV) August 8–12, 1926. Vinogradovo (D, FV) July 29–August 2, 1929. Environs of Ussuriisk, GTS (Z) August 10, 1966. Suchan (Nalshkov) August 20, 1933. De Vries Peninsula (KR) August 4, 14, and 16, 1955; (O) August 5 and 13, 1961, August 12 and 22, 1962, August 16, 1964, August 17–18, 1960, August 24, 1963. Sudzukhinsk forest reserve. Kievka (Kerzhnev) August 23, 1959. Kedrovaya Pad' forest reserve (E) August 24–26, 1965. Common at light in inhabited places. Flight July 29–August 22. Northeastern China, Japan (Hokkaido, Honshu).

Phalonidia lidiae Fil.

Filip'ev, 1940: 180, original description; Razowski, 1970: 220.

Known only from the foothills of southern Sikhote-Alin'.

SP—5 specimens. Yakovlevka (D, FV) June 12, 1926. Ussuriisk (Toka River) August 14–17, 1931. Singly in inhabited places. Probably two generations. Flight in June and August.

Phalonidia luridana Gregs.

Known from West Europe and the Kuril Islands.

SK—7 specimens. Konashir: environs of Sernovodsk (Z, K) July 16–23, 1967. Golovnina volc (K) August 1, 1967. Singly on mixed grass and meadows, above outgrowths of bamboo, among coniferous and mixed forests. Flight July 16–August 1.

Phalonidia minimana Car. (*walsinghamana* Pierce)

Caradja, 1916: 52, original description; Filip'ev, 1940: 183; Kuznetsov, 1967: 48; Razowski, 1970: 226.

Distribution: Trans-Palearctic (forest zones).

PR—5 specimens. Klimoutsy (K, S) June 8–July 23, 1958. Korsakovo (FCH) August 3, 1959. Kazakevichevo (Korb) 1907.

SP—36 specimens. Yakolevka (D, FV) July 15 and August 8–September 10, 1926. Vinogradovo (D, FV) July 11 and 15, August 6, 1929. Ussuriisk (FCH) June 29, 1963. Suchan (KR) August 19, 1928. Suifun, Okeanskaya (Transhel') August 9, 1929; (Zagulyaev) August 13 and September 30, 1950. Environs of Pos'et Gulf, across the river (Srebryanskii) August 22, 1925; Lake Khasan (Kerzhnev) July 24, 1963. Common at light in inhabited places. Possibly two generations. Flight June 29 to July 24 and August 8 to September 30.

SK—13 specimens. Kunashir: environs of Sernovodsk (Z, K) July 16–August 16, 1967; Lake Peschanoe (K) July 22, 1967; Cape Vodopadnyi (K) July 26, 1967; Golovnina voic (K) August 1–2, 1967. Singly in evening in mixed grass meadow and above outgrowths of bamboo in mixed and coniferous forests; oak groves and fir–yew–broad-leaved forests. Flight July 16–August 16.

Phalonidia permixtana Den. and Schiff.

Kuznetsov, 1967: 48; *Udana* Gn., err. det.; Razowski, 1970: 227.

In Europe larvae found in stems, inflorescences, and seeds of *Alimsa plantago aquatica, Butomus umbellatus, Gentiana lutea,* as well as *Pedicularis, Euphrasia,* and *Rhinanthus*. Two generations.

Distribution: Trans-Palearctic (forest zones).

PR—26 specimens. Environs of Blagoveshchensk (Efremov) July 1–7, 1965. Klimoutsy (K, S) June 8–July 23, 1958; (FCH) June 16 and July 31, 1959. Simonovo (FCH) June 9 and July 25–August 14, 1959. Korsakova (FCH) August 3–7, 1959. Common in marshy pastures, meadows, and wastelands; rare in black birch–oak–larch and oak forests. Flight June 8–August 14.

SP—22 specimens. Spassk (FCH) August 17, 1963. Suputinsk forest reserve (KR) August 14, 1947. Environs of Artem, Ugol'naya (A) June 21, 1961. Okeanskaya (FCH) May 22–June 1, 1963; (Transhel') August 7, 1929; (Zagulyaev) September 6, 1950. De Vries Peninsula (KR) July 14 and August 5, 1955; (O) July 7–16, July 9, July 23, August 17, 1960. Common at light in inhabited places. Flight May 22–September 6.

SK—25 specimens. Iturup: Berutarube volc (E) July 31, 1965, Kunashir, environs of Sernovodsk (Z, K) August 6–16, 1967. Kal'dera, Golovnina volc (K) August 2, 1967. Common in evening in forest glades, outgrowths of *Sasa*, among spruce–fir and mixed forests, at light in inhabited places, and mixed grass meadow near coasts. Rare along fringes of oak forest. Flight July 31–August 16.

Phalonidia dysodona Car.

Caradja, 1916: 52–53, original description; Filip'ev, 1940: 183; Kuznetsov, 1967: 48; Razowski, 1970: 228.

Distribution: Amur–Ussuriisk.

PR—5 specimens. Klimoutsy (K) May 31–June 14, 1958. Radde (Korb) 1905. Isolated in iris–sedge meadows.

SP—5 specimens. Yakovlevka (D, FV) August 15–16, 1926. Environs of Ussuriisk, GTS (K) May 23, 1966. Tigrovoi (KR) August 19, 1928. Environs of Vladivostok (O) August 17, 1960. Singly in meadows. Two generations. Flight in May and August 15–19.

Phtheochroides apicana Wlsgm.

Distribution: Japan.

SK—7 specimens. Kunashir: environs of Sernovodsk (K) August 4–12, 1967. Singly above outgrowths of tall grasses in fir–yew–broadleaved forests. Japan (from Hokkaido to Kyushu).

Phtheochroides clandestina Raz.

Distribution poorly studied. Species known from Pamir and islands of Japan.

SK—2 specimens. Kunashir: Tret'yakovo (Kostyuk) August 7, 1971, at light.

Eugnosta ussuriana Car. (*cosmolitha* Meyr.)

Caradja, 1926, original description; Razowski, 1970: 255.

Distribution: Japan–Ussuriisk.

SP—8 specimens. Suchan (collection of Caradja) August, 1925. Okeanskaya (FCH) July 27, 1963. De Vries Peninsula (KR) July 14, 1955; (O) July 15, 1961, July 27–30, 1959, July 30, 1960. Singly at light. Attracted by ultraviolet radiation.

Japan (Hokkaido and Honshu).

Eugnosta fenestrana Raz.

Razowski, 1964a: 351, original description; 1970: 257; Kuznetsov, 1967: 49.

Distribution: Eastern Palearctic (forests and forest-steppes).

Baikal region.

PR—1 specimen. Simonovo (FCH) August 14, 1959. Steppe meadow.

Northern China, Mongolia.

Eugnosta dives Butl.

Kennel, 1908–1921: 307; Caradja, 1916: 54 as *simpliciana* Kenn.; Kurentsov, 1950: 30; Kuznetsov, 1967: 49; Razowski, 1970: 259.

Larvae hibernate in root collars of *Asterales* (Oku, 1967). Distribution: Eastern Palearctic (forests and steppes).

Yakutia, Baikal region, Mongolia.

PR—48 specimens. Kumara (Hedemann) June 18 (30), 1877. Klimoutsy (K) July 15, 1958. Simonovo (Dorokhina, FCH) June 8–July 27, 1959. Environs of Blagoveshchensk (Hedemann) June 27 (July 9)–July 8 (20), 1877; (Efremov) July 14, 1955; Radde (Korb) 1905. Environs of Khabarov, Kazakevichevo (Korb). Common in wastelands and steppe meadows. Flight June 8–July 27.

SP—61 specimens. Yakovlevka (D, FV) June 29–August 7, 1926. Vinogradovo (D, FV) July 11–August 7, 1929. Environs of Ussuriisk (Mishchenko) August 10–14 and 19, 1934. GTS (Dul'keit) July 5, 1924; (FCH) July 15–18, 1959 and July 29, 1963; (Z, K) June 17–July 28, 1966. Suputinsk forest reserve (K) July 17–20, 1966. Neishula (FCH) July 13–15, 1963. Tigrovoi (KR) June 25–July 19, 1928, August 14, 1922. Okeanskaya (Zagulyaev) August 11–12, 1950. De Vries Peninsula (O) July 3–August 5, 1961, July 27, 1959, July 30–August 10, 1960, July 30, 1964; (KR) August 4, 1954. Common in abandoned areas, pastures, and wastelands. Singly in cedar–broad-leaved, oak, and broad-leaved valley forests. Flight June 17–August 19.

Northern China, Japan (Hokkaido and Honshu).

Eupoecilia angustana Hb.

Razowski, 1970: 275.

In Europe larvae found in inflorescences and seeds of *Achillea, Thymus, Origanum, Plantago, Solidago,* and *Calluna* (Hannemann, 1964). Distribution: Trans-Palearctic (forest zones).

SP—3 specimens. Vinogradovo (D, FV) July 29, 1929. GTS (K) May 27, 1966. Environs of Artem, Ugol'naya (A) June 20, 1961.

SK—26 specimens. Kunashir: environs of Sernovodsk (Z, K) June 19–August 8, 1967; Lake Peschanoe (K) July 1–6, 1967. Belkino (K) July 23, 1967. Common in mixed grass and tall grass, meadow along fringe of oak forests, fir–yew–broad-leaved and other mixed forests, especially on warm slopes. Flight June 19–August 8.

Eupoecilia ambiguella Hb.

Danilevskii, 1955: 81; Lyubarskaya, 1964: 83; Kuznetsov, 1967: 49; Razowski, 1970: 277.

Polyphagous larvae found in the Far East on *Schizandra, Vitis, Rhamnus, Fraxinus, Acanthopanax,* and *Lonicera.* In some years cause serious damage to seeds of lemon tree. Two generations. Pupae hibernate, but their diapause probably weak. Females of first generation lay eggs on vegetative and flower buds. Larvae after hatching feed on buds and flowers, covering them with silky threads. Females of second generation lay eggs on ovaries and fruits; larvae live inside fruits covered with silky thread, consuming seeds. Damaged fruits of lemon tree turn brown, and after larvae exit drop and shrivel. Larvae entering hibernation pupate under rolled margin of leaves and in slits in bark. Distribution: Amphi-Palearctic (zones of broad-leaved and mixed forests).

Europe and the Caucasus.

PR—2 specimens. Klimoutsy (K, S) June 20 and July 10, 1958. Valley of Amur River below Zeya, lower reaches of Zeya, Vureya and Arkhara rivers, basins of Bera, Bidzhana, Lugovaya, Khor, Kiya, and Chirka rivers (Lyubarskaya, 1964).

In the environs of Khabarov (Khekhtsirskii forest farm) 33 to 40% of the seeds of *Schizandra chinensis* are damaged annually. Flight noted during June 20–July 10. Emergence of larvae from fruits and pupation of second generation in September.

SP—38 specimens. Basin of Ussurii River and its tributaries, basin of rivers flowing into the Sea of Japan south of Olya Inlet (Lyubarskaya, 1964). Vyazemskii and Bikin river, Kirovskii (M) July 5, 1970. Yakovlevka (Zinov'eva) May 24, 1962. Vinogradovo (D, FV) June 18 and July 23, 1929. GTS (Z, K) May 27–June 13 and July 20–August

13, 1966. Baranovsk (FCH) June 8, 1963. Suputinsk forest reserve (K) June 17, 1966. Kaimanovka (M) June 16, 1971. Tigrovoi (KR) August 12, 1928. Suchan (KR) August 8, 1928. Environs of Artem (Kovalev) ex 1., October 4, 1966. Okeanskaya (FCH) July 27, 1963. Environs of Vladivostok and De Vries Peninsula (KR) August 4, 1954; (O) July 14–19 and August 4–September 2, 1961, July 27, 1960, June 10 and September 2, 1961. Popov Island (Kandybina) ex 1., August 20, 1969. Common at light and in evening in cedar–broad-leaved and valley broad-leaved forests. Larvae on *Schizandra chinensis, Vitis amurensis, Lonicera ruprechtiana, Acantopanax sessiliflorum.* Flight of first generation May 24–June 13; of second generation July 20–September 2.

SS—* Korsakovsky region (Lyubarskaya, 1964).

SK—1 specimen. Kunashir: environs of Sernovodsk (K) July 11, Mixed forests.

China, Japan.

Eupoecilia citrinana Raz.

Razowski, 1960: 401, original description; 1970: 279; Kuznetsov, 1967: 49.

Replaced in the western Palearctic by an allied species, *E. sanguisorbana* H.-S. Distribution: all of Manchuria.

PR—33 specimens. Klimoutsy (K, S) July 14–August 10, 1958; (FCH) July 31, 1959. Semonovo (Kerzhner, FCH) July 29–August 15, 1959. Korsakovo (FCH) July 4–7, 1959. Radde (Korb) 1905. Evur (KR) August 9, 1952. Singly in evening and at light in black birch–oak–larch, black birch–oak–pine, and oak forests, as well as in meadows and wastelands. Flight July 14–August 15.

SP—17 specimens. Yakovlevka (D, FV) August 10–30, 1926. Vinogradovo (D, FV) July 19 and August 1, 1929. Environs of Ussuriisk (Shabliovskii) August 14, 1969; (Mishchenko) September 4, 1931. GTS (N) August 10, 1962. Tigrovoi (KR) August, 12 1928. De Vries Peninsula (O) August 13 and 22, 1961, August 18, 1964. Singly in evening and at light in inhabited places, lespedeza–oak groves, and in outgrowths of shrubs. Flight July 19–September 4.

SK—15 specimens. Iturup, environs of Berutarube volc (E) July 31, 1965. Kunashir: environs of Sernovodsk (Z, K) July 20–August 13, 1967. Common on mixed grass meadow along fringes of oak groves; rare on forest glades overgrown with bamboo, among spruce–fir forests.

---

*Number of specimens not given in Russian original—General Editor.

Aethes amurensis Raz.

Razowski, 1964a: 348, original description; 1970: 300; Kuznetsov, 1967: 49.

Distribution: Amur–Ussuriisk.

PR—2 specimens. Klimoutsy (FCH) June 20, 1959. Simonovo (FCH) June 12, 1959. Blagoveshchensk (Razowski, 1964a).

SP—2 specimens. Ussuriisk (FCH) June 9, 1963. Okeanskaya (S) June 29, 1963.

Aethes mesomelana Wlkr. (*suppositana* Kenn., *cunabulana* Wlsgm.)

Kennel, 1908–1921: 265; Caradja, 1916: 51; Razowski, 1970: 304.

Distribution: Amur–Ussuriisk–China.

PR—2 specimens. Radde (Korb) 1905. Amur (Delle) June 10 (24), 1915.

SP—30 specimens. Yakovlevka (D, FV) July 19, 1926. Environs of Ussuriisk (Maslovskii) July 25, 1930. GTS (K, S) June 13–July 15, 1966. Suputinsk forest reserve (KR) August 22, 1947. Kangauz (M) July 10, 1971. Environs of Artem, Ugol'naya (A) July 14–19, 1960. Suchan (Dorris) 1890. Okeanskaya (FCH) July 16, 1963; (Zagulyaev) August 11, 1950. De Vries Peninsula (KR) July 20, 1955, July 30, 1957; (O) June 2 and July 13–19, 1961, July 13–August 1, 1960, August 16, 1964. Singly at light in inhabited places and wastelands. Probably two generations. Flight June 1–August 22.

China.

Aethes hoenei Raz.

Kuznetsov, 1966a: 203, as female of *A. citereflava* Kuzn., Razowski, 1970: 307.

Distribution: Ussuriisk–China.

SP—1 specimen. Yakovlevka (D, FV) August 27, 1926.

Aethes citreoflava Kuzn.

Kuznetsov, 1966a: 203, original description; Razowski, 1970: 308.

Known only from southern Sikhote–Alin'.

SP—7 specimens. Yakovlevko (D, FV) August 18 and 27, 1926. Ussuriisk (A) August 22 and September 3, 1957. Kedrovaya Pad' forest reserve (M) June 30, 1971. Singly at light. Flight June 30 and August 18–September 3.

Aethes cnicana Westw.

Caradja, 1916: 50; Kuznetsov, 1967: 49; Razowski, 1970: 309.

In Europe larvae in roots, stems, and pods of *Carduus* and *Cirsium* (Swatschek, 1958). Distribution: Trans-Palearctic (predominantly forest zones).

PR—56 specimens. Klimoutsy (K, S) June 24–August 27, 1958. Simonovo (Dorokhina, Kerzhner, FCH) June 23–August 14, 1959. Korsakovo (FCH) August 4–7, 1959. Samodon-on-Amur (Dorokhina; FCH) July 9 and August 3, 1959. Kazakevichevo and Radde (Caradja, 1916). Common in evening and at light in wastelands, pastures, and inhabited places. Singly in black birch–oak–larch and black birch–oak–pine forests. Flight June 23–August 27.

SP—56 specimens. Spassk (F) August 18, 1963. Yakovlevka (D, FV) August 12–31, 1926. Vinogradovo (D, FV) July 1 and 19, 1929. Environs of Artem, Ugol'naya (A) August 12–19, 1960. Upper reaches of Chapigou River (Zinov'eva) August 2, 1962. GTS (Z, K) June 13–August 10, 1966. Suchan (KR) August 23, 1928. Kangauz (M) July 6, 1971. Okeanskaya (FCH) July 27, 1963; (Zagulyaev) August 13, 1950. Environs of Vladivostok (Kononov, O, S, FCH) June 15–August 27. Nadezhdinskaya (M) June 23, 1971. Common at light in wastelands and inhabited places. Singly in burnt-out felled areas in valley broad-leaved and oak forests, in outgrowths of shrubs. Two generations. Flight June 1–13 to July 25, July 2–21 to August 27.

SS—2 specimens. Environs of Novoaleksandrovsk (L) July 26 and August 2, 1967.

SK—57 specimens. Kunashir: environs of Sernovodsk (Z, K) July 1–August 13, 1967. Cape Vudopadnyi (K) July 26, 1967; Cape Chetverikov (K) July 23, 1967. Common in evening on fringes and in fir–yew–broad-leaved, spruce–fir–broad-leaved, and oak–yew–broad-leaved forests, in mixed grasses and tall grass meadow along coasts, and in forest glades overgrown with bamboo. Singly in oak groves, Erman's birch forests, and abandoned orchards. Specimens from Kunashir distinguished from European forms by shape of transtilla. Flight July 1–August 13; intensifies after sunset.

Aethes deutschiana Zett.

Distribution: Trans-Palearctic (taiga zone).

Kurils—1 specimen. Shumshu: environs of Kozyrevsk (Azarova, Krivolutskaya) July 29, 1964.

Aethes triangulana Tr. (*kuhlweiniana* F.R., *excellentana* Chr.)

Christoph, 1881: 74, original description of *excellentana* Chr., Kennel, 1908–1921: 303; Caradja, 1916: 54; Kuznetsov, 1967: 49; Razowski, 1970: 319.

Larvae of *Veronica longifolia* (Razowski, 1970). East of Amur River represented by subsp. *excellentana* Chr. Distribution: Trans-Palearctic (forests and steppes).

PR—14 specimens. Klimoutsy (K, S) June 8–15, 1958. Simonovo (FCH) June 9–10, 1959. Radde (Christoph, 1881). Common in meadows and pastures among outgrowths of wormwood. Singly in black birch–oak–larch forests.

SP—45 specimens. Vyazemskii (Borzov) June 16 (28), 1909. Yakovlevka (D, FV) May 27–June 14, 1926; (Zinov'eva) June 2, 1962. Vinogradovo (D, FV) May 30–June 21, 1926; (Zinov'eva) June 2, 1962; Vinogradovo (D, FV) May 30 and June 21, 1929. GTS (Z, K) June 2–15, 1966. Suputinsk forest reserve (K) June 17, 1966. Upper reaches of Suputinka River (KR) May 25, 1933; Kaimanovka (M) June 16–21, 1971. Suchan (Dorris) 1890. Suifun, Okeanskaya (FCH) May 28, 1963. Environs of Vladivostok, Sedanka (FCH) June 21, 1963. Popov Island (M) July 8, 1971. Kedrovaya Pad' forest reserve, bank of Monchugai River (Zinov'eva) May 28–June 1, 1962; (M) June 27, 1971. Common in evening and at light in wastelands and outgrowths of shrubs near inhabited places. Singly in fringes of cedar–broad-leaved and broad-leaved forests in valleys along floodplains and mountain slopes. In Primor'e represented by subsp. *excellentana* Chr., which is also distinguished by dark hind wings. Flight May 27–June 28.

SS—6 specimens. Environs of Novoaleksandrovsk (L, SH) June 12–14, 1967. Singly in wastelands and fringes of mixed forests.

Aethes smeathmanniana F.

In Europe larvae between closed flowers and inflorescences or in seeds of Compositae (*Achillea millefolium, Anthemis cotula, Centaurea nigra, Lactuca sativa,* and others) (Hannemann, 1964). Pupation at feeding site. Specimens from Kunashir differ morphologically from West European specimens. Distribution: Holarctic (forest and steppe zones), but not found in Siberia.

SK—5 specimens. Kunashir: environs of Sernovodsk, Cape Vodopadnyi (K) July 26–30, 1967. Singly in mixed grass meadow along coasts and steep slopes with southern exposure.

Aethes margarotana Dup.

Kuznetsov, 1967: 49.

In Europe larvae in *Eringium maritimum* (Razowski, 1970).

Distribution: Trans-Palearctic (broad-leaved forests and steppes).

PR—2 specimens. Simonovo (FCH) June 3 and 9, 1959. Amur specimens differ somewhat from European specimens in shape of distal end of aedeagus.

Aethes rectilineana Car.

Razowski, 1970: 362.

Distribution: Japan–Ussuriisk–China.

SP—Askol'd (Razowski, 1970).

Japan, China, Mongolia.

Aethes flava Kuzn.

Kuznetsov, 1970a: 451, original description.

Known only from environs of Vladivostok.

SP—2 specimens. De Vries Peninsula (O) July 28, 1960, August 18, 1964.

Cochylidia heydeniana H.-S. (*pudorana* Stgr., *sabulicola* Wlsgm.)

Kuznetsov, 1967: 49; Razowski, 1970: 384.

In Europe larvae in inflorescences of *Solidago* and *Artemisia* (Hannemann, 1964). Two generations. Distribution: Trans-Palearctic (predominantly forests).

PR—26 specimens. Klimoutsy (FCH) 4–17, 1959; (S) June 9–July 2 and August 11, 1958. Korsakovo (FCH) August 4, 1959. Environs of Nikolaevsk (Masyutna) July 7–18, 1964. Singly in steppe meadows and along fringes of sparse black birch–oak–larch forests. Flight June 4–August 4.

SP—23 specimens. Yakovlevka (D, V) May 27–June 2 and July 4, 1926. Vinogradovo (D, FV) May 31 and July 19–26, 1929. GTS (K) May 30, 1966. Okeanskaya (FCH) May 20, 1963. De Vries Peninsula (O) July 27, 1959. Singly in wastelands, inhabited areas, and along fringes of broad-leaved and oak forests in valleys. Flight of first generation May 20–June 2, of second generation July 4–27.

SS—1 specimen. Environs of Novoaleksandrovsk (K) August 20, 1967. Singly in mixed forests.

SK—40 specimens. Kunashir: environs of Sernovodsk (Z, K) June 22 and July 25–August 16, 1967; Cape Vodopadnyi (K) August 6, 1967; rim of cauldron of Golovnina volc (K) August 1–2, 1967. Common during day and evening in forest glades overgrown with bamboo, among mixed and coniferous forests, as well as in mixed grass meadows.

Cochylida contumescens Meyr.

Known only from Hokkaido.

SK—4 specimens. Kunashir: Tret'yakovo (Kostyuk) August 7, 1971; Alekhino (Kostyuk) August 5, 1971.

Cochylidia subroseana roseotincta Raz.

Possibly a unique species, close to *C. subroseana* Hw., but distinguished by pink tinge on apices of forewings and upper corner of valves elongated in form of appendage. Area of distribution not adequately defined.

PR—1 specimen. Korsakova (FCH) August 5, 1959.

SP—21 specimens. Yakovlevka (D, FV) May 25–June 3 and July 13–September 4, 1926. Vinogradovo (D, FV) June 7, 1929. At light in inhabited places and broad-leaved forests damaged by felling. Two generations. Flight May 25–June 7 and July 13–September 4.

Cochylidia richteriana F.R. (*olindiana* Snell., *ineptana* Kenn.)

Snellen, 1883: 194; Kennel, 1908–1921: 249, 250; Kuznetsov, 1967: 49; Razowski, 1970: 382.

In Europe larvae on roots of *Artemisia campestris* (Swatschek, 1958). Distribution: Trans-Palearctic (forests).

PR—51 specimens. Klimoutsy (K, S) May 29–June 15, 1958; (FCH) June 5, 1959. Albazino (Hedemann) June 9 (20), 1877. Prefers mixed grass meadows, wastelands, and steppe black birch–oak–larch forests. Rare in other forest plantations.

SP—13 specimens. GTS (K) May 11–30, 1966. Okeanskaya (FCH) May 28, 1963. Vladivostok (Christoph) 1877. Common during evening on wastelands, pastures, and dumps. Maximum flight in last 10 days of May.

SK—1 specimen. Shikotan: environs of Malokuil'skii (E) July 10, 1971.

Cochylis hybridella Hb. (*dubitana clarana* Car.)

Caradja, 1916: 52; Kuznetsov, 1967; 49; Razowski, 1970: 411.

In Europe larvae in inflorescences of *Picris hieracioides* and *Crepis* (Hannemann, 1964). They leave places of feeding before pupation. Distribution: Trans-Palearctic (forests and steppes).

PR—4 specimens. Klimoutsy (K, S) July 15–20, 1958. Simonovo (FCH) July 25, 1959. Kazakevichevo (Korb) 1907.

SP—10 specimens. Vyazemskii (Borzov) July 25 (August 7)–July 27 (August 9) 1909. Yakovlevka (D, FV) August 12, 1926. Vinogradovo (D, FV) August 4–7, 1929. Ussuriisk (Tokarena) August 15, 1931. GTS (Z) August 12, 1966. Okeanskaya (Transhel') August 10,

1929. De Vries Peninsula (O) August 13, 1961. Singly in wastelands and inhabited places. Flight August 4–15.

SS—7 specimens. Environs of Novoaleksandrovsk (EV) July 17–30, 1970; (K) August 20, 1967. Chekhov Peak (EV) July 20–August 4, 1970. Singly in fringes of mixed forests.

SK—7 specimens. Kunashir: environs of Sernovodsk (K) July 4–August 8, 1967. Singly in fringes of fir–yew–broad-leaved, fir–broad-leaved, spruce–fir–birch, and oak forests.

Cochylis pallidana Z.

In Europe larvae in inflorescences of *Jasione montana* (Hannemann, 1964). Distribution: Trans-Palearctic (forest zones).

SP—3 specimens. Yakovlevka (Zinov'eva) July 3, 1962. GTS (K) July 25, 1966. Singly in oak–linden and broad-leaved forests in valleys.

Acornutia nana Hw.

Caradja, 1916: 51; Kuznetsov, 1967: 48; Razowski, 1970: 428.

Larvae in catkins of *Betula* (Swatschek, 1958). Distribution: Holarctic (forest zones).

PR—15 specimens. Klimoutsy (FCH) June 5–6, 1959; (K, S) June 12–28, 1958. Simonovo (FCH) June 9, 1959. Khabarov (Caradja, 1916). Environs of Nikolaevsk, Zayach'ya, and Krasnoe (Masyutina) June 30–July 3, 1964. Common in birch forests. Rare in black birch–oak–larch forests. Flight June 12–July 3.

SP—3 specimens. Vinogradovo (D, FV) June 7, 1929.

Tribe Archipini

Eulia ministrana L.

Danilevskii, 1955: 78; Kuznetsov, 1967: 52; 1970b: 41.

Mature larvae hibernate (Danilevskii, 1955). They are polyphagous and in Europe found on various arboreal plants of Fagales, Betulales, Salicales, Rosales, Rhamnales, and Tiliales. They live in rolled tubes of leaves and pupate in spring. Females lay eggs singly or in groups (of up to 20 eggs each). Larvae of earlier instars yellowish-green with black heads. Distribution: Holarctic (forests).

PR—24 specimens. Klimoutsy (K, S) June 9–29, 1958. Simonovo (FCH) June 13, 1959; environs of Nikolaevska, Zayach'ya (Masyutina) July 7, 1964. Common in white birch plantations; rare in black birch–oak–larch forests. Flight June 9–July 7.

UP—33 specimens. Yakovlevka (D, FV) May 31–June 6, 1926;

(Zinov'eva) June 8, 1962. Vinogradovo (D, FV) June 10–13, 1929. GTS (KR) June 1, 1955; (K) June 7–12, 1966. Kaimanovka (M) June 16–17, 1971; Suputinsk forest reserve, Egerskii Pereval (K) June 17–21, 1966; upper reaches of Suputinka River (KR) June 8, 1933; middle reaches of Suputinka (KR) June 30, 1935. Tskhamo-Dynza (KR) July 6, 1928. Chernaya mtn, 1,150 to 1,400 m (Vasyurii) June 18, 1972. Okeanskaya (S, FCH) May 25–June 13, 1963. Vladivostok airport (FCH) May 28, 1963. Barabash (Malinovskii) 1909. Nadezhdinskaya (M) June 24, 1971. Askol'd (Hedemann). Common in broad-leaved and birch forests in valleys and floodplains. Rare in spruce–black fir–broad-leaved, cedar–broad-leaved, and oak forests. Larvae on *Betula dahurica.* Phen in environs of GTS: flight June 1–30, oviposition second and third weeks of June, emergence of larvae June 23–August 15, 1966, until they reach IV-instar.

SS—5 specimens. Environs of Novoaleksandrovsk(L, SHO) June 13–14, 1967. Chekhov Peak (EV) July 1, 1970.

SK—9 specimens. Kunashir: environs of Sernovodsk, Belkino, Alekhino (Z, K). Singly in coniferous Erman's birch–fir–yew–broad-leaved, and mixed forests including oak. Flight June 21–July 8, 1967.

Pandemis corylana F.

Danilevskii, 1955: 74; Kuznetsov, 1967: 49; 1970b: 38.

Larvae hibernate. They are polyphagous and develop under curled edge and in rolled or woven leaves of various plant species of Rosales, Saxifragales, Fagales, Betulales, Urticales, Fabales, Ericales, and others. Feed on leaves which become skeletonized. More seriously damage orchard and park vegetation in southern Primor'e. Distribution: Trans-Palearctic (broad-leaved and mixed forests, forest-steppes), between Ural and Baikal locally.

PR—9 specimens. Magdachi (Masyitina) July 21, 1963. Klimoutsy (K, S) ex l., July 27–August 1, 1958. Simonovo (FCH) ex l., August 10–16, 1959. Radde (Korb) 1905. Environs of Khabarov "Dva Brata" (SHE) August 8, 1959. Lake Evoron (KR) August 15, 1952. Larvae found singly on *Alnus hirsuta, Corylus heterophylla, Betula dahurica, Rhododendron dahuricum,* and black birch–oak–larch and black birch–oak–pine forests. Phen: larvae June 3–July 18, pupation July 16–19, first flight July 27–August 16; flight July 21–August 16.

SP—32 specimens. Basin of Khora River (KR) August 18, 1937. Kirovskii (M) August 8, 1930. Vyazemskii (Borzov) August 26 (September 6), 1909. Yakovlevka (D, FV), August 24, 1926. Vinogradovo (D, FV) August 4, 1929. GTS (Z) August 7–10, 1966; (Zinov'eva) August 11–23, 1962; Baranovsk (S, FCH) ex l., July 12, 1963; Oblachnoi (S) August 10, 1963. Tigrovoi (KR) August 19 and September 6, 1928. Suifun, De Vries Peninsula (O) August 17, 1960. Environs of Vladivostok (FCH) September 4, 1963. Larvae on *Prunus salicina, P. ussuriensis, Rubus crataegifolius, Aronia melanocarpa, Spiraea media, S. betulifolia, Morus nigra, Rhododendron mucronulatum, Quercus mongolica, Populus davidiana, Salix viminalis, Vicia unijuga.* Damage fruits of Rosaceae in gardens and various arboreal plants in part, lespedeza and rhododendron groves, valley broad-leaved forests. Rarely, larvae on black fir–broad-leaved and cedar–broad-leaved forests. Moths common at light. Phen: larvae May 16–July 29, pupation June 23–July 30, first flight July 12–August 12, flight August 4–September 6.

SS—3 specimens. Environs of Novoaleksandrovsk: southern Sakhalin valley and foothills of Kamyshevskii range (L, SH). Larvae found singly on *Crataegus chlorosarca* and *Alnus hirsuta,* in mixed forests on floodplains and foothills. Phen: larvae May 25–July 18, pupation June 26–July 19, first flight July 3–29, flight August 21, 1967.

SK—4 specimens. Kunashir: environs of Sernovodsk, Lake Glukhoe, Golovnina volc (K). Larvae found singly on *Sorbus commixta, Quercus crispula,* and *Eubotryoides grayana* in oak and mixed forests. Phen: larvae June 30–August 8, pupation July 27–August 22, flight August 9–26, 1967.

Panedemis cerasana Hb. (*ribeana* Hb.)

Kurentsov, 1950: 31; Danilevskii, 1955: 76; Kuznetsov, 1967: 49.

In Europe diapausing larvae hibernate. III- and IV-instars in dense silky cocoons under bark of trunk, rarely in forks of branches. Emergence of hibernating larvae delayed and usually starts during period of bud formation in apple, but not delayed when temperature reaches 10 to 14°C. Larvae polyphagous and develop on plants of Rosales, Fagales, Betulales, Ericales, and others. In the Far East represented by subspecies *chlorograpta* Meyr., which does no damage even though larvae found in orchards on plants of Rosaceae. Pupation in leaves. Eggs laid in groups (sheets) predominantly on leaves of upper and middle tiers of crown, rarely on bark and fruits. Female oviposits one to four times. Distribution: Trans-Palearctic (zones of forests and steppes).

PR—7 specimens. Klimoutsy (K, S); Simonov (FCH). Larvae found singly on *Quercus mongolica* and *Betula platyphylla* in oak and black birch–oak–larch forests. Phen: larvae from May 29, pupation June 7–26, first flight June 19–July 7, flight June 26–July 14, 1958.

SP—13 specimens. GTS (K, S) June 12–July 8, 1966. Environs of Artem, Ugol'naya (A) June 26, 1961. Okeanskaya (FCH) June 21, 1963. De Vries Peninsula (KR) July 6, 1955. Environs of Vladivostok, Lyanchikhe (FCH) July 19, 1963. Larvae found singly on *Rosa dahurica* along fringes of lespedeza groves. Phen: larvae from May 20, pupation from June 7, first flight from June 20, flight June 19–July 19.

SS—1 specimen. Southern Sakhalin (L, SHO). One larva found on *Malus manshurica* in a park on May 27, pupation July 2, first flight July 26, 1967.

Pandemis cinnamomeana Tr.

Danilevskii, 1955: 75; Kuznetsov, 1970b: 40.

Young larvae hibernate. They are polyphagous and damage arboreal plants of Coniferales, Rosales, Fagales, Betulales, Saxifragales, Urticales, Salicales, Sapindales, and Ericales. Develop in leaves, rolled tubes, or in clumps at apex of twigs. Distribution: Trans-Palearctic (coniferous and mixed forests).

SP—14 specimens. Yakovlevka (Zinov'eva) June 22, 1962. Environs of Ussuriisk (S, FCH) ex l., July 5, 1963. Suputinsk forest reserve (M) July 24, 1970; upper reaches of Suputinka River (KR) July 6, 1933. Labalaza (FCH) August 10, 1963. Oblachnaya (FCH) August 11, 1963. Khualaza (FCH) July 3, 1963. Peishula (FCH) July 15, 1963. Larvae found singly on *Ulmus propinqua,* arboreal plants in coniferous, mixed, and deciduous forests, and rarely in parks. Phen: larvae from June 10, first flight from July 5, flight in Ussuriisk region June 22–July 15, in zone of coniferous forests August 10–11.

SS—3 specimens. Environs of Novoaleksandrovsk, slope of Susunaiskii range (K.L., SHO). Korsakov (E) August 10, 1965. Larvae found singly on *Quercus mongolica, Aronia melanocarpa,* and *Cretaegus* sp. in orchards and mixed and broad-leaved forests. Phen: larvae from May 25, pupation from June 14, first flight June 26–July 3, flight August 10.

SK—50 specimens. Uturup: environs of Podgornyi (Azarova, Krivolutskaya) August 12, 1963. Kunashir: environs of Sernovodsk (E) August 14, 1965. Mendeleevo–Sernovodsk–Alekhino (K, S) July 12–August 17, 1967. Belkino (K) August 3, 1967. Larvae slightly damage *Cerasus kurilensis* during period of bud formation and flowering in outgrowths along coasts. In fir–yew–broad-leaved, spruce–fir, Erman's birch, oak, and alder forests common on *Sorbus commixta, Cerasus sachalinensis, Ribes latifolium, Quercus crispula, Betula ulmifolia, Alnus hirsuta, A. japonica, Salix sachalinensis, S. caprea, Alnaster maximowiczii, Acer pictum, A. ukurundiense, Vaccinium* *hirtum, Taxus cuspidata,* and other arboreal plants. On alder and oak, larvae appear in spring even before bud opening. Phen: larvae June 4–July 27, pupation June 23–August 6, first flight June 30–August 7 flight July 18–August 17.

Pandemis heparana Den. and Schiff.

Danilevskii, 1955: 75; Kuznetsov, 1956a: 37; Kuznetsov, 1967: 49.

Biology very similar to *P. cerasana* Hb. Diapausing larvae of II- and III-instars hibernate in cocoons under bark of trees and in their crevices. Emergence from hibernation during period of bud opening. Polyphagous larvae continue feeding in spring, rolling leaf buds, apical leaves, and floral buds of arboreal plants into lumps (Juglandales, Rosales, Fagales, Betulales, Salicales, Saxifragales, Sapindales, Rhamnales, Urticales, Fabales, Dipsacales, and others). Pupation in leaves. Flight at light and in evening hours. Eggs laid in clusters (sheets). Female oviposits up to seven times. Larvae on emergence separate into groups of two to four between leaves, skeletonizing them. In Primor'e and Sakhalin two generations known. Distribution: Trans-Palearctic (forest and steppe zones).

PR—20 specimens. Klimoutsy (K, S. FCH). Korsakovo (FCH). Environs of Khabarov (SHE). Lake Evoron and Evur River (KR). Soviet Gavan' (Ul'yanov). Larvae common in floodplains of Amur River, parks, and gardens; in Amur-Zeya plateau in black birch–oak–larch and black birch–oak–pine forests. Develop on *Malus sibirica, Rosa* sp., *Betula platyphylla, Quercus mongolica, Corylus heterophylla, Rhododendron dahuricum,* and other arboreal-shrub plants, seriously damaging small apples in orchards and parks. Phen: in Amur-Zeya plateau larvae May 30–July 13, pupation June 28–July 14, first flight July 7–25, flight August 3–11, 1958; in Khabarov region, flight June 26–July 4, 1959; and in lower reaches of Amur, flight August 2–15, 1952.

SP—266 specimens. Vyazemskii (Borzov) June 27 (August 9)–July 6 (17) and July 28 (August 10), 1909; (SHE) August 20, 1959. Kirovskii (M) August 4–21, 1970. Spassk (Zinov'eva) June 29, 1962. Yakovlevka (D, FV) June 23–July 9 and August 26–September 4, 1926. Vinogradovo (D, FV) July 3–26, 1927. Ussuriisk and TSG (Gibanov, Z, Zinovleva, K, Shabliovskii) June 24–July 28 and August 8–September 1. Suputinsk forest reserve (M) July 23–24, 1970; (KR) August 14, 1947. Upper reaches of Suputinka River (KR) July 12, 1933. Environs of Artem, Ugol'naya (A) February 14–19, 1960. Peishula (FCH) July 15, 1963. Kangauz (FCH) July 25–26, 1963; (M) July 6–17, 1971. Tigrovoi (KR) July 8–24, 1928. Suchan (KR) July

26–27 and August 3–8, 1928. Upper reaches of Sitsa River (KR) July 14–24, 1928. Okeanskaya (Zagulyaev, S, FCH) July 15–August 2 and August 25–September 30. De Vries Peninsula (O, KR) July 2–25 and September 2. Kedrovaya Pad' forest reserve (Zinov'eva) August 19, 1962; (N) September 4, 1962. Larvae damage various fruits, wild and arboreal plants in gardens, parks, and forests. Found on *Malus manshurica, Prunus salicina, P. ussuriensis, Crataegus pinnatifida, Quercus mongolica, Alnus hirsuta, Corylus heterophylla, Betula dahurica, Juglans manshurica, Ulmus propinqua, Salix rorida, Populus davidiana, Philadelphus tenuifolius, Acer mono, Rhamnus ussuriensis, Ribes crataegifolius, Maackia amurensis, Acanthopanax sessiliflorum, Aralia manshurica, Viburnum sargentii,* and *Rhododendron mucronulatum.* Two generations, phenological boundaries of which not fully demarcated. Phen in environs of Ussuriisk: larvae May 15–July 5, pupation June 9–July 6, first flight June 20–July 18, flight of first generation June 24–July 28, of second generation August 8–September 1; in environs of Vladivostok: larvae June 15–July 8, pupation June 26–July 9, first flight June 5–19, flight of first generation July 2–23; first flight of second generation August 23, flight August 6–September 4.

SS—6 specimens. Novoaleksandrovsk (L, SHO), southern Sakhalin (L, SHO). Larvae in orchards, damage cultivated apples and plums in parks and in large forests *Alnus hirsuta, Malus sachalinensis, Crataegus chlorosarca,* and *Rosa* sp. Two generations. Phen: larvae May 24–June 27, pupation June 6–July 2, first flight of first generation June 23–July 3; larvae July 4–25, pupation July 19–August 2, first flight July 25–August 3, 1967.

Pandemis dumetana Tr.

Danilevskii, 1955: 77; Kuznetsov, 1967: 49; 1970b: 38.

Larvae of II-instar hibernate in deposits of dry leaves. They are polyphagous and after emergence from hibernation roll leaves of various arboreal plants with silky discharge and live in leaf clumps at apex of shrubs. In the Far East slightly damage strawberry. Larvae recorded on plants of Rosales, Ericales, and others. Pupation in leaves. Eggs laid in groups (sheets) on leaves. Distribution: Trans-Palearctic (forest and steppe zones).

PR—35 specimens. Magdagachi (Masyutina) August 11, 1963. Klimoutsy (K, S) July 26–August 8, 1958; (FCH) July 31, 1959. Simonovo (FCH) August 12–14, 1959. Korsakovo (FCH) August 5, 1959. Samodon-on-Amur (CH) August 3, 1959. Environs of Blagoveshchevsk, Gribskoe (Aniasimov) ex l., July 9, 1965. Khabarov

(Hedemann) August 9 (20), 1877. Lake Evoron (KR) July 31, 1952. Evur River (KR) August 1–9, 1962. Doshi River (KR) August 2, 1952. Soviet Gavan' (Ul'yanov) August, 1953. Larvae found singly in gardens and cultivated *Ribes,* and in floodplain outgrowths and black birch–oak–larch forests on *Spiraea salicifolia, Geum aleppicum, Veronica sibirica, Adenophora sublata, Vaccinium uliginosum,* and *Thalictrum minus.* Phen: larvae June 5–July 12, pupation July 2–13, first flight July 9–August 5, flight July 26–August 20.

SP—94 specimens. Vyazemskii (Borzov) July 21 (August 3)–August 4 (16), 1909; (SHE) August 10–12, 1959. Kirovskii (M) July 8–August 21, 1970. Region of Iman River (Shingar) July 16 (28), 1911. Yakovlevka (D, FV) August 15–27, 1926. Vinogradovo (D, FV) August 5, 1929. Baranovsk (Hedemann). GTS (Z, K) July 30–August 12, 1966; (Zinov'eva) August 9–15, 1962; upper reaches of Suputinka River (KR) August 12–20, 1934; Suputinsk forest reserve (M) July 24, 1970. Tigrovoi (KR) August 15–23, 1928. Suchan (KR) August 16–30, 1928. Sudzukhinskii forest reserve, Kievka (Kerzhner) August 23, 1959. Okeanskaya (Transhel') August 7–13, 1929; (Kerzhner) August 19, 1959; (FCH) August 20, 1963. Suifun (Hedemann). Barabash (Gavronskii) August 3 (15), 1903. Kedrovaya Pad' forest reserve (Kerzhner) August 22, 1963. Pos'et Gulf (Vul'fius) July 23 (August 5). Adimi (Emel'yanov) July 21 (August 3), 1904. Common at light and in evening at inhabited places, on mixed grass, meadows, in outgrowths of shrubs, and along fringes of lowland broad-leaved–oak and mixed forests damaged by felling. Flight July 30–August 30.

SS—5 specimens. Novoaleksandrovsk (L, SH); Kuznetsovka River, forest reserve (collector not known) August 8–12, 1951. Larvae found singly in orchards on cultivated *Fragaria.* Phen: larvae June 17–25, pupation June 26–July 25, first flight July 12–27.

SK—16 specimens. Kunashir: Mendeleevo-Sernovodsk-Alekhino (K); Lake Glukhoe (K). Larvae common on *Spiraea betulifolia, Filipendula kamtschatica, Malus sachalinensis, Ribes sachalinense, R. latifolium, Thermopsis lupinoides;* rare on *Rosa rugosa* and *Polyganum sachalinensis.* Found on outgrowths, in mixed and oak forests, and in meadows near coasts and on terraced slopes. Specimens from Kunashir Island darker in color than those from the mainland. Phen: larvae from June 8–August 2, pupation July 21–August 9, first flight July 21–August 10, flight August 6–16.

Argyrotaenia pulchellana Hw. (*politana* Hw.)

Danilevskii, 1955: 78; Kuznetsov, 1967: 50.

Pupae hibernate (Tanasijevic, 1960). Females lay eggs in groups (sheets) on upper surface of leaves of arboreal and herbaceous plants. Polyphagous larvae in Europe and the Caucasus damage apple and other rosaceous fruits, grape, tea, beans, mint, maize, chrysanthemum, and other garden, wild, and forest crops. Larvae of early instars live between two leaves glued together with silky adhesive from III-instar onward. Feed in rolled leaves and also damage fruit surface. Pupation in leaves, rarely in fruit. Distribution: Holarctic (forest and steppe zones).

PR—4 specimens. Klimoutsy (K, S) June 4–6, 1958; (FCH) June 4, 1959. Amur limans (Chernavin) June 13 (25), 1915. Found singly in evening on mixed grass in lowlands.

Choristoneura diversana Hb.

Danilevskii, 1955: 77; Kuznetsov, 1967: 50.

Polyphagous larvae of early instars in open buds, thereafter in rolled clumps or tubes of leaves of broad-leaved trees. Serious pest of garden and park vegetation, especially on lowlands. Larvae in gardens damage cultivated plants of Rosaceae, apple, plum, sour cherry, lemon tree, lilac, and other ornamental plants. Young larvae greenish, with black head, black prothoracic and anal scutella, and black legs. Older larvae chocolate-brown head, and light-colored anal scutellum. Distribution: Trans-Palearctic (forest and steppe zones); found locally in Siberia.

PR—1 specimen. Environs of Khabarov (SHE). Single larvae found on *Crataegus dahurica*; first flight June 3, 1959.

SP—181 specimens. Yakovlevka (Zinov'eva) June 17–25, 1962; (D, FV) July 4–19, 1926. Environs of Ussuriisk, GTS (Z, K) June 28–July 24, 1966. Environs of Artem, Ugol'naya (A) July 5–14, 1960. Tigrovoi (FCH) July 1, 1963. Suchan (Palshkov) July 19, 1938. Kangauz (M) July 7–15, 1971. Okeanskaya (FCH) July 9–11, 1959; (S, FCH) July 9–23, 1963. De Vries Peninsula (O) July 4–16, 1961; (KR) July 5–25, 1963, July 13–15, 1960. Environs of Vladivostok: Sedanka (FCH) July 11, 1966. In gardens and parks, larvae damage *Cerasus tomentosa, Prunus ussuriensis, P. salicina, Malus manshurica,* and *Pyrus ussuriensis.* In nut–ash, alder–lilac–choke cherry, and willow forests and floodplains, they severely damage the second tier, undergrowth, and regrowth of plants. Cause maximal damage to *Syringa amurensis* and plants of Rosaceae: *Crataegus pinnatifida, C. maximowiczii, Padus asiatica, Sorbaria sorbifolia, Malus manshurica,* and *Pyrus ussuriensis.* Also found in lowland broad-leaved forests on *Salix rorida* and other species of *Salix,* as well as *Schizandra chinensis, Armeniaca manshurica, Lonicera* sp., *Viburnum burejaeticus, V.*

sargentii, Fraxinus mandschurica, Juglans manshurica, Alnus hirsuta, Acer ginnala, Rosa sp., *Philadelphus tenuifolius,* and *Ulmus propinqua.* Damage less severe in cedar, broad-leaved, and black fir–broad-leaved forests, where larvae found on some of the aforementioned plants, as well as on *Acer ukurundiense.* Under a canopy of lilac detected on *Aralia manshurica* and *Rosa* sp. In oak groves larvae maximally damage the undergrowth of *Lespedeza bicolor, Rhododendron macronulatum,* and *Corylus heterophylla*; they were also found on *Quercus mongolica,* however. In oak–linden forests, they infest *Rhamnus ussuriensis.* When additionally fed with black haw, lespedeza, and aralia, only underdeveloped moths were obtained, indicating the nonsuitability of these plants for food. Phen in environs of Ussuriisk: larvae May 7–July 6, pupation May 25–July 7, first flight June 8–July 15, flight June 17–July 24, 1966.

SS—1 specimen. Environs of Novoaleksandrovsk (L) July 29, 1967.

Choristoneura murinana Hb.

Morphological differences between this species and the preceding one are not very reliable. Larvae biologically associated with only Coniferales, in which they damage the needles. Distribution: Trans-Palearctic, poorly studied (mixed and coniferous forests).

PR—8 specimens. Environs of Blagoveshchensk (Efremov) July 10–14, 1969.

SP—14 specimens. Basin of Iman River, Roshchinskii forest nursery (Sinchilina) 1967. Suputinsk forest reserve (Shabliovskii) July 12–14, 1968. Larvae definitely damage branches of *Abies* and *Picea.*

Choristoneura evanidana Kenn.

Kennel, 1901: 214, original description; 1908–1921: 132; Kuznetsov, 1969b: 49.

Larvae damage garden cultivated raspberry, currant, and plum. In forests, they primarily damage arboreal plants of Manchurian flora. Found on members of 12 botanical families. Live in rolled clumps or leaf tubes. Larvae of early instars grayish, with black or chocolate-brown head. Older larvae grayish-green, lighter on ventral surface, with black head, and chocolate-brown dots near eyes. Prothoracic scutellum chocolate-brown with black margins, while anal scutellum and body scutella and legs light-colored. Distribution: Ussuriisk–China.

SP—85 specimens. Yakovlevka (Zinov'eva) ex l., July 2, 1962. Environs of Ussuriisk, GTS (Z, K) July 17–August 9, 1966. Suputinsk forest reserve (M) July 24, 1970. Valley of Maikhe River (S, FCH) ex 1., July 8, 1963. Suchan (Dolgikh) July 28. Okeanskaya (S, FCH) July 23–August 4, 1963. De Vries Peninsula (O) July 7–19, 1960, July 10, 1962; (KR) July 14, 1955; (O) July 17–27, 1960, July 20, 1962, July 25, 1964, July 30, 1959. Environs of Vladivostok (FCH) August 5, 1963. Larvae common in lowland broad-leaved forests, along floodplains, and southern slopes. Found on: *Syringa amurensis, Philodendron amurense, Philadelphus tenuifolius, P. schrenki, Schizandra chinensis, Aralia manshurica, Armeniaca manshurica, Spiraea betulifolia, Tilia amurensis*, and *Maackia amurensis*. In lespedeza and rhododendron groves common on *Quercus mongolica, Betula dahurica, Corylus heterophylla, Rhododendron mucronulatum*, and *Lespedeza bicolor*. In black fir–broad-leaved and cedar–broad-leaved forests found in interwoven needles of *Abies holophylla* as well as *Corylus manshurica* and *Acer tegmentosum*. Phen: larvae May 10–July 7, pupation June 4–July 8, first flight July 1–29, flight July 7–August 9. In a portion of the July population, a delay in development of pupae was observed, with pupation occurring July 4–18 and first flight recorded only on July 29.

Choristoneura luticostana Chr. (*gigantana* Kenn.)

Christoph, 1881: 311, original description; Kennel, 1908–1921: 134; Kuznetsov, 1967: 50.

Larvae cut open buds and roll leaves at apices of branches or *Quercus, Betula, Lespedeza, Rhododendron*, and other leafy forest plants. Distribution: Manchuria.

PR—8 specimens. Klimoutsy (K, S), environs of Khabarov (Korb). Early and middle stage larvae green with black head, prothoracic scutella, abdominal segments, and distal segments of legs. Older larvae darker, blackish-green, especially on dorsal surface; head black, body light-colored, but prothoracic and anal scutella chocolate-brown. Damage leafy forests, especially lespedeza, *Quercus mongolica*. Larvae dislodged by wind from crowns are polyphagous and continue feeding on *Corylus heterophylla* and *Betula dahurica*. Phen: larvae May 31–June 19, pupation June 16–22, first flight June 20–30, flight July 14–16, 1958.

SP—84 specimens. Yakovlevka (D, FV) June 9–July 4, 1926; (Zinov'eva) June 20–21, 1962. Vinogradovo (D, FV) June 26–July 1, 1929. Artem (Kupyanskaya) July 4, 1966. Ussuriisk (Shabliovskii) July 15, 1966; GTS (Z, K) June 24–July 13, 1966. Suputinsk forest reserve (K) June 17, 1966. Environs of Artem, Ugol'naya (A) July 14, 1960. Peishula (FCH) July 14, 1963. Kangauz (FCH) June 25–July 9, 1963;

(M) July 4–8, 1971. Tigrovoi (KR) July 8–15, 1928. Reaches of Sitsa River (KR) July 14 and 24, 1928. Suchan (Dolgikh) July 1. Sudzukhinskii forest reserve (Litvinenko) 1959. Okeanskaya (S) June 26, 1963; (Zagulyaev) July 26 and August 11, 1950. De Vries Peninsula (O) June 21–25, 1962; (KR) June 30–July 6, 1953; (O) July 4–20, 1961. Environs of Vladivostok: Popov Island (M) July 8, 1971; Sedanka (FCH) July 23, 1963. Askol'd (Christoph) 1881. Kedrovaya Pad' forest reserve (M) June 27–July 1, 1971. Larvae harmful in lespedeza forest plants of first tier: *Quercus mongolica* and *Betula dahurica*. In undergrowth also found on *Lespedeza bicolor, Rhododendron mucronulatum*, and *Caragana arborescens*. Found singly in black fir–broad-leaved and cedar–broad-leaved forests. Imagoes attracted to light. Phen: in environs of Ussuriisk, larvae May 15–June 3, pupation May 28–June 4, first flight June 4–16, flight June 17–July 24. In environs of Vladivostok flight June 21–August 11.

China.

Choristoneura lafauryana Rag.

Danilevskii, 1955: 70; Mischenko, 1957: 124; Kuznetsov, 1967: 50; 1970b: 38.

Polyphagous larvae in Primor'e damage apices of branches of soyabean and rolled leaves of different arboreal and herbaceous plants. Distribution: Trans-Palearctic (broad-leaved and mixed forests, steppes).

PR—40 specimens. Klimoutsy (K, S) August 12, 1958; (FCH) July 31, 1959. Simonovo (FCH) July 23 and August 1, 1959. Korsakovo (FCH) August 4–5, 1959. Samodon-on-Amur (Kerzhner) July 25, 1959; (FCH) August 3, 1959. Environs of Blagoveshchensk (Efremov) July 14, 1965. Evur River (KR) August 1–8, 1952. Larvae found singly on *Clematis hexapetala* in floodplain outgrowths. At light in inhabited places, kitchen gardens, and lowlands. Phen: larvae from May 29, pupation July 12–23, first flight July 24, flight July 14–August 12.

SP—139 specimens. Vyazemskii (Borzov) July 14 (26)–July 31 (August 12), 1909. Kirovskii (M) July 6–August 2, 1970. Lake Khanka (Cherskii) July 19 (31), 1909. Yakovlevka (D, FV) July 20–24, 1926; (Zinov'eva) July 25, 1962. Vinogradovo (D, FV) July 16–August 7, 1929. Ussuriisk (FCH) July 1, 1959; (A) July 16–August 1, 1959; (Shabliovskii) July 25, 1966; GTS (Z, K) July 17–August 10, 1966; (N) August 7–10, 1962. Upper reaches of Suputinka River (KR) July 10, 1933. Adimi (Emel'yanov) June 19 (July 1)–July 23 (August 4), 1909. Lebekhe (Wolfson) ex 1., June 26, 1934. Shmakovka (Savost'yanov) July 13, 1933; (Wolfson) August 12, 1931. Kangauz (FCH) July 7,

1963. Suchan (KR) July 8, 1928. Tigrovoi (KR) July 28–August 1, 1928. Okeanskaya (FCH) July 16–27, 1963; (Transhel') August 5–8, 1922. Upper reaches of Chapigou River, tributary of Shufan (Zinov'eva, N) July 29–August 2, 1962. De Vries Peninsula (O) July 16–August 6, 1961; (KR) August 15, 1955. Environs of Vladivostok: Lyanchikhe (FCH) July 27, 1963; (Dul'keit) August 9, 1923. Pos'et Gulf (Vul'fius) July 15 (27)–July 23 (August 4), 1860. Larvae damage garden cultivated plum, currant, and soyabean. In open areas damage various species of *Artemisia*. Phen: larvae June 28–July 24, pupation July 25–August 18, first flight June 26–August 19, flight July 1–August 15.

SP—53 specimens. Kunashir: environs of Sernovodsk (Z, K). Larvae slightly damage new leaves of *Spiraea betulifolia* along fringes of forests. Attracted to light in large numbers near coasts and meadows in alder forests. Phen: larvae June 17–August 2, pupation July 4–August 3, first flight August 2–4, flight August 6–16.

Choristoneura lapponana Tgstr.

Distribution: Trans-Palearctic (taiga zone).

PR—1 specimen. "Amur" (Hedemann) June 9 (20), 1877.

Hoshinoa longicellana Wlsgm. (*disparana* Kenn.)

Kennel, 1908–1921: 133; Danilevskii, 1955: 69; Kuznetsov, 1967: 50.

Young larvae hibernate in dry leaves. They are numerous and continue feeding in spring on buds; thereafter they live in large rolled leaves of buds at apices of branches of arboreal members of Fagales, Oleales, Salicales, Rosales, and Ericales. Older larvae green, with black head; prothoracic scutellum, legs, shields of abdominal segments, including anal segment light-colored. Pupation in foliage fallen on ground. In Japan and the Korean Peninsula known as a serious pest of fruits of Rosaceae, especially apple, pear, and plum; in the Soviet Union damage mainly recorded in *Quercus mongolica*. Distribution: Manchuria.

PR—4 specimens. Klimoutsy (K, S) July 16, 1958. Korsakovo (FCH) August 7, 1959. Larvae slightly damage *Quercus mongolica* in oak–pine forests on slopes with southern exposure. Phen: larvae June 3–30, pupation July 1–12, first flight July 5–13, flight July 16–August 7.

SP—161 specimens. Kirovskii (M) July 24–August 8, 1970. Yakovlevka (D, FV) July 2–August 10, 1926; (Zinov'eva, N) July 2–August 23, 1963. Ussuriisk (FCH) July 1, 1959; (Givanov) July 28, 1966. GTS (Z, K) July 8–August 10, 1966. Suputinsk forest reserve (FCH) July

21–28, 1963. Environs of Artem, Ugol'naya (A) July 10–19, 1960. Peishula (FCH) July 15, 1963. Kangauz (FCH) July 6, 1963. Sudzukhinskii forest reserve (Litvinenko) July, 1959. Tachingou Bay (Kerzhner) July 25, 1959. De Vries Peninsula (O) August 2–13, 1961, August 17, 1960. Environs of Vladivostok: Popov Island (M) July 8, 1971. Askol'd (Dorris); Kedrovaya Pad' forest reserve (M) July 8, 1971. Larvae notably damage *Quercus mongolica* in lespedeza and rhododendron groves. Rare in lowland broad-leaved, elm–oak–linden forests. Found, in addition to oak, on *Fraxinus rhynchophylla, Salix rorida, Rhododendron mucronulatum, Cerasus maximowiczii,* and *Prunus* sp. Phen: In environs of Ussuriisk: larvae May 14–July 18, pupation June 9–July 19, first flight on June 23–July 29, flight July 8–August 10, 1966. In environs of Yakovlevka, flight at light July 2–August 23, 1962.

China, Korean Peninsula, Japan (Hokkaido, Honshu, Shikoku, Kyushu).

Archips pulchra Butl.

Kuznetsov, 1970a: 448.

In Japan larvae between needles of *Abies* sp. Distribution: Japan–Ussuriisk–China.

SP—4 specimens. Okeanskaya (FCH) July 27, 1963. De Vries Peninsula (O) June 30, 1959, July 19, 1961.

China, Japan (Hokkaido, Honshu).

Archips capsigerana Kenn.

Kennel, 1901: 212, original description; 1908–1921: 123; Kuznetsov, 1950: 30.

Larvae probably polyphagous, although found only in rolled leaves of *Fraxinus*. Distribution: Ussuriisk–China.

SP—7 specimens. Yakovlevka (D, FV) July 17, 1926. Vinogradovo (D, FV) July 11–17, 1929. Tigrovoi (KR) July 15–22, 1928. Suputinsk forest reserve (Zinov'eva) August 14, 1962. Environs of Vladivostok: Lyanchikhe (S, FCH) July 16, 1963. Askol'd (Kennel, 1901). Larvae found singly on June 20 in nut–ash forest on *F. mandschurica*. Pupation June 28, first flight July 16, flight at light July 15–August 14.

China.

Archips oporana L. (*piceana* L.)

Danilevskii, 1955: 71; Kuznetsov, 1956a: 37.

Larvae of III–instar hibernate in silky tunnels between woven needles of various Coniferales. In the Far East cause maximal damage to *Larix, Abies*, and *Pinus*. Larvae first mine needles, sometimes entering buds and branches, and thereafter feed between woven needles. They pupate at feeding site. In the Far East species represented by subsp. *similis* Butl. Distribution: Trans-Palearctic (coniferous and mixed forests).

SP—26 specimens. Lower reaches of Kolumbe River (KR) July 23–27, 1934. Basin of Khora River, Tundimaoni (KR) August 31, 1937. Kirovskii (M) July 17, 1970. Vinogradovo (D, FV) June 26–27, 1929. GTS (Z) July 16–20, 1966. Suputinsk forest reserve (K) June 20–24, 1966. Upper reaches of Suputinka River (KR) August 1–14, 1933. Upper reaches of Sitsa River (KR) July 25, 1928. De Vries Peninsula (O) July 21, 1963, August 4, 1961, August 17, 1960. Sudzukhinskii forest reserve (Litvinenko) July, 1959. More common in hilly regions in coniferous and mixed forests. Phen. in region of Suputinsk forest reserve: larvae in May beginning of June on young pine and cedar, pupation May 15–June 15, first flight June 1–30.

SK—7 specimens. Kunashir: Mendeleevo (Kostuyak) July 30–August 10, 1971; Sernovodsk (Kostuyak) August 2–3, 1971.

Archips decretana Tr.

Danilevskii, 1955: 69; Kuznetsov, 1967: 50.

Diapausing larvae of young instars hibernate. They are polyphagous and continue feeding during spring on open buds, flower buds, and in rolled leaves at apices of branches of various deciduous and some coniferous trees. In gardens they damage fruits of Rosaceae: apple, plum, hawthorn, mountain ash, and choke cherry. Distribution: Trans-Palearctic (mixed and broad-leaved forests, locally steppes).

PR—54 specimens. Magdagachi (Masyutina) July 24, 1963. Klimoutsy (K, S) July 10–21, 1958; (FCH) July 31, 1959. Simonovo (FCH) July 29, 1959. Environs of Radde (Pakhomov), environs of Khabarov (Pavlenko) June 26 (July 8), 1916. Evur River (KR) August 1–4, 1952. Vyatskoe, lower reaches of Amur River (Arsen'ev) June 24 (July 6), 1908. Soviet Gavan' (Ul'yanov) August, 1953. Larvae in large numbers in black birch–oak–larch forests on *Betula dahurica, B. platyphylla, B. sericea*, and *Rosa* sp. Commonly found in groves on *Quercus mongolica*, in birch forests on *Betula platyphylla*, in dwarf arctic birch–willow overgrowths on *Betula fruticosa* and *Salix brachypoda*. In floodplains damage *Malus pallasiana* and *Padus asiatica*. Phen: larvae May 22–July 30, pupation June 30–July 14, first flight July 2–29, more often attracted to light, July 6–August 4.

SP—42 specimens. Vyazemskii (Borzov) June 26 (July 8)–July 24 (August 3), 1909. Kirovskii (M) July 9, 1970. Yakovlevka (D, FV) July

14, 1926. Environs of Ussuriisk and GTS (Z, K. Shabiliovskii) July 12–28, 1966. Kangauz (M) July 10, 1971. De Vries Peninsula (O) July 7–16, 1961. Larvae in lowland broad-leaved forests damage *Alnus hirsuta, Malus manshurica, Prunus* sp., *Fraxinus rhynchophylla*, and *Filipendulla* sp. In black fir–broad-leaved forests found singly on *Carpinus cordata* and *Schizandra chinensis*, and in sparse bushy forests on *Rosa* sp. Phen: larvae May 25–July 4, pupation June 18–July 5, first flight July 2–18, flight July 7–28.

Archips breviplicana Wlsgm. (*criticana* Kenn.)

Kennel, 1901: 213; 1908–1921: 128.

Diapausing larvae of III- or IV-instars hibernate. They are polyphagous and in spring feed on open buds, flower buds, and rolled leaves of various arboreal plants, especially apple, pear, plum, sour cherry, hawthorn, mulberry, Manchurian walnut, alder, honeysuckle, and others. Larvae also found on soyabean. Second generation larvae damage fruits of Rosaceae. Distribution: Manchuria.

PR—1 specimen. Environs of Khabarov, Khekhtsirskii Pass (SHE) July 13, 1959.

SP—42 specimens. Kirovskii (M) July 8–19, 1970. Spassk (Kerzhner) August 17, 1963. GTS (Z) July 10–21, 1966; (Shabliovskii) August 31, 1969. Environs of Artem, Ugol'naya (A) July 19, 1960. Kangauz (M) July 8–15, 1971. Okeanskaya (Zagulyaev) August 30, 1950. De Vries Peninsula (O) July 4–August 6, 1960, July 19, 1961, August 23, 1960. Shamora (S, FCH) ex 1., July 11–22, 1963. Sudzukhinskii forest reserve (Litvilenko) July, 1959. Kedrovaya Pad' forest reserve (Tsvetaev) September 25, 1966. Larvae in oceanic alder and lowland broad-leaved forests on *Alnus japonica* and *Fraxinus rhynchophylla*. Found at light in inhabited places. Phen: larvae June 5–22, pupation June 23–July 8, first flight June 26–July 22, flight of first generation July 10–22, of second generation August 17–September 25.

SS—4 specimens. Environs of Novoaleksandrovsk, spurs of Susunaiskii range (L, Litvinenko, SHO). Larvae found singly in mixed forests on *Ulmus propinqua* and *Crateagus* sp. in gardens often found on apple, cherry, and crab-apple. Phen: larvae May 25–July 13, pupation June 14–29, first flight June 22–July 25.

China, Korean Peninsula, Japan (Hokkaido, Honshu).

Archips ingentana Chr.

Christoph, 1881: 64, original description; Kennel, 1908–1921: 127; Danilevskii, 1955: 70; Kuznetsov, 1970b: 38.

Larvae of middle instars hibernate. Highly polyphagous and during winter and summer damage various arboreal as well as herbaceous plants. In spring they cut open buds, and thereafter found predominantly in large clumps of rolled leaves or in cigar-shaped tube at apices of branches where they pupate. Distribution: Indo-Malayan Peninsula, Manchuria.

PR—20 specimens. Radde (Korb) 1905. Kazakevichevo (Korb) 1907.

SP—94 specimens. Vyazemskii (Borzov) July 4 (16), 1909. Yakovlevka (Zinov'eva) July 9–11, 1962. Vinogradovo (D, FV) July 29, 1929. Environs of Ussuriisk (FCH) July 1–16, 1959; (Gubanov) July 28, 1966. GTS (Z, K) July 16–August 8, 1966. Suputinsk forest reserve (M) July 23, 1970; (KR) August 22, 1947. Environs of Artem, Ugol'naya (A) July 18–19, 1960. Suchan (KR) July 26, 1928. Upper reaches of Chapigou River (Zinov'eva) July 29, 1962. Sudzukhinskii forest reserve (Litvinenko) July, 1959. Okeanskaya (FCH) July 9–13, 1959; (S, FCH) July 10–23, 1963; (Zagulyaev) July 15, 1952. De Vries Peninsula (KR) July 8–25, 1955; (O) July 9–13, 1961, July 15, 1962, July 17, 1953. Environs of Vladivostok (Dul'keit) August 9, 1923. Lyanchikhe (S, FCH) ex 1., June 23–July 17. Askol'd (Christoph, 1881). Larvae common in black fir–broad-leaved, cedar–broad-leaved, lowland and oak forests, in gardens, and inhabited places. Found on *Malus manshurica, Viburnum sargentii, Aruncus asiatica, Schizandra chinensis, Aralia manshurica*, and *Artemisia stolonifera*. Phen: May 15–June 29, pupation June 16–30, first flight June 23–July 16, flight July 1–August 22.

SS—12 specimens. Kholmsk (L) August 26, 1966. Kostromskoe (L, SHO) ex. 1., July 17, 1967. Kuznetsovka River, forest reserve, August 8, 1951. Environs of Novoaleksandrovsk (Z, L, SHO) July 28–August 21, 1966. Southern Sakhalin (K) August 20, 1967. Korsakov (E) August 20, 1965. Larvae in gardens on cultivated strawberry and apple, in mixed forests on *Alnus hirsuta* and *Rosa* sp., and in outgrowths of tall grass on *Filipendula kamtschatica*. Phen: larvae May 24–June 21, pupation June 6–July 28, first flight June 23–July 29, flight July 28–August 21.

SK—178 specimens. Iturup: footfills of Berutarube volc (E) July 30–31, 1955. Kunashir: environs of Kosmodem'yansk (Krivolutskaya) August 24, 1964; Cape Stolbchatyi (Z) August 10, 1967. Environs of Sernovodsk (Z, K) July 2–August 12, 1967; (E) August 14–15, 1965; Belkino (K) August 2–14, 1967; Golovnina volc (Krivolutskaya) July 8, 1962; (K) August 2, 1967; (E) August 10, 1965. Lake Peschanoe (K) July 6–22, 1967. Alekhino (Dorokhovy) August 24–25, 1966. Larvae found everywhere from seaside dunes to hilly coniferous forests. In outgrowths near forests they damage *Malus sachalinensis* and *Cerasus kurilensis*. Along fringes of oak and mixed forests, especially fir–yew–broad-leaved forests, commonly found on *Cerasus sachalinensis, Lonicera edulis, Hydrangea petiolaris, H. paniculata, Vitis kaempferi, Salix sachalinensis, Quercus crispula, Viburnum furcatum, Acer pictum, A. ukurundiense, Fragaria iinumae, Actinidia kolomikta, A. polygama, Alnus hirsuta, Alnaster maximowiczii*, and *Schizandra chinensis*. In alder forests, larvae found on *Alnus japonica* and *A. hirsuta*, and in Erman's birch forests on *Betula ulmifolia*. In outgrowths of tall grasses in mixed grass meadow found in large numbers on *Filipendula kamtschatica*, rarely on *Polygonum sachalinense*, as well as lilies, false hellebore, oxalis, sneezewort, yarrow, and other herbaceous plants. Females and some males from Kunashir Islands distinguished from mainland specimens by dark color of forewings. Species capable of living near fumarols, hot springs, and hot lakes in craters of volcanoes. In the cauldron of Golovnina volcanoe common near Lake Kipyashch. Larvae of different ages found throughout summer, but in first two weeks of August mostly first and last instars. Pupation June 7–August 8, first flight July 7–August 8. Eggs laid in sheets on leaves from second half of July, flight in evenings from July 2–August 28. Males attracted to light en masse.

China, Korean Peninsula, Japan, northern India.

Archips subrufana Snell.

Snellen, 1883: 187, original description; Kennel, 1908–1921: 127.

Larvae probably polyphagous. Distribution: Manchuria.

Shantar Islands.

PR—18 specimens. Klimoutsy (FCH) July 31, 1959; (S) August 8, 1958. Environs of Vlagoveshchensk (Efremov) July 10–14, 1965. Radde (Korb) 1905. Khabarov (Hedemann) August 12 (23) 1877. Lower reaches of Amur River, Vyatskoe (Arsen'ev) June 24 (July 7) 1908. Found singly at light in inhabited places. Flight July 6–August 23.

SP—90 specimens. Vyazemskii (Borzov) July 4 (16)–July 25 (August 6), 1916. Yakovlevka (D, FV) July 15–August 7, 1926. Vinogradovo (D, FV) July 16–August 2, 1929. Environs of Ussuriisk (FCH) July 1–16, 1959; (A) July 16 and August 11, 1957. Baranovsk (Andrievskii) 1913. GTS (Z, K) July 16, August 7, 1966. Upper reaches of Suputinka River (KR) July 15–25, 1935. Environs of Artem, Ugol'naya (A) July 19, 1960. Tigrovoi (KR) July 25–28, 1928. Shimakovka (Savost'yanov) July 12, 1930. Suifun, Chernigovka

(Emel'yanov) July 4 (16), 1914. Okeanskaya (FCH) July 16, 1963. De Vries Peninsula (O) July 15 and September 2–19, 1961. Environs of Vladivostok: Sedanka (Delle) July 7 (19), 1916. In southern Primor'e probably two generations. More common in inhabited places and broad-leaved forests damaged by felling. Attracted to light and fly in evening from July 1–September 19.

Korean Peninsula, China.

Archips rosana L.

Kuznetsov, 1969b: 50.

Diapausing eggs laid in groups of 40 to 100 (in sheets) on bark of lower part of stem or in forks of skeletonized twigs of various arboreal plants. Most favorable microclimatic conditions for oviposition and egg development created in shrub layer. Larvae highly polyphagous (Kuznetsov, 1960b) and in the European part of the USSR have been reported from 130 species of plants of 32 families. Larvae of early instars cut vegetation and flower buds; older instars roll leaves into clumps, often together with ovaries or fruits. Pupation in leaves. In the Far East severely damage fruits of Rosaceae in gardens and parks; on wild vegetation found only near latter. Primary area of distribution: western Palearctic (forests and steppes), spreading to the Holarctic. In the Far East transported with plant material, most probably relatively recently, and distributed locally in inhabited places or near them.

SP—38 specimens. Environs of Ussuriisk (FCH) July 1–14, 1959; (Sytenko) July 6–13, 1961; (K) ex 1., June 27–July 7, 1966; (Shabliovskii) July 12–25, 1966. GTS (Z) July 17, 1966. Known only from the environs of Ussuriisk, where it was first recorded by M.I. Fal'kovich. In 1959 larvae in gardens severely damaged cultivated varieties of currant, pear, apple, sour cherry and plum. Also noted on *Padus asiatica*. Imagoes on light and in evening. Phen: larvae May 26–June 25, pupation June 17–27, first flight June 27–July 7, 1966, flight July 1–25.

SS—More than 200 specimens. Environs of Novoaleksandrovsk (Z, K, L, SHO). Southern Sakhalin (SHO); Nevel'sk (L, SHO). Species known from islands since 1961. Larvae in gardens damage cultivated apple, pear, black mountain ash, European sour cherry and Nanking cherry, gooseberry, currant, strawberry, and goumi. In parks and along fringes of forests adjoining latter found on *Betula ulmifolia, Alnus hirsuta, Malus sachalinensis, Crataegus chlorosarsa, Sorbus commixta*, various species of *Rosa* and *Salix, Juglans sieboldiana, Philodendron sachalinense, Rubus sachalinense*, and *R. latifolium*. Phen: emergence of larvae from eggs from May 25, pupation June

30–July 15, pupae up to August 5, first flight July 11–August 12, flight July 15–August 21, 1967.

Archips viola Flkv. (*purpuratus* Kaw.)

Fal'kovich, 1965: 415, original description; Kuznetsov, 1969b: 49.

Presumably, diapause as eggs. Polyphagous larvae damage apple, plum, and pear in gardens in Primor'e, cutting leaves at apices of branches. In forests found on Manchurian flora. Recorded from members of eight plant families. Live in long, cigar-shaped tubes, rolled broad-leaved plants with single leaf, and on small-leaved plants with several leaves. Pupation in foliage. Older larvae blackish-green; head black, prothoracic scutellum chocolate-brown, posteriorly with black border, anal scutellum not prominent against background color, bristles of body and legs black. In West Europe replaced by allied species, *A. crataegana* Hb. Distribution: Japan–Ussuriisk.

SP—82 specimens. GTS (Z, K) July 17–26, 1966. Suputinsk forest reserve (K) ex 1., July 14, 1966. Okeanskaya (S, FCH) July 9–16, 1963. De Vries Peninsula (KR) July 15–August 18. Larvae common on fir–broad-leaved, cedar–broad-leaved, lowland broad-leaved–oak forests, as well as in gardens. In mixed, lowland forests, found on *Juglans manshurica, Pyrus ussuriensis, Sorbaria sorbifolia, Ulmus laciniata, Lonicera edulis, Syringa amurensis, Alnus hirsuta, Carpinus cordata*, and *Aralia manshurica*. In oak groves found on *Quercus mongolica, Corylus heterophylla*, and *Lespedeza bicolor*. Phen: larvae May 31–July 9, pupation June 22–July 10, first flight July 5–22, flight July 9–August 6.

SK—1 specimen. Kunashir, Alekhino (Kostyuk) September 1, 1971.

Japan (Hokkaido, Honshu).

Archips issikii Kod. (*abietis* Flkv.)

Fal'kovich, 1965: 414, original description.

Larvae in needles of various species of *Abies* in Japan on *A. concolor* and *A. firma* (Kawabe, 1965a). Distribution: China–Ussuriisk.

SP—58 specimens. GTS (K) August 8–12, 1966. Suputinsk forest reserve (Kashcheev) July 7, 1970, July 21–August 4, 1972. Kangauz (M) July 10, 1971. Okeanskaya (FCH) July 16–August 21, 1963. Environs of Vladivostok: Sedanka (FCH) August 4, 1963. Larvae on undergrowth of *Abies holophylla*. Common only in fir–broad-leaved and cedar–broad-leaved forests with fir. Phen: larvae start from June, pupation end of June, first flight from July 17, flight August 16–21. Imagoes attracted to light.

Japan (Hokkaido, Honshu).

Archips fumosus Kod.

Larvae on needles of *Abies nephrolepis* and *Picea ajanensis*. In Japan (Hokkaido) also on yew (*Taxus cuspidata*) and spruce (*P. punges*) (Kawabe, 1965a). Distribution: Ussuriisk.

SP—4 specimens. Environs of Ussuriisk: Suputinsk forest reserve (Kashcheev) ex 1., August 4–15, 1972. Spruce–fir–broad-leaved forests.

Archips xylosteana L.

Danilevsky, 1955: 74; Kurentsov, 1956a: 37; Kuznetsov, 1970b: 39.

Diapausing eggs laid in groups of 10 to 40 (in sheets) in forks or on bark of branches and lower parts of trunks. Larvae highly polyphagous and damage almost all types of arboreal plants typical of broad-leaved forests, especially those of Rosales, Fagales, Betulales, Sapindales, Morales, Oleales, Tiliales, etc. In the Far East and Japan damage fruits of Rosaceae in gardens. Early instars cut through vegetation and flower buds, while older instars almost always live in cigar-shaped tubes rolled crosswise to leaf veins, and skeletonize leaf. Pupation in leaves. Distribution: Amphi-Palearctic.

Europe, the Caucasus, mountains of Turkmenia, Asia Minor.

SP—122 specimens. GTS (FCH) July 16–17, 1959; (A) July 16–August 7, 1957; (Z, K) July 12–August 12, 1966. Suputinsk forest reserve (M) July 24, 1970. Tigrovoi (KR) July 21–25, 1928. Okeanskaya (FCH) July 10–13, 1959, July 22–27, 1963. De Vries Peninsula (KR) July 20 and August 6, 1955; (O) July 15, 1960, July 16, 1961. Environs of Vladivostok: Lyanchikhe (S, FCH) ex 1., July 16–24, 1963; Cape Sokol (S, FCH) ex 1., July 18, 1963. Larvae severely damage foliage of *Quercus mongolica*; rare on *Corylus heterophylla* in lespedeza and rhododendron groves. Damage less in gardens of fruits of Rosaceae, forest nurseries, and forest plantations. Larvae common on outgrowth of shrubs near inhabited places, in oak–linden, and valley broad-leaved forests where they are found not only on oak and filberts, but also on *Tilia amurensis, Rhamnus dahurica, Alnus hirsuta, Betula* sp., *Ulmus propinqua, Syringa amurensis, Fraxinus rhynchophylla, Pyrus ussuriensis, Malus manshurica*, and *Salix rorida*. In black fir–broad-leaved and cedar–broad-leaved forests, larvae also occur on *Betula dahurica, Aralia mandshurica*, and *Populus davidina*. Imagoes on light. Phen: larvae May 31–July 1, pupation June 19–July 1, first flight July 5–17, flight July 10–August 12.

SS—11 specimens. Environs of Novoaleksandrovsk, spurs of Susunaiskii range (K, L, SHO). Southern Sakhalin (SHO). Nevel'sk (L, SHO). Larvae common in mixed forests on *Quercus crispula*, *Betula ulmifolia, Acer pictum, Ulmus propingua*, and *Crataegus chlorosarca*. Phen: larvae July 15–August 4, pupation June 20–August 10, first flight August 2–11, flight August 20–22.

SK—3 specimens. Kunashir: environs of Sernovodsk. Larvae found singly in oak and mixed forests with oak, in rolled leaves of *Quercus crispula*. Phen: larvae July 11–August 10, pupation July 27–August 4, first flight August 4–13, 1967.

China, Korean Peninsula, Japan (Hokkaido, Honshu).

Archips dichotoma Flkv.

Fal'kovich, 1965: 417, original description.

Diapausing eggs laid in groups (sheets) on bark of arboreal plants. Larvae polyphagous and recorded on members of seven plant orders. In gardens damage fruits of Rosaceae. Live in rolled clumps of leaves where they pupate. Larvae of middle instars grayish-green; head black, prothoracic scutellum and legs black. In last instar head red. Recorded in Japan, Kuril Islands, and Sakhalin; in latter replaced by close species, *A. fuscocupreana* Wlsgm.

Distribution: Ussuriisk–China.

SP—119 specimens. Arsen'ev (Zinov'eva) June 28, 1962. Ussuriisk and GTS (A, FCH) July 16–August 5, 1957. GTS (Z, K) July 3–July 28, 1966. Kangauz (M) July 10–15, 1971. Tigrovoi (FCH) July 25, 1928. Okeanskaya (FCH) July 9–13, 1959, July 23–27, 1963. Shamorskoe forest nursery (Kupyanskaya) ex. 1., June 10, 1965. De Vries Peninsula (KR) July 18–20, 1955; (O) July 13–19, 1960, July 20, 1961. Common in lowland broad-leaved forests along southern slopes and in lespedeza groves. Larvae reported on *Aralia mandshurica, Juglans manshurica, Armeniaca manshurica, Fraxinus rhynchophylla, Lespedeza bicolor, Maackia amurensis, Ulmus propingua*, and *Salix rorida*. In gardens damage crops of plum and pear. Phen: larvae May 27–June 27, pupation June 12–28, first flight June 23–July 4, flight June 28–August 5. Imago attracted to ultraviolet radiation and light from other lamps.

Korean Peninsula, China.

Archips fuscocupreana Wlsgm. (*ishidai* Mtsm.)

Kuznetsov, 1970b: 38.

Diapausing eggs laid in groups or sheets on bark of trees. Serious pest of horticulture in Japan where also found on soyabean. Polyphagous larvae recorded for members of 10 plant orders, but cause maximal damage to fruits of Rosaceae in gardens. Live in flower buds and rolled clumps of leaves. Older larvae grayish-green, head red, prothoracic scutellum and legs black.

Distribution: Japan.

SS—33 specimens. Environs of Novoaleksandrovsk, gardens (L) July 28, 1966. Foothills of Kamyshovyi range (L) August 2–21, 1963. Spurs of Susunaiskii range (L) August 3, 1963. In gardens, larvae cause significant damage to crab-apple, Nanking cherry, black currant, and gooseberry. Also recorded on *Elaeagnus multiflora*. In floodplains found on broad-leaved forests on *Alnus hirsuta* and *Crataegus chlorosarca*, in mixed forests on *Rosa* sp. Phen: larvae June 17–July 7, pupation June 26–July 24, first flight August 8–31, flight July 28–August 21.

SK—4 specimens. Kunashir: environs of Sernovodsk, Lake Peschanoe, Belkino (K). Larvae found singly in rolled leaves of *Malus sachalinensis* and *Rosa rugosa* in outgrowths near forests, and on *Padus ssiori, Alnus hirsuta*, and *Betula ulmifolia* in mixed forests. Also found on cultivated apple or crab-apple in abandoned gardens. Phen: larvae July 1–29, pupation July 23–August 8, first flight July 23–August 9.

Japan (Hokkaido, Honshu, Kyushu, Shikoku).

Archips nigricaudana Wlsgm.

Eggs diapause. Serious pest of fruits of Rosaceae and ornamental arboreal plants in gardens and parks of Japan. Polyphagous larvae recorded for members of 11 plant orders. In broad-leaved plants live in rolled cigar-shaped tubes, and in small-leaved plants in clumps of rolled leaves at apices of branches. Older larvae brownish-gray or olive-green to black. Head, prothoracic and anal scutella black, body light-colored, lustrous, legs black.

Distribution: Japan–Ussuriisk–China.

SP—79 specimens. Ussuriisk (Shabliovskii) July 4, 1965. GTS (Z, K) June 24–July 8, 1966. Suputinsk forest reserve (FCH) July 22, 1963 (Shabliovskii) July 12–14, 1968. Luk'yanovka, Temnye Spring (FCH) July 8, 1963. Kangauz (FCH) June 27–July 4. Maikhe (FCH) ex 1., June 23, 1963. Okeanskaya (FCH) June 25–July 20, 1963, July 9–12, 1959. Environs of Vladivostok: Lyanchikhe (S, FCH) ex 1., June 30, 1963; Sedanka (FCH) July 11, 1963. Sudzukhinskii forest reserve (Litvinenko) July, 1959. Larvae in lespedeza cause notable damage to *Quercus mongolica*; rare on *Lespedeza bicolor* and *Corylus heterophylla*. In mixed and broad-leaved forests found in bark and outgrowths of shrubs. Near inhabited places found on *Abies holophylla, Fraxinus rhynchophylla, Syringa amurensis, Salix* sp., *S. caprea, Corylus manshurica, Lonicera* sp., *Maackia amurensis*. Phen: larvae May 25–June 15, pupation May 30–June 14; first flight June 16–30, flight June 24–July 20. Imagoes attracted to ultraviolet radiation and other lights. Also fly in evening.

China, Korean Peninsula, Japan (Hokkaido, Honshu).

Homonopsis illotana Kenn.

Kennel, 1901: 210, original description; 1908–1921: 113; Kuznetsov, 1964c: 873–875.

Polyphagous larvae in rolled leaves of East Asian arboreal plants of Rosales, Ericales, Saxifragales, Rhamnales, Sapindales, and Fabales. Older larvae greenish-gray, light-colored on ventral side, with whitish longitudinal stripe along back; head yellow, with four black spots arranged in transverse row; prothoracic scutellum black with yellow border along posterior margin; anal scutellum not expressed; body shields not perceptible.

Distribution: Japan–Ussuriisk–China.

SP—24 specimens. GTS (Z, K) July 23–24, 1966. Suchan (Dorris). Okeanskaya (FCH) July 10–13, 1959. De Vries Peninsula (O) July 14, 1961. Environs of Vladivostok: Sedanka (FCH) August 4, 1963; Akademgorodok (Kupyanskaya). Larvae common in fir–broad-leaved forests; rare in cedar–broad-leaved, lowland broad-leaved oak and linden forests, in parks and gardens. Food plants: *Malus manshurica, Micromeles alnifolia, Philadelphus tenuifolius, Deutzia amurensis, Actinidia arguta, Rhamnus ussuriensis, Acer pseudosieboldianum, Lespedeza bicolor*. Phen: larvae May 27–June 27, pupation June 12–28, first flight June 25–July 11, flight July 10–August 4. Imagoes often fly in evening, rarely at light.

China, Japan.

Homonopsis foederatana Kenn.

Kennel, 1901: 211, original description; 1908–1921: 122; Obraztsov, 1967: 173.

Polyphagous larvae in woven needles of *Abies* and rolled leaves of Rosales, Saxifragales, and Sapindales. Older larvae grayish-black; head and prothoracic scutellum black, and body shields light-colored.

Distribution: Manchuria.

SP—16 specimens. Environs of Ussuriisk (Tokareva) ex 1., June 20, 1932. Suputinsk forest reserve, Egerskii Pass (K) June 21, 1966. Kangauz (M), July 3, 1971. Environs of Vladivostok: Sedanka (S, FCH) June 25 and July 23, 1963; Popov Island (M) July 8, 1971. Kedrovaya Pad' forest reserve (M) June 27–July 1, 1971. Larvae found singly in black fir–broad-leaved and spruce–broad-leaved forests on *Abies holophylla, Lonicera ruprechtiana*, and *Acer tegmentosum*.

Found in gardens of cultivated plum. Phen: larvae from May 22, first flight June 10–20, flight June 21–July 23. Imagoes at light and fly in evening in damaged mixed and broad-leaved forests.

SS—5 specimens. Novoaleksandrovsk, spurs of Susunaisky range (K, L, SHO); southern Sakhalin (L, SHO). Larvae found singly in mixed forests between rolled leaves of *Rosa* sp., *Crataegus chlorosarca, Padus ssiori*, and *Viburnum furcatum*. Also found in parks. Phen: larvae May 20–June 13, pupation June 6–14, first flight June 19–27, flight July 9, 1967.

China, Japan (Hokkaido, Honshu).

Syndemis musculana Hb.

Danilevskii, 1955: 71; Kuznetsov, 1967: 50.

Diapausing pupae hibernate. Larvae in rolled leaves of *Populus, Salix, Quercus*, and *Betula*. Hind wings of males in Kuril populations lighter in color than in individuals from the mainland. Distribution: Holarctic (forest-tundra and steppes).

PR—11 specimens. Beketovo (Hedemann) June 7 (19), 1877. Klimoutsy (K, S) May 30–June 15, 1958. Simonovo (FCH) May 26–June 10, 1959. Radde (Korb) 1905. Found singly in black birch–larch and black birch–oak–pine forests. Larvae on *Populus tremula*. Phen: larvae from July 16, pupation in August, first flight after hibernation in spring, flight May 26–June 19. Imagoes fly in evening.

SP—14 specimens. Vinogradovo (D, FCH) May 27–June 7, 1929. GTS (K) June 14, 1966. Suputinsk forest reserve (K) June 17–20, 1966. Tigrovoi (KR) June 12 and July 10, 1928. Environs of Vladivostok, Shamora Bay (FCH) May 31, 1963. Found singly at light in cedar–broad-leaved and lowland broad-leaved forests. Flight May 27–July 10.

SS—2 specimens. Environs of Novoaleksandrovsk, foothills of Susunaisky range (L, SHO) June 16, 1967. Fly in evening.

SK—26 specimens. Kunashir: environs of Sernovodsk, Lake Glukhoe (Z, K) June 9–27, 1967. Confined to oak forests with *Quercus crispula* and *Betula ulmifolia*. Imagoes during day and in evening hover over sunlit oak and birch.

Dentisociaria armata Kuzn.

Kuznetsov, 1970a: 450–451, original description.

Distribution: Amur–Ussuriisk–China.

SP—12 specimens. Vyazemsky (SHE). Adimi (Emel'yanov) June 21 (July 3), 1904. Yakovlevka (D, FV) August 7, 1926. Okeanskaya (Zagulyaev) August 30, 1950. De Vries Peninsula (O) July 17, July 23, and August 30, 1960; September 5, 1961.

Possibly the name used here is a recent synonym of *Pandemis inopinatana* Kenn. If it is confirmed that the latter species is dimorphic, then the name proposed by Kennel (1908–1921) was wrongly listed by him as a recent synonym of *Archips nigricaudana* Wlsgm. Unfortunately, *Pandemis inopinatana* Kenn. was described on the basis of females, and *P. armata* Kuzn. on the basis of males. Hence it does not suffice to investigate the types; only by observing copulating pairs can the question of synonymy be solved. Flight from July 3–September 5. Imagoes fly in evening, but more often at light in inhabited places, parks, and in broad-leaved forests.

Ptycholomoides aeriferana H.-S.

Danilevskii, 1955: 68; Kuznetsov, 1967: 50.

Larvae on different species of *Larix,* in Siberia also found on *Betula*. Live in rolled needles or leaves. Distribution: Trans-Palearctic (zone of coniferous and mixed forests, locally).

PR—10 specimens. Magdagachi (Masyutina) July 19, 1963. Klimoutsy (S, K) July 10 and August 8, 1958; (FCH) July 31, 1959. Lake Evoron (KR) July 31, 1952. Evur River (KR) August 8, 1959. Found singly on black birch–oak–larch and larch forests. Flight at light and in evening, July 10–August 8.

Aphelia viburniana Den. and Schiff.

Kurentsov, 1950: 30; Danilevskii, 1955: 79; Kuznetsov, 1967: 50; 1970b: 39.

Young larvae hibernate. Highly polyphagous and resume feeding in spring on new buds, or live under rolled edges and between rolled leaves at apices of branches. Recorded for members of 11 plant orders. Distribution: Trans-Palearctic (tundra, forest-tundra, zones of forests, and steppes).

PR—more than 100 specimens. Klimoutsy (K, S) July 1–16, 1958. Simonovo (Dorokhina, FCH) July 2–12, 1959. In floodplains larvae severely damage foliage of young apple (*Malus pallasiana*) and *Spiraea sericea*. In oak forests very common on undergrowth of *Quercus mongolica* and *Rhododendron dahuricum*. In black birth–larch and black birch–oak–pine forests, larvae often found on *Malus pallasiana, Spiraea sericea, Rosa dahuricum, Rhododendron dahuricum, Betula platyphylla, Salix* sp., *Artemisia desertorum, Lathyrus humilis, Sanguisorba tenuifolia, Senecio amurense*, and *Atractylodes ovata.*

Imagoes found in evening not only in forests, but also in lowlands and vacant lands near inhabited places; mass flight to light. Phen:

larvae May 27–June 9, pupation June 11–July 1, first flight June 28–July 13, flight July 1–16, 1958.

SP—12 specimens. Vyazemskii (Borzov) July 5 and 14 (17 and 26), 1909. Oblachnaya, 1,700 m, subalpine meadows (Vasyurin) July 21, 1972.

SK—72 specimens. Kunashir: environs of Sernovodsk (K) July 12–August 10, 1967; Lake Peschanoe (K) July 12–18, 1967; Cape Bodopadnyi (K) July 31, 1967. Shikotan: Krabozavodsk (E) July 13, 1965. Adapted to marshes, alder forests near the ocean and lakes, fringes of spruce forests or Sakhalin spruce, and outgrowths of pine forests. In marshes of the Sernovodsk Isthmus larvae severely damage *Myrica tomentosa, Alnus japonica, Ledum macrophyllum*, and *Oxycoccus microcarpus*. Also common on *Lonicera edulis, Empetrum nigrum, Sanguisorba tenuifolia*, and *Andromeda polifolia*. Rare on *Pinus pumila*. Phen: larvae June 4–July 25, pupation June 28–August 8, first flight July 19–August 9, flight July 12–August 6. Flight in marshes, along fringes of alder and spruce forests during the day and in evening; flight not discontinued even in cloudy weather.

Aphelia caradjana Wlsgm.

Known only from Priamur.

PR—2 specimens. Radde (collection of Caradja).

Aphelia inumbratana Chr.

Christoph, 1881: 67, original description; Kennel, 1908–1921: 179.

Polyphagous larvae in new buds and rolled leaves at apices. On branches on species of Rosales and Asterales. Pupation in leaves. Known only from southern Sikhote-Alin'.

SP—19 specimens. Yakovlevka (D, FV) July 17, 1926. Environs of Ussuriisk (Mishchenko) July 10, 1934. GTS (Z, K) July 8–25, 1966. De Vries Peninsula (O) July 16, 1961. Vladivostok (Christoph, 1881). Askol'd (Dorris). Larvae common in outgrowths of shrubs near inhabited places, in vacant lands, and pastures in forest glades (*Artemisia* sp.); rare on *Rosa dahurica*. In damaged or felled areas of lowland broad-leaved forests, along floodplains on *Spiraea betulifolia*. Phen in environs of Ussuriisk (GTS): larvae May 24–June 24, pupation June 25–26, first flight July 6–12, flight July 8–25, 1966.

Aphelia paleana Hb.

Danilevskii, 1955: 78.

Larvae develop in various members of Graminea, skeletonizing the leaves under rolled edges, thereafter converting them into tubes by attaching two adjacent ones with silky threads, obstructing the emergence of spikes and causing their deformation. Pupation in leaves or stubble. Distribution: Trans-Palearctic (forest zone).

PR—1 specimen. Fishing areas in lakes in limans of Amur River (Chernavin) July 10 (22), 1915.

SP—6 specimens. Origin of Kolumbe River (KR) June 28–July 10, 1934.

SS—2 specimens. Environs of Novoaleksandrovsk (L, SHO) August 2, 1967. Larvae on Graminea, first flight August 15, 1967.

SK—22 specimens. Kunashir: Lake Peschanoe (K) July 12–13, 1967. Eggs laid in sheets on July 12 on leaves of *Pfleum* sp.; emergence of larvae July 27. Larvae reach size of 0.5 cm on August 15 (probably, II-instar). Imagoes mass on timothy grass meadow along southern slopes of places abandoned by man.

Clepsis helvolana Fröl. (*rusticana* Tr.)

Kuznetsov, 1967: 51.

Polyphagous larvae in Europe found on *Vaccinium myrtillus, Gentiana amarella, Convallaria polygonatum, Dorycanium* sp., *Lotus* sp. (Swatschek, 1958), *Polygonatum* sp., *Comarum* sp., *Lysimachia* sp. (Hannemann, 1961). Live in rolled leaves. Distribution: Trans-Palearctic (locally in zone of forests and steppes).

PR—20 specimens. Klimoutsy (K, S) May 31–June 17, 1958; (FCH) June 4–5, 1959. Simonovo (FCH) June 8–9, 1959. Common in meadows, lowlands, dwarf arctic birch–willow overgrowths.

SP—2 specimens. De Vries Peninsula (KR) May 27, 1956 and June 30, 1953.

Clepsis rogana Gn.

Kurentsov, 1950: 30.

Larvae polyphagous. In Europe found between rolled leaves of *Vaccinium myrtillus, Luzula* sp., *Veratrum* sp. (Hannemann, 1961). Distribution: Trans-Palearctic (locally in forest zones, especially in hilly regions).

SP—1 specimen. Lower reaches of Kolumbe (KR) July 10, 1934.

Clepsis aerosana Ld.

Kennel, 1908–1921: 185; Kuznetsov, 1967: 51.

Distribution: Trans-Palearctic (predominantly steppe zones).

PR—11 specimens. Anosovo (Hedemann) June 15 (27), 1877. Klimoutsy (K, S) June 19–July 4, 1958. Simonovo (FCH) June 12–13, 1959. Found singly in steppe groves and black birch–oak–larch forests.

SP—1 specimen. Origin of Kolumbe (KR) July 14, 1934.

Clepis rurinana L. (*semialbana* Gn.)

Kennel, 1908–1921: 142; Danilevskii, 1955: 74; Kuznetsov, 1967: 51.

Larvae of middle instars hibernate. Resume feeding in spring on new leaves while rolling them. Often develop on herbaceous plants. In Europe found on *Rosa, Lonicera, Viburnum, Chelidonium, Urtica, Convolvulus, Euphorbia, Pulicaria, Anthriscus*, and *Lilium* (Hannemann, 1961). In southern Primor'e, several generations develop but phenological limits between them not distinct. Distribution: Trans-Palearctic (zones of broad-leaved forests and steppes, locally).

PR—29 specimens. Dzhadinda (Popov) July 12 (24), 1915. Klimoutsy (Kerzhnev) July 14, 1959; (K, S) July 15–August 16, 1958. Simonovo (FCH) July 25, 1959. Radde (Korb) 1905. Environs of Khabarov (SHE) ex 1., August 5, 1959. Common in groves and black brich–oak–larch forests, rarely in floodplain forests. Larvae found singly on *Adenophora latifolia* and *Malus sibirica.* Phen: larvae June 30–July 9, pupation from July 10, first flight July 19–August 5, flight July 14–August 16.

SP—153 specimens. Lower reaches of Kolumbe River (KR) June 28–July 12, 1934. Kirovskii (M) July 9–31, 1970. Spassk (FCH) August 17, 1963. Yakovlevka (D, FV) June 10–23, July 13–14, August 26–September 8, 1926. Vinogradovo (D, FV) June 14–22, July 11–24, August 2, 1929. Arsen'ev (Zinov'eva) June 28, 1962. Environs of Ussuriisk (Shabliovskii) July 15, 1966, August 14–September 1, 1969. GTS (K, S) June 7–August 9, 1966; (FCH) June 11, 1963 and June 26–July 4, 1959; (N) August 10, 1962. Suputinsk forest reserve (K) June 17–20, 1966; (M) July 23, 1970; (KR) August 12, 1932. Environs of Artem, Ugol'naya (A) July 11, 1960. Peishula (FCH) July 15–25, 1963. Kangauz (FCH) June 25–July 5, 1963; (M) July 6–10, 1971. Tigrovoi (FCH) July 1, 1963. Suchan (KR) July 2–August 28, 1928. Khualaza (FCH) July 6, 1963. Okeanskaya (S, FCH) June 17–September 7, 1963; (Zagulyaev) June 20–August 30, 1950; (Transhel') July 20, 1928. De Vries Peninsula (O) June 15–July 3, 1961; (KR) July 1–8, 1953, July 6, 1960. Common in groves and cedar–broad-leaved forests. Larvae found singly on *Vicia unijuga* and *Philadelphus tenuifolius* in rolled leaves. Phen: larvae June 8–22, pupation June 23, first flight July 2–4, flight June 10–September 8.

SK—46 specimens. Iturup: foothills of Berutarube volc (E) July 30–31, 1965. Kunashir: southern Kurils (E) August 17, 1965; environs of Sernovodsk and Lake Glukhoe (Z, K) July 11–29, 1967; Lake

Peschanoe (K) July 22, 1967; Belkino and Cape Chetverikov (K) July 23, 1967. Common in oak forests; rare in mixed forests with *Quercus crispula*, along fringes of fir–yew–broad-leaved and marshy alder–spruce forests. Specimens from Iturup and Kunashir Islands larger than specimens from the mainland and females with diffused pattern in forewings. Flight July 11–August 17.

Clepis liratana Chr. (*tricensa* Meyr.)

Christoph, 1881: 68, original description; Kennel, 1908–1921: 144; Kuznetsov, 1967: 51.

Distribution: Manchuria.

PR—3 specimens. Klimoutsy (K) 1958. Environs of Khabarov: Khekhtsirskii Pass (SHE) July 3, 1959. Environs of Nikolaevsk (Masyutina) August 1, 1964.

SP—17 specimens. Ussuriisk (FCH) July 13, 1959. Tigrovoi (KR) July 10–25, 1928. Okeanskaya (FCH) July 10–12, 1959, June 27–July 31, 1963. Askol'd (Christoph, 1881).

SS—3 specimens. Environs of Novoaleksandrovsk: spurs of Susunaiskii range (L) July 29, 1967; (K) August 20, 1967; Kamyshovogo (L) August 21, 1967. Found singly in mixed forests.

SK—81 specimens. Iturup: foothills of Berutarube volc (E) August 1, 1965. Kunashir: Mendeleevo (K) July 15, 1967; Alekhino (Krivolutskaya, Sofronova and Konovalova) July 5–10 and August 2, 1962; environs of Sernovodsk and Lake Glukhoe (Z, K) July 2–August 14, 1967; Lake Peschanoe (K) July 22, 1967; Belkino (K) August 14, 1967; Cape Vodopadnyi (K) July 26, 1967. Shikotan: Malokuril'sk (E) July 27, 1965; Krabozavodsk (E) July 13, 1965. Found en masse along fringes of mixed broad-leaved forests: oak, alder, fir–yew–broad-leaved, oak–fir–yew, Erman's birch, spruce–fir–Erman's birch; in overgrowths of tall grasses in abandoned gardens, in outgrowths of Rosaceae near the ocean, and in mixed grass meadows. Flight July 2–August 14.

Clepsis congruentana Kenn.

Kennel, 1901: 227, original description; 1908–1921: 190.

Distribution: Japan–Ussuriisk–China.

SP—71 specimens. Ussuriisk and GTS (FCH) July 8–15, 1959; (Z, K) July 17–25, 1966; (Kolomiets) July 18–25, 1963. Environs of Artem, Ugol'naya (A) July 19, 1960. Peishula (FCH) July 15, 1963. Okeanskaya (S, FCH) July 6–26, 1963. De Vries Peninsula (O) July 7–14, 1961; July 13–August 22, 1960; July 15, 1959; July 26, 1962; (KR) July 30, 1957. Environs of Vladivostok (FCH) July 17, 1963.

Sedanka (FCH) July 11, 1963. Askol'd (Kennel, 1901). Found singly in mixed and broad-leaved forests. Flight July 7–August 22.

SK—33 specimens. Kunashir: environs of Sernovodsk (Z, K) July 10–August 17, 1967; Cape Vodopadnyi (K) August 6–12, 1967; Lake Peschanoe (K) July 22, 1967. Shikotan: Malokuril'sk (E) July 27–August 3, 1965. Found singly in fir–yew–broad-leaved, oak, and alder forests. Flight July 10–August 17.

China, Japan (from Hokkaido to Kyushu).

Clepsis strigana Hb. (*districta* Meyr.)

Kuznetsov, 1967: 51.

Young larvae hibernate. In Priamur and Primor'e; a secondary, but very polyphagous pest. Larvae in open buds and rolled leaves at apices of branches of soyabean, perilla, sunflower, sage, and lucerne. Also found on plants of Rosaceae, honeysuckle, and yellow acacia. In Europe found on several dozen herbaceous plants of *Euphorbia, Artemisia, Hypericum, Verbascum, Sedum, Gnaphalium, Hieracium, Anchusa, Peucedanum*, and others (Hannemann, 1961). Pupation in leaves. In the southern part of the area of distribution two generations develop. Distribution: Trans-Palearctic (zone of broad-leaved forests and steppes).

PR—29 specimens. Magdagachi (Masyutina) July 18–24, 1963. Blagoveshchensk (Hedemann) July 4–5 (16–17), 1877. Klimoutsy (Kerzhner) June 28, 1959; (K, S) July 9–21. Simonovo (Dorokhina, Kerzhner, FCH) July 7–August 1, 1959. Environs of Khabarov (SHE) ex l., August 15, 1959. Larvae common in rolled leaves of *Sorbus sambucifolia, Adenophora latifolia, Astragalus membranaceus*, in black birch–oak–larch forests, on pastures, and lowlands. Phen: larvae in June and July, pupation up to August 12, first flight July 12–August 15, flight June 28–August 15.

SP—23 specimens. Vyazemskii (Borzov) July 10 (22)–August 7 (20), 1909; Kirovskii (M) July 9–30, 1970. Spassk (S, FCH) August 17, 1963. Yakovlevka (D, FV) June 23–September 7, 1926. Arsen'ev (Zinov'eva) June 28, 1962. Suifun (collection of Romanov). Kaimanovka (M) June 18, 1971. Kangauz (M) July 8, 1971. De Vries Peninsula (O) June 14–15, 1961, July 13, 1963. Flight of first generation June 14–July 10, of second generation August 17–September 7.

Clepsis fulva Fil., comb. n.

Filip'ev, 1962: 371, original description.

Larvae live in rolled leaves. Known only from southern Sikhote-Alin'.

SP—9 specimens. Kirovskii (M) July 24, 1970. Suputinsk forest reserve (K) ex. p., June 30, 1966. Peishula (S) July 12, 1963. Tigrovoi (KR) July 22, 1928. Suchan (KR) July 21–26, 1928. Okeanskaya (FCH) July 23–26, 1963. Pupate in rolled leaves of *Micromeles alnifolia*. Imagoes found singly in cedar–broad-leaved and black fir–broad-leaved forests. Flight June 30–July 26.

Adoxophyes orana F.R. (*congruana* Wlkr., *reticulana* Hb.)

Kurentsov, 1950: 31; Danilevskii, 1955: 72; Kuznetsov, 1967: 50–51; 1970b: 39.

Diapausing larvae of II- and III-instars hibernate in bud scales and crevices in bark of various arboreal plants under a woven canopy of leaves. In spring they resume feeding on leaves rolled into tubes or several wrapped together. In wrapping leaves with fruit matter, they damage the latter, leading to rot and drop. Development possible only under atmospheric humidity above 60% and temperatures in the range of 10 to 30°C. Pupation in leaves. Eggs laid in groups (sheets) on smooth surface or on fruits. Single oviposition with an average of 18 to 100 eggs, and potential fecundity up to 400 eggs. Reduction in humidity during the period of flight reduces fecundity. In the southern part of the area of distribution, two generations develop. Diapause appears under the action of seasonal changes in day length; photoperiodic response subject to geographic changes. Larvae emerging from autumn generation skeletonizes leaves in silky tubes along veins on lower side until they enter hibernation in September or even later. Serious pest of horticulture in the Far East, especially in floodplains. Larvae polyphagous and damage mainly plants of Rosaceae and Saxifragaceae, especially apple, pear, and plum, as well as many arboreal plants. Distribution: Indo-Malayan Peninsula and the Palearctic (mixed and broad-leaved forests; in Siberia found locally).

PR—10 specimens. Environs of Blagoveshchensk (Gudzenko) July 15 (27), 1907; (Efremov) July 16, 1965. Environs of Khabarov (SHE) ex 1., August 7–20, 1959. Larvae in gardens along floodplains damage crab-apple and currant. Phen. in environs of Khabarov: larvae July 27–August 13, pupation August 5–14, first flight August 7–20, 1959.

SP—86 specimens. Vyazemskii (Borzov) July 27–28 (August 9–10), 1909. Yakovlevka (D, FV) June 9–18, 1926. Vinogradovo (D, FV) June 26–July 12, 1929. Environs of Ussuriisk, Plant Protection Station (Maslovskii) June 26 and August 3, 1930; (Shabliovskii) June 27–July 7, 1959, August 14, 1969. GTS (Z, K) June 13–24, July 13, August 13, 1966; (N) August 23, 1962; Suputinsk forest reserve (FCH) June 13, 1963; (D) June 17–20, 1966. Kaimanovka (M) June 21, 1971. Environs of Artem, Ugol'naya (A) July 14, 1960. Kangauz (FCH) June 26, 1963; (M) July 3–10, 1971. Tigrovoi (KR) June 30, July 10–12, August 9, 1928. Suchan (Palshkov) July 2: 1932; (KR) July 10, 1928. Okeanskaya (FCH) June 21 and September 2, 1963; (Maslovskii) August 11, 1929. De Vries Peninsula (O) June 17–20 and August 5, 1961, July 13 and August 17–18, 1960, August 23, 1963. Environs of Vladivostok, Sedanka (S) June 25, 1963. Kedrovaya Pad' forest reserve (M) July 30, 1971; (Zinov'eva) August 21, 1962. Larvae in gardens damage crabapple, plum, pear, currant, gooseberry, and lemon trees. In oak forests and lowland broad-leaved forests found on *Corylus heterophylla, C. manshurica, Lespedeza bicolor, Schizandra chinensis*, and *Ulmus propingua*. Phen: larvae May 19–June 19, pupation May 23–June 20, first flight June 11–29, flight of first generation June 13–July 13, of second generation August 5–September 2.

SS—1 specimen. Environs of Novoaleksandrovsk (K). Larvae found singly on May 26 in artificial plantations on *Quercus mongolica*. First flight June 29, 1967.

SK—3 specimens. Environs of Sernovodsk, Lake Glukhoe, Lake Peschanoe (K). Larvae found singly in rolled leaves of *Quercus crispula, Alnus hirsuta, A. japonica*, and *Salix sachalinensis* in oak forests and in marshes near lakes. Phen: larvae June 9–July 19, first flight July 21–August 7, 1967.

Ptycholoma imitator Wlsgm.

Kuznetsov, 1967: 51.

Young larvae hibernate (Oku, 1967). Significant pest of Rosaceae fruits, especially apple, pear, and plum in southern Primor'e and Japan. Larvae also found on Betulales. Live in rolled leaves where they pupate. Distribution: Manchuria.

PR—3 specimens. Simonovo (FCH) July 23, 1959. Environs of Khabarov (SHE) ex 1., July 8, 1959. Larvae found singly on *Betula dahurica* and *Malus sibirica* in parks and black birch–larch forests.

SP—97 specimens. Kirovskii (M) July 5–August 8, 1970. Vinogradovo (D, FV) August 1–4, 1929. Ussuriisk (Tokareva) ex. 1., July 24–August 14, 1931; (Gibanov) July 28, 1926. GTS (Z, K) July 14–August 12, 1966; (Zinov'eva, N) August 12, 1962; (Kolomiets) August 1–2, 1963. Baranovsk (Andrievskii) 1913. Chernigovka (Emel'yanov) June 30 (July 12), 1914. Environs of Artem, Ugol'naya (A) July 19, 1960. Suchan (Palshkov) July 19–August 23, 1934. Ussuri (Emel'yanov) July 15 (27), 1911. Okeanskaya (FCH) July 14–27, 1963; (Zagulyaev) July 15, 1952. De Vries Peninsula (O) July 11, 1961, July 17, 1960, August 13, 1962. Barabash (Gavronskii) July 1–12 (12–24),

1903. Kedrovaya Pad' forest reserve (Kerzhner) August 22, 1963. Common on light in oak forests and gardens. Fly in evening in cedar–broad-leaved, fir–broad-leaved, and valley broad-leaved forests. In gardens larvae damage cultivated apple and plum. In forests found on *Salix rorida*. Phen: larvae from May 31, pupation from June 24, first flight July 10–August 14, flight July 5–August 22.

China, Korean Peninsula, Japan (Hokkaido, Honshu).

Ptycholoma micantana Kenn. (*elegans* Hed.)

Kennel, 1901: 218, original description; 1908–1921: 146; Danilevskii, 1955: 71.

Polyphagous larvae found on plants of Rosales, Betulales, and *Eleutherococcus*.

Slightly damage plum gardens of southern Primor'e. Distribution: Amur–Ussuriisk–China.

PR—2 specimens. Environs of Khabarov (SHE). Larvae July 5 on *Rosa dahurica*, pupation July 6, first flight July 13, 1959. Found singly in parks.

SP—8 specimens. GTS (Z) July 24, 1966. Suputinsk forest reserve (K) ex p., June 26, 1966. Suputinsk State Farm (Tokareva) ex 1., July 2, 1932. Ussuri (Dorris). Okeanskaya (S, FCH) ex 1., June 27, 1963. Found singly in gardens and fir–broad-leaved, cedar–broad-leaved forests. Larvae on cultivated plum as well as *Carpinus cordata* and *Eleutherococcus senticosus*. Phen: larvae May 1–16, pupation June 16–17, first flight June 26–July 2, flight July 24.

Ptycholoma plumbeolana Brem.

Bremer, 1864: 89; Kennel, 1908–1921: 146; Kuznetsov, 1967: 51.

Distribution: Amur–Ussuriisk–China.

PR—22 specimens. Simonovo (Dorokhina) June 30, 1959. Radde (Korb).

SP—3 specimens, Ussuri (Bremer). Kul'dur (Korovin) June 28, 1971.

China (Chingan).

Ptycholoma lecheana L. (*circumclusana* Chr.)

Christoph, 1881: 66–67, original description of subspecies; Kennel, 1908–1921: 147; Kuznetsov, 1967: 51; 1970b: 39.

Diapausing larvae of III-instar hibernate in fairly compact white puparia in cracks of bark of various deciduous trees and shrubs under a canopy of woven leaves. Emergence of larvae from hibernation in spring takes place when the average daily temperature is 10°C. They resume feeding, cutting budding leaves, rolled leaves, flower buds, flowers, and sometimes fruits. They pupate in leaves or on trunks. Imagoes active after sunset, early night, and morning hours. Eggs laid in groups (sheets) on branches. Larvae after emerging skeletonize leaves or cut small depressions in fruits. The eastern Palearctic subsp. *circumclusana* Chr. is a serious pest of gardens in the southern Far East. Larvae highly polyphagous and may damage, in addition to all deciduous trees, needles of larch and leaves of some plants. Distribution: Trans-Palearctic (zones of mixed and broad-leaved forests, forest-steppes).

PR—23 specimens. Klimoutsy (K, S) July 18–27, 1958. Simonovo (FCH) June 13, 1959. Blagoveshchensk (Hedemann) June 13 (25), 1879. Radde (Korb) 1905. Common in black birch–oak–larch, black birch–oak–pine, and birch forests. Larvae often found on *Salix raddeana, S. xerophila, Betula platyphylla, Quercus mongolica*, and in floodplains also on *Malus pallasiana*. Phen: larvae May 29–June 15, pupation June 5–16, first flight June 13–26, flight June 13–27.

SP—141 specimens. Yakovlevka (D, FV) June 4–9, 1926; (Zinov'eva) June 8, 1962. Vinogradovo (D, FV) June 22–July 1, 1929. GTS (K) June 9–24, 1966; (FCH) June 10, 1963. Suputinsk forest reserve (K) June 17–24, 1966. Kaimanovka (M) June 21, 1971. Environs of Artem, Ugol'naya (A) June 14, 1961. Tigrovoi (KR) June 24–July 2, 1928. Khualaza (FCH) July 3, 1963. Okeanskaya (S, FCH) May 13–June 18, 1963. De Vries Peninsula (O) June 14–19, 1961. Shamora (S) ex 1., June 21. Nadezhdinskaya (M) June 23, 1971. Kedrovaya Pad' forest reserve (M) July 27, 1971. Common in gardens, parks, and oak forests. Cedar–broad-leaved and floodplain broad-leaved forests. Larvae polyphagous and notably damage cultivated varieties of apple, pear, plum, sour cherry, and currants in gardens. In forests common on *Malus manshurica, Pyrus ussuriensis, Padus asiatica, Rosa dahurica, Armeniaca manshurica, Crataegus maximowiczii, C. pinnatifida, Quercus mongolica, Juglans manshurica, Carpinus cordata, Alnus japonica, A. hirsuta, Corylus heterophylla, C. manshurica, Betula dahurica, Ulmus propingua, U. laciniata, Acer ginnala, A. mono, A. mandshuricum, Viburnum burejaeticus, Syringa amurensis, Actinidia arguta, Philodendron amurense, Philadelphus tenuifolius, Maackia amurensis, Lespedeza bicolor*, and *Rhododendron mucronulatum*. Phen: larvae May 13–June 8, pupation May 22–June 5, first flight May 30–June 21, flight June 4–July 3, primarily after sunset in early hours of dusk.

SS—5 specimens. Environs of Novoaleksandrovsk (K) ex 1., June 15–29, 1967. Korsakov (Golovko) ex 1., July 21, 1965. Larvae in gardens damage black currant, gooseberry, blackberry, mountain ash, plum and sour cherry. In parks and forests larvae found on *Malus manshurica, M. sachalinensis, Alnus hirsuta,* and *Vaccinium ovalifolium.* Phen: Larvae May 25–June 13, pupation May 28–June 20, first flight June 12–July 30, flight en masse in mid-June.

SK—26 specimens. Kunashir: Mendeleevo–Sernovodsk–Alekhino (Z, K); Belkino (K); Lake Peschanoe (K). Shikotan: Malokuril'sk (E) July 27, 1965; Krabozavodsk (E) July 13, 1965; foothills of Shikotan mountains (E) July 16–24, 1965. Common in oak and mixed forests. Larvae on *Padus ssiori, Cerasus sachalinensis, Betula ulmifolia, Alnus hirsuta, A. japonica, Quercus crispula, Acer ukurundiense, Hydrangea petiolaris*, and *H. paniculata.* Phen on Kunashir Islands: larvae June 9–July 11, pupation June 23–July 15, first flight July 4–16, flight July 11–27, 1967.

Lozotaenia coniferana Iss.

Larvae in needles of fir or spruce bound together with silky threads. Distribution: Japan.

SK—1 specimen. Shikotan: Cape Krai Sveta (Kostyuk) August 19, 1971.

Lozotaenia forsterana F.

Danilevskii, 1955: 78.

Larvae polyphagous. In Europe found between leaves of *Vaccinium myrtillus, V. uliginosum, V. vitisidaea*, as well as *Ledum, Hedera, Lonicera, Ribes, Larix, Ligustrum, Abies, Picea*, and *Luzula* (Hannemann, 1961). Pupation in leaves. Distribution: Trans-Palearctic (forest-tundra, taiga, mixed forests).

SP—2 specimens. Vinogradovo (D, FV) July 11–12, 1929.

Pseudeulia magnata Yasuda

Distribution: Japan–Ussuriisk.

SP—2 specimens. Vinogradovo (D, FV) May 28, 1929. Tigrovoi (KR) May 13, 1928.

SS—1 specimen. Environs of Kholmsk, Yablochnoe (L) June 14, 1966. Garden.

Japan (Honshu).

Epagoge perpulchrana Kenn.

Kennel, 1901: 223, original description; 1908–1921: 176; Kurentsov, 1950: 30; Kuznetsov, 1967: 51.

Larvae polyphagous and found on plants of Pinaceae, Fagaceae, and Vitaceae. Live in rolled leaves where they pupate. Distribution: Amur–Ussuriisk–China.

PR—2 specimens. Simonovo (FCH). Khekhtsir (Yurchenko). Larvae found singly on *Quercus mongolica* and *Picea ajanensis*. First flight June 16, 1959 and June 16, 1967.

SP—37 specimens. Yakovlevka (D, FV) June 18–21, 1926. GTS (Z, K) June 19–July 3, 1966. Suputinsk forest reserve (K) June 17–20, 1966; (Kashcheev) June 25–27, 1972. Tigrovoi (KR) July 12, 1928. Suchan, Khlystovka River (Palshkov) June 25, 1934. Kangauz (FCH) June 27, 1963; (M) July 3, 1971. Okeanskaya (FCH) July 9, 1959. Common on light in cedar–broad-leaved forests, oak groves. One pupa in GTS on *Vitis amurensis* on June 5, first flight June 16, 1966, flight June 17–July 12.

Epagoge orientis Fil.

Filip'ev, 1962: 370, original description.

Known only from southern Sikhote-Alin'.

SP—17 specimens. Yakovlevka (Zinov'eva) July 12, 1962. Ussuriisk and GTS (FCH) July 8–17, 1959; (A) August 16, 1957. Tigrovoi (KR) July 24, 1928. Khualaza (KR) July 21, 1928. Okeanskaya (FCH) July 16–18, 1963. De Vries Peninsula (O) July 30, 1959. Found singly at light in oak groves and mixed forests. Flight July 8–August 16.

Epagoge inconditana Kenn.

Kennel, 1901: 210, original description; 1908–1921: 112; Kuznetsov, 1967: 51; 1970b: 39.

Larvae hibernate. Found in fruits of *Rosa*, but probably polyphagous. Distribution: Manchuria.

PR—17 specimens. Klimoutsy (K, S) July 18–August 1, 1958; (FCH) July 31, 1959. Konuma (KR) July 18–27, 1947. Environs of Blagoveshchensk (Efremov) July 14, 1965. Environs of Khabarov (collection of Staudinger). Common in evening in black birch–oak–larch forests; rare in floodplain broad-leaved forests. Flight July 14–August 1.

SP—18 specimens. GTS (FCH) July 15–17, 1959; (Z) July 25, 1966. Peishula (FCH) July 25, 1963. Suchan (KR) August 8, 1928. Environs of Artem, Ugol'naya (A) July 19, 1960. Okeanskaya (FCH) July 10–27, 1963; (Zagulyaev) September 6, 1950. Environs of Vladivostok, Sedanka (Delle) June 25 (July 7), 1915. Found singly at light and in evening in oak groves and lowland broad-leaved forests. Flight July 7–August 8 and September 6.

SS—26 specimens. Dolinsk (Lyubarskaya) ex 1., 1961. Kholmsk

(EV) July 2–15, 1971. Environs of Novoaleksandrovsk (EV) July 17, 1971; (Z, L, K) July 26–August 20, 1967. Southern Sakhalin (EV) July 22, 1971; (Z) August 20, 1967. Kuznetsovka River forest reserve, August 8, 1951. Korsakov (E) August 20, 1965. Found singly in mixed forests. Larvae in September in fruits of *Rosa rugosa*. Flight July 26–August 23.

SK—188 specimens. Iturup: Lesozavodsk (Azarova, Krivolutskaya) July 19, 1963. Foothills of Berutarube volc (E) July 31, 1965. Kunashir: Kosmodem'yansk (Krivolutskaya) August 28, 1964; southern Kurils (E) August 17, 1965. Environs of Sernovodsk (Z, K) July 2–August 17, 1967; Lake Peschanoe (K) July 22–31, 1967; Cape Vodopadnyi (Z, K) July 25–26, 1967; Belkino (Z, K) August 2–3, 1967; Lake Glukhoe (Z, K) July 11–August 2, 1967; Golovkina volc (K) August 2, 1967. Common in outgrowths of Rosaceae along the coast in fir–yew–broad-leaved, fir–broad-leaved, oak, coniferous, and Erman's birch forests, and in outgrowths of tall grasses, in gardens, and places abandoned by man. More than 10 specimens found. Flight July 2–August 28.

China, Japan (Hokkaido, Honshu).

Capua favillaceana Hb.

Danilevskii, 1955: 69; Kuznetsov, 1967: 51; 1970b: 39.

Pupae hibernate. Flight from mid-May to July. Eggs laid in groups (sheets) of 5 to 20. Fertility of females increases with water intake. Larvae polyphagous and early instars skeletonize leaves of *Quercus, Betula, Rubus, Alnus, Vaccinium*, and other arboreal shrubs. Feeding on fresh leaves, they destroy them. Development slow. Distribution: Trans-Palearctic (broad-leaved and mixed forests, forest-steppes).

PR—5 specimens. Klimoutsy (FCH) June 4–17, 1959. Simonovo (FCH) June 8–14, 1959.

SP—128 specimens. Yakovlevka (Zinov'eva) May 22, 1962; (D, FV) May 23–June 20, 1926. Vinogradovo (D, FV) May 27–June 10, 1929. Baranovsk (FCH) June 8, 1963; GTS (Z, K) May 21–June 25, 1966. Suputinsk forest reserve (K) May 21–June 17, 1966. Kaimanovka (M) June 16–21, 1971. Khualaza (KR) June 10, 1928. Environs of Suchan, Sikhote-Alin' pass (KR) June 1–22, 1928. Northern slopes of Tskhamo'-Dynz (KR) June 6, 1928. Tigrovoi (KR) June 20–21, 1928. Okeanskaya (S, FCH) May 22–28, 1963; (Mordvilko) June 5–6, 1926. Nadezhdinskaya (M) June 23, 1971. Common in lespedeza groves, lowland broad-leaved forests along floodplains and slopes, in oak–linden forests, in outgrowths of shrubs near inhabited places. Found singly in cedar–broad-leaved and spruce–broad-leaved forests.

Imagoes in evening and at light. Flight May 21–June 27, moderately intense in first few days of June.

SS—24 specimens. Environs of Novoaleksandrovsk, spurs of Susunaiskii range (L, SHO) May 30–July 1, 1967. Common in mixed forests damaged by felling. Imagoes observed during day and in evening.

SK—89 specimens. Kunashir: environs of Sernovodsk and Lake Glukhoe (Z, K) June 8–July 31, 1967; Lake Peschanoe (K) June 19–July 1, 1967; Cape Chetverikov (K) June 25, 1967; Alekhino (K) June 21, 1967. Common in oak forests with *Quercus crispula*. Found singly in Erman's birch, broad-leaved, spruce–fir–broad-leaved, fir–yew–broad-leaved forests with oak, as well as in tall grass meadows, and along fringes of forests. Flight June 8–July 31, 1967, during day and in evening, and also under forest cover in rainy weather.

Philedone gerningana Den. and Schiff.

Kuznetsov, 1967: 51.

In Europe polyphagous larvae on various herbaceous plants (*Medicago, Potentilla, Lotus, Scabiosa, Plantago, Statice*) (Swatschek, 1958) and *Vaccinium uliginosum*. Distribution: Trans-Palearctic (forests and steppes).

PR—7 specimens. Klimoutsy (S) August 11–15, 1958. Simonovo (Dorokhina, FCH) August 13–14, 1959. Rarely in steppe oak–larch forests and lowlands. Flight August 11–15; mistakenly reported as June by Kuznetsov (1967).

Pseudargyrotoza conwagana F.

Danilevskii, 1955: 77; Lyubarskaya, 1964: 78–83.

Pupae hibernate in upper layer of forest litter and remain there together with fallen leaves and fruits of *Fraxinus* and *Syringa*. Winter diapause of pupae transforms into summer diapause and first flight occurs only midsummer. Larvae in the Far East severely damage fruits of ash and lilac, although in Europe they were also found in seeds of *Ligustrum* and *Berberis* (Hannemann, 1961). They consume seeds, often leaving only the coat. Older larvae penetrate fruits and pupate in a thin cocoon there or in rolled leaf edges strengthened with silky threads. On the mainland in the Far East periodic mass reproduction of this species is observed throughout the territory in which *F. mandschurica* occurs, and is definitely not coincident with the period of pupation on Sakhalin Island. *P. conwagana* is a serious pest of ash and lilac in botanical gardens, parks, and often damages valley broad-leaved, coniferous–broad-leaved, and elm–ash forests, especially in floodplains. On the average these larvae destroy 15 to 20%, at places even 50 to 85% of the seeds of *F. mandschurica*, and up to 70% of the seeds of *S. amurensis*, and 10 to 14% of the seeds of *F. rhynchophylla*. Also recorded on *S. wolfii*. In botanical gardens this species also damages seeds of introduced plants such as *F. pennsylvanica, S. vulgaris*, and *S. emodi*. In the Far East represented by the unique subspecies *aeratana* Kenn. Distribution: Amphi-Palearctic. Nominative subspecies in West Europe, European part of the USSR, and the Caucasus. The eastern subspecies does not move beyond the limits of the Manchurian subregion.

PR—7 specimens. Environs of Khabarov (SHE) August 6–9, 1959. Khekhtsir (SHE) July 9, 1959. Larvae damage *S. amurensis* in parks during August.

SP—139 specimens. Vinogradovo (D, FV) June 21–July 17, 1929. Ussuriisk (FCH) July 1–8, 1959. GTS (FCH) June 26–July 16, 1959; (Z, K) July 11–August 5, 1966. Upper reaches of Suputinka River (KR) June 23, 1933. Peishula (S, FCH) July 12–14, 1963. Kangauz (FCH) June 23–July 5, 1963; (M) July 3–8, 1971. Tigrovoi (FCH) June 28, 1933; (KR) July 15, 1928. Okeanskaya (S, FCH) June 16–July 23, 1963; (FCH) July 9–13, 1959. Shamora (S) July 10, 1963. De Vries Peninsula (KR) June 30, 1953; (O) August 22, 1960. Environs of Vladivostok, Sedanka (S, FCH) June 25–August 4, 1963. Kedrovaya Pad' forest reserve (M) July 1, 1971. Common, and damages ash and lilac in ash–elm and ash–lilac plantations destroyed by felling, and other lowland broad-leaved forests along floodplains, as well as parks and gardens. Rare in fir–broad-leaved and cedar–broad-leaved forests along slopes. Flight June 2–16 to August 5.

SS—(Lyubarskaya, 1964).

SK—1 specimen. Kunashir: environs of Sernovodsk (K) July 13, 1967. Rare in fir–yew–broad-leaved forests on oceanic terraces in which ash and lilac also occur.

Tribe Cnephasiini

Propiromorpha rhodophana H.-S.

Kuznetsov, 1967: 51.

Pupae hibernate. Larvae in Europe in seeds of *Clematis integrifolia*. Distribution: Amphi-Palearctic (broad-leaved, rarely mixed forests).

Central and southern Europe, Asia Minor, northeast Africa, Mongolia.

PR—6 specimens. Klimoutsy (K, S) May 31–June 16, 1958. Found singly in sparse black birch–oak–larch forests and in floodplain meadows.

SP—20 specimens. Yakovlevka (D, FV) May 10–31 and July 14–20, 1926. Vinogradovo (L, FV) July 23–30, 1929. GTS (K) May 23–30, 1966. Common in pastures, in outgrowths of shrubs near inhabited places, along fringes of lowland broad-leaved forests, in mixed grass meadows. Imagoes fly in evening. Flight May 10–31 and July 14–30, indicating possibility of two generations per year.

Cnephasia alternella Stph. (*uniformana* Car., *cinereipalpana* Raz., *kurentzovi* Fil.)

Razowski, 1958: 581, original description of *C. cinereipalpana* Raz.; Filip'ev, 1962: 380, original description of *C. kurentzovi* Fil.; Razowski, 1965: 255.

Larvae polyphagous. Young instars mine leaves, then leave them and form fairly large chambers of leaves wrapped in silky threads together with twigs and sometimes flower buds. In the Far East primarily found on herbaceous plants of Asteraceae, rarely on Solanaceae, Brassicaceae, Rosaceae, and Oleaceae. The East Asian subspecies *cinereipalpana* Raz. differs slightly in structure of the male genitalia from specimens of Europe and southern Kurils. Distribution Amphi-Palearctic (broad-leaved, rarely mixed forests).

Europe, the Caucasus, southern Ural region, mountains of Turkmenia.

SP—147 specimens. Yakovlevka (D, FV) July 14–15, 1926. Ussuriisk (Shabliovskii) July 12–15, 1966. GTS (FCH) June 28–July 8, 1959; (Z, K) June 24–July 28, 1966. Suputinsk forest reserve (KR) August 22, 1947. Kangauz (FCH) June 25–July 7, 1963; (M) July 3–10, 1971. Tigrovoi (KR) July 7–12, 1928. De Vries Peninsula (KR) June 25, 1957, June 30–August 5, 1955; (O) July 6–16, 1960, July 8–9, 1959. Okeanskaya (S, FCH) June 29–July 22, 1963; (FCH) July 9–11, 1959; (Zagulyaev) August 11, 1950. Environs of Vladivostok, Lyanchikhe (S) June 30–July 10, 1963. Adimi (Emel'yanov) July 21–24 (July 3–6), 1904. Common in inhabited places, vacant lands, and pastures along fringes of damaged mixed and broad-leaved forests. In fields and kitchen gardens larvae occur on transplanted seedlings of cabbage. In wastelands and forests they primarily develop on weeds of Asteraceae: *Artemisia stolonifera* and other species of wormwood, *Petasites japonicus*, and so forth. They are also found on undergrowths of *Fraxinus rhynchophylla* and other arboreal plants. Phen: larvae emerge from June 2–22, pupation June 7–23, first flight June 23–July 4, flight June 24–August 22. Imagoes common at light, rare in evening.

SS—12 specimens. Environs of Novoaleksandrovsk (Ermolaev) ex l., July 8–August 10, 1970; (L, SHO) ex p., July 22, 1967; (K) August 20, 1967. In kitchen gardens larvae on *Solanum tuberosum*, in gardens on cultivated *Fragaria,* and on *Rosa* and *Sorbus*. Damage not significant. In mixed forests and tall grasses larvae on *Petasites japonicus, Senecio palmatus, Taraxacum* sp., and other plants of Asteraceae. Phen: larvae June 10–July 24, pupation June 20–July 29, first flight July 8–August 10, flight August 20.

SK—56 specimens. Kunashir: southern Kurils (E) August 17, 1965. Sernovodsk and Lake Glukhoe (K) August 6–16, 1967. Alekhino (E) August 11–13, 1965; (Dorokhovy) August 25, 1966. Common at light in inhabited places and along fringes of oak groves and damaged mixed forests, in mixed grass and tall grass meadows. Larvae in rolled leaves of *Ptarmica japonica* and other Asteraceae. Phen: larvae from July 1, first flight July 30, flight July 29–August 25.

Cnephasia ussurica Fil.

Flip'ev, 1962: 378, original description.

Known only from southern Sikhote-Alin'.

SP—6 specimens. Tigrovoi (KR) July 8–24, 1928. Tskhamo-Dynza mountain (KR) July 6, 1928.

Cnephasia alticola Kuzn.

Kuznetsov, 1966: 205, original description.

Known only from southern Sikhote-Alin'.

SP—1 specimen. Peak of Khualaza mountains, 1,600 m (FCH) July 3, 1963.

Oxypteron stenoptera Fil.

Filip'ev, 1962: 381, original description; Kuznetsov, 1967: 51.

Distribution: Amur–Ussuriisk–China.

PR—45 specimens. Klimoutsy (FCH) June 4–6, 1959; (K, S) June 5–25, 1959. Common in dense black birch–oak forests on northern and northwestern exposures.

SP—1 specimen. Northern slope of Tskhamo-Dynza mountain (K) June 6, 1928.

Kawabea ignavana Chr.

Christoph, 1881: 73, original description; Kennel, 1908–1921: 225; Razowski, 1965: 293.

Distribution: Japan–Ussuriisk–China.

SP—1 specimen. Ussuriisk (Christoph, 1881). Upper reaches of

Suputinka River (KR) April 24, 1935.

Japan (Hokkaido).

Eana argentana Cl.

Kuznetsov, 1971a: 515.

Larvae polyphagous and in Europe found on various plants, more often on herbaceous, as well as on seedlings of *Picea* (Hannemann, 1961). Distribution: Trans-Palearctic (coniferous and mixed forests).

PR—1 specimen. "Amur Expedition of Hondati, group of Prokhorov, July 19, 1912."

SK—46 specimens. Urup: Podgornoe (Azarova, Krivolutskaya) August 12, 1963. Kunashir: environs of Sernovodsk (Z, K) July 5–August 6, 1967. Shikotan: Krabozavodsk (E) July 13–August 5, 1965. Common on mixed grass, tall grass and sedge–cereal meadow along fringes of sparse oak, fir–yew–broad-leaved, and other forests, as well as outgrowths of Rosaceae near the ocean. Flight July 5–August 12. Imagoes in evening and at light.

Eana incanana Stph.

Larvae polyphagous. In Europe damage *Chrysanthemum* (Klimesch, 1961. Noted on *Ornithogalum nutans* and *Scilla* (Hannemann, 1961). Distribution: Trans-Palearctic (forest zones).

PR—1 specimen. Pokrovka (Hedemann) May 25 (June 7), 1877.

SP—19 specimens. Yakovlevka (D, FV) July 13, 1926. Ussuriisk (A) June 4, 1957; (FCH) July 7–8, 1959; (Shabliovskii) July 12–15, 1966. GTS (Z) July 15–17, 1966. Suputinsk forest reserve (KR) August 22, 1947. Tigrovoi (KR) July 24, 1928. De Vries Peninsula (O) June 30, 1959–July 9, 1961, July 12, 1960; (KR) July 15, 1957. Found singly at light in inhabited places.

Eana vetulana Chr.

Christoph, 1881, 72, original description; Kennel, 1908–1921: 211; Razowski, 1965: 324; Kuznetsov, 1967: 51.

Distribution: Manchuria.

PR—10 specimens. Klimoutsy (K, S) July 10–16, 1958. Simonovo (Dorokhina) July 7, 1959; (FCH) July 29, 1959. Blagoveshchensk (Hedemann) July 1–12, 1877. Radde (Korb) 1905. Found singly at light and in black birch–oak–larch forests. Flight July 7–29, 1959.

SP—25 specimens. Yakovlevka (D, FV) June 26–July 10, 1926. Vinogradovo (D, FV) June 23–July 12, 1929. Upper reaches of Suputinka River (KR) June 24, 1933. Okeanskaya (S) June 29, 1963. Vladivostok (Christoph) June 18 (30), 1877 (lectotype *Sciaphila* *vetulana* Chr.). Askol'd (Hedemann). Common in lowland broad-leaved forests along floodplains. Flight June 23–July 12.

Korean Peninsula and Japan.

Doloploca praeviella Ersch.

Kennel, 1908–1921: 222; Kuznetsov, 1967: 52.

Pupae hibernate. Larvae in Kazakhstan reported on *Spiraea*, but evidently polyphagous. Distribution: Eastern Palearctic (mostly forest steppes). Mountains of Kazakhstan, southern Siberia, and Baikal region.

PR—1 specimen. Simonovo (FCH) June 12, 1959.

SP—5 specimens. Yakovlevka (D, FV) June 20, 1926. GTS (Z, K) May 11–June 4, 1966. Confined to pastures with flower beds of shrubs of Rosaceae: lilac and roses. Imagoes in evening at light.

Doloploca buretica Stgr.

Razowski, 1965: 332.

Distribution: Amur–Ussuriisk–China.

Trans-Baikal (Kentei).

SP—50 specimens. Yakovlevka (D, FV) May 1–10, 1929. Vinogradovo (D, FV) April 23–May 13, 1929. GTS (K) April 30–May 18, 1966. De Vries Peninsula (Kononov) April 5–May 6, 1958; (KR) May 25, 1957. Vladivostok (D, FV) April 24–May 20, 1929. Common in damaged broad-leaved forests, oak, choke-cherry–common birch, elm–oak, and nut–ash forests; also in outgrowths of shrubs near inhabited places. Rather common along mountain slopes, rare along floodplains. Rare in black fir–broad-leaved forests. Flight April 5–May 25. Imagoes at light, during daytime hours (4:00–7:00 p.m.), and in morning. Elongated eggs laid singly, initially green, but turn red before larvae emerges. Emergence of larvae from May 9.

Doloploca characterana Snell.

Snellen, 1883: 191, original description; Kennel, 1908–1921: 222; Razowski, 1965: 134; Kuznetsov, 1967: 52.

Distribution: Amur–Ussuriisk–China.

PR—2 specimens. Klimoutsy (S) June 4, 1958. "Imas-china May 31," lectotype *D. characterana* Snell.

SP—Suchan (Dorris) 1895 (Razowski, 1965). Mongolia (Kentei).

Trachysmia rigana Sod.

Kuznetsov, 1967: 52.

In southern Primor'e two generations develop. Larvae on *Ane-*

mone (Razowski, 1965). Distribution: Trans-Palearctic (steppes and forest-steppes).

PR—3 specimens. Klimoutsy (K) June 8, 1958; (FCH) June 20, 1959. Rarely at light along fringes of steppe black birch–oak–larch forests.

SP—5 specimens. Yakovlevka (D, FV) June 29 and August 10, 1926. Vinogradovo (D, FV) May 30–June 9, 1929. De Vries Peninsula (O) June 10, 1961. Rarely at light along fringes of lowland broad-leaved forests. Flight May 30–June 29 and in August.

Tribe Ceracini

Cerace xanthocosma Diak.

Kurentsov, 1956b: 240.

In Japan two generations develop (Yasuda, 1965a). Larvae hibernate. They are polyphagous and found on *Quercus acuta, Punica granatum, Magnolia grandiflora, Ilex pedunculosa, Acer palmatum, Clethra barvinensis, Pieris japonica, Lyonia ovalifolia*, and various species of *Prunus* and *Cinnamonum.* In South Asia replaced by vicarious species *C. guttana* Feld. Distribution: Japan.

SS—Korsakov (Otomari) (Kurentsov, 1956b).

Japan (Honshu, Shikoku, Kyushu).

Eurydoxa advena Fil. (*sapporensis* Mtsm.)

Filip'ev, 1930a: 373; Kurentsov, 1956b: 239.

Young larvae hibernate (Oku, 1961). They live in groups in silken nests on *Picea jezoensis* (Yasuda, 1965a); also found on *Abies veitchii.* Notable pests on Hokkaido. Resume feeding after hibernation, covering several apical branches with common nest-type network prepared from silky discharge. They pupate in weak cocoons inside this network or on branches. Flight on Hokkaido at end of July–beginning of August. This species was described from central Sikhote-Alin' on the basis of a single male *Ceraceopis ussuriensis* Kurentz. which, most probably, is the male of *E. advena* Fil., but due to sexual dimorphism differs from the holotype (female) of this species described by Filip'ev.

Distribution: Japan–Ussuriisk.

SP—3 specimens. Watershed of Bikina and Khora Rivers, Arsen'eva, at 800 m (KR) July 22, 1948 (Kurentsov, 1956b). Khualaza (KR) August 11, 1928. Oblachnaya (Kononov and KR) August 1, 1950 (Kurentsov, 1956b). Rare in montane mixed forests at height of 800 to 1,000 m. Flight July 22–August 11.

SS—Korsakov (Otomari) August 12, 1922 (Yasuda, 1965a).

SK—2 specimens. Kunashir: Cape Petrov, 7 to 10 km north of southern Kuril'sk (Konovalova, Krivolutskaya) August 31, 1964; Shikotan: environs of Malokuril'sk (Kostyuk) August 14, 1971. Common locally in spruce–fir forests near the ocean. Imagoes found during day under forest canopy in bright sunlight. In cloudy weather hover over *Abies sachalinensis*. Flight August 14–September 1.

Tribe Tortricini

Spatalistis christophaena Wlsgm. (*exuberans* Kenn., *joannisi* Wlsgm.)

Kennel, 1908–1921: 153, 154.

In Japan larvae in rolled leaves of *Quercus acuta* (Razowski, 1966). Distribution: Japan–Ussuriisk–China.

SP—29 specimens. GTS (Z) August 7–10, 1966; (Zinov'eva, N) August 15–23, 1962. Upper reaches of Chapigou River (Zinov'eva) July 31, 1962. Suchan (Palshkov) August 1–13, 1933. De Vries Peninsula (O) July 16–August 13, 1961, August 2, 1964; (KR) August 16, 1957. Okeanskaya (FCH) July 20–September 2, 1963; (Kerzhner) August 19, 1959. Found singly on light in oak forests and broad-leaved forests with *Quercus mongolica*. Flight July 16–September 2, mixed flight in August.

China, Korean Peninsula, Japan (Hokkaido, Honshu).

Spatalistis bifasciana Hb.

Kuznetsov, 1971a: 514.

Larvae probably hibernate. They are polyphagous and in Europe develop from July to autumn in berries of *Vaccinium, Rhamnus*, and *Cornus* (Hannemann, 1961). In Japan recorded in berries of *Rhamnus costata* and *Cornus controversa* (Razowski, 1966). Iturup males differ from the central European form in length of sclerotized appendages at apex of valve and females in shape of ostial funnel. Phenological periods shift with change in latitude. Flight on Kushu and Shikoku Islands in May, on Honshu from May to July, on Hokkaido in July, in Primor'e from end June to mid-July, and on Kunashir Island from end June to mid-August. Distribution: Amphi-Palearctic (European broad-leaved, Far East mixed forests).

Europe.

SP—39 specimens. GTS (FCH) June 28–July 17, 1959; (Z) July 13, 1966. Environs of Artem, Ugol'naya (A) July 13, 1960. Khualaza (KR) July 1, 1949; (FCH) July 3, 1963. Peishula (FCH) July 13, 1963. Kangauz (FCH) June 26, 1963. Tigrovoi (FCH) June 29–July 2, 1963. Okeanskaya (S, FCH) June 22–August 5, 1963. Environs of Vladivostok, Lyanchikhe (S) June 30–July 11, 1963. Common in lowland broad-leaved forests along floodplains. Flight in environs of Okeanskaya June 22–August 5.

SS—2 specimens. Environs of Novoaleksandrovsk, residue of mixed forests (L, SHO) July 1–26, 1967.

SK—49 specimens. Iturup: foothills of Berutarube volc (E) July 31, 1965. Kunashir: environs of Mendeleevo (K) July 19, 1967; Cape Vodopadnyi (K) July 26, 1967; environs of Sernovodsk (Z, K) June 21–August 17, 1967; Belkino (Z) August 3, 1967; Lake Peschanoe (K) July 1–27, 1967; environs of Alekhino (K) August 2, 1967. Found singly in spruce–fir–broad-leaved, fir–yew–broad-leaved, fir–broad-leaved forests with oak, coniferous–Erman's birch, and other mixed forests, in oak groves and alder forests. Rare in outgrowths of tall grasses along fringes of forests. Flight during day and in evening, June 21–August 17, 1967. Shikotan (Kostyuk) August 15–22, 1971.

China, Japan (from Hokkaido to Kyushu).

Paratorna scriepuncta Fil.

Filip'ev, 1962: 373, original description; Razowski, 1966: 139.

Known only from southern Sikhote-Alin'. In the Himalayas replaced by the closely related species *P. fenestralis* Raz.

SP—16 specimens. Vinogradovo (D, FV) July 8–9, 1929. Upper reaches of Suputinka River (D, FV) July 5, 1933. Suputinsk forest reserve (Shabliovskii) July 12–14, 1968. Khualaza (FCH) July 12, 1963. Peishula (FCH) July 12–13, 1963. Kangauz (FCH) July 6, 1963; 25 km east of Varfolomeevka (Kerzhner) July 17, 1963. Found singly in evening in black fir–broad-leaved and cedar–broad-leaved forests. Flight July 5–August 17.

Paratorna cuprescens Flkv.

Fal'kovich, 1965: 429, original description.

Known only from southern Sikhote-Alin'.

SP—45 specimens. GTS (Z) July 18, 1966. Environs of Artem, Ugol'naya (A) June 14, 1961, July 11, 1960. Kangauz (FCH) June 25–July 6, 1963. Okeanskaya (FCH) June 21–July 23, 1963. Environs of Vladivostok: Sedanka (FCH) June 21–July 11, 1963. Common in lowland broad-leaved forests along floodplains; rare in black fir–broad-leaved and cedar–broad-leaved forests. Flight in evening June 14–July 23

Acleris comariana Z. (*baracola* Mts.)

Kuznetsov, 1967: 52.

Eggs hibernate. In spring larvae in Japan damage new leaves of strawberry (Oku, 1967), but in the Far East recorded only on *Spiraea* and *Comarum*. In southern Primor'e two generations develop. Distribution: Holarctic (marshes and floodplains).

PR—40 specimens. Simonovo (FCH) July 27–August 14, 1959. Common in marshes; larvae on *S. salicifolia* and *C. palustre*.

SP—38 specimens. De Vries Peninsula (O) July 2–13, July 25, and September 5, 1961; (KR) July 6, 1955; (O) July 7, 1959, July 13, August 28, and September 30, 1960. Okeanskaya (A) July 9, 1959; (FCH) July 9–12, 1959; (S, FCH) July 10–20, 1963. Larvae common in rolled leaves of *S. salicifolia* and *S. betulifolia* in lowland broad-leaved forests along floodplains near inhabited places. Phen: larvae May 25–July 1, pupation May 26–July 2, first flight June 23–July 20, flight of first generation July 2–25, of second generation 28–September 30.

Acleris latifasciana Hw. (*schalleriana* auct.)

Caradja, 1916: 45; Filip'ev, 1931: 508; Danilevskii,1955: 66; Razowski, 1966: 210; Kuznetsov, 1970b: 40.

Eggs hibernate. Larvae slightly damage fruits and berries of Rosaceae in gardens as well as wild plants of *Rosales* and *Ericales* (tree-type shrubs as well as herbs) in forests. Feed on leaves, buds, and opening flower buds. In the Far East represented by three color forms. On Kunashir 72% of the population consists of f. *comparana* Hb. and about 20% of f. *latifasciana* Hw. Distribution: Trans-Palearctic (broad-leaved and mixed forests).

PR—4 specimens. Radde (Korb); Kazakevichevo (Caradja, 1916). Liman of Amur River, Ozernakh (Chernavin) 1915.

SP—29 specimens. GTS (K) ex 1., July 31, 1966; (Z, K) August 3–13, 1966; (Zinov'eva) August 26, 1962. Suputinsk forest reserve (KR) August 14, 1947. Suifun (Dorris). De Vries Peninsula (KR) August 3, 1957; (O) August 3, 1960. Okeanskaya (FCH) July 16–31, 1963; (Zagulyaev) September 12, 1950. Environs of Vladivostok: Sedanka (A) August 14, 1959; Petrov Island (D) September 20, 1934. Kedrovaya Pad' forest reserve (Tsvetaev) October 12, 1966. Found singly in lowland broad-leaved forests along floodplains. Larvae on *Spiraea salicifolia* and *S. media*. Phen: larvae from June 28, pupation July 13–17, first flight July 31–August 2, flight August 3–October 12.

SS—42 specimens. Environs of Novoaleksandrovsk, foothills of Susunaiskii range (Z, K, L, SHO) August 16–22, 1967. Southern Sakhalin (Z, K, L) August 20, 1967. Kholmsk (L) August 15, 1966. Larvae common in gardens on cultivated strawberry, currant, and raspberry; mass in fringes of mixed forests of *Filipendula kamtschatica*.

Phen: larvae June 10–July 25, pupation July 8–20, first flight July 24–August 7, flight August 15–21, 1967.

SK—32 specimens. Kunashir: Cape Stolbchatyi (Z) August 10, 1967. Environs of Sernovodsk, Lake Glukhoe, Alekhino, Lake Peschanoe, Belkino (Z, K) August 3–16, 1967. Shikotan: environs of Malokuril'sk (Krivolutskaya) August 28, 1963. Larvae slightly damage *Fragaria iinumae, Spiraea betulifolia, Cerasus kurilensis, Rubus sachalinensis* in mixed forests of various types destroyed by felling; also in oak groves and outgrowths of Rosaceae near the ocean. Throughout southern Kunashir Island found along fringes of oak, Erman's birch, coniferous and mixed forests, in tall grass and mixed grass meadows, even on *Filipendula kamtschatica*. Emerging larvae 1.0 to 1.5 mm long found en masse in outgrowths of *Filipendula kamtschatica* and on leaves of this plant up to beginning of bud formation. Dozens of young larvae were seen on individual branches. They skeletonize the leaf blades and wrapped them with silky threads in the form of an accordion. Damage similar in strawberry and *Aruncus asiatica*. In sour cherry found more often under rolled margins of leaves and on *Eubotryoides grayana* in new flower buds. Phen: larvae June 12–July 28, pupae July 7–August 12, first flight July 28–August 11, flight August 3–18.

Acleris albiscapulana Chr.

Christoph, 1881: 63, original description; Kennel, 1908–1921: 79; Filip'ev, 1931: 516; Razowski, 1966: 219.

Imagoes probably hibernate since flight takes place in May–June and August–October. Distribution: Manchuria.

PR—Kazakevichevo (Korb) 1907 (Razowski, 1966).

SP—6 specimens. Vinogradovo (D, FV) May 14–27, 1929. GTS (K) June 4–9, 1966. Suputinsk forest reserve (K) June 21, 1966. Environs of Vladivostok (Christoph, 1881). Found singly at light in valley broad-leaved, cedar–broad-leaved, and spruce–broad-leaved forests. Flight May 27–June 21.

SK—6 specimens. Environs of Sernovodsk (Z, K) June 3–13 and July 8–15. Alekhino (K) June 12, 1967. Found singly in fir–yew–broad-leaved and oak forests.

Korean Peninsula, Japan (Hokkaido, Honshu, and Shikoku).

Acleris nigrilineana Kaw.

Larvae on needles of *Pinus* and *Abies*. Possibly, other coniferous trees also. Distribution: Japan–Ussuriisk.

SP—4 specimens. Environs of Tetyukhe, Taiga town (Kashcheev)

September 21, 1971. Sinancha (Kashcheev). Phen: larvae in August, pupation and August. First flight from September 3.

Japan (Honshu).

Acleris abietana Hb.

Imagoes hibernate. In Europe larvae found on needles of *Picea*, *Abies*, and *Pinus*. Females differ from the European specimens in shape of lateral evaginations of walls of sterigma. Distribution: Trans-Palearctic (coniferous forests).

SP—2 specimens. Sinancha (Kashcheev). Suputinsk forest reserve, Egerskii Pass (K) June 21, 1966. One pupa found on *Picea ajanensis* in cedar–broad-leaved forest.

Acleris maccana Tr. (*fishiana* Fern)

In Europe imagoes hibernate and females lay eggs in spring (Razowski, 1966). Larvae live on species of *Ericales*, in the western Palearctic in rolled leaves of *Vaccinium myrtillus, V. uliginosum*, and *Ledum palustre*. Distribution: Holarctic (forest-tundra and coniferous forests).

SK—2 specimens. Kunashir: cauldron of Golovnina volc (K). Larvae massed on August 2 in rolled leaves of *Ledum macrophyllum* in sparse coniferous forests along rim of cauldron. Pupation August 15–26, first flight September 6–16, 1967.

Acleris platynotana Wlsgm. (*ocydroma* Meyr.)

Kuznetsov, 1967: 53.

In Japan imagoes hibernate (Oku, 1961). Larvae on evergreen species of Ericales and Aquifoliaceae (*Rhododendron linearifolium, Vaccinium* sp., *Ilex pedunculosa*) (Razowski, 1966) and *Lyonia ovalifolia* (Yasuda, 1965a). Flight in Japan during May–June and from August to October. Cycle of development in the Far East possibly different. Distribution: Manchuria.

PR—6 specimens. Klimoutsy (K) ex 1., July 9, 1958. Simonovo (FCH) ex 1., July 3–11, 1959. Larvae found singly in rhododendron groves and black birch–oak–pine forests in rolled leaves of *Rhododendron dahuricum*. Phen: larvae from June 15, pupation from June 28, first flight July 3–11.

SP—1 specimen. Environs of Vladivostok, Sedanka (S, FCH). Large larvae on *R. mucronulatum* on June 21, pupation July 5, first flight July 12, 1963.

China (hilly regions) Japan (Hokkaido, Honshu).

Acleris caerulescens Wlsgm. (*staudingeri* Kenn.)

Walsingham, 1901: 370, original description; Kennel, 1908–1921: 64.

Eggs probably hibernate. Larvae in rolled leaves of *Fraxinus*. Older larvae green with yellow head. Distribution: Japan–Ussuriisk–China.

SP—76 specimens. GTS (Z, K) July 28–August 6, 1966; (FCH) August 2, 1963; (Zinov'eva) August 23, 1962. Suputinsk forest reserve (Zinov'eva) August 14, 1962. Suchan (Tsvetaev) July 28, 1943. De Vries Peninsula (O) August 12, 1959, August 17, 1960. Okeanskaya (FCH) August 14, 1959, August 28, 1963. Environs of Vladivostok, Sedanka (A) August 14, 1959. Kedrovaya Pad' forest reserve (Tsvetaev) September 25–October 15, 1966. Common in damaged alder–ash and other valley broad-leaved forests with Manchurian ash. Larvae damage *F. mandschurica* in deciduous forests. Rare in black fir–broad-leaved and cedar–broad-leaved forests. Phen: larvae May 31–June 18, pupation June 1–19, in July apparently summer estivation of pronymphs or pupae occurs, flight July 28–October 15. Imagoes attracted to light en masse.

China, Japan (Hokkaido, Honshu).

Acleris paradiseana Wlgsm. (*paradiseana* Kenn.)

Walsingham, 1901: 370, original description; Kennel, 1908–1921: 67; Kurentsov, 1950: 30; Kuznetsov, 1969b: 43; 1970b: 40.

Eggs supposedly hibernate. Larvae of middle instars greenish with black head and legs; in older larvae only head remains black. They live in tubes under rolled margins of leaves in species of Rosales. Distribution: Manchuria.

PR—1 specimen "Amur". Collection of Staudinger, 1893.

SP—98 specimens. Environs of Ussuriisk, Baranovsk (Dorris). Upper reaches of Chapigou River (Zinov'eva) August 2, 1962. Suifun (Dorris). Suchan (Dorris). Okeanskaya (S, FCH) July 31–August 2, 1963; (A) August 11–24, 1959; (Kerzhner) August 19, 1959; (KR) September 10, 1947. Shamora (S, FCH) ex 1., July 24, 1963. De Vries Peninsula (O) July 21, 1964; (KR) July 30, 1957; (O) August 6, 1962, August 16, 1964, August 17, 1960. Environs of Vladivostok, Sedanka (A) August 14, 1959; (FCH) August 4–September 8, 1963. Kedrovaya Pad' forest reserve (Tsvetaev) August 12 and September 24–October 18, 1966. Common in destroyed lowland broad-leaved and mixed forests, in oak groves along slopes and floodplains, and in outgrowths of Rosaceae near the ocean. Larvae on *Cerasus maximowiczii, Crata-*

egus pinnatifida, and *Micromeles alnifolia*. Most probably, part of the population undergoes summer diapause, since flight is much prolonged. Phen in Vladivostok region: larvae June 4–July 1, pupation July 2–7, first flight July 18–24, flight in evening and on light July 21–September 10 and September 24–October 18.

SS—33 specimens. Siretoko Peninsula, Tobuti (D) September 4, 1947. Environs of Novoaleksandrovsk (Z, K, L, SHO) August 16–22, 1967. Kholmsk (L) August 30, 1966. Korsakov (E) August 20–21, 1965. Common in mixed forests damaged by felling and debris. Larvae on *Sorbum sambucifolia* and *Crataegus chlorosarca*. Imagoes in gardens often collected with nets from apple and plum. Phen: larvae May 18–June 9, pupation June 10–20, first flight July 8–21, flight August 16–September 4.

SK—7 specimens. Kunashir: Lake Peschanoe, environs of Sernovodsk (K). Larvae during period of flowering and fruiting found frequently in abandoned gardens on crab-apple. Damage insignificant. In spruce–fir–broad-leaved forests on terraces and in outgrowths near the ocean; found singly on *Cerasus kurilensis, C. sachalinensis,* and *Padus ssiori*. Phen: larvae June 4–July 20, pupation July 12–August 9, first flight August 1–10, 1967.

China, Japan (Hokkaido, Honshu, Kyushu).

Acleris cribellata Flkv.

Fal'kovich, 1965: 419, original description; Razowski, 1966: 256.

Larvae light yellow; prothoracic scutella, legs, and anal scutellum same color as body; head usually yellow, along sides sometimes with two dark spots. Polyphagous. Found on plants of unrelated orders—Magnoliales, Oleales, and Sapindales. Live in leaves folded in half along midrib and wrapped in silky threads. Known only from southern regions near the ocean.

SP—5 specimens. Okeanskaya (FCH) August 15, 1959. Vladivostok, Akademgorodok (A) August 28, 1965. Larvae found singly in lowland broad-leaved forests along floodplains and in parks on *Acer tegmentosum, Schizandra chinensis*, and *Fraxinus mandschurica*. Imagoes attracted to light of quartz lamps. Pronymphs or pupae probably enter summer estivation. Phen: larvae June 19–July 15, pupation July 5–16, first flight July 22–31, flight August 15–28.

Acleris longipalpana Snell. (*electrina* Raz. and Yasuda)

Snellen, 1883: 184, original description; Kennel, 1908–1921: 89; Filip'ev, 1931: 522; Razowski, 1966: 258.

Imagoes probably hibernate since flight takes place in August and

May. In West Europe replaced by an allied species, *A. lorquinina* Dup. Distribution: Manchuria.

PR—1 specimen. Khabarov (Hedemann) August 14 (23).

SP—1 specimen. Yakovlevka (D, FV) May 16, 1926. Cedar–broad-leaved forests.

Japan (Hokkaido, hilly regions of Honshu).

Acleris delicatana Chr.

Christoph, 1881: 60, original description; Kennel, 1908–1921: 69; Filip'ev, 1931: 513; Razowski, 1966: 268.

Adult larvae light yellowish to yellow, head pale yellow; legs, prothoracic and anal setae same color as body. Live in cigar-shaped leaf tubes, formed by turning leaf margin, on species of Betulales, in Japan on *Carpinus japonica*. Pupation at place of damage. Flight in southern Primor'e extends from June to mid-September, because part of population enters summer diapause and pupation, creating the impression of two generations. Distribution: Japan–Ussuriisk–China.

SP—54 specimens. Ussuri (Hedemann) August 16 (29), 1877. GTS (Z, K) July 28, 1966; (Zinov'eva) August 22–26, 1962. De Vries Peninsula (O) July 12–26, 1963, July 30, 1959, August 12, 1960, August 16, 1964, September 5, 1962. Okeanskaya (S, FCH) July 20–September 6, 1963; (A) August 21–24, 1959; September 4, 1947. Vladivostok, July–August (Christoph, 1881). Larvae mass in rolled leaves of *Corylus heterophylla, C. manshurica*, and *Carpinus cordata* in damaged lespedeza and filbert groves, in parks, and in botanical gardens. Imagoes common at light. Rare in native black birch–broad-leaved forests. Most of population estivates at pupal stage. Phen: May 29–June 22, pupation June 4–23, estivating pupae June 4–July 15, first flight July 16–17, pupal development June 16–July 7, first flight July 2–9, flight on light July 12–September 6.

SS—1 specimen. Southern Sakhalin, forest reserve (K) August 20, 1967.

SK—2 specimens. Kunashir: environs of Sernovodsk and Alekhino (K). Larvae found singly in mixed and black birch forests on *Betula ulmifolia*. Phen: larvae June 21–25, pupation July 17, first flight August 5, 1967, flight August 26, 1973 (Kerzhner).

Japan (Hokkaido, Honshu, Kyushu).

Acleris alnivora Oku.

Imagoes hibernate. In Japan larvae live in rolled leaves of *Alnus hirsuta*. In all likelihood summer diapause takes place at the stage of pronymph or pupa. Distribution: Japan–Ussuriisk.

SP—9 specimens. Environs of Ussuriisk and Baranovsk (Dorris). GTS (K) May 10–22, 1966. Kedrovaya Pad' forest reserve (Tsvetaev) October 13, 1966. Found singly at light in lowland broad-leaved forests with *A. hirsuta*. Flight in May and from October enter hibernation.

Japan (Hokkaido, mountains of Honshu).

Acleris issikii Oku

Razowski, 1966: 286.

In Japan (Oku, 1961) hibernation of imagoes recorded but needs to be confirmed, because in Primor'e apparently eggs hibernate. Larvae in rolled leaves of *Populus nigra, P. italica, P. sieboldi*, and species of *Salix*. Flight in June–October. Distribution: Japan–Ussuriisk.

SP—46 specimens. Environs of Ussuriisk (FCH) July 3–7, 1959. GTS (Z, K) July 3–8, 1966. Peishula (Z) July 15, 1966. Tigrovoi (KR) July 15, 1928. Environs of Artem, Ugol'naya (A) July 11, 1960. De Vries Peninsula (O) July 3–7, 1961, July 12, 1963, September 5, 1962. Okeanskaya (FCH) July 9–13, 1959; (FCH) June 30–July 16, 1963. Larvae light green with black head. Common in parks and floodplain willow groves in rolled leaves of *Salix rorida* and *S. siuzevii*. Imagoes also at light in lowland broad-leaved forests along floodplains. In southern Primor'e probably two generations develop. Phen in environs of Ussuriisk: larvae June 6–17, pupation June 15–18, first flight June 25–29, flight of first generation June 30–July 16, of second generation in September.

Japan (Hokkaido, mountains of Honshu).

Acleris emargana F.

Caradja, 1916: 44; Danilevskii, 1955: 63; Kuznetsov, 1967: 53.

Eggs hibernate. Larvae of middle instars with black head; older larvae entirely light green. Develop in rolled leaves on species of Salicales, rarely on Betulales. Flight from June to October. In the Far East represented by a few color aberrations arising from geographic adaptation. In America replaced by the subspecies *blackmorei* Obr. and in Tibet by the subspecies *tibetana* Raz. Distribution: Holarctic (forest zones, forest-steppes).

PR—17 specimens. Simonovo and Korsakovo (FCH) August 7, 1959. Radde (Korb) 1905. Environs of Khabarov (SHE) August 8, 1959. Common in floodplains of Amur River.

SP—24 specimens. GTS (Z) August 5, 1966. Foothills of Oblachnaya mountain (S) August 12, 1963. Yanmut'khouza (Kerzhner) August 15, 1963. Tigrovoi (KR) September 24, 1928. Okeanskaya (S) July 30, 1963. Kedrovaya Pad' forest reserve (Tsvetae) October 11–18,

1966. Common in coniferous forests, birch forests, and willow forests in floodplains. In southern Primor'e either two generations develop or part of population enters summer diapause. Flight notably prolonged, recorded from July 30 to August 15 and September 24 to October 18.

SS—50 specimens. Environs of Novoaleksandrovsk (Z, K, L, SHO) August 9–21, 1967. Foothills of Kamyshovyi range (L) August 21, 1967. Southern Sakhalin (S, K, L, SHO) August 20, 1967. Common in willow forests in floodplains, damage mixed forests, gardens, parks, and forest reserves. Flight in evening August 9–21.

SK—7 specimens. Konashir: environs of Sernovodsk (K). Found singly in spruce–fir–broad-leaved, fir–yew–broad-leaved, and spruce–fir forests, willow forests near lakes, on marshes, and in alder forests. Larvae on *Salix sachalinensis, S. caprea*, and *Alnus japonica*. Phen: larvae June 10–July 20, pupation July 8–20, first flight August 1–8, 1967.

Acleris apiciana Hb. (*rufana* auct.)

Razowski, 1966: 298; Kuznetsov, 1967: 53; 1970b: 40.

Imagoes hibernate. Females lay eggs in May–June. Larvae in the Far East in rolled and woven leaves of Rosales, but in Europe they are also found on *Myrica gale* and Salicales. Pupation occurs at places of feeding. Flight from September to entrance into hibernation and in spring. Distribution: Trans-Palearctic (coniferous and mixed forests).

PR—16 specimens. Dzhalinda (Popov) 1915. Klimoutsy (K, S) May 22–June 14 and September 8, 1959; (FCH) June 4, 1959. Simonov (FCH) May 27–30, 1959. Found singly in sparse black birch–oak–larch and black birch–oak–pine forests as well as in dwarf Arctic birch–willow outgrowths. Flight May 22–June 14 and from September 8 until hibernation.

SP—2 specimens. GTS (K) May 12–24, 1966. In outgrowths of shrubs of Rosaceae on pastures.

SS—4 specimens. Environs of Novoaleksandrovsk (EV) May 16–June 11, 1970.

SK—10 specimens. Kunashir: environs of Sernovodsk, Cape Vodopadnyi, Belkino, Golovnina volc (K). Common in outgrowths of Rosaceae near the ocean in Sernovodsk Isthmus, as well as near foothills, along slopes, and in cauldron of Golovnina volc. Larvae during period of bud formation significantly damage apices of branches and buds of *Rubus sachalinensis, R. triphyllus*, and *Spiraea betulifolia*; rare on *Rosa rugosa, Malus sachalinensis, Sanguisorba tenuifolia, Aruncus asiaticus, Potentilla megalantha*, outgrowths of shrubs, as well as meadows. Species relatively rare in fringes of mixed forests in central part of island. Phen: larvae June 30–August 26, pupation July 30–September 17, first flight September 6–22.

Acleris fimbriana Thnbg. (*tephromorpha* Meyr., *crocopepla* Meyr.)

Kuznetsov, 1955: 124–128.

Cycle of development complicated by seasonal dimorphism. In the Far East represented only by smoky-gray form, f. *fimbriana* Thnbg. (*tephromorpha* Meyr.), which hibernates. In spring females lay eggs singly or in small groups on leaves and branches of shrubs. Larvae primarily live in rolled leaves of shrubs and small trees of Ericales and Rosales. In the northern part of the Korean Peninsula they damage cultivated varieties of Ericales and Rosales in gardens; species develops two generations here and summer generation represented by yellow-orange form, f. *lubricana* Mn. (*crocopepla* Meyr.). In America represented by the subspecies *minuta* Rob., which also has two seasonal forms: dark-winged hibernating form, f. *cinderella* Riley, and summer orange form f. *minuta* Rob. Distribution: Holarctic, but disconnected.

Europe, the Caucasus. Kazakhstan.

PR—1 specimen. Greater Shantar Island (Dul'keit) May 15, 1925.

Northeastern China, North America.

Acleris exsucana Kenn.

Kennel, 1901: 208, original description; 1908–1921: 98; Caradja, 1926: 40; Filip'ev, 1931: 524.

Imagoes hibernate. Oviposition in spring. In Japan probably develops two generations; larvae in rolled leaves of *Deutzia scabra* (Yasuda, 1965b), flight in April, June, and September–October. In the Far East one generation per year. In Europe and America replaced by a close species, *A. schalleriana* L., which is trophically associated with *Viburnum*. Distribution: Japan–Ussuriisk–China.

SP—5 specimens. Yakovlevka (D, FV) May 11 and September 17, 1926. Vinogradovo (D, FV) May 18, 1929. GTS (K) May 11, 1966. Suputinsk forest reserve (K) October 3, 1948. Suchan (Kennel, 1901). Found singly in lowland broad-leaved forests and outgrowths of shrubs near inhabited places. Imagoes drop from *Rosa* when shaken. Flight May 11–18 and September 17–October 3.

SS—1 specimen. Environs of Novoaleksandrovsk (K) ex 1., September 11, 1968. Residue of mixed forests.

Japan (from Hokkaido to Kyushu).

Acleris submaccana Fil.

Filip'ev, 1962: 379, original description; Razowski, 1966: 312.

Imagoes hibernate. Oviposition in spring. Larvae in rolled leaves of Betulales. Flight in September–October and after hibernation in May–June. Distribution: eastern Palearctic (mixed and coniferous forests).

Southern Siberia (Minusinsk), Baikal region.

PR—1 specimen. Kazakevi (Korb) 1907. Larvae on *Betula platyphylla* (Razowski).

SP—22 specimens. Vyazemskii (Borzov) August 21 (September 21), 1909. GTS (K) June 19, 1966. Suputinsk forest reserve, Egerskii Pass, 600 m (K) June 17, 1966. De Vries Peninsula (Kononov) June 6, 1958. Okeanskaya (FCH) June 22, 1963. Kedrovaya Pad' forest reserve (Tsvetaev) October 15–23, 1966. Found singly in spruce–broad-leaved, cedar–broad-leaved, black birch–broad-leaved, and lowland broad-leaved forests. Larvae on *Betula costata* and other species of *Betula*. Phen: flight of hibernating imagoes June 6–22, larvae from June 21, pupation July 19, first flight August 14, flight September 3–October 23.

SK—2 specimens. Kunashir: environs of Sernovodsk (K). Larvae found singly in alder forests near the ocean on *Alnaster maximowiczii*. Phen: larvae July 17–August 10, pupation August 10–September 5, first flight August 26–September 19.

Japan (Hokkaido, Honshu).

Acleris umbrana Hb.

Filip'ev, 1931: 512; Kurentsov, 1950: 30; Danilevskii, 1955: 67.

In Europe imagoes hibernate. Larvae in rolled leaves of *Sorbus, Prunus*, and *Padus* (Razowski, 1966). Flight begins in August. Distribution: Trans-Palearctic (broad-leaved and mixed forests).

SP—5 specimens. Vinogradovo (D, FV) May 21–28, 1929. GTS (K) June 11, 1967. Middle course of Suputinka River (KR) June 5, 1935. Northern slopes of Pidan (KR) June 29, 1928. Older larvae in fringes of lespedeza on *Pyrus ussuriensis*.

Acleris cristana Den. and Schiff.

Caradja, 1916: 44; Filip'ev, 1931: 510; Danilevskii, 1955: 63; Razowski, 1966: 318; Kuznetsov, 1967: 53; 1970b: 41.

Imagoes hibernate. Oviposition in spring. Larvae in rolled leaves of species of Rosales. Sometimes seriously damage ripe fruits of hawthorn. In Japan on *Prunus salicina* and *Crataegus cuneatus*. In Europe also noted on *Salix, Carpinus*, and *Ulmus*, but these reports from literature require verification. In the Far East represented by nine color forms, as determined by Filip'ev (1931), with f. *cristalana* Don., predominant. Distribution: Amphi-Palearctic (broad-leaved and mixed forests).

Europe (from England to the Caucasus).

PR—11 specimens. Radde (Korb). Kazakevichevo (Korb) 1907. Korsakovo (FCH) August 5–7, 1959. Environs of Khabarov (SHE) ex 1., June 28, July 22, and August 4, 1959. Larvae in gardens in rolled leaves of *Pyrus ussuriensis* and *Rosa* sp. Also common in floodplain broad-leaved forests.

SP—78 specimens. Yakovlevka (D, FV) May 1–10 and August 25–September 17, 1926. Vinogradovo (D, FV) May 9–26, 1929. Environs of Ussuriisk: Baranovsk (Hedemann); GTS (Z, K) May 4–27, 1966; (Zinov'eva) August 23, 1962; Suputinsk forest reserve (KR) September 30, 1948. Suchan, Tasano (KR) May 30, 1928. Origin of Sitsa River (KR) May 10–19, 1928. Suifun (Hedemann). De Vries Peninsula (Kononov) May 5, 1958; (O) August 6, 1960. Adapted to gardens and lowland broad-leaved forests along floodplains, especially in nut–ash forests. Rare in outgrowths of shrubs with Rosaceae and in oak groves. Larvae on *Pyrus ussuriensis, Malus manshurica*, and *Crataegus maximowiczii*, and on cultivated plum and apple. In forest reserves cause significant damage to fruits of hawthorn. Flight in evening and at light. Imagoes drop from apple and plum when trees shaken. Phen. in environs of Ussuriisk: flight of hibernating imagoes May 1–30, larvae May 19–June 30, pupation June 28–July 11, first flight July 25–31, flight August 6–September 30.

SS—1 specimen. Environs of Novoaleksandrovsk (L, SHO). Larvae in gardens of blackberry and on mountain ash (*Aronia melanocarpa*) on June 14, pupation July 13, first flight August 3, 1967.

SK—1 specimen. Kunashir: cauldron of Golovnina volc (K). Larvae found singly between wrapped leaves of *Sorbus commixta* and *Cerasus sachalinensis*, pupation from August 26, first flight September 11, 1967.

Japan.

Acleris scabrana Den. and Schiff.

Filip'ev, 1931: 509; Danilevskii, 1955: 66.

Imagoes hibernate. Oviposition in spring. Larvae in rolled leaves of *Salix*. Distribution: Holarctic (forest zone).

SP—1 specimen. Suifun (Hedemann).

Acleris hastiana L. (*pulverosana* Wlkr.)

Danilevskii, 1955: 64; Kuznetsov, 1967: 53.

Imagoes hibernate. Oviposition in spring; eggs laid singly or in small groups on *Salix* and *Populus*. Larvae damage leaves, mainly of apical branches. Pupation in leaves. Distribution: Holarctic (forest-tundra, coniferous and mixed forests, forest-steppes).

PR—12 specimens. Klimoutsy (K, S) May 10–June 19, 1957. Korsakov (Zinov'ev) September 20–22, 1958. Found singly in black birch–oak–larch forests of various types with willows. Larvae in rolled leaves and in floodplain outgrowths of *S. raddeana*. Phen: flight of hibernating imagoes from May 10–June 19, larvae June 30–August 11, pupation August 11–12, first flight August 28–September 6, flight September 20–22.

SP—1 specimen. Okeanskaya (S, FCH) ex 1., *Salix* sp. Larvae June 10, pupation July 2, first flight July 16, 1963.

Acleris salicicola Kuzn.

Kuznetsov, 1970a: 448, original description.

Imagoes probably hibernate. Larvae in rolled leaves of *Salix*. Some pupae estivate in September, flight in September–October. Known only from Kunashir Island.

SK—1 specimen. Kunashir: environs of Sernovodsk (K). Larvae found singly in mixed forests on *S. sachalinensis*, July 27–September 5, pupation August 29–September, first flight from September 30, 1967.

Acleris shepherdana Stph.

Filip'ev, 1931: 523; Razowski, 1966: 358; Kuznetsov, 1967: 52.

Eggs probably hibernate. Larvae in rolled leaves wrapped in silky threads on herbaceous and shrub plants of Rosales. Flight in August–September. Distribution: Trans-Palearctic (forest zones, forest-steppes).

PR—26 specimens. Klimoutsy (K, S) August 8–September 14, 1958. Simonovo (FCH) August 9–14, 1959. Radde (Korb). Environs of Khabarov (SHE) ex 1., August 5, 1959. Kazakevichevo (Korb) 1907. Common in black birch–oak–larch and larch–birch forests, as well as dwarf arctic birch–willow floodplain outgrowths. Rare on steppe meadows. Larvae often on *Sanguisorba parviflora, S. officinalis, Sorbaria sorbifolia*, and *Filipendula* sp. Phen: larvae June 30–July 23, pupation July 6–24, first flight July 24–August 5, flight August 9–September 14.

SP—19 specimens. Yakovlevka (D, FV) August 6–7, 1926. GTS (Zinov'eva, N) August 7, 1962; (Z) August 8–10, 1966. Okeanskaya

(S) ex 1., July 26, 1963. De Vries Peninsula (KR) August 5–6, 1955, August 16, 1957; (O) August 17, 1960; (KR) August 18, 1954. Found singly in herbaceous meadows, damaged oak groves, and lowland broad-leaved forests. Larvae on *Filipendula* sp. Imagoes in evening and on light. Phen: larvae May 25, pupation July 5, first flight July 26, flight August 5–19.

SK—5 specimens. Urup: Podgornyi (Krovolutskaya) August 8, 1964. Kunashir: environs of Sernovodsk and Belkino (K). Found singly on mixed grass meadows and marshes. Larvae on *Sanguisorba tenuifolia*. Phen: larvae June 14–August 5, pupation July 17–24, first flight August 4–11, 1967.

Acleris roscidana Hb.

Filip'ev, 1931: 517; Kuznetsov, 1967: 52.

Imagoes probably hibernate. In Europe larvae in rolled leaves of *Betula* and *Populus tremula* in June–July (Klimesch, 1961). Flight in September and after hibernation in May. Distribution: Trans-Palearctic (forest zone).

PR—1 specimen. Klimoutsy (K) May 26, 1958. Imagoes alight on shaking *Betula* in black birch–oak–larch forests.

SP—8 specimens. Yakovlevka (D, FV) September 8–17, 1926. Vinogradovo (D, FCH) May 16, 1929.

Acleris amurensis Car.

Caradja, 1928: 293, original description; Kennel, 1908–1921: 81, fig. 52–53; Razowski, 1966: 394.

Imagoes hibernate. Larvae in June in rolled leaves of *Betula*. In Kurils estivation of pronymphs or pupae occurs in July. Flight in August–September and after hibernation in April–June. Distribution: Manchuria.

PR—7 specimens. Radde, Kazakevichevo (Korb) 1907.

SP—22 specimens. Yakovlevka (D, FV) May 2 and September 14–17, 1926. Vinogradovo (D, FV) May 19–June 2, 1929. Environs of Ussuriisk, Baranovsk (Hedemann); GTS (Zinov'eva) August 23, 1962. Upper reaches of Suputinka River (KR) September 24, 1935. Suputinsk forest reserve (KR) August 24, 1948. Okeanskaya (A) August 21–23, 1959; (KR) September 4, 1947. Kedrovaya Pad' forest reserve (Tsvetaev) October 10, 1966. Petrov Island (D) September 20, 1934. Pos'et Gulf (Vul'fuis) July 23 (August 4), 1860. Common in destroyed lowland broad-leaved forests, especially among floodplains, rarely in cedar–broad-leaved forests. Imagoes at light.

SK—1 specimen. Kunashir: environs of Sernovodsk (K). Larvae in rolled leaves of *Betula ulmifolia* July 21–25, first flight August 14, 1967.

Japan (Hokkaido, mountains of Honshu).

Acleris expressa Fil.

Filip'ev, 1931: 517, original description; Razowski, 1966: 395.

Imagoes hibernate. Flight in May–June and July–August. Distribution: Manchuria.

PR—2 specimens. Kazakevichevo (Korb).

SP—26 specimens. Yakovlevka (D, FV) May 1 and June 7, 1926. Vinogradovo (D, FV) May 13, 1929. Environs of Ussuriisk, Baranovsk (Dorris). De Vries Peninsula (O) June 17–18 and July 12–25, 1961, June 27 and July 27–August 10, 1959, July 12–24, 1963, July 17–August 22, 1960, July 27–August 6, 1962. Kedrovaya Pad' forest reserve (Tsvetaev) October 7, 1966. Common at light in outgrowths of shrubs near inhabited places and in damaged broad-leaved forests. Rarely in cedar–broad-leaved forests. In southern Primor'e undergoes summer estivation or develops two generations. Flight of hibernating imagoes in September [*sic*]–June 27, thereafter July 12–August 22 and October 7.

Japan (Hokkaido, Honshu).

Acleris uniformis Fil.

Filip'ev, 1931: 512, original description; Razowski, 1966: 402.

Distribution: Japan–Ussuriisk.

SP—1 specimen. Yakovlevka (D, FV) September 12, 1926.

Japan (Hokkaido, Honshu).

Acleris filipievi Obr. (*grissa* Fil.)

Filip'ev, 1931: 519, 520, original description; Razowski, 1966: 404–405; Kuznetsov, 1969b: 37.

Imagoes probably hibernate. Larvae in rolled leaves of *Juglans manshurica* and *Tilia amurensis*. Summer estivation of pronymphs or pupae. Flight in April–May and August–October. Distribution: Japan–Ussuriisk–China.

SP—15 specimens. GTS (K) May 17, 1966; (Zinov'eva) August 23, 1962. Upper reaches of Suputinka River (KR) September 9, 1935. De Vries Peninsula (O) September 5, 1962; (Konovalova) September 9, 1960. Okeanskaya (A) August 13–20, 1959, August 12, 1963. Vladivostok, Sedanka (A) August 14, 1959. Petrov Island (D) October 8, 1934. Confined to nut-ash forests. Rare in cedar–broad-leaved forests and forest reserves with *J. manshurica*. Phen: larvae June 14, pupation from June 25, first flight from July 19, flight August 13–October 8 and after hibernation April 9–May 17. Imagoes attracted to light.

Japan (Honshu).

Acleris hispidana Chr.

Christoph, 1881: 61, original description; Kennel, 1908–1921: 80; Filip'ev, 1931: 517; Razowski, 1966: 405; Kuznetsov, 1967: 52.

Imagoes hibernate. Oviposition in spring. Larvae live in rolled leaves of *Quercus*, folding leaf in half along midrib and sticking edges of two halves together with silky discharge. Pupation in rolled leaves. Most pronymphs estivate in August. Estivation in Kurils longer than in Upper Priamur. Flight in September. In Europe replaced by the close species *A. literana* L. Distribution: Manchuria.

PR—11 specimens. Radde (Korb) Klimoutsy (K, S). Larvae common on *Q. mongolica* in oak groves, and black birch–oak–larch and black birch–oak–pine forests. Phen: flight of hibernating imagoes from May 24–June 23, larvae June 18–August 3, pupation August 4–8, first flight August 29–September 3, 1958.

SP—11 specimens. Yakovlevka (D, FV) May 1–24, 1926. Vinogradovo (K, FV) May 5, 1929. Spassk (D, FV) May 16, 1926. Ussuriisk and environs of Vladivostok (Christoph, 1881). In Okeanskaya groves often on oak–elm and lowland broad-leaved forests near inhabited places. Rare in cedar–broad-leaved and black fir–broad-leaved forests. Flight May 1–24, 1926.

SK—4 specimens. Kunashir: environs of Sernovodsk (K). Larvae found singly on *Q. crispula* in oak groves and fir–yew–broad-leaved forests with oak. Phen: larvae from July 28, resume feeding from August 4, summer estivation of pronymphs in first half of August, pupation August 29, first flight September 6–26, 1967.

Japan.

Acleris similis Fil.

Filip'ev, 1931: 515, original description; Razowski, 1966: 407; Kuznetsov, 1967: 52.

Imagoes hibernate. In spring they fly up to end of May, congregating on damaged birch trees and fresh stumps where they feed on oozing sap. Larvae of young instars with black head; older larvae green, darker on dorsal surface, with white setae, and chocolate-brown head; prothoracic scutellum with two black spots, legs black. Notably damage foliage of shrubs of Rosales; rare on Ericales. Live in rolled leaves at apices of branches. Pupation in leaves, flight from August until entrance into hibernation. Distribution: eastern Palearctic (broad-leaved and mixed forests).

Southern Siberia, Baikal region.

PR—20 specimens. Anitino (Hedemann) May 19 (June 1), 1877. Klimoutsy (K, S) May 30, 1958. Greater Shantar Island, Amuka (Dul'keit) May 3–8, 1925. Larvae congregate on *Spiraea sericea, S. salicifolia*, and *Rosa dahuricum* in pastures and other growths in floodplains. Found singly in black birch–oak–larch forests and on *R. dahuricum* [*sic*] and *Vaccinium uliginosum*. Phen: flight of hibernating imagoes in May, larvae June 4–July 22, pupation July 23–August 8, first flight August 22–September 20, autumn flight in August–September.

SP—3 specimens. Yakovlevka (K, FV) September 17, 1926. Tigrovoi (KR) April 19, 1934 and May 13, 1928. Rare in lowland broad-leaved forests along floodplains. Flight in September and after hibernation in April–May.

Japan (Hokkaido).

Acleris nigriradix Fil.

Filip'ev, 1931: 513, original description; Razowski, 1966: 408.

Imagoes hibernate, flight in April–May and September. One of the preimaginal stages supposedly undergoes summer estivation. Distribution: Manchuria.

PR—1 specimen. Kazakevichevo (Korb) 1907.

SP—59 specimens. Yakovlevka (D, FV) May 1–24 and September 8–17, 1926. Vinogradovo (D, FV) May 13–June 3, 1929. GTS (K) May 4–June 7, 1966. Suputinsk forest reserve (K) June 19, 1966. De Vries Peninsula (Kononov) May 5, 1958. Common in oak groves, elm–oak and valley broad-leaved forests, undergrowths of shrubs, and near inhabited places. Imagoes at light and in evening. Drop off when *Acer mono, Quercus mongolica*, and *Ulmus propinqua* shaken. Flight in region of Ussuriisk–Yakovlevka May 1–June 19 and September 8–17.

Japan (mountains of Honshu).

Acleris lacordairana Dup.

Kennel, 1908–1921: 87; Filip'ev, 1931: 527; Razowski, 1966: 415; Kuznetsov, 1967: 53.

Imagoes probably hibernate since flight takes place in June and end of September. In Japan represented by the morphologically poorly differentiated subspecies *roxana* Raz. and Yasuda. Distribution: Palearctic, disconnected. Distributed locally and not found in Siberia.

PR—3 specimens. Klimoutsy (S) June 21, 1958. Kazakevichevo region (Korb) 1907. Imagoes drop off when *Salix raddeana* shaken in black birch–oak and larch forests.

SP—1 specimen. Suputinsk forest reserve (KR) September 30, 1948. Mixed forests.

Japan (from Hokkaido to Kyushu).

Acleris strigifera Fil.

Filip'ev, 1931: 518, original description; Razowski, 1966: 420.

Imagoes probably hibernate since flight occurs in May and September. Distribution: Japan–Ussuriisk–China. In Japan, south of Honshu Island, replaced by the closely related species *A. takeuchii* Raz. and Yas., and in the eastern Mediterranean by *A. boscanoides* Raz.

PR—6 specimens. Vinogradovo (D, FV) May 20–28, 1929. GTS (K) May 21, 1966. Found singly in morning hours at light in broad-leaved forests.

Japan (Honshu mountains).

Acleris proximana Car.

Distribution: Ussuriisk–China. Newly discovered in the fauna of the Soviet Union.

SP—2 specimens. Ussuriisk (Shabliovskii) August 9, 1965. De Vries Peninsula (O) July 22, 1960. Imagoes at light in inhabited places.

China.

Acleris ulmicola Meyr.

Kennel, 1908–1921, pl. V, fig. 4, *boscana* F. err. det.; Caradja, 1916: 45, *boscana* err. det.; Filip'ev, 1931: 520, *boscana* F. err. det.; Razowski, 1966: 426; Kuznetsov, 1967: 52.

Two generations and, accordingly, seasonal forms that differ sharply in coloration. Imagoes gray and hibernate. Oviposition in spring. Larvae of middle instars pale green with black head and legs; prothoracic scutellum with border along posterior margin. Anal scutellum and body plates light-colored. Larvae at beginning of summer develop between glued leaves of *Ulmus*, pupate at feeding site, and metamorphose into whitish moths (summer form). New generation develops by end of summer. Larvae pupate and metamorphose into gray-colored moths, which hibernate until spring. In Europe replaced by the closely related dimorphic species *A. boscana* F. Distribution: Manchuria.

PR—3 specimens. Shilka (Hedemann). Environs of Blagoveshchensk (Efremov) July 1–7, 1965. Radde and Kazakevichevo (Caradja, 1916). Environs of Khabarov (SHE) ex 1., *Ulmus* sp., July

25, 1959. All specimens collected in floodplains of Amur River.

SP—86 specimens. Vinogradovo (D, FV) July 11–12, 1929. Environs of Ussuriisk (FCH) July 8–16, 1959. Baranovsk (Andrievskii) 1913; (A) September 21–22, 1959; GTS (Z, K) May 10–23 and July 15–August 7, 1966. Suputinsk forest reserve (KR) August 16–22, 1947. Peishula (FCH) July 12, 1963. Tigrovoi (KR) July 15, 1928. Environs of Artem, Ugol'naya (A) July 14–19, 1960. De Vries Peninsula (KR) April 8, 1956; (O) July 3–August 13, 1961, July 19–August 17, 1960, July 24, 1963; (KR) July 15–August 16, 1957. Okeanskaya (FCH) July 16–17, 1963. Environs of Vladivostok (S, FCH) ex 1., September 21, 1963. Kedrovaya Pad' forest reserve (N) August 5, 1962. Common in parks, forest reserves, felled elm–oak, lowland broad-leaved forests, and shrubs of elm forests near inhabited places. Rare in black fir–broad-leaved and cedar–broad-leaved forests. Larvae on *U. propinqua* and *U. pumila*. Phen in environs of Ussuriisk: flight of hibernating imagoes May 10–23, larvae of summer generation up to June 23, pupation from June 24, first flight July 6–17, flight July 8–August 22; larvae of hibernating generation September 3–6, pupation from September 8, first flight September 21, flight September 21–22. In environs of Vladivostok, flight of hibernating imagoes from April 8, flight of summer generation July 3–August 17, flight of hibernating generation from August 5. Imagoes congregate at light of incandescent or ultraviolet lamps.

SS—2 specimens. Environs of Novoaleksandrovsk (L, SHO). Larvae on *U. propinqua* in highly damaged lowland broad-leaved forests on July 25, first flight August 12, flight May 30, 1967.

Japan (Hokkaido, Honshu).

Acleris logiana Cl. (*niveana* F.)

Filip'ev, 1931: 522; Danilevskii, 1955: 65; Razowski, 1966: 428; Kuznetsov, 1967: 53.

Imagoes hibernate and feed during spring on sap of injured birch trees. Larvae in rolled leaves of *Betula*. Pupation at feeding site. Flight from August to onset of hibernation, resumed again in spring. Coloration of forewings varies from snow-white to gray. In females collected in the Far East, sclerotized section of duct of bursa copulatrix longer than in European specimens. Distribution: Holarctic (forest-tundra, coniferous, mixed, and broad-leaved forests, forest-steppes).

PR—25 specimens. Shilka (Hedemann). Klimoutsy (Zinov'eva, K, S). Simonovo (FCH). Common in damaged birch, black birch–oak–larch, black birch–larch, and black birch–oak–pine forests. Larvae on *B. platyphylla* and *B. dahurica*. Phen: flight of hibernating imago May

19–June 29, larvae July 4–August 7, pupation July 13–August 8, first flight August 9–26, flight August 13–September 19, 1958.

SP—5 specimens. Yakovlevka (D, FV) May 21, 1926. Vinogradovo (D, FV) May 18–24, 1929. Suchan, Tasino (KR) June 6, 1928. Petrov Island (D) September 27, 1934. Found singly in birch forests. Flight May 18–June 6 and in September.

SK—4 specimens. Kunashir: environs of Sernovodsk (K). Found singly in Erman's birch and coniferous–Erman's birch forests. Larvae on *Betula ulmifolia*. Phen: flight of hibernating imagoes May 25–July 8, larvae from June 21, first flight August 26, 1967.

Acleris affinatana Snell.

Snellen, 1883: 185, original description; Kennel, 1908–1921: 96; Filip'ev, 1931: 527; Razowski, 1966: 435; Kuznetsov, 1967: 52.

Two generations. Represented by two major seasonal forms with different coloration, but not different in structure of genitalia. Imagoes of f. *pryerana* Wlsgm. with well-defined costal spots and hibernate. Feed on sap of injured birch trees during sap flow in spring. Larvae skeletonize leaves of *Quercus mongolica*, and in Japan also of *Q. acuta, Q. acutissima, Q. dentata*, and *Zelkova serrata*. Pupate at feeding site and metamorphose into yellow moths (summer form) f. *affinatana* Snell. in which costal spot barely defined. This form externally differs little from summer form of *A. perfundana* Kuzn. (see below). The remark of Razowski (1966) about the "probable loss of the type specimen of *Teras affinatana* Snell." is incorrect. The male is preserved in the collection of the Institute of Zoology, Academy of Sciences of the USSR, and bears these labels: "Chingan," "27.7 Hed. *affinitana*," "Koll. b. Vel. Kn. Nikolai Mikhailovich". I use this opportunity to designate it as the lectotype. Distribution: Manchuria.

PR—12 specimens. Klimoutsy (K, S) May 19–July 1 and ex 1., September 6, 1958. Novostepanovka (FCH) June 4, 1959. Simonovo (Dorokhina, FCH) June 3–23, 1959. Larvae found singly on *Q. mongolica* in black birch–oak–larch and black birch–oak–pine forests. Phen: flight of imagoes of hibernating generation May 19–July 1, flight of summer generation July–beginning of August, larvae of hibernating generation in August, pupation from September 1, first flight from September 6, 1958.

SP—11 specimens. Khanka Island (Hedemann) September 5 (17), 1877. Yakovlevka (D, FV) May 19 and July 22, 1926. Environs of Ussuriisk and Baranovsk (A) September 21–22, 1959. GTS (K) May 23, 1966. Suputinsk forest reserve (Tokareva) ex 1., July 26, 1932. Common in outgrowths of shrub oak. Larvae on *Q. mongolica*. Phen:

flight of imagoes of hibernating generation May 19–23 and September 17–22, flight of summer generation July 22–26.

SK—1 specimen. Environs of Sernovodsk (Z) July 23, 1967.

China (Chingan), Japan (from Hokkaido to Kyushu).

Acleris perfundana Kuzn.

Kuznetsov, 1962b: 337, original description; Razowski, 1966: 440; Kuznetsov, 1967: 52.

Represented by several color forms that do not differ in structure of genitalia. Imagoes of two major forms hibernate: chocolate-brown to orange (f. *perfundana* Kuzn.) and straw-yellow with black spots (f. *nigropunctana* Kuzn.). Older larvae light green with black head, prothoracic scutellum, and legs, and light-colored anal scutellum. They skeletonize leaves of *Quercus mongolica* and *Q. crispula*; in Japan also recorded on *Zelkova serrata*. Pupate at feeding site and metamorphose into almost monochromatic yellow summer form, externally very similar to *A. affinatana* f. *affinatana* Snell. Distribution: Manchuria.

PR—21 specimens. Klimoutsy (K, S) May 21–24, July 17, and September 24, 1958. Simonovo (Dorokhina, FCH) July 5–22 and ex. 1., September 10, 1959. Korsakovo (Zinov'eva) September 3, 1958. Environs of Khabarov (Kasparyan) ex 1., September 12–14, 1964. Common in botanical gardens, forest reserves, sparse oak groves, black birch–oak, larch, and black birch–oak–pine forests. Larvae on *Q. mongolica*. Phen. in environs of Klimoutsy: flight of imagoes of hibernating generations May 21–24, larvae of summer generation June 2–30, pupation June 26–July 1, first flight July 5–11, larvae of hibernating generation in August, pupation from August 23, first flight September 3–10, flight up to September 24, 1958.

SP—73 specimens. Lebekhe (Wolfson) June 14, 1934. Environs of Ussuriisk and GTS (Z, K) May 1–21, August 12–August 10, 1966 [*sic*] (FCH) 3–8, 1959 [*sic*]; (A) September 21–22, 1959. Environs of Artem (Ugol'naya, A) July 19, 1960. De Vries Peninsula (O) July 13–23 and August 19, 1960, July 14–16, 1961. Okeanskaya (FCH) July 12, 1959. Vladivostok (Hedemann) September 26 (October 8), 1877. Flattened eggs laid singly. Larvae locally damage foliage of *Q. mongolica* in lespedeza and rhododendron groves damaged by felling, oak–linden forests and outgrowths of shrub oak near inhabited places. Rare in lowland broad-leaved forests with oak. Phen. in environs of Ussuriisk: flight of imagoes of hibernating generation May 1–27, eggs from May 9, larvae of summer generation June 3–25, pupation June 22–26, first flight June 26–July 9, flight July 12–August 10, larvae of hibernating generation in August, first flight August 21–September 21. Environs of Vladivostok: flight of hibernating generation August 18–October 8. Imagoes common during day, rare at light and in evening. In spring feed on oozing sap of injured birch trees.

Japan (Honshu).

Acleris tripunctana Hb. (*ferrugana* Tr.)

Filip'ev, 1931: 522; Danilevskii, 1955: 63; Kuznetsov, 1967: 52.

Imagoes hibernate. In Europe larvae probably polyphagous and noted in rolled leaves of tree-shrub plants of Betulales, Fagales, and Salicales. More often on *Betula*. Distribution: Holarctic (forest zones).

PR—4 specimens. Pokrovka (Hedemann) May 25–29 (June 7–11), 1877. Klimoutsy (S) May 25, 1958. Rare in floodplains and black birch–oak–larch forests.

SP—1 specimen. Yakovlevka (D, FV) July 9, 1926.

Acleris enitescens Meyr.

Kuznetsov, 1970b: 41.

Two generations. Larvae live in small groups or singly in rolled leaves at apex of branches of *Rubus*. In Sri Lanka replaced by closely related species *A. sagmatias* Meyr. Distribution: Manchuria–Indo-Malayan Peninsula.

SS—1 specimen. Kholmsk (EV) July 9, 1970.

SK—8 specimens. Kunashir: Mendeleevo, Sernovodsk, Alekhino (K). Larvae of first generation cause notable damage during period of bud formation and flowering of *R. sachalinensis* along fringes of fir–yew–broad-leaved and other mixed forests, especially along the roadside. Larvae of second generation develop during period of maturation of berries. Hence damage caused by them not high. Phen: larvae of first generation June 5–17, pupation from June 17, first flight July 23, flight July 10–August 4, larvae of second generation August 1–12, pupation August 12, first flight August 22–26, 1967.

China, including Taiwan, Japan (from Hokkaido to Kyushu), mountains of India.

Croesia leechi Wlsgm. (*sumptuosana* Car.)

Razowski, 1966: 500–502.

Larvae in rolled leaves of *Lespedeza*. Distribution: Japan–Ussuriisk–China.

SP—36 specimens. Environs of Ussuriisk (Shabliovskii) July 15, 1956, July 17, 1965. GTS (Z, K) June 24–August 8, 1966; (FCH) June 27–July 4, 1959, July 29, 1963. Kangauz (FCH) July 4, 1963. De Vries

Peninsula (O) July 5–11, 1961, July 19–23, 1960; (KR) July 22, 1957. Environs of Vladivostok, Sedanka (FCH) July 11, 1963. Okeanskaya (S, FCH) June 27–July 27, 1963; (FCH) July 10, 1959. Common in lespedeza groves, rare on pastures and wastelands. Larvae of *L. bicolor* on June 5, first flight June 23, flight June 24–August 8.

SK—1 specimen. Kunashir: Alekhino (Kerzhner) July 30, 1973.

China, Japan (Honshu).

Croesia conchyloides Wlsgm.

Razowski, 1966: 502–504.

Eggs probably hibernate. Larvae whitish-yellow; head, prothoracic and anal scutella and legs black. Live in rolled leaves of *Quercus* and pupate at places of feeding. In Sakhalin part of population of larvae or pupae undergoes summer diapause. Flight in July–August. Distribution: Japan–Ussuriisk–China.

SP—104 specimens. Kangauz (FCH) June 27 and July 7, 1963. De Vries Peninsula (O) July 1–16, 1961, July 9, 1959, July 13–29, 1963; (KR) July 14, 1955; (O) July 16–August 22, 1960. Okeanskaya (S, FCH) June 21–July 23, 1963; (Zagulyaev) July 2, 1950; (FCH) July 16, 1959. Kedrovaya Pad' forest reserve (N) August 5, 1962. Larvae damage *Q. mongolica* in parks and destroy oak groves; rare in mixed forests with oak. Phen in environs of Okeanskaya: larvae May 22–30, pupation from May 30, first flight June 15–17, flight June 21–August 22, with mixed flight in July. Imagoes common at light, particularly attracted to ultraviolet lamps; rare in evening.

SS—4 specimens. Environs of Novoaleksandrovsk, foothills of Susunaiskii range (K, L). Found singly in artificial plantations of *Q. mongolica*. Phen: larvae May 26, pupation from June 5, flight in nature August 3–7, 1967.

SK—1 specimen. Kunashir: Dubovoe (Kerzhner) July 19, 1973.

China, Japan (Hokkaido, Honshu).

Croesia bergmanniana L.

In Europe eggs laid singly on branches and twigs, hibernate. Larvae in rolled leaves of shrubs of Rosales. Pupation in leaves. Distribution: Trans-Palearctic (forest zones).

SS—6 specimens. Environs of Novoaleksandrovsk (L) August 2, 1967. Chekov Peak (EV) August 4, 1970. Found singly in mixed forests. Larvae on *Rubus sachalinensis* and *Rosa* sp. Phen: larvae June 8–29, Pupation June 30–July 14, first flight June 24–July 15, flight August 2–4. Imagoes in evening.

Croesia fuscotogata Wlsgm. (*pretiosana* Kenn.)

Kennel, 1901: 208, original description of *C. pretiosana* Kenn.; 1908–1921: 98; Razowski, 1966: 513–516; Kuznetsov, 1969b: 42.

Older larvae musty green with chocolate-brown head and prothoracic scutellum; body cover and legs not distinguished by color. Larvae live in rolled leaves of *Viburnum* and pupate in them. Distribution: Japan–Ussuriisk–China.

SP—10 specimens. Suifun (Dorris). GTS (Z) July 23–August 2, 1966. Okeanskaya (A) August 15–20, 1959; (FCH) August 21–31, 1963. Confined to lowland broad-leaved forests along floodplains. Larvae on *V. sargentii.* Phen: larvae June 24, pupation from July 2, first flight July 16, flight July 23–August 31.

Japan (Honshu, Shikoku, Kyushu).

Croesia bicolor Kuzn.

Kuznetsov, 1964c: 879, original description; Razowski, 1966: 516; Kuznetsov, 1969b: 42.

Eggs supposedly hibernate. Older larvae musty green, with black head, prothoracic scutellum, and legs. Live in tubes made of leaves of *Viburnum*, folded along midrib. Edges of leaves glued together with silky discharge. Frass in tubes not ejected. *Populus koreana* mistakenly reported as food plant (Razowski, 1966). Distribution: Ussuriisk–China.

SP—39 specimens. GTS (Z, K) ex 1., June 8–11, 1966. Peishula (FCH) July 12, 1963. Kangauz (FCH) June 25–July 3, 1963. Tigrovoi (FCH) June 28–July 2, 1963. Okeanskaya (FCH) July 22, 1963. Larvae on *V. burejaeticus* in lowland broad-leaved and cedar–broad-leaved forests along floodplains. Environs of GTS, in nut–ash forests, this species damaged about 30% of the foliage of near-by shrubs in 1966. Found rarely in primary associations of black fir–broad-leaved and cedar–broad-leaved forests. Phen. in environs of GTS: larvae May 15–23, feeding terminates from May 20; in June summer estivation of pronymphs or pupae probably takes place. Flight June 25–July 12.

Croesia stibiana Snell.

Snellen, 1883: 189, original description; Kennel, 1908–1921: 171; Razowski, 1966: 519–520; Kuznetsov, 1969b: 42.

Larvae in rolled leaves of *Viburnum*. In general summer estivation well expressed. Distribution: Japan–Ussuriisk–China.

SP—5 specimens. Suifun (Hedemann). GTS (K) July 1, 1966. Kedrovaya Pad' forest reserve (E) August 24–26, 1965. Rarely found in nut–ash forest with *Virburnum*. Larvae on *A. burejaeticus*. Phen: larvae feed from May 15, feeding terminates June 2, pupation June 7, first flight July 1, 1966.

Japan.

Croesia phalera Kuzn.

Kuznetsov, 1964c: 878, original description; Razowski, 1966: 520; Kuznetsov, 1967: 52; 1970: 40.

Eggs probably hibernate. Larvae green with black head, live in *Fragaria*. Young instars skeletonize assembled leaves; thereafter leaves folded along midrib and margins glued to form characteristic "packets". Pupation in leaves. Distribution: Manchuria.

PR—3 specimens. Klimoutsy (S, K) July 14–16, 1958. Simonovo (Kerzhner) July 19, 1959. Found singly along fringes of birch–oak–larch forests with *Fragaria*.

SP—2 specimens. De Vries Peninsula (KR) July 8, 1953; (O) July 12, 1963.

SK—67 specimens. Kunashir: Mendeleevo, environs of Sernovodsk, Lake Glukhoe, Alekhino (Z, K). Larvae cause serious damage to wild *F. iinumae* along fringes of oak groves and in glades among mixed forests, along roads, and in felled areas; at some places damage about 50% of foliage. Damage perceptible during period of strawberry flower bud formation and terminates with maturation of fruit. Phen: larvae June 8–21, pupation June 18–August 1, first flight July 9–August 1, flight July 25–August 13. Imgoes mass on overgrowths of strawberry during dusk or after sunset.

Croesia askoldana Chr.

Christoph, 1881: 70, original description; Kennel, 1908–1921: 171; Razowski, 1966: 522–523; Kuznetsov, 1969b: 42.

Eggs supposedly hibernate. Larvae on Caprifoliaceae. In the Far East damage plants of *Lonicera* and *Diervilla* in felled forests and parks, and in Japan also found on *Deutzia*. Young instars with black head, prothoracic scutellum, and legs. Last instars light green, with yellowish to chocolate-brown head and light-colored lustrous prothoracic and anal scutella. High humidity and feeding on decomposing food essential to normal larval development. Hence young instars damage pedicels of new leaves at apex of branches; after leaves wilt larvae roll them into clumps inside which they live singly. Thus this species damages a far greater number of leaves than required for feeding. Pupation probably occurs in forest litter since even in severely damaged foliage pupae were not detected. Part of the population, especially in the Kurils, estivates at stages of pronymphs under conditions of high humidity. Distribution: Manchuria.

PR—2 specimens. "Amur," collection of Staudinger.

SP—58 specimens. Ussuri (Dorris). Suifun (Hedemann). GTS (Z, K) July 24–28, 1966. Suputinsk forest reserve (M) July 22, 1970. Foothills of Oblachnaya mountain (S) August 9–12, 1963. Khualaza (KR) August 2, 1928. De Vries Peninsula (O) July 19, 1960. Okeanskaya (S, FCH) July 20–September 2, 1963; (A) August 15, 1959. Environs of Vladivostok; Sedanka (FCH) August 4, 1963; (A) August 14, 1959. Askol'd (Christoph, 1881). Kedrovaya Pad' forest reserve (N) August 5, 1962. Larvae damage *Lonicera ruprechtiana* in lowland broad-leaved forests and *Diervilla florida* in parks and botanical gardens. Also common on *Lonicera* in black fir–broad-leaved and cedar–broad-leaved forests. Phen: larvae May 10–June 10, pupation in suboptimal conditions May 27–June 11, first flight June 18–July 3, flight during much delayed period from July 20–September 2. Imagoes at light and in evening.

SK—22 specimens. Kunashir: environs of Sernovodsk (K). Larvae damage *Lonicera edulis* in oak groves, fir–yew–broad-leaved and other mixed forests along floodplains and terraces near the ocean. Phen: larvae June 2–July 9, pupation June 20–July 27, first flight July 18–27, flight from August 8, 1967.

Northeastern China, Japan (Hokkaido, Honshu, Kyushu).

Croesia aurichalcana Brem.

Bremer, 1864: 89, original description; Kennel, 1908–1921: 170; Caradja, 1916: 47, original description ab. *auristellana* Car.; Kurentsov, 1950: 31; Danilevskii, 1955: 76; Razowski, 1966: 525; Kuznetsov, 1967: 52.

Eggs hibernate. Older larvae grayish-yellow with chocolate-brown head and prothoracic scutellum, and light-colored legs. Larvae of young instars with black legs. Live in cigar-shaped tubes of leaves in species of *Tilia* in the Far East and of *T. japonica* in Japan (Razowski, 1966). During periods of high winds some larvae swept into shrubs of lower tiers and continue feeding on *Cerasus maximowiczii, Crataegus* sp., *Viburnum burejaeticus, Lespedeza bicolor*, and other plants. These plants are not suitable for development, however, and pupae feeding on them are smaller than normal. To reduce turgor, larvae cut the petiole of several leaves at apex of branch; causing wilt and facilitating rolling into tubes. In time, leaves turn black inside cigar-shaped tubes and begin to decompose and wither on outer surface. Hence larvae require moist but decomposing food for their development.

Pupation probably takes place in forest litter since pupae are almost never found inside tubes and in cracks of bark. Species severely damages felled forests and parks. Damage augmented because each larva cuts several petioles, thereby destroying a far greater number of leaves than required for feeding. In the Far East this species is represented by several color forms, with some transitional forms in-between. Darkest colored form (f. *auristellana* Car.) most common in Primor'e region. In environs of Vladivostok and Okeanskaya, constitutes about 30% of population; relatively rare in Ussuriisk. Distribution: Manchuria.

PR—12 specimens. Samodon–on–Amur (Zenov'eva, Kerzhner, FCH) August 3–16, 1959. Khabarov (Hedemann) August 4–5 (17–18), 1877. Rare in floodplains of Amur.

SP—223 specimens. Lower reaches of Kolumbe River (KR) July 27, 1934. Yakovlevka (Zinov'eva) July 19, 1962. Vinogradovo (D, FV) July 19–August 2, 1929. Ussuriisk (Shabliovskii) August 18, 1968. GTS (FCH) July 15, 1959; (Z, K) July 23–August 12, 1966; (Zinov'eva, N) August 7–23, 1962. Suputinsk forest reserve (KR) August 1–9, 1933. Suifun (Hedemann). Suchan (KR) July 26–August 16, 1928. Khualaza (KR) August 2, 1928. Sokolovka, Tachingov Inlet (Kerzhner) August 28, 1959. De Vries Peninsula (O) July 13–August 3, 1961, July 22–August 17, 1960, July 30, 1959; (KR) August 16, 1957. Okeanskaya (S, FCH) July 12–September 6, 1963; (A) August 10, 1959. Environs of Vladivostok (Maslovskii) July 26, 1929. Lyanchikhe (KR) September 4, 1947. Kedrovaya Pad' forest reserve (Zinov'eva) August 19, 1962; (Kerzhner) August 22, 1963; (N) September 4, 1962. Petrov Island (D) August 17–18, 1934. Larvae damage *T. amurensis* and rarely *T. mandshurica* in parks, botanical gardens, and felled linden, oak–linden, oak–elm, lowland broad-leaved, and black fir–broad-leaved forests. They are common in basal association of mixed forests but do not damage. In southern Primor'e large part of population of pronymphs or pupae enters summer diapause. Phen: larvae May 20–June 18, pupation June 1–19, first flight July 1–16, flight during period of July 12–September 6. Imagoes mass at light and in evening.

Northeastern China, Korean Peninsula, Japan (Hokkaido, Honshu).

Croesia indignana Chr.

Christoph, 1881: 69, original description; Razowski, 1966: 526.

Distribution: Japan–Ussuriisk.

SP—9 specimens. GTS (Zinov'eva) August 23, 1962. De Vries Peninsula (O) July 3–16, 1961, July 19–22, 1960, August 5, 1964.

Okeanskaya (FCH) July 13–14, 1959. Rare at light in inhabited places.

Japan.

Croesia tigricolor Wlsgm.

Eggs supposedly hibernate. Older larvae, with black head, prothoracic scutellum, and legs, live in open plant buds, and cut and interweave leaves of *Micromeles alnifolia*. They prepare a fairly compact undulating clump on leaves inside which larva develops, often damaging apical growth. Subsequently young branch dies. In Japan this species has been recorded on *Alnus* (Razowski, 1966), which requires confirmation. Summer diapause probably takes place. Distribution: Japan–Ussuriisk.

SP—36 specimens. GTS (FCH) July 8, 1959; (Z, K) July 24, 1966. Kangauz (FCH) July 5, 1963. Okeanskaya (S, FCH) July 6–9 and August 2–29, 1963. Environs of Vladivostok, Sedanka (FCH) July 11–August 4, 1963. Adapted to destruction of black fir–broad-leaved forests, occasionally damaging up to 40% of the foliage of *M. alnifolia*. Rare in other mixed forests containing this plant. Phen: larvae May 23–30, pupation May 26–June 2, first flight June 17–20, flight in period of July 6–24 and August 2–29.

Japan (Hokkaido, Honshu).

Croesia crataegi Kuzn.

Kuznetsov, 1964c: 877, original description; Razowski, 1966: 529.

Eggs supposedly hibernate. Older larvae green with yellow or chocolate-brown to yellow head and light-colored prothoracic scutellum. Live in open buds and leaves glued together on *Crataegus pinnatifida*. Larvae of young instars with black prothoracic scutellum. They damage gardens, parks, and outgrowths of hawthorn near the ocean and near inhabited places. Known only from southern Sikhote-Alin' and adjacent ocean regions.

SP—71 specimens. Ussuriisk, garden (K) ex 1., May 18–20, 1966; (FCH) July 7, 1959. GTS (Z, K) July 5–15, 1966. Environs of Artem, Ugol'naya (A) July 5–19, 1960. Okeanskaya (S, FCH) July 5–10, 1963. Environs of Vladivostok, Shamora (S) July 10, 1963. Phen: larvae May 17–June 3, pupation from May 28, first flight June 13–20, flight July 5–19.

Tortrix sinapina Butl. (*kawabei* Raz.)

Kuznetsov, 1969: 38.

Eggs hibernate. Older larvae green or whitish-green with large black setae along body surface, black head and blackish legs. Prothoracic scutellum black or chocolate-brown with black dots along sides. Severely damage *Quercus* and primarily live in cigar-shaped rolled leaves glued together. Rarely roll leaf in different manner. Larvae of last instar more polyphagous and successfully continue feeding on *Fraxinus mandschurica, Betula manshurica, Corylus heterophylla*, and *C. manshurica*. Rare on *Malus manshurica, Tilia amurensis*, and *Schizandra chinensis*. Before pupation larvae usually exits from rolled leaf in which it has fed and moves to lower levels of forest. Here pupation takes place under rolled margin of leaves of the various plants mentioned above as well as *Lespedeza bicolor, Rhododendron mucronulatum*, and so forth. Possibly some of the larvae pupate in forest litter. In the western Palearctic this species is replaced by the bio-morphologically close species, *T. viridana* L. Distribution: Manchuria.

SP—121 specimens. Environs of Ussuriisk (Shabliovskii) July 12–15, 1966. GTS (Z, K) June 24–August 2, 1966. Suputinsk forest reserve (Shabliovskii) July 12–14, 1968. Suchan (Palshakov) July 27, 1933. Kangauz (FCH) June 27–July 5, 1963. Environs of Artem, Ugol'naya (A) July 18, 1960. De Vries Peninsula (O) June 23–July 16, 1961, June 29, 1963, July 7, 1959, July 19, 1960. Okeanskaya (S) July 1–3, 1963; (FCH) July 10–13, 1959. Environs of Vladivostok (S, FCH) June 30, 1963. Askol'd (Dorris) 1878. Larvae severely damage Mongolian oak (*Q. mongolica*) in forest reserves and oak groves somewhat less. Confined to upper tier. Rare in felled birch forests, lowland broad-leaved, and cedar–broad-leaved forests. Phen. in environs of GTS: larvae May 15–June 15, pupation June 1–6, first flight June 19–July 4, flight June 23–August 2, 1966. Imagoes at light and in evening.

SS—2 specimens. Environs of Novoaleksandrovsk (L) August 3, 1967.

China, Japan (Hokkaido, Honshu).

Tribe Microcorsini

Microcorses trigonana Wlsgm.

Larvae live in acorns of *Quercus mongolica*. Imagoes in Japan appear in April, in Primor'e in beginning of June. Distribution: Japan–Ussuriisk.

SP—2 specimens. GTS (K) June 9, 1966. Terneiskii forest nursery (Lyubarskaya) September, 1949 (date probably relates to larvae).

Japan (Honshu).

Microcorses mirabilis Kuzn.

Kuznetsov, 1964c: 875, original description; Kuznetsov, 1970a: 442.

In Japan replaced by the closely related vicarious spring form, *M. marginifasciata* Wlsgm. Known only from southern Sikhote-Alin'.

SP—3 specimens. GTS (Zinov'eva) August 23, 1962. Okeanskaya (A) August 20, 1959. Kedrovaya Pad' forest reserve (Tsvetaev) September 24, 1966.

Subfamily Olethreutinae

Tribe Bactrini

Bactra robustana Chr.

In Europe larvae found in stems and roots of *Scirpus maritimus* (Hannemann, 1961). Distribution: Trans-Palearctic (moist biotopes of broad-leaved forests and steppes).

PR—20 specimens. Environs of Blagoveshchensk (Efremov) July 1–14, 1965. Common at light in floodplains of Amur River.

SP—5 specimens. Yakovlevka (D, FV) August 7, 1926. De Vries Peninsula (KR) July 14–20, 1955; (O) July 30, 1959 and August 19, 1960. At light in inhabited places along floodplains.

Bactra festa Diak.

Distribution: Japan

SK—14 specimens. Kunashir: environs of Sernovodsk (K) July 10, 1967; Cape Chetverikov (K) July 23, 1967. Common in old felling areas among fir–yew forests, rare in fir–yew–broad-leaved forests.

Japan (Hokkaido).

Bactra lacteana Car. (*gozmanyana* Toll, *alexandri* Diak.)

Caradja, 1916: 62, original description; Diakonoff, 1962: 31, 39, 45.

Distribution: Trans-Palearctic (marshes and other humid biotopes in forest and steppe zones).

PR—49 specimens. Klimoutsy (K, S) June 30–July 24, 1958; (FCH) June 17–18, 1959. Simonovo (Borokhina, FCH) July 3–27 and August 15, 1959. Common at light and in evening in marshes and dwarf arctic birch–willow forests, common larch forests, and various black birch–oak–larch forests. Probably two generations but second generation only partial. Flight June 17–July 27, and second half of August.

SP—60 specimens. Lake Kanka (FCH) August 19, 1963. Yakovlevka (D, FV) June 26, 1926. Ussuriisk and GTS (K) June 19–July 17, 1966; (Mishchenko) August 14, 1929. Suputinsk forest reserve (K) June 17, 1966. Upper reaches of Suputinka River (KR) July 10, 1933. Environs of Artem, Ugol'naya (A) July 13–19, 1960. Peishula (FCH) July 15, 1963. Tigrovoi (KR) June 24, 1928. Khatunichi (FCH) July 12, 1963. Okeanskaya (FCH) June 21–July 23, 1963; (Zagulyaev) August 30 and September 12, 1950. De Vries Peninsula (O) June 10, 1961; (KR) July 6–August 5, 1955; (O) July 13, 1960. Sudzukhinskii forest reserve (Kerzhner) August 23, 1959. More often at light in inhabited places along floodplains. Found singly in evening in cedar–broad-leaved and lowland broad-leaved forests. Two generations. Flight June 17–August 5 and August 14–September 12.

SK—76 specimens. Kunashir: environs of Sernovodsk (Z, K) July 11–August 16, 1967; Lake Peschanoe (K) July 22–27, 1967. Common in various marshes, in meadows with trees of alder and Sakhalin spruce, sedge–mixed grass meadows, and alder groves near the ocean. Rare in oak groves, fir–yew–broad-leaved, Erman's birch, and spruce–fir forests. Probably only one generation.

Bactra extrema Diak.

Diakonoff, 1962: 37, original description.

Known only from southern Primor'e.

SP—9 specimens. Yakovlevka (D, FV) August 17, 1926. Suchan (KR) August 23, 1928. Okeanskaya (Zagulyaev) August 30–September 12, 1950. Caught at light in inhabited places.

Bactra furfurana Hw.

Caradja, 1916: 62; Diakonoff, 1962: 28, original description var. *kurentsovi* Diak.

Larvae in roots of *Juncus* (Hannemann, 1961). Distribution: Holarctic (universal except for forest-tundra, tundra, and deserts).

PR—38 specimens. Klimoutsy (FCH) June 17–20, 1959. Blagoveshchensk (Kerzhner) June 20, 1959. Common in evening on sedge–horsetail covered marshes with *Juncus*.

SP—23 specimens. Yakovlevka (D, FV) July 19–August 10, 1926. Vinogradovo (D, FV) June 11–July 9 and August 4, 1929. Ussuriisk (Mishchenko) July 17, 1929; (Tokareva) August 15–16, 1931; GTS (Z, K) June 24–27 and August 7, 1966. Peishula (FCH) July 15, 1963. Suchan (KR) August 25–30, 1928. Suifun (Hedemann). Okeanskaya (Zagulyaev) August 30 and September 6, 1950. De Vries Peninsula (O) July 16, 1961 and August 22, 1960. Common at light in inhabited places. Two generations: flight June 11–July 17 and August 4–September 6.

Bactra loeligeri Diak.

Diakonoff, 1962: 41, original description.

Known only from southern Sikhote-Alin'.

SP—3 specimens. Yakovlevka (D, FV) July 13, 1926. Vinogradovo (D, FV) July 5 and 9, 1929.

Tribe Eudemini

Eudemis porphyrana Hb. (*pomedaxana* P. and M.)

Kuznetsov, 1967: 53; 1970b: 41.

Larvae in spring, in opening buds of various species of Rosales; thereafter live in cigar-shaped tubes rolled along midrib of leaf. On hawthorn may feed in woven ovaries. Maximal damage done to chokecherry, apple, and plum in floodplains, gardens, and parks. Rare in forests. Distribution: Trans-Palearctic (broad-leaved and mixed forests); in Siberia reported from only one place (Kuznetskii-Alatau).

PR—12 specimens. Simonovo (Kerzhner) July 26, 1958. Korsakovo (FCH) August 3–7, 1959. Environs of Khabarov (SHE) July 25, 1959, dendrarium (Lyubarskaya). Confined to floodplains. Larvae on *Crataegus maximowiczii*. Phen: larvae from July 5, flight July 26–August 7.

SP—136 specimens. Kirovskii (M) August 4, 1970. Yakovlevka (D, FV) July 20 and August 25, 1926. Vinogradovo (D, FV) August 8, 1929. GTS (Z, K) July 15–August 12, 1966. Peishula (FCH) July 7, 1963; Kangauz (FCH) July 6, 1963; Suchan (KR) July 30, 1928. Foothills of Oblachnaya mountain (S) August 10–11, 1963. Okeanskaya (S, FCH) July 10–August 20, 1963. De Vries Peninsula (O) July 2, 1963, July 14–August 13, 1961, July 19–August 17, 1960. Kedrovaya Pad' forest reserve (N) September 4, 1962. Larvae in cedar–broad-leaved, fir–broad-leaved, nut–ash, elm–dwarf arctic birch, oak, oak–linden–elm, and other broad-leaved forests. Damage gardens, parks, and outgrowths of shrubs near inhabited places. En masse on *Padus asiatica* and lowland broad-leaved forests; common on *Crataegus maximowiczii* and *C. pinnatifida*. In gardens found on *Malus manshurica* and *Prunus* sp. In Primor'e larvae more polyphagous than in Europe, and found singly on *Salix caprea* and *Quercus mongolica*. Phen: larvae May 8–June 12, pupation May 26–June 13, first flight June 20–July 11, flight July 10–September 4. Imagoes attracted to light.

SK—3 specimens. Kunashir: environs of Sernovodsk (K). Larvae on *Padus ssiori* and *Cerasus sachalinensis* during period of flowering and opening of leaves in fir–broad-leaved and oak–maple forests. Phen: larvae from June 14, pronymphs from June 25, pupation from July 11, first flight July 20–23, 1967. Some pronymphs probably enter summer estivation during development, which continues for about 10 days.

Eudemopsis purpurissatana Kenn.

Kennel, 1901: 252, original description; 1908–1921: 478; Kurentsov, 1950: 30; Fal'kovich, 1962a: 190; 1971b: 68.

Larvae of young instars cut pieces from new buds of *Schizandra chinensis*. By damaging apical growth they prevent opening of leaves, which they also destroy by wrapping in silky discharge and living inside them; they also cut flower buds. Greatest damage is done to large leaves at the upper tier of forests, since they develop successfully only in blackened leaves due to their requirement for high humidity. Rare on *Actinidia arguta*. Distribution: Amur–Ussuriisk–China.

PR—Khabarov (Fal'kovich) 1962.

SP—27 specimens. In Vinogradovo (D, FV) July 29–30, 1929. Lubyanka, near Anuchino (FCH) August 6, 1963. GTS (Z, K) ex l., June 24–July 4, 1966; (Zemlina) ex l., July 4, 1955; (Zinov'eva) August 26, 1962. Kangauz (FCH) July 6, 1963; Suchan (Kennel, 1901). Okeanskaya (FCH) August 5, 1963. De Vries Peninsula (O) July 15 and 22, 1961. Confined to cedar–broad-leaved, black birch–broad-leaved forests; found singly in lowland broad-leaved forests. Imagoes attracted to light. Phen: larvae from May 15, pupation June 2–23, first flight June 24–July 4, flight July 6–August 26. Part of pronymphs or pupal population probably undergoes summer diapause.

Northeastern China.

Tribe Olethreutini

Hedya salicella L.

Larvae damage new buds and roll leaves of *Salix* and *Populus* into tubes. Eggs laid singly on leaves. Distribution: Trans-Palearctic (forests and steppes).

PR—4 specimens. Radde (Korb) 1905.

SP—3 specimens. GTS (Z) July 19–28, 1966. At light in inhabited places.

Hedya abjecta Flkv.

Fal'kovich, 1962c: 353, original description.

Larvae develop and pupate in rolled leaves of Chinese hawthorn. Distribution: Ussuriisk–China.

SP—13 specimens. GTS (Z, K) June 24, 1966. Environs of Artem, Ugol'naya (A) July 5, 1960. Okeanskaya (FCH, S) June 29 and July 9, 1963. Lyanchikhe (S) June 30, 1963. De Vries Peninsula (O) July 1, 1953. Larvae in lowland broad-leaved forests, especially in floodplains, at some places cause notable damage to *Crataegus pinnatifida*. Imagoes attracted to light. Phen. in environs of Ussuriisk: larvae from May 24, pronymphs from May 25, pupation from May 29, first flight June 10–15, flight June 24–July 9, 1966.

China.

Hedya vicinana Rag.

Ragonot, 1894: 200, original description; Kennel, 1908–1921: 366.

Larvae of middle instars supposedly hibernate. In spring they resume feeding in leaf clumps at apex of branches of willow and poplar. Pupation in leaves. Distribution: eastern Palearctic.

Southern Siberia, Baikal region.

PR—21 specimens. Radde (Korb) 1905. Environs of Khabarov, Khekhtsirskii Pass (SHE) July 9 and 13, 1959.

SP—56 specimens. Vinogradovo (D, FV) July 9, 1929. GTS (Z) July 23–August 6, 1966. Environs of Artem, Ugol'naya (A) July 11–18, 1960. Kangauz (FCH) June 27–August 5, 1963. Khualaza (FCH) July 6, 1963. Okeanskaya (FCH) July 10–27, 1963. Lyanchikhe (S, FCH) ex. 1., June 20–July 1, 1963. Environs of Vladivostok, Sedanka (FCH) July 11, 1963. De Vries Peninsula (O) July 1 and 16, 1961, July 22, 1957, July 25, 1964. Common in cedar–broad-leaved, black fir–broad-leaved, and valley broad-leaved forests in floodplains. Also noted in inhabited places. Reach zone of coniferous forests. Larvae on *Salix zerophila* and *Populus koreana*. Imagoes attracted to ultraviolet lamps. Phen: larvae from May 22, pupation May 27–June 2, first flight June 20–July 1, flight June 27–August 6.

SS—16 specimens. Environs of Novoaleksandrovsk (EV) July 17, 1970; (L, SHO) August 2 and 19, 1967; Susunaiskii range (K) August 2, 1967. Foothills of Kamyshovyi range (L) August 21, 1967. Environs of Kholmsk (EV) July 15, 1970. Environs of Novoaleksandrovsk (EV) July 27, 1970. Found singly on conifers, lowland broad-leaved forests, and in inhabited places. Larvae on *Salix sachalinensis* and *S. caprea*. Phen: larvae June 10–28, pupation June 18–29, first flight July 2–18, flight July 15–August 21.

SK—8 specimens. Kunashir: environs of Sernovodsk (K). Larvae found singly in fir–yew–broad-leaved forests, in new leaves of *S.*

caprea. Phen: larvae June 5–18, pupation June 17–19 with summer diapause, first flight July 11–15, 1967.

Japan (Honshu).

Hedya inornata Wlsgm. (*crassiveniana* Kenn.)

Kennel, 1901: 244; 1908–1921: 367; Caradja, 1916: 56; Kuznetsov, 1967: 54.

Larvae in cigar-shaped rolled leaves of Mongolian oak (*Quercus mongolica*), damage oak forests. Distribution: Manchuria.

PR—19 specimens. Klimoutsy (K, S) July 9–27, 1966. Simonovo (FCH) July 29, 1959. Environs of Blagoveshchensk (Efremov) July 7–14, 1965. Radde (Korb) 1905. Common in oak groves; found singly in black birch–oak, larch, and black birch–oak–pine forests. An indicator in forest with Mongolian oak. Phen: larvae from June 3, pupation from June 21, first flight July 1–8, flight July 9–27.

SP—74 specimens. Ussuri (Kennel, 1901). Yakovlevka (D, FV) July 1–August 5, 1926. Vinogradovo (D, FV) July 11–20, 1929. Ussuriisk (FCH) July 3, 1959; (Mishchenko) July 17, 1934; GTS (Z, K) July 15–August 22, 1966; Baranovsk (Andrievskii) 1913. Suputinsk forest reserve (Tokareva) ex 1., June 29, 1932. Environs of Artem, Ugol'naya (A) July 13–14, 1960. Nakhodka (Kerzhner) August 20, 1959. Okeanskaya (S, FCH) ex 1., June 20, 1963. De Vries Peninsula (O) July 2–August 17. Petrov Island (D) August 18 and 29, 1934. Severely damages lespedeza and rhododendron groves. Imagoes and larvae rare in broad-leaved forests and cedar–broad-leaved forests, especially along mountain slopes. Phen: larvae from June 3, first flight June 20–29, flight July 1–August 29.

China, Japan (Honshu).

Hedya semiassana Kenn.

Kennel, 1901: 246, original description; 1908–1921: 368; Kuznetsov, 1969b: 37.

Larvae in wrapped leaves of Manchurian walnut glued together with silky discharge. Distribution: Manchuria. Pupae estivate for two to four weeks.

PR—1 specimen. Environs of Khabarov, Khekhtsirskii Pass (SHE) July 9, 1959.

SP—18 specimens. Biskii and Ussuri (Kennel, 1901). GTS (FCH) July 13, 1963; (K, Z) July 13–August 6, 1966. Baranovsk (Kennel) 1901. Environs of Artem, Ugol'naya (A) July 19, 1960. Imagoes found singly at light in cedar–broad-leaved, black fir–broad-leaved, nut–ash, and other broad-leaved forests with *Juglans manshurica*, especially in floodplains. Phen in environs of Ussuriisk: larvae from May 21, pupation from June 14–18, first flight under humid conditions June 29–July 10, flight under usual climatic conditions July 13–August 6.

Japan (Hokkaido, Honshu).

Hedya perspicuana Kenn.

Kennel, 1901: 251, original description; 1908–1921: 378; Caradja, 1916: 56.

Distribution: Ussuriisk–China.

SP—39 specimens. Vyazemskii (SHE) August 10, 1959. Ussuriisk (Shabliovskii) July 10, 1965; (Dul'keit) July 18, 1921. GTS (Z) July 15, 1966; (FCH) July 29, 1963. Suputinsk forest reserve (FCH) July 8, 1963. Environs of Artem, Ugol'naya (A) July 13, 1960. Kangauz (FCH) June 27 and July 4, 1963. Suchan (Dorris) 1890. Khualaza (KR) August 2, 1928. De Vries Peninsula (O) June 25–August 13. Okeanskaya (FCH) July 27, 1963. Environs of Vladivostok, Sedanka (FCH) July 11, 1963. Askol'd (Kennel, 1901). Found singly in cedar–broad-leaved, lowland broad-leaved, and other broad-leaved forests, especially those thinned by felling. Attracted to ultraviolet lamps. Flight June 25–August 13.

Northeastern China.

Hedya dimidiana Cl. (*schreberiana* L.)

Caradja, 1916: 56; Danilevskii, 1955: 90; Kuznetsov, 1970b: 41.

Larvae of middle instars hibernate. In spring they develop in vegetative buds, flower buds, and rolled apical leaves, causing significant damage to arboreal plants of Rosaceae in gardens, parks, and forests damaged by felling. On the basis of morphological structures this species is divided into two well-isolated subspecies. Eastern subspecies, in turn, can be divided into several geographic forms. Distribution: Amphi-Palearctic (mixed and broad-leaved forests).

SP—24 specimens. Lower reaches of Kolumbe River (KR) July 4, 1934. Vinogradovo (D, FV) June 13, 1929. GTS (Tokareva) ex 1., May 23, 1963. Okeanskaya (FCH) July 10–17, 1963. De Vries Peninsula (O) July 9, 1961. Environs of Vladivostok (FCH, S) June 21–25, 1963. Larvae dark green with black head. Damage cultivated apple, plum, sour cherry, and apricot in gardens and parks. In lowland broad-leaved and cedar–broad-leaved forests damaged by felling, found on wild plants of Rosaceae: *Cerasus maximowiczii, Padus asiatica, Malus manshurica, Pyrus ussuriensis, Armeniaca manshurica.* Rare in root association of mixed forests. Phen: larvae May 10–June 14, pupation May 23–June 15, first flight May 24–June 23, flight June 11–July 17.

SS—5 specimens. Environs of Novoaleksandrovsk (L); southern Sakhalin (L, SHO). Khabarov (EV). Larvae common in gardens of crab-apple, parks, and damaged mixed forests on *Cerasus sachalinensis* and *Sorbus commixta*. Phen: larvae from May 24, pupation from June 2, first flight June 12–July 10, flight from July 20.

SK—16 specimens. Iturup: foothills of Berutarube volc (E) July 31, 1965. Kunashir: environs of Sernovodsk, Lake Glukhoe, Lake Peschanoe (K, S) July 18–19, 1967. Alekhino (Dorokhovy) July 4, 1966. Larvae damage outgrowths of *Cerasus kurilensis* near the ocean, and *C. sachalinensis* in abandoned gardens. Found singly in spruce–fir–broad-leaved forests on ocean terraces and in oak groves with curly oak on *Sorbus commixta* and *Padus ssiori.* Phen: larvae from June 4, pupation June 12–July 11, first flight June 30–July 12, flight July 18–19.

Northeastern China, Japan (Hokkaido, Honshu, Shikoku).

Hedya ignara Flkv.

Fal'kovich, 1972c: 354, original description.

Larvae of middle instars supposedly hibernate. In spring they damage opening buds and loosely wrapped clumps of leaves at apices of branches of arboreal members of Rosales. Distribution: Japan–Ussuriisk–China.

SP—26 specimens. Vinogradovo (D, FV) July 1, 1929. Ussuriisk (Tokareva) ex 1., June 15, 1932; GTS (S, K) ex 1., June 4–12, June 24, 1966. Environs of Artem, Ugol'naya (A) July 5, 1960. Suchan (Palshkov) July 19, 1931. Okeanskaya (S, FCH) July 9, 1959, July 13–16, 1963, ex 1., July 12–15, 1963. Shamora (S, FCH) ex 1., June 21–July 10, 1963. De Vries Peninsula (O) June 17–July 13. Larvae dark chocolate-brown to almost black. Damage cultivated apple in gardens and parks. Found singly in lespedeza groves and valley broad-leaved and oak–linden forests on *Crataegus pinnatifida, C. maximowiczii*, and *Malus manshurica*. Imagoes attracted to light. Phen: larvae May 23–June 2, pupation May 26–June 14, first flight June 4–15, flight June 17–July 16.

SS—2 specimens. Environs of Novoaleksandrovsk (L, SHO) ex 1., July 26, 1967; (EV) July 17, 1970. Larvae from June 1 on *Crataegus chlorosarca* in wastelands, damaged spruce–fir–broad-leaved forests, and gardens. Pupation June 8, first flight June 26–July 17.

Northeastern China, Japan.

Hedya pruniana Hb.

Larvae hibernate. In spring resume feeding on opening buds and subsequently on rolled leaves of arboreal members of Rosaceae, especially plum. Pupation in leaves. Distribution: Amphi-Palearctic (mixed broad-leaved forests, steppes). In the Far East known only from gardens of Ussuriisk.

Europe, European part of the USSR, the Caucasus, and Ural region.

SP—10 specimens. Ussuriisk (Shabliovskii) June 19, 1965; (K) ex 1., June 6–17, 1966. Larvae only in gardens, damage *Prunus ussuriensis*. Found singly on cultivated apple and plum. Phen: older larvae May 26–June 2, pupation May 28–June 2, first flight June 6–17, 1966.

Hedya ochroleucana Fröl.

Caradja, 1916: 56; Danilevskii, 1955: 89; Kuznetsov, 1967: 54.

Larvae hibernate. In spring resume feeding on new buds, flower buds, and rolled leaves at apices of branches of roses and briar. Imagoes attracted to light. Distribution: Holarctic (forests and steppes).

PR—30 specimens. Klimoutsy (K, S) June 30–July 15, 1958; Simonovo (FCH) July 2–August 12, 1959. Blagoveshchensk (Hedemann) July 5 (16), 1877. Radde (Korb) 1905. Environs of Khabarov, dendrarium (SHE) June 27, 1959; Khekhtsirskii Pass (SHE) June 30 and July 9, 1959. Larvae on *Rosa dahurica*. Imagoes common in black birch–oak–larch, black birch–oak–pine, oak, and other forests with briar, as well as in inhabited places. Rare in meadows and lowlands. Phen: larvae June 2–10, pupation June 11–29, first flight July 30, flight June 27–August 12.

SP—35 specimens. Kirovskii (M) July 9 and August 4, 1970. Yakovlevka (D, FV) August 28, 1926. Vinogradovo (D, FV) July 1–7, 1929. GTS (K, S) June 19–July 25; (Dul'keit) June 26, 1924. Environs of Artem, Ugol'naya (A) June 26 and July 18, 1960. De Vries Peninsula (O) July 6, 1955 and August 23, 1956. Sudzukhinskii forest reserve (Litvinenko) June, 1959. Congregate in outgrowths of *Rosa* in pastures. Found singly in gardens and parks, as well as in forests damaged by felling: oak and lowland broad-leaved forests. Flight in evening June 19–August 28.

SS—8 specimens. Environs of Novoaleksandrovsk (EV) July 17, 1970; (L) July 26 and August 16, 1967. Chekhov Peak (EV) ex 1., July 22, 1970. Found singly in forests damaged by felling and mixed forests damaged by grazing. Larvae on *Rosa* sp. from May 16, pupation June 27–July 12, first flight July 8–26, 1970.

Hedya atropunctana Zett. (*dimidiana* Sod.)

Caradja, 1916: 56; Danilevskii, 1955: 88; Kuznetsov, 1967: 54.

Pupae hibernate. First flight in early spring. In southern Primor'e and southern Kuril Islands two generations per year; in Priamur probably only one generation per year. Larvae on birch and alder. Cause characteristic damage: bend leaves along midrib and after gluing edges with silky discharge, skeletonize surface from inner side, forming a packet. Frass not ejected from packets. Larvae cuts leaf tissue around itself before pupation, apparently to facilitate its drop from the packet to the ground. Distribution: Holarctic (forest-tundra, forests, forest-steppes).

PR—13 specimens. Albazino (Hedemann) June, 1877. Klimoutsy (K, S) June 4–July 2, 1958. Kazakevichvo (Korb) 1907. Imagoes found singly in black birch–oak–larch forests and dwarf arctic birch–willow outgrowths.

SP—8 specimens. Vyazemskii (SHE) August 3, 1959. Yakovlevka (D, FV) June 2 and August 15, 1926. Suchan, Sikhote-Alin' Pass (KR) June 4, 1928. Okeanskaya (Transshel') August 6, 1929. De Vries Peninsula (O) June 15, 1961, July 17, 1960, August 4, 1961, August 18, 1960. Imagoes found singly in coniferous, mixed, and broad-leaved forests with *Betula*, and also in inhabited places. Attracted to light. Flight of first generation June 2–15, of second generation July 17–August 18.

SK—9 specimens. Kunashir: environs of Sernovodsk and Belkino (Z, K). Larvae common on *Betula ulmifolia* in Erman's birch and other forests with *B. ulmifolia*. Flight of first generation June 25–August 2, larvae August 10–28, pupation August 17–20, flight of second generation August 29, 1967. Shikotan (Kerzhner) June 21, 1973.

Pseudohedya gradana Chr.

Christoph, 1881: 419, original description; Walsingham, 1900: 432; Kennel, 1908–1921: 649; Fal'kovich, 1962a: 192.

Distribution: Amur–Ussuriisk–China.

PR—1 specimen. Environs of Khabarov (SHE) July 9, 1959.

SP—22 specimens. Yakovlevka (Zinov'eva) July 12, 1962; (D, FV) July 13, 1926. Upper reaches of Suputinka River (KR) July 1 and 9, 1933. Environs of Artem, Ugol'naya (A) July 19, 1960. Kangauz (FCH) July 4–7, 1963. Okeanskaya (FCH) July 9–12, 1959; (FCH, S) August 1 and 5, 1963. Environs of Vladivostok (Christoph) July 26–29, 1877. De Vries Peninsula (O) July 26, 1961. Found singly in lowland broad-leaved forests. Flight July 4–August 5.

Northeastern China.

Pseudohedya cincinna Flk.

Fal'kovich, 1962c: 357; original description.

Known only from southern Primor'e.

SP—14 specimens. Yakovlevka (Zinov'eva) July 19, 1962. GTS (Z) July 24–August 12. Kangauz (FCH) July 7, 1963. Okeanskaya (FCH) July 12, 1959; (S) August 4, 1963. Okeanskaya–Shamora road (S) July 3, 1963. De Vries Peninsula (O) August 19, 1960. Environs of Vladivostok, Sedanka (FCH) August 5, 1963. Found singly in cedar–broad-leaved, black fir–broad-leaved, nut–ash, oak–linden forests with lespedeza and filbert, and also in inhabited places. Imagoes attracted to light of filament lamps. Flight July 12–August 19.

Pseudohedya retracta Flkv.

Fal'kovich, 1962c: 355, original description.

Larvae in cigar-shaped leaf tubes (margins rolled under) of hornbeam and filbert. Development of pronymphs delayed in summer for more than 10 days. Distribution: Manchuria.

PR—2 specimens. Environs of Khabarov: Khekhtsirskii Pass (SHE) July 9, 1959; "Dva Brata" (SHE) August 8, 1959. Larvae on *Corylus heterophylla*.

SP—38 specimens. Yakovlevka (Zinov'eva) July 12, 1962. GTS (S, K) August 6–8, 1966. Kangauz (FCH) August 4, 1963. Okeanskaya (FCH) July 10–30, 1959; (A) July 13, 1959; (FCH, S) July 23–August 4, 1963. Adapted to black fir–broad-leaved forests with hornbeam. Rare in lowland broad-leaved forests. Larvae on *Carpinus cordata* and *Corylus manshurica*. Imagoes attracted to light. Phen. in GTS: larvae feed from May 27–June 7, pronymphs June 1–18, pupation June 8–19, first flight June 24–July 6, flight July 10–August 8.

Northeastern China, Japan (Honshu).

Proschistis peregrina Flkv.

Fal'kovich, 1966a: 211, original description.

Distribution: probably, Ussuriisk–China.

SP—1 specimen. Tigrovoi (FCH) July 1, 1963.

Proschistis pictana Kuzn.

Kuznetsov, 1969a: 353, original description.

In Primor'e replaced by the closely related species, *P. peregrina* Flkv., and in Japan by a more distant species, *P. cyanura* Meyr.

Known only from Kunashir Island and Japan.

SK—108 specimens. Kunashir: environs of Sernovodsk (Z, K) June 16–August 8; Lake Glukhoe (Z, K) June 16–July 24; Lake Peschanoe (K) June 19–July 22; Velkino (K) July 6; Alekhino (K) June 21; Cape Chetverikov (K) June 25, 1967. Imagoes during day and in evening hover over branches of *Actinidia* in all mixed and broad-leaved forests containing this creeper. Often found in fringes of sparse fir–yew–broad-leaved, spruce–fir–broad-leaved, fir–yew–broad-leaved forests with oak, elm–maple forests, rarely in groves wich curly oak, conifer–Erman's birch forests, and forests of Erman's birch with *Betula ulmifolia*. Found in maximum numbers in first 10 days of July (along the fringes of fir–yew–broad-leaved forests, more than 30 specimens per hour). Flight June 16–August 8, 1967.

Proschistis shicotana Kuzn.

Kuznetsov, 1969a: 355, original description.

Distribution: Japan.

SK—1 specimen. Shikotan: foothills of Shikotan mountains (E) July 23, 1965.

Japan.

Salichiphaga acharis Butl.

Kennel, 1908–1921: 368; Caradja, 1916: 56; Kuznetsov, 1967: 54.

Larvae in rolled leaves of willow and poplar (Issiki, 1957). Distribution: Manchuria.

PR—8 specimens. Blagoveshchensk (Efremov) July 7–14, 1965. Khabarov (Korb) 1905. Found singly in floodplains of Amur River. Flight July 7–August 9.

SP—38 specimens. Vyazemskii (Pal'chevskii) July 12 (25), 1903; Borzov, July 17 (30)–1 (13), 1909 [*sic*]; (SHE) August 10, 1959. Shmakovka (Romanova) August 2, 1931. Kirovskii (M) July 13–16, 1970. Yakovlevka (D, FV) July 29, 1926. Vinogradovo (D, FV) July 29–30, 1929. Ussuri (Emel'yanov) July 29, 1911. Ussuriisk (Maslovskii) July 15–25, 1930, July 28–August 1, 1929; (Tokareva) August 15–16, 1931. Upper reaches of Suputinka River (KR) July 25, 1933. Environs of Artem, Ugol'naya (A) July 19, 1960. Suchan (Dorris) 1890. Okeanskaya (FCH) July 26, 1963. De Vries Peninsula (O) June 26, 1962, July 7–15, 1961, July 14, 1955, July 19, 1960. Common in evening and attracted to light in lowland broad-leaved forests, especially along floodplains, and also in inhabited places.

China, Japan.

Saliciphaga caesia Flkv.

Fal'kovich, 1962c: 359, original description.

Larvae in cigar-shaped tubes of leaves glued together with silky discharge at apices of branches of willows. Severely damage forests and parks after felling. Distribution: Amur–Ussuriisk–China.

PR—2 specimens. Environs of Khabarov (SHE) July 19 and 25, 1959.

SP—175 specimens. Kirovskii (M) July 16, 1970. Yakovlevka (D, FV) July 13–20, 1926. Spassk (Kerzhner) August 7, 1963. Ussuriisk (A, Gibanov, Shabliovskii) July 15–August 22. GTS (Z, K, FCH) July 12–August 10.* Environs of Artem, Ugol'naya (A) July 19, 1960. Okeanskaya (S, FCH) July 22–August 3, 1963; Cape Sokol' (S, FCH) ex 1., July 10–19, 1963. De Vries Peninsula (O) July 21–August 6.* Larvae severely damage *Salix rorida*, rarely damage other smooth-leaved willows in lowland broad-leaved forests along floodplains, in sparse forests and shrubs near the ocean, and in pastures, parks, gardens, and inhabited places. Found singly in black fir–broad-leaved, cedar–broad-leaved, oak–elm, and other broad-leaved forests along floodplains and montane linden slopes. Imagoes attracted to light. Phen in environs of Ussuriisk: larvae May 13–June 21, pupation June 15–21. Summer larvae estivate for about 10 days. First flight June 29–July 27, flight July 12–August 22.

Sciaphila branderiana L. (*Tortrix aerosana* f. *saiana* Car.)

Danilevskii, 1955: 87.

Larvae in cigar-shaped rolled leaves of aspen and poplar. Distribution: Trans-Palearctic (forests, forest-steppes); in Siberia known only from single location (Kuznetskii-Alatau).

SP—15 specimens. Yakovlevka (D, FV) June 11–July 5, 1926. GTS (K) ex 1., June 12, 1966. Suputinsk forest reserve (K) June 17, 1966. Kangauz (FCH) July 4–5, 1963. Tigrovoi (FCH) June 29, 1963; (KR) July 8, 1928. Okeanskaya (FCH) June 21–26, 1963. Larvae singly on *Populus davidiana* in black fir–broad-leaved, cedar–broad-leaved, and lowland broad-leaved forests and lespedeza groves. Phen: May 20–29, pupation May 30, first flight June 12, flight June 11–July 8.

SS—1 specimen. Environs of Novoaleksandrovsk, wastelands (EV). One larva found on *Populus maximowiczii* on June 17, pupation June 22, first flight July 3, 1970.

---

*Year omitted in Russian original—General Editor.

Apotomis turbidana Hb.

Kuznetsov, 1967: 53.

Larvae of middle instars supposedly hibernate. Live on birches and resume feeding in spring in rolled leaves, more often in upper part of plant. Distribution: Trans-Palearctic (forests).

PR—35 specimens. Klimoutsy (K, S) June 24–July 11, 1958; (FCH) June 20, 1959. Simonovo (Dorokhina) July 20, 1959. Korsakova (FCH) August 7, 1959. Larvae damage *Betula platyphylla* in birch forests. Found singly in black birch–oak–larch and black birch–oak–pine forests. Imagoes congregate during flight in evening; July 8, 1958–24 specimens per hour. Imagoes shy away from sunlit trunks of *B. platyphylla* in evening. Phen: larvae from May 27, pupation June 4–12, first flight June 18–27, flight June 24–August 7.

SP—20 specimens. GTS (Z) July 30, 1966. Kangauz (FCH) June 27–July 4, 1963. Suchan (Vasil'ev, KR) August 16, 1928. Tigrovoi (FCH) July 2, 1963; (KR) July 27, 1929. Okeanskaya (S, FCH) June 27–July 27, 1963. De Vries Peninsula (O) July 6, 1955. Found singly in evening and at light in black fir–broad-leaved, cedar–broad-leaved, lowland broad-leaved forests, and birch groves. Attracted to ultraviolet lamps. Flight June 27–August 16.

Apotomis sororculana Zett.

Danilevskii, 1955: 90.

In Europe larvae of middle instars hibernate. Develop on birches and resume feeding in spring. Distribution: Trans-Palearctic (conifer and mixed forests, forest-tundra).

PR—1 specimen. Pokrovka (Hedemann) May 15 (28), 1877.

SP—3 specimens. Vinogradovo (D, FV) May 27–June 5, 1929.

Apotomis betuletana Hw.

Danilevskii, 1955: 87; Kuznetsov, 1967: 54.

Larvae in rolled leaves of birches. Distribution: Trans-Palearctic (forest zones, forest-steppes).

PR—9 specimens. Klimoutsy (K, S.) Samodon-on-Amur (Zinov'eva) August 6, 1959. Evur River, Komsomol'skoi forest nursery (KR) August 8, 1952. Larvae of middle instars found singly on *Betula platyphylla* from May 29 onward in black birch–oak–larch, black birch–oak–pine, and birch forests. Pupation June 29–July 30, first flight July 21–25, 1958.

SP—20 specimens. Vyazemskii (Borzov) August 10 (22), 1909. Vinogradovo (D, FV) August 7, 1929. GTS (Z, K) August 7, ex 1., July 26 and August 10, 1966; (Zinov'eva) August 23–24, 1962. Foothills of Oblachnaya mountain (S) August 8–18, 1963. Suchan (Palshkov) August 8, 1934; (KR) August 18, 1928. Okeanskaya (Zagulyaev) August 12, 1950; (FCH) August 21, 1963. De Vries Peninsula (O) September 7, 1961. Lake Khasan (Zagulyaev) August 4, 1950. Larvae in birch forests in rolled leaves of *B. manshurica* in zone of coniferous forests and below it. Imagoes also in lowland broad-leaved forests and in inhabited places. In evening hover near trunks of birch. Attracted to light.

SS—10 specimens. Environs of Novoaleksandrovsk (K, L, SHO). Larvae on *B. paraermanii* and *B. taushi* in birch groves and conifer and mixed forests. Phen: larvae from June 14, pupation from July 8, first flight July 26–August 7, flight August 16–21, 1967.

SK—2 specimens. Kunashir: environs of Kosmodem'yansk (Krivolutskaya) August 26, 1964; environs of Sermovodsk (K) July 28, 1967. Found singly in black birch forests.

Apotomis vigens Flkv.

Fal'kovich, 1966a: 214–216, original description.

Distribution: eastern Palearctic (forests).

South Siberia.

SP—5 specimens. GTS (FCH) June 28–July 17, 1959. Suputinsk forest reserve (FCH) July 28, 1963. Valley of Yanmut'khouza River (S) August 10, 1963. Found singly in floodplains in mixed forests and lowland broad-leaved forests. Flight July 17–August 10.

Apotomis capreana Hb.

Caradja, 1916: 56; Danilevskii, 1955: 87; Kuznetsov, 1967: 54.

Larvae of middle instars hibernate. Develop on willows and resume feeding in spring on new buds and in rolled leaves. Distribution: Holarctic (forests).

PR—16 specimens. Klimoutsy (K, S), environs of Blagoveshchensk (Efremov), Radde (Korb) Khabarov (Maslovskii). Larvae often on *Salix raddeana* in birch forests and on *S. xerophila* in mixed black birch–oak–larch forests. Found singly in other types of black birch–oak–larch forests. Imagoes near these willows in evening. Phen: larvae May 29–June 7, pupation June 7–26, first flight June 28–July 8, flight July 8–20, 1958.

SP—19 specimens. Vyazemskii (Borzov) July 4–20 (July 16–August 2) 1909. Kirovskii (M) July 7–August 3, 1970. Environs of Ussuriisk: Varanovsk (Andrievskii) 1913; GTS (Z, K) June 27–August 3, 1966. Kangauz (FCH) July 5, 1963. Tigrovoi (FCH) July 2, 1963. Okeanskaya (S) June 27–July 27, 1963. Environs of Vladivostok, Sedanka (FCH) August 4, 1963. Found singly on *S. viminalis* and other species of drooping willow in floodplain willow forests and lowland broad-leaved forests. Phen: larvae May 10–28, pupation May 24–29, first flight June 16–17, flight June 27–August 4.

SS—10 specimens. Environs of Novoaleksandrovsk and foothills of Kamyshovyi range (Z, K, L, SHO) August 2–21, 1967. Found singly in lowland mixed and broad-leaved forests along floodplains. Imagoes hover near willow trees in evening.

SK—4 specimens. Kunashir: environs of Sernovodsk (K); environs of Kosmodem'yansk (Krivolutskaya) August 26, 1964. Larvae found singly in new leaves of *S. sachalinensis* in fir–yew–broad-leaved forests. Phen: larvae June 17–29, pronymphs June 30–July 7, pupation July 8–21, first flight July 22, flight toward light August 8–9, 1967.

Apotomis stagnana Kuzn.

Kuznetsov, 1962c: 49, original description; 1967: 54,

Larvae of middle instars hibernate in characteristic tubes made from dry leaves at apices of branches of *Salix brachypoda*. In spring resume feeding on tender foliage and cause severe damage to willow species of dwarf arctic birch–willow in outgrowths of marshes. Distribution: eastern Palearctic (mixed and coniferous forests).

Yakutia, Mongolia.

PR—more than 100 specimens. Klimoutsy (K, S) June 26–August, 4, 1958; (Kerzhner, FCH) July 14 and 31, 1959. Simonovo (Dorokhina, FCH) June 21–August 3, 1959. Dominant and destructive species in dwarf arctic birch–willow overgrowths in Amur-Zeya plateau. Found singly also in larch, black birch, oak–larch, and floodplain forests. Diapausing larvae, in spite of warm weather in last two weeks of May, 1958, did not resume feeding until the end of the month. Larvae resume feeding en masse in spring and concomitant increase in damage evident from beginning of June. Pupation from June 8 to end of June. First flight June 24–July 6, flight July 26–August 14. Imagoes rapidly increased in numbers from this period in 1958 and en masse flight noted from June 27 onwards. In the evening of July 8, 1958 imagoes extremely abundant—36 specimens per hour. Only at end of June did population begin to decline [*sic*]. From August 10 young larvae began to appear and rolled leaves into characteristic tubes; damage caused by them, however, was very insignificant. They developed slowly and diapaused thereafter.

Apotomis vaccinii Kuzn.

Kuznetsov, 1969a: 352, original description.

Larvae of middle instars probably hibernate. In spring resume feeding in rolled leaves at apices of branches of *Vaccinium* in mixed and coniferous forests. Distribution: Japan.

SS—3 specimens. Environs of Novoaleksandrovsk, Susunaiskii range, foothills (K); path at Chekhov Peak (L, SHO). Larvae on *V. ovalifolia* in spruce–fir and mixed forests from May 25, pupation June 5–16, first flight June 29–July 1, 1967.

SK—5 specimens. Kunashir: environs of Sernovodsk, Lake Peschanoe (K). Larvae on *V. hirtum* in spruce–fir–broad-leaved forests near lakes from June 12 onward. Pupation July4–15, first flight July 16–August 4, flight August 17, 1967.

Apotomis lineana Den. and Schiff. (*scriptana* Hb.)

Larvae in new buds or between rolled leaves of tall willows. Distribution: Trans-Palearctic (forests).

PR—5 specimens. Samodon-on-Amur (FCH) August 4, 1959. Environs of Khabarov, Khekhtsinskii Pass (SHE) July 9–13, 1959. Floodplains of Emur River, Komsomol'skoe forests (KR). Found singly in floodplains.

SP—13 specimens. GTS (FCH) July 16–17, 1959; (K) ex 1., June 29, 1966. Tigrovoi (FCH) June 29, 1963. De Vries Peninsula (KR) July 20, 1955. Okeanskaya (FCH) July 17, 1963. Larvae on *Salix* sp. Imagoes in lowland broad-leaved forests, especially in floodplain willow forests after felling. Flight June 29–August 5.

Apotomis monotona Kuzn.

Kuznetsov, 1962b: 340, original description; 1967: 54.

Larvae in rolled leaves of Dahurian birch, rarely on Asian white birch. Distribution: Amur–Ussuriisk.

PR—12 specimens. Klimoutsy (K, S) July 10, 1958. Simonovo (FCH) July 23–25, 1959. Samodon-on-Amur (FCH) August 23, 1959. Imagoes in evening in black birch–oak–larch and black birch–oak–pine forests with *Betula dahurica,* on trunks of this birch. Phen: larvae from June 14, pupation from June 22, first flight July 6–9, flight July 10-August 3.

SP—16 specimens. GTS (Z) July 16–August 7, 1966. Suputinsk forest reserve (FCH) July 28, 1963. De Vries Peninsula (O) July 19, 1960, July 22, 1957. Okeanskaya (FCH) July 23–24, 1963. Found singly at light in lespedeza groves, nut–ash, and other lowland broad-leaved forests with *B. dahurica.* Flight July 16–August 7.

Apotomis inundana Den. and Schiff.

Larvae in rolled leaves of aspens. Distribution: Trans-Palearctic (forests and forest-steppes), but in Siberia reported from only one location (Kuznetskii-Alatau).

SP—2 specimens. GTS (Z) August 7 and 20, 1966. Imagoes attracted to light in inhabited places.

Apotomis semifasciana Hw.

Kuznetsov, 1967: 54.

Larvae in rolled leaves at apices of branches of willows. Distribution: Trans-Palearctic (found locally in forest zones).

PR—7 specimens. Klimoutsy (K, S) July 20–August 8, 1958; (FCH) July 21, 1959. Simonovo (FCH) July 29, 1959. Valley of Evur River (KR) August 5, 1952. Larvae found singly on *Salix xerophila* in well-lit black birch–oak–larch forests damaged by felling. Imagoes in evening and attracted to light; also found in inhabited places. Phen: larvae July 4–14, pupation from July 14, first flight from July 23, flight July 20–August 8.

SP—1 specimen. Tigrovoi (FCH) June 29, 1963.

Olethreutes mori Mtsm. (*japonicum* Wlsgm.)

Young larvae hibernate. In spring enter buds of mulberry and feed. Damage to growing leaf buds seldom evident. Pupation in glued leaves. Distribution: Japan–Ussuriisk–China.

SP—111 specimens. GTS (Z, K, S, FCH) July 12–29. Artem (Kunyanskaya) ex l., July 11–13, 1969. Okeanskaya (S, FCH) July 13, 1959. De Vries Peninsula (O) July 27, 1960. Number one pest of cultivated mulberry in gardens and parks, earlier known only from Japan. Environs of Ussuriisk (GTS) damage to buds on large bushes in 1966 about 80% damage less in small bushes. In upper tier of crown of mature plantation damage more than half surface of foliage by end of June. The isolated and introduced nature of mulberry plantations in inhabited places of Primor'e and the detection of tortricids only in gardens and parks in the absence of their parasites, enable us to conclude that in Primor'e this pest is recently introduced. Mass reproduction in GTS continued at least from 1959 through 1966. Phen: larvae from mid-May to June 29, pupation June 15–July 4, first flight June 30–July 23 (1 specimen on August 7, 1959), flight July 12–29. Imagoes during dusk and attracted to ultraviolet lemps.

Northeastern China, Korean Peninsula, Japan (Hokkaido).

Olethreutes moderata Flkv.

Fal'kovich, 1962c: 365, original description; Kuznetsov, 1967: 56.

Polyphagous larvae in new buds and rolled leaves of arboreal species of Rosales, Fagales, Rhamnales, Tiliales, Oleales, and Ericales. Pupation in leaves. Distribution: Amur–Ussuriisk.

PR—5 specimens. Korsakovo (FCH) August 3–5, 1959. Environs of Blagoveshchensk (Efremov) July 10–14, 1965. Khabarov (Mevzos) June 26, 1921. Found singly in floodplains and inhabited places.

SP—138 specimens. Ussuriisk and GTS (Z, K) June 28–August 2, 1966; (A, FCH) July 4–20, 1959. Khualaza (FCH) July 6, 1963. Floodplains of Yanmut'khouza River (S) July 10, 1963. Peishula (FCH, S) July 12–19, 1963. Kangauz (FCH) June 25–August 8, 1963. Tigrovoi (FCH) June 29–July 2, 1963. Suchan (KR) July 2–26, 1928. De Vries Peninsula (O) July 1, 1961, July 7–13, 1960. Okeanskaya (S, FCH) June 30 and July 18, 1963. Shamora (S) ex 1., June 28, 1963; Kedrovaya pad' forest reserve (Zinov'eva) July 6, 1962. Larvae slightly damage various woody plants, especially fruits of Rosaceae, cedar–broad-leaved, black birch–broad-leaved, nut–ash, and other valley broad-leaved forests. Found singly in lespedeza and rhododendron groves and in outgrowths of shrubs near inhabited places. In gardens and parks found on *Ribes nigra, Crataegus pinnatifida, C. maximowiczii, Padus asiatica,* and *Spiraea betulifolia.* In forests additionally found on *Quercus mongolica, Syringa amurensis, Rhododendron mucronulatum, Rhamnus ussuriensis, Tilia amurensis, Diervilla florida, Viburnum sargentii, Salix* sp., and *Acer* sp. Phen: larvae May 13–25, pupation May 24–June 7, first flight June 5–29, flight June 25–August 2. Imagoes attracted to light.

Olethreutes ineptana Kenn.

Kennel, 1901: 255, original description;1908–1921:418.

Distribution: Manchuria.

PR—1 specimens. Kazakevichevo (Korb)1907.

SP—8 specimens. Environs of Artem, Ugol'naya (A) July 11–19, 1960. Kangauz (FCH) June 27, 1963. Okeanskaya (FCH) July 9, 1959, July 23, 1963. De Vries Peninsula (KR) July 6, 1955. Askol'd (Kennel, 1901). Found singly in mixed and broad-leaved forests as well as in inhabited places. Flight June 27–July 23.

Japan (Hokkaido, Honshu, Kyushu).

Olethreutes exilis Flkv.

Fal'kovich,1966b: 39, original description.

Distribution: Manchuria.

PR—2 specimens. Samodon-on-Amur (FCH) August 3, 1959.

SP—2 specimens. Kangauz (FCH) July 1–2, 1963.

SK—3 specimens. Kunashir: environs of Semovodska (Z) July 23; (K) August 4; environs of Belkino (Z) August 28, 1967. Found singly in fir–yew–broad-leaved and other mixed forests as well as in oak groves. Flight July23–August 28, 1967.

Olethreutes dolosana Kenn.

Kennel, 1901: 234, original description; 1908–1921: 253; Caradja, 1916: 57; Kurentsov, 1950: 30.

In Japan young larvae hibernate (Oku, 1961). Probably omnivorous. Distribution: Manchuria.

PR—3 specimens. Environs of Khabarov (SHE) July 25, 1959. Khekhtsirskii Pass (SHE) July 9, 1959.

SP—224 specimens. Kirovskii (M) July 22–23, 1970. Spassk (FCH) July 17, 1963. GTS (Z, K) July 6–August 13, 1966; (FCH) July 7–16, 1959 (Zinov'eva) August 12, 1962. Environs of Artem, Ugol'naya (A) July 14, 1960. Khualaza (FCH) July 6, 1963. Peishula (FCH, S) July 12–15, 1963. Kangauz (FCH) June 26–July 7, 1963. Tigrovoi (FCH) June 29, 1963. Suchan (Kennel, 1901). Okeanskaya (S, FCH) July 8–27, 1963; (FCH) July 31, 1959. Imagoes congregate in mixed grass meadows, gardens, along fringes of valley broad-leaved forests, floodplains, and mountain slopes. Rare along fringes of cedar–broad-leaved, and black fir–broad-leaved forests, and in inhabited places. Found singly in lespedeza groves. Attracted to light. Flight June 26–August 13.

Japan (Hokkaido, Honshu, Shikoku, Kyushu).

Olethreutes examinata Flkv.

Fal'kovich, 1966b: 42, original description; Kuznetsov, 1967: 55.

Distribution: Amur–Ussuriisk.

PR—93 specimens. Klimoutsy (K, S) 1–19, 1958: (Kerzhner, FCH) June 28–July 21, 1959. Simonovo (Dorokhina, Kerzhner, FCH) July 4–27, 1959. Korsakovo (FCH) August 3, 1959. Samodon-on-Amur (FCH) July 9 and August 3, 1959. Khabarov, July 8, 1929. Imagoes congregate in pastures, mixed grass meadows, and mixed grass lowlands. Rare in fields, inhabited places, black birch–oak–larch and black birch–oak–pine forests damaged by felling, floodplain broad-leaved forests, and dwarf arctic birch–willowoutgrowths. Flight June 28–August 3.

SP—22 specimens. Vyazemskii (Borzov) June 28–July 2 (July 11–

14), 1909. Spassk (Zinov'eva) June 29, 1962. GTS (Z) July 3–15, 1966. Suputinsk forest reserve (K) June 20, 1966. Peishula, Zmeinka (FCH) July 13–14, 1963. Tigrovoi (FCH) June 29, 1963. De Vries Peninsula (O) July 19, 1960. Environs of Vladivostok. Sedanka (FCH) July 11–23, 1963. Kedrovaya Pad' forest reserve (N) August 5, 1962. Found singly in evening and attracted to light in lowland broad-leaved forests, and in inhabited places. Flight June 20–August 5.

Olethreutes semicremana Chr.

Christoph, 1881: 77, original description; Kennel, 1908–1921: 433; Caradja, 1916: 59; Kuznetsov, 1967: 56.

Distribution: Amur-Ussuriisk.

PR—10 specimens. Korsakovo (FCH) August 3 and 6, 1959; Radde (Korb) 1905. Environs of Khabarov (SHE) July 25, 1959. Khekhtsirskii Pass (SHE) July 9, 1959. Found singly in floodplain and other broad-leaved forests.

SP—30 specimens. Vyazemskii (Borzov) July 7 (19), 1908. Environs of Ussuriisk, experimental station (Mishchenko) July 17–22, 1964. GTS (FCH) July 8–17, 1959; (Z) July 27–August 2, 1966. Suputinsk forest reserve (FCH) July 28–29, 1963. Khualaza (FCH) July 12, 1963. Khatunichi (FCH) July 12, 1963. Peishula (FCH) July 12–15, 1963. De Vries Peninsula (O) July 23, 1960. Imagoes common in lowland broad-leaved forests along floodplains. Found singly in cedar–broad-leaved and black fir–broad-leaved forests, and in inhabited places. Flight July 8–August 2.

Olethreutes agatha Flkv.

Fal'kovich, 1966b: 45, original description.

Emerald-green larvae with black head and prothoracic scutellum. Live in rolled leaves of Amur deutzia and Buryat black haw. Since the larvae prevent unfolding of leaves, damage resembles a lumpy head. Known only from the Ussuri basin.

SP—43 specimens. GTS (Z, K) June 19–August 2, 1966. Peishula (FCH) July 12, 1963. Okeanskaya (FCH) July 9–14, 1959; (FCH) July 20–August 4, 1963. Environs of Vladivostok: Sedanka (S) July 11, 1963. Larvae common on *Deutzia amurensis* in black fir–broad-leaved forests. Imagoes also in lowland broad-leaved and cedar–broad-leaved forests with *D. amurensis*. Found singly in inhabited places. Attracted to light. Part of pronymph population estivates. Phen: larval feeding May 29–June 30, pronymphs June 4–13, pupation June 13–25, first flight June 23–July 2, flight June 19–August 4.

Olethreutes transversana Chr.

Christoph, 1881: 75, original description; Kennel, 1908–1921: 434; Caradja, 1916: 59; Kuznetsov, 1967: 57.

Larvae in rolled leaves of raspberry, currant, and strawberry, and pupate in them. Distribution: Manchuria.

PR—10 specimens. Pomneevka (Christoph, 1881). Environs of Blagoveshchensk (Efremov) July 7–14, 1965; Gribskoe (Amisimova) ex 1., July 12, 1965. Radde (Korb) 1905. Environs of Khabarov (SHE) July 24, 1959. Larvae found singly on *Ribes* sp. in floodplains of Amur River. Flight July 7–24.

SP—96 specimens. Kirovskii (M) 23–August 6, 1970. Spassk (Zinov'eva) July 26, 1962. Ussuri (Emel'yanov) August 4, 1911. Vinogradovo (D, FV) July 23–24, 1929. GTS (Z) July 20–August 12, 1966; (Zinov'ev, N) August 12, 1962; (Tokareva) August 15, 1931. Upper reaches of Suputinka River (S) July 29, 1963. Peishula (FCH) July 12, 1963. Tigrovoi (KR) August 1, 1928. Suchan (KR) August 8, 1928; (Palshkov) August 18, 1935. De Vries Peninsula (O) July 19, 1960. Okeanskaya (S, FCH) July 16–August 5, 1963; (Transhel') August 7, 1929. Environs of Vladivostok (Starokadamskii) August 3–4, 1910. Sedanka (S) August 4, 1963. Kedrovaya Pad' forest reserve (Kerzhner) August 22, 1963. Larvae found singly on *Rubus crataegifolius*. Imagoes often in lowland broad-leaved forests along floodplains damaged by felling. Found singly in cedar–broad-leaved, black fir–broad-leaved, oak, oak–linden forests, in gardens, kitchen gardens, and inhabited places. Attracted to sources of ultraviolet light. Phen: larvae July 2, first flight August 2, 1963, flight July 2–August 22.

Northeastern China, Korean Peninsula, Japan (Hokkaido, Honshu).

Olethreutes orthocosma Meyr.

Larvae probably omnivorous. Distribution: Manchuria.

PR—1 specimens. Environs of Khabarov, Khekhtsirskii Pass (SHE) July 9, 1955.

SP—107 specimens. Environs of Ussuriisk (Tokareva). GTS (Z) July 19–August 3, 1966. Suputinsk forest reserve (FCH) July 28, 1963. Peishula (FCH) July 25, 1963. Okeanskaya (FCH) July 15–26, 1959, July 11–27, and August 17, 1963; (A) August 8, 1959. Environs of Vladivostok (FCH) August 5, 1963. Imagoes congregate on roads. Found singly in cedar–broad-leaved, black fir–broad-leaved, lowland broad-leaved, and oak forests, as well as in inhabited places and outgrowths of shrubs near them. Flight July 11–August 8; one specimen on August 17.

China, Japan.

Olethreutes velutina Wlsgm.

Larvae omnivorous. Live in rolled leaves of filbert–vetch and, probably, other plants. Distribution: Manchuria.

SP—50 specimens. Spassk (Zinov'eva) July 9, 1962. Vinogradovo (D, FV) July 16–17, 1929. GTS (Z, K) July 13–August 2, 1966; (FCH) July 16–17, 1959. Peishula (FCH) July 12 and 15, 1963. Kangauz (FCH) July 4, 1963. De Vries Peninsula (O) July 19, 1964. Environs of Vladivostok, Sedanka (FCH) August 4, 1964. Larvae on *Corylus heterophylla* and *Vicia unijuga* in filbert and lespedeza groves. Imagoes common in black fir–broad-leaved, cedar–broad-leaved, lowland broad-leaved, oak, and oak–linden forests. Rare in inhabited places. Attracted to light. Phen: larvae June 3–18, pupation June 12–19, first flight June 27–29, Flight July 9–August 4.

Northeastern China, Korean Peninsula, Japan (Honshu, Shikoku, Kyushu).

Olethreutes irina Flkv.

Fal'kovich, 1966c: 216, original description.

Known only from southern Sikhote-Alin'.

SP—1 specimen. Suputinsk forest reserve (FCH) July 28, 1963.

Olethreutes symmathetes Car

Caradja, 1916: 58, original description; Kuznetsov, 1967: 55; 1970b: 42.

Larvae of middle instars supposedly hibernate. Omnivorous and after hibernation feed on new buds, leaves, and flowering buds primarily of herbaceous plants. Replaced in western Palearctic by very closely related omnivorous species, *O. lacunana* Den. and Schiff. Distribution: Manchuria.

PR—8 specimens. Magdagachi (Masyutina) July 1–2, 1963. Klimoutsy (K, S) July 9–18, 1958. Simonovo (FCH) July 22–29, 1959. Middle course of Shevli River (Zolotarev) July, 1931. Found singly in birch and black birch–oak–larch forests, and in grassy hillock-sedge meadows. Flight July 1–29.

SP—7 specimens. Origin of Kolumbe River (KR) July 8, 1934. Peishula (FCH) July 12, 1963. Tigrovoi (KR) June 30, 1928. Origin of Ussuri River, Berezovskii Pass (KR) July 31, 1937. Environs of Vladivostok, Lyanchikhe (FCH) July 11, 1963. Kedrovaya Pad' forest reserve (N) June 27, 1962. Flight June 27–July 31.

SK—118 specimens. Kunashir: environs of Sernovodsk (Z, K). Cape Vodopadnyi (K); Belkino (K); Lake Peschanoe (K); Alekhino (E). Shikotan: environs of Malo Kuril'sk foothills of Shikotan mountains (E). Larvae damage *Spiraea betulifolia, Filipendula kamtschatica,* and *Pedicularis resupinata* in mixed grass meadows, in outgrowths of tall grasses, and along fringes of oak groves and mixed forests. Found singly on strawberry *Fragaria iinumae* and tara vine (*Actinidia agruta* and *A. kolomikta)* in mixed forests. Moths common in marshes and alder forests, rare along seashore outgrowths of briar and sour cherry, fir–few forests, outgrowths of Sakhalin knotweed, and herbaceous glades. Phen: larvae June 8–July 23, pupation June 21–July 22, first flight July 10–30, flight July 1–August 6, 1967 and July 14–August 14, 1965.

Olethreutes rivulana Scop.

Caradja, 1916: 57; Kuznetsov, 1967: 55.

Larvae omnivorous. Live on various herbaceous plants but rare on shrubs and undergrowth of trees. Damage new buds, leaves, and reproductive organs. In southern Primor'e and island archipelagos replaced by the closely related species, *O. pryerana* Wlsgm. Distribution: Trans-Palearctic (mixed and broad-leaved forests, forest-steppes).

PR—84 specimens. Magdagachi (Masyutina) July 24, 1963. Blagoveshchensk (Hedemann) July 12 (24), 1877. Klimoutsy (K, S) July 9–August 27, 1968. Simonovo (FCH) July 22–August 6, 1959. Korsakovo (FCH) August 6, 1959. Samodon-on-Amur (FCH) August 4, 1958. Kainolovo near Gorskaya (Birulya) July 15 (27), 1897. Radde and Khabarov (Caradja, 1916). Larvae on *Vaccinium uliginosum* and *Geum* sp. in steppe-forests and lowlands. Imagoes mass in birch forests (evening of August 2, 1958—20 specimens per hour), as well as dwarf arctic birch–willow outgrowths on lowlands and in mixed grass meadows. Found singly in oak groves, floodplains, forests, and steppe meadows. Phen: larvae July 11–18, pupation from July 18, first flight July 25–August 5, flight July 9–August 27.

SP—1 specimen. Soviet Gavan' (Ul'yanov) August, 1953.

Olethreutes pryerana Wlsgm.

Oku, 1965: 453, original description of subspecies; Kuznetsov, 1970b: 41.

Larvae of middle instars supposedly hibernate. Omnivorous and after hibernation feed on leaves of various plants, primarily herbaceous, but often found on shrubs and creepers as well. In island archipelagos this species is divided into several subspecies, which differ in structure of male genitalia. One has been described from Kunashir Island (Oku, 1965) as an independent species (*Paracelypha kurilensis* Oku), but it is more correct to consider it a subspecies of *O. pryerana* Wlsgm. Replaced in western Palearctic by another omnivorous species, *O. rivulana* Scop. Imagoes attracted to light. Distribution: Manchuria.

PR—2 specimens. Korsakova (FCH) August 5, 1959. Samodon-on-Amur (FCH) August 3, 1959.

SP—161 specimens. Vinogradovo (D, FV) July 11–24, 1929. Lubyanka near Anuchino (FCH) August 6, 1963. GTS (Z, K) July 5–August 12, 1966; (FCH) July 15–17, 1959. Suputinsk forest reserve (KR) August 18, 1947. Foothills of Oblachnaya mountain (O) August 8–12, 1963. Peishula (S, FCH) July 13–15, 1963. Tigrovoi (FCH) June 29, 1963; (KR) July 24, 1928. Suchan (Palshkov) July 16, 1938; (KR) July 27, 1928. Izvilinka (FCH) August 7, 1963. Khualaza (FCH) July 12, 1963. Valley of Malazy River (KR) September 4, 1931. Okeanskaya (S, FCH) July 22–August 5, 1963. De Vries Peninsula (O) July 11–16, 1961. Environs of Vladivostok: Sedanka (FCH) June 24 and August 4, 1963. Kedrovaya Pad' forest reserve (Kerzhner) August 22, 1963. Lake Khasan (Zagulyaev) August 4, 1950. Common in lowland broad-leaved, cedar–broad-leaved, black fir–broad-leaved forests, in gardens, and in outgrowths of shrubs near inhabited places. Flight July 5–September 4.

SS—36 specimens. Environs of Kholmsk, Yablochnoe (Lagidze). Environs of Novoaleksandrovsk, gardens (EV, Litvinenko, L, SHO). Phen: larvae on strawberry and black currant in gardens, May 31–June 25, pupation June 26–August 9, first flight June 28–August 10, flight July 4–August 29.

SK—358 specimens. Iturup: environs of Lesozavodsk (Krylov). Kunashir: environs of Kosmodem'yansk, Cape Razdornyi (Krivolutskaya); Mendeleevo, Lake Peschanoe, Cape Vodopadnyi, environs of Sernovodsk, Belkino, Lake Goryachee in cauldron of Golovnina volc (K); environs of Alekhino (Azarova, E, K, Konovalova, Krivolutskaya); Cape Stolbchatyi (Z). Found throughout Kunashir Island. High incidence in July with several dozen specimens collected per hour in seashore outgrowths of sour cherry and apple, on mixed grass and tall grass meadows along fringes of mixed forests, oak groves, and other broad-leaved forests on seashore terraces, near lakes, and deeper inside the islands. Found in fewer numbers in coniferous, black birch, and alder forest, and in marshes. Single specimens sighted in dunes and forest clearances. Larvae found singly on *Fragaria iinumae, Polygonum sachalinense, Thermopsis lupinoides,* and often on *Actinidia polygama,* and *A. kolomikta.* Damage to *Actinidia* unique; in period of flower bud formation and beginning of flowering, larvae damage petioles and cut part of branch, which causes leaf wilt. Live in tubes under rolled margins of wilted leaves. Phen: larvae June 12–July 28, pupation July 4–August 2, first flight July 30–August 3, flight July 2–August 29. Imagoes attracted to light.

Japan (Hokkaido, Honshu).

Olethreutes doubledayana Barr.

Filip'ev, 1934: 1977; Kuznetsov, 1967: 55.

In Japan larvae found on various leguminous plants. In Europe larvae recorded on *Lotus rectus.* In southern Primor'e two generations develop. Distribution: Trans-Palearctic (humid biotopes of forest zones).

PR—24 specimens. Magdagachi (Masyutina) July 5–21, 1963. Klimoutsy (K, S) July 9–August 1, 1958. Simonovo (Dorokhina, FCH) July 4–27, 1959. Samodon-on-Amur (Dorokhina) July 9, 1959. Svobodnyi (FCH) July 20, 1959. Khabarov (Pavlenko) July 17, 1916. Imagoes common on cereal–sedge and mixed grass meadows, in pastures of sedge-mixed grass, and in birch–spruce forests. Rare in birch forests, dwarf arctic birch–willow outgrowths, and marshy black birch–oak–larch forests. Rather common in floodplains. Flight July 9–August 18.

SP—81 specimens. Lower reaches of Kolumbe River (KR) July 30, 1934. Kirovskii (M) July 5–August 7, 1970. Lake Khanka (FCH) August 19, 1963; Santakheza (Plyater-Plokhotskaya) August 29, 1929. Yakovlevka (D, FV) July 20 and August 12, 1926. Vinogradovo (V, FV) July 26–27, 1929. Spassk (FCH) August 17, 1963. Ussuriisk (FCH) June 29–July 8, 1959; (Tokareva) August 14–16, 1931. GTS (Z) August 3, 1966; (N) August 12, 1962. Upper reaches of Suputinka River (KR) July 5, 1933. Origin of Sitsa River (KR) July 14, 1928. Tigrovoi (KR) July 8 and August 1, 1928. Suchan (Dolgikh) July 28; (KR) July 30, 1928. Novokievka (Mishchenko) June 27, 1933. Nakhodka (Emel'yanov) July 17, 1916. Okeanskaya (FCH) June 16, 1963; (FCH) July 10, 1963, July 10–16, 1959; (Transhel') August 10, 1929; (Zagulyaev) August 14–30, 1950. De Vries Peninsula (O) July 15, 1957, August 1–26, 1960. Environs of Vladivostok, Lyanchikhe (S, FCH) July 5–17, 1963. In southern Primor'e in region of Okeanskaya three flight peaks recorded: mid-June, mid-July, and second half of August. Flight June 16–August 26.

SK—44 specimens. Kunashir: Cape Vodonadnyi (K) July 25–August 14, 1967; environs of Sernovodsk (K) August 10–16, 1967. Common on meadows; sedge–umbelliferous, sedge–cereal, and mixed-grass-type forests, alder forests, and outgrowths of sour cherry and briar. Flight in evening and attracted to light July 25–August 16, 1967.

Olethreutes tiedemanniana Z.

Kuznetsov, 1967: 55.

Larvae in lower part of stems of *Equisetum heleocharis* (Swatschek, 1958). Distribution: Trans-Palearctic (found locally in marshy habitats of forest zones).

PR—8 specimens. Klimoutsy (Zinov'eva) 1958. Simonovo (FCH) July 2–27, 1959. Imagoes in outgrowths of horsetail in floodplains and marshes.

Olethreutes paleana Car.

Caradja, 1916: 59, original description.

In West Europe replaced by the closely related species, *O. latifasciana* Hw. Distribution: Manchuria.

PR—1 specimen. Radde.

SP—1 specimen. Environs of Vladivostok, Sedanka (S) August 4, 1963.

SK—2 specimens. Kunashir: Southern Kurils (Kostyuk) August 12, 1971; Shikotan: environs of Malokuril'sk, August 15, 1971.

Northeastern China.

Olethreutes cespitana Hb.

Kuznetsov, 1967: 55.

In the Far East represented by morphologically well-differentiated subspecies, *kirinana* Toll, which differs from the European nominative species in details of structure of valves. Distribution: Holarctic (all zones except tundra and desert). Imagoes in evening and attracted to light.

PR—113 specimens. Magdagachi (Masyutina) July 22–August 16, 1969. Klimoutsy (K, S) July 9–August 12, 1958; (FCH) July 21, 1959. Simonovo (Dorokhina, Kerzhner, FCH) July 4–August 13, 1959. Korsakovo (Kerzhner, FCH) July 25–August 5, 1959. Imagoes in large number on fallow steppe meadows and plowed fields. Found singly in sparse black birch–oak–larch forests. Flight July 4–August 16, 1939.

SP—129 specimens. Vyazemskii (Borzov) August 1 (13), 1909. Adimi (Emel'yanov) July 3 (16), 1904. Spassk (Zinov'eva) July 26, 1962; (S, FCH) August 17, 1963. Yakovlevka (D, FV) June 26–July 4 and August 27, 1926; (Zinov'eva) July 12, 1962. Vinogradovo (D, FV) July 7 and July 29–August 4, 1929. GTS (A) June 4–July 5, 1957; (Z, K) June 14–August 13, 1966; (FCH) June 28–July 15, 1959; (N) August 10, 1962; (Tokareva) August 10, 1931. Suputinsk forest reserve (M) July 23, 1970. Environs of Artem, Ugol'naya (A) July 11–19, 1960. Foothills of Oblachnaya mountain (S) August 10, 1963. Peishula (FCH) July 13–15, 1963; Zmeinka (FCH) July 14, 1963. Kangauz (FCH) July 27, 1963. Tigrovoi (FCH) July 2, 1963; (KR) July 21, 1928. Suchan (Palshkov) July 16–19, 1938, September 26, 1937; (KR) July 30, 1928. Okeanskaya (Zagulyaev) June 20–July 10 and August 11–September 6, 1950; (FCH) July 12–16, 1959. De Vries Peninsula (O) July 13, 1960, August 22, 1961. Lake Khasan (Zemlina) July 14, 1959. Imagoes very common in kitchen gardens, pastures, and wastelands, in outgrowths of shrubs near inhabited places, and in broad-leaved forests damaged by felling. In the south two generations develop. In environs of Vladivostok, flight June 20–July 19 and August 11–September 26.

SS—2 specimens. Chekhov Peak (EV) August 4, 1970.

SK—2 specimens. Environs of Sernovodsk (Z, K) August 12–13, 1967. Found singly along roadsides and near inhabited places.

Olethreutes flavipalpana H.-S.

Kuznetsov, 1967: 55.

In evening and attracted to light. Found in association with previous species. Distribution: Trans-Palearctic (broad-leaved forests, steppes, forest-steppes).

PR—11 specimens. Blagoveshchensk (Hedemann) July 11 (22), 1877. Klimoutsy (K, S) July 14–August 8, 1958. More often in meadows. Found singly in steppe black birch–oak–larch forests.

SP—57 specimens. Yakovlevka (D, FV) July 5–22, August 30, October 4 and 10, 1926. Vinogradovo (D, FV) July 5–30, 1929. GTS (FCH) June 12, 1959; (A) July 11, 1957; (Z, K) June 24–July 20, 1966. Peishula (FCH) July 15–16, 1963. Kangauz (FCH) June 25–August 8, 1963. Tigrovoi (FCH) June 29, 1963; (KR) July 7, 1928. Suchan (KR) August 8, 1928. Upper reaches of Chanigou River (Zinov'eva) July 29, 1962. Smolyaninov (FCH) June 25, 1963. Okeanskaya (Zagulyaev) July 2, 1950. De Vries Peninsula (O) June 2, 1961. Common in wastelands, lowlands, and outgrowths of shrubs near inhabited places. Rare along fringes of broad-leaved and cedar–broad-leaved forests. Two generations develop with no distinct division between them. Flight in environs of Yakovlevka July 5–October 10, 1926; in environs of Vladivostok flight commences on June 2.

Olethreutes rurestrana Dup.

Kuznetsov, 1967: 54.

Larvae live in root collar of *Hieracium umbellatum* (Hannemann, 1961). In the Far East often represented by f. *lucivagana* Z. Distribution: Trans-Palearctic (broad-leaved and mixed forests, forest steppes).

PR—33 specimens. Klimoutsy (K, S) July 12–August 16, 1958; (FCH) July 29, 1959. Simonovo (Dorokhina, FCH) July 5–26, 1959. Samodon-on-Amur (FCH) August 3, 1959. Found singly in oak groves, black birch–oak–larch and black birch–oak–pine forests. Flight July 5–August 16.

Olethreutes striana Den. and Schiff.

Larvae supposedly hibernate. In Europe live in roots of *Taraxacum officinale* (Hannemann, 1961). Pupation in hard cocoon made of soil particles. Distribution: Trans-Palearctic (forests, steppes).

SP—1 specimen. Okeanskaya (Zagulyaev) August 11, 1950.

Olethreutes fraudulentana Kenn.

Kennel, 1901: 256, original description; 1908–1921: 417; Kuznetsov, 1967: 54.

Distribution: Manchuria.

PR—11 specimens. Klimoutsy (K, S) July 13–20, 1958. Imagoes along boundaries of fields and ridges.

SP—16 specimens. Strugovka (Wolfson) July 9, 1933. Vinogradovo (D, FV) June 26–July 29, 1929. Ussuriisk and GTS (Dul'keit) July 6, 1924; (Z, K) June 25–July 12, 1966; (FCH) July 29, 1963; (A) August 16, 1957. Tigrovoi (KR) July 8–24, 1928. Suchan (KR) July 30, 1928. De Vries Peninsula (KR) August 6, 1955. Imagoes in fields, kitchen gardens, and wastelands near inhabited places. Flight June 26–August 16.

Northeastern China.

Olethreutes obovata Wlsgm.

Kuznetsov, 1967: 54.

Outgrowths of *Spiraea*. Distribution: Manchuria.

PR—5 specimens. Sermonovo (Dorokhina, FCH) July 5 and July 25, 1959. Korsakovo (Kerzhner) August 6, 1959. Found singly in valley broad-leaved forests along floodplains.

SP—1 specimen. Suputinsk forest reserve (K) June 17, 1966. Rare in lowland broad-leaved forests.

Northeastern China, Japan (Honshu).

Olethreutes aviana Flkv.

Fal'kovich, 1959: 463, original description; Kuznetsov, 1967: 54.

Imagoes fly from outgrowths of *Spiraea*. Distribution: eastern Palearctic (mixed forests and steppes).

Southern Siberia.

PR—2 specimens. Klimoutsy (K) July 20, 1958. Environs of Blagoveshchensk (Efremov) July 10–14, 1965.

SP—6 specimens. Kirovskii (M) July 16–30, 1970. Suchan (KR) August 19, 1928. Ussuriisk, gardens (Shabliovskii) July 25, 1966.

Northeastern China.

Olethreutes cacuminana Kenn.

Kennel, 1901: 253, original description; 1908–1921: 412.

This species is divided into subspecies. In females from Iturup the ostium is more rounded and the projection at its anterior margin, expressed in Kunashir specimens, absent. Distribution: Manchuria.

SP—More than 250 specimens. Yakovlevka (D, FV) June 3–23, 1926. Vinogradovo (D, FV) June 13–July 7, 1929. Varanovsk (FCH) June 8, 1963; GTS (Z, K) May 29–July 3, 1966; (FCH) July 8, 1959. Upper reaches of Suputinka River (KR) June 8, 1933. Suputinsk forest reserve (FCH) June 13, 1963; (K) June 17–21, 1966. Environs of Artem, Ugol'naya (A) June 3, 1961. Maikhe (FCH) June 6, 1963. Kangauz (FCH) June 25–July 4, 1963. Tigrovoi (FCH) June 25, 1963. Suchan (KR) June 4–July 9, 1928; (Palshkov) June 6, 1933. Origin of Sitsa River (KR) June 14, 1928. Okeanskaya (Mordvilko) June 5, 1926; (FCH) June 14, 1963; (FCH) July 11, 1959. Kedrovaya Pad' forest reserve (Mordvilko) June 15, 1926. Imagoes in evening and morning in lowland broad-leaved and cedar–broad-leaved forests (congregate—several dozen specimens per hour). Rare in spruce–fir–broad-leaved, oak, elm-oak, and other broad-leaved forests, and also in mixed grass and tall grass meadows. Flight May 29–July 11.

SS—2 specimens. Southern Sakhalin (EV) June 26, 1970.

SK—208 specimens. Iturup: Base of Berutarube volc (E) July 30–31, 1965. Kunashir: environs of Sernovodsk (Z, K) June 5–August 3, 1967; Alekhino (K) June 12–22, 1967; Lake Peschanoe (K) June 19–July 1, 1967; Cape Chetverikov (K) July 6, 1967; Belkino (K) July 23, 1967. Shikotan: Malokuril'sk (E) July 17, 1965. Found en masse along fringes of fir–yew–broad-leaved, oak, and other mixed forests. Rare in black birch, seashore outgrowths of members of Rosaceae, meadows of mixed grass and tall grass, outgrowths in meadows, and in Sakhalin knotweed. Flight June 5–August 3.

Japan.

Olethreutes boisduvaliana Dup.

Kuznetsov, 1967: 55.

Distribution: Trans-Palearctic (found locally in humid biotopes of forests and steppes).

PR—26 specimens. Magdagachi (Masyutina) July 2, 1963. Klimoutsy (Kerzhner, FCH), June 18–July 28, 1959; (K, S) July 5–August 12, 1958. Simonovo (Dorokhina) July 4–12, 1959. Imagoes often on pastures in floodplains. Found singly in birch forests and black birch–oak–larch forests. Flight June 18–August 12.

SP—4 specimens. GTS (K) June 24–25, 1966. Okeanskaya (Zagulyaev) June 20, 1950. In outgrowths of shrubs near inhabited places, attracted to light.

SK—2 specimens. Shikotan: environs of Malokuril'sk (E) July 14, 1965.

Olethreutes obsoletana Zett. (*nebulosana* Zett.)

Kuznetsov, 1967: 55.

Distribution: Trans-Palearctic (coniferous forests) (Figure 3).

Figure 3. Distribution of *Olethreutes obsoletana* Zett. Taiga zone delineated by black line.

PR—26 specimens. Magdagachi (Masyutina) July 2–8, 1963. Klimoutsy (K) June 27, 1958. Simonovo (Dorokhina) June 30–July 12,

1959. Environs of Nikolaevsk (Masyutina) July 26, 1964. Imagoes common in evening in dwarf arctic birch and willow outgrowths, marshes covered with sphagnum moss and sedge, hillock meadows of sedge and mixed grass–sedge, covered with sparse forests of birch. Flight June 27–July 26.

Olethreutes captiosana Flkv.

Kuznetsov, 1960: 690, original description; Kuznetsov, 1967: 56.

Larvae probably live in forest litter; feeding similar to the European vicarious species, *O. arcuella* Cl., on shed foliage. Population on Kunashir Island distinguished by light-colored hind wings. Distribution: eastern Palearctic (west up to Salairskii range).

Southern Siberia (locally), Baikal region, and Trans-Baikal.

PR—More than 300 specimens. Konuma (KR) July 25, 1947. Klimoutsy (K, S) June 19–August 4. Simonovo (FCH) June 9–July 5, 1959. Blagoveshchensk (Hedemann) July 6 (18), 1877. Radde (Korb) 1905. Khabarov (SHE) June 28, 1959. Environs of Nikolaevsk (Masyutina) July 18, 1964. Most common forest species recorded for forest formations. Maximum population found in Spassk black birch–oak–larch forests in last two weeks of June; in lespedeza growths, steppe black birch–oak–larch forests and birch forests in first two weeks of July. Rare in steppe meadows and lowlands. Maximum population, 47 specimens per hour. Flight June 19–August 4.

SP—More than 100 specimens. Lower reaches of Kolumbe River (KR) June 12–17, 1934. Yakovlevka (D, FV) June 10, 1926; (Zinov'eva) July 10, 1962. Vinogradovo (D, FV) July 3, 1929. Ussuriisk (Mishchenko) August 7, 1921. GTS (Z, K) June 9–July 28, 1966. Suputinsk forest reserve (FCH) June 13, 1963; (K) June 17–21, 1966. Khualaza (FCH) July 3, 1963. Tskhamo-Dynza (KR) July 6, 1928. Tigrovoi (KR) June 25, 1928. Suchan (KR) June 25–July 3, 1928. Okeanskaya (FCH) June 16–18, 1963. Environs of Vladivostok (FCH) June 7–15, 1963. Kedrovaya Pad' forest reserve (Mordvilko) June 19–20, 1926. Imagoes congregate on broad-leaved forests: oak–elm, oak–linden, and lowland forests. Rare in mixed forests: cedar–broad-leaved, fir–broad-leaved, and spruce–fir–broad-leaved; meadows of mixed grass and outgrowths of shrubs near inhabited places. Found singly in coniferous and birch forests. Flight June 7–August 7.

SS—64 specimens. Environs of Novoaleksandrovsk (L, SHO) June 19–July 10, 1967; (EV) June 20–July 13, 1970. Southern Sakhalin (EV) June 26, 1970. Kholmsk (EV) July 3, 1970. Chekhov Peak (EV) June 21–July 7, 1970. Common in mixed and coniferous forests.

SK—102 specimens. Kunashir: Lake Lagunnoe (Krivolutskaya)

July 10, 1962; environs of Sernovodsk (Z, K) and Belkino (K) June 27–August 1, 1967. Imagoes common during day and in evening in oak groves and fir–yew–broad-leaved forests on terraces. Rare in black birch and coniferous forests. Found singly in seashore outgrowths of Rosaceae, tall grass, and mixed grass meadows.

China, Japan (Hokkaido, Honshu).

Olethreutes subtilana Flkv.

Fal'kovich, 1959: 460, original description.

Area of distribution unique; probably disconnected Palearctic, although in Europe known only from environs of Luga.

Leningrad district, eastern Siberia.

PR—5 specimens. Radde (Korb). Khabarov (Korb) 1907.

SP—49 specimens. Ussuriisk (FCH) June 8–14, 1963; GTS (Z, K) June 1–July 13, 1966; (FCH) June 10–12, 1963, June 12–28, 1959. Suputinka (FCH) June 29, 1963. Suputinsk forest reserve (K) June 20–21, 1966. Maikhe (FCH) June 6, 1963. Khualaza (FCH) July 3, 1963. Tigrovoi (FCH) June 28–July 1, 1963; (KR) July 10, 1928. Environs of Vladivostok (FCH) June 15, 1963. Found singly in evening in lowland broad-leaved forests along floodplains and mountain slopes, oak groves, oak–linden, cedar–broad-leaved, fir–broad-leaved, and spruce–fir–broad-leaved forests, and in outgrowths of shrubs. Flight June 1–July 13.

SK—35 specimens. Iturup: base of Berutarube volc (E) July 18, 1965. Kunashir: environs of Sernovodsk (Z, K) June 24–July 23, 1967. Shikotan: Malokuril'sk (E) July 11–23, 1965. Imagoes often seen during day and in evening in fir–yew–broad-leaved forests. Rare in oak groves and spruce–fir forests. Seldom in outgrowths of tall grass. Flight June 24–July 23.

Olethreutes bidentata Kuzn.

Kuznetsov, 1971b: 427, original description.

PR—1 specimen. Radde (Korb) 1905.

Olethreutes siderna Tr.

Caradja, 1916: 56; Kuznetsov, 1967: 56; 1970b: 41.

Larvae in rolled leaves at apices of branches of various species of lilac and herbaceous members of Rosaceae. Damage flower buds. In the southern Kuril Islands represented by the eastern subspecies *notata* Wlsgm., which differs from the nominative European subspecies in arrangement of setae in basal half of valves. Population from the Shikotan and Iturup Islands not morphologically distinct. Distribution: Holarctic (predominantly forest zones).

PR—14 specimens. Klimoutsy (FCH) June 18, 1959; (K, S) June 27–July 10, 1958. Khabarov (SHE) June 22, 1959. Kazakevichevo (Korb) 1907. Larvae found singly in floodplain outgrowths of *Spiraea salicifolia*; first flight June 24, flight June 18–July 10.

SP—22 specimens. Yakovlevka (D, FV) June 14–18, 1926. Ussuriisk (FCH) July 6, 1959. GTS (Z, K) June 25–July 21, 1966. Environs of Artem, Ugol'naya (A) June 26, 1961, July 11, 1960. Chernigovka (Emel'yanov) June 10 (23), 1913. Khualaza (FCH) July 3, 1963. Tigrovoi (FCH) June 30–July 1, 1963. Larvae on *S. media*. Imagoes found singly in nut–ash and other broad-leaved forests along floodplains. Phen: larvae from June 12, pupation from June 19, first flight June 30, flight June 10–July 21.

SS—2 specimens. Novoaleksandrovsk and southern Sakhalin (EV). Larvae in rolled leaves of *Spiraea* sp. June 8–22, pupation June 22–23, first flight July 4, 1970.

SK—91 specimens. Iturup: foothills of Berutarube volc (E) July 30–August 1, 1965. Kunashir: southern Kurils (E) August 17, 1965; environs of Sernovodsk (Z, K) July 16–August 4, 1967; Lake Peschanoe (K) July 22, 1967; Golovina volc (K) August 2, 1967. Shikotan; environs of Malokur'sk (E) August 3, 1965. Larvae on *Spiraea betulifolia, Aruncus asiaticus,* and *Filipendula kamtschatica.* Imagoes congregate in mixed grass meadow and along fringes of oak groves near outgrowths of *S. betulifolia.* Phen: larvae June 12–July 20, pupation June 26–July 26, first flight July 8–27, flight July 16–August 4.

Olethreutes electana Kenn.

Kennel, 1901: 257, original description; 1908–1921: 418.

Larvae with brownish-green body, black head, and black setae on body segments. Live in rolled leaves of Amur deutzia. Damaged leaves resemble a boat because leaf folded along midrib. Frass accumulates in corners of damaged leaves. Distribution: Manchuria.

PR—Kazakevichevo (Caradja, 1916).

SP—49 specimens. GTS (Z) July 19, 1966. Kangauz (FCH) June 26–July 4, 1963. Suchan (Kennel, 1901). Okeanskaya (S, FCH) June 27–July 20, 1963. De Vries Peninsula (O) July 7–9, 1961. Environs of Vladivostok, Sedanka (FCH) July 11–23, 1963. Found frequently in parks, singly in black fir–broad-leaved, cedar–broad-leaved, and oak–maple forests with *Deutzia amurensis*. Phen: larvae from May 22, pupation May 24–28, first flight June 8–15, flight June 26–July 23.

China, Japan (Honshu, Kyushu).

Olethreutes hydrangeana Kuzn.

Kuznetsov, 1969a: 352, original description.

Larvae of young instars brownish to chocolate-brown. Appear at commencement of flower bud formation in climbing hydrangea and live in buds of creeper. In cutting apical growth larvae prevent opening of leaf. Damaged half-opened buds gradually rot and older larvae live inside them and pupate there. Known only from Kunashir Island.

SK—20 specimens. Kunashir: environs of Sernovodsk (Z, K). Larvae found singly in lower tier of mixed forests and oak groves. In fir–yew–broad-leaved forests imagoes hover en masse in evening hours in upper tier of forest near sparse stand of large sunlit trees of fir–spruce and yew covered with flowering and postflowering hydrangea (*Hydrangea petiolaris*). Population, up to 15 specimens per hour. Phen: larvae from June 8, pupation June 17–23, first flight July 8–13, flight July 8–25, 1967.

Olethreutes hemiplaca Meyr. (*albipalpis* Meyr.)

Distribution: Ussuriisk–China.

SP—1 specimen. Ussuriisk (Shabliovskii) June 15, 1966. Collected at lights in garden of plant protection station.

Northeastern and eastern China.

Olethreutes tephrea Flkv.

Fal'kovich, 1966a: 218, original description.

Larvae damage needles at apices of branches and cones of *Pinus pumila* and *Picea ajanensis*. In Japan noted on needles of *Abies sachalinensis* and *Picea jezoensis* (Oku, 1968). Distribution: Amur–Ussuriisk–Japan.

PR—2 specimens. Khekhtsir (Yurchenko) ex 1., June 25, 1967. Amgun' (Yurchenko) August 20, 1969.

SP—49 specimens. Basin of Sinancha River (Kashcheev) ex 1., July 21, 1968. Yakovlevka (D, FV) August 25, 1926. Foothills of Oblachnaya mountain, floodplains of Yanmut'khouza River (FCH) August 9–16, 1963; 25 km east of Varfolomeevka (FCH) August 17, 1963. Larvae and pupae in June, first flight under laboratory conditions from June 25; however, flight recorded later in nature—August 9–25. Found often in cedar–broad-leaved and spruce–fir forests. Imagoes usually remain in slits in bark of spruce. Larvae often in undergrowth.

Japan (Hokkaido).

Phiaris schaefferana H.-S.

Distribution: poorly known. Species earlier known only from West Europe.

SK—1 specimen. Kunashir: environs of southern Kurils (Kostyuk) August 12, 1971.

Phiaris turphosana H.-S.

Kennel, 1908–1921: 396; Kuznetsov, 1967: 55.

Larvae supposedly on species of Ericales. Specimens from Priamur and other regions of East Asia much larger than European ones, but do not differ in genital structure. Distribution: Trans-Palearctic (taiga zone, tundra, mixed forests), but not found in western Siberia.

PR—64 specimens. Klimoutsy (K, S) May 31–June 30, 1958; (FCH) June 4–17, 1955. Liman of Amur River, fishing region Ozernakh (Chernavin) June 22 (July 5), 1915. Bol'shoi Shantar Island, peak of Yakushibi mountain (Dul'keit) June 7, 1925. Common indicator species of black birch–larch forests on the Amur-Zeya plateau. Found more often in native biotopes than in felled forests. Maximum population in native biotopes June 5, 1958—22 specimens per hour. Flight May 31–July 5.

SP—3 specimens. Lysaya mountain (Vasyurin) June 23–25, 1971.

Phiaris olivana Tr.

Kuznetsov, 1967: 55.

Distribution. Trans-Palearctic (forest-tundra, forest zones, forest-steppes).

PR—32 specimens. Simonovo (Dorokhina, FCH) July 18–August 12, 1959. Usually found in marshy meadows.

Phiaris bipunctana F.

Danilevskii, 1955: 87; Kuznetsov, 1967: 55.

In Europe larvae found in rolled leaves of *Vaccinium vitis-idaea, V. myrtillus,* and *Rhododendron* sp. (Swatschek, 1958). Distribution: Trans-Palearctic (forest-tundra, taiga zone, mixed forests).

PR—68 specimens. Magdagachi (Masyutina) July 18–19, 1963. Klimoutsy (K, S) June 19–July 18, 1958; (Kerzhner, FCH) June 17–July 21, 1959. Simonovo (FCH) July 27, 1959. Samodon-on-Amur (Dorokhina) July 10, 1959. Imagoes congregate in black birch–oak–larch forests with Ericales and members ofVassiniaseae.Imagoes congregate in evening of July 8—up to 39 specimens per hour. Rare in marshes and in dwarf arctic birch–willow outgrowths. Flight June 17–July 19.

SP—33 specimens. Soviet Gavan (Ul'yanov) August, 1953. Origin of Kolumbe River (KR) July 7 and 14, 1934. Vinogradovo, Degtyanka (D, FV) July 8–9, 1929. Khualaza (FCH) July 3, 1963; (KR) August 13, 1928. GTS (K) June 25, 1966. Tigrovoi (KR) June 25–30, 1928. Confined to zone of coniferous forests, rising upward to bald mountain peaks. Rare in mixed forests. Flight June 25–August 13.

Phiaris metallicana Hb.

Kennel, 1908–1921: 428; Caradja, 1916: 58, original description of subspecies; Kuznetsov, 1967: 55; 1971b: 67, original description of subspecies.

In Europe larvae found between rolled leaves of *Vaccinium* (Hannemann, 1961). In the Far East two subspecies known. The subspecies *amurensis* Car. is distributed in the continent east of Baikal and differs from the nominative European subspecies in color and minute morphological details. In the subspecies *bicornutana* Kuzn. from Shikotan Island a second cornuta has developed; this geographic subspecies possibly ought to be separated as an independent species. Distribution: Trans-Palearctic (taiga, mixed forests).

PR—more than 100 specimens. Magdagachi (Masyutina) July 1–9, 1963. Klimoutsy (K, S) June 23–July 17, 1958; (Kerzhner, FCH) June 18–July 21, 1959. Environs of Nikolaevsk-on-Amur (Masyutina) July 7 and 14, 1964. Noted only in forest formations, where it prefers the shade of black birch–oak–larch forests. In the Amur-Zeya plateau it is second in population to the species *Olethreutes captiosana* Flkv. Imagoes congregate in first two weeks of July in the shade of black birch–oak–larch forests, up to 20 specimens per hour. Flight June 18–July 21.

SP—69 specimens. Lower reaches of Kolumbe River (KR) June 30, 1934. Ussuri (Bremer) July 7. Yakovlevka (D, FV) June 7–17, 1926. Vinogradovo (D, FV) June 11–27, 1929. Baranovsk (FCH) June 8, 1963. GTS (Z, K) June 4–July 12, 1966. Suputinsk forest reserve (K) June 18–21, 1966. Upper reaches of Suputinka River (KR) July 1, 1933. Suchan (KR) June 4–19, 1928. Biskin (Dorris). Askol'd (Dorris). Common in lowland broad-leaved, cedar–broad-leaved, and elm–oak forests. Rare in fir–broad-leaved, spruce–fir, and oak forests. Flight June 4–July 12.

SP—4 specimens. Environs of Novoaleksandrovsk (L, SHO) June 16–29, 1967. Found singly in mixed forests.

SK—3 specimens. Shikotan: environs of Malokuril'sk (E) July 14, 1965; Cape Krai Sveta (E) July 25, 1965.

Cymolomia hartigiana Sax.

Kurentsov, 1950: 30; Danilevskii, 1955: 91.

In Europe, according to some researchers, larvae hibernate, and according to other observers, pupae hibernate. Larvae on fir and spruce first mine needles and then cover them with silky thread, causing superficial damage. Serious pest in zone of spruce–fir forests of the Far East. Distribution: Trans-Palearctic (coniferous and mixed forests).

PR—13 specimens. Khabarov and environs (Lyubarskaya, SHE) ex 1., June 26–July 25, 1959. Larvae in spruce–fir forests damaged by felling and in municipal parks on *Picea ajanensis*.

SP—27 specimens. Khualaza (KR) July 21, 1928; Il'i (D, FV) July 31, 1926. Kangauz (FCH) June 26–July 5, 1963. Tigrovoi (FCH) ex 1., July 1–3, 1963. Okeanskaya (FCH) July 17, 1963. Environs of Vladivostok, Sedanka (S, FCH) June 11–July 11, 1963. Larvae damage parks and destroy black fir–broad-leaved forests. In mountains reach upper fringe of spruce–fir-forests. Phen: larvae from June 19, pupation July 9–26, first flight July 1–27, 1963, flight June 11–July 31.

Cymolomia taigana Flkv.

Fal'kovich, 1966a: 221, original description.

Known only from southern Sikhote-Alin'.

SP—4 specimens. Suputinsk forest reserve, Egerskii Pass, 600 m (K) June 21, 1966. Kangauz (FCH) June 26, 1963. Tigrovoi (FCH) June 26 and June 30, 1963. Found singly in spruce–fir–broad-leaved forests. Imagoes fall from crown on shaking *Picea jezoensis* in evening.

Pristerognatha penthinana Gn.

Larvae in stems of *Impatiens noli-tangere* (Hannemann, 1961). In males from the Far East dark border on hind wings narrower than in European specimens. Distribution: Trans-Palearctic (forest zones) but from Siberia known only from one location (Kuznetskii-Alatau).

SP—71 specimens. Vinogradovo (D, FV) June 4–24, 1929. Ussuriisk (FCH) July 9, 1959. GTS (Z, K) April 3–June 13, 1966. Suchan (KR) June 27, 1928. Upper reaches of Malazy River (KR) June 27, 1931. Okeanskaya (S, FCH) May 25–June 14, 1963. Environs of Vladivostok: Shamora (FCH) June 2, 1963. Imagoes congregate in evening on fringes of lowland broad-leaved forests, especially in floodplain willow forests and nut–ash forests. Also common in inhabited places of floodplains. Flight May 25–June 9.

SS—3 specimens. Kholmsk (EV) July 3, 1970. In a garden.

SK—27 specimens. Kunashir: environs of Mendeleevo (K) July 19, 1967; environs of Sernovodsk (K) June 9–July 19, 1967; Lake Peschanoe (K) July 12, 1967; Alekhino (K) June 21, 1967. Found singly along fringes and along roadsides in mixed forests: fir–yew–broad-leaved, fir–broad-leaved, and spruce–fir–broad-leaved, as well as in abandoned gardens. Flight June 9–July 19.

Pristerognatha heydeniana H.-S.

Larvae probably on *Impatiens noli-tangere*. Polytypic species, divided into several integrated subspecies. In females from Kunashir Island dents at base of gnathos not developed and spinules and sacculus arranged in different manner; however, female specimens from Primor'e poorly distinguished on basis of genital structure. Distribution: Trans-Palearctic (broad-leaved and mixed forests).

PR—1 specimen. Environs of Blagoveshchensk (Efremov) July 1–7, 1965.

SP—62 specimens. GTS (Z, K) June 10–July 13, 1966. Okeanskaya (FCH) June 3–July 18, 1963. Environs of Vladivostok: Sedanka (S) June 25, 1963; Shamora (FCH) June 2, 1963. Imagoes congregate in evening on fringes of lowland broad-leaved forests along floodplains together with previous species. Flight June 2–July 18.

SK—4 specimens. Kunashir: environs of Sernovodsk (Z, K) July 8–25, 1967; Lake Peschanoe (K) July 22, 1967. Imagoes rare along fringes of fir–yew–broad-leaved and fir–broad-leaved forests.

Selenodes lediana L.

In Europe larvae found in rolled leaves and inflorescences at apices of branches of *Ledum palustre* (Hannemann, 1961). Distribution: Trans-Palearctic (taiga forests).

SK—4 specimens. Kunashir: southern Kurils (Kostyuk) August 12, 1971. Golovnina volc (Kerzhner) June 7–13, 1973. Outgrowths of *Ledum* on marsh.

Selenodes dalecarliana Gn.

Kurentsov, 1950: 29; Kuznetsov, 1967: 56.

Larvae initially under rolled margins of leaves and then in twisted leaves of *Pyrola rotundifolia* and *P. secunda* (Swatschek, 1958; Hannemann, 1961). Distribution: Trans-Palearctic (tundra, taiga).

TR—10 specimens. Magdagachi (Masyutina) July 18, 1963; Klimoutsy (K, S) June 3–August 4, 1958. Found singly in black birch–oak–larch forests, dwarf arctic birch, and willow outgrowths with *Pyrola*.

SP—3 specimens. Pidan range, bald mountain peaks (KR) July 28,

1928. Tskhamo-Dynza (Vasyurin) July 15, 1972.

Selenodes roseomaculana H.-S.

Caradja, 1916: 56.

In Europe larvae found on various species of *Pyrola* in rolled leaves (Hannemann, 1961). Distribution: Trans-Palearctic (taiga and mixed forests).

PR—1 specimen. Radde (Korb) 1905.

Selenodes concretana Wck.

Kuznetsov, 1967: 57.

Larvae probably on Ericales. Distribution: Trans-Palearctic (coniferous forests).

PR—6 specimens. Klimoutsy (K, S) May 30–June 5, 1958. Imagoes in black birch–oak–larch forests with Ericales.

SP—1 specimen. Tskhamo-Dynza (Vasyurin) July 15, 1972.

Pseudohermenias ajanensis Flkv.

Fal'kovich, 1966a: 223, original description.

In Japan larvae on *Picea jezoensis* and *Abies* (Oku, 1968). In western Palearctic replaced by morphologically distinct species, *P. clausthaliana* Sax. Distribution: China–Ussuriisk.

SP—10 specimens. Roshchino in basin of Iman River, Suputinsk forest reserve, Egerskii Pass, 600 m (K) June 21, 1966. Tigrovoi (FCH) June 28–July 1, 1963. Pupae on *P. ajanensis.* Imagoes collected by shaking crown of this plant.

SS—7 specimens. Dolinsk, arboretum July 20, 1963. Kholmsk (EV) July 10, 1970.

SK—7 specimens. Kunashir: environs of Sernovodsk (K) July 8–16, 1967. Shikotan: environs of Malokuril'sk (E) August 3–5, 1965. Found singly in fir forests. Larvae drop on shaking *Abies sachalinensis.* Flight July 8–August 5.

Japan (Hokkaido).

Piniphila decrepitana H.-S.

Kuznetsov, 1967: 57.

Larvae in male inflorescences of pine. Distribution: Trans-Palearctic (taiga).

PR—1 specimen. Simonovo (Kerzhner) July 21, 1959.

SP—11 specimens. GTS (Z, K) June 24–July 16, 1966. Found singly at light in a village near trees of *Pinus silvestris.*

Orthotaenia secunda Flkv.

Fal'kovich, 1962c: 363, original description; Kuznetsov, 1967: 57; 1970b: 42.

Larvae of III- or IV-instar hibernate. Omnivorous and after hibernation feed on new buds, leaves, and flower buds at apices of branches of various arboreal plants in forests and some wild herbaceous plants in meadows. These plants belong to the orders Betulales, Fagales, Rosales, Sapindales, and Ericales. In gardens larvae damage various fruit–berry crops. Females, from Kunashir Island differ from Amur specimens in possessing a narrow notch at anterior margin of ostium and by the narrower and more widely separated lateral lobes of sterigma. Sakhalin males are distinguished from paratypes from the mainland by narrow projection on lower margin of valves, which is smaller than spines on it. Throughout the rest of the Palearctic this species is replaced by another omnivorous species, *O. undulana* Den. and Schiff. (*urticana* Hb.). Distribution: Manchuria.

PR—8 specimens. Klimoutsy (K) July 10, 1958. Simonovo (FCH) July 22–August 1, 1959. Larvae in oak groves, black birch–oak–larch, and black birch–oak–pine forests. Found singly on *Corylus heterophylla* and *Rhododendron dahuricum.* Phen: larvae June 3–27, pupation in second half of June, first flight June 27–July 3, flight July 10–August 1.

SP—133 specimens. Yakovlevka (D, FV) June 21–July 14, 1926. Environs of Ussuriisk (FCH) June 26–July 8, 1959; (Tokareva) July 10, 1931; GTS (Z, K) June 11–July 12, 1966. Suputinsk forest reserve (FCH) June 13, 1959; (K) June 17–21, 1966. Upper reaches of Suputinka River (KR) July 1, 1933. Peishula (FCH) July 12–13, 1963. Tigrovoi (FCH) June 29–July 2, 1963. Kangauz June 25–July 5, 1963. De Vries Peninsula (KR) June 30, 1933, July 20, 1955. Found en masse in floodplain broad-leaved forests, lespedeza and rhododendron groves, shrubbery of thin forests, near inhabited places, and in gardens. Rare in mixed forests: cedar–broad-leaved and fir–broad-leaved. From the beginning of May, larvae found in dormant buds of *Quercus mongolica.* Later they also damage: *Corylus heterophylla, Betula dahurica, Acer mono, Spiraea betulifolia,* and *Rhododendron mucronulatum.* In forests, found on *Aronia melanocarpa, Rubus* sp., and *Malus manshurica.* Phen: larvae May 8–June 11, pupation May 27–July 12, first flight June 5–27, flight June 11–July 20.

SS—14 specimens. Environs of Novoaleksandrovsk (L, K, SHO), foothills of Susunaiskii range (K). Larvae common in damaged mixed, lowland broad-leaved, and coniferous forests, especially along floodplains. Common on *Rubus sachalinensis, Crataegus chlorosarca,* *Viburnum furcatum, Populus maximowiczii, Alnus hirsuta, Vaccinium ovalifolia,* and *Petasites japonicus.* In gardens damage cultivated raspberry, blackberry, and mountain ash *Aronia melanocarpa.* Phen: larvae May 20–June 29, pupation May 28–June 23, first flight May 29–July 3.

SK—65 specimens. Kunashir: environs of Sernovodsk, Lake Glukhoe, Belkino, Cape Vodopadnyi (Z, K) July 4–August 12, 1967. Environs of Alekhino (Dorokhovy) June 4–28. Larvae along fringes of oak groves and mixed forests on seashore terraces cause notable damage to *Rubus sachalinensis* and *Spiraea betulifolia* during period of flower bud formation. Found singly on *Fragaria iinumae.* In mixed grass and other meadows damage up to 50% of budding apices of *Thermopsis lupinoides.* Usually found on *Betula ermani, B. ulmifolia, Quercus crispula, Acer pictum, Filipendula kamtschatica,* and *Eubotryoides grayana.* From June 3 larvae start to appear on slopes of mixed grass meadows on apices of herbaceous plants and from June 8 have been recorded on new buds of trees. In seashore outgrowths where plant growth and insect development are slower, hibernating larvae appear two weeks later and are found up to July 27. Flight of imagoes extends up to August. Phen: larvae June 3–July 27, pupation June 18–July 23, first flight July 1–29, flight June 28–August 12.

Northeastern China.

Rudisociaria expeditana Snell.

Snellen, 1883, original description; Kennel 1908–1921: 409; Kuznetsov, 1967: 57.

Distribution: eastern Palearctic (forests, forest-steppes, and steppes). In mountains up to 2,000 m.

Ural region, northern Kazakhstan, southern Siberia, Trans-Baikal, Tuvin, and Mongolia.

PR—more than 100 specimens. Klimoutsy (FCH) June 4–12, 1959; (K, S) June 10–July 6, 1958. Simonovo (FCH) June 8–19, 1959. Common in steppe black birch–oak–larch forests, where on June 13, 1958 insect population reached 44 specimens per hour. Found singly in oak–pine groves, mixed grass meadows, and lowlands. Flight in evening June 4–July 6.

Tia enervana Ersch.

Kuznetsov, 1967: 57.

American specimens morphologically very similar to east Siberian specimens. Distribution: Siberia–Nearctic.

PR—48 specimens. Simonovo (FCH) July 25–August 14, 1959. Common on marshes.

Aterpia sieversiana Nolck.

Snellen, 1883: 200, original description; Kennel, 1908–1921: 713; Fal'kovich, 1966c: 868; Kuznetsov, 1967: 57.

In Priamur represented by the morphologically poorly distinguishable eastern subspecies, *quadrimaculana* Snell. Distribution: Trans-Palearctic (forest zones), and unknown for western Siberia.

PR—3 specimens. Klimoutsy (S) June 30, 1958. Blagoveshchensk (Hedemann) June 25 (July 6); lectotype *quadrimaculana* Snell. Environs of Blagoveshchensk (Efremov) July 10–14, 1965. Found singly in black birch–oak–larch forests.

Aterpia flavipunctana Chr.

Christoph, 1881: 141, original description; Kennel, 1908–1921: 684; Fal'kovich, 1966c: 869; Kuznetsov, 1967: 57.

Distribution: Amur–Ussuriisk–China.

PR—3 specimens. Klimoutsy (K) July 5 and 20, 1958. Simonovo (FCH) July 23, 1959. Found singly in black birch–oak–larch and floodplain broad-leaved forests.

SP—11 specimens. Yakovlevka (D, FV) July 10 and 14, 1926. Vinogradovo (D, FV) June 10, 1929. Ussuriisk (Gibanov) August 22, 1966. GTS (Z, K) June 19 and July 24–31, 1966. Okeanskaya (Zagulyaev) August 14, 1950. De Vries Peninsula (O) July 7, 1961, July 13, 1960. Found singly in black fir–broad-leaved and lowland broad-leaved forests, as well as in inhabited places. Probably two generations develop. Flight of first generation June 10–July 14, of second generation July 24–August 22; imagoes in evening and at light.

Korean Peninsula, northeastern China.

Aterpia chalibeia Flkv.

Fal'kovich, 1966c: 870, original description; Kuznetsov, 1967: 57.

Distribution: Amur–Ussuriisk.

PR—1 specimen. Svobodnyi, 55 km west (FCH) July 21, 1959.

SP—5 specimens. GTS (K) June 28, 1966; (Z) July 23 and 26, 1966. Environs of Artem, Ugol'naya (A) July 12 and 14, 1960. Found singly in evening in lowland broad-leaved forests.

Aterpia circumfluxana Chr., comb. n.

Christoph, 1881: 78, original description; Snellen, 1883: 201; Kennel, 1908–1921: 539; Caradja, 1916: 64; Kuznetsov, 1967: 61.

Distribution: Manchuria.

PR—9 specimens. Blagoveshchensk (Hedemann) June 25 (July 7), 1877. Klimoutsy (K, S) June 23–July 17, 1958. Radde (Korb) 1905. Found singly at light and in evening in steppe black birch–oak–larch forests as well as in birch-willow outgrowths.

SP—20 specimens. Shamakovka (Wolfson) June 22, 1931. Yakovlevka (D, FV) June 1–18, 1926; (Zinov'eva) July 3–9, 1962. Vinogradovo (D, FV) June 7–July 12, 1929. GTS (K) June 25, 1966. Environs of Artem, Ugol'naya (A) June 14, 1961. Suchan (Dorris) 1890. Confined to broad-leaved forests. Attracted to light most often in oak–linden, linden, and floodplain broad-leaved forests. Rare in filbert groves. Flight June 1–July 12.

Japan, China.

Endothenia gentiana Hb.

Kuznetsov, 1967: 57.

Larvae develop in stems and inflorescences of *Dipsacus silvester, Plantago, Gentiana,* and other herbaceous plants, and subsequently hibernate in them (Hannemann, 1961). Distribution: Trans-Palearctic (more often in forest zones).

PR—3 specimens. Klimoutsy (S) July 23, 1958; (FCH) June 4, 1959. Blagoveshchensk (Hedemann).

SP—6 specimens. Yakovlevka (D, FV) July 10 and August 5, 1926. Adimi (Emel'yanov) June 14 (27), 1904. Okeanskaya (FCH) July 11, 1959; (Zagulyaev) August 13, 1950. De Vries Peninsula (O) July 26, 1959. Found singly in inhabited places, in evening and at light.

SS—1 specimen. Environs of Novoaleksandrovsk (L) August 16, 1967.

SK—1 specimens. Environs of Sernovodsk (K) June 27, 1967. Mixed forests, diurnal.

Endothenia marginana Hw.

In Europe larvae found on inflorescences of Compositae and Labiatae: *Stachys, Galeopsis, Pedicularis, Cirsium,* and others (Hannemann, 1961). Distribution: Trans-Palearctic (primarily forest zones).

PR—1 specimen. Blagoveshchensk (Hedemann).

SP—13 specimens. GTS (Z) August 12, 1966. Suputinsk forest reserve (K) July 19–21, 1966. Kangauz (FCH) July 5, 1963. Okeanskaya (FCH) May 30–July 29, 1963. De Vries Peninsula (FCH) July 9, 1961. Found singly in evening and at light in lowland broad-leaved forests and inhabited places.

Endothenia limata Flkv.

Fal'kovich, 1962c: 362, original description; Kuznetsov, 1967: 57.

Known only from Priamur.

PR—2 specimens. Simonovo (FCH) June 12, 1959. Environs of Blagoveshchensk (Efremov) July 1–3, 1965.

Endothenia atrata Car.

Caradja, 1926: 164, original description; Kuznetsov, 1967: 57; Fal'kovich, 1970a: 74.

Distribution: Amur–Ussuriisk.

PR—34 specimens. Klimoutsy (K, S) July 15–August 9, 1958. Simonovo (FCH) July 25–August 15, 1959. Samodon-on-Amur (FCH) August 3, 1959. Environs of Blagoveshchensk (Efremov) July 14, 1965. Found most often in evening in steppe meadows, lowlands, and steppe black birch–oak–larch forests.

SP—35 specimens. Kirovskii (M) July 30–August 8, 1970. Yakovlevka (D, FV) July 5–August 10, 1926. Vinogradovo (D, FV) July 23–August 2, 1929. Chernigovka (Emel'yanov) July 5 (18), 1914. GTS (Z) July 10–August 9, 1966; (Zinov'eva) August 12–22, 1962; (A) August 18–22, 1957. Okeanskaya (FCH) July 12, 1959; (A) August 11–21, 1959. De Vries Peninsula (KR) August 18, 1954. More often at light in inhabited places and lowlands. Found singly in steppe oak groves and outgrowths of shrubs. Flight July 5–August 22.

SS—1 specimen. Environs of Pravda (Kostyuk) July 25, 1971.

Endothenia villosula Flkv.

Fal'kovich, 1966a: 225, original description; Kuznetsov, 1967: 57.

Known only from Priamur and Mongolia.

PR—23 specimens. Klimoutsy (K, S) June 14–August 28, 1958. Simonovo (Dorokhina, FCH) June 10–August 10, 1959. Environs of Blagoveshchensk (Efremov) July 1–7, 1965. More often in meadows. Found singly in black birch–oak–larch and black birch–oak–pine forests. Flight June 10–August 28.

Endothenia furvida Flkv.

Kuznetsov, 1967: 57; Fal'kovich, 1970a: 70, original description.

Distribution: eastern Palearctic.

Southern Siberia (Minusinsk).

PR—2 specimens. Klimoutsy (K) June 27 and July 15, 1958. Rare in birch–willow outgrowths.

SP—2 specimens. Ussuriisk, 30 km northwest (FCH) June 28, 1963.

Endothenia hebesana Wlkr. (*adustana* Krog.)

Fal'kovich, 1959: 461; 1970a: 75.

In America larvae damage stems, flower buds, flowers, and seeds of *Verbena, Antirrhinum, Iris, Verbascum, Delphinium, Gentiana,* and other ornamental plants. Eggs laid in small groups (up to five per group) on flower buds and peduncles. In the Far East no damage has been reported. Distribution: disjunct Holarctic (broad-leaved and mixed forests); in the Palearctic found locally.

European part of the USSR, mountains of Kazakhstan, and western Siberia.

SP—1 specimens. Vinogradovo (D, FV) June 26, 1929.

Northwestern China, America.

Endothenia nigricostana Hw.

Caradja, 1916: 56; Kuznetsov, 1967: 57.

In Europe larvae found in stems of *Stachys* and *Lamium* (Hannemann, 1961). In the Far East often represented by ab. *remyana* H.-S. Distribution: Trans-Palearctic (in Siberia only from two locations: Minusinsk and Kuznetskii-Alatau).

PR—3 specimens. Environs of Blagoveshchensk (Efremov) July 1–7, 1965. Radde (Caradja, 1916). Found singly at light in floodplains of Amur River.

SP—20 specimens. Lower reaches of Kolumbe River (KR) June 17, 1934. Yakovlevka (D, FV) August 17, 1926. Vinogradovo (D, FV) June 24–July 12, 1929. GTS (K) May 29–June 16, 1966; (FCH) June 28, 1959; Suputinsk forest reserve (K) June 17–21, 1966. Environs of Artem, Ugol'naya (A) July 18, 1960. Tigrovoi (FCH) June 30, 1963. De Vries Peninsula (D) July 21, 1959. More common in fringes of cedar–broad-leaved and lowland broad-leaved forests along floodplains. Found singly in spruce–fir–broad-leaved forests, meadows, and outgrowths of shrubs near inhabited places. Probably two generations: flight May 29–August 17.

SK—1 specimen. Kunashir: environs of Sernovodsk (K) July 31, 1967. In alder forests near seashore.

Endothenia ingrata Flkv.

Fal'kovich, 1970a: 70, original description.

In the Kurils replaced by another closely related species, *E. designata* Kuzn. Known only from southern Sikhote-Alin'.

SP—2 specimens. GTS (FCH) June 27, 1959. Upper reaches of Chapigou, a tributary of Shufan River (Zinov'eva) July 2, 1962.

Endothenia designata Kuzn.

Kuznetsov, 1970a: 434, original description.

Distribution: China.

SK—20 specimens. Kunashir: environs of Sernovodsk and Lake Glukhoe (K) July 19–August 16, 1967; Cape Vodopadni (K) July 26–August 12, 1967. Common in steep slopes of southern exposure in mixed grass meadows and along fringes of oak groves. Rare along fringes of mixed forests and alder groves.

Endothenia informalis Meyr.

Kuznetsov, 1967: 57.

Distribution: Amur–Ussuriisk.

PR—1 specimen. Korsakovo (FCH) August 3, 1959.

SP—1 specimen. Okeanskaya (A) August 23, 1959.

Endothenia ericetana Westw.

Kuznetsov, 1967: 57.

Larvae on *Mentha arvensis* (Swatschek, 1958), *Stachys* and *Symphytum* (Klimesch, 1961). Distribution: Trans-Palearctic (forests and steppes).

PR—58 specimens. Magdagachi (Masyutina) July 19–20, 1963. Svobodnyi (FCH) July 20, 1959. Klimoutsy (Zinov'eva, K, S) July 9–August 27, 1958; (FCH) July 31, 1959. Simonovo (FCH) July 26–August 1, 1959. Korsakovo (FCH) August 3–4, 1959. Environs of Blagoveshchensk (Efremov) July 7, 1965. Radde (Korb) 1905. Middle course of Sěvli River (Zolotarev) July, 1931. Khabarov (Maslovskii). Common in mixed grass pastures, lowlands, wastelands, steppe meadows, fields of buckwheat and other field crops in inhabited places. More often at light, sometimes in evening. Flight July 7–August 27.

SP—71 specimens. Vyazemskii (Borzov) July 5 (18)–August 6 (19), 1903. Kirovskii (M) July 5–August 4, 1970. Shmakovka (Savost'yanov) July 10, 1933. Yakovlevka (D, FV) July 10–22 and August 3–October 21, 1926. Vinogradovo (D, FV) July 26–August 6, 1929. Ussuriisk (Mishchenko) July 12, July 29–September 10, 1931; (Tokareva) August 3–29, 1931; (Shabliovskii) August 7, 1965, August 14, 1969. Environs of Artem, Ugol'naya (A) July 13–19, 1960. Adimi (Emel'yanov) July 23 (August 4), 1904. Tigrovoi (KR) July 24–25, 1928, August 13, 1922. Suchan (KR) July 30, 1928. Sudzukhinskii forest reserve (Litvinenko) June, 1959. Okeanskaya (FCH) July 16, 1963. De Vries Peninsula (KR) July 29, 1955, August 4–18, 1954; (O) July 29, 1961, August 1–September 30, 1960. Zarech'e in region of

Pos'et Bay (Srebryanskii) August 22, 1925. Common at light in inhabited places, in wastelands, kitchen gardens, meadows, and lowlands. Rare along fringes of mixed and broad-leaved forests. Probably two generations: flight of first generation from end of June up to July 22, of second generation July 29–September 30.

SS—1 specimen. Siretoko (D) August 12, 1947.

SK—21 specimens. Kunashir: southern Kurils (E) August 17, 1965. Environs of Sernovodsk (K) August 10–16, 1967. Common at light in seashore meadows and in inhabited places.

Endothenia menthivora Oku

Kuznetsov, 1967: 57.

This could be a recent synonym of *Endothenia austerana* Kenn. Larvae hibernate in roots of *Mentha*; during spring they enclose themselves in a cocoon in soil at a depth of about 1.0 cm to hibernate, then pupate (Oku, 1963), and estivate up to mid-July; flight July–August. Eggs laid singly on leaves. Larvae emerging from eggs penetrate the stems and move down to the roots. Distribution: Manchuria.

PR—17 specimens. Svobodnyi (FCH) July 20, 1959. Klimoutsy (K) July 15, 1958. Environs of Blagoveshchensk (Efremov) July 1–14, 1965. Common at light in broad-leaved forests along floodplains of Amur River and in inhabited places. Rare in black birch–oak–larch forests.

SP—12 specimens. Yakovlevka (D, FV) July 1, 1926. Vinogradovo (D, FV) July 3–20, 1929. Adimi (Emel'yanov) July 14 (27), 1904. Ussuriisk (A) 1957. Upper reaches of Suputinka River (KR) July 12, 1933. Okeanskaya (Zagulyaev) July 20, 1950. De Vries Peninsula (KR) July 5, 1953; (O) July 24, 1963. Found singly at light in inhabited places. Flight June 26–July 24.

Japan, northeastern China.

Endothenia remigera Flkv.

Fal'kovich, 1970a: 72, original description.

Distribution: probably, Ussuriisk–China.

SP—4 specimens. Vinogradovo (D, FV) July 23, 1929. De Vries Peninsula (O) July 30, 1959 and July 30, 1960.

Endothenia sp.

Known only from Primor'e.

SP—2 specimens. Okeanskaya (FCH) July 17, 1963. De Vries Peninsula (O) June 1, 1961.

Tribe Lobesiini

Lobesia coccophaga Flkv.

Fal'kovich, 1970b: 62.

Larvae in berries of *Lonicera.* Distribution: Japan–Ussuriisk.

SP—3 specimens. Okeanskaya (FCH) June 30, 1963; (Novik) ex 1., November 20 and December 17, 1965.

Lobesia reliquana Hb. (*permixtana* Hb.)

Caradja, 1916: 59; Lyubarskaya, 1964: 88; Kuznetsov, 1967: 53.

Pupae hibernate in forest litter. Larvae omnivorous and found in rolled leaves and catkins of birch, in needles of larch, and in leaves of *Acantopanax.* Distribution: Trans-Palearctic (forests and steppes).

PR—22 specimens. Veketovo (Hedemann) June 7 (18), 1877. Interfluve of Lesser Pera on Greater Ergel' (Zinov'eva) ex p., December 29, 1957. Klimoutsy (K, S) June 5–July 20; (FCH) June 16 and 18, 1959. Radde (Korb) 1905. Environs of Khabarov (Lyubarskaya, SHE). Found singly in lespedeza–oak–larch forests, birch forests, dwarf arctic birch–willow outgrowths, lespedeza–oak in parks, and inhabited places. Larvae in region of Khabarov found in August–September in rolled leaves of *Acantopanax sessiliflorum* as well as in seeds of *Maackia amurensis* (Lyubarskaya, 1964). Latter needs confirmation since it might possibly pertain to *Laspeyresia maackiana* Danil. In Amur-Zeya plateau larvae found in rolled leaves of *Betula fruticosa* in July–August, pupation from August 24, first flight in early spring, flight June 5–July 20.

SP—83 specimens. Lower course of Bikin River (Lyubarskaya, 1964); Yakovlevka (D, FV) May 31, 1926. Vinogradovo (D, FV) June 13–21, 1929. GTS (Z, K) May 21–June 16 and July 19, 1966; (FCH) June 10, 1963. Baranovsk (FCH) June 8, 1963. Suputinsk forest reserve (K) June 17–20, 1963. Environs of Artem, Ugol'naya (A) July 13, 1960. Kangauz (FCH) June 26–July 5, 1963. Tigrovoi (FCH) June 28–July 1, 1963. Suchan (KR) June 4–25, 1928. Okeanskaya (S, FCH) May 28–June 17, 1963. De Vries Peninsula (O) August 4–13, 1961, August 17–19, 1960. Environs of Vladivostok, airport (FCH) May 28, 1963. Common in evening in cedar–broad-leaved, black birch–broad-leaved and lowland broad-leaved forests along floodplains and mountain slopes. Found singly in sparse shrub growths near inhabited places. Probably two generations: flight May 21–July 5, July 13 and July 19–August 19.

SS—8 specimens. Environs of Novoaleksandrovsk (L, SHO) June 21, 1967. Kholmsk (EV) July 3, 1970.

SK—22 specimens. Kunashir: environs of Sernovodsk (Z, K) June 19–July 17, 1967; Lake Peschanoe (K) July 1, 1967. Golovnina volc (K) August 1, 1967. Shikotan: Malokuril'sk (E) July 27, 1965. More often in forests of black birch. Found singly in fir–yew–broad-leaved, fir–yew–oak, and other mixed forests, oak groves, outgrowths of Rosaceae near the ocean, and in coniferous–birch and spruce–fir forests with admixture of pine. Flight June 19–August 1.

Lobesia duplicata Flkv.

Kuznetsov, 1967: 53; Fal'kovich, 1970b: 66, original description.

Distribution: Manchuria (west up to Irkutsk).

Baikal region.

PR—61 specimens. Klimoutsy (FCH) June 5, 1959; (K, S) June 8–30, 1958. Simonovo (FCH) June 3–8; (Dorokhina) July 5, 1959. Found congregating in evening on dwarf arctic birch–willow outgrowths, where on June 14, 1948 insect population reached 26 specimens per hour. Found singly at light in black birch–oak–larch and black birch–oak–pine forests. Flight June 3–July 5.

SP—9 specimens. Yakovlevka (D, FV) June 6–July 1, 1926. GTS (K) June 9 and (Z) June 24, 1966; (FCH) June 28, 1959. Baranovsk (FCH) June 18, 1963. Upper reaches of Suputinka River (KR) June 8, 1933. Rare along fringes of lowland broad-leaved and mixed forests; in evening and at light. Flight June 6–July 1.

Lobesia bicinctana Dup.

Kuznetsov, 1967: 53.

Distribution: Trans-Palearctic (broad-leaved and mixed forests, steppes, found locally).

PR—13 specimens. Klimoutsy (K, S) July 9–August 8. Simonovo (FCH) July 25, 1959; (Kerzhner) August 15, 1959. Kazakevichevo (Korb) 1907. Found singly in evening in sparse black birch–oak–larch forests, in lowlands covered with mixed grass, steppe meadows, pastures, and wastelands. Flight July 9–August 15.

SP—3 specimens. Yakovlevka (D, FV) June 19, 1926. Vinogradovo (D, FV) June 29, 1929. Ussuriisk (Shablivoskii) August 14, 1969. Probably two generations develop.

SK—8 specimens. Kunashir: environs of Sernovodsk (Z, K) July 16–21, 1967; Cape Vodopadnyi (K) July 26, 1967; cauldron of Golovnina volc (K) August 1, 1967. More often on mixed grass meadows, in glades among coniferous forests and outgrowths of bamboo. Rare along fringes of mixed forests and marshy alder forests. Specimens from Kunashir distinguished by light-colored hind wings. Flight July 16–August 1.

Tribe Ancylidini

Enarmonia formosana Scop. (*woeberiana* Den. and Schiff.)

Kuznetsov, 1969b: 43.

In Europe larvae of III- to V-instars hibernate under bark of apple, pear, quince, sour cherry, plum, sweet cherry, apricot, peach, wild myrobalan, and other members of Rosaceae. Older larvae pupate in spring and younger instars resume feeding under bark; pupation extends up to second half of August. Flight from May to September. Eggs laid singly in slits in bark of trunk near roots, primarily at places wounded by mechanical or biological causes. Larvae emerging from eggs damage bast and sap wood of Rosaceae, making narrow sinuous or short broad paths causing heavy flow of sap, especially in trees of pitted fruits. Females from Ussuriisk differ sharply from European specimens in smaller body dimensions; however, insufficiency of material does not permit a resolution of the question of the nature of this variability. Distribution: Amphi-Palearctic (broad-leaved and mixed forests).

Europe, Ural region, the Caucasus.

SP—2 specimens. GTS (Z) July 28, 1966. Ussuriisk (Shabliovskii) June 25, 1970. Found at light in gardens.

Enarmonia flammeata Kuzn.

Kuznetsov, 1971a: 435, original description.

Distribution: Japan.

SS—42 specimens. Environs of Nevel'sk (EV) July 27, 1970. Kholmsk (EV) July 3–10, 1970. Found locally in outgrowths of bamboo.

SK—179 specimens. Iturup: Lesozavodsk (Azarova, Krivolutskaya) July 19, 1963; foothills of Berutarube volc (E) July 31–August 1, 1965. Kunashir: environs of Mendeleevo (K); Stolbchatyi (Z); Alekhino (K); Belkino (K); and environs of Sernovodsk (Z, K) July 6–August 13, 1967. Shikotan: environs of Malokuril'sk (E) and foothills of Shikotan mountain (E) July 12–August 5, 1965. Imagoes active during day, flying even in cloudy weather. Maximum population (up to 25 specimens per hour) along fringes of spruce–fir forests and outgrowths of bamboo along mountain slopes. Also common along fringes of fir–yew–broad-leaved, yew–oak–broad-leaved, and other mixed forests along seaside terraces and mountain slopes. Single specimens, apparently of postsummer origin, found in oak and alder groves.

Enarmonia major Wlsgm.

Kuznetsov, 1969a: 359.

Kunashir specimens smaller than Japanese ones (from Hokkaido). Distribution: Japan.

SK—52 specimens. Environs of Sernovodsk (Z, K) July 17–August 13, 1967. Imagoes active during day, flying in sunny as well as cloudy weather. Very common among outgrowths of bamboo in forest glades and along fringes of birch and spruce–fir forests along mountain slopes. Rare in meadows. Found singly in seashore outgrowths of sour cherry, briar, and oak groves.

Japan (from Hokkaido to Kyushu).

Enarmonodes aino Kuzn.

Kuznetsov, 1968a: 587, original description.

In Priamur and Primor'e replaced by the closely related species, *E. recreantana* Kenn. Distribution: Japan.

SK—3 specimens. Kunashir: southern Kurils (E) August 17, 1965. Environs of Sernovodsk (K) August 7, 1967. Found singly along fringes of fir–yew–broad-leaved and other mixed forests.

Enarmonodes recreantana Kenn.

Kennel, 1900: 155, original description; 1908–1921: 686; Kuznetsov, 1968a: 585.

In the Kuril Islands replaced by the closely related species, *E. aino* Kuzn. Distribution: Amur–Ussuriisk.

PR—6 specimens. "Amur" (Hedemann); Korsakova (FCH) August 3 and 6, 1959. Blagoveshchensk (Hedemann) July 16 (28), 1877.

SP—20 specimens. Yakovlevka (D, FV) June 27, 1926. Ussuriisk (Mishchenko) July 15–22, 1934. Kangauz (FCH) July 5, 1963. Peishula (FCH) July 12–13, 1963. Okeanskaya (FCH) July 20, 1963. Imagoes along fringes of lespedeza groves, lowland broad-leaved, and cedar–broad-leaved forests.

Enarmonodes kunashirica Kuzn.

Kuznetsov, 1969a: 364, original description.

Distribution: Japan.

SK—4 specimens. Kunashir: environs of Alekhino (Krivolutskaya and Konovalova) July 18–22, 1962; (Kostyuk) August 5, 1971.

Semnostola magnifica Kuzn.

Kuznetsov, 1964c: 882, original description.

On the basis of pattern of forewings and genital structure this species is similar to the South American species, "*Eucosma*" *atricapilla* Meyr. In southern China it is replaced by the closely related species, *S. semicirculana* Car., and in Burma by *S. mystica* Diak. Distribution: Manchuria.

PR—1 specimen, Khabarov, nursery (SHE) July 12, 1959.

SP—31 specimens. Ussuriisk (A) and GTS (Z, FCH). Environs of Artem. Ugol'naya (A). Peishula (FCH), Suchan (KR, Palshkov), Tigrovoi (KR), Okeanskaya (FCH), De Vries Peninsula (O). Found singly in lowland broad-leaved forests. Imagoes attracted to light especially to ultraviolet lamps. Flight July 12–August 23.

Northeastern China, Japan (Honshu).

Semnostola trisignifera Kuzn.

Kuznetsov, 1970a: 435, original description.

On the basis of structure of male genitalia this species is similar to the previous one, but differs in type of androconial apparatus. Known only from southern Sikhote-Alin'.

SP—5 specimens. GTS (Z) July 19, July 24, and August 5, 1966. Environs of Artem, Ugol'naya (A) July 18–19, 1960. Imagoes found rarely in black fir–broad-leaved, cedar–broad-leaved, and nut–ash forests.

Eucosmomorpha albersana Hb. (*ussuriana* Car.)

Caradja, 1916: 67; Kuznetsov, 1950: 29.

In Europe older larve or pupae hibernate. Larvae develop at end of summer and during autumn between rolled leaves of various species of *Lonicera* and also *Symphoricarpus* (Danilevskii, 1955). The East Asian subspecies *ussuriana* Car. is distinguished by median transverse stripe and darker hind wings of males. Distribution: disconnected Palearctic; subspecies *albersana* Hb. distributed in the east up to southern Altai, while subspecies *ussuriana* Car. known only from Priamur and Primor'e.

PR—Kazakevichevo (Korb) 1907.

SP—15 specimens. GTS (K) June 12, 1966. Khualaza (FCH) July 3, 1963. Sikhote-Alin' Pass (KR) June 1–4, 1928. Bald mountain peaks of Pidan range (KR) June 28, 1928. Okeanskaya (FCH) May 26–June 7, 1963. Environs of Vladivostok, airport (FCH) May 28, 1963. Found singly in all zones up to bald mountain peaks. Flight May 26–July 3.

Eucosmomorpha multicolor Kuzn.

Kuznetsov, 1964c: 880, original description.

Known only from southern Sikhote-Alin'.

SP—9 specimens. Ussuriisk (FCH) June 24–July 1, 1959. GTS (K) June 11, 1966. Yakovlevka (D, FV) June 7, 1926. Vinogradovo (D, FV) June 7 and July 8–9, 1929. De Vries Peninsula (O) July 19, 1961. Imagoes in lowland broad-leaved forests. Flight June 7–July 19.

Lipsotelus xylinana Kenn.

Kennel, 1901: 157, original description; 1908–1921: 250.

Significant pest of leaves of bearberry along fringes of mixed and broad-leaved forests. Larvae develop in tubes under rolled margins of leaves. Distribution: Japan–Ussuriisk–China.

SP—49 specimens. Vinogradovo (D, FV) July 23–24, 1929. GTS (Z, K) July 28–August 3, 1966. Suputinsk forest reserve (K) ex 1., July 14–18, 1966. Suifun (Hedemann). Suchan (Dorris). Okeanskaya (S, FCH) July 20–August 20, 1963. Environs of Vladivostok (FCH) September 11, 1963. Larvae common on *Rhamnus dahurica* and *R. ussuriensis* in lowland broad-leaved, cedar–broad-leaved, and black fir–broad-leaved forests. Also noted along fringes of oak–linden forests on slopes of northern exposure. Phen. in environs of Ussuriisk: larvae May 15–July 1, pupation June 3–July 20, first flight June 17–July 18, flight July 20–August 20.

Northeastern China, Japan.

Ancylis amplimacula Flkv.

Fal'kovich, 1965: 423, original description.

Known only from southern Sikhote-Alin'.

SP—4 specimens, GTS (FCH) July 6, 1959; (K) July 18 and (Z) July 19, 1966. Suputinsk forest reserve (K) June 17, 1966. At light in lowland broad-leaved and cedar–broad-leaved forests.

Ancylis laetana F.

Caradja, 1916: 72; Danilevskii, 1955: 92; Kuznetsov, 1967: 57.

In Europe adult larvae hibernate in fallen leaves. They develop on aspen and willows under rolled margins of leaves and between leaves glued together with silky discharge and pupate in spring. Distribution: Trans-Palearctic (forests and forest-steppes).

PR—29 specimens. Klimoutsy (K, S) June 5–July 16, 1958. Simonovo (FCH) June 9, 1959. Radde (Korb) 1905. Imagoes found throughout black birch–oak–larch forests with *Populus tremula*.

SP—6 specimens. Yakovlevka (D, FV) May 21–June 1, 1926. GTS (Z, K) June 27 and 24, 1966 [*sic*]. Suputinsk forest reserve (K) June 17, 1966. Found singly at light in lowland broad-leaved, black fir–broad-leaved, and cedar–broad-leaved forests with aspen.

Ancylis melanostigma Kuzn.

Kuznetsov, 1970a: 436, original description.

Distribution: Amur–Ussuriisk–China.

PR—2 specimens. Kazakevichevo (Korb) 1907.

SP—3 specimens. Suputinsk forest reserve (K) June 17–21, 1966. Found singly at light in spruce–fir–broad-leaved and cedar–broad-leaved forests.

Northeastern China.

Ancylis geminana Don. (*biarcuana* Stph.)

Caradja, 1916: 72; Danilevskii, 1955: 92; Kuznetsov, 1967: 58.

In Europe larvae found on *Salix*. Live in rolled margins of leaves. Distribution: Trans-Palearctic (forest-tundra, forest zones).

PR—70 specimens. Klimoutsy (K, S) June 3–July 12, 1958. Simonovo (FCH) June 8 and August 3, 1959. Anosovo and Kumara (Hedemann). Kazakevichevo (Korb) 1907. Found singly in all forest formations except oak groves, but more often in steppe black birch–oak–larch forests.

SP—22 specimens. Yakovlevka (D, FV) May 24, 1926. Vinogradovo (D, FV) May 28–June 13, 1929. Environs of Artem, Ugol'naya (A) July 5, 1960. Suchan (KR) June 1–July 2, 1928. Pidan range (KR) June 28–29, 1928. GTS (K) June 7–12, 1966. Maikhe River (FCH) June 6, 1963. De Vries Peninsula (O) June 19, 1961. Okeanskaya (S, FCH) May 20–June 18, 1963. Kedrovaya Pad' forest reserve (Zinov'eva) May 27, 1962. Found singly in all zones including bald mountain peaks, more often in lowland broad-leaved forests. Flight May 24–July 2.

Ancylis repandana Kenn.

Kennel, 1901: 303, original description; 1908–1921: 449; Danilevskii, 1955: 93; Kurentsov, 1956a: 37; Kuznetsov, 1967: 58.

Older larvae or pupae hibernate. Live in rolled tubes of leaves skeletonizing those of Mongolian oak (*Quercus mongolica*). Severely damage sprouting bush associations and sparse oak groves. Distribution: Manchuria.

PR—more than 50 specimens. Klimoutsy (K, S) May 17–July 6, 1958. Simonovo (FCH) May 31, 1959. Typical of forest associations containing Mongolian oak. Imagoes congregate in black birch–oak–larch, black birch–oak–pine, and oak forests, and in sprouting outgrowths of oak. Maximum population on May 28–29, 1958 in black birch–oak–pine forests (29 specimens per hour) and lespedeza groves (26 specimens per hour).

SP—31 specimens. Yakovlevka (D, FV) May 4–9, 1926; (Zinov'eva) May 24, 1962. Vinogradovo (D, FV) May 14–18, 1929. GTS (K) May 9–12, 1966. Upper reaches of Suputinska River (KR) April 12, 1935. Valley of Malaza River (KR) May 14, 1931. De Vries Peninsula (Kononov) May 5, 1958. Environs of Vladivostok (D, FV, KR) April 24–May 6. Kedrovaya Pad' forest reserve (Zinov'eva) May 11, 1962; (O) May 25, 1957. Tetyukhe. Imagoes in oak groves and mature outgrowths of Mongolian oak. Flight April 24–May 25.

Ancylis nemorana Kuzn.

Kuznetsov, 1969a: 361, original description.

Older larvae supposedly hibernate. Develop on curly oak and possibly Erman's birch. In Europe replaced by the vicarious species, *A. mitterbacheriana* Den. and Schiff. Distribution: Japan.

SS—1 specimen. Chekhov Peak (EV) June 29, 1970.

SK—88 specimens. Kunashir: environs of Sernovodsk (K) June 17–July 29, 1967; Belkino (K) July 14, 1967; Lake Peschanoe (K) July 6, 1967. Imagoes and larvae in various types of mixed forests with curly oak and in oak forests. Especially common in fir–yew–broad-leaved and other mixed forests on seashore terraces. Eggs laid in sheets under laboratory conditions of June 27, 1967. Larvae emerged on July 5 and I- to II-instars fed on folded leaves of *Betula ulmifolia* and *Quercus crispula*. In August all of them moved onto oak. From the beginning of August larvae also appeared in nature, skeletonizing woven leaves. Toward the end of August they reached III- to IV-instars. Flight June 17–July 29.

Ancylis partitana Chr.

Christoph, 1881: 430, original description; Kennel, 1908–1921: 442; Caradja, 1916: 72; Kuznetsov, 1967: 58.

Larvae supposedly on leaves of oak (*Quercus mongolica* and *Q. crispula*). Distribution: Manchuria.

PR—20 specimens. Klimoutsy (K, S) June 4–30, 1958. Simonovo (FCH) June 23–31, 1959. Radde (Korb) 1905. Kazakevichevo (Korb) 1907. Imagoes more often in black birch–oak–pine forests. Found singly in oak groves and black birch–oak–larch forests.

SP—6 specimens. Yakovlevka (Zinov'eva) May 22, 1962; (D, FV) June 1, 1926. Vinogradovo (D, FV) June 13, 1929. GTS (FCH) June 14, 1966. Vladivostok (Christoph, 1881) May 30 (June 12), 1877. Imagoes found rarely in lespedeza groves, oak–linden, and other broad-leaved forests with oak.

SK—21 specimens. Kunashir: environs of Sernovodsk (Z, K) June 18–July 28, 1967. Typical of oak groves containing *Q. crispula*. Imagoes found more often along fringes.

Northeastern and central China.

Ancylis upupana Tr.

Kuznetsov, 1967: 58.

Larvae in rolled leaves of *Betula* and *Quercus*. Distribution. Trans-Palearctic (broad-leaved and mixed forests). In Siberia only known from one location (Kuznetskii-Alatau).

PR—10 specimens. Klimoutsy (K, S) June 19–July 12, 1958. Simonovo (FCH) June 10–18, 1959. Found singly in black birch–oak–larch forests.

SP—2 specimens. GTS (K) June 3–11, 1966. Reported only from broad-leaved forests along southern slopes.

SS—16 specimens. Environs of Novoaleksandrovsk (L, SHO) June 14–July 1, 1967. Imagoes along fringes of mixed forests and birch forests.

SK—18 specimens. Kunashir: environs of Sernovodsk (Z, K) June 8–July 20, 1967. Alekhino (Krivolutskaya) June 27 and July 6, 1962. Shikotan: environs of Malokuril'sk (E) July 16–17, 1965. Imagoes found singly in Erman's birch, coniferous–birch, fir–yew–broad-leaved, and other mixed forests.

Ancylis loktini Kuzn.

Kuznetsov, 1969a: 363, original description.

Distribution: Ussuriisk–Japan.

SP—2 specimens. GTS (K) June 10 and 13, 1966. Imagoes in lowland broad-leaved forests along floodplains.

SS—1 specimen. Environs of Novoaleksandrovsk (L) June 13, 1967.

Ancylis corylicolana Kuzn.

Kuznetsov, 1962b: 342, original description; 1967: 58.

Larvae supposedly on leaves of *Corylus heterophylla*; imagoes hover over bushes of this plant. Distribution: Amur–Ussuriisk.

PR—98 specimens. Klimoutsy (K, S) June 10–July 13, 1958. (FCH) June 4–20, 1959. Simonovo (Dorokhina, FCH) June 9–July 4, 1959. Radde (Korb) 1905. Kazakevichevo (Korb) 1907. Indicator of Erman's birch–oak–larch forests with *Corylus heterophylla*. Found singly in oak groves.

SP—6 specimens. Yakovlevka (D, FV) June 1–4, 1926. Vinogradovo (D, FV) June 16, 1929. Rare in broad-leaved forests.

Ancylis uncella Den. and Schiff. (*uncana* Hb.)

Caradja, 1916: 72; Kuznetsov, 1967: 58.

In Europe larvae found on leaves of *Calluna* and *Erica* (Klimesch, 1916). Distribution: Trans-Palearctic (forest-tundra, taiga, and mixed forests).

PR—80 specimens. Anikino (Hedemann). Magdagachi (Masyutina) June 8, 1963. Klimoutsy (K, S) May 25–July 13, 1958. Simonovo (FCH) May 25–July 25, 1959. Radde (Korb) 1905. Kazakevichevo (Korb) 1907. Common in steppe-forests destroyed by felling; rare in black birch–oak–larch forests. Found singly in birch groves and black birch–oak–pine forests.

SP—8 specimens. Yakovlevka (D, FV) June 1, 1926. Vinogradovo (D, FV) May 27–June 13, 1929. Ussuriisk (Mishchenko) June 2, 1923. Suchan (KR) June 1, 1928. Khualaza (FCH) July 3, 1963. Found singly on marshes in creek valleys.

SS—more than 200 specimens. Environs of Novoaleksandrovsk, slopes of Susunaiskii range (K, L, SHO) May 25–June 13, 1967; (EV) June 11–29, 1970. Kholmsk (EV) July 3, 1970. Chekhov Peak (EV) June 19–July 1, 1970. Common in mixed and coniferous forests destroyed by felling, and also along marshes.

SK—21 specimens. Kunashir: environs of Sernovodsk (Z, K) June 9–July 16, 1967; Alekhino (K) June 12, 1967. Imagoes congregate on glades overgrown with dwarf bamboo, less numerous in coniferous–birch forests and rare on seashore terraces along fringes of oak groves and mixed forests.

Ancylis unguicella L.

Danilevskii, 1955: 93; Kuznetsov, 1967: 58.

Larvae on Ericaceae. Indicator of forest formation with *Vaccinium*. Distribution: Holarctic (forest-tundra, taiga zone).

PR—33 specimens. Anitino (Hedemann). Klimoutsy (K, S) May 3–June 17, 1958. Simonovo (FCH) May 29–June 8, 1959. Imagoes common in black birch–oak–larch forests. Found singly in black birch–oak–pine forests and birch–willow outgrowths.

Ancylis comptana Froel.

Danilevskii, 1955: 92; Kuznetsov, 1967: 58; 1970b: 42.

In Europe older larvae hibernate in wrapped dry leaves. Pupation in spring. Flight of first generation begins with an average diurnal temperature of 10°C. This species is primarily associated with *Fragaria*, but also noted on *Rubus*. In the southern part of the Far East two generations develop. Distribution: Holarctic (steppes, broad-leaved and mixed forests).

PR—11 specimens. Magdagachi (Masyutina) July 5, 1963. Klimoutsy (K, S) May 31–June 14 and July 20, 1958. Simonovo (Dorokhina, FCH) July 25–27, 1959. Rare on wastelands, mixed grass meadows, in birch–willow overgrowths and in steppe black birch–oak–larch forests.

SP—4 specimens. De Vries Peninsula (O) July 27, 1959. Okeanskaya (FCH) May 23, June 18, and July 17, 1963.

SS—17 specimens. Environs of Novoaleksandrovsk (L) May 20–21, 1962; (L, SHO) June 13–July 1, 1967. Common in evening in gardens; imagoes hover above strawberry and black currant.

SK—10 specimens. Kunashir: environs of Sernovodsk (Z, K) June 11–21, 1967. Alekhino (K) June 12, 1967. Common along fringes of oak groves, mixed and coniferous–Erman's birch forests with bamboo in outgrowths of *Fragaria iinumae*.

Ancylis kenneli Kuzn.

Kuznetsov, 1962b: 344, original description; 1967: 58.

Distribution: eastern Palearctic (steppes and forest-steppes from western Siberia to China, up to forest zones).

PR—more than 100 specimens. Klimoutsy (K, S) June 6–July 9, 1958. Simonovo (FCH) June 2–11, 1959. Pokrovka (Hedemann). Congregate in mixed grass meadows, wastelands, and steppe and black birch–oak–larch forests destroyed by felling; sometimes found together with the previous species. Found singly in more humid black birch–oak–larch, black birch–oak–pine, and common birch forests, in floodplains, and dwarf arctic birch–willow outgrowths.

SP—6 specimens. Yakovlevka (D, FV) May 20–June 2, 1926. Vinogradovo (D, FV) May 22, 1929. Shamora (S) June 17, 1963. Found singly in broad-leaved forests.

SS—3 specimens. Chekhov Peak (EV) June 19, 1970.

Ancylis sp.

Kuznetsov, 1967: 58.

Larvae hibernate. In September found singly in rolled leaves of *Rosa dahurica*. Distribution: Palearctic (steppes and forest-steppes).

PR—5 specimens. Klimoutsy (K, S) Larvae from September, 1958, pupation in March, first flight in April, 1959.

Ancylis kurentzovi Kuzn.

Kuznetsov, 1969a: 362, original description.

Distribution: Amur–Ussuriisk.

PR—1 specimen. Khabarov.

SP—1 specimen. Suchan (KR) June 4, 1928.

Ancylis tineana Hb.

Caradja, 1916: 71; Kuznetsov, 1967: 58.

In Europe larvae found on fruits of Rosaceae, but in Priamur probably associated with members of Ericales. Distribution: Holarctic (forest, forest-tundra, forest-steppes).

PR—23 specimens. Klimoutsy (FCH) June 3, 1959; (K, S) June 6–July 16, 1958. Simonovo (FCH) June 8–21, 1959. Radde (Korb) 1905. Environs of Nikolaevsk (Masyutina) July 17, 1964. Common in dwarf arctic birch–willow and birch–willow outgrowths. Found singly in black birch–oak–larch forests.

Ancylis selenana Gn.

Danilevskii, 1955: 93; Kuznetsov, 1970b: 42.

Diapausing larvae of V-instar hibernate in fallen leaves and soil litter near roots of trees. Pupation during spring with the onset of an average diurnal temperature of 10°C. Eggs laid singly on lower surface of leaves. Young larvae live between two leaves glued together with silky threads, usually skeletonize the upper surface but sometimes cut floral ovaries. Feeding stops toward September. Serious pest of apple in Baikal and Primor'e regions. Larvae also feed on pear, sour cherry, plum, choke-cherry, hawthorn, as well as birch. Distribution: Amphi-Palearctic (broad-leaved and mixed forests).

West Europe, European part of the USSR, the Caucasus, and east of Baikal.

PR—2 specimens. Khabarov, nursery (SHE) April 4, 1960, August 8, 1959. Ex. 1., on leaves of pear.

SP—19 specimens. Yakovlevka (D, FV) May 20–June 23, 1926. Vinogradovo (D, FV) May 22–June 21, 1929. GTS (Z, K) May 23–July 3, 1966. Suputinsk forest reserve (K) June 17, 1966. Environs of Artem, Ugol'naya (A) June 14, 1961, June 28, 1960. Okeanskaya (FCH) June 21 and July 9, 1963. Shamora (FCH) May 31, 1963. More often in lowland broad-leaved and mixed forests. Found singly in shrub sparse forests and broad-leaved forests along southern mountain slopes.

SK—17 specimens. Iturup: foothills of Berutarube volc (E) July 31–August 1, 1965. Kunashir: environs of Sernovodsk (Z, K) June

3–July 6, 1967; Lake Glukhoe (K) June 4, 1967; Lake Reschanoe (K) June 19–July 6, 1967; Alekhino (K) June 12–21, 1967. Flight June 3–August 1. Imagoes more often in seashore outgrowths of sour cherry and mixed forests on seashore terraces.

Northeastern China, Japan (from Hokkaido to Kyushu).

Ancylis apicella Den. and Schiff. (*siculana* Hb.)

Danilevskii, 1955: 93.

Larvae on various species of *Rhumnus*. Initially in folded leaves, thereafter skeletonizing them. Distribution: Amphi-Palearctic (broad-leaved and mixed forests).

Europe, the Caucasus, Ural region, Kazakhstan, and south of Amur River.

PR—1 specimen. 'Amur'' (Hedemann).

SP—2 specimens. Vinogradovo (D, FV) June 3, 1926. Kedrovaya Pad' forest reserve (M) June 28, 1971.

Ancylis myrtillana F.

Kuznetsov, 1967: 59.

In Europe larvae found on leaves of *Vaccinium myrtillus* and *V. uliginosum* (Swatschek, 1958). Distribution: Trans-Palearctic (forest-tundra, coniferous and mixed forests).

PR—15 specimens. Klimoutsy (K, S) June 13–July 2, 1958. Simonovo (Kerzhner, FCH) June 7–17, 1959. Common in birch–willow outgrowths. Rare in black birch–oak–larch forests with *Vaccinium*.

SP—4 specimens. Okeanskaya (S, FCH) June 18 and July 24, 1963. Shamora (S) June 1, 1963. Rare in seashore overgrowths and lowland broad-leaved forests.

Ancylis badiana Den. and Schiff. (*lundana* F.)

Kuznetsov, 1967: 58.

Older larvae supposedly hibernate. They skeletonize under rolled leaf margin or between two leaves glued together of herbaceous members of Leguminosae, especially *Trifolium, Vicia,* and *Lathyrus.* Distribution: Trans-Palearctic (forests, steppes).

PR—38 specimens. Klimoutsy (K, S) June 12–August 27, 1959. Simonovo (FCH) June 10–19, 1959. Radde (Hedemann) July 23 (August 5) 1877. Environs of Khabarov (Korb) 1907. One generation only toward end of July and August only flying specimens found. Found singly in oak, black birch–oak–pine, black birch–oak–larch forest, and dwarf arctic birch–willow overgrowths on steppe meadows and lowlands.

SP—105 specimens. Kirovskii (M) July 22, 1970. Yakovlevka (D, FV) May 25–June 3, 1926. Vinogradovo (D, FV) May 27–June 24, 1929. GTS (K) May 21–July 7, 1966. Suputinsk forest reserve (K) June 20, 1966. Tskhamo-Dyuza (KR) July 6, 1928. Khualaza (KR) June 20, 1928. Tigrovoi (KR) July 12, 1928. Origin of Sitsa River (KR) May 24, 1928. Kangauz (FCH) June 26, 1963. Okeanskaya (S, FCH) May 22–June 15, 1963. De Vries Peninsula (O) July 5, 1961, July 12, 1960, August 12, 1959, August 17, 1960. Shamora (S, FCH) June 2, 1963. Environs of Vladivostok, Sedanka (S) September 2, 1963. Two generations: flight May 20–July 12 and August 1–September 8. Common in lowland broad-leaved forests. Rare in oak and mixed forests.

SP—5 specimens. Kholmsk, nursery (L) June 3, 1967. Environs of Novoaleksandrovsk (L) May 30–June 13, 1967. Imagoes along fringes of mixed forests.

SK—16 specimens. Iturup: foothills of Berutarube volc (E) July 18–31, 1965. Kunashir: environs of Sernovodsk and Cape Vodopadnyi (Z, K) July 12–August 12, 1967. Common in meadows along southern seashore slope and in outgrowths of *Vicia* and *Lathyrus*. Rare along fringes of oak groves and mixed forests as well as in tall grass along seashore terraces.

Ancylis mandarinana Wlsgm.

Walsingham, 1900: 440, original description; Kennel, 1908–1921: 715; Kuznetsov, 1967: 58.

Larvae between wrapped leaves of *Lespedeza bicolor* (Issiki, 1957). Indicator of forest formations with lespedeza. Unlike the previous species, avoids meadow associations. Distribution: Manchuria.

PR—108 specimens. Anosovo (Hedemann) June 15 (27), 1877 (Walsingham, 1900). Klimoutsy (K, S) June 18–August 4, 1958; (FCH) June 18–July 21, 1959. Simonovo (Dorokhina, FCH) June 13–July 21, 1959. Common in oak groves, black birch–oak–larch, and black–oak–pine forests. Maximum population in black birch–oak–pine forests on July 6, 1958 (21 specimens per hour).

SP—12 specimens. Yakovlevka (D, FV) May 28–July 29, 1926. Vinogradovo (D, FV) June 13 and August 1, 1929. Environs of Ussuriisk, GTS (FCH) June 10, 1963; (K) May 27, 1966. Found singly in oak groves and other broad-leaved forests with lespedeza.

Northeastern China, Korean Peninsula, Japan (Honshu, Kyushu).

Ancylis paludana Barr. (*angulifasciana* Z., *maritima* Dyar.)

Kuznetsov, 1967: 59.

Larvae found in wrapped leaves of various herbaceous and leguminous plants. In Priamur probably on *Lespedeza bicolor* also. Distribution: disconnected Holarctic (forests).

British Isles, then east of Kuznetskii-Alatau.

PR—more than 100 specimens. Environs of Magdagachi, village Krutoi (Masyutina) June 2–8, 1959. Klimoutsy (K, S) June 1–29, 1958. Simonovo (FCH) June 2–12, 1959. Typical of forests containing lespedeza. Maximum population in black birch–oak–pine forests in beginning of June (24 specimens per hour). Also common in black birch–oak–larch forests. Found singly in oak groves, birch–willow outgrowths, lowlands, and mixed grass meadows. Flight commences two weeks earlier than in previous species.

SP—2 specimens. Yakovlevka (D, FV) June 1, 1926. Upper reaches of Sitsa River (KR) June 3, 1928.

Kamchatka, North America.

DESCRIPTION OF NEW SPECIES

Type specimens of the new species described below are preserved in the collection of the Institute of Zoology, Academy of Sciences of the USSR, Leningrad.

Danilevskiana Kuznetzov, gen. n.

Type species: *Danilevskiana pusilla* Kuznetzov, sp. n.

On the basis of structure of male genitalia and venation, this monotypic genus is very similar to the southeastern genus, *Tymbarcha* Meyr. (type species *T. cerinopa* Meyr.), although veins in wings arranged differently, socii poorly developed, and valves quite reduced.

Forewing of male without costal vein, fold, and notch under apex, but with pattern of straight transverse stripes. Venation with a feature typical of only two genera in world fauna of the tribe Tortricini (*Tymbarcha* Meyr. and *Asterolepis* Raz.), veins R_4 and R_5 (Figure 4, A) stalked. However, unlike these genera, veins M_3 and C_1 in forewing of *Danilevskiana* Kuzn. originate separately. In hind wing stalk of veins M_3 and Cu_1very short, while stalk of veins R and M_1 almost equal in length to free branches.

Valves very short, but apical lobes (brachiola) large. Apex of sacculus with tuft of short, thick, modified setae. Aedoeagus without cornuti. Transtilla present. Uncus absent and its function possibly taken over by long anal tube; ventral surface of latter with sclerotized cord covered with minute spinelike setae, especially at apex of tube. Socii rudimentary.

Danilevskiana pusilla Kuznetzov, sp. n.

External appearance of moth: Wingspan 12 mm. Basic color of forewing bright yellow with pattern of isolated black scales scattered along margins of five light gray, slightly lustrous, transverse stripes. These stripes are almost straight and parallel. Basal area along costal margin of wing interrupted with gray and black scales. Basal transverse stripe darker than others and extends from dorsal margin of wing up to vein *Sc*. Wing before midpoint intersected by second transverse stripe 1.0 mm in width. Apical half of wing with three more transverse stripes that do not reach costal margin; one stripe, about 0.50 mm wide, commences from tornal angle, and other two shorter ones located in apical region, less distinct, and close-set. Fimbria yellow. Hind wing gray with yellowish-gray fimbria. Head, palpi, and back yellow.

Male genitalia (Figure 4, B): Length of brachioles almost equal to length of remaining part of valves. Apex of sacculus, in addition to setae, with group of short, conical, modified setae (about 20). Aedoeagus relatively large but equal in length to valves, bent at corner close to right angle. Socii in holotype not similar in shape. Short spinelike setae present on lower side cover sclerotized stripe at apex of anal tube.

Material: Holotype, male. Primor'e territory, Okeanskaya (Anufriev) July 12, 1959.

Argyrotaenia improvisana Kuznetzov, sp. n.

On the basis of forewing pattern, similar to the Central American species, *A. velutinana* Wlkr., but it would be premature now to judge their relationship because of inadequate material for comparison.

External appearance of moth: Wingspan 14 to 15 mm. Forewing of male without costal fold, all veins free. Basic color gray, with indistinct yellowish granulation. Pattern dark brown and all spots and stripes bordered with yellow scales. Brown basal spot with admixture of yellow scales, its apical margin diffuse. Wing obliquely transected by median band 1.0 mm in width; large triangular process originates in middle of this band, sometimes isolated in form of separate spot. Subapical triangular spot very large, its length along costal margin up to 2.0 mm. Tornal spot indistinct, sometimes fused with subapical spot. Fimbria gray, with admixture of yellowish scales. Hind wing monochromatic, gray. Veins *R* and M_1 with very short stem. Fimbria gray, with slightly darker basal line. Head on upper side covered with yellow and brown scales. Palpi yellow, terminal segment black.

Male genitalia (Figure 4, C): Valves with broad sclerotized sacculus

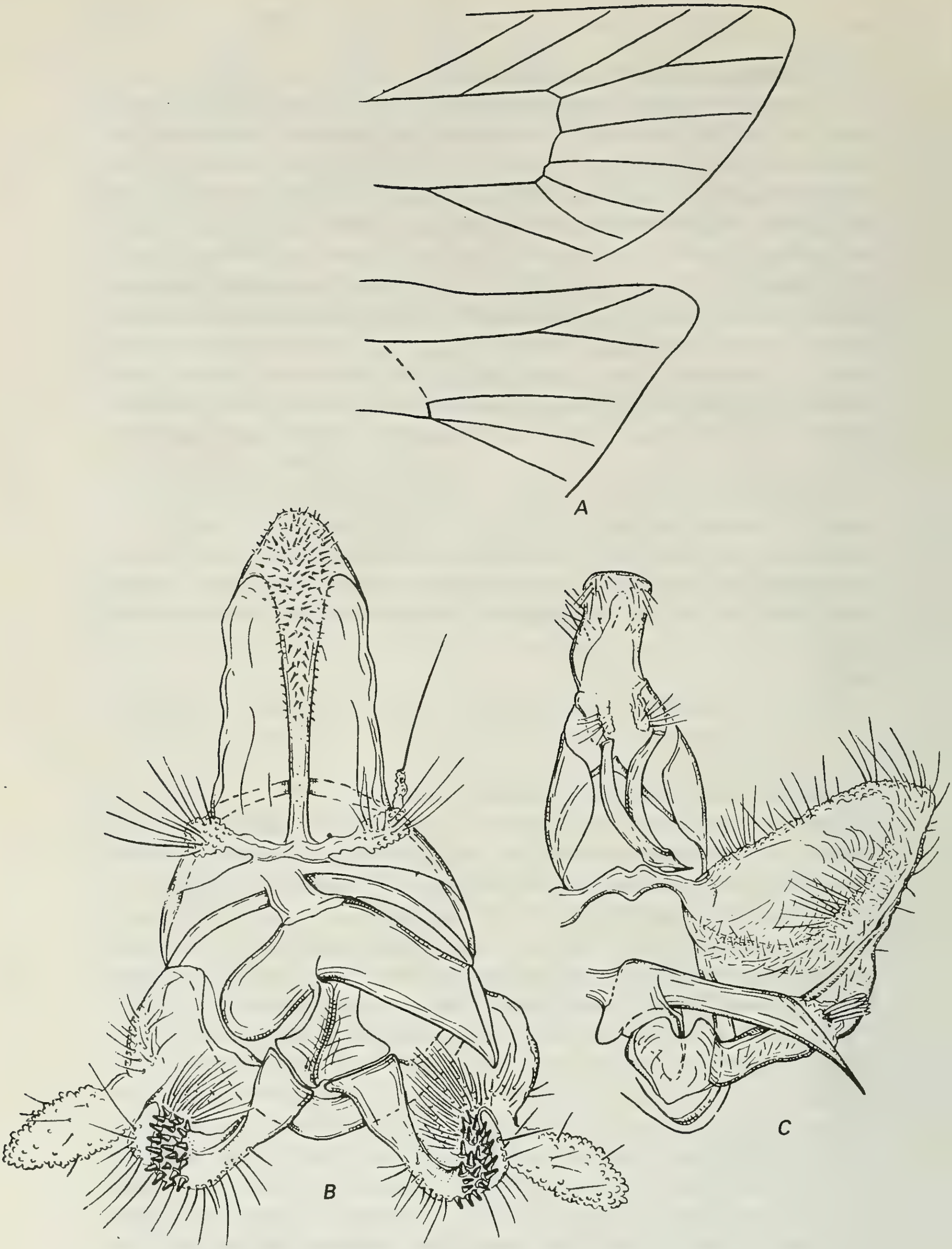


Figure 4. Subfamily Tortricinae.

A and B—*Danilevskiana pusilla* gen. and sp. n., holotype, Primor'e territory, Okeanskaya. A—venation; B—male genitalia.

C—*Argyrotaenia improvisana* sp. n., holotype, male, Primor'e territory, southern Sikhote-Alin', Tskhamo-Dynza.

that narrows gradually toward apex. Aedoeagus almost straight, with brush of cornuti. Apex of aedoeagus obliquely truncated and lower wall elongated in form of long cusp. Transtilla smooth, without spinules, and broadens slightly in middle part. Apex of gnathos broadens slightly. Socii small. Uncus broad, well developed. Setae cover distal end on upper side of uncus and form two groups on lower side.

Material: Holotype, male and paratype, male. Primor'e territory, southern Sikhote-Alin', Tskhamo-Dynza, 1,450 m, bald mountain peaks and green moss–spruce forests (V.D. Vasyurin) July 15, 1972.

Petrova lemniscata Kuznetsov, sp. n.

Pattern of forewings and structure of female genitalia similar to *P. teleopa* Meyr., but distinguished by long posterior apophyses, shape of anal papillae, and postvaginal plate.

External appearance of moth: Wingspan 12 to 13 mm. Forewing with obliquely truncated outer margin, basic color blackish-brown, with silver and gray, slightly lustrous pattern. Base of wing lead-gray. Basal area transected by transverse silver-gray stripe bent at acute angle and originating from pair of costal stripes. Middle transverse band of two pairs of bifurcate and distinct costal stripes located before midpoint of costal margin of wing in two separate lines, which subsequently fuse. This band divided into one to two dark lines and in one wing of holotype connected by oblique anastomosis with other line of fenestra bordering small pretornal spot. Along outer half of costal margin of wing lie three to four white bifurcate costal stripes. Lines of fenestra broad, silvery, inner one longer than outer, and fused at apex of third and fourth costal stripes (counting from alar apex). At tornal corner lines of fenestra contiguous. Broad and often interrupted gray subcostal line commences from apical costal stripes, bends at whitish subapical stripes, and almost reaches outer line of fenestra. Hind wing monochromatic, gray; fimbria gray with dark basal line. Head on dorsal surface ocherous-yellow. Palpi, pronotum, and tegulae gray.

Female genitalia (Figure 5, A): Genital plate uniformly covered with a theca and with shallow notch along posterior margin. Ostium encircled by narrow sclerotized semicircular ring and opens in middle of semicircular ostial sclerite. Posterior part of postvaginal plate in form of membranous rectangle with two groups of setae (each group with about 10 setae). Circular sclerotized duct of bursa as in *P. teleopa* Meyr. Signa small, one slightly shorter than the other. Anal papillae long, broaden notably downward. Posterior apophyses much longer than anterior ones.

Material: Holotype, female. Primor'e territory, Chuguevka, from

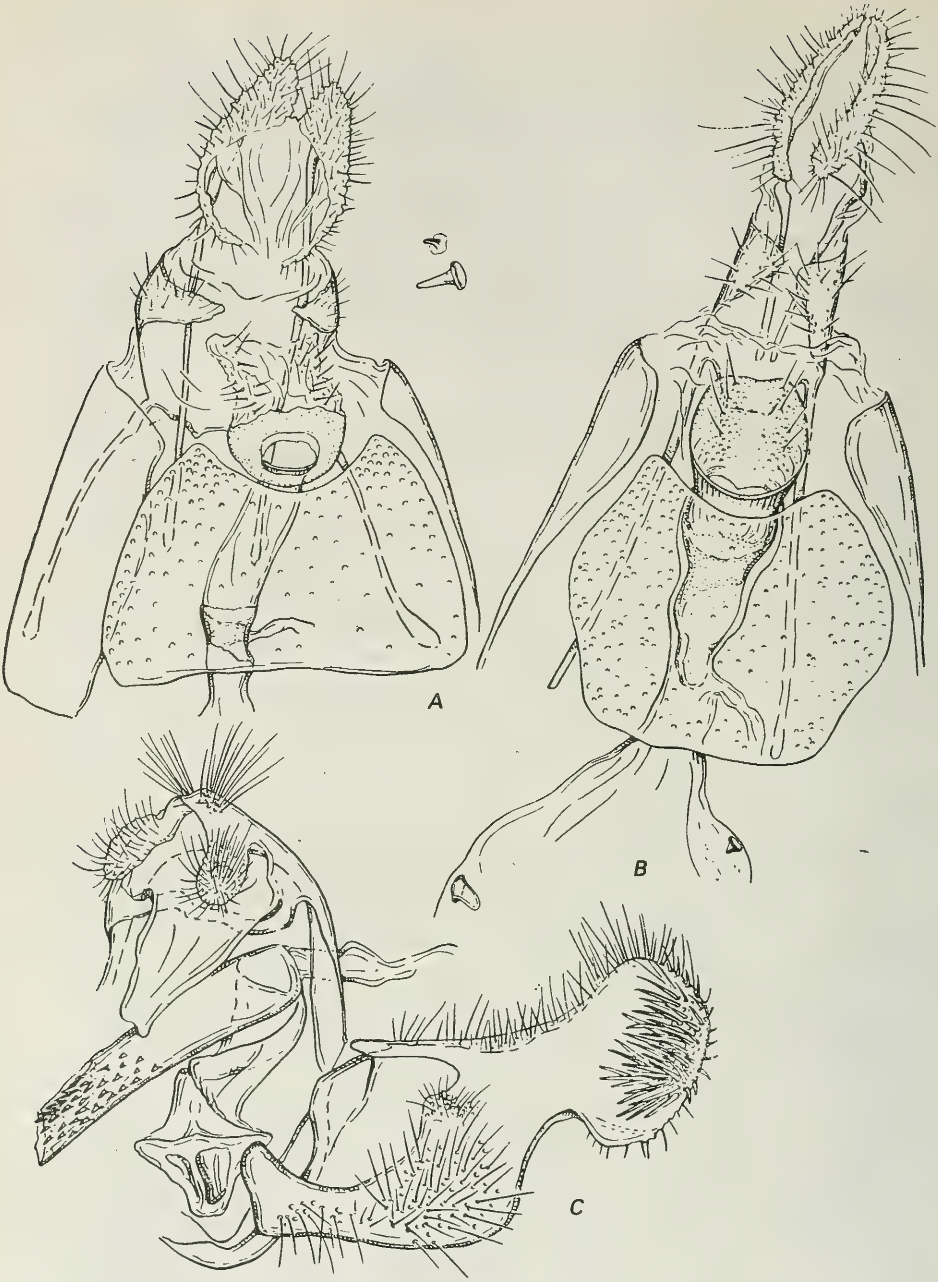


Figure 5. Subfamily Olethreutinae, genitalia.

A—*Petrova lemniscata* sp. n., holotype, female, Primor'e territory, Chuguevka.

B and C—*Epiblema kostjuki* sp. n., paratypes, Kurils Islands, Kunashir, Tret'yakovo. B—male; C—female.

cones of Korean spruce (*Picea koraiensis*), collected in August, 1969 (G. Yurchenko); first flight May 17, 1970. Paratype female: same site, first flight May 15, 1970.

Epiblema kostjuki Kuznetzov, sp. n.

Externally resembles *E. ermolenkoi* Kuzn., but in structure of aedoeagus, ostium, and ductus bursae occupies a distinct position in the Palearctic species of the genus *Epiblema* Hb.

External appearance of moth: Wingspan 17 to 20 mm. Forewing of male with broad costal fold not reaching outer margin of basal area. Area bicolored: basal part with pinkish-gray scale with admixture of black, densely covering costal fold; outer part of basal area blackish-brown with honey tone. Outer margin of basal area bent at an acute angle near costal margin of wing. Dorsal spot longer, more distinct, and broader than in *E. ermolenkoi* Kuzn., and shaped like a tilted gray rectangle. Its apex reaches gray subcostal lines. Dorsal spots divided by three to four vague blackish lines. Color of outer area of wing blackish-brown with honey tone; irregular triangular pretornal spot blackish-brown. Lines of fenestra with three to four black spots. Subcostal lines do not reach fenestra. Along apical half of costal margin of wing with five distinct double yellow costal stripes. Subapical structures with long yellow line along fimbria. Hind wing dark gray; in male, anal region and apex interrupted by black scales; veins R and M_1 quite basal; and M_3 and Cu_1 stalked. Fimbria dark gray with blackish basal line. Palpi blackish laterally, but inner surfaces yellowish. Head and back dark gray on upper side.

Male genitalia (Figure 5, B): Valves with broad base and small rounded cucullus. Sacculus uniformly covered with setae. Harpes in form of short tubercle covered with setae, as in *E. graphana* Tr. and *E. fuchsiana* Rössl. Cucullus with short but thick setae only in upper half; lower half with dentate outer margin and triangular curve on lower side. Aedoeagus long and stout, without cornuti in holotype. Right wall of aedoeagus, unlike most Palearctic species of this genus, covered with numerous cuticular spinules in distal half. Socii short, with rounded apices. Uncus rudimentary, with two groups of long setae on upper side.

Female genitalia (Figure 5, C): Genital plate uniformly covered with a theca, with shallow notch along posterior margin. Ostium covered by large cyathiform funnel. Postvaginal plate broad, irregularly oval, with two longitudinal rows of long setae (each row with four to five setae). Dorsal wall of ductus bursae unevenly sclerotized from ostial funnel up to opening of seminal duct; sclerotization narrows gradually and replaced on left side by membrane on approach to opening of seminal duct. Signa small; smaller one almost conical. Anal papillae long and narrow. Posterior apophyses much shorter than anterior ones.

Material: Holotype, male; paratypes, seven males and two females. Southern Kuril Islands, Kunashir Island, Tret'yakovo (Kostyuk) August 7, 1971. Paratype, male: same site, Mendeleevo (Kostyuk) July 31, 1971. Part of paratypes preserved in Institute of Zoology, Academy of Sciences of the Ukrainian SSR (Kiev).

CONCLUSIONS

1. The fauna from the southern part of the Far East (Priamur, southeast Primor'e, Sakhalin, and southern Kuril Islands) is distinguished by an abundance of tortrices. In this territory 558 species of 108 genera have been found, and all known 14 tribes of this Palearctic family represented.
2. The greater majority of these species are monocyclic, a few perennial, and about 50 bicyclic, at least in southern Primor'e.
3. In addition to one diapause, typical of all tortrices of the Far East, in many monocyclic species a summer–monsoon diapause occurs. Like the summer diapause it takes place in several stages of ontogenesis and can be considered an adaptation to the alternation of humid and dry periods of the year.
4. The seasonal cycles of the Far East tortrices are of 26 types, differing in distribution of dormant and active stages over the months of the year, and sometimes in seasonal dimorphism and other peculiarities. These cycles are subject to geographic change in a definite direction. Polycyclism is lost in northern populations. In continental populations outside Amur territory a tendency toward loss of the summer diapause is evident.
5. The diapause is required by factors of the external environment or genetic mechanisms, which ensure synchronization of the seasonal cycles in tortrices with food plants and climatic rhythms. On the basis of this synchronization a specific phenological stratification of fauna is created for each region of the Far East.
6. The food relations, phenology, habitat, adaptations, and distribution of 333 species of the subfamily Tortricinae, supertribe Olethreutidii, and tribe Ancylidini have been examined. Four new species have been described.

REFERENCES

Amsel, H.G. 1960. Eine neue japanische *Laspeyresia*-Art., *Mushi,* 33, 13, 105-106.

Ankersmit, G.W. 1968. The photoperiod as a control agent against *Adoxophues reticulana* (Lapidoptera, Tortricidae), *Entom. Exper. et Applic.,* vol. 11, pp. 231–240.

Bremer, O. 1864. Lepidopteren Ostsibiriens, insbesondere des Amur-Landes, gesammelt von Herren G. Radde, R. Maack und P. Wulffius, *Mém. Acad. Sci. St. Pétersb.,* 7, 8, 1–104.

Butler, A.G. 1879. *Illustrations of Typical Specimens of Lepidoptera, Heterocera in the Collection of the British Museum.* London, vol. III, pp. xviii + 82.

Caradja, A. 1916. Beitrag zur Kenntnis der geographischen Verbreitung der Pyraliden und Tortriciden des europäischen Faunengebietes, nebst Beschreibung neuer Formen, *Iris,* vol. 30, pp. 1-88.

Caradja, A. 1925. Ueber Chinas Pyraliden, Tortriciden, Tineiden nebst kurze Betrachtungen, zu denen das Studium dieser Fauna Veranlassung gibt, *Mem. Sect. Stiint. Acad. Romana,* ser. III, 3, 7, 257–383.

Caradja, A. 1926. Nach einige Worte über ostasiatische Pyraliden und Microlepidopteren, *Iris,* vol. 11, pp. 155–170.

Caradja, A. 1927. Die Kleinfalter der Statzner schen Ausbeute, nebst Zuträge aus meiner Sammlung, *Mem. Sect. Stiint. Acad. Romana,* ser. III, 4, 8, 361–428.

Caradja, A. 1928. Ueber einige neue und schon bekannte Pyraliden und Tortriciden aus dem palaearktischen Faunengebiete, *Iris,* vol. 42, pp. 287–291.

Caradja, A. 1931. Second contribution to our knowledge about the Pyralidae and Microlepidoptera of Kwanhsien, *Bull. Sect. Scient. Akad. Ronmaine,* 3, 5, 59–75.

Caradja, A. 1939a (1938). Materialien zu einer Microlepidopterenfauna von Atunste (Nordwest-Yünan), *Iris,* vol. 52, pp. 99–104.

Caradja, A. 1939b (1938). Materialien zu einer Lepidopterenfauna des Taipeishanmassive (Tsinlinshan), Provinz Shensi, *Iris,* vol. 52, pp. 104–111.

Caradja, A. 1939c. Materialien zu einer Microlepidopterenfauna des Yangtstetales bei Ratang, *Iris,* vol. 43, pp. 15–32.

Caradja, A. 1934. Materialien zu einer Microlepidopteren-Fauna Kwangtungs, *Iris*, vol. 48, pp. 28–43.

Caradja, A. and E. Meyrick. 1935. *Materialien zu einer Microlepidop-*

teren-Fauna der Chinesischen Provinzen Kiangsu, Chekiang und Hunan. Berlin, pp. 1–96.

Caradja, A. and E. Meyrick. 1936. Materialien zu einer Lepidopterenfauna des Taishanmassiys, Provinz Shantung, *Iris*, vol. 50, pp. 135–159.

Caradja, A. and E. Meyrick. 1937–1938. Materialien zu einer Microlepidopteren-Fauna des Yülingshanmassivs (Provinz Yünan), *Iris,* 1937, vol. 51, pp. 137–182; 1938, vol. 52, pp. 1–29.

Christoph, H. 1881. Neue Lepidopteren aus dem Amurgebietes, *Bull. Soc. Nat. Moskau,* vol. 56, pp. 1–80, 405–436.

Clarke, J.F.G. 1958. *Catalogue of the Specimens of Microlepidoptera in the British Museum (Natural History) Described by Edward Meyrick.* III. *Tortricidae, Olethreutidae, Noctuidae.* London, 600 pp.

Danilevskii, A.S. 1955. Sem. Tortricidae—listovertki (The tortrice moths—fam. Tortricidae). In: *Vrediteli Lesa.* Izd. Akad. Nauk SSSR, Moscow-Leningrad, vol. 1, pp. 62–115.

Danilevskii, A.S. 1958. O vidovom sostave plodozhorok (Lepidoptera, Pyralidae, Carposinidae, Tortricidae), vredyashchikh sadovodstvu na Dalnem Vostoke [Species composition of fruit flies (Lepidoptera, Pyralidae, Carposinidae, Tortricidae) damaging horticultural crops in the Far East]. *Entom. Obozr.*, 37, 2, 282–293.

Danilevskii, A.S. 1960. Novye vidy roda *Hemimene* Hb. (Lepidoptera, Tortricidae) iz predelov SSSR [New species of the genus *Hemimene* Hb. (Lepidoptera, Tortricidae) within the USSR]. *Entom. Obozr.,* 39, 4, 939–949.

Danilevskii, A.S. 1961. Fotoperiodizm i sezonnoe razivitie nasekomykh (Photoperiodicity and Seasonal Development of Insects). Izd. LGU, 243 pp.

Danilevskii, A.S. 1963. Novye vidy listovertok (Lepidoptera, Tortricidae) palearkticheskoi fauny [New species of tortrice moths (Lepidoptera, Tortricidae) from the Palearctic fauna]. *Entom. Obozr.,* 42, 1, 164–177.

Danilevskii, A.S. and V.I. Kuznetsov. 1968. Listovertki (Tortricidae) triba plodozhorki (Laspeyresiini) [Tortrice moths (Tortricidae). Tribe of fruit flies (Lespeyresiini)]. *Fauna SSSR. Nasekomye Cheshuekrylye.* Izd. Nauka, Moscow-Leningrad, vol. 1, new ser., 98, 636 pp.

Danilevskii, A.S. and I.A. Kuznetrova. 1968. Vnutrividovye adaptatsii nasekomykh k klimaticheskoi zonal'nosti (Intraspecific adaptations of insects to climatic zones). In: *Fotoperiodicheskie*

Adaptatsii u Nasekomykh i Kleshchei. Izd. LGU, pp. 3–51.

Danilevskii, A.S. and G.G. Shel'deshova. 1968. Prisposobitel'noe znachenie fotoperiodicheskoi i kholodovoi reaktivatsii (Adaptive significance of photoperiodicity and cold reactivation). In: *Fotoperiodicheskie Adaptatsii u Nasekomykh i Kleshchei.* Izd. LGU, pp. 80–99.

Danilevskii, A.S., N.I. Goryshin and V.N. Tyshchenko. 1970 Mekhanizm ekologicheskikh ritmov u nazemnykh chlenistonogikh (Mechanism of ecological rhythms in terrestrial arthropods). *Tr. Petergofsk. Biol. Inst. LGU,* vol. 20, pp. 40–88.

Diakonoff, A.N. 1962. Preliminary survey of the palearctic species of the subgenus *Bactra* Stephens (Bactra, Tortricidae, Lepidoptera), *Zool. Verhandl. Rijksmus. Nat. Hist., Leiden,* vol. 59, pp. 1–48.

Dickson R.C. 1949. Factors governing the induction of diapause in the Oriental fruit moth, *Ann. Entom. Soc. America,* vol. 42, pp. 511–537.

Fal'kovich, M.I. 1959. Novye i maloizvestnye vidy roda *Argyroplose* (s. lat.) iz Yuzhnvi Sibiri (Lepidoptera, Tortricidae) [New and little-known species of the genus *Argyroploce* (s. lat.) from southern Siberia (Lepidoptera, Tortricidae)]. *Entom. Obozr.*, 38, 2, 460–466.

Fal'kovich M.I. 1960. *Phiaris captiosana* sp. n.—vikariant *Phiaris arcuella* Cl. v vostochnykh raionakh Palearktiki (*Phiaris captiosana* sp. n.—a vicarious form of *Phiaris arcuella* Cl. in the eastern regions of the Palearctic). *Entom. Obozr.*, 39, 3, 692–695.

Fal'kovich, M.I. 1962a. Novye palearkticheskie rody listovertok triby Olethreutini (Lepidoptera, Tortricidae) [New Palearctic genera of tortrice moths of the tribe Olethreutini (Lepidoptera, Tortricidae)]. *Entom. Obozr.*, 41, 1, 190–197.

Fal'kovich, M.I. 1962b. Priminenie vtorichnopolovykh priznakov v sistematika podsemeistva Olethreutinae (Lepidoptera, Tortricidae) [Use of secondary sex characters in the taxonomy of the subfamily Olethreutinae (Lepidoptera, Tortricidae)]. *Entom. Obozr.*, 41, 4, 878–885.

Fal'kovich, M.I. 1962c. Novye vidy triby Olethreutini (Lepidoptera, Tortricidae) s Dal'nego Vostoka [New species of the tribe Olethreutini (Lepidoptera, Tortricidae) from the Far East]. *Tr. Zool. Inst. AN SSSR,* vol. 30, pp. 353–368.

Fal' kovich, M.I. 1965. Novye vostochnoaziatskie vidy listovertok (Lepidoptera, Tortricidae) [New East Asian species of tortrice moths (Lepidoptera, Tortricidae)]. *Entom. Obozr.*, 49, 2, 414–437.

Fal'kovich, M.I. 1966a. Novye palearkticheskie vidy listovertok podsemeistva Olethreutinae (Lepidoptera, Tortricidae) [New Palearctic species of tortrice moths from the subfamily Olethreutinae (Lepidoptera, Tortricidae)]. *Tr. Zool. Inst. AN SSSR*, vol. 37, pp. 208–227.

Fal'kovich, M.I. 1966b. Novye vidy roda *Olethreutes* Hb. (Lepidoptera, Torticidae) s Dal'nego Vostoka [New species of the genus *Olethreutes* Hb. (Lepidoptera, Tortricidae) from the Far East]. In: *Novye Vidy Fauny Sibiri i Prilezhashchikh Regionov*. Izd. Nauka, Novosibirsk, pp. 39–48.

Fal'kovich, M.I. 1966c. Obzor listovertok roda *Aterpia* Gn. (Lepidoptera, Tortricidae) s opisaniem dvukh novykh vidov [Review of tortrice moths of the genus *Aterpia* Gn. (Lepidoptera, Tortricidae) with a description of two new species]. *Entom. Obozr.*, 45, 4, 865–873.

Fal'kovich, M.I. 1970a. Novye i maloizvestnye vidy roda endoteniya—*Endothenia* Stph. (Lepidoptera, Tortricidae) fauny SSSR [New and little-known species of hte genus *Endothenia* Stph. (Lepidoptera, Tortricidae) in the fauna of the USSR]. *Vestn. Zool., Kiev*, vol. 3, pp. 68–76.

Fal'kovich, M.I. 1970b. Novye palearkticheskie vidy roda *Lobesia* Gn. i zamechaniya po sinonimike nekortoykh listovertok (Lepidoptera, Tortricidae) [New Palearctic species of the genus *Lobesia* Gn. and notes on the synonyms of some tortrice moths (Lepidoptera, Tortricidae)]. *Vestn. Zool., Kiev,* vol. 5, pp. 62–69.

Filip'ev, N.N. 1962. Novye vidy listovertok podsem. Tortricinae (Lepidoptera, Tortricidae) fauny SSSR [New tortrice species of the subfamily Tortricinae (Lepidoptera, Tortricidae) in the fauna of the USSR]. *Tr. Zool. Inst. AN SSSR,* vol. 30, pp. 369–381.

Filipjev, N. [Filip'ev, N.N.]. 1930a. Lepidopterologische Notizen. VII: Eine neue Tortricidengattung aus den Gebirgen des Ussurigebiete, *Dokl. Akad. Nauk SSSR,* ser. A, no. 14, pp. 373–375.

Filipjev, N. [Filip'ev, N.N.]. 1930b. Lepidopterologische Notizen. IX: Eine neuer Obstblüten-Schädling aus dem Ussurigebiete, *Ezhegodnik Zool. Muz. AN SSSR,* pp. 341–346.

Filipjev, N. [Filip'ev, N.N.]. 1931 (1930). III. Übersicht der ostsibirischen Arten der Gattung *Peronea* Curtis (Lepidoptera, Tortricidae), *Ezhegodnik Zool. Muz. AN SSSR,* pp. 497–528.

Filipjev, N. [Filip'ev, N.N.]. 1934. Notices lépidoptérologiques. XV. La distribution de l'*Argyroploce doubledayana* Barrett, *Lambillionea, Bruxelles,* 34, 8–9, 177–180.

Filipjev, N. [Filip'ev, N.N.]. 1940. *Piercea* gen. n. (Lepidoptera, Tortricidae), *Tr. Zool. Inst. AN SSSR*, vol. 6, pp. 171–183.

Hannemann, H.J. 1961. Kleinschmetterlinge oder Microlepidoptera. I. Die Wickler (s. str.) (Tortricidae). In: *Die Tierwelt Deutschlands*. Jena, vol. 48, pp. 1–233.

Hannemann, H.J. Kleinschmetterlinge oder Microlepidoptera. II. Die Wickler (s. l.) (Cocylidae and Carposinidae). In: *Die Tierwelt Deutschlands*. Jena, vol. 50, pp. 1–78.

Honma, K. 1966. Photoperiodic responses in two local populations of the smaller tea tortrix, *Adoxophyes orana* Fischer von Röslerstamm (Lepidoptera, Tortricidae), *Appl. Entom. Zool., Tokyo,* 1, 1, 32–36.

Issiki, S. 1957. Tortricidae. In: *Icones Heterocerorum Japonicorum in Coloribus Naturalibus* edited by T.S. Esaki, S. Issiki et al. Osaka, vol. 21, pp. 52–89.

Kawabe, A. 1963a. A revision of the genus *Tortricodes* (Tortricidae), *Tinea,* 6, 1/2, 5–8.

Kawabe, A. 1963b. Descriptions of three new and one unrecorded species of the genus *Acleris* Hb., *Trans. Lepid. Soc. Japan,* 14, 3, 70–75.

Kawabe, A. 1963c. Some notes on the Japanese Tortricidae (1). On the species of the genus *Pandemis* Hb. *Kenkyu to Hyoron, Biannual Report of Hosei Second High School,* vol. 10, pp. 79–92.

Kawabe, A. 1964a. Descriptions of three new species of Archipsini from Japan, *Trans. Lepid. Soc. Japan,* 15, 1, 1–7.

Kawabe, A. 1964b. Some notes on the Japanese Tortricidae (2). On the species of the genus *Homona* Walker. *Kenkyu to Hyoron, Biannual Report of Hosei Second High School,* vol. 11, pp. 17–25.

Kawabe, A. 1965a. A revision of the genus *Archips* from Japan, *Trans. Lepid. Soc. Japan,* 16, 1/2, 13–40.

Kawabe, A. 1965b. On the Japanese species of the genus *Clepsis* Hb. (Lepidoptera, Tortricidae), *Kontyû,* 33, 4, 459–465.

Kawabe, A. 1966. Record of *Choristoneura lafauriana* (Raganot) from Japan (Lep., Tortricidae), *Japan Heterocerist's J.,* vol. 41, pp. 380–381.

Kawabe, A. 1968a. Notes on Tortricinae from Formosa (Lepidoptera, Tortricidae), *Tinea,* 7, 2, 120–126.

Kawabe, A. 1968b. The micro-moth fauna of Izu Islands, *Japan Heterocerists's J.,* vol. 50, pp. 535–540.

Kawabe, A. 1970a. On the Tortircid moths found in the high altitudes of Japan, *Japan Heterocerist's J.,* vol. 62, pp. 22–25.

Kawabe, A. 1970b. Twelve unrecorded species of the Olethreutinae from Japan (Tortricidae), *Tinea,* 8, 2, 201–207.

Kawabe, A. 1971. Two species of the Cochylidae found in the high altitudes of Japan, *Japan Heterocerist's J.*,vol. 65, pp. 75–76.

Kawabe, A. 1972a. Two new and three unrecorded species of the subfamily Olethreutinae from Japan (Lepidoptera, Tortricidae), *Tinea,* 9, 1, 242–246.

Kawabe, A. 1972b. New and unrecorded species of the family Cochylidae from Japan (Lepidoptera), *Tinea,* 9, 1, 247–252.

Kennel, J. 1900. Neue palaearctische Tortriciden, nebst Bemerkungen über einige bereits beschriebene Arten, *Iris,* vol. 13. pp. 124–159.

Kennel, J. 1901 (1900). Neue Wickler des palearctischen Gebietes, *Iris,* vol. 13, pp. 205–305.

Kennel, J. 1908–1921. Die palaearctischen Tortriciden. *Zoologica.* Stuttgart, 21, 54, 1–727.

Klimesch, J. 1961. Ordnung Lepidoptera. Teil I. Tortricina. In: *Die Nordost-Alpen im Spiegel ihrer Landtierwelt* edited by H. Franz, vol. 2. pp. 543–619.

Kouznetsov, V.I. [Kuznetsov, V.I.]. 1962c. Nouvelles espéces de Tortricides (Lepidoptera, Tortricidae) de la region de l'Amour (URSS), *Bull. Soc. Entom. Mulhouse,* Juill. Août, pp. 49–61.

Kurentsov, A.I. 1950. Predvaritel'nye itogi izucheniya listovertok (Tortricidae, Lepidoptera) na Dal'nem Vostoke [Preliminary results of the study of tortrice moths (Tortricidae, Lepidoptera) in the Far East]. *Soobshch. Dal'n Vost. Fil. AN SSSR,* vol. I, pp. 29–32.

Kurentsov, A.I. 1956a. Vrednye nasekomye lesnykh kul'tur na Dal'nem Vostoke (Harmful insects of forest crops in the Far East). *Tr. Dal'n. Vost. Fil. AN SSSR, Ser. Zool.,* 3, 6, 7–54.

Kurentsov, V.I. 1956b. O dvukh zamechatel'nykh vidakh listovertok (Ceracidae, Lepidoptera) Ussuriiskoi fauny [Two remarkable species of tortrice moths (Ceracidae, Lepidoptera) of Ussurian fauna]. *Tr. Dal'n. Vost. Fil. AN SSSR, Ser. Zool.,* 3, 6, 239–252.

Kuznetsov, V.I. 1955. Persikovaya (*Peronea lubricana* Mn.) i klyukvennaya (*Peronea fimbriana* Thnbg.) listovertki (Lepidoptera, Tortricidae) kak formy odnogo vida [The peach (*Peronea lubricana* Mn.) and cranberry (*Peronea fimbriana* Thnbg.) tortrice moths (Lepidoptera, Tortricidae) as forms of a single species]. *Entom. Obozr.,* vol. 34, pp. 124–128.

Kuznetsov, V.I. 1960a. Novye vidy rodov *Salsolicola* Kuz., g. nov., *Pammene* Hb. i *Laspeyresia* Hb. (Lepidoptera, Tortricidae) fauny SSSR [New species of the genera *Salsolicola* Kuz., g. nov., *Pammene* Hb., and *Laspeyrsia* Hb. (Lepidoptera, Tortricidae) in the fauna of the Sov. Union]. *Entom. Obozr.* 39, 1, 189–199.

Kuznetsov, V.I. 1960b. Materialy po faune i biologii cheshuekrylykh (Lepidoptera) Zapadnogo Kopet-Daga (Data on the fauna and biology of Lepidoptera of western Kopet Dag). *Tr. Zool. Inst. AN SSSR,* vol. 27, pp. 11–93.

Kuznetsov, V.I. 1962a. Novye palearkticheskie vidy listovertok roda *Laspeyresia* Hb. (Lepidoptera, Tortricidae) [New Palearctic species of tortrice moths from the genus *Laspeyresia* Hb. (Lepidoptera, Tortricidae)]. *Entom. Obozr.,* 41, 3, 627–642.

Kuznetsov, V.I. 1962b. Novye vidy listovertok (Lepidopera, Tortricidae) s Dal'nego Vostoka [New tortrice species (Lepidoptera, Tortricidae) from the Far East]. *Tr. Zool. Inst. AN SSSR,* vol. 30 pp. 337–352.

Kuznetsov, V.I. 1964a. Novye i maloiavestnye palearkticheskie vidy roda *Pammene* Hb. (Lepidoptera, Tortricidae) [New and little-known palearctic species of the genus *Pammene* Hb. (Lepidoptera, Tortricidae)]. *Entom. Obozr.,* 43, 3, 692–705.

Kuznetsov, V.I. 1964b. Novye vidy listovertok (Lepidoptera, Tortricidae) iz Kazhakhstana [New species of tortrice moths (Lepidoptera, Tortricidae) from Kazakhtan]. *Tr. Zool. Inst. AN SSSR,* vol. 34, pp. 258-265.

Kuznetsov, V.I. 1964c. Novye rody i vidy, listovertok (Lepidoptera, Tortricidae) s Dal'nego Vostoka [New genera and species of tortrice moths (Lepidoptera, Tortricidae) from the Far East]. *Entom. Obozr.,* 43, 4, 873–889.

Kuznetsov, V.I. 1966a. Novye vidy listovertok (Lepidoptera, Tortricidae) iz Yushnogo Primor'ya [New species of tortrice moths (Lepidoptera, Tortricidae) from southern Primor'e]. *Tr. Zool. Inst. AN SSSR,* vol. 37, pp. 177–208.

Kuznetsov, V.I. 1966b. Obzor fauny i e'kologii listovertok (Lepidoptera, Tortricidae) Amuro-Zeiskogo plato [Review of the fauna and ecology of tortrice moths (Lepidoptera, Tortricidae) of the Amur-Zeya plateau]. *Entom. Obozr.,* 45, 3, 481–493.

Kuznetsov, V.I. 1967. Listovertki (Lepidoptera, Tortricidae) Amuro-Zeiskogo mezhdurech'ya i ikh ekologiya [Tortrice moths (Lepidoptera, Tortricidae) of the Amur-Zeya interfluve and their ecology]. *Tr. Zool. Inst. AN SSSR,* vol. 41, pp. 1–72.

Kuznetsov, V.I. 1968a. Novye listovertki (Lepidoptera, Tortricidae) Kuril'skikh ostrovov [New tortrice moths (Lepidoptera, Tortricidae) of the Kuril Islands)]. *Entom. Obozr.,* 42, 3, 567–588.

Kuznetsov, V.I. 1968b. Proiskhozhdenie i evolyutsiya listovertok (Lepidoptera, Tortricidae) Dal'nego Vostoka v zvyazi s razvitiem landshafta, klimata i rastitel'nosti Vostochnoi Azii [Origin and evolution of tortrice moths (Lepidoptera, Tortricidae) of the Far East in relation to changes in landscape, climate, and vegetation in eastern Asia]. *Otchetnaya Nauchn. Sessiya Zool. Inst. AN SSSR po Itogam Rabot 1967 g., Tez. Dokl.* Leningrad, pp. 11–12.

Kuznetsov, V.I. 1969a. Novye vostochnoaziatskie vidy listovertok (Lepidoptera, Tortricidae) [New east Asian species of tortrice moths (Lepidoptera, Tortricidae)]. *Entom. Obozr.*, 48, 2, 352–272.

Kuznetsov, V.I. 1969b. Ekologicheskie svazi listovertok (Lepidoptera, Tortricidae) s rastitel'nost'yu yuga Dal'nego Vostoka [Ecological relationships of tortrice moths (Lepidoptera, Tortricidae) with the vegetation of the southern part of the Far East]. *Dokl. na XXI Ezhegodnom Chtenii Pamyati N.A. Kholodkovskogo.* Izd. Nauka, Leningrad, pp. 27–52.

Kuznetsov, V.I. 1970a. Novye svoeobraznye listovertki (Lepidoptera, Tortricidae) Dal'nego Vostoka [New unique tortrice moths (Lepidoptera, Tortricidae) of the Far East]. *Entom. Obozr.*, 49, 2, 434–451.

Kuznetsov, V.I. 1970b. Listovertki (Lepidoptera, Tortricidae) vredyashchie rozotsvatnym plodovym Yuzhno-Kuril'skikh ostrovov [The tortrice moths (Lepidoptera, Tortricidae) damaging fruits of Rosaceae on the southern Kuril Islands]. *Tr. Sakhalinsk. Obl. Stantsii Zashch. Rast.*, vol. 1, pp. 37–44.

Kuznetsov, V.I. 1971b. Novye vostochnoaziatskie vidy listovertok podsem. Olethreutinae (Lepidoptera, Tortricidae) [New east Asian species of tortrice moths of the subfamily Olethreutinae (Lepidoptera, Tortricidae)]. *Entom. Obozr.*, 50, 2, 427–443.

Kuznetsov, V.I. 1972a. Novye listovertki (Lepidoptera, Tortricidae) iz Mongolii [New tortrice moths (Lepidoptera, Tortricidae) from Mongolia]. In: *Nasekomye Mongolii.* Izd. Nauka, Leningrad, vol. 1, pp. 715–720.

Kuznetsov, V.I. 1972b. Evolyutsiya i proiskhozhdenie Yuzhno-Kuril'skoi fauny listovertok (Lepidoptera, Tortricidae) [Evolution and origin of the southern Kuril fauna of tortrice moths (Lepidoptera, Tortricidae)]. *Zool. Zhurn.*, 51, 2, 220–227.

Kuznetsov, V.I. 1972c. Novye i maloizvestnye palearkticheskie plodozhorki triby Laspeyresiini (Lepidoptera, Tortricidae) [New and little-known Paleartic fruit moths of the tribe Laspeyresiini (Lepidoptera, Tortricidae)]. *Entom. Obozr.*, 51, 2, 387–400.

Kuznetsov, V.I. 1973. Opisaniya novykh vostochnoaziatskikh listovertok podsem. Olethreutinae (Lepidoptera, Tortricidae) [Description of new east Asian tortrice moths of the subfamily

Olethreutinae (Lepidoptera, Tortricidae)]. *Entom. Obozr.*, 52, 3, 682–699.

Kuznetsov, V.I. and A.A. Stekol'nikov. 1973. Filogeneticheskie svyazi v sem. Tortricidae (Lepidoptera) na osnove funktsional'noi morfologii genitalii [Phylogenetic relationships in the family Tortricidae (Lepidoptera) based on studies of the functional morphology of the genital organs]. This volume, pp. 20–56.

Kuznetzov [Kuznetsov], V.I. 1971a. Zur Evolution der Wicklerfauna (Lepidoptera, Tortricidae) der Südkurilen, *Tr. XIII Mezhdularodnogo Entom. Kongr.*, vol. 1, pp. 514–515.

Lyubarskayaa, V.N. 1964. Listovertki (Lepidoptera, Tortricidae), povrezhdayushchie shishki, plody i semena drevesnykh porod, kustarnikov i drevesnykh lian na Sovetskom Dal'nem Vostoke [Tortrice moths (Lepidoptera, Tortricidae) damaging cones, fruits, and seeds of trees, shrubs, and arboreal creepers in the Soviet Far East]. In: *Ekol. Masekomykh Primor'ya i Priamur'ya.* Izd. Nauka, Moscow, pp. 78–128.

Mani, E. 1968. Biologische Untersuchungen an *Pandemis heparana* (Den. und Schiff). unter besonderer Berücksichtigung der Faktoren, welche die Diapause induzieren und die Eiablage beeinflussen, *Mitteil. Schweiz. Entom. Ges.*, 40, 3–4, 145–203.

Masaki, S. 1957. Ecological significance of diapause in the seasonal cycle of *Abraxas miranda* Butl., *Bull. Fac. Agric. Mie Univ.*, vol. 15, pp. 15–24.

Masaki, S. 1958. The response of a "short-day" insect to certain external factors: the induction of diapause in *Abraxas miranda* Butl., *Japan J. Appl. Entom. a. Zool.*, 2, 4, 285–294.

Matsumura, S. 1931. *6000 illustrated Insects of Japan Empire.* Tokyo, 1497 pp.

Motschulsky [Mochul'skii], V. 1866. Catalogue des Insectes Recus du Japan, *Bull. Soc. Nat. Moscau,* pp. 163–200.

Obraztsov, N. 1967. Notes on the genus *Homonopsis* V. Kuznetsov (Lepidoptera, Tortricidae), *Entom. Berichten,* vol. 27, pp. 173–175.

Oku, T. 1956. Notes on seven species of the genus *Acleris* Huebner from Japan with descriptions of two new species, *Ins. Matsumurana,* 20, 3–4, 114–118.

Oku, T. 1957. Descriptions of a new species of *Acleris* Huebner with notes on synonymy, *Ins. Matsumurana,* 21, 1–2, 74–76.

Oku, T. 1961. Biological notes on Tortricidae. I. Hibernal behaviour, *Coenonympha,* vol. 11, pp. 189–196.

Oku, T. 1963a. A new mint borer of Tortricidae from Japan, with description of a new genus (Lepidoptera: Tortricidae), *Ins. Matsumurana,* 26, 2, 104–107.

Oku, T. 1963b. Biological notes on Tortricidae. II. Seasonal prevalence of some Tortricidae, 1, *Coenonympha,* vol. 14, pp. 252–254.

Oku, T. 1964a. Biological notes on Tortricidae. III. Seasonal prevalence of some Tortricidae, 2, *Coenonympha,* vol. 17, pp. 316–319.

Oku, T. 1964b. Discovery of *Zeiraphera corpulentana* (Kennel) in Japan, *Tohoku Konchu Kenkyu,* 1, 3, 63–66.

Oku, T. 1965. Two new species of Tortricidae from the Kuril Islands (Lepidoptera: Tortricidae), *Kontyû,* 33, 4, 452–455.

Oku, T. 1966. Diapause of some apple leaf-rollers at an earlier larval instar (Lepidoptera: Tortricidae). I. Pre-diapause behaviour and peculiarity of life cycle, *Kontyû,* 34, 2, 144–153.

Oku, T. 1967. Tortricoidea as agricultural and horticultural pests in Hokkaido, with special reference to the host plants. *Sb. Soobshch. Patspon. S.-Kh. Opytn. Stantsii Tokhoku,* vol. 16, pp. 44–62.

Oku, T. 1968. New or little-known species of the subfamily Olethreutinae injurious to coniferous trees from Japan (Lepidoptera: Tortricidae), *Kontyû,* 36, 3, 227–236.

Ragonot, E.L. 1894. Notes synonymiques sur les Microlépidopteres et descriptions d'espèces peu connues ou inédites, *Bull. Soc. Entom. France,* vol. 63, pp. 161–226.

Razowski, J. 1960. Studies on the Cochylidae (Lepidoptera). Part III, *Polsk. Pismo Entom.,* 30, 21, 397–402.

Razowski, J. 1964a. Studies on the Cochylidae (Lepidoptera). Part IX. Revision of the Caradja collection with descriptions of new species, *Acta Zool. Cracov,* 9, 4, 337–354.

Razowski, J. 1964b. A discussion of some groups of Tortricini (Lepidoptera: Tortricidae) with descriptions of new genera and species, *Acta Zool. Cracov,* 9, 4, 357–415.

Razowski, J. 1965. The palearctic Cnephasiini (Lepidoptera, Tortricidae), *Acta Zool. Cracov,* 10, 3, 199–344.

Razowski, J. 1966. *World Fauna of the Tortricini (Lepidoptera, Tortricidae).* Krabow, 576 pp.

Razowski, J. 1968. Preliminary data on the Japanese Cochylidae (Lepidoptera), *Trans. Lepid. Soc. Japan,* 18, 1–2, 1–3.

Razowski, J. 1970. *Cochylidae. Microlepidoptera Palaearct.* Wien, vol. 3, pp. xiv + 1–528.

Razowski, J. and T. Yasuda. 1964. Descriptions of new Japanese *Acleris* species (Lepidoptera, Tortricidae), *Trans. Lepid. Soc.*

Japan, vol. 14, pp. 80–89.

Russ, K. 1966. Der Einfluss der Photoperiodizität auf die Biologie des Apfelwicklers (*Carpocapsa pomonella* L.). *Pflanzenschutzberichte, Sonderheft,* pp. 27–92.

Shel'deshova, G.G. 1965. Geograficheskaya izmenchivost' fotoperiodicheskoi reaktsii i sezonnogo razvitiya yablonnoi plodozhorki-- *Laspeyresia pomonella* L. (Lepidoptera, Tortricidae) [Geographic variation of the photoperiodic reaction and seasonal development of the codling moth—*Laspeyresia pomonella* L. (Lepidoptera, Tortricidae)]. *Tr. Zool. Inst. AN SSSR,* vol. 36, pp. 5–25.

Shel'deshova, G.G. 1967. Ekologicheskie faktory, opredelyayushchie areal yablonnoi plodozhorki *Laspeyresia pomonella* L. v severnom i yuzhnom polushariyakh (Ecological factors determining the area of distribution of the codling moth—*Laspeyresia pomonella* L.—in the northern and southern hemispheres). *Entom. Obozr.,* 46, 3, 583–605.

Snellen, P. 1883. Nieuwe of weinig bekende Microlepidoptera van Noord-Azie met afbeeldingen door I. Van Leeuwen, *Tijdschr. Entom.,* vol. 26, pp. 181–228.

Swatschek, B. 1958. *Die Larvalsystematik der Wickler* (*Tortricidae und Carposinidae*). Berlin, 269 pp.

Tanasijevič, N. 1960. Zhivotni tsiklus i shtetnost *Conchylidia implicitana* Wck. i *Argyrotaenia pulchellana* Haw. (Lepidoptera: Agapantidae: Tortricidae). *Zborn. Rad. Pol'privredn. Fak. Univ. Beogradu,* 8, 295, 1–9.

Tateyama, I. and T. Oku. 1967. Notes on the Oriental larch bark moth, *Laspeyresia laricicolana* Kuznetzov in Japan, with descriptions of the larva and pupa (Lepidoptera: Tortricidae), *Kontyû,* 35, 1, 17–21.

Walsingham, M. 1900. Asiatic Tortricidae, *Ann. and Mag. Natur. History,* 7 ser., V (1899): 368–386, 451–490; VI: 121–137, 234–243, 333–341, 401–409, 429–448.

Yasuda, T. 1962. A study of the Japanese Tortricidae, I, *Publ. Entom. Labor. Univ. Osaka Pref.,* vol. 7, pp. 49–52.

Yasuda, T. 1965a. A study of the Japanese Tortricidae, II. Tribe Ceracini, *Kontyû,* 33, 1, 1–6.

Yasuda, T. 1965b. The Japanese species of the Tortricid genus *Acleris* (*Lepidoptera*), *Bull. Univ. Osaka Pref., Ser. B.,* vol. 17, pp. 11–49.

New Species of Leaf Rollers (Lepidoptera, Tortricidae) from Mountains of Central Asia

Yu. A. Kostyuk

The material for these new descriptions was collected by me during the Expedition of the Zoological Museum, Academy of Sciences of the Ukraine SSR from 1968 to 1969 in Tuvin and adjacent regions of northwestern Mongolia. Two of the species described below have already been reported from this region (Kostyuk, 1971).

The types of these new species are preserved in the Institute of Zoology, Academy of Sciences of the Ukraine SSR (Kiev).

I express deep gratitude for the assistance rendered to me by V.I. Kuznetsov and M.I. Fal'kovich.

Clepsis danilevskyi Kostjuk, sp. n.

On the basis of pattern this species resembles *C. aerosana* Led., to which it is closely related by structure of the male genitalia.

External appearance of moth (Figure 1): Wingspan 20 mm. Costal fold not present. Antennae reach middle of anterior margin of wing, dark brown, with dense whitish cilia, and clusters of flat straw-yellow scales on each segment. Head with reddish-brown piliform scales; thorax dark brown with admixture of reddish-brown and ocherous-yellow scales along posterior margin. Palpi twice longer than diameter of eye, slightly pubescent, broaden toward apex, and covered with long rusty scales masking last segment. Scales of abdomen dark gray, lustrous. Forewings narrow, broaden slightly, with sharply bent costal margins near base of wing; outer margin truncated, tornal corner smoothly rounded. Basic color of forewings ocherous-yellow with very distinct reddish-chocolate-brown pattern; latter covers basal area, median band, and subapical spots. Border of basal area with coarse hair, highly truncated, and reaches middle in region of posterior margin. Median band broad, with parallel margins, obliquely directed toward posterior alar margin, reaches its tornal corner, and thereafter curves roundly upward, narrows gradually, and merges into middle of outer margin. In *C. aerosana* Led. (hundreds of specimens examined) median band does not curve toward outer margin; in most individuals it is even, not flat, and divided into two, rarely three, isolated spots. Subapical spot large, elongated-oval, and attenuate in apical part. Fimbria ocherous-yellow, with dividing line of deeper color, and admixture of long grayish scales near tornus. Groups of lead-gray lustrous scales scattered here and there in basic pattern of *C. aerosana* Led., absent in *C. danilevskyi.* Hind wings dark gray, with deep pinkish-yellow granulation near apex and along outer margins (in *C. aerosana* Led. monochromatic light gray).

Male genitalia (Figure 2): Valves simple, without harpes and depressions, triangular with rounded apex, and not sclerotized along upper margin. Sacculus well defined, sclerotized, broadens abruptly in middle, then narrows sharply distally, and does not reach outer margin of valve. Inner surface of valves in basal half with inward depression; slightly sclerotized central area elongated-oval; distal region soft and covered with rather dense slender setae. Appendages of valves (transtilla) almost contiguous, not fused, in form of inwardly directed, highly sclerotized structures armed with spinescent evaginations of various size. Aedoeagus highly sclerotized, arcuate, with pointed, falcate apex. Part of right wall membranous, laden with minute chitinized spinules. Inverted part of aedoeagus with three long acicular cornuti. Tegumen broad, its height almost equal to width. Uncus broad, with rounded

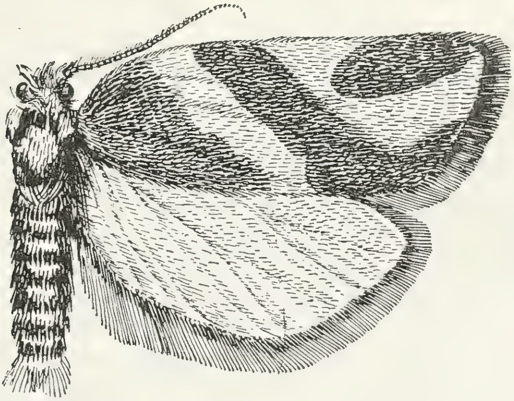


Figure 1. *Clepsis danilevskyi* Kostjuk, sp. n., holotype, male, pattern of wing. Tuvin, Munku-Khairkhan-Ula.

apex, and bent almost at a right angle. Socii barely discernible, in form of small projecting membranous lobes laden with slender setae. Gnathos highly sclerotized, without lateral processes, with inverted grooved distal appendage.

Differences in the genital structure of *C. danilevskyi* sp. n., and *C. aerosana* Led. can be judged from the drawings in Figure 3.

Material: Holotype, male: Tuvin, mountain massif Mongun-Taiga, Munku-Khairkhan-Ula city, eastern bank of Lake Khindiktig-Khol', 3,500 m, alpine meadow, July 13, 1969 (Kostyuk). Paratype, male; same site.

Clepsis tannuolana Kostjuk, sp. n.

Based on genital structure, *C. tannuolana* sp. n. is closely related to the group of Japanese species (*C. monticolana* Kawabe *C. jinboi* Kawabe, *C. aliana* Kawabe, *C. insignata* Oku) recently described from the high mountains of Hokkaido and Honshu (Kawabe, 1965). It is also closely related to the North American species *C. fucana* Wlsnm. (? = *busckana* Keiffer), but judging from the drawing provided by

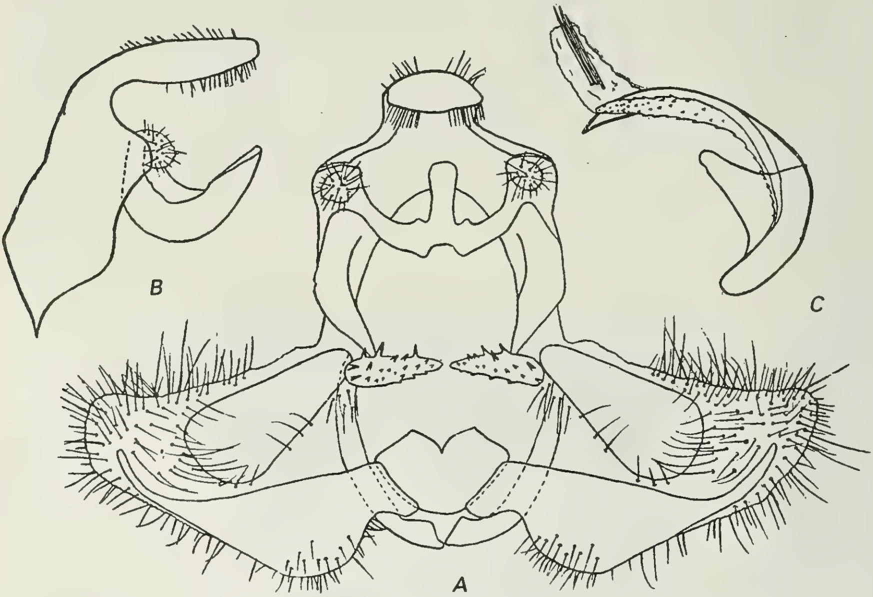


Figure 2. *Clepsis danilevskyi* Kostjuk, sp. n., paratype, male, genitalia. Tuvin, Munku-Khairkhan-Ula.

A—general appearance; B—aedoeagus, view from right side; C—tegumen, uncus, socii, and gnathos, from left side.

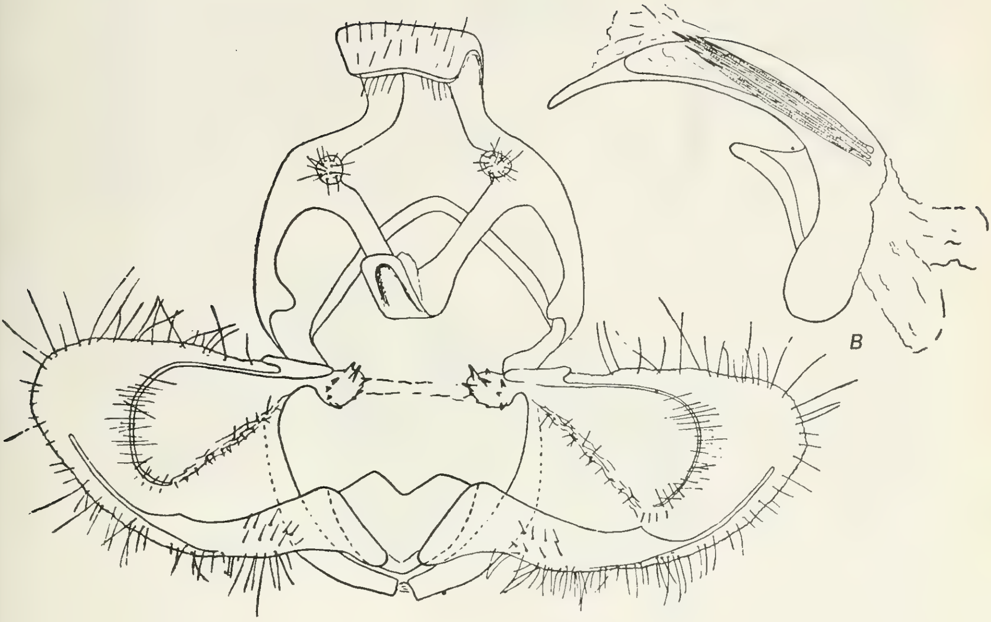


Figure 3. *Clepsis aerosana* Led., male, genitalia. Tuvin.
A—general appearance; B—aedoeagus, view from right side.

Freeman (1985) significant differences exist in structure of the male genitalia and even more so in the female genitalia.

External appearance of moth (Figure 4): Wingspan 17 to 18 mm. Costal fold absent. Head and thorax ocher to chocolate-brown, abdomen dark gray. Antennae (in length reach middle of anterior margin of wing) dark chocolate-brown, and densely pubescent with minute dark cilia. Palpi slightly pubescent, in length barely 1.5 times longer than diameter of eye, covered with ocherous-yellow and chocolate-brown scales; last segment well defined. Forewings with uniformly curved costal margin, only slightly broader toward outer margin, tornal corner smoothly rounded. Basic color of forewings pale honey. Basic pattern distinct, consists of reddish-brown or whitish scales (Bondartsev, 1954). Outer margin of basal area in form of two large serrations; upper one fuses with transverse band of wing and broadens

---

[1] I sent one of my specimens (male) to the British Museum for a comparison with the type specimen of Walsingham (1879). Dr. J.D. Bradley was kind enough to confirm the distinctness of *C. tannuolana* sp. n.

toward lower side; inner margin of band somewhat sinuate, outer one fuses with outer marginal spot as well as with large subapical spot that extends toward middle of costal margin, so that only two to three rounded sections remain of ground color in outer area. Between basal area and median band pale sandy background obliterated by large irregular spot of lead-gray lustrous scales; small concentrations of similar scales discernible near tornus and in region of median cell. Fimbria musty-yellow with admixture of gray scales. Hind wings gray.

Figure 4. *Clepsis tannuolana* Kostjuk, sp. n., holotype, male, pattern of wing. Tuvin, Munku-Khairkhan-Ula.

Females differ notably in color. Basic color of forewings pale yellow, with slight brownish or reddish-orange pattern. Pubescence of head, palpi, and fimbria pale yellow. Thorax in some individuals ash-grey, in others pale yellow.

Male genitalia (Figure 5): Valves rounded-cordate, without harpes and depressions. Highly sclerotized, broad sacculus sharply defined, reaches margin of valve, with apical part upcurved. Upper halves of valves in form of soft and barely sclerotized lobes densely laden with long slender setae. Basal appendages of valves raised, large, and with rounded apices laden with chitinized tubercles of various size. Aedoeagus highly sclerotized, curved at middle, its apical part on left side obliquely truncated in vertical plane, on right side with a few papillate outgrowths near apex. Inner side of aedeagus with cluster of very thin, long, caducous cornuti. Uncus long, bent at a right angle, broadens slightly, with rounded apex, and on lower side densely laden with slender setae. Socii, as in the closely related American species, absent, but "shoulders" of laterally compressed tegumen isolated and their

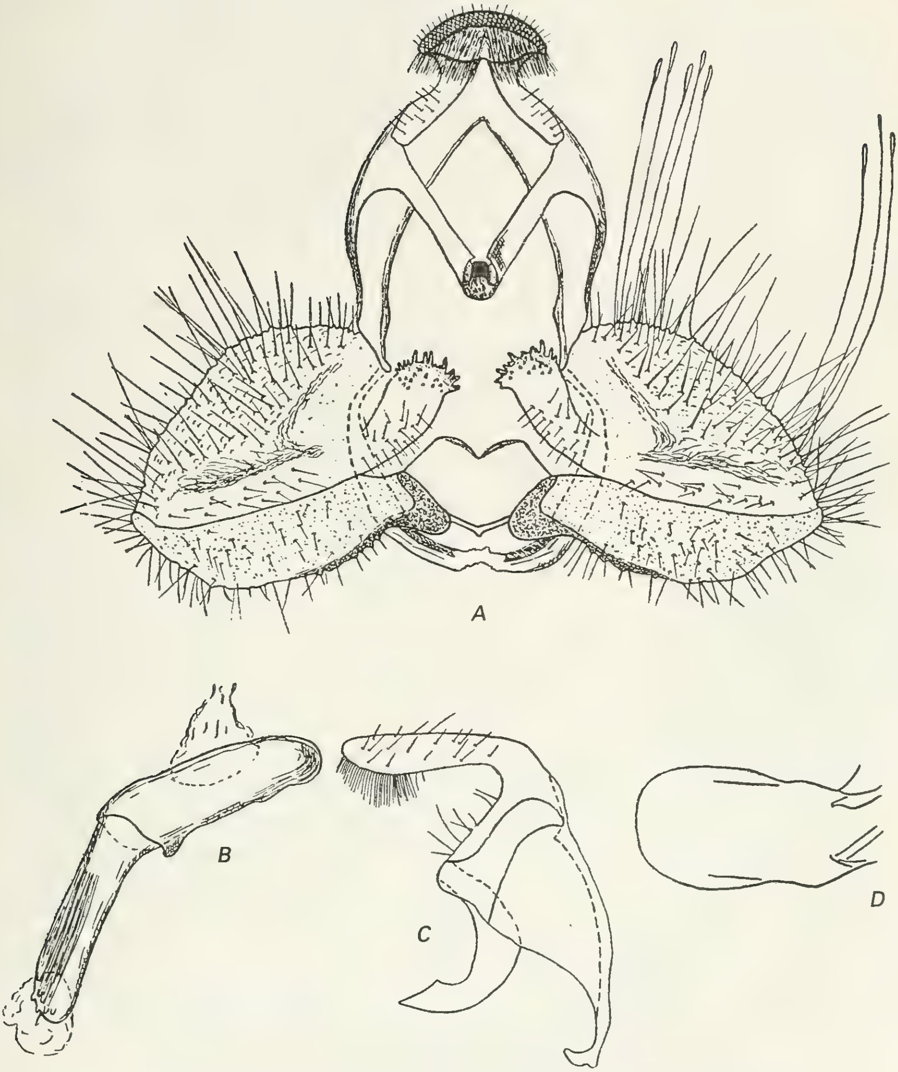


Figure 5. *Clepsis tannuolana* Kostjuk, sp. n., paratype, male, genitalia. Tuvin, Munku-Khairkhan-Ula.

A—general appearance; B—aedeagus, view from right side; C—tegumen, uncus, and gnathos, view from right side; D—uncus, general view.

highly sclerotized oblong areas laden with setae—a feature not known in Palearctic species of the genus *Clepsis* Gn. Gnathos simple in structure, without lateral lobes, distally slightly attenuate.

Figure 6. *Clepsis tannuolana* Kostjuk, sp. n., paratype, female, genitalia. Western Tannu-Ola.

Female genitalia (Figure 6): Anal papillae broad, calceolate. Posterior apophysis about 1.5 times shorter than anterior. Sexual opening rounded, fairly broad. Ductus bursae commences with slightly sclerotized infundibular broadening, constituting a single unit with large postvaginal sclerite; posterior margin of latter with small projection in middle. Duct of copulatory bursa long, membranous throughout length. Copulatory bursa ovata, without signa.

Biology: Found universally in outgrowths of cinquefoin (*Dasiphora fruticosa*). Frightened moths fly away and resettle only on leaves of this shrub, apparently a food plant of the larvae of this species.

Material: Holotype, male. Tuvin, Mongun-Taiga mountain massif, Munku-Khairkhan-Ula city, 3,000 m, montane tundra, June 18, 1968 (Kostyuk). Paratypes (collected by Yu.A. Kostyuk), 10 males: same site, June 18, 1968; 4 males, Tuvin, Mongun-Taiga mountain massif, upper reaches of Tolaityg River, 3,000 m, montane tundra, June 30, 1968; 1 male, same site, east shore of Lake Khindiktig-Khol', 3,500 m, alpine meadows, July 30, 1969; 119 males, 78 females, western Tannu-Ola, Khundurgun Pass, upper reaches of Ulug-Khondergei River, 1,900 m, montane tundra, July 9, 1969.

Eriopsela mongunana Kostjuk, sp. n.

Based on drawing, closely resembles *E. quadrana* Hb.

External appearance of moth: Wingspan 22 mm. Forewings narrow, highly elongated, with straight costal margin, and sharply truncated outer margin. Basic color of forewings monochromatic light gray. Pattern indistinct, consists of scattered, diffuse pale chocolate-brown scales. Highly truncated basal area discernible only in lower half of wing; in upper half condensed pale chocolate-brown scales and small

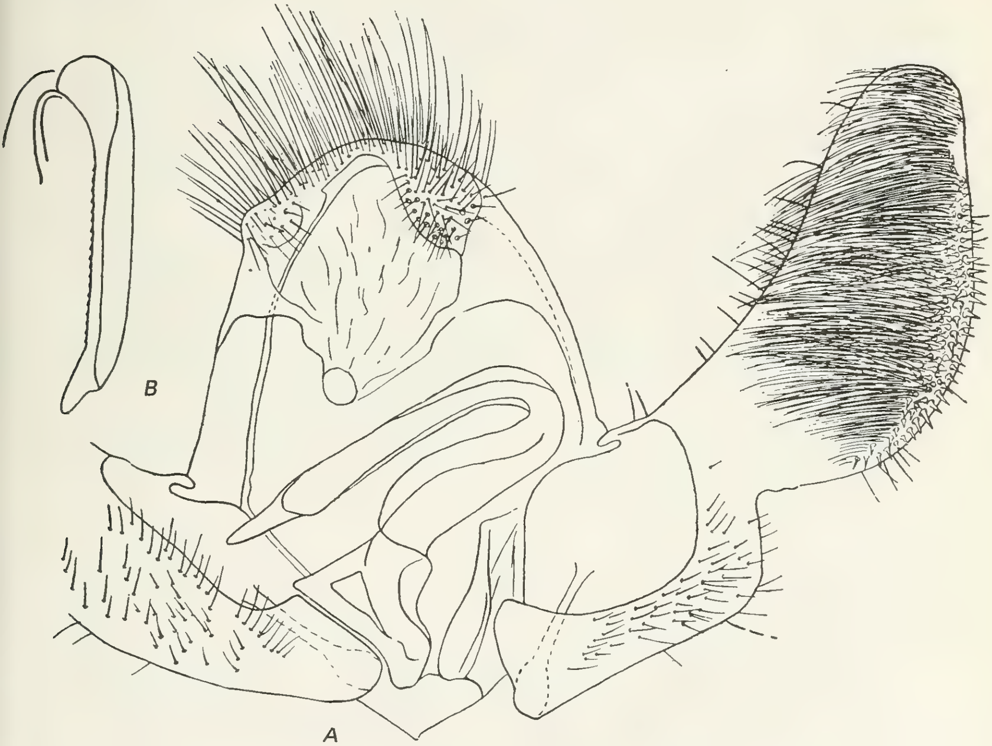


Figure 7. *Eriopsela mongunana* Kostjuk, sp. n., holotype, male, genitalia. Tuvin, Munku-Khairkhan-Ula.

A—general appearance; B—aedoeagus, dorsal view.

patch along subcostal vein perceptible near base. Oblique and rather narrow median band commences from costal margin, bends abruptly at an obtuse angle in region of discal cell, and uniformly broadens near depression in posterior margin of wing, forming triquestrous pretornal spot. Costal stripes not sharp; chocolate-brown indistinct stripes of same color extend from them toward posterior wing margin and diffused throughout outer marginal area. Fimbria pale chocolate-brown; marginal line brown. Hind wings gray; fimbria light-colored, with dark line along base. Palpi, thorax, and abdomen ash-gray, tegulae reddish-chocolate-brown.

Male genitalia (Figure 7). Based on genital structure, this species is also quite close to *E. quadrana* Hb., but differs from latter in structure of valves, upper fultura, presence of terminal process, and different arrangement of depressions on aedeagus.

Valves elongated, upcurved. Cucullus sharply demarcated by deep prominent rectangular projection; lower margin smoothly rounded (in *E. quadrana* Hb. notch rounded and cucullus broadens abruptly behind it). Cucullus densely pubescent (except for small glabrous area), and laden with minute spinules along lower margin of basal half. Aedeagus straight, right side membranous, left wall sclerotized, and terminates in leftwardly directed narrow terminal process. Behind process, along left wall of aedoeagus, longitudinal serrated stripe evident, formed by minute compact chitinous depressions. Fultura high, broadens smoothly upward, 1.5 times larger than in *E. quadrana* Hb. Uncus absent; socii lobate, soft, and densely laden with setae.

Material: Holotype, male. Tuvin, Mongun-Taiga mountain massif, Munku-Khairkhan-Ula city, east shore of Lake Khindiktig-Khol', 3,500 m, alpine meadow, July 13, 1969 (Kostyuk).

REFERENCES

Bondartsev, A.S. 1954. Shkala tsvetov (Color Scale). Moscow-Leningrad; pp. 1–27.

Freeman, T.N. 1958. The Archipinae of North America (Lepidoptera, Tortricidae), *Canadian Entom.,* 90, Suppl., pp. 5–89.

Kawabe, A. 1965. Japanese species of the genus *Clepsis* Hb. (Lepidoptera, Tortricidae), *Kontyû,* 34, 4, 459–465.

Kostyuk, Yu.O. 1971. Do niznaniya luskokrilikh (Lepidoptera) Tuvi i Pivnichno-Zakhidnoi Mongolii. Listoviikovi (Tortricidae). Povidomleniya I. [Key to Lepidoptera of Tuvin and southwestern Mongolia. Tortrice (Tortricidae), I]. *Zb. Prots. Zool. Muz., Kiev,* vol. 34, pp. 38–50.

Walsingham, Th. 1879. *Illustrations of Typical Specimens of Lepidoptera, Heterocera in the Collection of the British Museum.* London, vol. 4, p. 12, pl. 63, fig. 2.

Phylogeny of the Superfamily Tineoidea (Lepidoptera)

A.K. Zagulyaev

The works of Petersen (1957, 1964), Gozmány (1959, 1960), and Căpuşe (1964, 1968) on Palearctic and African members (Gozmány, 1965, 1967) of Tineidae and our own studies on the moth fauna of the Soviet Union (Zagulyaev, 1960, 1964, 1965, 1968, 1969, 1973), have more or less defined the species composition of this family for the greater part of the Palearctic.

A combined analysis of the morphology and biological peculiarities of these moths has not only provided guidelines for their classification, but indicated the basic prerequisites for phylogenetic conclusions and determination of the position of this family among moths.

Analysis of the natural system of Tineoidea is difficult because the fauna of non-Palearctic regions has been poorly studied and information on tropical members of the families Euplocamidae, Deuterotineidae, and Ochsenheimeriidae is almost nil.

The phylogenetic scheme proposed below is based mainly on Palearctic and partly Ethiopian material of Tineidae, with reference also to neotropical members of Acrolophidae.

The relationship of Tineidae to other allied families and their phylogenetic relationships are reexamined. The phylogenetic scheme is based on characters in plesiomorphic and apomorphic conditions as understood by Hennig (1953, 1966). This study of recent generalized forms and several fossils revealed that the following features could be considered primary (primitive) or plesiomorphic, i.e., initial for other conditions, in mothlike lepidopterans.

Comparatively large body covered, like the wings, with sparse scales. Forewings broad with slightly sclerotized costa and a complete set of veins and cells; hindwings broad, apically obtuse and with short fimbria. Moths possessing such wings are poor fliers, flying low over forest litter under forest canopy.

Sexual dimorphism poorly expressed externally. Legs stout, short, scansorial, with strong claw apparatus. All oral appendages developed, including large mobile pilifers, stout galea, and long five-segmented maxillary palpi. Imaginal feeding possible. Apophyses of sternite I of abdomen in form of small, poorly sclerotized appendages, with large chitinous sac inside segment. Male genitalia with complete set of parts, not subject to reduction and fusion. Females with sternite and tergite of segment VIII, sclerotized and segmented, long posterior and anterior apophyses originating from sternite, ostium located behind middle of sternite VIII, and telescopic ovipositor with soft anal papillae bearing long setae. Ecologically, these are moisture-loving moths associated with humid forests. Larvae live in decomposing wood or forest litter.

The following major directions in the development of the above characters are discernible in the evolution of these Lepidoptera.

Reduction in general body dimensions and simultaneously of wings, with vestiture consisting of minute densely compressed scales, or partial disappearance of scales on wings. Narrowing and costal sclerotization of forewings; lanceolate appearance of hind wings, with elongation of fimbria. Partial reduction of cells and venation in both wings. The evolution of flight in relation to the emergence of moths from under forest canopy proceeded either toward active and rapid or passive gliding with the development of all its peculiarities, as understood by Rodendorf (1949). Strengthening of sexual dimorphism—females larger and rarely apterous. Elongation of legs and development of spines on them, closer to cursorial type, especially in apterous insects. Reduction of mouthparts because of aphagy to complete reduction of individual appendages. Evagination and strong sclerotization of apophyses of abdominal sternite I in relation to its greater mobility and elevation. Reduction and fusion of individual parts of genitalia: in males, narrowing of vinculum and tegumen, fusion of uncus lobes, reduction of subuncus or gnathos; in females, reduction of subvaginal plate, displacement of ostium toward sternite VII, and bifurcation of anterior apophysis. In many cases evolutionary changes in the genitalia are difficult to explain. Xerophilization of moths in relation to their emergence into forest-steppes and arid regions. Larvae in litter of steppes and deserts, or in nests.

Development incorporating the characters listed above indicates not only the distance of mothlike lepidopterans from the initial plesiomorphic condition, but it also is considered apomorphic by me, i.e., characters derived or specialized. Groups similar in plesiomorphic characters are symplesiomorphic (for a particular character), and apomorphic–synapomorphic. Characters typical for a given taxon are designated autplesiomorphic or autapomorphic.

To explain conditions of one or the other characters in Tineidae and other closely related families, changes in multiple characters were examined in many families of lower Lepidoptera, commencing with the Jugatae. In the present article, drawings of the change in just a single character—apophyses of abdominal sternite I—illustrate the process of evolution. An attempt has also been made to characterize the hypothetical ancestors of Tineoidea, and the question of the position and relationships of this superfamily is discussed.

PHYLOGENETIC RELATIONSHIPS IN THE SUPERFAMILY TINEOIDEA

It is most appropriate to begin with the peculiarities and problems of defining the family Tineidae. As noted repeatedly by Zagulyaev (1968, 1969) and Căpuşe (1968), these moths can be characterized by a combination of several characters, some of which will be discussed. Entire head covered with long, slender, ruffled pubescence. Maxillary palpi usually long and five-segmented. Additional ocelli absent. In

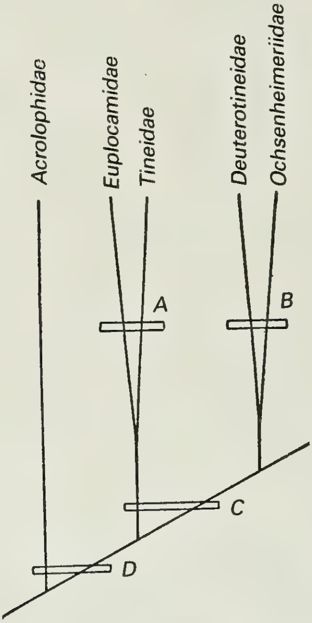


Figure 1. Scheme of phylogenetic relationships in the superfamily Tineoidea. A to D—synapomorphic relationships.

forewings, R_4 and R_5 widely separated and R_5 merges into anterior margin of wing; in hind wings, R_1 merges into anterior margin of wing, M_3 and Cu_1 in most species widely separated at base, and A_1 terminates before level of apex of radiocubital cell. Middle pair of spurs on hind tibiae located before middle or at middle of tibia. Male genitalia: lobes of subuncus well developed, anal tube short and membranous or even absent in many species. Larvae with separate dorsal and substigmal setae on prothorax. Based on life history and food specialization, larvae detritomycetophagous or keratophagous.

Although Tineidae represents a monophyletic group, ecologically it combines three distinct biological types—hepialoid, psychoid, and tineoid—and several subtypes which, in my opinion, reflect the major phylogenetic lines of development of Tineidae (Zagulyaev, 1972). The hepialoid is one of the most generalized ancient types of Lepidoptera and combines the most primitive members in the family (Scardiinae and greater majority of Nemapogoninae and Myrmecozelinae). The psychoid type includes most of the species from the subfamily Meessiinae. The tineoid type includes keratophagous moths (Tineinae) and higher mycetophagous moths (Nemapogoninae). The psycheo-tineoid types are specialized biological groups, but their specialization developed on a morphologically primitive base.

The closest to Tineidae (and especially to Scardiinae) is Euplocamidae. Both families are synapomorphic for a series of characters (Figure 1, A). Middle tibiae shorter than femora (Figure 3, B). Wings relatively broader, with short fimbria, and sparse scales; forewings equal in width to hind wings, without stigma, with poorly costalized margins, and *Sc* longer, terminating behind middle of anterior margin (Figure 2, A). Apophyses of anteroabdominal sternite resemble falcate processes that convert into chitinous sacs (Figure 10, C). Androconia represented by clusters of long narrow scales. In male genitalia such characters are broad vinculum and tegumen with well-defined sutures, second lobe of uncus (Figure 4); in female genitalia highly sclerotized tergite and sternite of segment VIII, and location of ostium closer to posterior margin of vaginal plate (Figure 5). In larvae and pupae several general apomorphic characters for both families were noted. Larvae with semiprognathic type of head with five ocelli and relatively short five-segmented antennae. Body with thin translucent cuticle, flat, relatively short setae, and thoracic legs with widely separated coxae. Pupae with thin cuticle, short wing covers, and suture between mesothorax and metathorax turned in direction of metathorax.

On the basis of life history Euplocamidae belongs to forest adapted

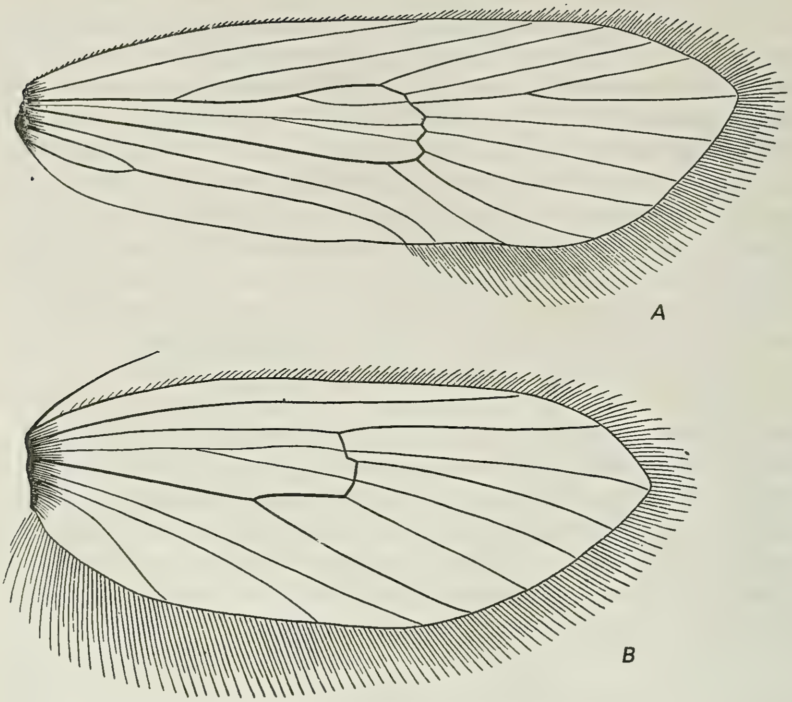


Figure 2. Venation of *Euplocamus anthracinalis* Scop.

A—forewing; B—hind wing.

moths. The larvae of this group are wood detritophages, living in decomposing wood and forest litter, and ecologically, like Scardiinae, they belong to the hepialoid biological type. The foregoing peculiarities not only bring Euplocamidae and Tineidae closer, but even provide a basis for considering them sister families, i.e., derived from a common stock. Euplocamidae is characterized by a series of autapomorphic characters: antennae with very long and complex bipinnate pubescence, relatively short maxillary palpi and galea, and third segment of labial palpi slightly shorter than second (Figure 6). In the forewings R_4 and R_5 stalked. In the male genitalia, anal tube sclerotized; in the female, vaginal plate covered with minute acicular spinules. However, Euplocamidae retains several characters of a plesiomorphic nature. For example, forewings with distinct middle cell (Figure 2, A) and hind wings with very short radiocubital cell (equal to half length of wing). The male genitalia has retained a very broad tegumen and vinculum, undeveloped saccus, and long anal tube (longer than uncus). All this

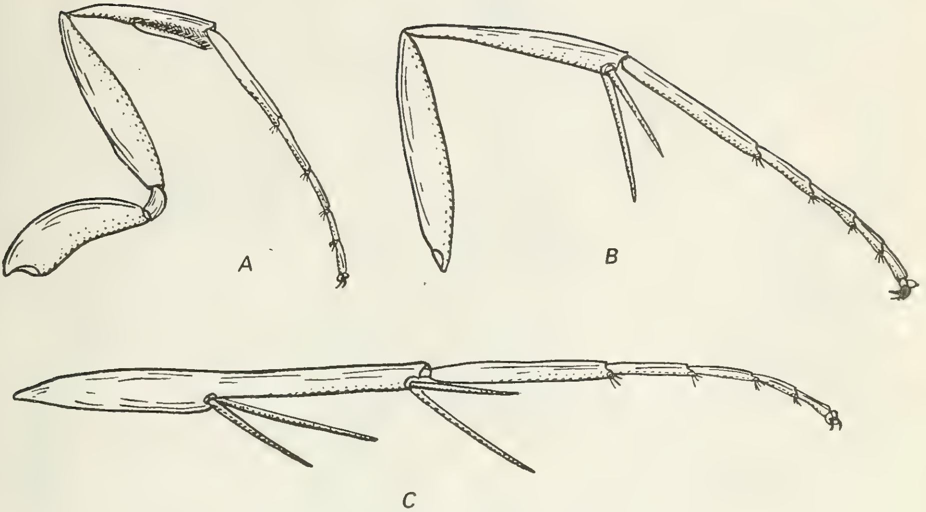


Figure 3. Legs of *Euplocamus anthracinalis* Scop.

A—foreleg; B—middle leg; C—hind leg.

attests to the fact that Euplocamidae, compared to Tineidae, possesses a higher number of distinct archaic characters.

The group closest to Tineidae–Euplocamidae, comprises steppe and desert moths of the families Deuterotineidae and Ochsenheimeriidae. Both families are synapomorphic in several characters (Figure 1, B): presence of spines on tibial and tarsal segments, translucent basal half of hind wings, and forewings with R_1 merging into anterior margin of wing about at level of apex of radiocubital cell. Apophyses of abdominal sternite I in form of narrow sclerotized cords (Figure 10, E). Male genitalia: valves covered with spinules or short stout setae and branches of subuncus fused at apex; females without sacs of fluff on segment VII. Both families are close in many biological properties. These are moths of open landscapes. Their larvae are grass or steppe detritophages and live in cobwebs spun in beds of cereals or forest litter, where most construct ventilation tubes. The moths are active in the morning and at sunset. Mainly males fly; females are less mobile or even apterous (Deuterotineidae). Larvae hatching from eggs are passively carried on silky threads by air currents. Ecologically, moths of both families are of the hepialoid type, myrmecozeloid subtype, and in this respect very close to the subfamily Myrmecozelinae of Tineidae.

Figure 4. Genitalia of male *Euplocamus anthracinalis* Scop.

A—general appearance, lateral view; B—uncus, ventral view.

The groups of moths examined above are forest members of Euplocamidae and forest-steppe Tineidae on the one hand, and steppe-desert families Deuterotineidae and Ochsenheimeriidae on the other. They are synapomorphic with respect to several characters (Figure 1, C): glabrous eyes not covered with setae, galea and maxillary palpi shorter than labial palpi, and antennae not longer than forewing. In the forewings R_5 merges into anterior margin of wing apex, and common stalk of A_{2+3} merges into wing margin before or at level of outer margin of radiocubital cell. First tarsal segment of middle legs shorter than remaining part of tarsus; hind tibiae with long pubescence and equal to or shorter than tarsi. Abdominal tergites without spinules. In the female genitalia, the seminal duct originates from bursa copulatrix. Larvae live in silky tubular tunnels prepared in feeding substratum, or inside portable cases.

However, the Euplocamidae–Tineidae group has maintained several characters of a plesiomorphic nature. Tibiae and tarsi are devoid of spinules (except for apical segments) and forewings equal to

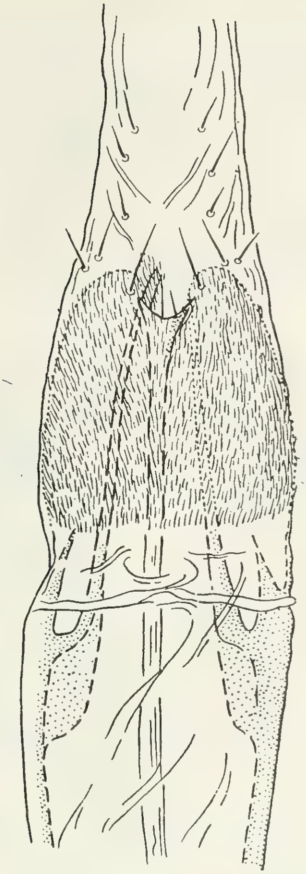


Figure 5. Genitalia of female *Euplocamus anthracinalis* Scop.

hind ones in width. In most species medial stem with cell, apophyses of abdominal sternite I in form of processes with broad base that converts into sac, male genitalia with broad vinculum and tegumen, and in many cases uncus with widely separated lobes. These features provide a basis for considering the group Euplocamidae–Tineidae a plesiomorphic sister group of Deuterotineidae–Ochsenheimeriidae, which is closer in position to the generalized prototype.

The presence of convergent apomorphic characters on the one hand in steppe members of Tineidae (especially in some members of Myrmecozelinae), and on the other in Deuterotineidae should be noted: complex pattern in wings of males, females apterous, elongation of middle tibiae, and similar ecological peculiarities such as eggs

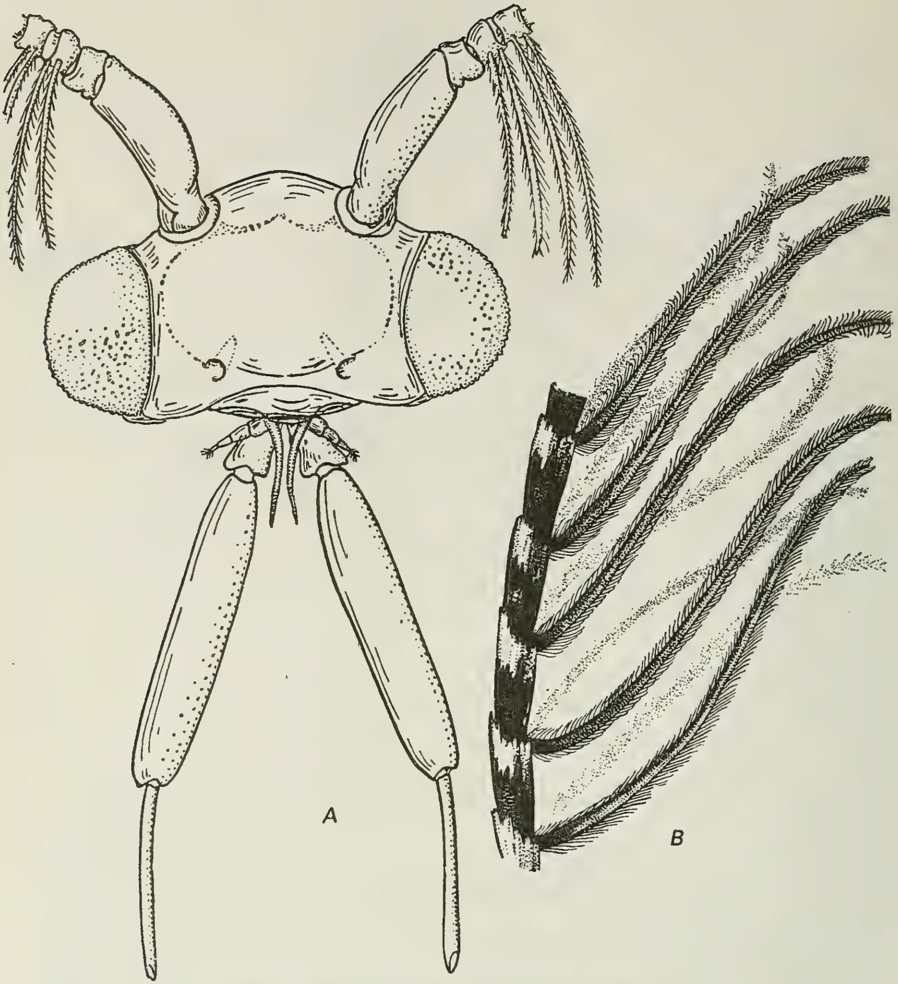


Figure 6. Head of *Euplocamus anthracinalis* Scop.
A—general appearance; B—middle segments of antennae (high magnification).

laid in large numbers and dispersal of larvae. In these situations, convergent synapomorphy was the result of adaptation to similar conditions of life. It appeared independently in each family and cannot be construed as an affinity between the two groups.

A study of the above families and their phylogenetic relationships made it possible to combine them in a group given the status of superfamily, Tineoidea s. str. (Zagulyaev, 1969). Under the superfamily,

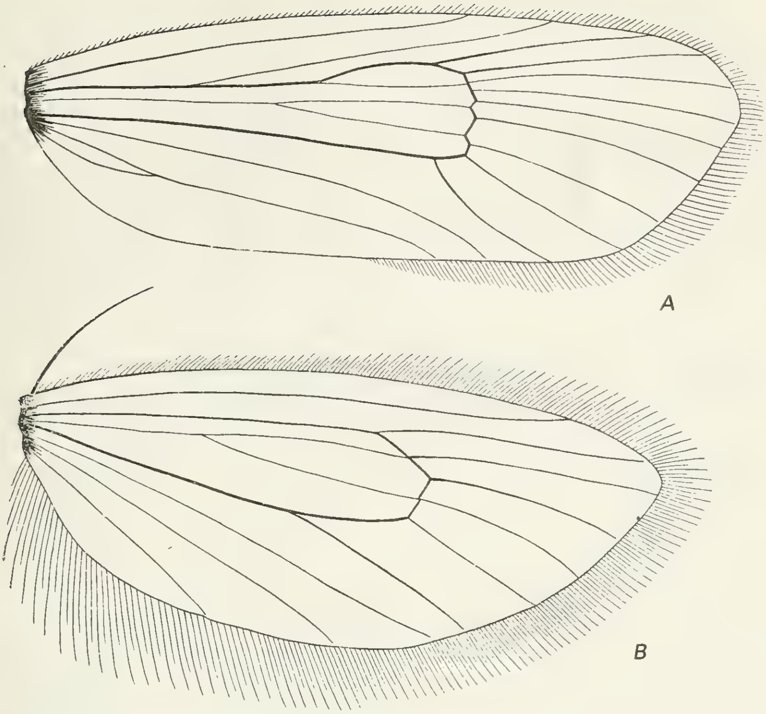


Figure 7. Venation of *Acrolophus popeanellus* Cl. (*Anaphora scardina* Zll.).
A—forewing; B—hind wing.

members of the New World Acrolophidae should be provisionally included. Studies of additional material recently collected led to the discovery of not only the well-known morphological proximity of this family to Euplocamidae and to lower members of Tineidae (Scardiinae), but also revealed combination of characters in Acrolophidae that are typical of Palearctic members of Tineoidea. Analysis of the material enabled me to consider Acrolophidae and Palearctic members of Tineoidea as synapomorphic (Figure 1, D) on the basis of the following series of characters: pubescence on frons and vertex ruffled, maxillary palpi segmented and usually longer than first segment of labial palpi, antennae longer than half length of wing, and tineoid type of venation (Figure 7). Fore-tibiae shorter than femora (Figure 8, A), uncus bifurcate or falcate and articulate with tegumen, or suture between them defined, and subuncus or gnathos usually with lobes. In addition, the life history of these moths is quite similar to that of many groups of Tineoidea. Larvae construct a cobweb network in roots of herbaceous plants and in the turf of cereals.

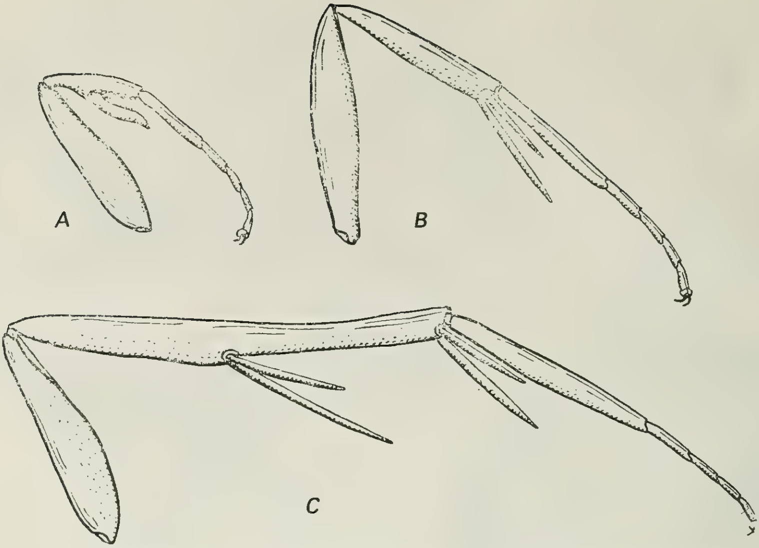


Figure 8. Legs of *Acrolophus popeanellus* Cl. (*Anaphora scardina* Zll.).
A—foreleg; B—middle leg; C—hind leg.

Concomitantly some autapomorphic characters are found in Acrolophidae: very long labial palpi reach to back of thorax and first tarsal segment of hind legs longer than remaining part (Figure 8, C). Simultaneously several characters of a plesiomorphic nature have been retained: R_5 in forewings merges into outer wing margin, hind tibiae longer than tarsi, apophyses of abdominal sternite I short, broad, poorly sclerotized, and with saccate base (Figure 10, B). Some of these characters are also typical of Psychidae (Kozhanchikov, 1956); acicular spinules and setae on vertex are typical for such primitive moths as Incurvariidae and Adelidae. Thus, initial (primordial) traits are fully developed in Acrolophidae. It can be assumed that members of Acrolophidae which have survived to the present period are ancient relict forms exhibiting characters of subsequent specialization.

As mentioned earlier (Zagulyaev, 1969), the series of primitive characters probably formed the basis for Forbes (1923) bringing Tineoidea closer to Incurvarioidea through Acrolophidae. However, some authors (McDunnough, 1939; Hasbrouck, 1964), on the basis of the series of characters for the imago have concluded that Acrolophidae should be considered one of the primitive families under Tineoidea, serving as a connecting link with Psychidae. Studies in which characters have been divided into apomorphic and plesiomorphic not only enable one to maintain this point of view, but to also consider Acrolophidae (with the largest number of generalized characters among almost all the groups of the superfamily) the most primitive among Tineoidea. Thus, indications suffice for placing Acrolophidae near the base of the tineoid trunk, with the assumption that Acrolophidae is a plesiomorphic sister group of Palearctic members of Tineoidea. Given this, one may also assume that the prototype of all members of Tineoidea was so primitive that it possessed the generalized characters typical of Acrolophidae as well as other groups in the tineoid stem.

HYPOTHETICAL ANCESTOR OF TINEOIDEA AND ORIGIN OF MAJOR BRANCHES OF THE SUPERFAMILY

The data presented above enables me to propose a theory concerning the possible generalized prototypes or ancestor of the superfamily Tineoidea.

The ancestor of Tineoidea was probably an archaic group with many primitive characters differing little from the ancestor of Acrolophidae. The general prototype probably lived in humid deciduous forests. It was a rather large crepuscular or nocturnal mothlike lepidopteran and hence ungainly in flight. Head with dense ruffled pubescence. Oral appendages well developed (pilifers, five-segmented maxillary and three-segmented labial palpi with tuft of setae). Proboscis in form of two short pointed stylets used in penetrating the substratum and sucking water. Forewings broadly oval with poorly sclerotized anterior margin, narrower than hind wings, and with large sparse scales; *Sc* long and merged into anterior margin beyond its middle, radiocubital cell located in the middle of the wing or slightly displaced toward posterior margin, and medial stem and cell well developed. Hind wings broad, medial stem and cell developed, and all three anal veins developed; fimbria short (not more than half the wing width). At rest wings steepled, forming small anal fold in hind wings. Foretibiae equal to femora, hind tibiae longer than tarsi. Apophyses of abdominal sternite I in form of small process protruding from sternite with broad bifurcate base converting into chitinous sac; tuft of minute setae located in middle of posterior margin of sternite. In male genitalia, vinculum and tegumen broad, uncus with segmented lobes, and subuncus defined. In females, lobes of vaginal plate covered with slender setae and ostium situated closer to posterior margin of lobes. Apophyses long, middle ones stretched toward sternite, ovipositor telescopic with soft anal papillae, covered with long setae. Larvae

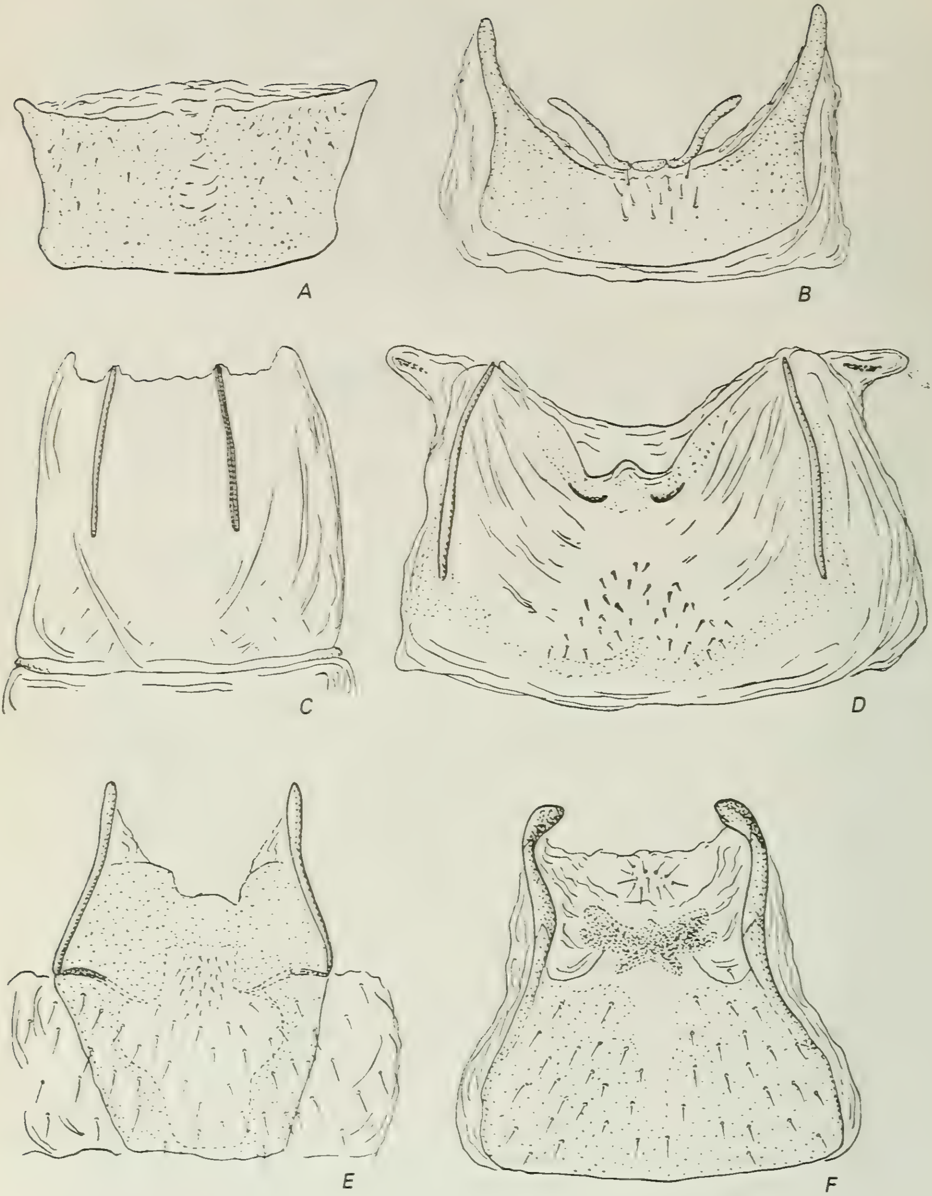


Figure 9. Sternite and apophyses of abdominal segment I.

A—*Micropteryx thunbergella* F.; B—*Eriocrania sparmannella* Bosc.; C—*Lithocolletis malella* Grsm.; D—*Incurvaria capitella* Cl.; E—*Talaeporia tubulosa* Retz.; F—*Melasina lugubris* Hb.

probably lived in cobweb network in forest litter or decomposing wood and fed on dead plants by making paths in the substratum. Head of larvae semiprognathic type (with very short vertical suture and long frontal suture), with six ocelli on each side. First pair of thoracic legs probably widely separated, and head and thorax flattened dorsoventrally. Setae on thorax and abdominal segments large and flat. Planta of prolegs with complete set of crochets. Pupation in last instar. Pupae with two rows of spines on tergite and traces of larval prolegs on abdominal sternites.

Moths with such a series of generalized characters are not known today, although the possibility that some tropical forms could be close to the generalized ancestor cannot be over-ruled. This description of the general structure of a hypothetical ancestor, its habitat, and life history are based on known species of Acrolophidae and observations of their behavior (Forbes, 1923; Hasbrouck, 1964), my observations and examination of some members of Euplocamidae, and my analysis of the most primitive present-day moths, Scardiinae. Furthermore, for the general characterization of the ancestor, descriptions of 10 species of Tineidae found in amber were also used (Kuznetsov, 1941).

To better understand the general picture of the sequence of family divergence, in addition to the characters of the generalized prototype, it was necessary to study changes in certain characters during the process of evolution. For example, the first abdominal segment is attached to the thorax and, in addition to various structures on the tergite, carries a pair of apophyses on the sternite. However, in the primitive stage, as seen in Micropterygidae (Figure 9, A), the apophyses were still not isolated and the sternite itself divided into two parts by a membrane, or highly sclerotized and covered with scattered (predominantly in the anterior margin) minute setae. The function of attachment to the thorax was performed by cords and processes on the tergite. Apparently the micropterigoid type should be considered one of the most generalized. In Eriocraniidae (Figure 9, B) and Hepialidae elongation of the lateral sections of the sternite into lobate appendages took place, the latter became slightly more sclerotized, setae scattered along the middle of the anterior margin of the sternite, and small processes also developed on the same. It should be noted that the development of apophyses in the primary types took place in various groups of Microlepidoptera in definite directions. One such development can be seen in Lithocolletidae (Figure 9, C). In these insects well-defined and highly sclerotized apophyses are readily seen in the relatively membranous sternite, which do not continue beyond the limits of the latter; a minute setal cluster is present near the posterior margin of the sternite. In this lithocolletoid type one may also include the apophysate structure of the first sternite of Nepticulidae and Cosmopterygidae on the basis of the drawing by F. Kasy (1970) for *Hodgesiella* Riedl. Further development of this type could probably be considered the apophysate structure in Incurvariidae (Figure 9, D). In these moths the apophyses are also long and broad, immovable within the limits of the sternite, and mostly surrounded by a pigmented field, with sclerotized sections in the middle of the anterior margin well defined; a setal cluster is present in the middle region of the posterior margin. Modification of the incurvaroid type is seen in Adelidae.

The structure of the apophyses is unique in Talaeporiidae (Figure 9, E). They are virgate, slightly inflated, and the anterior apex continues beyond the limits of the sternite, carrying the membrane of the anterior margin with it. The surface of the sternite is pigmented with a minute setal cluster in the middle region of the posterior margin of the sternite. Further apophysate development is evident in lower members of Psychidae (Figure 9, F). The apices of the apophyses in these insects are not only broad but are perceptibly curved, and the apophyses are connected by a membrane with a median cluster of minute setae. In higher psychids further modification of the apophyses takes place; they become falcate, and their base broadens. Thus, the psychoid type of apophysis manifested in Talaeporiidae finds maximum development in higher Psychidae.

A different type of structure is seen in Teichobiidae (Figure 10, A) in which the apophyses represent small pointed processes rising from the sternite with a broad bifurcate base that converts into a slender chitinous sac, which serves as a supporting element. Very minute setae cluster between the apophyses near the anterior margin of the sternite. The sternite of segment II in all members of Psychoidea and Incurvarioidea is densely covered with setae. Even further development of the apophyses is found in Acrolophidae (Figure 10, B). The anterior apices of the apophyses are stretched into thin and slightly curved appendages; their base broad, bifurcate, and converted into a sac. The structure of the apophyses of Acrolophidae is quite close to their structure in Euplocamidae (Figure 10, C). Further expansion of the free apices of the apophyses takes place in these moths, and the membrane between them also has a broader base that converts into a sac. Minute setae cluster in the middle part of the posterior margin of the sternite. The next stage of development is the elongation and sclerotization of the apophyses in lower Tineidae (Figure 10, D). The valves of the sac are close-set, forming a poorly sclerotized tube that serves as a supporting element to the elongated and protruding part of

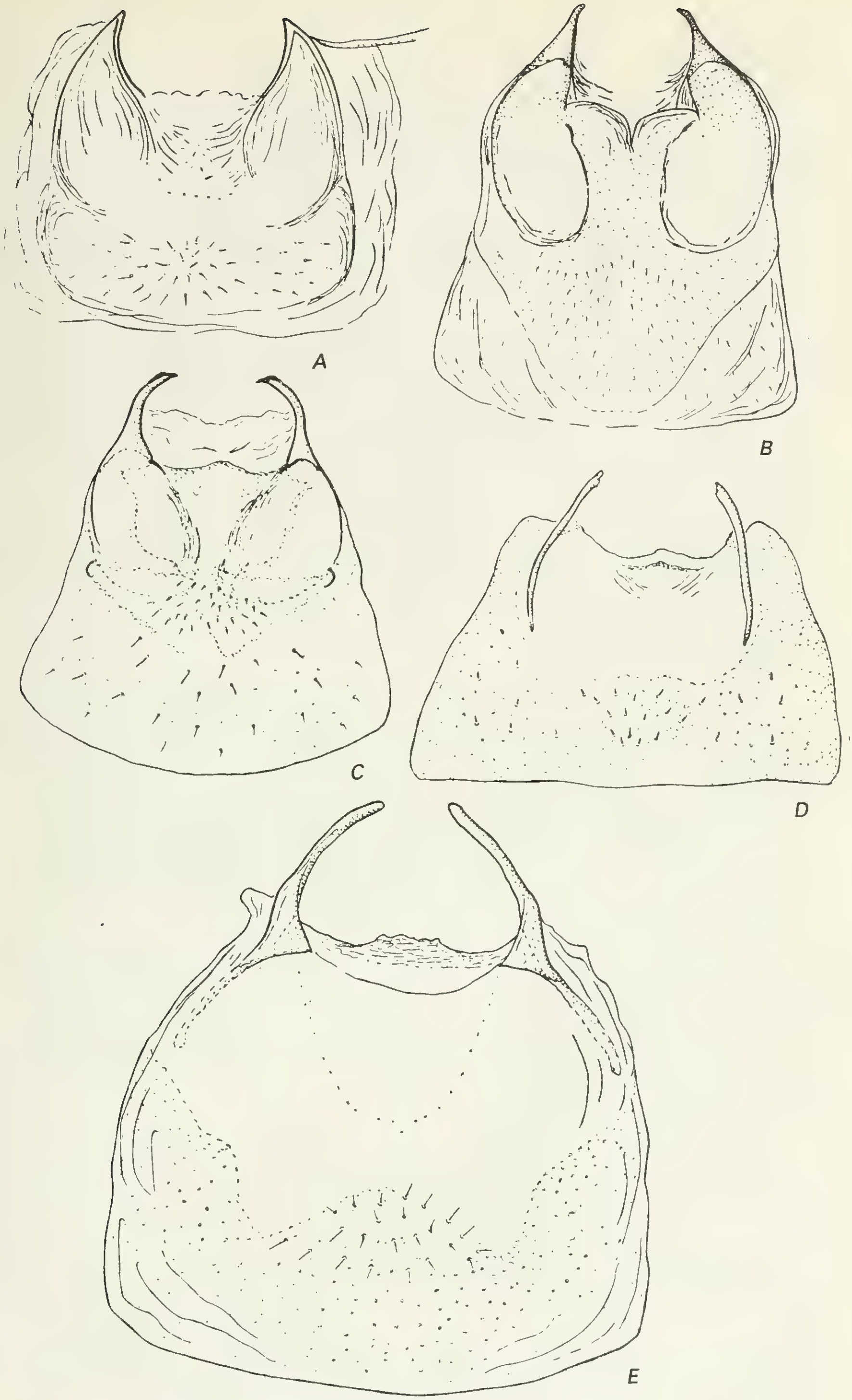


Figure 10. Sternite and apophyses of abdominal segment I.

A — *Teichobia verhuellella* St.; B — *Acrolophus popeanellus* Cl. (*Anophora scardina* Zll.); C — *Euplocamus anthracinalis* Sc.; D — *Scardia polypori* Esp.; E — *Ochsenheimeria taurella* Schiff.

each apophysis. The base of the apophyses still remains broad and minute setae cluster in the middle of the posterior margin of the sternite.

It should be noted that the development of apophyses of the tineoid type, begun in Teichobiidae, is better expressed in Tineidae, in which the gradual sclerotization of their basal part, elongation of the free apices, and concentration of setae in the middle of the posterior margin of the sternite are distinct. Further development of this type is observed in Ochsenheimeriidae (Figure 10, E) in which the apophyses are more slender, basally more sclerotized, with insignificant sclerotization of the sternite walls. In the middle of the anterior margin of the sternite a transverse sclerotized thickening is perceptible. As a modification of this type of apophysis one could probably point to Deuterotineidae in which notable thinning and elongation of the basal part of the apophyses has occurred (they reach the sternite of segment II). The sclerotized anterior margin of the sternite has three long setae; several minute setae occur in the middle of the posterior margin of the sternite.

Thus an analysis of the changes in structure of the apophyses and the first sternite of the abdomen from the initial and nondifferentiated types reveals several trends in their development. One trend is seen in the tineoid type. The structure of the apophyses in the form of sclerotized lobate processes and their broad base should be considered the most primitive condition; the broad base converts into a chitinous sac that serves as a supporting element. Moths with this type of apophysis have a weak, ungainly, and quite slow flight, and their abdomen is usually thick, fairly soft, and less mobile.

A similar picture of development during the process of evolution was seen in changes in wing structure and venation and in structure of the legs. Analysis of changes in these characters and affinity of groups in terms of the most important characters with respect to evolution to the prototype of Tineoidea were used as the basis for the scheme of phylogenetic relationships.

In general terms the evolution of Tineoidea can probably be understood as follows. The common ancestor with a series of generalized properties of other families of Tineoidea divided repeatedly into several branches. One gave rise to present-day Acrolophidae, and the other served as the ancestral stem for the remaining four families. This stem subsequently divided into two branches. One continued to develop in forests and ultimately gave rise to Euplocamidae and Tineidae; the ancestor of the other, though developing in the forest-steppe, proceeded along a different path: it acquired peculiarities related to life under conditions of open landscapes and arid climate—relatively long cursorial legs, spine development on the tibial and tarsal segments in moths, reduction of wings in females, and so forth. It moved into steppes, diverged, and gave rise to present-day members of Deuterotineidae and Ochsenheimeriidae. The families of this second branch are more specialized morphologically and ecologically. The first followed that direction of evolution toward changeover to life in open landscapes.

The data presented above accords fully with my earlier assumption (Zagulyaev, 1969) that the superfamily Tineoidea is a monophyletic group.

REFERENCES

Căpuşe, I. 1964. Contributions a la systematique de la sousfamille Tineidae (Lep., Tineidae), *Bull. Soc. Entomol. Mulhouse,* Oct., pp. 92–94.

Căpuşe, I. 1968. *Fauna Republicii Socialiste Romania. Insecta: Fam. Tineidae.* Bucureşti, 11, 9, 1–463.

Forbes, W. 1923. The Lepidoptera of New York and neighbouring states, *Mem. Cornell Univ. Agric. Exptl. Stat.,* vol. 68, pp. 1–729.

Gozmány, L. 1959. Tineid moths from Afghanistan (Lep., Tineidae), *Acta Zool. Acad. Sci. Hung.,* 5, 3–4, 341–352.

Gozmány, L. 1965. New and rare tineids from the Palearctic region and one from Ethiopia (Lepidopt.), *Acta Zool. Acad. Sci. Hung.,* 6, 1–2, 103–115.

Gozmány, L. 1965. Some collections of tineid moths from Africa (Lepidoptera), *Acta Zool. Acad. Sci. Hung.,* 11, 3–4, 253–294.

Gozmány, L. 1967. The tineid moths of the Royal Museum of Central Africa, Tervuren, Belgium (Lepidoptera: Tineidae), *Ann. Mus. Roy. Afriq. Centr., Zool. Sci., Tervuren, Belgique,* 8, 157, 1–100.

Hasbrouck, F. 1964. Moths of the family Acrolophidae in America north of Mexico (Microlepidoptera), *Proc. U.S. Nat. Museum,* 114, 3475, 487–706.

Hennig, W. 1953. Kritische Bemerkungen zum phylogenetischen System der Insecten, *Beitr. Entomol.,* 3, 1, 1–85.

Hennig, W. 1966. *Phylogenetic Systematics.* London, 263 pp.

Kasy, F. 1970. Eine neue Stagmathophora s. l. von den Kanarischen Inseln (Lepidoptera, Cosmopterygidae), *Ann. Naturhist. Mus. Wien,* vol. 74, pp. 195–200.

Kozhanchikov, I.V. 1956. Chekhlonosy-meshechnisty (sem. Psychidae) [Case-bearer moths (fam. Psychidae)]. In: *Fauna SSSR. Nasekomya Cheshuekrylye.* Izd. AN SSSR, Moscow-Leningrad, III, 2, nov. ser., 62, 516 pp.

Kuznetsov, N.Ya. 1941. Cheshuekyrlye yantarya (Lepidoptera of Amber). Izd. AN SSSR, Moscow-Leningrad, 136 pp.

McDunnough, J. 1939. Checklist of the Lepidoptera of Canada and the United States of America. II: Microlepidoptera, *Mem. Southern California Acad. Sci., Los Angeles,* 2, 1, 1–171.

Petersen, G. 1957. Die Genitalien der paläarktischen Tineiden (Lepidoptera, Tineidea), *Beitr. Entomol.,* 7, 1–2, 55–176.

Petersen, G. 1961. Zur Taxonomie Verbreitung der paläarktischen Nemapogon-Arten (Lepidoptera, Tineidae), *Československ. Entomol.,* 58, 3, 272–283.

Rodendorf, B.B. 1949. Evolyutsiya i klassifikatsiya letatel'nogo apparata nasekomykh (Evolution and classification of the flight apparatus of insects). *Tr. Paleontol. Inst. AN SSSR,* vol. 16, pp. 1–176.

Zagulyaev, A.K. 1960. Nastoyashchie moli (Tineidae): chast' tret'ya, podsemeistvo Tineinae [Clothes moths (Tineidae): pt. III, subfamily Tineinae]. In: *Fauna SSSR. Nasekomye Cheshuekrylye.* Izd. AN SSSR, Moscow-Leningrad, IV, 3, nov. ser., 78, pp. 1–267.

Zagulyaev, A.K. 1964. Nastoyashchie moli (Tineidae): chast' vtoraya, podsemeistvo Nemapogoninae [Clothes Moths (Tineidae): pt. II, subfamily Nemapogoninae]. In: *Fauna SSSR. Nasekomye Cheshuekrylye.* Izd. Nauka, Moscow-Leningrad, IV, 2, nov. ser., 86, pp. 1–424.

Zagulyaev, A.K. 1965. Reviziya palearkticheskikh molei triby Cephimallotini (Lepidoptera, Tineidae) [Revision of the Palearctic moths of the tribe Cephimallotini (Lepidoptera, Tineidae)]. *Zool. Zhurn.,* 44, 3, 386–395.

Zagulyaev, A.K. 1968. Sistematika i filogeniya vnutri semeistva nastoyashchikh molei (Lepidoptera, Tineidae) [Systematics and phylogeny within the family of clothes moths (Lepidoptera, Tineidae)]. *Entom. Obozr.,* 47, 1, 215–226.

Zagulyaev, A.K. 1969. Polozhenie semeistva Tineidae v sisteme i ego evolyutsiya (Taxonomic position of the family Tineidae and its evolution). *Zool. Zhurn.,* 48, 4, 538–549.

Zagulyaev, A.K. 1972. Biologicheskie tipy nastoyashchikh molei (Lepidoptera, Tineidae) [Biotypes of clothes moths (Lepidoptera, Tineidae)]. *Entom. Obozr.,* 51, 3, 485–497.

Zagulyaev, A.K. 1973. Nastoyashchie moli (Tineidae): chast' chetvertaya, podsem. Scardiinae [Clothes moths (Tineidae): pt. IV, subfamily Scardiinae]. In: *Fauna SSSR. Nasekomye Cheshuekrylye.* Izd. Nauka, Leningrad, IV, 4, nov. ser., 104, pp. 1–127.

Tribe Teleiodini Tribus Nov. (Lepidoptera, Gelechiidae) and the Systematic Position of Some of Its Species

V.I. Piskunov

This article pertains to notch-wing moths. An intense study of this group revealed considerable heterogeneity among its families. Hence new families have been isolated, the latest established by Gozmány in 1967. At the same time, large natural generic groups have been analyzed within a family, in a narrower sense, and new taxa described. The work of Povolny (1964) on the tribe Gnorimoschemini may be cited as an example. The new tribe, Teleiodini, established by me, occupies a rather important place in the system of notch-wing moths; several of its members are economically important, mainly as forest pests. At the same time, however, species of this group have been poorly studied and the most complete information on its taxonomy available in the work of Sattler (1960).

The types of the new species described below and their corresponding preparations (with five-digit numbers) are preserved in the Institute of Zoology, Academy of Sciences of the USSR, Leningrad. Other preparations mentioned herein, which do not belong to the type material and carry two-digit and three-digit numbers are preserved in the Department of Invertebrate Zoology, University of Belorussia, Minsk. The basis for the present article was the collection of the Institute of Zoology, Academy of Sciences of the USSR.

Teleiodini Piskunov, tribus n.

Type genus: *Teleiodes* Sattler, 1960.

Close to the nominative tribe, Gelechiini,[1] but differs in elongated

---

[1] I recognize the nominative tribe in a narrower sense, i.e., as a series of closely related genera grouped around the type genus, *Gelechia* Hb.

Figure 1. *Teleiodes oskella* Piskunov, sp. n., holotype, male, genitalia. Preparation No. 11763. Environs of Lake Naroch', Minsk District (× 80).

tubular uncus, pointed at apex, strong development of tergite of abdominal segment VIII in male genitalia, and presence of a prevaginal plate in female genitalia.

Imago: Forewings with groups of ruffled scales and variable pattern. Basic type represented by variable number of dots and stripes scattered over wing area. In these specialized species a regular pattern is observed in the arrangement of certain components. Punctate type—three pairs of dots uniformly arranged along wing. Second pattern type—characterized by absence of individual punctate components and presence of large Z-shaped design extending along longitudinal axis of wing. Third type—characterized by presence of large, broad, transverse stripes on light-colored background.

In forewings vein M_1 not fused, at least for short distance, with radial stem.

Male genitalia: Tergite and sternite of segment VIII modified for sexual function. Sternite represented by very large semicylinder, sometimes with notch on lower and posterior margins; shape on the whole fairly constant. Tergites large, cucullate; some sharply distinguished by complex structure, for example in the genera *Teleiodes* Sattl. (Figure 1), *Klaussattleria* Căpuşe (Figure 2), and especially *Teleiopsis* Sattl. Structure of valves variable: elongated, slightly broader at base, with appendage in middle; bifurcate with one branch long and acicular, the other branch short, setose, and rounded at apex; on single branch, without acicular setae. In latter case valves sometimes fuse at margins, establishing contact with aedoeagus (Figure 3). Uncus very well developed, with acute apex, paired in *Xenolechia* Meyr. Gnathos present in *Teleiodes* Sattl. and *Teleiopsis* Sattl.; its presence or absence a generic character. Saccus often rudimentary, usually with flat or whistle-shaped process directed upward and backward. Aedoeagus moderately long, sometimes slightly curved; apex often obliquely truncated, cornuti absent. Vallum absent.

Female genitalia: Lobes of vaginal plate widely separated. Prevaginal plate often cucullate, covering ostium. Rarely, postvaginal plate also present. In case prevaginal plate absent, ostium may be membranous or sclerotized. Sometimes ostial region very complex: elongated and highly sclerotized region of duct of copulatory bursa shifted far downward, and ostium per se located at apex. In other cases ductus bursae devoid of sclerotization. Signum unique: rhomboidal or oval in shape, with dentate margins, and deep notch along larger axis. Ovipositor long and telescopic.

The tribe includes the following genera: *Teleiodes* Sattl.; *Klaussattleria* Căpuşe; *Xenolechia* Meyr.; *Teleiopsis* Sattl.; *Abrasteia* Chamb.; *Streyella* Janse; and *Carpatolechia* Căpuşe.

Let us now examine the four genera represented in our fauna in greater detail. *Abrasteia* Chamb. is known from the Nearctic (Sattler, 1960) and *Streyella* Janse from Ethiopia (Janse, 1958). The genus *Carpatolechia* Căpuşe has only recently been described (Căpuşe, 1964) on the basis of a single male specimen from the southern spurs of the Carpathians.

Genus Teleiodes Sattler, 1960

(*Teleia* Hein., nom. praeocc.)

Type species: *Tinea vulgella* Hübner, 1810–1813.

Distribution of genus: Palearctic.

Gnathos either small and acicular, or large and lobate. In most

Figure 2. *Klaussattleria proximella* (Hb.), male, genitalia. Preparation No. 218. Vitebsk (× 80).

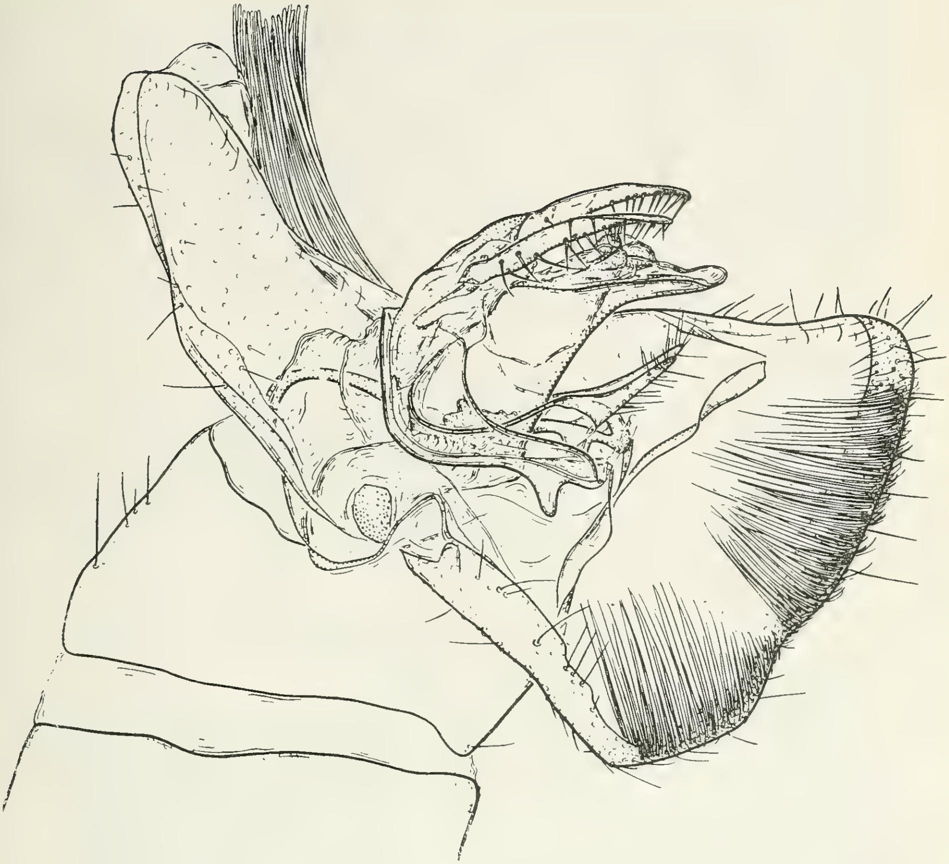


Figure 3. *Xenolechia scriptella* (Hb.), male, genitalia. Preparation No. 134. Podberez'e, environs of Vitebsk (× 80).

species valves complex, rarely simple, represented by broad and rounded apical branch. Genus includes these species: *Teleiodes vulgella* (Hb.): *T. humeralis* (Z.); *T. myricariella* (Frey); *T. notatella* (Hb.); *T. fugacella* (Z.); *T. cisti* (Stt.); *T. cisticola* (Wocke); *T. sequax* (Haw.); *T. oskella* Pisk., sp. n.; and *T. marsata* Pisk., sp. n.

Genus Klaussattleria Căpuşe, 1968

(*Sattleria* Căpuşe, nom. praeocc.; *Pseudotelphusa* Janse, nom. praeocc.)

Type species: *Telphusa probata* Meyrick, 1909.

Distribution of genus: Palearctic and Ethiopia.

Gnathos absent. Valves consist of two branches or narrow acicular branch reduced. Genus includes the following species: *Klaussattleria probata* (Meyr.); *K. proximella* (Hb.), comb. n.; *K. triparella* (Z.), comb. n.; *K. scalella* (Scop.); *K. fugitivella* (Z.), comb. n.; *K. wagae* (Now.), comb. n.; *K. tessella* (Hb.); *K. istrella* (Mn.); *K. modesta* (Dan.), comb. n.; *K. sokolovae* Pisk.; *K. danilevskyi* Pisk., sp. n.; and *K. vovkella* Pisk., sp. n.

Genus Xenolechia Meyrick, 1895

Type species: *Anacampsis aethiops* Westwood, 1851.

Distribution of genus: Palearctic.

Gnathos absent. Uncus consists of two separate lobes pointed at end and located on common base. Acicular branch of valves reduced; broad branch with rounded apex plays role of fultura (Figure 3). Genus includes these species: *Xenolechia aethiops* (Westw.); *X. scriptella* (Hb.); and *X. tristis* (Stgr.).

Genus Teleiopsis Sattler, 1960

Type species: *Recurvaria diffinis* Haworth, 1828.

Distribution of genus: Palearctic.

Gnathos long and lobate. Valves elongated, with appendage in middle or close to base. Tergite of segment VIII much elongated; pair of auriculate lobes situated at middle. Genus includes these species: *Teleiopsis diffinis* (Haw.); *T. lunariella* (Wlsgm.); *T. elatella* (H.-S.); *T. rosalbella* (Fol.); *T. albifemorella* (Hoffm.) *T. terebinthinella* (H.-S.); and *T. sarcochroma* (Wlsgm.).

Synonyms and taxonomic position of *T. sarcochroma* (Wlsgm.) described by Sattler (1968).

Affinity of new branch to Gelechiini proved by the following characters: usual complex structure of valves and division of segment VIII into tergite and sternite in male genitalia and, especially form of signa in female genitalia. One group with similar structure of claspers, i.e., the genus *Chionodes* Hb. (Gelechiini) and several species of *Teleiodes* Sattl. and *Klaussattleria* Căpuşe (Teleiodini).

In the process of development of the valves, the fultura begun to play a role; establishing contact with the aedoeagus the valves finally achieved their primary function of grasping the abdomen of the female during copulation, which is apparently related to the strong development of the sternite of segment VIII, which accommodates the primary function of the valves. Danilevskii (1955) first paid attention to this development while describing the species *Klaussattleria modesta* (Dan.). However, this question is interesting from a broader point of view. As noted by Stekol'nikov (1967), the evolution of the male genitalia in Lepidoptera proceeded toward a gradual reduction of segment IX and involvement of segment VIII in copulation. Such a direction of evolution reflects a general tendency toward reduction in number of segments and their fusion in the insect or, in a broader sense, the disappearance of segmental copulation practiced by their ancestors in the architectonics of these insects. The new tribe illustrates this trends very well.

The last revision of the genus *Gelechia* Hb., done by Sattler (1960), also included the tribe under discussion. For the genus *Teleia* Hein., a name used earlier in the family Tortricidae, the name *Teleiodes* Sattl. was proposed. A new genus was also established—*Teleiopsis* Sattl. The name *Abrasteia* Chamb. to replace *Telphusa* Chamb. nom. praeocc. was accepted. The most controversial question was the genus *Klaussattleria* Căpuşe; Căpuşe (1968a, 1969b) proposed this name for the preoccupied one, *Pseudotelphusa* Janse. This genus was established for species without a gnathos (in distinction from the genus *Teleiodes* Sattl. in which the gnathos is present). Janse (1958) included the European species *proximella* Hb. and *scalella* Scop. under this genus. Sattler (1960) agreed with the inclusion of *T. scalella* Scop., but left the inclusion of *T. proximella* Hb. open to further consideration. In his opinion, *Klaussattleria proximella* (Hb.) is closer to the genus *Teleiopsis* Sattl. The basis for this opinion probably is the complex tergite of segment VIII in *K. proximella* (Hb.) (Figure 2). This tergite is highly sclerotized, with a broad apex in which the corners resemble rounded lobes, and densely covered with setae. A complex tergite is also present in the species described by me, *Teleiodes oskella* Pisk., sp. n. It appears that these tergites of segment VIII are closer to the usual form as seen in *Teleiodes* Sattl. and *Klaussattleria* Căpuşe, than to the complex tergite of *Teleiopsis* Sattl. The shape of this tergite is discussed above. Moreover, other parts of the copulatory apparatus (for example, the valves), as well as the absence of a gnathos indicate the closeness of *K. proximella* (Hb.) in particular to the genus *Klaussattleria* Căpuşe. Sattler makes no mention of other species without a gnathos and also included in this genus; I have detailed these species in my analysis of the genus.

The phylogenetic relationships of the central genera within the tribe are depicted in Figure 4. *Xenolechia* Meyr., with a double uncus,

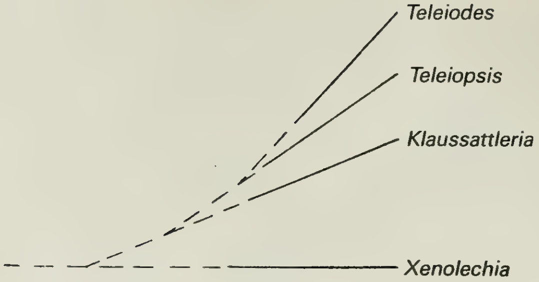


Figure 4. Phylogenetic relationships of major genera of tribe Teleiodini.

is the most isolated among the four. Here let us note that the uncus was of paired origin in phylogenesis. The evolution of the valve–aedoeagus complex proceeded in the genus *Xenolechia* Meyr. independently and even more rapidly than in genera with an unpaired uncus. The other two genera, *Teleiodes* Sattl. and *Teleiopsis* Sattl. are close to each other (presence of gnathos). The genus *Teleiopsis* Sattl. is more ancient, exhibiting some primitive traits (large dimensions of moths, and complex valves not divided into two separate branches).

In spite of the publication of Sattler's article (1960), applied and theoretical faunistic publications continue to use incorrect generic names right up to *Gelechia* Hb. The preoccupied names *Teleia* Hein. and *Telphusa* Chamb. are commonly employed (Plugaru, 1965; Tibatina, 1966, 1970; Apostolov, 1969, 1970). Some species of this tribe are very similar in coloration of the forewings, which is probably the reason for incorrect synonymy and mistakes in identification. For example, on the basis of forewing pattern, *Klaussattleria triparella* (Z.) and *K. wagae* (Now.) are almost indistinguishable. On the basis of genitalia, the independent status of these two species is indisputable. Nevertheless *K. wagae* (Now.) has been listed as a synonym of *K. triparella* (Z.) (Hrubý, 1964). In several faunistic publications pertaining to the southern European part of the USSR and partly in those listed above, *K. triparella* (Z.) has been reported from oak forests. However, my field work during 1969–1971 in the oak forests of Sumsk and Kharkov Districts revealed only one species in large numbers *K. wagae* (Now.). It therefore seems to me that the material collected earlier and identified as *K. triparella* (Z.) needs thorough reinvestigation. In view of the difficulties that have developed in the identification of these two species, I have provided drawings of the genitalia of *K. wagae* (Now.) (Figures 5 and 6).

Biology: Larvae of most of the genera of the new tribe are

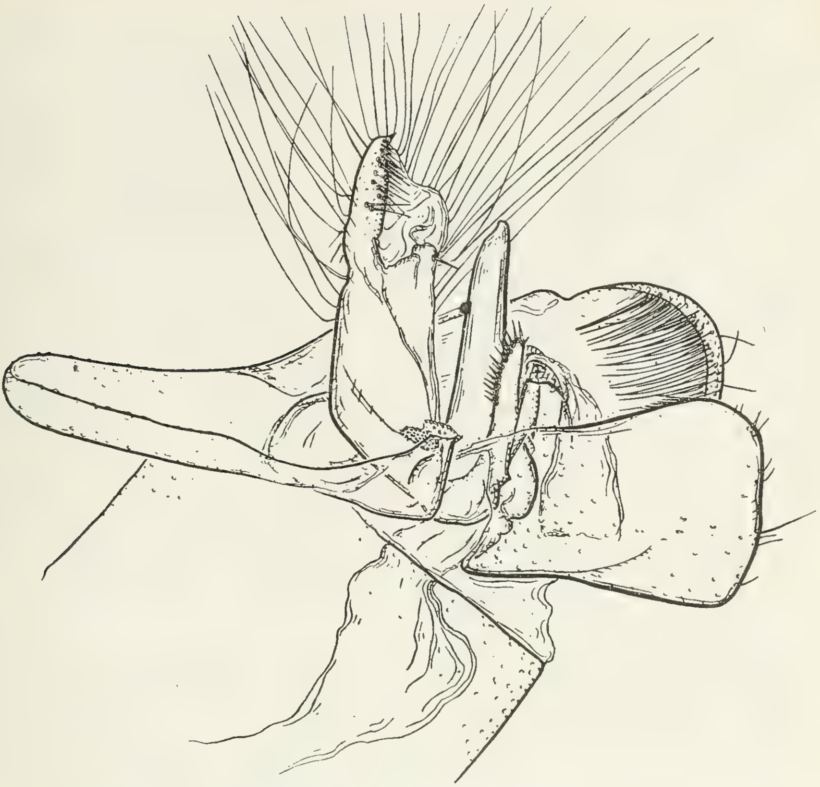


Figure 5. *Klaussattleria wagae* (Now.), male, genitalia. Preparation No. 51. Kupyansk, Khar'kov District (× 80).

dendrophils (orders Fagales, Betulales, Salicales, Sapindales, Rosales, Malvales, Urticales, Anacardiales, and Ligustrales). With regard to *Klaussattleria scalella* (Scop.), there are reports of its larvae feeding on mosses and lichens (Wolff and Krausse, 1922; Hrubý, 1964). Species of the genus *Teleiopsis* Sattl. are hortophils; the type species has been recorded on buckwheat (*Rumex acetosella* L.) (Hrubý, 1964.)

DESCRIPTION OF NEW SPECIES

Teleiodes oskella Piskunov, sp. n.

Wingspan 14 mm. Forewings gray, with diffuse glazed chocolate-brown pattern. Base of wing notably near costal margin; lower side, near posterior margin with black spot. Diffuse stripe extends along costal margin up to half its length. One stripe near posterior margin at basal fourth of wing, two dots in center, a weak transverse band

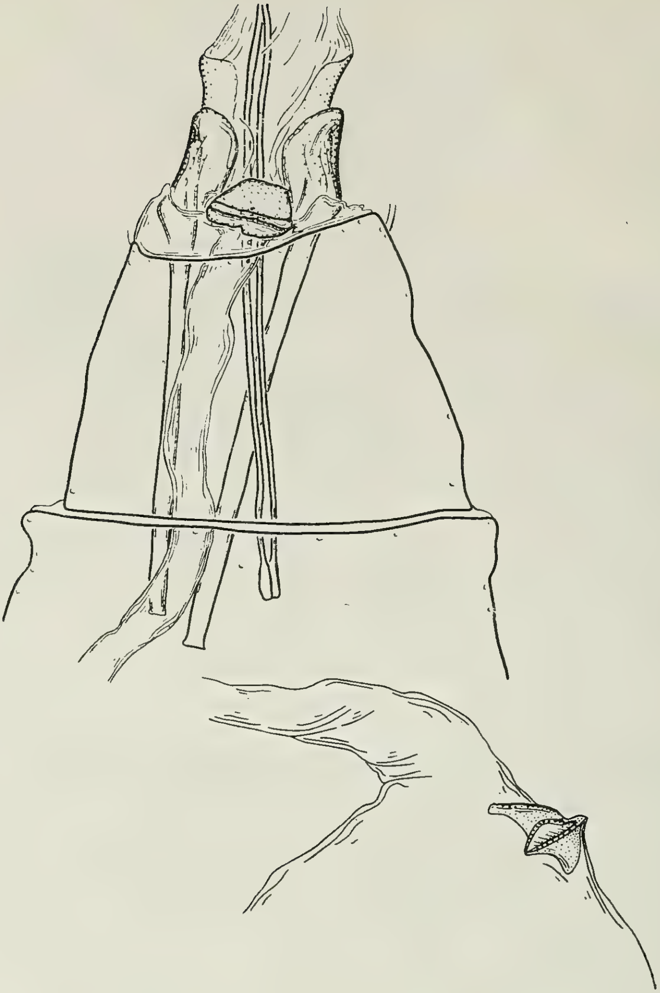


Figure 6. *Klaussattleria wagae* (Now.), female, genitalia. Preparation No. 51. Kupyansk, Khar'kov District (× 80).

at two-thirds length of wing, and one longitudinal stripe near outer margin at three-fourths length of wing. Chocolate-brown scales scattered throughout wing. Pattern better preserved on right wing of holotype. Fimbria gray. Hind wings matte gray, fimbria gray with sheen.

Thorax silvery-gray, tegulae chocolate-brown to gray. Head on upper side rough, in front with gray glazed scales. Labial palpi yellowish-gray, lustrous; 2nd and 3rd segments distinguishable at apices.

Male genitalia (Figure 1): Tergite of segment VIII complex in structure. Lobes at base elongated, highly sclerotized; apex broad with rounded projections on sides covered with dense setae along margins. Tergite terminates on upper side in campanullate membrane. Sternite of segment VIII usual for genus in shape. Valves consist of two branches. Branch situated closer to aedeagus with sparse setae and rounded apex. Second branch narrower than first, longer, saber-shaped, with slightly pointed apex. Uncus strong, down-curved, with acute apex, and almost entirely covered with dense setae. Gnathos small, pointed at end, falcate, and up-curved. Lobes of tegumen quite widely separated at base. Sacculus in form of broad grooved plate with apex down-curved. Aedoeagus tubular, with base broadening on upper side and obliquely truncated on same side at apex. Aedoeagus exceeds saccus by 1.70 times in length.

Material: Holotype, male. Belorussia, 2 km north of Lake Naroch', environs of village with same name, Myadel'sk region, Minsk District, July 18, 1970 (Piskunov). Preparation No. 11763, male.

Moths caught on trunk of maple in an old abandoned apple garden.

On the basis of genital structure, *Teleiodes oskella* Pisk., sp. n. belongs to that group of species of *Teleiodes* Sattl. which have a small acicular gnathos. The new species is closest to *T. fungacella* Z. However, *Teleiodes oskella* Pisk., sp. n. differs sharply from all other known species of the genus *Teleiodes* Sattl. in the complex structure of the tergite of segment VIII in males.

Klaussattleria danilevskyi Piskunov, sp. n.

Wingspan 16 to 17 mm. Forewings musty white, with complex pattern of black and chocolate-brown scales. Base of wing on costal and hind margins dark. Black band before middle of wing narrow and oblique near costal margin, broad and straight near posterior margin. Second diffuse band located at two-thirds length of wing, commences with black spot on costal margin. Two black spots occur on outer side of this band. Three bright black spots occur between both bands. Apex of wing with five to six black scales. Several groups of highly ruffled scales located near base and in central part of wing. Fimbria white; isolated scales blackened at places. Hind wings white with silvery-white sheen, fimbria same color.

Thorax and tegulae musty white, darker in anterior part. Head musty white on upper side, toward front silvery-white. Second segment of labial palpi chocolate-brown, with white apex and interception beyond middle. Third segment black, with white interruption in middle.

Female genitalia (Figure 7): Lobes of vaginal plate narrow and widely separated. Prevaginal plate absent. Ostium bordered by two oval sclerites with acute posterior termination. Bursa copulatrix located on segments III to V. Signa rhomboidal, with minutely serrated margins. Anterior apophysis terminates very near anterior margin of segment VII. Posterior apophysis reaches three-fourths length of segment VII.

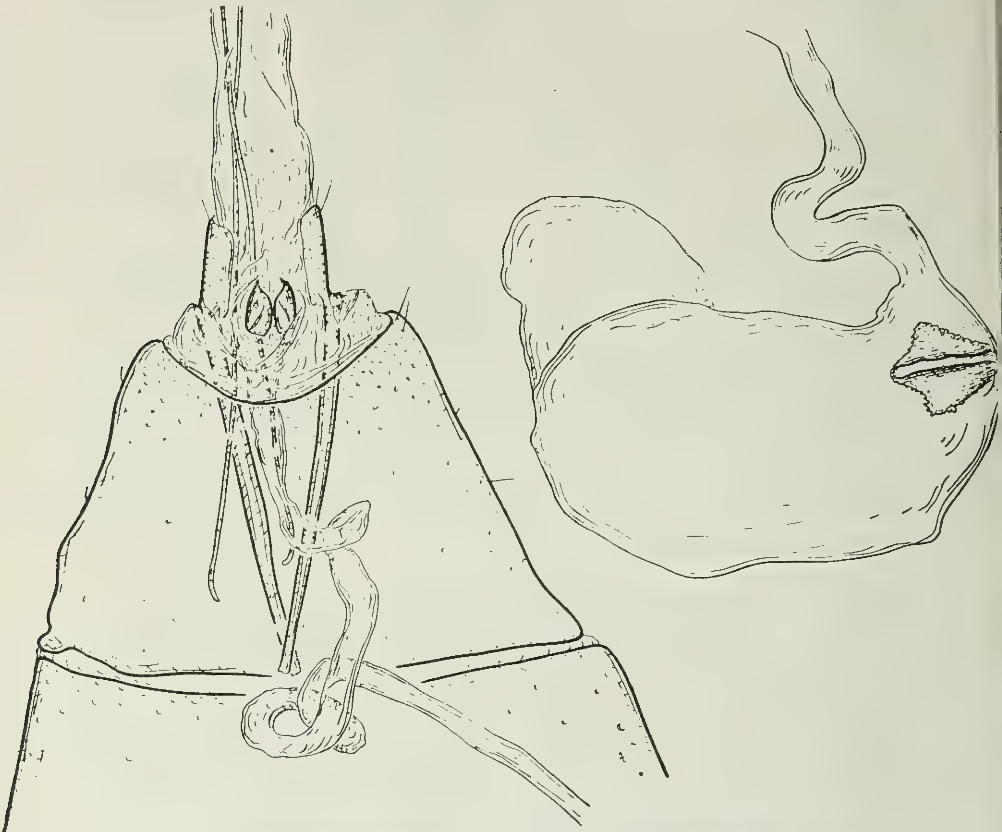


Figure 7. *Klaussattleria danilevskyi* Piskunov, sp. n., holotype, female, genitalia. Preparation No. 11771. Tadzhikistan, Kondara ravine (× 80).

Material: Holotype, female, Tadzhikistan, Kondara ravine, southern slope of Gissar range, April 24, 1966 (Danilevskii). Preparation No. 11771, female. Paratypes, two females: same site (Danilevskii).

The taxonomic position of this species remains tentative since males are not known. In the genus *Klaussattleria* Căpuşe, I consider it closer to *Klaussattleria modesta* (Dan.), from which *K. danilevskyi*

Pisk., sp. n. differs in the different type of sclerotization of the ostium and shape of signa. In *K. modesta* (Dan.) the signa is almost cruciate.

Teleiodes marsata Piskunov, sp. n.

Wingspan 13 to 14 mm. Forewings gray, with three pairs of black dots in middle of wing. Hind wings light gray. Fimbria of both wings same color.

Thorax, head, and tegulae with dark gray scales with light-colored apices. Second segment of labial palpi white, with isolated sparse black scales; 3rd segment also white, with black interceptions in middle and before apex.

Female genitalia (Figure 8): Lobes of vaginal plate in form of right-angled triangles, with acute corners contiguous with ostial region. Prevaginal plate absent. Ostium poorly defined and without sclerotization. Copulatory bursa located in segments V–VI. Signa rhomboidal, with rounded corners, and very minutely dentate margins. Anterior apophysis reaches middle of segment VI; posterior apophysis terminates near anterior margin of segment VII.

Material: Holotype, female. Belorussia, Podberez'e, 6 km north of Vitebsk, May 28, 1970 (Piskunov). Preparation No. 11776, female. Paratype, female: same site, May 28, 1970 (Piskunov).

Moths caught on trunks of linden and oak along fringe of deciduous forest near bank of Western Dvina River.

The absence of males precluded certainty about the affinity of this species to either of two genera — *Klaussattleria* Căpuşe and *Teleiodes* Sattl. This species was placed under the genus *Klaussattleria* because the basic pattern of the forewings is very similar to that in *K. triparella* (Z.). Based on the presence of a gnathos in males caught in 1972, the new species is included in the genus *Teleiodes* Sattl.

Klaussattleria vovkella Piskunov, sp. n.

Wingspan 12 to 13 mm. Forewings musty white; chocolate-brown spot near base of costal margin, and black dot near posterior margin. Broad and diffuse chocolate-brown to gray Z-shaped band passes through entire middle of wing. Usually there are two black dots before middle of wing, closer to posterior margin, and black arc directed by its convex side toward posterior margin of wing; arc immediately beyond middle of wing. Fimbria white. Hind wings gray, lustrous, with gray fimbria.

Thorax and head silvery-white. Tegulae white at base, light chocolate-brown posteriorly. Second segment of labial palpi with chocolate-brown and black scales, only apex and a band over two-

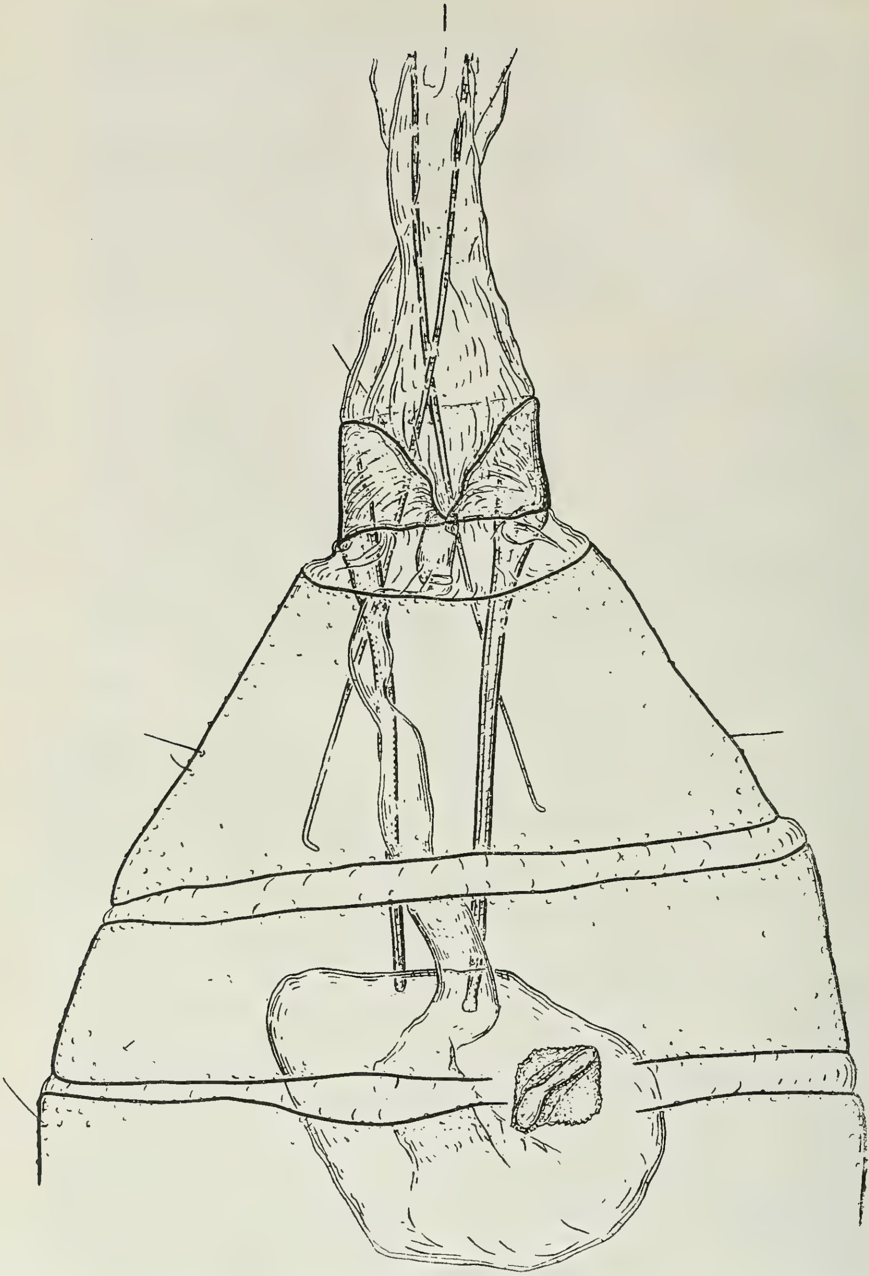


Figure 8. *Teleiodes marsata* Piskunov, sp. n., holotype, female, genitalia. Preparation No. 11776. Podberez'e, environs of Vitebsk (× 80).

Figure 9. *Klaussattleria vovkella* Piskunov, sp. n., holotype, male, genitalia. Preparation No. 11772. Kupyansk, Khar'kov District (× 80).

thirds its length white. Third segment white, with chocolate-brown base, a black band in middle, and gray apex.

Male genitalia (Figure 9): Tergite and sternite of segment VIII typical for genus in shape. Valves consist of two branches—one long and acicular and one with rounded apex. Latter only twice broader

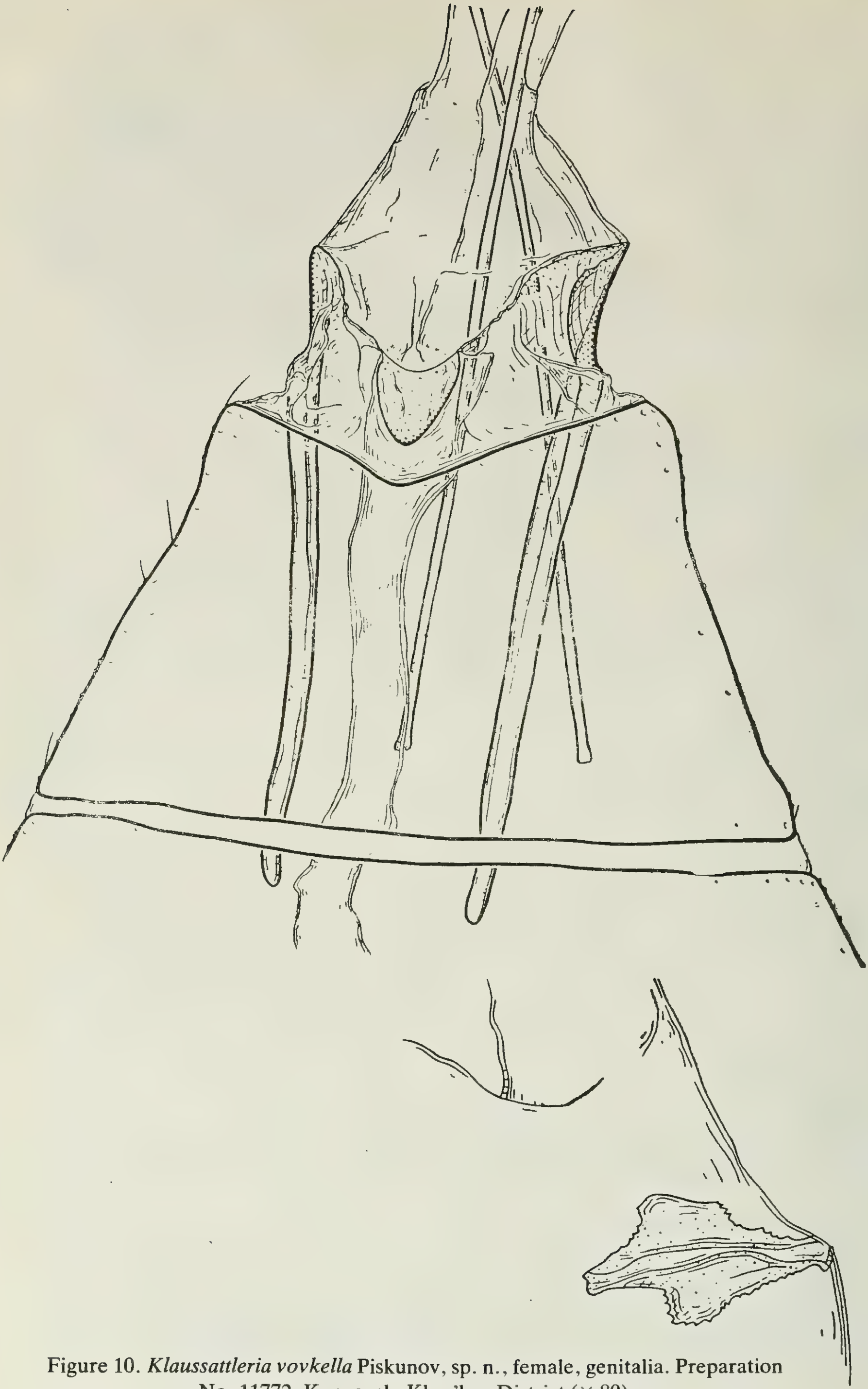


Figure 10. *Klaussattleria vovkella* Piskunov, sp. n., female, genitalia. Preparation No. 11772. Kupyansk, Khar'kov District (× 80).

than acicular branch, with sparse setae along lower margin. Uncus short, strong, and pointed at end. Saccus small, with process directed upward and backward. Aedoeagus in form of straight tube, broadens slightly at base, and even less so at apex.

Female genitalia (Figure 10): Lobes of vaginal plate widely separated. Prevaginal plate absent. Ostium conical, sclerotized. Bursa copulatrix located in segments I to III. Signa highly elongated longitudinally, almost cruciate, with minute denticles along margins. Anterior apophysis reaches terminus of segment VI.

Material: Holotype, male. Ukraine, Kupyansk, Khar'kov District, August 12, 1969 (Piskunov). Preparation No. 11772, male. Paratype, three females: same site, August 12, 13, and 18, 1969 (Piskunov).

Three specimens caught on trunk of oak in oak forests in valley of Oskol River; one (female) on trunk of aspen; seen in large numbers on slopes covered with oak forests.

Based on the pattern of the forewing this new species resembles *Xenolechia scriptella* (Hb.). Based on the male genitalia it is very close to *Klaussattleria fugitivella* (Z.), differing only in details of the structure of the aedeagus. Aedeagus in *K. fungitivella* (Z.) narrows noticeably at apex. Based on the female genitalia, *K. vovkella* sp. n. differs sharply from females of *K. fugitivella* (Z.); latter species with a prevaginal plate and different signa structure.

REFERENCES

Anostolov, L.G. 1969. K voprosu o strukture populyatsii vrednykh nasekomykh lesnykh biogeotsenozov yugo-vostochnoi Ukrainy (On the problem of the population structure of harmful insects of the forest biogeocenosis in southeastern Ukraine). *Vestnik Zool.*, vol. 4, pp. 60–65.

Anostolov, L.G. 1970. Dendrofil'naya entomofauna Gerbovetskogo lesa (Dendrophilic entomofauna of the Gerbovetskii Forest). *Sb. Rabot po Lesnomu Khozyaistvu Moldavii.* Izd. Kartya Modlovenyaske, Kishinev, vol. 4, pp. 213–223.

Căpuşe, I. 1964. Über drei Arten Paläarktischer Gelechiidae: *Carpatolechia dumitrescui* n. g., n. sp., *Aproaerema aureliana* n. sp. und *Mirificarma formoselia* (Hb.) n. comb. (Lepidoptera: Gelechiidae), *Entomol. Tidskr.*, 85, 1–2, 12–19.

Căpuşe, I. 1968a. *Sattleria* nom. nov. (Lepidoptera, Gelechiidae), *Entom. Ber.*, 28, 1, 18–19.

Căpuşe, I. 1968b. *Klaussattleria* nom. nov. nov. (Lepidoptera, Gelechiidae), *Entom. Ber.*, 28, 1, 80.

Danilevskii, A.S 1955. Novye vidy nizsshikh cheshuekrylykh (Lepidoptera, Microheterocera), vredyashchie drevesnym i kustarnikovym porodam v Srednei Azii [New species of lower Lepidoptera (Microheterocera) damaging trees and shrubs in Central Asia]. *Entom. Obozr.*, vol. 34, pp. 108–123.

Gozmány, I.A. 1967. The family Holcopogonidae fam. nov. (Lepidoptera) and its constituent taxa, *Acta Zool. Acad. Scient. Hung.*, 13, 3–4, 271–278.

Hrubý, K. 1964. *Prodromus Lepidopter Slovenska*. Bratislava, 962 pp.

Janse, A.J.T. 1958. *The Moths of South Africa*. Johannesburg, vol. 6, pp. 1–144 + pls. 1–32.

Plugaru, S.G. 1965. Parazity vrednykh lesnykh nasekomykh Moldavii (Parasites of harmful forest insects of Moldavia). In: *Vrednaya i Poleznaya Fauna Besnozvonochnykh Moldavii*. Izd. Kartya Moldovyanske, Kishinev, vol. 1, pp. 25–43.

Povolný, D. 1964. Gnorimoschemini trib. nov.—eine neue Tribus der Familie Gelechiidae nebst Bemerkungen zu ihrer Taxonomie (Lepidoptera), *Čas. Čs. Spol. Entom.*, 61, 4, 330–359.

Sattler, K. 1960. Generische Gruppierung der europaischen Arten der Sammelgattung *Gelechia* (Lepidoptera, Gelechiidae), *Dtsch. Entom. Z.*, N. F., 7, I/II, 10–118.

Sattler, K. 1964. Über *Telphusa canariensis* Walsingham, 1908, *Ztschr. Wien. Entom. Ges.*, 49 (75), 5/6, 88–90.

Sattler, K. 1968. Die systematische Stellung einiger Gelechiidae (Lepidoptera), *Dtsch. Entom. Z.*, N. F., 15, I/III, 111–131.

Stekol'nikov, A.A. 1967. Funktsional'naya morfologiya kopulyativnogo apparata arkhaichnykh cheshuekrylykh i obshchie napravleniya evolyutsii genitalii Lepidoptera (Functional morphology of the copulatory organs of archaic lepidopterans and general directions of evolution of genitalia in Lepidoptera). *Entom. Obozr.*, 46, 3, 670–689.

Tibatina, I.A. 1966. Vyemchatokrylaya mol'—vreditel' berezy v Zapadnoi Sibiri (The notch-winged moth—a pest of birch in western Siberia). In: *Fauna i Ekologiya Chlenistonogikh Sibiri*. Izd. Nauka, Siberskoe Otd., Novosibirsk, pp. 58–62.

Tibatina, I.A. 1970. Materialy k faune nekotorykh Microlepidoptera, vredyashchikh bereze v Zapadnoi Sibiri (Data on fauna of some Microlepidoptera damaging birch in western Siberia). In: *Fauna Sibiri*. Izd. Nauka, Siberskoe Otd., Novosibirsk, pp. 202–221.

Wolff, M. and A. Krausse. 1922. *Die Forstlichen Lepidopteren*. Jena, 338 pp.

Some Information on the Coleophoridae (Lepidoptera) of the Kyzyl-Kum Desert

M.I. Fal'kovich

Case-bearing moths play an important role in the desert complex of Microlepidoptera. In a number of species they are inferior only to moth borers, but occupy first place in the number of food associations. Members of this group have been recorded in 18 genera from 6 families of desert flora together with leaf-cutters, stem-borers, gall-makers, and those which eat the reproductive parts of plants. Case-bearers particularly are pests of fruits of Chenopodiaceae—the dominant family of plants in the desert zone.

This article presents data on the food associations, developmental cycle and other peculiarities on the biology of case-bearer moths, which have not been studied earlier in the deserts of Central Asia. Most of the species were only recently described (Fal'kovich, 1970, 1972a, 1972b). Eight other new species are described in this article (types preserved in the Institute of Zoology, Academy of Sciences of the USSR, Leningrad).

Studies were conducted from 1966 to 1972 in the Kyzyl-Kum Desert Station of the Institute of Botany, Academy of Sciences, Uzbek SSR (southern range of Kul'dzhuktan mountains, 110 km northwest of village Shafrikan in Bukhara District). I am deeply indebted to the scientists of this station, especially I.F. Momotov, A.D. Li, and A.G. Alimzhanov, for their assistance in this work and for arranging the conditions necessary for the study. I am also indebted to B.T. Shapkov who prepared photographs from micropreparations.

BIOLOGICAL TYPES OF CASE-BEARERS AND THEIR FOOD ASSOCIATIONS

Larvae of the family Coleophoridae live almost without exception in portable cases in humid regions and mine leaves or hollow fruits.

However, under desert conditions some species discard their case and various biotypes appear. The largest caseless group comprises larvae of the "fruit moth" type. Their entire development takes place inside the fruit and pupation in the soil. Species of this series belong mainly to the *Coleophora clypeiferella* Hofm. group (*C. ammodyta* Flkv., *C. saxauli* Flkv., *C. climacopterae* Flkv. in litt.), but also include individual members of other groups (*C. caroxyli* Flkv. and *C. campella* sp. n.). A small but very interesting and genetically different series is the gall-makers (*C. serinipennella* Chr., *C. elephantella* Flkv., *C. galligena* Flkv.). Two species are borers (*C. transcaspica* Toll and *C. alhagii* Flkv.); their larvae bore through the pith of the stem of fodder plants. Finally, the occurrence of inquilinism should be noted, albeit facultative. Two species live in the galls of other insects, but in the second or third generation the greater majority of larvae develop in fruits (the case is permanently absent in *C. caroxyli* Flkv., and in *C. galligena* Flkv. only larvae of the first generation live in galls, do not complete construction of the case and pupate in the gall; the autumn generation hibernates in completed cases).

Among species that construct cases, miners which feed on the vegetative parts and leaves of plants or those which attack shoots predominate (29 species, or 48%). In some instances they also feed on flower buds and mature fruits, often observed for example in *C. singreni* Flkv., but such feeding is not obligatory.

The number of obligate consumers of reproductive organs of plants is much higher (23 species, or 40%) compared to humid regions. In this series one can separate species which have adapted to feeding almost exclusively on flower buds and flowers (*C. eremosparti* Flkv., *C. amentastra* Flkv.), or only on fruits (autumn generation of *C. polynella* Flkv. and several species of the group *C. clypeiferella* Hofm.). Sometimes, however, development begins in the flowers or ovaries and terminates in maturing fruits (*C. calligoni* Flkv. and others). In individual instances mixed feeding takes place. Thus *C. asperginella* Chr. first feeds on the ovaries of *Corispermum* and then on its leaves; its case includes fruit skins as well as leaf material.

Based on plant host relationships, species of coleophoridae developing on herbaceous plants generally predominate. It is rather interesting that in the desert zone case-bearers live almost exclusively on tree-shrub plants (this peculiarity is a normal condition for desert Lepidoptera as a whole). Only 7 species (12%) have been found on annual herbaceous plants, but leaf-miners negligible among them: *C. asperginella* Chr. and *C. trientella* Chr. feed on fruits of *Corispermum*; *C. climacopterae* Flkv. and another species not yet described, live in fruits of *Climacoptera*; *C. transcaspica* Toll lives in stems of *Salsola*; and *C. serinipennela* Chr. forms galls on *Atriplex*. Only *C. denigrella* Grsm. mines the leaves of *Atriplex* which, strictly speaking, is not a desert plant. Apparently the maintenance of such associations with herbaceous plants in desert conditions is very difficult for oligophagous insects, and is usually achieved only by significant changes in biological adaptations.

The distribution of case-bearers over families and genera of food plants is also typical for desert fauna. Based on richness of fauna, Chenopodiaceae predominates—36 species (60%), followed by Asteraceae—11 species (more than 18%), Fabaceae—7 species (about 12%), Polygonaceae—2 species, Caryophyllaceae—2 species, and Solanaceae—2 species (about 3%). Among genera of plants with the largest number of case-bearers are wormwood (*Artemisia*)—10 species; *Caroxylon*[1]—7 species; *Arbuscula*—7 species; milk vetch (*Astragalus*)—5 species; saxaul (*Haloxylon*)—4 species; *Malpigipila*—4 species, and *Aellenia*—3 species. Almost all desert case-bearers are narrowly oligophagous or monophagous. Only for one species (*C. gallivora* Flkv.) has feeding on two genera of Chenopodiaceae (*Haloxylon* and *Arbuscula*) been established.

DEVELOPMENTAL CYCLE

Most of the case-bearers whose biology has been studied develop a single generation. Desert fauna is no exception but polycyclic species are not rare either. These species belong to various groups and may have monocyclic ancestors. Hence one may propose that polycyclic development is a secondary phenomenon, at least within the limits of the Palearctic fauna of case-bearers.

Up to three generations during the vegetative growth period have been recorded for *C. tshogoni* Flkv. and *C. denigrella* Grsm. The occurrence of a minimum of two generations has been established for *C. keireuki* Flkv., *C. petraea* Flkv., *C. gallivora* Flkv., *C. polynella* Flkv., and *C. caroxyli* Flkv. Judging from the nature of their flight, some other species of moths are also not monocyclic.

The main hibernating stage of desert case-bearers is the larvae. In most cases they enter hibernation after feeding has been completed. The group of diapausing "well-fed" larvae includes 42 species (70%).

---

[1] In the present article a section of the genus *Salsola*, an aggregate genus, is treated as an independent genus to avoid distorting the general picture of distribution of case-bearer moths on the basis of genera of food plants.

This type of hibernation is primarily typical of the carpophages. If fruiting of the food plant takes place in autumn, overwintering larvae may continue to diapause up to the end of summer without pupation and the emergence of moths. The development of eggs and larvae of the new generation in such cases commences without delay at early stages (*C. amentastra* Flkv., *C. diogenes* Flkv., *C. isabellina* Flkv.). Another variant of the cycle of development with the same stage of hibernation is the absence of estivation in hibernating larvae. The moths in this case fly at the beginning of summer, but larval development is delayed and takes place only in autumn (*C. stuposa* sp. n., *C. psamata* sp. n., *C. tytri* Flkv., *C. tsherkesi* Flkv., and others). At the time of the appearance of the imago and, consequently, different estivating stages, even extremely close species may differ (*C. isabellina* Flkv. and *C. tsherkesi* Flkv.). In the case of fruiting of the food plant in early summer, the nature of the developmental cycle of a carpophage differs somewhat. Thus in *C. calligoni* Flkv. pupation of the hibernating larvae begins very early, the moths fly in early spring, and larvae have already appeared during the flowering period in *Calligonum*. From the beginning of June up to the time of fruit maturation, estivation begins in larvae that have completed feeding and is subsequently completed in hibernation.

In addition to carpophages, hibernation in larvae that have completed feeding takes place in borers (*C. alhagii* Flkv.), some gall-formers (*C. serinipennella* Chr.), and in all the polycyclic species as well as some monocyclic species of desert leaf-cutters: *C. aelleniae* Flkv., *C. haloxyli* Flkv., *C. captiosa* Flkv., and *C. lycii* Flkv. It should be noted that the feeding period of mature larvae in the last three species occurs in late summer and autumn, a rare exception among case-bearing leaf-cutters.

In carpophages part of the population always enters perennial diapause. This phenomenon, however, may also take place in certain leaf-cutting species with the hibernation of fully fed larvae. Thus delay in development for up to two and three years has been demonstrated for *C. aelleniae* Flkv.

Diapausing larvae most often keep their head down, i.e., toward the opening of the case. Larval activity varies in different species. A larva may remain fairly mobile and with the smallest disturbance, for example, change in light conditions, detach the case from the substratum and crawl in search of another place more convenient for fixation (*C. stegosaurus* Flkv., *C. haloxyli* Flkv., and almost all carpophages—*C. calligoni* Flkv., *C. cyrta* sp. n., *C. psamata* sp. n., *C. polynella* Flkv., and others). On the other hand, the larva may be poorly mobile and remain at its place under the same conditions. However, if the case is detached when constructed, the larva may move it slightly trying to accommodate itself somewhere else in the vicinity (*C. captiosa* Flkv., *C. tschogoni* Flkv., *C. keireuki* Flkv., and others). More rarely, the larva turns its head upward in the case before entering diapause, i.e., faces the valve, and after fixation never shifts to another place. Diapause proceeds in this manner in some carpophages which burrow (with the case) into the soil (*C. macrura* Flkv. and other species of this group), but rarely is such a condition observed in leaf-cutters, for example in *C. aelleniae* Flkv. Incidentally, the passive condition of the larva in this case is relative; if a small cut is made in the surface of the case of this species (*C. aelleniae* Flkv.), the larva covers the slit with a silky discharge.

Hibernation of the larva occurs quite often at a young stage—in the initial case or after two to three molts. This group includes 14 species (about 23%). It should be emphasized, however, that this mostly includes groups that formed under different natural conditions and is represented in the desert by only isolated species or some closely related species (group of *C. conyzae* Z., *C. vibicella* Hb., and *C. arenariella* Z., associated only with leguminous and Compositae plants).

In some species in which moths fly in autumn the eggs hibernate. This peculiarity is typical of *C. eucoleos* Flkv., *C. elephantella*, and *C. dormiens* Flkv.

Thus the case-bearer fauna in the desert zone is not only very rich, but distinguished from the fauna of other zones by a greater biological variability.

* * *

Keys to case-bearers found on plants of various genera are given below. They were prepared on the basis of specimens used by Hering (1957), but only miners of the western Palearctic fauna were examined. The genera of food plants are arranged in alphabetic order. Information on damaged plant parts and structure of completed cases constitute major characters in identification.

Two major types of cases are distinguished—leafy and silky. Leafy cases are characterized by the fact that to increase the case size, the larva uses the uneaten part of the leaf. Silky cases are increased only by a silky discharge (the initial case may, however, consist of leaf material).

The opening at the caudal end of the case through which the larva ejects frass, is closed by a valve. The valve may consist of two parts in the form of a simple slit usually located in a vertical plane, or a three-walled structure resembling a pyramid along with slits at the corners. In some cases the larva wraps part of the case with an additional silky sheet called the pallium. In some species the pallium covers almost the entire case (Figure 23), while in others it occupies only the posterior end and is turned toward the region of the valve (Figure 24).

Length, unless specified otherwise, is indicated for completed cases. Larval feeding period is also given.

Key to Species Based on Larval Cases

Acanthophyllum (Caryophyllaceae)

1 (2). Case covered with sand, surface smooth. Figures 1a and 1b. .... **Coleophora dentatella** Toll and Ams.

Case silky, gradually attenuate caudally, uniformly covered with sand. Grows from cephalic end up to length of 22 to 25 mm. At end of development, slender and curved caudal part discarded; expansion of case does not take place. Valve three-sided. Length of completed case: male 12 to 15 mm, female 8 to 12 mm. June and (after diapause) April–beginning May. Young larvae hibernate on *A. elatius* Bge. and Boiss.

2 (1). Case not covered with sand, surface with longitudinal grooves. Figure 2 ..... **Coleophora afghana** Toll and Ams.

Case silky, straight; male's thinner and more slender than female's; surface with six to seven longitudinal, coarse, convex stripes to which isolated sand particles and other matter are attached. These stripes (material of hibernation case) uniformly alternate with smoother, slightly longitudinally rugulose shallow grooves of almost same width. Increase takes place caudally, with expansion of case occurring in process; superfluous constructions (grooves and valves) remain pure white for sometime, thickening and turning yellowish only at end of development. Valve three-sided, very large; case narrows sharply just before valve (and due to this peculiarity, case resembles airplane). Final color pale, sandy or brownish-gray. Length 10 to 12 mm. June and (after diapause) April. Young larvae hibernate. Found on *A. elatius* Bge. and Boiss.; with continuous feeding on other members of Caryophyllaceae also.

Aellenia (Chenopodiaceae)

1 (2). Case small, about 7.0 mm, notably compressed laterally; caudal end with slender tube curving upward and slightly forward. Figure 3 .... **Coleophora tshogoni** Flkv.

Case leafy, consists of three obliquely imbricate pieces, margins of which may more or less protrude downward. Initial case (in form of slender tube) located on upper side at caudal end. Valve poorly developed, formed before entrance into pupation by vertical slit at end of case. Length 6.0 to 7.5 mm. Color chocolate-brown to yellow. May–beginning of October; up to three generations. Fully fed larvae hibernate. Found on *A. subaphylla* C. A. M., rarely on *A. glauca* M. B.

2 (1). Case long, 12 mm or more, not compressed, straight.

3 (4). Case up to 14 mm; caudal part narrows abruptly as if in steps. Figures 4a and 4b .... **Coleophora dormiens** Flkv.

Case leafy, consists of two parts differing in thickness: caudal part thinner, sometimes with longitudinal ridges formed by folds of leaves stretched by larva (Figure 4a). One or even both parts may consist of two pieces woven firmly together with no visible suture. Valve three-sided, formed only before entrance of larva into estivation; during developmental process caudal end of case periodically discarded. Length 12 to 14 mm. Color grayish-yellow or yellow to chocolate-brown, usually without darker longitudinal stripes, since widening of case occurs only in isolated examples. End of April–May. Moths fly in late autumn. Eggs hibernate. On *A. subaphylla* C. A. M., *A. hispidula* Bge., and *A. glauca* M. B.

4 (3). Case more than 16 mm; caudal part narrows gradually. Figure 5..................... **Coleophora aelleniae** Flkv.

Case leafy, consists of one or two, rarely three sections. Circular sutures, if present, barely perceptible. Valve three-sided, formed at end of development; initially caudal part of case, sometimes very long, cut by larva. Length 16 to 20 mm. Color chocolate-brown to yellow with one to three dark stripes (traces of expansion of case, done by making longitudinal sections and subsequently fixing with silky discharge). May–June. Fully fed larvae hibernate. On *A. subaphylla* C. A. M. (under forced feeding, will feed on other species of *Aellenia*, but not in nature).

Alhagi (Fabaceae)

1 (1). Larvae without case, inside stem .... **Coleophora alhagii** Flkv.

Larvae yellow, with chocolate-brown head; prolegs on segments III to VI of abdomen well developed, planta with two transverse series of crochets. Length 12 mm. Larvae bores through pith of branch up to root collar, making passage of "brown powder". In autumn bore curved, silk-covered, free passage toward surface of stem and cover outer opening with three-sided valve. May–October. Well-fed larvae hibernate in lower part of stem (1.0 to 5.0 cm below opening) after turning head upward, in light silky cocoon. Pupation and emergence of moths in early spring, but with warm weather found in middle of winter. On *A. sparsifolia* Shap., but probably on other species of *Alhagi* also.

Arbuscula (Chenopodiaceae)

1 (6). Larvae feed on leaves.

2 (3). Cases made of short and oblique pieces of leaves. Valve two-sided, poorly developed. Figure 6 .... **Coleophora bojalyshi** Flkv.

Case leafy, consists of five to six obliquely arranged pieces, with caudal part cylindrical. Valve two-sided, not compact, in form of long sections on dorsal and ventral surfaces, and formed at end of development. Length 10.0 to 11.5 mm. Color matte chocolate-brown, terminal part (initial hibernation case) dark brown. June and (after diapause) end of April–beginning of May. Young larvae hibernate. On *A. arbuscula* Pall.

3 (2). Case consists of long cylindrical pieces of leaf. Valve three-sided, distinct.

4 (5). Case usually less than 12 mm long, dark chocolate-brown, often greenish in feeding larva. On *A. arbusculiformis* Drob. Figure 7 .... **Coleophora petraea** Flkv.

Case leafy, tubular, straight or slightly curved, consists of two to four pieces of different sizes (often three pieces, with first two long and last one, which forms valve, short). Sutures between pieces barely discernible. Valve three-sided; caudal part of case discarded before its formation. Length 8.0 to 12.0 mm. Color dark chocolate-brown, sometimes with greenish tinge. End of April–May, and end of July–August; at least two generations. Fully fed larvae hibernate.

5 (4). Case usually more than 12 mm long, yellow to chocolate-brown, without greenish tinge. On *A. arbuscula* Pall. Figure 8· .... **Coleophora** sp.

Case leafy, shape and method of construction similar to previous species, but suture between large frontal pieces usually distinct in form of transverse groove. Narrow stripe sometimes passes along lower side or on lateral side (trace of section perceptible on expansion of case). Valve three-sided. Length 12 to 14 mm. May–beginning of June. Fully fed larvae estivate and hibernate.

6 (1). Larvae do not feed on leaves.

7 (8). Larvae feed on galls made by other insects (flies of Cecidomyiidae). Figure 43 ... **Coleophora gallivora** Flkv.

Case silky, surface slightly rugulose, uniform. Four to five not very straight stripes extend along case, which are sometimes contiguous at anterior and posterior ends; stripes same color as case but smoother than space between them and discernible only under high magnification on incomplete and not fully covered case. Valve three-sided. Length 6.0 mm. May–beginning of June, end of September–beginning of October. At least two generations. Fully fed larvae hibernate. On *A. arbuscula* Pall. and *A. richteri* Kar.; also develop on saxaul (*Haloxylon*).

8 (7). Larvae feed on fruits.

9 (10). Larvae without case, inside fruit. Planta of prolegs without crochets .... **Coleophora ammodyta** Flkv.

Larvae yellowish-white, with brown head; prolegs reduced, in form of dermal cicatrices. Length 6.0 mm. September–October. Larvae hibernate after feeding in sandy cocoons. On *A. richteri* Kar.

10 (9). Larvae (at least older instars) in case. Planta of prolegs with crochets.

11 (12). Case cigar-shaped, without transverse sutures. Figure 43 ... . **Coleophora gallivora** Flkv.

Description of case under couplet 7 (8).

12 (11). Case cylindrical, with more or less discernible transverse sutures (in young larvae consists of one to two fruits).

13 (14). Case light, with distinct sutures. On *A. arbuscula* Pall. Figure 9 .... **Coleophora macrura** Flkv.

Case silky, consists of five to six cylindrical sections (belts). Valve three-sided. Length 6.0 to 6.5 mm. Color chocolate-brown to yellow; individual sections may be much darker than others. Initial stage of construction of case consists of two fruits glued together; intermediate stage, case increased with additional silky belts; at end of development fruits discarded and replaced by valve. September–beginning of October. Fully fed larvae hibernate.

14 (13). Case dark, belts usually indistinct. On *A. richteri* Kar. and *A. paletzkiana* Litv.

15 (16). Food plant, *P. richteri* Kar. Moths with longitudinal grayish striae. Flight end of May–beginning of June. Figure 10 .... **Coleophora tsherkesi** Flkv.

Case silky, consists of five to six cylindrical belts, readily discernible only in incomplete and not fully covered cases. Valve three-sided, constructed after discarding fruits at caudal end of case (Figure 10a and 10b). For hibernation, larva moves into sand where it constructs a conical operculum to cover oral opening of case that is covered with sand (Figure 10c). Length 4.5 to 5.5 mm. Color dark brown. September–October. Fully fed larvae hibernate.

16 (15). Food plant, *A. paletzkiana* Litv. Moths without distinct longitudinal striae, whitish. Fly August–beginning of September. Figure 11 .... **Coleophora isabellina** Flkv.

Case as in *C. tsherkesi* Flkv., but usually darker, blackish. End of September–October. Fully fed larvae hibernate.

Artemisia, Seriphidium (Asteraceae)

1 (16). Larvae mine leaves. Found in spring and beginning of summer (March–June).

2 (11). Case silky.

3 (6). Case sheathlike; surface smooth, valve two-sided.

4 (5). Case pale chocolate-brown, with ocherous-pink tinge in feeding larvae; upper margin with more or less distinct dark brown patch before caudal end. Figure 12 .... **Coleophora zhusani** Flkv.

Case silky, sheathlike, with end curved downward, oblique sinuous wrinkles, and comparatively weak longitudinal grooves; ventral keel free, developed only in caudal part of case. Valve two-sided. Length 10.0 to 11.5 mm. Color of fresh case pale pinkish-ocher; margin darker, rugulose, and intersecting wrinkles and grooves create impression of weakly reticulate structure. Silky part of hibernation case dark brown, and hence rather sharp dark stripe or patch formed in front of caudal part of complete case. Beginning of June and (after diapause) April–May. Young larvae hibernate. On *A. turanica* Krasch.

5 (4). Case dull white, with gray or yellow tinge, without dark patch in front of caudal end. Figure 13 .... **Coleophora gazella** Toll.

Case generally similar to that of preceding species, but longitudinal grooves larger, sharper, and distinct not only on dorsal surface, but also along sides (in anterior half of case); ventral side of case with slight dilatation. Length 12 to 14 mm. Color dull white, more monochromatic, without reticulation and darkening in front of caudal end. End of May–beginning of June and (after diapause) April–May. Larvae hibernate. On *A. turanica* Krasch., more often on f. *diffusa* Krasch. in stony desert.

6 (3). Case tubular, surface fluffy or sandy; valve three-sided.

7 (10). Case covered with hairs of food plant, appears fluffy.

8 (9). Case attenuate not only toward caudal end but also cephalic end; anterior part sharply down-curved so that cephalic opening located in horizontal plane. Figure 17 .... **Coleophora seriphidii** Flkv. in litt.

Case silky, broader in middle part, attenuate toward both ends, densely pubescent. Five or six almost glabrous stripes extend along case, quite uniformly arranged, straight, narrow, and at places barely perceptible (covered by surrounding pubescence). Individual stripes may bifurcate. Plane of cephalic opening parallels longitudinal axis of case. Valve three-sided. Length 4.5 to 5.0 mm. Color brownish-gray, longitudinal stripes brown; case of young larvae almost white. End of April–May. Fully fed larvae estivate and hibernate. On *A. turanica* Krasch.

9 (8). Case distinctly attenuate only toward caudal end, its anterior part slightly down-curved so that cephalic opening located in slightly sloping plane. Figure 18 .... **Coleophora polynella** Flkv.

Case silky, broader anteriorly, gradually attenuating toward caudal end; surface slightly uneven (tuberculate), densely covered with hairs of plant. Longitudinal stripes very weak, barely discernible, seen under high magnification as narrow grooves in caudal half of case. Valve three-sided.

Length 4.0 to 4.5 mm. Color grayish-white. May; second generation on fruits. On *A. turanica* Krasch.

10 (7). Case covered with sand particles. Figure 19 .... **Coleophora psammion** Flkv.

Case silky, fairly uniform in width, not attenuate caudally; anterior end slightly down-curved. Surface of case entirely covered with sand particles. Valve three-sided, short, rounded, poorly perceptible. Length 4.0 mm. May; number of generations and hibernating stage not known.

11 (2). Case leafy.

12 (15). Case consists of fairly parallel and uniformly arranged pieces of leaves, which protrude slightly only along upper and lower margins.

13 (14). Case up to 8.0 mm long. Food plant, *A. juncea* Kar. and Kir. Figure 14 .... **Coleophora vitilis** Flkv.

Case leafy, consists of fairly large pieces of leaves arranged alternately on one or the other side; hence case appears woven. Pieces for increasing size of case cut from middle part of leaf blade, with apex discarded. Number of pieces not less than four on each side; edges very mildly raised along margins of case. With increase in size of case, dorsal side moves down to ventral side. Valve two-sided. Length 6.5 to 8.0 mm. Color chocolate-brown or grayish. Beginning of June and (after diapause) end April–beginning of May. Young larvae hibernate.

14 (13). Case up to 6.5 mm long. Food plant, *A. turanica* Krasch. Figure 15 .... **Coleophora subparcella** Toll and Ams.

Case leafy, consists of masticated apices of individual leaf blades arranged in imbricate pattern on upper and lower sides (seven to eight pieces each). Valve two-sided. Length 6.0 to 6.5 mm. Color yellowish-chocolate-brown. Beginning of June and (after diapause) April–May. Young larvae hibernate.

15 (12). Case consists of irregularly scattered masticated pieces of leaves, clustered at places, and protruding notably along lateral sides. Figure 16 .... **Coleophora paraptarmica** Toll and Ams.

Case leafy, consists of several pieces, some of which contain two to three intact leaf pieces, arranged so irregularly that one case differs notably from another in external appearance. Caudal end of case slightly down-curved, sometimes almost straight. Valve two-sided. Length 5.5 to 6.5 mm.

Color yellow or light chocolate-brown; caudal part (initial hibernation case) much darker, brownish. Beginning of June and (after diapause) May. Young larvae hibernate. On *A. turanica* Krasch.

16 (1). Larvae eat flower buds, flowers, or fruits; found in autumn (September–November).

17 (20). Case initially prepared from inflorescences (baskets) of wormwood and covered with leaflets until hibernation.

18 (19). Case at least 10 mm long, with attached leaflets, appears ruffled. Valve not visible from outside. Figure 20 .... **Coleophora amentastra** Flkv.

Case silky; inner side consists of pieces of flower buds glued together; leaflets of sheaths highly desiccated but do not drop because joined by silky threads. Only when larva enters hibernation in cracks in soil and under stones, etc., do some leaflets drop and brownish-gray rough ("fluffy") case becomes visible; plane of cephalic opening perpendicular to longitudinal axis of case. Valve three-sided. Length 7.0 to 8.0 mm; when case covered with leaflets, 10 to 12 mm. September–October. Fully fed larvae hibernate. On *A. turanica* Krasch. and *A. juncea* Kar. and Kir.

19 (18). Case up to 6.0 mm long, with attached leaflets of sheath. Valve protrudes from basket (at end of development of larva). Figure 22 .... **Coleophora** sp.

Case silky; inner side woven with masticated basket of wormwood; leaflets of sheath not attached by threads and toward end of larval development gradually drop off. Valve three-sided. Length 6.0 mm. Color of part protruding from basket white. October–November. Fully fed larvae hibernate. On *A. turanica* Krasch.

20 (17). Case initially prepared from silky discharge, without baskets of wormwood, and covered only with plant pubescence. Figure 21 .... **Coleophora polynella** Flkv.

Case silky, relatively short and thick; larva uses fluff detached from plant surface in construction. Valve three-sided, obtuse. Length 4.5 to 5.0 mm. Color brownish with gray tinge (initially white). October–early November. Fully fed larvae hibernate. On *A. turanica* Krasch.

Astragalus, Ammodendron (Fabaceae)

1 (8). Case silky; increases with cutting of leaves by developing larvae.

2 (5). Case with cover.

3 (4). Cover large, enveloping almost entire case. Length up to 10 mm. Figure 23 .... **Coleophora astragalorum** Flkv.

Case silky; end down-curved. Cover anteriorly reaches cephalic opening of case, dull white, matte; surface with folds, but without distinct scaly projections along sides; upper part, along margin, more reticulate and lustrous; slightly transparent, forming one to four protuberances located randomly and sometimes unpaired (i.e., present only on margin ofone side of cover). Valve two-sided. Length 9.0 mm. Color of case (excluding cover) pale chocolate-brown or chocolate-brown to yellow. End of May and (after diapause) end of March–April. Young larvae hibernate.

4 (3). Cover small, located at curved terminal part of case. Length more than 10 mm. Figure 24 ..... **Coleophora albens** Flkv.

Case silky, massive, almost round in cross section, comparatively uniform in width; ventral margin without distinct keel, slightly convex or almost straight. Case with smooth oblique wrinkles, surface smooth and lustrous. Cover encloses only caudal end of case, which is down-curved. Valve two-sided. Length 13 to 16 mm. Color whitish, with slight yellow or creamish tinge. Beginning of June and (after diapause) end of April–May. Young larvae hibernate.

5 (2). Case without cover.

6 (7). Case more or less broadens in middle part. Length up to 15 mm. Figure 25 .... **Coleophora singreni** Flkv.

Case silky, sheathlike, with caudal end slightly down-curved; ventral keel in form of tubercle or small hump, rarely ventral margin of case straight. Surface with oblique pubescent wrinkles, sometimes also with small blackish patches along sides of wrinkles, commencing from lower margin of cephalic opening to curve of upper margin. Longitudinal grooves absent or barely perceptible on upper side of case in middle. Valve two-sided. Length 12.5 to 15.0 mm. Color dull white, matte. Beginning of June and (after diapause) April–beginning of May. Young larvae hibernate.

(6). Case does not broaden in middle. Length more than 18 mm. Figure 26 .... **Coleophora eucoleos** Flkv.

Case silky, sheathlike, narrow, long, and straight or slightly curved; caudal end curves downward gradually but not always to the same degree. Ventral keel not developed (in young and middle-aged larvae keel sharply raised, but thereafter used for increasing walls during expansion). Surface with very indistinct oblique wrinkles; longitudinal grooves weak, distinguishable only on upper side of case (in early stages more distinct and sometimes even continue onto sides). Valve two-sided. Length 19 to 24 mm. Color whitish, matte; in initial stages of development often white, later often with pinkish tinge at end. End of April–beginning of June. Larvae estivate. Moths fly in August. Hibernation probably during egg stage.

8 (1). Case leafy, not increasing in size after leaves cut. Figures 27a and 27b .... **Coleophora testudo** Flkv.

Case entire, consists of single piece—apical part of leaf or almost entire leaf (depending on size). Shape of case more or less oval, sometimes slightly irregular; caudal end (apex of leaf) may be pointed; dorsal surface of case corresponds to lower side of leaf, convex with distinct midrib; ventral surface plain. Cephalic opening of case ventral and visible only when case viewed from lower side. Caudal opening in form of transverse slit also situated on ventral surface. Case cut in first mining and immediately acquires final size, i.e., does not expand and is not extended. Valve undeveloped. Length 5.0 to 9.0 mm. Color chocolate-brown to yellow; toward spring acquires dull or gray tinge; sometimes black dots present (fruiting bodies of saprophytic fungi). End of May and (after diapause) end of March–April. Young larvae hibernate.

Atriplex (Chenopodiaceae)

1 (2). Larvae live in cases .... **Coleophora denigrella** Grsm.

Case silky, with anterior part down-curved; cephalic opening almost in horizontal plane (in incomplete cases highly truncated). Surface uneven, with tubercles and plumes of silky deposits. Valve three-sided. Length about 5.0 mm. Color brownish, in young larvae pure white. April–October; at least three generations. Fully fed larvae hibernate.

2 (1). Larvae form galls on stems. Figure 28 ....
.........................**Coleophora serinipennella** Chr.

Galls large, oval or elongated; not always constant in shape. May–October. Fully fed larvae hibernate.

Calligonum (Polygonaceae)

1 (2). Larvae mine green branches. Case up to 7.0 mm. Figure 29. .... **Coleophora zhusguni** Flkv.

Case silky, with straight caudal part and sharply down-curved anterior end; cephalic opening in horizontal plane. Valve three-sided. Length 6.0 to 7.0 mm. Color pale chocolate-brown; light-colored, gray oval spot, sometimes with black punctation (initial hibernation case) located on curve of cephalic end on upper side. Beginning of June and (after diapause) April–May. Young larvae hibernate. On *C. leucocladum* (Schrenk) Bge.

2 (1). Larvae feed on fruits; case usually 10 mm. Figure 30 .... **Coleophora calligoni** Flkv.

Case silky, with highly convex dorsal margin and slightly sloped caudal end; anterior end down-curved but cephalic opening occurs in tilted plane. Surface of case slightly rugulose. Case of young larvae with well-developed ventral keel, used during expansion of case. Residue of keel cut by larva. Valve three-sided. Length 10 to 14 mm. With shortage of fruit, case smaller. Color brownish, with light-colored, yellowish, slightly raised spots forming marbled pattern. May–beginning of June. Fully fed larvae estivate and hibernate. Diapause of up to three to four years recorded. On *C. microcarpum* Borszcz., *C. junceum* (Fisch. and Mey.) Litv., rarely on other species of *Calligonum*.

Caroxylon[2] (Chenopodiaceae)

1 (2). Larvae form large galls on branches. Figure 31 .... **Coleophora elephantella** Flkv.

Galls in form of thickening on branches with broad cavity inside; length highly variable (4.0 to 10.0 mm). Branch growth terminated and "witch broom" cluster of twigs appears at apex. Larvae stout, light yellow, with chocolate-brown head; prolegs absent on segment VI of abdomen.

2 (1). Larvae do not form galls.

3 (6). Larvae feed on leaves.

4 (5). Case expands slightly in middle, with one to three smooth

---

[2] Only *Caroxylon orientalis* Gmel. (= *rigida* Pall.) examined.

longitudinal stripes. Length at least 10 mm. Figure 32 .... **Coleophora** sp.

Case leafy, tubular, with cephalic part slightly directed downward, and consists of two or three cylindrical sections (in latter case two long and one caudal form valve, very short). Suture between pieces indistinct, but sometimes fold occurs before suture. Valve three-sided. Length 10 to 11 mm. Color pale chocolate-brown, with two to three dark longitudinal stripes in middle part of section, on which leaf pubescence absent (traces of expansion of case). May–beginning of June. Fully fed larvae estivate and hibernate.

5 (4). Case does not expand in middle, without longitudinal stripes. Length not more than 8.0 mm. Figure 33 ....**Coleophora keireuki** Flkv.

Case leafy, tubular, straight; caudal end slopes downward just slightly. Case consists of two to three cylindrical pieces, sutures indistinct, but sometimes masticated apex of leaf raised in form of tubercle before suture. No expansion of case takes place, its surface completely covered with leaf pubescence. Valve three-sided, often not compact (in which case larva covers slit with light silky coat), formed upon completion of feeding by larva; caudal part of case discarded priorly. Length 7.0 to 8.0 mm to 12.0 mm; incomplete case consists of four to five pieces (Figure 33b). Color yellow to chocolate-brown or brownish. May–beginning of October; at least two generations. Fully fed larvae hibernate.

6 (3). Larvae do not feed on leaves.

7 (8). Larvae in galls constructed by flies of Cecidomyiidae .... **Coleophora caroxyli** Flkv.

Larvae yellow, with chocolate-brown head, attenuate toward posterior end, and 4.0 mm in length. Inside gall, after positioning itself in small cavity, body shrinks noticeably in size and becomes almost spherical. All prolegs present but reduced, with inconstant number of minute crochets. May–October; at least two generations. Found in galls of *Asiodiplosis propria* Marik.; also develops in fruit of *Caroxylon.*

8 (7). Larvae feed on fruit.

9 (10). Larvae without case, total development takes place inside fruit. Length up to 5.0 mm ..... **Coleophora caroxyli** Flkv.

Description given in couplet 7 (8).

10 (9). Larvae in case (if inside fruit, subsequently uses fruit as a case). Length at least 7.0 mm.

11 (12). Case consists of fruits attached together. Figure 34 .... **Coleophora pagodella** Flkv.

Larva cuts each hollowed fruit and attaches it to upper side of another fruit; toward end of development case consists of three, rarely four fruits, sequentially located one on the other. After completing development larvae exit from case, cut round opening in last of hollowed out fruits, and move into soil for hibernation, where they weave an oval, rather compact (parchment) cocoon. Color of larva light yellow, head chocolate-brown. Prolegs on segments III–VI of abdomen reduced, without crochets.

12 (11). Case silky.

13 (14). Case without inclusions on surface; width at valve not more than cross section of case. Length up to 10 mm. Figure 35. .... **Coleophora cyrta** Flkv.

Case silky; cephalic end sharply down-curved, caudal part often slightly raised. Surface rough, with minute transverse wrinkles. Four to six uneven stripes of different lengths and widths and covered with longitudinal wrinkles, extend along case. Valve three-sided, comparatively small. Length 9 to 10 mm, usually 9.5 mm. Color chocolate-brown, longitudinal stripes with clearer tone. End of September–October. Larvae hibernate after feeding.

14 (13). Case sparsely covered with sand particles. Width of valve greater than cross section of case. Length more than 10 mm. Figure 36 .... **Coleophora psamata** Flkv.

Case silky, oral end smoothly down-curved, caudal part always straight. Sand cover in form of uneven longitudinal stripes with broad interval between them, passing ventrally and laterally (traces of expansion of case), usually five or six in number; some stripes may merge at ends. Valve three-sided, each side with sharply raised ridge. Length 11 to 13 mm. Color yellowish-gray. End of September–October. Larvae hibernate after feeding.

Ceratoides (= *Eurotia*) (Chenopodiaceae)

1 (1). Larvae feed on fruit. Figure 37 .... **Coleophora** sp.

Case consists of single hollowed-out fruit, which completely retains its shape, color, and pubescence. At end of development larvae make white silky tube inside fruit, which slightly extends beyond fruit anteriorly; subsequently tube darkens. Valve three-sided, very short, and barely perceptible (does not protrude behind fruit). Length 6.0 to 7.0 mm. Larvae hibernate after feeding.

Climacoptera (Chenopodiaceae)

1 (2). Larvae dull yellow, with series of diffuse chocolate-brown spots. Length 7.0 to 8.0 mm .... **Coleophora climacopterae** Flkv.

Larva without case, feeds inside fruit, moving from one fruit to another without emerging on surface (through bored peduncle). Color of larva initially dull white, thereafter yellow; head chocolate-brown. Color around tubercle darker, deep chocolate-brown; spots usually visible to naked eye in form of paired dorsal series and unpaired lateral rows of small punctation. Prolegs on abdominal segments III–VI reduced, without crochets; anal prolegs small, also without hooks. October. Fully fed larvae hibernate.

2 (1). Larvae bright yellow, without spots. Length 5.0 to 6.0 mm. .... **Coleophora** sp.

Life history and morphological peculiarities similar to those of preceding species. Color initially yellow to whitish, thereafter yellow, particularly bright in middle of abdomen; diapausing larvae fade again. Head chocolate-brown. October. Larvae hibernate after feeding.

Corispermum (Chenopodiaceae)

1 (2). Case barrel-shaped, made without leaf material. Figure 38. .... **Coleophora trientella** Chr.

Case silky, short, thick, as if inflated in middle; near cephalic end and along sides with symetrically arranged halves of membrane of hollowed-out fruit. Valve three-sided. Length 4.0 to 5.0 mm. Color dark brown. May–June. Moths fly in spring and at end of summer; possibly, two generations. Hibernating stages not detected. On *C. lehmannianum* Bge.

2 (1). Case flat, including pieces of leaves in it. Figure 39a and 39b. .... **Coleophora asperginella** Chr.

Case combined type; caudal part with membrane of fruit, while cephalic part consists of leaf pieces. Shape approximately oval, lateral margins sometimes uneven, with protruding apices of leaves. Dorsal surface of case convex, ventral surface flat, lateral margins distinctly expressed (in form of ridges). Valve three-sided but also somewhat flat. Length 7.0 to 8.0 mm. Color greenish-brown. May–June. Biology as in preceding species.

Eremosparton (Fabaceae)

1 (1). Case sheathlike. Larvae feed on flower buds and flowers. Figure 40 .... **Coleophora eremosparti** Flkv.

Case silky, with oblique sinuous wrinkles, without distinct longitudinal grooves, slightly curved, with convex dorsal side. Very slight inflation remains from ventral keel to before attenuate and smoothly down-curved caudal part of case. Valve two-sided. Length 18 to 23 mm. Color dull or yellowish-white. May–June. Egg supposedly hibernates. On *E. flaccidum* Litv.

Haloxylon (Chenopodiaceae)

1 (4). Larvae feed by assimilating branches.

2 (3). Case consists of several imbricate pieces arranged obliquely. Figure 41 .... **Coleophora haloxyli** Flkv.

Case leafy, consists of six sections of branches which gradually enlarge toward anterior end; on ventral side terminals of branches protrude slightly and, depending on their shape, configuration of cases may differ slightly. Caudal end of case with small tube (initial case) through which frass is ejected. Length 8.0 to 9.0 mm. Color chocolate-brown to yellow. September–October. Larvae hibernate after feeding. Found on *H. persicum* Bge.

3 (2). Case consists of three pieces arranged at an angle in relation to each other. Figures 42a and 42b. .... **Coleophora captiosa** Flkv.

Case leafy, consists of thin caudal tube (initial case rolled from cut skin of first mine) and two apices of hollowed branches. In gluing second and third pieces, larva changes orientation of case each time, so that dorsal side becomes ventral. Some branches with dried apex; usual piece may be much longer than required and even protrude behind case, giving it an unusual appearance. Valve undeveloped, and moth moves out of case through caudal tube, using suture on lower side. Length 6.5 to 7.5 mm. Color chocolate-brown to yellow. September–October. Larvae hibernate after feeding. On *H. aphyllum* (Minkw.) Iljin.

4 (1). Larvae do not feed by assimilating branches.

5 (6). Larvae in case. Figure 43 ... **Coleophora gallivora** Flkv.

Case silky and surface slightly rugulose, homogeneous. Four to five stripes along case, which are not straight, sometimes contiguous at anterior or posterior ends; stripes not distinguished by color, simply smoother than intervals between them, and perceptible only under high magnification in case not yet fully formed. Valve three-sided. Length up to 6.0 mm. First generation lives in galls of flies and especially psyllids (*Cailardia* Bergev.); larvae again complete construction of case and pupate inside gall. Autumn generation, developing mainly at cost of fruit, undergoes hibernation in yellowish or chocolate-brown cases. May–beginning of June and September–beginning of October. Larvae hibernate after feeding. In addition to saxaul, also found on *Arbuscula*.

6 (5). Larvae without case.

7 (8). Larvae form galls on branches. Figure 44 .... **Coleophora galligena** Flkv.

Galls oblong-oval, up to 15 mm long, in form of slightly bulging branches, and hence barely discernible. Found only on previous year's thin branches. August–September and (after hibernation) April–May. On *H. persicum* Bge.

8 (7). Larvae feed on fruit .... **Coleophora saxauli** Flkv.

Larvae yellowish-white with chocolate-brown head; prolegs reduced, without crochets. Length 5.0 to 6.0 mm. End of September–October. Larvae hibernate after feeding in sand-covered cocoons. On *H. aphyllum* (Minkw.) Iljin and *H. persicum* Bge.

Lycium (Solanaceae)

1 (2). Case covered with multiple transverse pieces of leaves; caudal end down-curved. Figure 45 .... **Coleophora stegosaurus** Flkv.

Case leafy, consists of up to 20 pieces, and ctenoid on dorsal side. Pieces glued together only on upper side, free on lower side, and entire lower side of case consists simply of silky network. Ventral keel well developed in caudal part of case. Valve two-sided. Length 11 to 13 mm. Color of silky base of case chocolate-brown, leafy pieces chocolate-brown to yellow. End of May–October. Larvae hibernate after feeding. On *L. ruthenicum* Murr.

2 (1). Case consists of several (five to six) obliquely arranged pieces; caudal end straight. Figure 46 .... **Coleophora lycii** Flkv.

Case leafy, consists of five or six (rarely seven) pieces, length of which distinctly greater toward front; length of anterior larger pieces greater than width. Case broad in middle, attenuates caudally (quite steeply but uniformly so). No distinct keel present. Valve two-sided. Length 10 to 12 mm. Color yellow to chocolate-brown; three to four posterior pieces (overwintered case) rather faded. July–October and (after hibernation) end of April–May. Young larvae hibernate. On *L. ruthenicum* Murr.

Malpigipila (Chenopodiaceae)

1 (2). Larvae without case; entire development takes place inside fruit .... **Coleophora campella** Flkv.

Larvae chocolate-brown or ocher-yellow, with more or less discernible chocolate-brown band in middle of each segment; head brown; prolegs absent on segment VI of abdomen and reduced on segments III–V, without crochets; crochets well developed on anal prolegs. Length 4.0 mm. End of September–October. Larvae-hibernate after feeding. On *M. gemmascens* Pall.

2 (1). Larvae with case, prepared after hollowing fruit.

3 (6). Case consists of hollowed fruits.

4 (5). Case consists of two immature fruits (without alate appendages), rarely of one large fruit; subsequently made of silky discharge [see couplet 7 (8)]. Larvae with dark punctation (tubercles colored). Figure 47a and 47b .... **Coleophora tytri** Flkv.

5 (4). Case consists of three fully developed fruits sequentially one over the other; subsequently constructed with silky discharge. Larvae monochromatic (tubercles not colored). Figure 48 .... **Coleophora** sp.

Case consists of three fruits attached to each other. After hollowing fourth fruit, larvae make a large hole in its outer surface and exit from the case to hibernate in soil. Length of case 7.0 to 8.0 mm. Color, depending on color of fruit, yellow or red with varying tones. September-October. Larvae hibernate after feeding. On *M. gemmascens* Pall.

6 (3). Case silky.

7 (8). Case cylindrical, uniform in diameter, smooth. Figure 47c. .... **Coleophora tytri** Flkv.

Case silky, somewhat slender, slightly curved. Consists of five to six cylindrical sections; sutures between them often visible as darker rings. Cephalic opening in vertical plane (in relation to longitudinal axis of case). Valve three-sided, made after cutting fruit in caudal part of case. Length 4.5 to 5.3 mm. Color chocolate-brown to yellow, usually with light ocherous tinge; case of young larvae yellowish. September–October. Larvae hibernate after feeding. On *M. gemmascens* Pall.

8 (7). Case short and stout, broader in middle, covered with plant pubescence. Figure 49 .... **Coleophora stuposa** Flkv.

Case silky, very compact, dorsal side highly convex, ventral side almost straight. Cover of case clothlike, dense; sometimes incidental sand particles adhere to it. Cephalic opening located in slightly slanted plane, and in incomplete cases in horizontal plane. Valve three-sided, short. Length 4.5 to 5.0 mm. Color of cover gray, silky base brown, with five to six indistinct but lustrous longitudinal lines partially obliterated by surrounding pubescence. Case of young larvae whitish-gray. September–October. Larvae hibernate after feeding. On *M. gemmascens* Pall.

Nanophyton (Chenopodiaceae)

1 (2). Larvae without case, inside fruit (prepare case only on entering hibernation) .... **Coleophora diogenes** Flkv.

Larvae dull yellow, young larvae with pinkish tinge, head chocolate-brown. Prolegs reduced, without crochets; anal prolegs with crochets. Length about 5.0 mm. October–beginning November. Larvae hibernate after feeding in case.

2 (1). Larvae with case, inside fruit.

3 (4). Case covered with sand; cephalic opening located in oblique plane. Figure 50 .... **Coleophora nanophyti** Flkv.

Case silky, compact (short and thick); sandy cover continuous. Valve three-sided, very short, barely perceptible. Length 4.5 to 5.0 mm. In spring, after sandy cover completed during hibernation, color of case turns whitish-gray. September–October. Larvae hibernate after feeding. On *N. erinaceum* Pall. (Bge.).

4 (3). Case without inclusions, smooth. Cephalic opening located in vertical plane. Figure 51 ... **Coleophora diogenes** Flkv.

Case silky, straight, cylindrical, surface slightly rough, without inclusions. Valve three-sided. Length 4.5 to 5.5 mm. Color dark chocolate-brown. Larva moves out of fruit for hibernation. October–early November. Larvae hibernate after feeding. On *N. erinaceum* Pall. (Bge.).

Salsola (Chenopodiaceae)

1 (1). Larvae without case, inside stem .... **Coleophora transcaspica** Toll.

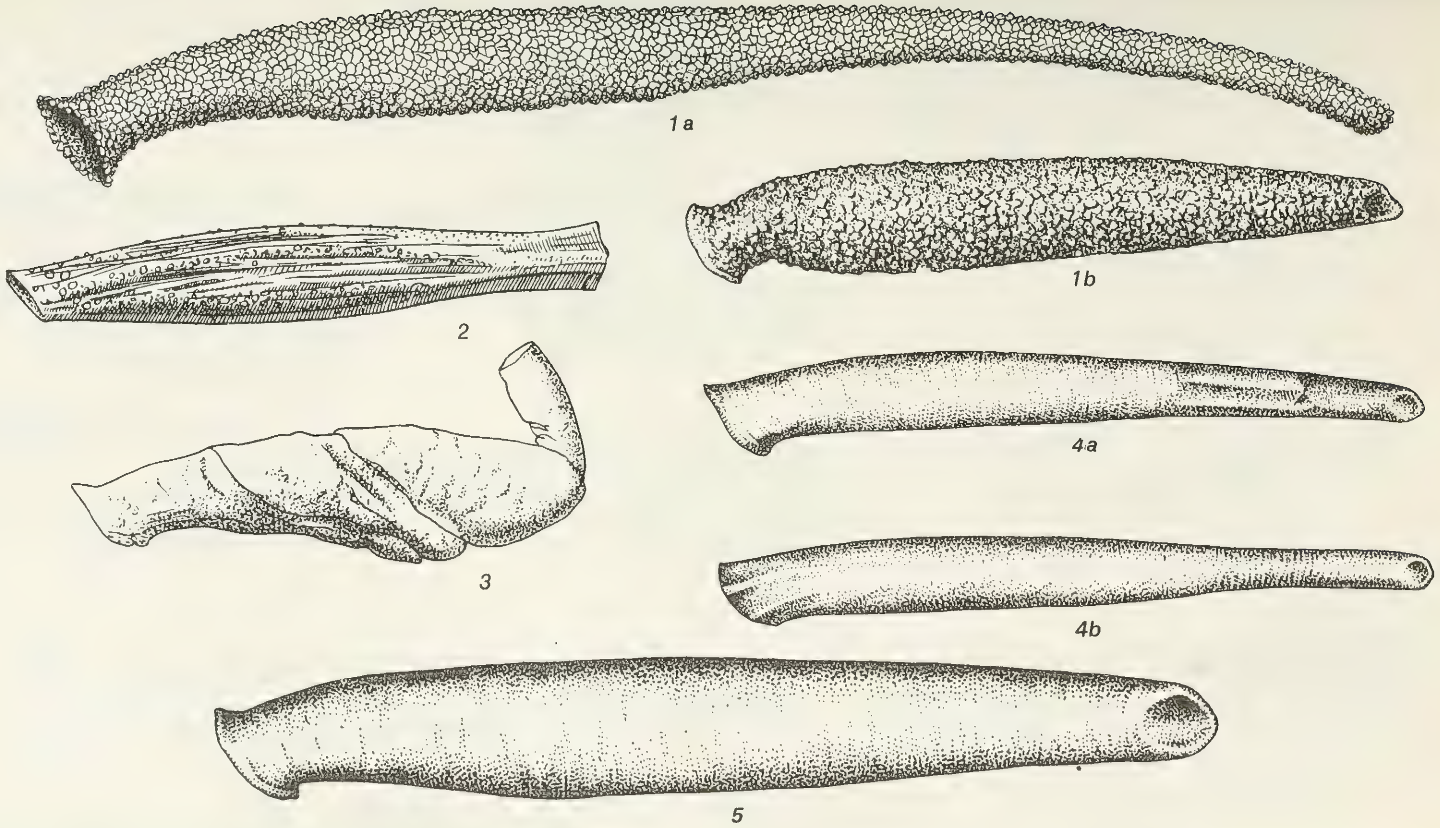
Larvae yellow, rather bright; head chocolate-brown. Segments of thorax slightly broadened, thoracic legs reduced. Prolegs on abdominal segments III–V fused into unpaired middle tubercle, and only one series of fused crochets developed on segment III; segments IV and V unarmed. Prolegs absent on segment VI. Anal prolegs with crochets. Length 12 mm. Bores along free path in stem in which it moves rapidly up and down. July–October. Larvae hibernate after feeding. On *Salsola paulsenii* Litv., but probably also lives on other annual saltworts.

DESCRIPTION OF NEW SPECIES

Coleophora testudo Falkovitsh, sp. n.

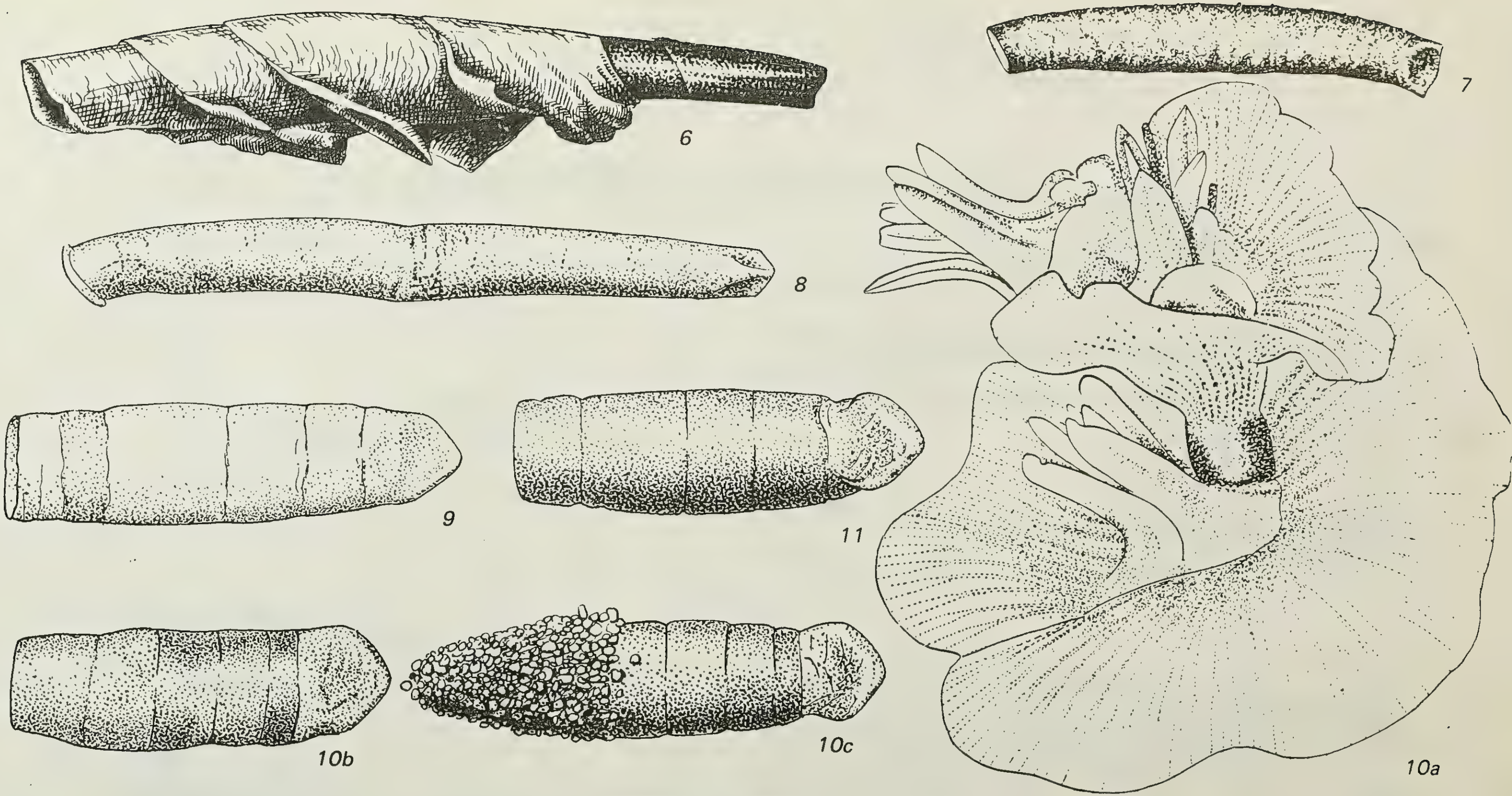
This species is close to *C. crocinella* Tngstr. Major distinctions: color of forewing more dull; spinescent section of ductus bursae much shorter; and case entire, consists of single piece of leaf (in other species of this group consists of several pieces).

Wingspan 10.5 to 11.5 mm. Palpi comparatively slender, whitish, sometimes with admixture of chocolate-brown on upper side of 2nd and 3rd segments. Length of palpi 2.5 to 2.6 times greater than diameter of eye; 2nd segment almost equal to 3rd in length, cluster of scales at end short, not longer than one-fourth 3rd segment. Basal segment of antennae covered with dense ruffled scales that do not form clusters. Base of flagellum slightly thickened because of compact scales. In female this section not longer than basal segment, with



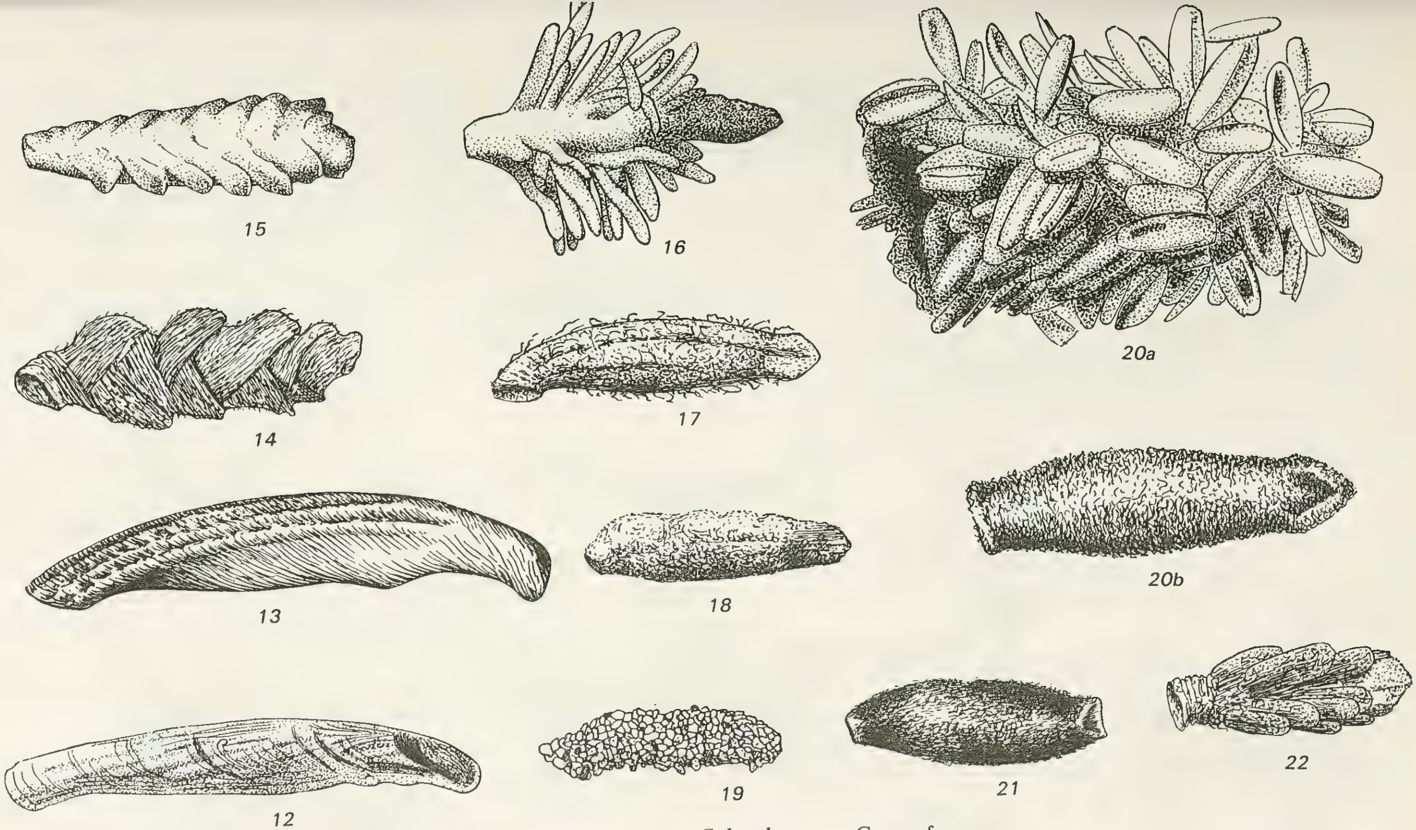
Figures 1 to 5. *Coleophora* spp. Cases.

1 and 2—species living on *Acanthophyllum:* 1a—*C. dentatella* Toll and Ams., intermediate stage of case construction; 1b—same, completed case; 2—*C. afghana* Toll and Ams.; 3 to 5—species living on *Aellenia:* 3—*C. tshogoni* Flkv., 4a and 4b—*C. dormiens* Flkv.; 5—*C. aelleniae* Flkv.



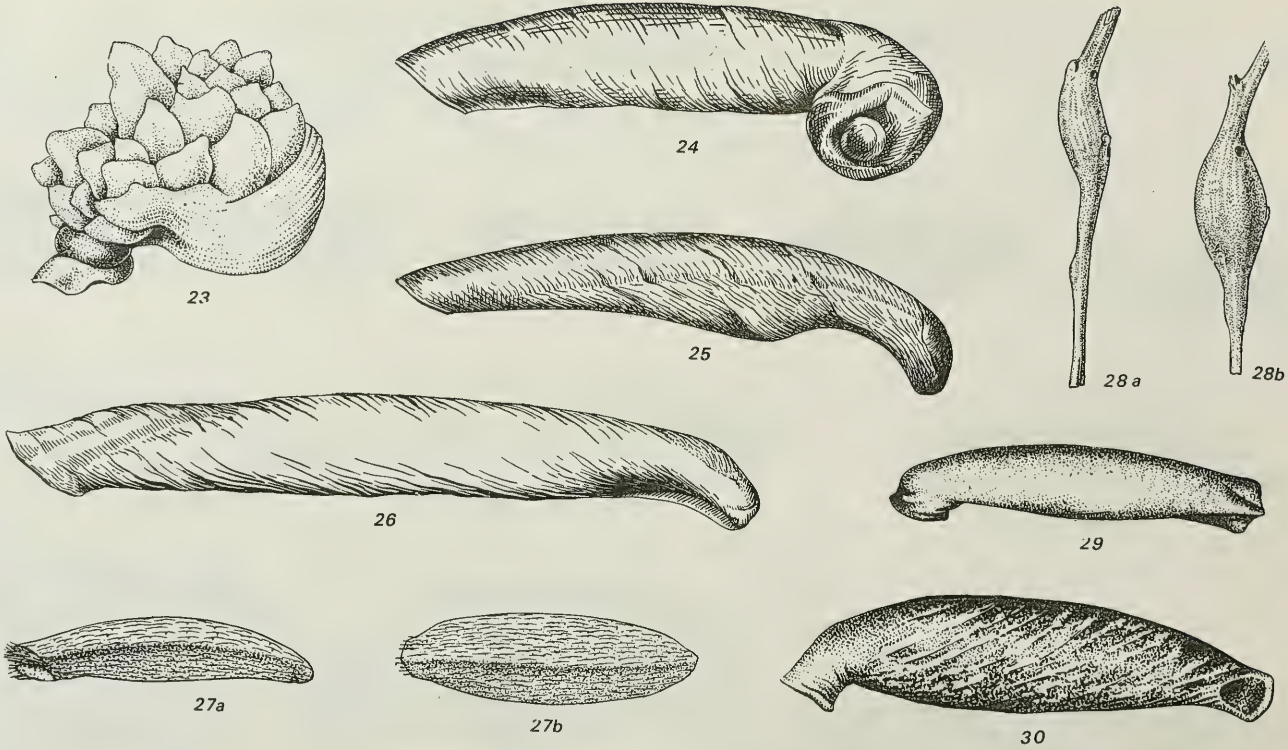
Figures 6 to 11. *Coleophora* spp. Cases of species living on *Arbuscula*.

6—*C. bojalyshi* Flkv.; 7—*C. petraea* Flkv.,; 8—*Coleophora* sp.; 9—*C. macrura* Flkv.; 10a — *C. tsherkesi* Flkv., intermediate stage of case construction; 10b — same, completed case; 10c — same, hibernation case; 11 — *C. isabellina* Flkv.



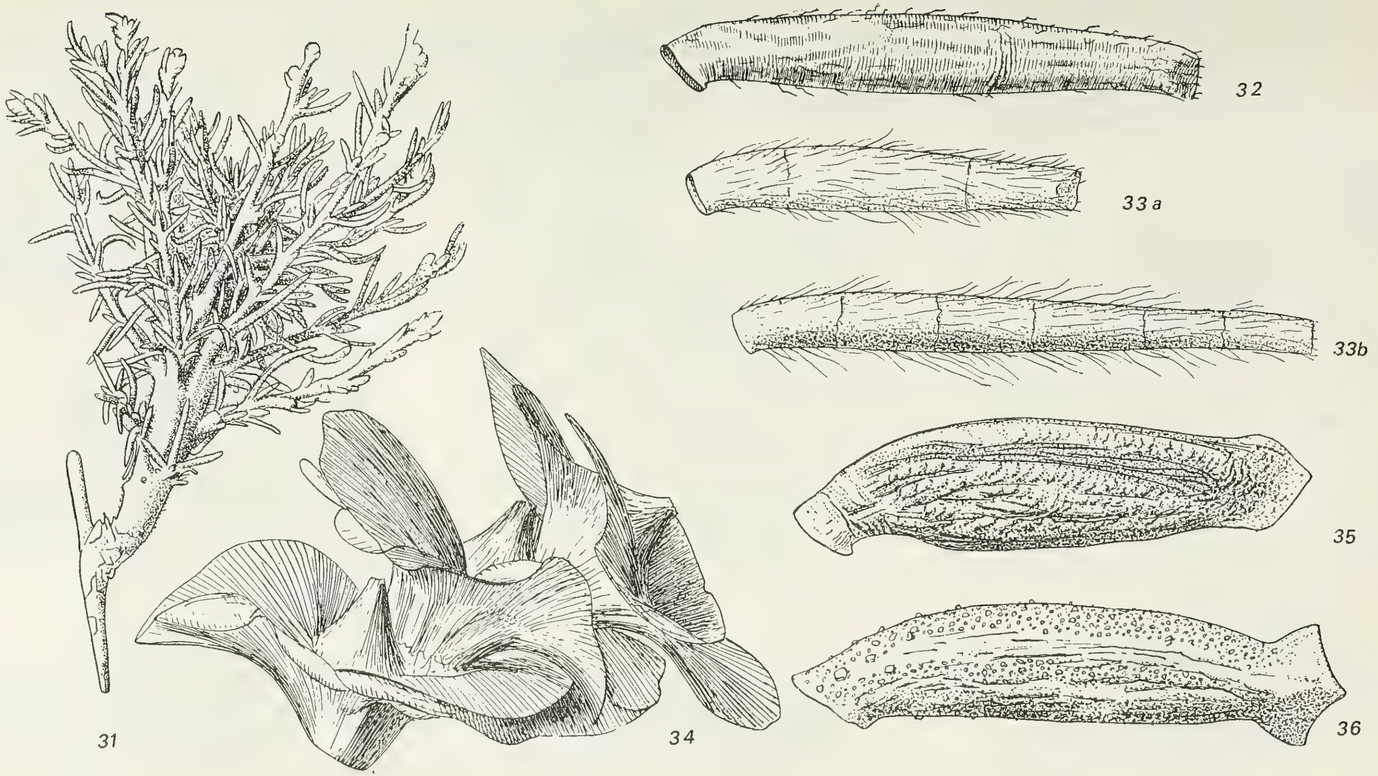
Figures 12 to 22. *Coleophora* spp. Cases of species living on *Artemisia*.

12 — *C. zhusani* Flkv.; 13 — *C. gazella* Toll; 14 — *C. vitilis* Flkv.; 15 — *C. subparcella* Toll and Ams.; 16 — *C. paraptarmica* Toll and Ams.; 17 — *C. seriphidii* Flkv. in litt.; 18 — *C. polynella* Flkv., spring generation; 19 — *C. psammion* Flkv.; 20a — *C. amentastra* Flkv.; 20b — same, after hibernation; 21 — *C. polynella* Flkv., autumn generation; 22 — *Coleophora* sp.



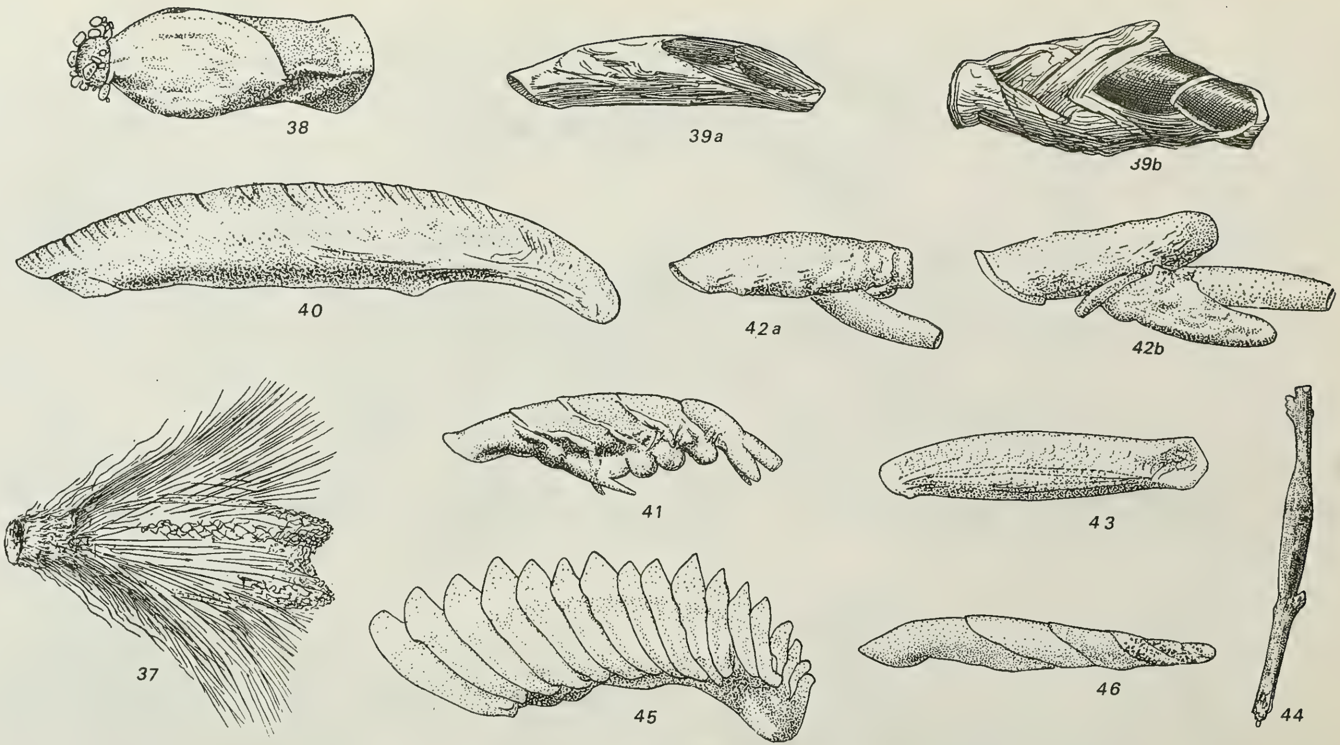
Figures 23 to 30. *Coleophora* spp. Cases and galls.

23 to 27 — species living on *Astragalus*: 23 — *C. astragalorum* Flkv.; 24 — *C. albens* Flkv.; 25 — *C. singreni* Flkv.; 26 — *C. eucoleos* Flkv.; 27a — *C. testudo* Flkv., lateral view; 27b — same, dorsal view; 28 — *C. serinipennella* Chr., galls on stems of *Atriplex*; 29 to 30 — species living on *Calligonum*: 29 — *C. zhusguni* Flkv.; 30 — *C. calligoni* Flkv.



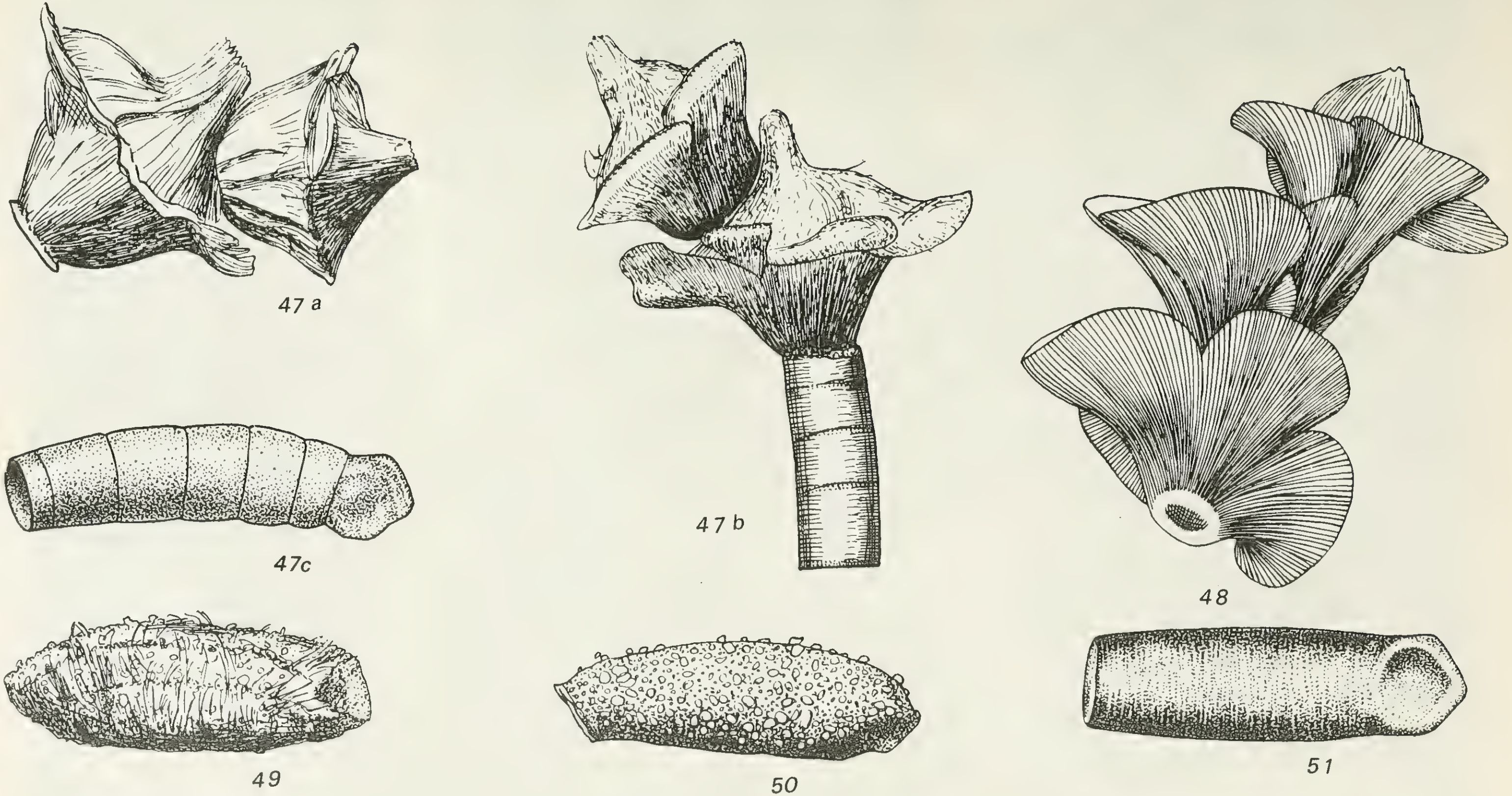
Figures 31 to 36. *Coleophora* spp. Cases and galls of species living on *Caroxylon*.

31 — *C. elephantella* Flkv., gall on branch of *Keireuk*; 32 — *Coleophora* sp.; 33a — *C. keireuki* Flkv.; 33b — same, intermediate stage of case construction; 34 — *C. pagodella* Flkv.; 35 — *C. cyrta* Flkv.; 36 — *C. psamata* Flkv



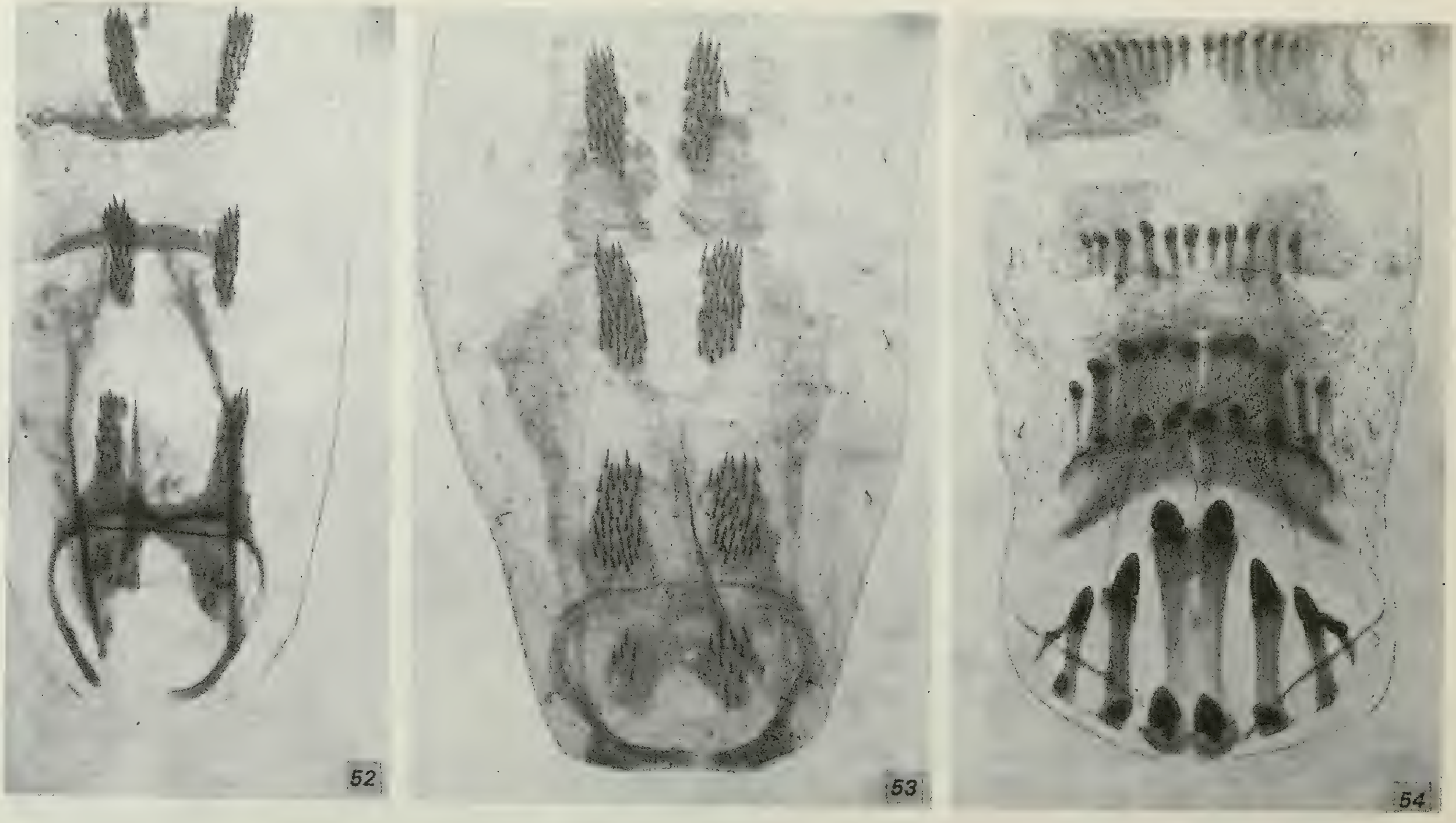
Figures 37 to 46. *Coleophora* spp. Cases and galls.

37 — *Coleophora* sp. living on *Ceratoides*; 38 and 39 — species living on *Corispermum*: 38 — *C. trientella* Chr.; 39a — *C. asperginella* Chr., lateral view; 39b — same, dorsal view; 40 — *C. eremosparti* Flkv. living on *Eremosparton*; 41 to 44 — species living on *Haloxylon*: 41 — *C. haloxyli* Flkv.; 42a — *C. captiosa* Flkv., intermediate stage of case construction; 42b — same, completed case; 43 — *C. gallivora* Flkv.; 44 — *C. galligena* Flkv.; 45 and 46 — species living on *Lycium*: 45 — *C. stegosaurus* Flkv.; 46 — *C. lycii* Flkv.



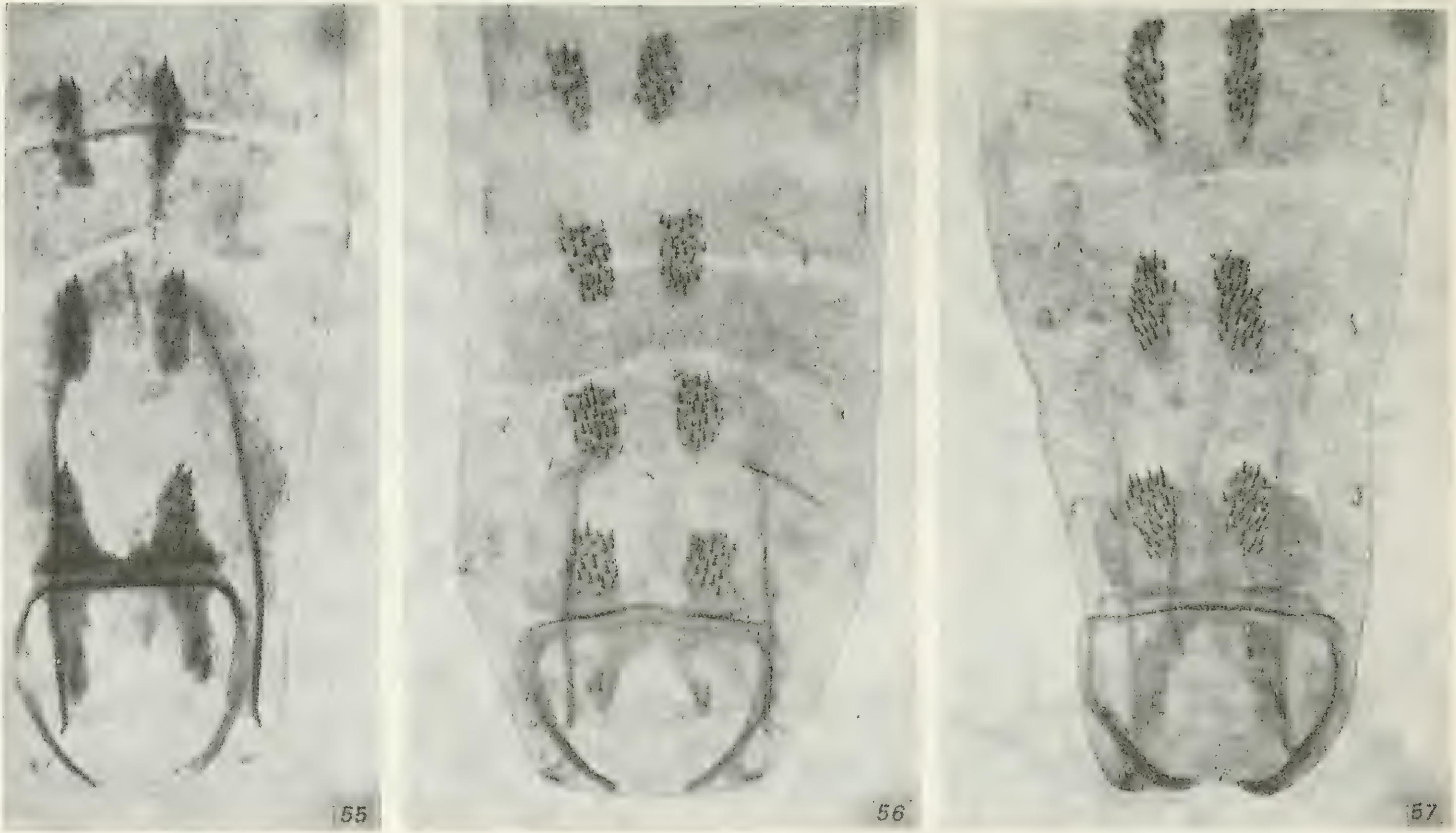
Figures 47 to 51. *Coleophora* spp. Cases.

47 to 49 — species living on *Malpigipila*: 47a — *C. tytri* Flkv., initial stage of case construction; 47b — same, intermediate stage; 47c — same, completed case; 48 — *Coleophora* sp.; 49 — *C. stuposa* Flkv.; 50 and 51 — species living on *Nanophyton*: 50 — *C. nanophyti* Flkv.; 51 — *C. diogenes* Flkv.



Figures 52 to 54. *Coleophora* spp., males, basal segments of abdomen.

52 — *C. testudo*, sp. n.; 53 — *C. vitilis* sp. n.; 54 — *C. pagodella*, sp. n.



Figures 55 to 57. *Coleophora* spp., males, basal segments of abdomen.

55 — *C. psammion*, sp. n.; 56 — *C. stuposa*, sp. n.; 57 — *C. psamata*, sp. n.

yellowish scales; in male even shorter and darker, brown. Further, flagellum annular, consists of alternating pure white and dark brown segments. Head and back white, with somewhat yellowish tinge. Forewings ocherous-yellow or chocolate-brown to dull yellow (especially in basal half). A narrow and rather fine white stripe extends along anterior margin. Another barely perceptible whitish line extends along fold of anal area in basal half. Posterior margin of wing with diffuse whitish stripe, which usually extends beyond beginning of fimbria. Outer margin of wing edged with scattered whitish scales (sometimes absent in male). Fimbria grayish, brown at wing apex, and white at anterior margin. Hind wings and fimbria pale, grayish. Spinescent plates on tergites of abdomen (Figure 52) oblong, with rounded or pointed ends in male, usually large, sometimes almost rectangular in female; number of spines often 30 to 40. Spines also developed on segment I, but only a few (up to 10) on each plate.

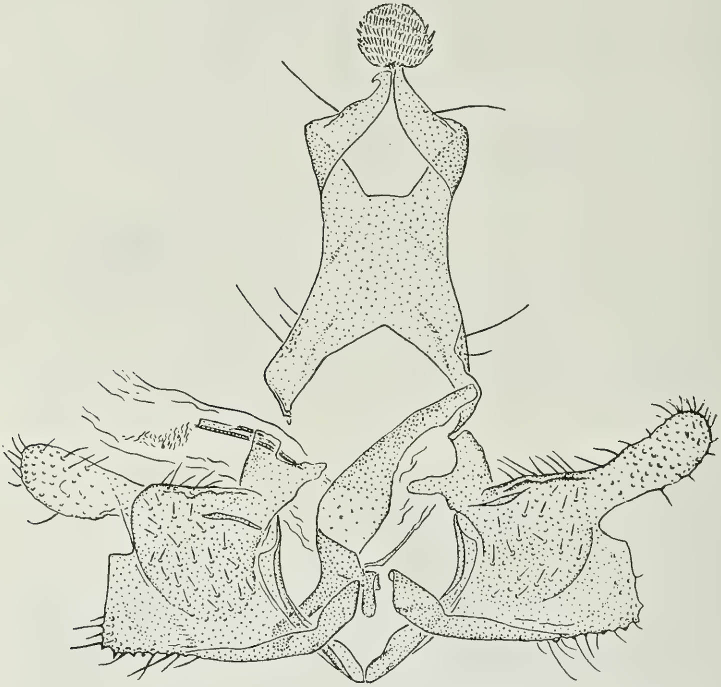
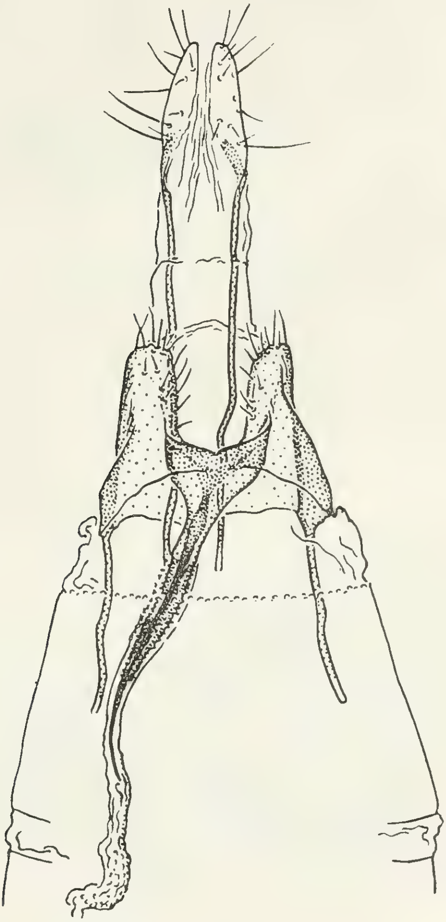


Figure 58. *Coleophora testudo* Falkovitsh, sp. n., holotype, male, genitalia. Permanent preparation No. 798.

Male genitalia (Figure 58): Gnathos rounded. Aedoeagus almost straight, sclerotized on upper side, near base, and also on left side (i.e., consists of a single cord). Cecum long and slender. Cornutus in form of comparatively small sclerotized strip. Sacculus almost rectangular, its lower margin in-curved, its distal part (near ventrocaudal corner) unevenly dentate. Dorsocaudal corner obtuse. Cucullus membranous, comparatively small, slightly oval, narrow at base.

Female genitalia (Figure 59): Anal papillae oblong, transparent, with sparse but rather stout setae. Posterior apophysis twice length



Figures 59. *Coleophora testudo* Falkovitsh, sp. n., female, genitalia.

of anterior. Sternite VIII almost trapezoidal, its length slightly less than width. Caudolateral corners slightly rounded. Middle notch of posterior margin broad, reaching center of sternite, surrounded with short setae. Antrum cyathiform, with broad ostium. Spinescent part of duct distinctly shorter than segment VIII, with well-expressed central cord rising beyond limits of spinescent part by two-thirds length of latter. Signa not present.

Material: Holotype, male. Zhamansai demarcated area, Bukhara District, May 3, 1972, ex 1., from *Astragalus unifoliolatus*. Paratypes, five males and nine females. Same site, May 3–6, 1972, ex 1.; one male and three females, Ayakguzhumdy in Bukhara District, May 4–5, 1972, ex 1., from *A. villosissimus* (Fal'kovich).

Coleophora vitilis Falkovitsh, sp. n.

Belongs to *C. ptarmica* Wlsm. group; distinguished from all other species of this group by short process at dorsocaudal corner of sacculus, absence of spines on bursal duct, and structure of case (without protruding pieces of leaves).

Wingspan 13 to 15 mm. Palpi slender, whitish; length 1.5 to 1.6 times diameter of eye; 2nd segment about equal to 3rd in length,

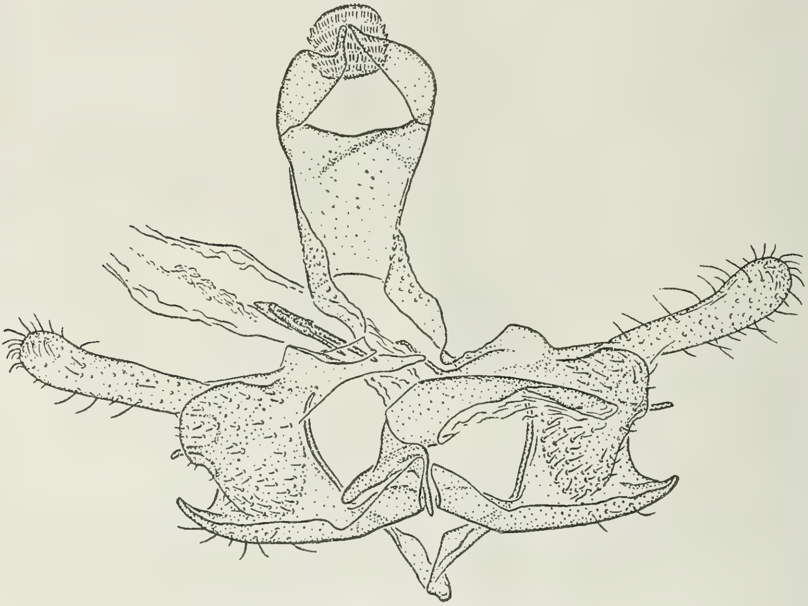


Figure 60. *Coleophora vitilis* Falkovitsh, sp. n., holotype, male, genitalia. Permanent preparation No. 799.

without distinct cluster of scales at end; 3rd segment acuminate. Basal segment of antennae without brush, covered with dense, slightly divergent scales. Flagellum simple, dull white, annular but not sharply so; segments darken in middle section so that basal part of flagellum light and apical part dark. Head and back whitish, with very light chocolate-brown to yellow tinge. Forewings whitish along radial and cubital stems, as well as anal vein; faded ocherous lines also present but not usually visible to naked eye. These lines continue along all branches of *R, M,* and *Cu* but even less discernible and interrupted at places. Hind wings pale gray. Fimbria of both pairs of wing whitish-gray. Forelegs with broad chocolate-brown stripe along outer side. Spinescent plates on tergites of abdomen (Figure 53) almost rectangular (somewhat uneven), gradually attenuate toward caudal end. Segments II to IV with 40 to 50 spines each in male and 50 to 60 spines each in female. Abdominal sternites of female membranous, sclerotized in male (sternites IV and V with median interval, sclerotization on segment VI becomes punctate and disappears on segment VII).

Male genitalia (Figure 60): Gnathos small, rounded. Aedoeagus with fairly narrow left cord; right cord discernible near base of aedoeagus. Cecum comparatively slender and long. Cornuti consist of two spines firmly attached at base. Sacculus broad; both caudal corners form pointed dents, slightly in-curved; lower dent larger than upper and notch between dents semicircular. Valvula large, with rounded and highly raised outer margin, and sparsely pubescent. Cucullus long and narrow, broadens slightly at apex.

Female genitalia (Figure 61): Anal papillae short and broad, with fairly dense long setae. Anterior apophysis 8.0 to 9.0 times shorter than posterior. Sternite VIII short, width greater than length, caudolateral corners rounded. Median notch of posterior margin deep, with seven to eight medium-sized setae on each side. Narrow ridges originate from middle of lateral margins of ostium and continue almost parallel to anterior margin of sternite VIII toward base of anterior apophysis. Antrum broad, cyathiform. Sclerotized part of duct reaches half length of segment VI; its lateral cords transversely rugulose, without spines. Signa in form of almost rectangular plate; dentation uniform in width, apically rounded.

Material: Holotype, male. Zhamansai demarcated area, Bukhara District, June 1, 1972, ex 1., from *Artemisia juncea*. Paratypes, 56 males and females. Same site, May 30–June 6, 1972, ex 1. (Fal'kovich).

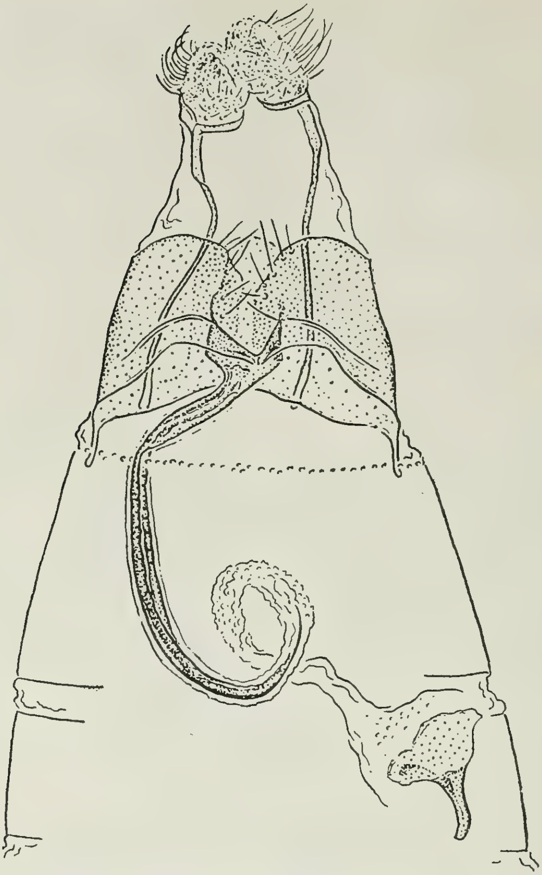


Figure 61. *Coleophora vitilis* Falkovitsh, sp. n., female, genitalia.

Coleophora campella Falkovitsh, sp. n.

Species occupies an isolated taxonomic position.

Wingspan about 8.0 mm. Palpi yellow to whitish, slender, length almost equal to diameter of eye; 3rd segment slightly longer than 2nd. Proboscis very long. Basal segment of antennae without brush, on lower side with slightly divergent yellowish scales; base of flagellum over length equal to basal segment slightly flattened because of similar yellowish scales; further, flagellum almost white with dark brown annulations. Forewings whitish with distinct sandy-yellow tinge and scattered brown scales, which also form diffuse discal spot. Hind wings gray. Fimbria of both pairs of wings pale, grayish. Spinescent plates

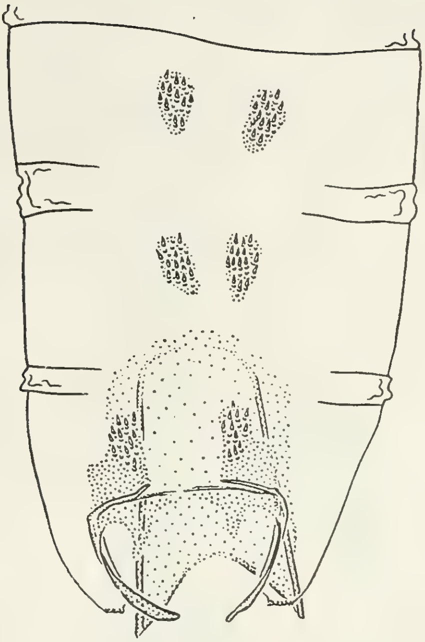


Figure 62. *Coleophora campella* Falkovitsh, sp. n., female, basal segments of abdomen.

(Figure 62) short and oval, almost equal in size from abdominal tergites II to VII; number of spines on each about 30. Segment I of abdomen devoid of spines.

Female genitalia (Figure 63): Ovipositor extremely long, telescopic. Anal papillae small, narrow, sclerotized, without setae. Hind apophysis 3.3 to 3.4 times longer than anterior. Sternite VIII highly attenuate toward posterior end, almost conical; posterior margin with minute pubescence along sides. Median notch of posterior margin deep; ostium located in center of sternite. Antrum very large, urceolate (broad region in middle oval in shape), and reaches half length of segment VII. Caudal part of duct broad, highly sclerotized, without spines; curves sharply to left, extends forward, forming broad transverse and longitudinal folds. Its surface, like antrum, covered with dense minute plates and appears granulated. Single sclerotized section occurs mid-length of duct. Signa in form of plate with rounded margins and raised lateral corners; depression slightly longer than plate itself, unguiculate.

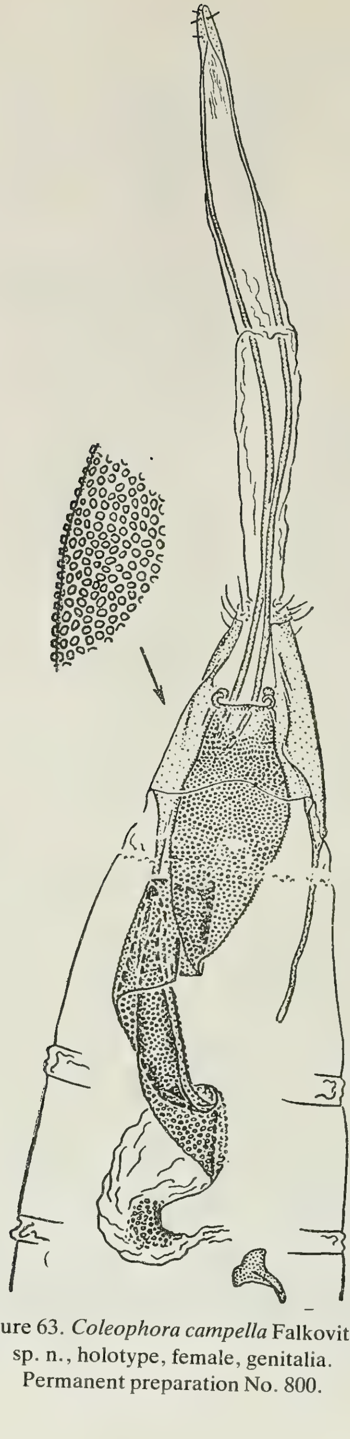


Figure 63. *Coleophora campella* Falkovitsh, sp. n., holotype, female, genitalia. Permanent preparation No. 800.

Material: Holotype, female. Ayakguzhumdy in Bukhara District, July 20, 1972 ex 1., in fruit of *Salsola* (*Malpigipila*) *gemmascens* (Fal'kovich).

Coleophora pagodella Falkovitsh, sp. n.

Close to *C. saxauli* Flkv. and *C. ammodyta* Flkv.; distinguished by chocolate-brown to gray color of forewing and details of genital structure.

Wingspan 12 mm. Palpi slender, faded yellow, 1.5 times or slightly greater in length than diameter of eye; 3rd segment 1.3 times shorter than 2nd. Basal segment of antennae with divergent scales on lower side forming fimbria. Flagellum with short compact scales at base; this region almost same length as basal segment or slightly more. Rest of flagellum sharply annulate. Color of head, back, and wings pale chocolate-brown to gray. Chocolate-brown scales scattered singly or in groups throughout wing surface; groups quite distinct in form as diffuse spots on discal vein and especially in middle of anal fold. Hind wings and fimbria brownish-gray. Spinescent plates (Figure 54) by and large same as in other related species.

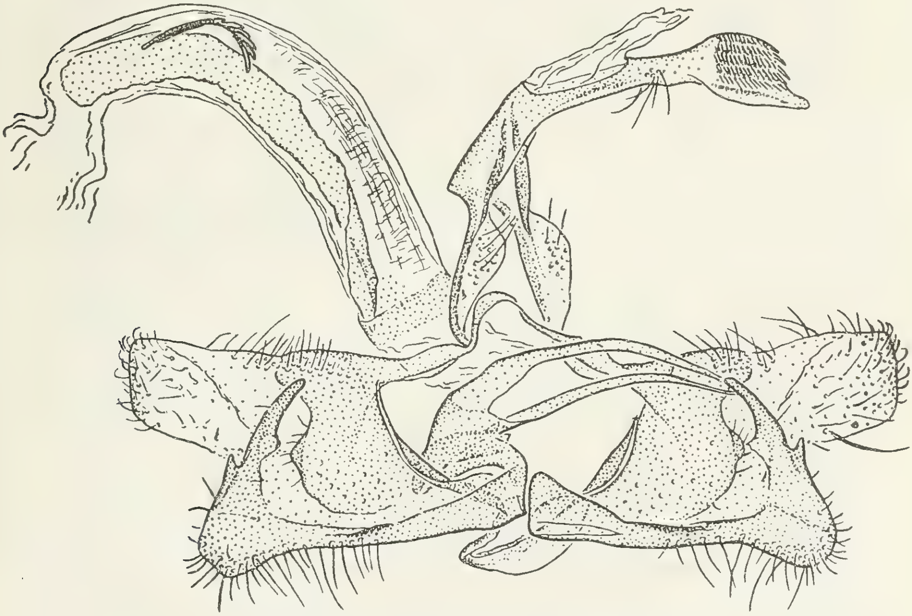


Figure 64. *Coleophora pagodella* Falkovitsh, sp. n., holotype, male, genitalia. Permanent preparation No. 801.

Male genitalia (Figure 64): Gnathos similar to that of *C. saxauli* Flkv., with glabrous beak-shaped apex. Left cord of aedeagus broader and slightly longer than right cord and situated above it. Ejaculatory duct longer than valves, with relatively small cluster of cornuti. Sacculus lobate, uniformly rounded, with notch on lower margin; apical spine moderately long, slightly in-curved; additional spine located near base forms small angle with it. Valvula raised at a right angle on upper margin; forms small sclerotized tubercle (distinctly visible on lower side) near middle part of raised portion, which is absent in other related species. Cucullus relatively broad, almost rounded along margin.

Material: Holotype, male. Ayakguzhumdy in Bukhara District, September 2, 1970, ex 1.; on fruits of *Salsola* (*Caroxylon*) *orientalis* (Fal'kovich).

Coleophora psammion Falkovitsh, sp. n.

This species is very close to *C. obliterata* Toll; distinguished by presence of median depression on short cord of aedeagus, sharper cornutus, and smaller size of moths.

Wingspan slightly more than 7.0 mm. Palpi dull white, slender, their length twice diameter of eye; 2nd segment almost covered with close-set scales, without cluster; 3rd segment almost equal to 2nd in length (may be slightly shorter). Basal segment of antennae with close-set scales; flagellum simple, dull white, with diffuse brown annulations. Head and back dull white. Forewings grayish-white; diffuse brown darkening continues along radial stem and its branches; similar but narrower, barely discernible line extends along anal vein. These lines (mainly in apical half of wing) accompanied by scattered dark brown scales. Hind wings light gray, with luster. Fimbria of both pairs of wings pale, grayish. Spinescent plates of tergites of abdomen (Figure 55) elongated, irregularly oval, gradually attenuate toward caudal end; largest one (segment VIII) with 10 to 11 spinules. Plates of segment I with four to six spines each. Sternites of abdomen sclerotized.

Male genitalia (Figure 65): Gnathos oval. Aedoeagus very long, arched, its right cord longer, highly flattened before end, broad, and down-curved; small depression located on upper side near middle part of left cord. Sclerotized part of ejaculatory duct short and slender, cornutus one (very slender spine on narrow plate). Valves by and large same as in *C. obliterata* Toll. Ventrocaudal corner raised in form of small depression; dorsocaudal corner almost equal in width to appendage. Apex of appendage turned, flat, its base with large triangular

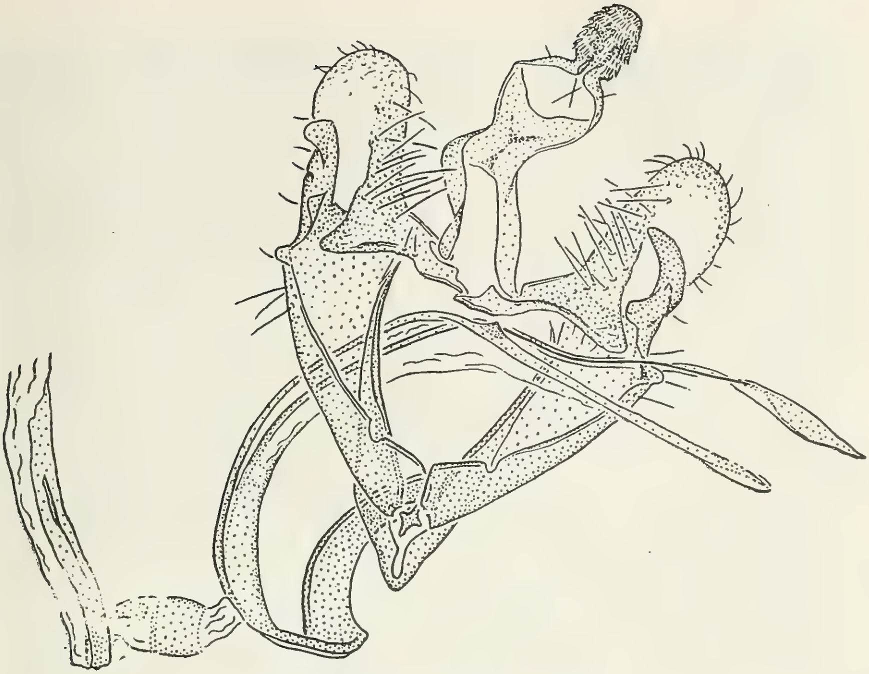


Figure 65. *Coleophora psammion* Falkovitsh, sp. n., holotype, male, genitalia. Permanent preparation No. 802.

depression, and small tubercle situated at middle. Valvula forms obtuse angle on lower side. Cucullus fairly broad, uniform in width, with rounded apex.

Material: Holotype, male. Kul'dzhuktan mountains in Bukhara District, June 9, 1972 ex 1., *Artemisia turanica* (Fal'kovich).

Coleophora stuposa Falkovitsh, sp. n.

Based on pattern of forewings, quite close to *C. psamata* sp. n., but differs sharply in barely perceptible ventrocaudal corner of sacculus and absence of long spines on ductus bursae.

Wingspan 10.5 to 12.5 mm. Palpi white; 2nd segment light yellow on outer side. Length of palpi slightly more than twice diameter of eye; 2nd segment with small close-set scales, without terminal cluster; 3rd segment 1.1 to 1.2 times shorter than 2nd. Basal segment of antennae yellow on outer side, covered with short, even, and slightly divergent scales on ventral surface. Flagellum simple, whitish. Color of head and pronotum white with yellow tinge, particularly distinct on frons and at base of tegulae. Forewings ocherous-yellow; broad stripes extending along wing white with silky luster. Costal stripe broadest, almost equal to half wing width at middle, and continues to costal fimbria. Narrow medial stripe branches off this stripe and extends toward discal apex. Third stripe located on anal fold attenuates gradually and does not reach level of discal vein. Dorsal stripe along posterior margin of wing almost same width as previous one; extends beyond commencement of fimbria. Distal ends of these three stripes located in straight line almost parallel to outer margin of wing. Discal apex tubercular, not always developed; small silky white patch usually located behind it in distal area. Indistinct dull white (usually without sheen) stripes continue along radial and medial branches; interval between stripes along outer margin with series of uneven spots or patches formed by clusters of tubercular scales. Background of wing in distal area also faded, pale yellowish, so that color nondescript here and pattern indistinct. Hind wings gray, with sheen. Fimbria of both pairs of wings grayish, light-colored. Spinescent plates of tergites of abdomen (Figure 56) irregularly oval; sometimes closer to rectangular; segments II to VI do not narrow caudally. Number of spines on single tergite from 20 to 30, on segment I usually 2 to 7.

Male genitalia (Figure 66): Uncus rounded. Both cords of aedeagus equal in shape and size, slightly curved, pointed toward end; very

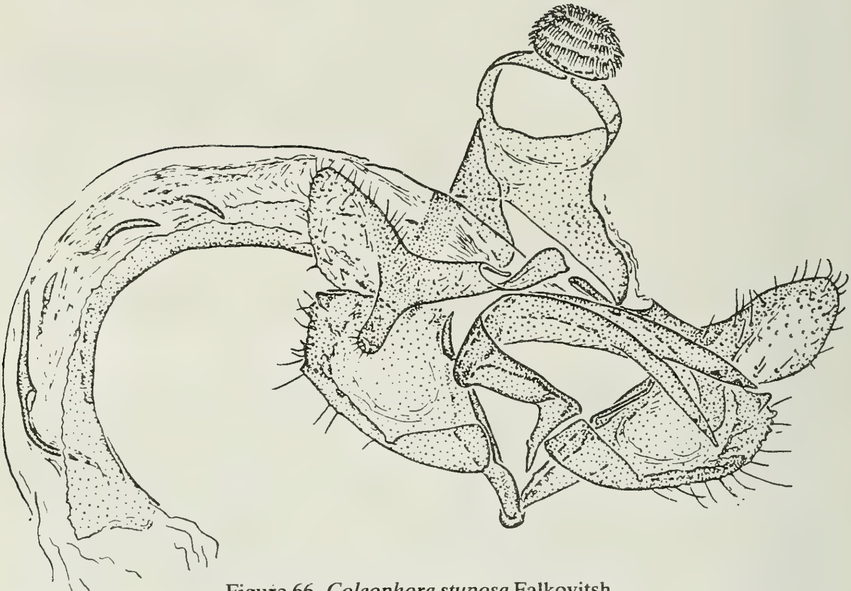


Figure 66. *Coleophora stuposa* Falkovitsh, sp. n., male, genitalia.

small, barely perceptible denticle located before end on left, and sometimes almost on right cord (in some cases two denticles present or denticles absent). Cecum short. Sclerotized part of ejaculatory duct very long, broad; cornuti few in number, all isolated: proximal one in form of large spine on very long and narrow base, three others much smaller. Sacculus rather broad; ventrocaudal corner resembles depression and curved in. Dorsocaudal corner not raised, located at level of lower margin of sacculus, and with small crest on inner margin. Caudal margin of sacculus almost straight, serrated. Valvula narrow, transversely elongated. Cucullus oblong.

Female genitalia (Figure 67): Anal papillae small, narrow, with several fairly long setae. Posterior apophysis 2.2 times longer than anterior. Sternite VIII completely sclerotized, its length less than width, caudolateral corners rounded; posterior margin with sparse long setae, its notch reaching one-third length of sternite. Antrum slightly sclerotized, broadens in middle part, its length barely greater than segment VIII. Caudal section of duct spiraled, forming 1.5 coils, with spinescent lateral cords, and well-developed central cords. Outer spinescent growth of this section poor. Middle part of duct broad, coarsely rugulose; caudal part with fine granulation. Duct very long, in stretched condition twice length of abdomen. Signa in form of irregularly rounded plate, with short broad dent. Small and uneven sclerotized stripe located on wall of bursa.

Material: Holotype, female. Ayakguzhumdy, Bukhara District, May 24, 1972 ex 1., on fruits of *Salsola* (*Malpigipila*) *gemmascens*. Paratypes, 12 males and 22 females. Same site, May 18–June 14, 1972 (Fal'kovich).

Coleophora cyrta Falkovitsh, sp. n.

Very close to *C. attalicella* Z.; differs in details of pattern and in long antrum.

Wingspan 14 to 15 mm. Palpi ocherous-yellow; 3rd segment whitish on upper side; length of palpi almost twice diameter of eye; 2nd segment with apical cluster of scales; 3rd segment distinctly shorter than 2nd. Basal segment of antennae ocherous-yellow, with slightly divergent scales on lower side. Flagellum white, not annulate. Head and back ocherous-yellow, latter with two diffuse longitudinal whitish stripes. Tegulae whitish, lustrous, with admixture of ocherous-yellow scales at base. Forewings ocherous-yellow, longitudinal stripes white and lustrous. Costal stripe, almost contiguous with fimbria, occupies about one-fourth alar width. Medial stripe isolated, distinctly raised beyond end of costal stripe. Anal stripe slightly narrower than costal, not reaching

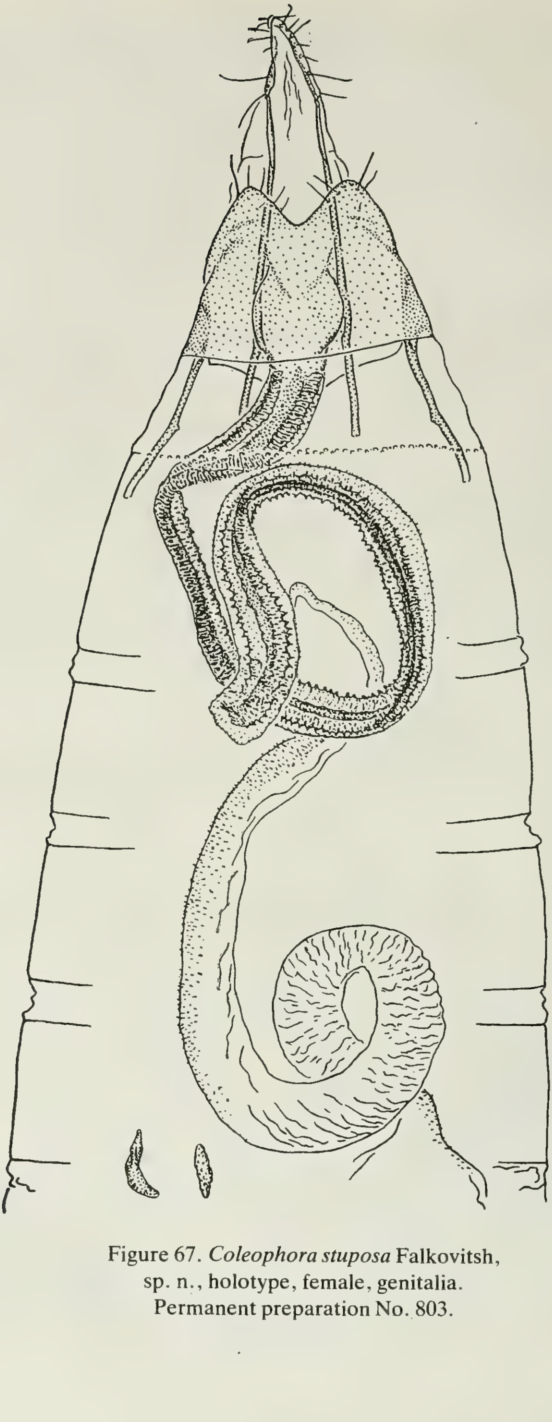


Figure 67. *Coleophora stuposa* Falkovitsh, sp. n., holotype, female, genitalia. Permanent preparation No. 803.

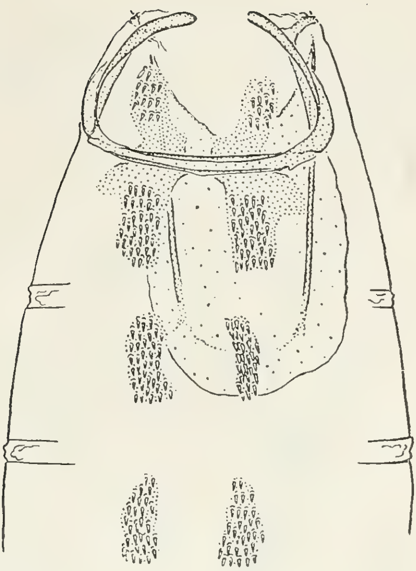


Figure 68. *Coleophora cyrta* Falkovitsh, sp. n., female, basal segments of abdomen.

outer margin of wing; terminals of these two stripes located at same level. Dorsal stripe narrow, continues beyond commencement of fimbria. Radial veins accompanied by scattered chocolate brown scales, forming very diffuse stripes. Discal spot not present. Fimbria grayish-yellow. Hind wings gray, with yellowish-gray fimbria. Spinescent plates on tergites II and III of abdomen (Figure 68) short, rectangular, each with about 40 spines. Plates become smaller toward posterior end and distinctly attenuate in anterior part. Plates on segment I small, with 10 to 15 spinules each.

Female genitalia (Figure 69): Anal papillae small, elongated. Posterior apophysis twice longer than anterior. Sternite VIII highly sclerotized, trapezoidal, with deep (up to one-third length) semicircular notch on posterior margin. Rounded laterocaudal corners with fairly long setae. Antrum broad and long, almost reaching end of posterior apophysis, turns slightly leftward, and convex along right side. Caudal section of duct shorter than antrum, curved, with central and lateral cords, and slender minute curved spinules. More proximally duct without cord but laden with large isolated setae, and with minute plates in anterior part. Duct very long, forming urceolate spiral, three to four coils. Bursa located right at base of abdomen.

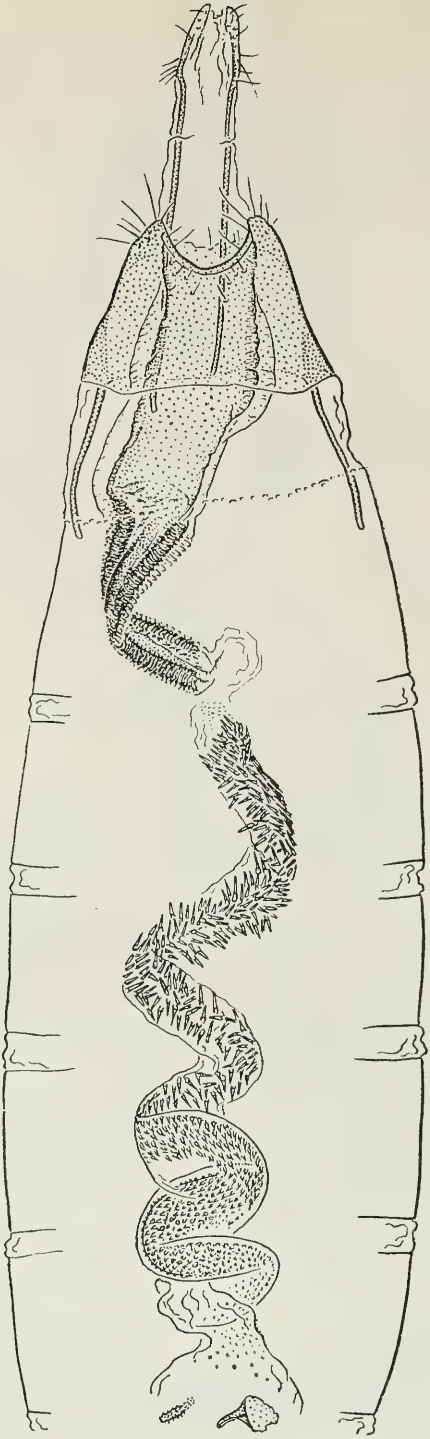


Figure 69. *Coleophora cyrta* Falkovitsh, sp. n., holotype, female, genitalia. Permanent preparation No. 804.

Signa irregularly rounded, with slender unguiculate depression. Accessory plate small.

Material: Holotype, female. Ayakguzhumdy, Bukhara District, September 1, 1969, ex 1., fruits of *Salsola* (*Caroxylon*) *orientalis*. Paratype, female. Same site, September 14, 1973, ex 1. (Fal'kovich).

Coleophora psamata Falkovitsh, sp. n.

This species is close to the preceding one but differs in larger body dimensions and peculiarities of pattern (medial stripe reduced in forewing).

Wingspan 18 to 20 mm. Palpi slender, whitish; outer side of 2nd segment with yellowish stripe along upper margin, its terminal cluster very weak, indistinct. Length of palpi about 2.5 times greater than diameter of eye; 3rd segment 1.3 times shorter than 2nd. Basal segment of antennae ocherous-yellow on outer side, whitish on inner side; ventral side covered with smooth and slightly divergent scales. Flagellum with slightly thickened basal segment, usual short scales, nonannulate, and whitish. Head and back dull yellow, with admixture of whitish scales: tegulae shiny white, with yellow spot at base. Background of forewings yellowish, consists of yellow scales with ocherous apices. Longitudinal stripes silvery-white. Median costal stripe reaches one-third width of wing or slightly more and continues up to commencement of costal fimbria. Medial stripe isolated, located in distal part of cell, short, merges into chocolate-brown discal spot. Anal stripe rather uniform in width, at base of wing joins costal stripe for short distance, its distal end almost reaching wing margin. Dorsal stripe attenuates gradually, extends notably beyond base of fimbria. Color along veins in distal area ocherous to chocolate-brown, but stripes very indistinct, consisting of scattered scales, with light yellow intervals between them. Fimbria on costal margin of wing light yellow, more grayish at outer margin. Hind wings gray, with slightly more light-colored fimbria. Spinescent plates (Figure 57) elongated, reduce slightly in caudal direction. Number of spines on segment II more than 20 and on segment I 5 to 7.

Male genitalia (Figure 70): Gnathos rounded. Left cord of aedoeagus arcuate, narrows uniformly toward end, with small laterally divergent depression almost at middle of upper margin; termination of cord obliquely truncated. Right cord less curved and less attenuate toward end, where large and upright depression located. Cecum short. Ejaculatory duct massive, highly curved, with ribbon-shaped sclerotization along ventral side. Cornutus in form of isolated large spine on rather broad plate. Sacculus large, its ventrocaudal corner almost

Figure 70. *Coleophora psamata* Falkovitsh, sp. n., holotype, male, genitalia. Permanent preparation No. 805.

straight, slightly in-curved. Dorsocaudal corner in form of massive process, also slightly in-curved, and unevenly serrated at apex; small crest continues along inner margin. Valvula small, triangular, with minute setae. Cucullus broad and short, lobate.

Material: Holotype, male. Ayakguzhumdy, Bukhara District, June 7, 1972 ex 1., on fruits of *Salsola* (*Caroxylon*) *orientalis*. Paratype, 2 males. Same site, May 23 and 25, 1969 (Fal'kovich).

REFERENCES

Fal'kovich, M.I. 1970. Novye sredneaziatskie vidy chekhlonosok (Lepidoptera, Coleophoridae), svyazannykh s drevesnokustarnikovymi rasteniyami iz semeistva marevykh (Chenopodiaceae) [New Central Asian species of case-bearer moths (Lepidoptera, Coleophoridae) associated with arboreal-shrub plants from the family Chenopodiaceae]. *Entom. Obozr.*, 49, 4, 869–885.

Fal'kovich, M.I. 1972a. Novye vidy chekhlonosok (Lepidoptera, Coleophoridae), vyvedennykh iz gusenits v pustyne Kyzylkum [New species of case-bearer moths (Lepidoptera, Coleophoridae) reared from larvae in the Kyzyl-Kum desert]. *Tr. Vsesoyuzn. Entom. Obshch-va*, vol. 55, pp. 66–92.

Fal'kovich, M.I. 1972b. Novye sredneaziatskie vidy chekhlonosok (Lepidoptera, Coleophoridae), zhivushchikh na polynakh [New Central Asian species of case-bearer moths (Lepidoptera, Coleophoridae) living on wormwood]. *Vestn. Zool.*, vol. 4, pp. 65–71.

Hering, E.M. 1957. *Bestimmungstabellen der Blattminen von Europa.* Epe, vols. 1 and 2, 1185 pp.

Review of the Morphology of Noctuid Moths (Lepidoptera, Noctuidae)

M.A. Ryabov

This article is a chapter from M.A. Ryabov's unfinished monograph on owlet moths of the Caucasus. In spite of the fact that these studies were conducted many years ago, the information presented here has not lost its importance. The author has discussed questions essential for improving the classification of the Noctuidae, one of the largest and most important families among Lepidoptera. The information will greatly assist workers in the field of agriculture as well as faunists and amateur entomologists because the paucity of information in literature on the morphology of the adult stage of owlet moths and the inadequacy of appropriate terminology has led to difficulties in the identification of even the most common harmful species.

I.L. Sukhareva edited and finalized for press the chapter from Ryabov's manuscript—V.I. Kuznetsov.

HEAD AND ITS APPENDAGES

Shape and pubescence of head: The rounded shape of the cephalic capsule shows little or no variation. In most owlet moths the frons is smooth, more or less convex, its chitinous cover sometimes distinctly thickened. Only in some groups, including many cutworms, are the frontal processes well developed: they vary from a small rounded protuberance, flat or slightly compressed at the apex (genera *Agrotis* O. and *Euxoa* Hb.), to conical or spinescent processes located on a rounded elevation, rarely directly on the frons (Figure 1). The presence of frontal processes is related to life in places with an arid climate: together with the armature of the foretibiae, they facilitate the exit of the imago from the soil. In some cases (*Aegle* Hb. and other closely related genera from the subfamily Jaspidiinae) the anterior margin of the cranium, rising above the proboscis, is extended in the form of large spines located in a single plane. Together with the frontal spines they constitute a strong boring apparatus. Sometimes the armature of the frons consists simply of a short rounded elevation in the center or a coating slightly raised above the margin of the oral cavity. Frontal processes are fully revealed upon removing the scaly-pubescent cover. Their structure serves as a character for identification of species, and sometimes also genera.

The following characters among the special features of the scaly cover of the head are used in the taxonomy of owlet moths: smooth cover with predominance of scales of usual type, cover with predominance of pubescent scales, cover of mixed type, ruffled or some other kind of brush of hairs on the frons and vertex, as well as their coloration.

Antennae: These provide a series of significant characters for identification. The setose type is most common; in males compared to females, the antennal segments have a better developed vestiture of setae and cilia. Often the antennal structure in males is more complex than in females. The first stage of complexity is a beaded type. Serrate and crestate antennae in males are more complex in structure. Segments of serrate antennae have conical lateral processes, developed maximally in the middle segments, but not greater in length than the thickness of the segment itself. Processes of crestate antennae resemble the depressions of the crest in shape. They, too, are developed most on the middle segments, but are smaller in length than the thickness of the segment. The border between serrate and crestate structures in the antennae is not sharp; neither is the border between crestate and pinnate structures. Crestate and pinnate structures usually cover only a part of the segments but are absent at the antennal apex. In all cases of serrate, crestate, or pinnate structures, the outer processes are shorter than the inner: given poor serration, the outer processes are barely discernible; with poor crestate formation the antennae are often only serrate along the outer margin. Rarely, discoidal antennae occur in owlet moths, in which the segment broadens like a spoon on the lower side, as in the genus *Allophyes* Tams.

In males all except the apical antennal segments are covered with cilia arranged randomly or collected in tufts. The length of the cilia varies from species to species; it is usually not greater or only slightly greater than the length of the segment; their ratio to the length or thickness of the segment is of taxonomic importance. Females usually have glabrous antennae, without cilia. In both sexes, except for the basal and one to two apical segments, the antennae bear setae which,

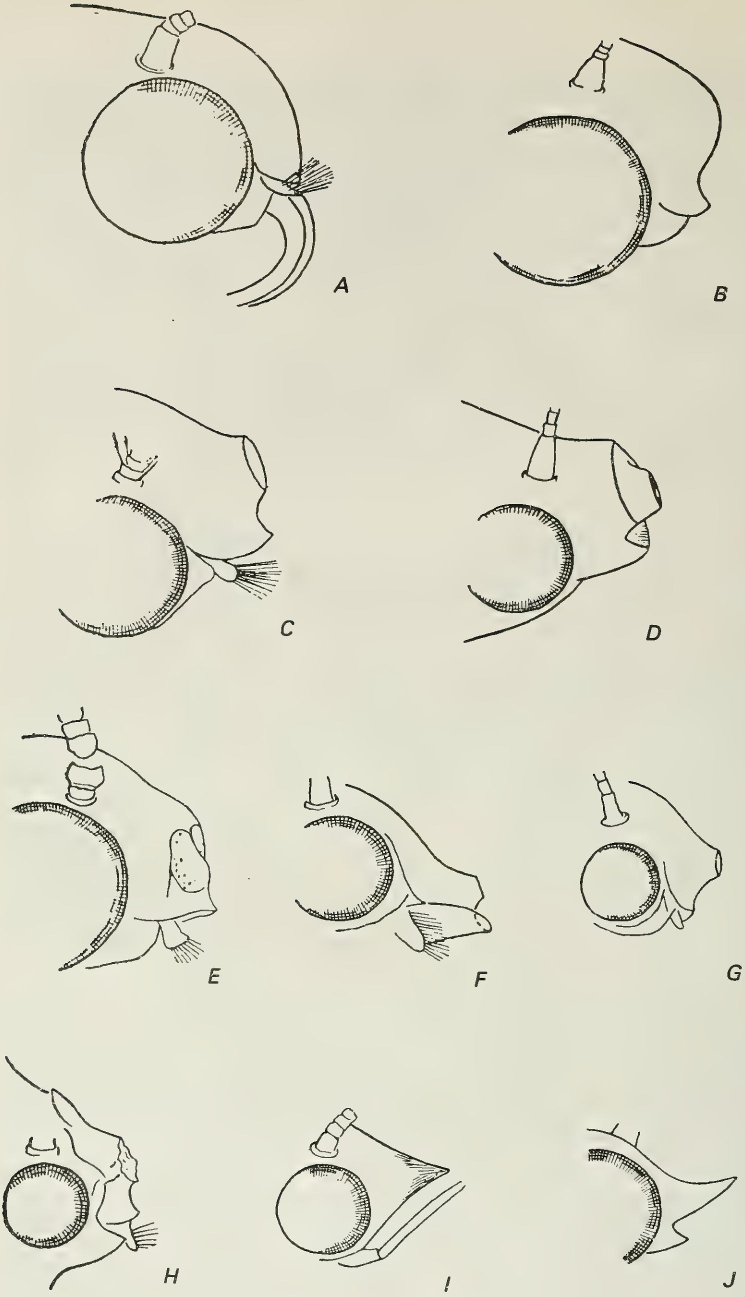


Figure 1. Frontal processes.

A — *Lycophotia insignata* Ld.; B — *Parexarnis fugax* Tr.; C — *Euxoa distinguenda* Ld.; D — *Apaustis rupicola* Schiff.; E — *Craterestra hoplites* Pung.; F — *Discestra eremistis* Pung.; G — *Cardepia sociabilis* Grasl.; H — *Aedia venosa* Chr.; I — *Coenobis rufa* Hw.; J — *Aegle vespertalis* Hb.

unlike cilia, are termed basal. The size and number of basal setae are variable. They are usually much stouter and slightly longer than the cilia or, contrarily, slightly shorter. Thus in *Amathes* Hb. (*Graphiphora* auct.) they are much longer than the cilia and almost twice greater in thickness than the segments. The number of setae is fairly constant and their arrangement on the segment is as follows: one or two dorsal, one lateral on each side, and two more or less close-set abdominal (Figure 2). In many genera of the subfamily Herminiinae, especially in *Zanclognatha* Ld., the long segments of the antennae bear very long lateral setae and one short dorsal seta in the thickened basal part. Males of some species of this genus have three to four thickened segments in the basal half of the antennae armed with three to four short, stout (almost spinescent) lateral setae on each side.

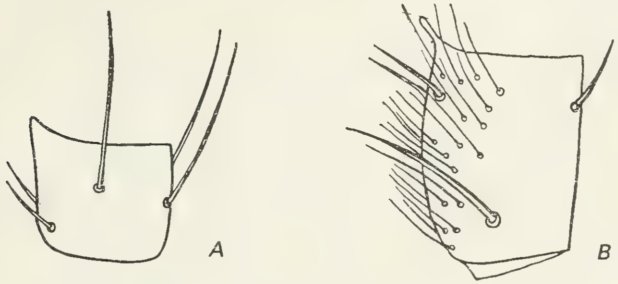


Figure 2. Structure of antennae.

A — *Diarsia dahlii* Hb , 21st segment of antenna, male, lateral view; B — *Bomolocha crassalis* F., 25th segment of antenna, male, lateral view.

Eyes: In most owlet moths the eyes are round, large, and glabrous. Only in the subfamily Hadeninae are they usually densely covered with short cilia. A characteristic feature of the subfamily Cuculliinae is that the eyes are bordered with cilia that fall off on maceration with caustic soda (unlike cilia on the eyes of members of the subfamily Hadeninae). In the subfamily Heliothidinae there are owlet moths with round glabrous eyes that are smaller than the usual dimensions. In some cases, for example, in the genus *Anarta* O., the eyes are small and reniform.

Proboscis: Until recently morphological peculiarities of the proboscis were rarely used in identification. Only Börner (1939) used the features of this important organ extensively in the systematics of owlet moths. My own studies, begun after reading Börner's work, also indicate the possibility of using of proboscis in characterizing supraspecific groups of various sizes as well as individual species. Mention must be made of the considerable complexity of structure of this organ, performing tactile and gustatory functions. On it are located the so-called "taste cones" which are of two types: a) somewhat long, pointed setae located directly on the surface of the proboscis; and b) short, obtuse, sensory cones. Cones on the sockets vary in structure (Figure 3).

Bristlelike cones, apparently tactile in function, are scattered over the surface of the proboscis from the base to the apex where cones on the sockets are arranged. Obtuse cones of usual structure are scattered primarily at the tip of the proboscis among the cones on the sockets. In *Rivula sericealis* Sc., and some other owlet moths, however, obtuse cones are distinctly longer and the only type of cones in the apical part of the proboscis. Since *Rivula* Gn. feeds normally in experiments, apparently the obtuse cones at least partly serve "gustatory" functions.

The cones on the sockets, arranged in the apical part of the proboscis, function as the main taste organs. With loss of feeding they become reduced or disappear completely. The cones themselves, somewhat variable in size, are located at the apex of the socket. The structure of the socket is of taxonomic importance. The simplest structure is cylindrical and observed in many members of the Plusiinae. The cylindrical socket with longitudinal ridges is the most widespread. In most cases the ridges number six and plus or minus one ridge is usually an aberration. Rarely, the ridges are apically pointed and the cone itself more or less embedded in the rosette, which is particularly noticeable in the reduced terminal cones of the proboscis (Figure 3, C). The outer margin of the ridge may be smooth, straight, arcuate, or serrate. Sockets with serrate margins on the ridges are observed in *Mamestra* O., *Discestra* Hmps., *Hadena* Schrk. (in the genus *Mythimna* O. only two ridges are serrate along the margins, while the others are smooth), *Omphalophana* Hmps., and *Eutelia* Hb. In the genus *Cucullia* Schrk. serrated ridges of the sockets are observed in species of the *verbasci* group, while the ridges are smooth in species of the *umbratica* and *argentina* groups. With a reduction of the proboscis, the ridges of the sockets are not so prominent, often smoothened, and their apices underdeveloped. In some cases of a normally functioning proboscis the sockets have only two apically blunt ridges (in *Pyrrhia victorina* Sodof and others). Reduction in number of ridges to two or their complete smoothening is observed on the sockets located near the base of the proboscis. The most unique cones of the sockets are found in *Scoliopteryx* Germ., *Calpe* Tr., and *Pericyma* H.-S.:1) short, on short sockets, located on highly sclerotized scales; 2) lanceolate,

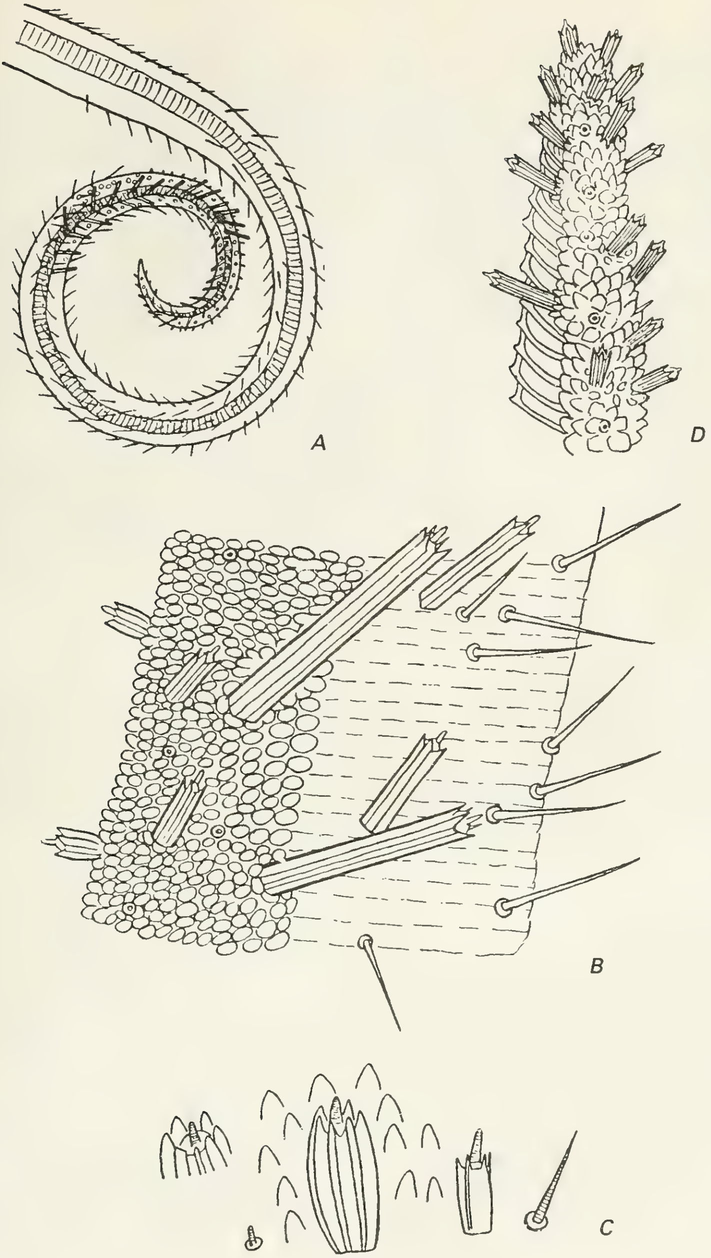


Figure 3. Structure of proboscis.

A — *Orrhodia* sp., tip of proboscis; B — *Orrhodia* sp., segment of proboscis surface under high magnification; C — *Sarrothripus musculana* Ersch., sensory cones on sockets and setae; D — *Chloridea armigera* Hb., apex of proboscis.

highly sclerotized, located on equally sclerotized rounded sockets or on sockets with ridges of varying length; 3) usual, located on branched, foliate sockets; 4) highly sclerotized, lanceolate, on likewise branched, foliate sockets, and 5) similar cones on sockets with mixed structure of the two preceding groups. In most owlet moths the cones on the sockets are arranged in the membranous region of the proboscis where the surface sculpture is granular or cellular. The granules may differ in size and density of arrangement in various species. On the base of the cones on the socle the grains are distributed more evenly and resemble a rosette. The proboscis in *Scoliopteryx* Germ., *Calpe* Tr., and *Pericyme* H.-S. is noted for its uniform sclerotized surface; in species of the first two genera the proboscis is strong, lanceolate to flat, and sometimes serrate at the apex. Apparently the proboscis in these moths is of the fruit-sucking type, represented in the fauna of the Soviet Union by some tropical owlet moths. In these the cones on branched sockets are located in a single row along the outer (dorsal) ridge of the proboscis.

The proboscis is sclerotized throughout its length in groups with a small number of taste cones such as *Rivula* Gn. and Plusiinae, and its sculpture is oblong-imbricate or transverse-annular.

The proboscis varies in length. The longest proboscis among owlet moths is found in species of *Hadena* Schrk. and *Cucullia* Schrk.; when extended, the proboscis in these species reaches the end of the abdomen or is even slightly longer than the insect itself. Usually the proboscis reaches only the base of the abdomen. The surface of the proboscis and taste cones was studied under high magnification (up to × 600).

Details of the structure of the proboscis usually characterize genera or species groups of genera, and only rarely species. In the latter case this applies exclusively to the development (and function) of the proboscis or to its reduction (and aphagy); examples of this type are numerous in *Agrotis* O., *Porphyrinia* Hb., and other genera.

The reduction I observed in the group of owlet moths having a proboscis with taste cones located on the cellular surface, considerably decreases the importance of these characters in the systematics of groups of a higher order, and in several cases also of genera. The simplification and modification (often increased diameter of the proboscis than in closely related feeding species) attendant on reduction are so significant that a comparison of individual elements becomes meaningless.

Palpi: The structure of the maxillary palpi is fairly uniform. The peculiarities of the labial palpi are more widely used in taxonomy, although in most cases their structure is also not so characteristic as to use it when a large number of other distinguishing characters are available. The labial palpi are usually curved in the region of the 1st segment; together with the straightness of the 2nd and 3rd segments, the palpus is somewhat tilted forward. The 3rd segment is round or slightly elongated, sometimes notably tilted forward, and usually longer. The pubescence of the 3rd segment is of taxonomic significance, sometimes due to smoothly contiguous scales, sometimes to hairs of different length directed variously. The color of the outer lateral surface of the 2nd segment is usually much darker or more intense, and thus brighter than in other parts of that segment and in the 3rd segment; rarely, the last segment is similar in color.

The subfamilies Hypeninae and Herminiinae are characterized by elongated and projecting palpi, the primary feature of their external structure.

THORAX AND ITS APPENDAGES

The morphology of the thoracic region of owlet moths is not used in identification. Only the pubescence of the thorax is sometimes noted as a character of a species or a group. As on the head, the pubescence on the thorax may be smooth (consisting of scales of the usual type) or pilose (piliform scales). Longer tufts of setae, mostly in the form of a brush, may develop on individual segments of the thorax. The color of these brushes, the general outline of the thorax or its individual segments, and the pattern of the patagium (collar) and tegulae are of taxonomic importance in certain cases.

Biologically the smooth-scaled pubescence of the thorax apparently facilitates greater mobility of the insect. Dense pubescence is usually associated in the owlet moth with flight in cold weather (early spring and especially late autumn) or adaptation to alpine habitats.

Prothorax: The prothoracic appendages are often used in identification—patagium (or collar), the pattern color, and dimensions, which characterize species and sometimes even genera. For example, species of the genus *Ogygia* Hb. are distinguished by a sharp bicolored collar, while in members of the genus *Cucullia* Schrk. the patagium forms a high cowl.

Mesothorax: The color of the tegulae and their pattern are of some taxonomic importance, since usually they are similar to the dorsal surface of the last two segments. Rarely, distinctions are significant and species specific. The pattern of the tegulae is more often represented by a dark border slightly away from the margin.

Metathorax: Offers no distinguishing characters except for the nature and presence of more or less developed hairs.

Wings: Shape and venation. Wing shape, on the whole, is fairly uniform in owlet moths. The forewings are usually longer than the hind wings, triangular, with more or less rounded and even outer margins. In *Scoliopteryx* Germ. (and its closest tropical genera) and *Laspeyria* Germ. the outer margin of the wing is deeply notched before the apex. The forewings in species of *Calpe* Tr. have a large angular projection in the middle of the posterior margin. In the forewings and hind wings of the genus *Zethes* Rbr. a small angular projection occurs in the middle part of the outer margin. The relative length and width of the wings, inclination, and pattern of the outer and rarely anterior margin of the wing can be used as characteristics in identification. Significant variations are also observed in the shape of the wing apex. The hind wing is more uniform in shape, rounded, more or less elongated, and sometimes with a slight depression before the apex. Among the characteristics of wing shape, primarily of the forewing, are its index which can be used to some extent, i.e., ratio of maximum wing length to maximum width. However, the index does not characterize either the total length of the wing or the relative position of its anterior and posterior margins.

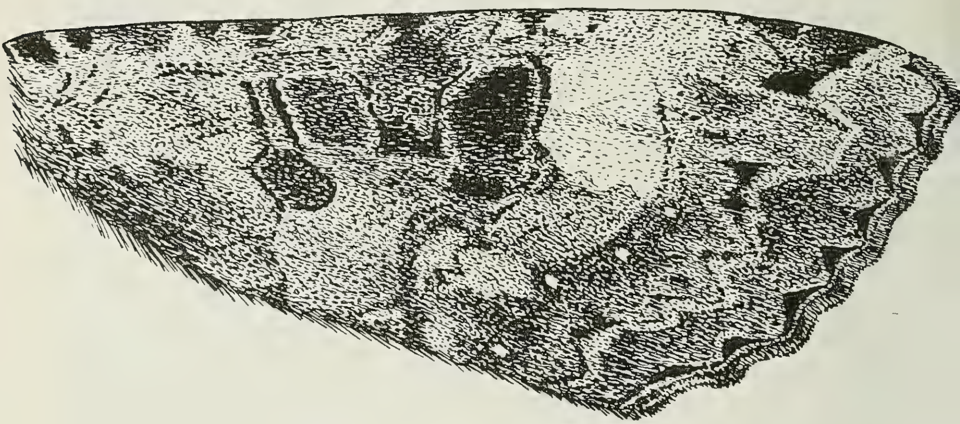


Figure 4. *Aplecta prasina* Schiff., forewing.

Wing venation, widely used in several other families of Lepidoptera, is uniform in owlet moths. The presence of a narrow accessory cell on the anterior margin is characteristic; it is formed by the branches of the radius (*R*) and the medial vein (Figure 5, A), or only the branches of the radius. This cell is found in most owlet moths of the

Russian fauna. An exception to this rule—absence of the accessory cell—is a very important diagnostic character for a few genera (for example, *Porphyrinia* Hb., and the unique example among our owlet moths of the genus *Rivula* Gn.), and it is also found as an individual variation in species with usual venation. Another significant character of the forewings is the branching of veins R_2–R_5.

Based on venation of the hind wings, the owlet moths (except for the subfamily Apatelinae) are divisible into two groups—Quadrifinae, with vein M_2, and Trifinae, without M_2 (Figure 5). The antiquity of this important character is indisputable and divides most owlet moths into forest dwellers (larvae feeding on trees) and inhabitants of open landscapes. However, the significance of this division is lost due to the occurrence of species and genera with reduced M_2, rather frequently seen in the subfamily Jaspidiinae. My studies on larvae, genitalia, and other important structures point to other exceptions also. Secondary characters in the venation of the hind wing are variations in the mutual position of veins M_2, M_3, and Cu_1 (and sometimes also Cu_2). In *Tecophora* Ld. a significant deviation from the usual venation of the hind wing occurs due to the presence of a scent gland on the wings of males. Finally, in *Jaspidia fasciana* L. a partial isolation of veins *Sc* and R_1 occurs in the hind wings, whereas in all other cases these veins are completely fused throughout their length.

Börner (1939) lists the so-called "crest" formed by the setae at the base of the anal fold of the forewing as an organ typical for the majority of owlet moths and essentially specific for the family.

Finally, a knowledge of the coupling device of the wings enables one to determine with confidence the sex of an individual insect when the antennae exhibit no perceptible sex distinctions. Coupling of the hind wing in males of owlet moths is effected by a single long, strong bristle, while in females it is accomplished through several slender and short bristles, often partly fused at the base. The corresponding device of the forewing is located higher in males than in females, and the bristle of the hind wing in normal position always protrudes significantly, a feature absent in females. The shape of the bristles of this device on the forewing and their arrangement on the hind wing are of taxonomic importance in the subfamily Nycteolinae.

Pattern of wings. The wing pattern of owlet moths is fairly uniform and hence any deviations from the general scheme are always good taxonomic characters. For purely practical purposes the conventional pattern of the forewing can be divided into the following components: bands (only transverse), lines, spots, and fields (Figure 4). The forewing is intersected by three bands: first (or basal), second (or inner),

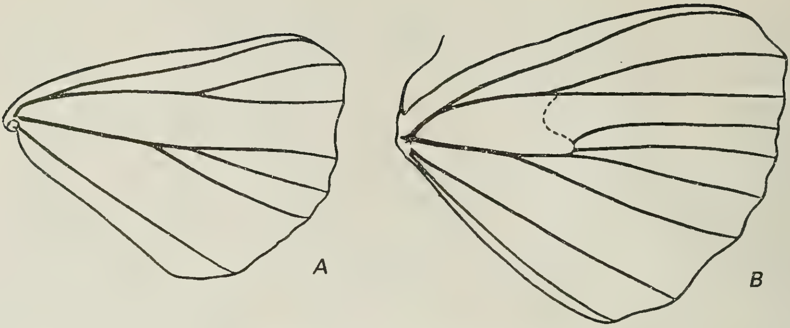


Figure 5. Venation of hind wings.

A — *Diarsia dahlii* Hb.; B — *Autographa gamma* L.

and third (or outer). Quite often, they are to some extent curved, sinuous, or dentate, relatively broad lines, lighter in color compared to the basic background of the wing. These bands are usually bordered on both sides by darker than the background, thinner lines.

Usually the inner border (line) of the first (basal) band is better developed than the outer one; the outer border of the second band and inner border of the first band, i.e., those directed toward the middle field, are very distinct. The first band is usually incomplete and reaches only to the cubital vein; on the lower side both borders fuse, often forming a diffuse dark spot or, after diverging, surround the light-colored roundish spots. The second band intersects the wing more or less crosswise, slightly away from the first band. The bands and their slopes are, on the whole, characteristic of a species, although sometimes subject to considerable individual variability. This is particularly true of the third band, which often shows considerable individual variability. It usually begins on the costa above the reniform spot, forms a sharp bend in the costal field, then smoothly encircles the reniform spot on the outer side to some distance from the spot, and after curving or breaking at Cu_2, it is directed straight, at an angle, or arched toward the posterior margin of the wing. Many details of structure of the third band, sometimes rather minute, are of taxonomic significance, and almost all of them descriptive. I shall mention here only one more common example, namely, the apices of the depressions formed by the line of the outer border of the band per se may be separated and acquire the nature of independent elements of the pattern—dark- or light-colored spots along the veins in the submarginal field.

The borders of all three bands on the costa usually spread and resemble oblique smears. The extent of expression of these smears corresponds to that of the borders. The latter are either not developed in some cases or barely visible, for example in some representatives of *Paradichagyris amoena* Stgr., *Hiptelia miniago* Fr., *Mesogona acetosellae* Schiff., and many other owlet moths. However, individual smears formed by the borders are mostly retained in these cases in the form of traces. When the light-colored line of the band blends with the background, usually the weaker line of the band also disappears. As a result, any band is expressed only as a single dark border. Such cases significantly distort the picture of the pattern, but are widely known among owlet moths: in some groups more as the rule than the exception.

On the forewing three basic spots occur in the typical pattern—round, reniform, and wedge-shaped (Figure 4). The nature of each of these spots, as well as their presence or absence, is an important specific character. The round spot is located in the basal half of the cell and its shape can vary significantly from the normal. Among the Noctuinae the most common is a somewhat irregular, laterally compressed spot with, in most cases, the longitudinal axis slightly inclined in relation to the longitudinal axis of the body. The spot is sometimes compressed downward, along the vertical line. The shape may also be disturbed by a projection connecting it with the reniform spot. All these peculiarities in the shape of the spot, as well as its size, are characteristic of a species, although they are subject to individual variability to some extent.

The following general remarks are important in relation to the color of the round spot. It is rarely monochromatic; usually a darker nucleus can be seen, which sometimes almost completely fills the spot, and the thin peripheral margin which is often black or dark brown. The nucleus is sometimes looped or resembles the figure "8" with a gap inside. The peripheral margin of the spot rarely remains entire; usually it is interrupted in various places. The spot may be open toward the costal field and in that case it is similar in color. Rarely the spot is open downward into the cubital region, and in this case it is light in color. Sometimes the periphery of the spot is not sharp, but diffuse. The shape and size of the basal part of the cell between the round spot and the second band depend on the size and position of the round spot.

The reniform spot is located on the cross-vein and intersected by it and by the veins originating from it on the outer side. The spot is often reniform or pod-shaped with a more or less deep notch or depression on the outer side; however, it may also be somewhat angular or convex or compressed laterally. It may be diffuse or vestigial. All the foregoing applies to the reniform spot in relation to the round spot. Only when the spots of the cell are open is the reniform spot less open than the round spot.

The cell between the spots is often notably darkened. In this instance the region of the submarginal field adjoining the reniform spot on the outer side is also often darkened; the border of this darkening is usually diffuse. On the whole, the shape and color of the round and reniform spots as well as the cell between them are usually very important characters for a species.

The wedge-shaped spot also plays a significant role in the description of a species. It is situated longitudinally in the middle field between the cubitus and anal fold, its base resting on the second band, and apex touching the middle of the band, sometimes crossing through the whole middle field. Its usual shape is round-cuneiform, rarely cuneiform, sometimes (when small) almost round, and sometimes (when well developed) in the form of a streak. Its color usually blends with that of the middle field or is lighter; a nucleus is usually absent or barely developed and the dark outline often sharp and thick, sometimes completely engulfing the spot. The cuneiform spot is often absent, usually a specific character, but sometimes a manifestation of individual variability in the pattern.

The basal or subcubital streak is probably closely associated with the cuneiform spot. This dark or black streak is located at the wing base under the cubital vein. Sometimes it passes directly into the cuneiform spot, but more often the two are separated by the second band. In some cases, instead of the streak a dark field with rounded or more often indefinite shape is located under the cubitus.

Subapical spot. The darkening that accompanies the submarginal line on the outer side in the costal field is often broad, acquiring a more intense, usually dark color, and thus forms an isolated spot near the wing apex. The presence of this spot and details of its structure are specific in most cases; rarely the spot may be present or absent in the same species, which depends on the intensity of color of the insect. Usually, the costal margin of the wing within the limits of the spot has sharp light-colored oblique streaks.

Cuneiform streaks in the submarginal field are developed in many species, arranged longitudinally between the veins, and dark in color, often black. The extent of their development, even with significant individual variability, in most cases remains an important character at the species or subspecies level.

Lines. The submarginal line is located between the third band and the outer margin of the wing. It is usually lighter in color than the general background, slender, and broken at an angle or sinuous. In the case of a break or curve in the line, the large projections on veins M_2 and Cu_1 serve as a species or supraspecific peculiarity, since a somewhat sharp ⩾-shaped figure results. The break in the submarginal line at a right angle on vein $R_2 + R_4$ is somewhat permanent. The marginal line passes along the outer margin of the wing, which is usually dark or black, and divided in the form of small segments, triangles, lunes, or dots.

Fields. The costal field lies along the anterior wing margin. The light coloration of this field, its shape, and intersection by bands are often important in the identification of a species.

The middle field is bordered by the second and third bands and is often indistinct. The middle band bordering it is a dark stripe, either sharp or diffuse. It passes through the wing more or less parallel to the third band, crossing the costal field, the cell (between the spots or along the lower lobe of the reniform spot), and the subcubital part of the middle field, reaching the posterior margin of the wing. The presence of the middle band and its pattern are very important taxonomic features in the identification of a species. Depending on the general inclination of the bands bordering the middle field, the latter varies in the width in the lower subcubital half.

The submarginal field is transverse in relation to the wing between the third band and the submarginal line. Its color is usually complicated by an admixture of the inner shadow of the submarginal line, which often includes cuneiform smears. The isolated apices of the depressions of the outer border of the third band, and sometimes the band itself, in the form of dark- and light-colored spots along the veins, and in some species also their inclusion in the submarginal field, complicates the pattern.

The marginal field is located between the submarginal line and the outer margin of the field. It usually includes the outer dark submarginal line, which is generally less intense than the inner one. Its pattern is often further complicated by the light-colored projections of the submarginal line.

Color of the veins. The pattern of the forewings and its individual components is often complicated by the color of the veins. Light coloration of the veins, especially the cubitus within the limits of the cell, is observed more often.

Pattern of forewing on underside. The color of the underside of the forewings in females is significantly more monochromatic in the majority of cases, and the pattern simpler than that of the upper side. The pattern is usually diffuse and individual components not discernible. The third band is often found here in the form of a dark single transverse stripe, usually more sharply developed in the costal field; on the whole, it is located in the same manner as on the upper side of the wing. Another usual component of the pattern is the diffuse outline of the reniform spot. The dark submarginal line is also often developed. The costal field is lighter in color over a larger part than the remaining surface of the wing.

Hind wing. In most owlet moths the hind wing is folded oblong and at rest is completely covered by the forewing. It is shorter than the forewing and more uniform in shape. Its outer margin is rounded, sometimes with a slight depression before the apex.

The basic color of the wing varies from pure white to blackish-brown, sometimes yellow, reddish, or light blue. The pattern usually consists of a band which, on the basis of location, corresponds to the third band of the forewing, often a spot on the cross-vein, and the submarginal line. The band on the whole is arcuate. A fairly common phenomenon, especially in owlet moths, is the development of a dark border (or continuous darkening) along the outer margin. The inner side of the border usually matches the band (for example, in species of the group *Triphaena* Hb.), the darkening often reaching such a width that only the basal part of the wing remains light-colored; by and large the band is concealed, rarely fully revealed. In individual cases (for example, in *Catocala* Schrk.) the border and the well-developed, broad, curved band are developed independently. Finally, in isolated cases the tone of the wing along the veins is dark, spreading radially toward the wing base. A still more complex pattern is observed in *Leucanitis* Gn. and other closely related genera.

In individual groups of owlet moths the hind wing exhibits in part the same pattern and color as the forewing; this is related to the position of the wings at rest, when the hind wing is only partly covered by the forewing. In European fauna, the species of *Zethes* Rmbr., *Ectypa* Billb., *Pericyma* H.-S., and others exhibit such coloration.

The hind wing in most owlet moths is colored on the underside similar to the upper side, or it is even more monochromatic and retains the same components of the pattern; however, the pattern on the underside is often better expressed, especially the band and the median spot. The pattern becomes complicated in species with a well-developed border, highly developed band, and rays along the veins. In such cases, it may differ significantly from the pattern on the upper side of the wing, which happens, for example, in the genus *Leucanitis* Gn. In species in which the pattern of the forewings is partly repeated on the upper side of the hind wing, the latter is usually monochromatic on the underside. Among the peculiarities of coloration of the underside of the hind wing mention must be made of the frequent darkening of the costal margin, which is sometimes broad and intense.

Fimbria. For the purpose of identification, usually the coloration and pattern of the outer margin of the fimbria are considered. The fimbria are often colored differently than the wing. In *Dichagyris romanovi* Chr. the fimbria are rusty-brown and the wing background light yellow. On the hind wing such differences are quite common, with the fimbria mostly white and the wing surface dark, as in *Eurois occulta* L. In the fimbria one can distinguish the slender light-colored basal line adjoining the wing margin, and further followed by one or two (sometimes even three) light-colored lines. These are parallel to the basal line, the one closer to it being well developed. As a result, immediately beyond the basal line, a narrow region of the dark basic background is seen along the fimbria, which is known as the median line of the fimbria. Sometimes this line is narrow and poorly developed, while the outer light-colored neighboring line is broader and sharper. Finally, the fimbria on the forewing is often divided into spots by transverse light-colored sections, which generally are a continuation of the light coloration of the veins.

Legs: For a long time, only one character of the leg structure—the armature of the tibiae—was used in the taxonomy of owlet moths. Kozhanchikov (1933) used the structure of the tarsal claws to divide Palearctic owlet moths into two groups and Börner (1939) used the armature of the tarsal segments as one of the taxonomic characters for some groups of European owlet moths. The armature of the tibiae, consisting of spines, is really very significant and convenient in the identification of many owlet moths, although it does not always conform with their natural groupings. These spinose tibiae of all three pairs of legs, or only of the middle or hind legs, are typical among members of Trifinae, primarily in the widespread subfamilies Noctuinae and Triphaeninae, and many members of Heliothidinae, and rare among representatives of other subfamilies. Among Quadrifinae spinose tibiae are typical for some *Leucanitis* Gn. and some other genera. While the position of the spines is fairly constant on the middle and hind tibiae, those of the foretibiae differ significantly in size, number and arrangement; these differences constitute specific and supraspecific characters. The structure of the tarsal claws—their entirety or bifurcation, size, and relative position of the upper and lower appendages—is often used in taxonomy.

From a taxonomic point of view, however, the peculiarities noted by Börner (1939), namely, the armature of the tarsi, are more significant. The armature of the 1st to 4th tarsal segments is arranged as follows: 1) spines commence at the base of the segment or close to it and form three distinct rows, the middle one often close-set to the row extending along the outer side of the segment; 2) spines also commence from the base of the segment itself or near it, but the middle row is bifurcate throughout the length of the 2nd to 4th segments (on the 1st segment it bifurcates usually before the apex or at the apex); and 3) spines form three sparse rows (especially the middle one), commencing at a notable distance from the base of the segment. These features are quite distinct even in dry specimens.

The first type of armature is common among members of Trifinae, as well as Quadrifinae; the second type is seen only among Trifinae; and the third is typical of members of the subfamilies Hypeninae, Rivuliinae, and Herminiinae from Quadrifinae, as well as for some members of Trifinae. Among some members of Trifinae tarsi of unique shape are found, with condensed segments and numerous highly developed spines, for example in *Onychestra* Hmps. and *Mycteroptus* H.-S. Such tarsi enable the moth to dig through the soil to emerge on the surface after hatching. In the subfamily Herminiinae the middle legs of the male are highly modified; their tibiae or tarsi are armed with clusters of scales and setae, part of which (scales and setae) are probably related to scent glands. The relative development of individual segments of the leg, especially the coxa and femur, are seldom used in the taxonomy of owlet moths.

Auditory apparatus: Located partly in the region of the metathorax and partly in the region of abdominal segments I to II, the auditory apparatus consists of chambers inside the body and an "ear shell" in the pleural region of abdominal segment I, and in most cases includes the spiracle of this segment. The size of the dorsal chambers (resonators), size of the auditory pit, and expression and shape of the "ear shell" and sclerites on the membrane of the abdominal chamber vary in different groups of owlet moths. An exception is seen in members of Herminiinae in which the spiracle located outside the "shell" is slightly below and behind it.

According to Eggers (1923, 1928) and Börner (1939), the following families have an auditory apparatus of more or less the same type: Pyralidae, Geometridae, and Cymatophoridae (with outer apparatus in the lower half of abdominal segments I to II), as well as Notodontidae, Arctiidae, Lymantriidae, and Nolidae (with outer apparatus in pleural region of abdominal segment I). Members of the first three families are readily distinguished from other owlet moths on the basis of structure of the auditory apparatus (lower surface of the base of abdomen soaked with xylol or benzene for examination). Tiger moths and borer moths are differentiated with great difficulty; to examine the auditory apparatus their abdomen must be treated with caustic soda. These three families are distinguished by the position of the first abdominal spiracle outside the "ear shell" much below and for the most part behind it; in this respect they are similar to Herminiinae. It must be noted that a study of the auditory apparatus in members of the family Liparidae, as interpreted by Kozhanchikov (1950), revealed sharp differences between Lymantriidae and Apatelinae and, contrarily, a distinct closeness between lappet moths and owlet moths.

The importance of the auditory apparatus in the taxonomy of owlet moths has been demonstrated by Richards (1933), who studied the fine structure of this apparatus in detail. It should be noted here that complete accord was found between his conclusions on the larval taxonomy of owlet moths and the work conducted by A.M. Gerasimov (1952) and myself.

ABDOMEN

Scent glands at the base of the abdomen: In males of many species of owlet moths segments I to II of the abdomen carry lateral brushes of unique piliform scales associated with the scent glands. In individual cases they emit a pungent, sometimes pleasant, odor on pressing the gland in a freshly killed male and completely unfolding the setaceous crown. This apparatus is best developed in the subfamilies Hadeninae and Cuculliinae.

The granular capitate gland, which includes the basal brush (penicillus), is located in the region of the first abdominal pleurite. The brush itself is located in the longitudinal pleural pocket of segments III to V; the slitlike opening of the pocket adjoins sternites III to IV of the abdomen. The posterior margin of sternite II forms knoblike processes which in a straightened active condition push the gland out from the pleural fold, causing the setaceous crown to unfold. At rest, the brush is located inside the pocket, and the knob bent like a spring (Figure 6, A). Development of the brush and pocket vary in individual groups of owlet moths. In *Callopistria* Hb. the gland and brush are twinned (Figure 6, E). The color of the brushes in the lateral pockets is light yellowish-gray. In the genus *Mythimna* O. the short, broad brushes are blackish-brown in some species and enclosed in a common median, broadly rounded sinus formed by sternites I to II of the abdomen (Figure 6, B, C); in other species the brushes rest in lateral pockets. Finally, in many species of the same genus both glands and brushes are absent, although on the basis of other characters (primarily structure of the genitalia, pattern and color of the wings) they are sometimes very close to species with scent glands. The same picture is seen in *Cucullia* Schrk.; species of the groups *umbratica* and *argentea* have well-developed brushes in lateral pockets, while species of the group *verbasci* are devoid of such an apparatus.

Thus the taxonomic significance of this character is not constant; it is most important as a character for differentiation at the species as well as supraspecific level in certain cases. Possibly in groups predominantly possessing a scent apparatus of the type described, its absence in individual species should be considered a secondary phenomenon. However, I did not find anything similar to a rudiment of this apparatus during my long studies. In some species of the genus *Mythimna* O., adjacent to the scent apparatus with a common medial pocket, there are long, dense, blackish-brown setae arranged in the form of a "beard" along both sides of the ventral surface of the metathorax, close to its posterior margin, and directed downward, which almost fuse with the setae of the scent apparatus.

Scent glands of other abdominal segments: The scent apparatus at the base of the abdomen in some genera or only in some species of a genus are often replaced by a similar apparatus in other segments of the male abdomen, particularly segments VII and VIII. Scent organs in segment VIII are fairly common in many groups of owlet moths, although highly variable in structure. Elongated scales of the outer cover behind the anterior margin of sternite VIII serve as the simplest expression of the organ and are located on the glandular surface and are sometimes slightly compressed. Such an unpaired organ is found in many members of Trifinae. Further complexity is expressed in the greater development of the glandular cavity through elongation and the piliform scales forming brushes. The simplest form of the scent apparatus on segment VIII is sometimes also present even in the case of scent glands located at the base of the abdomen, for example in some species of the genus *Cucullia* Schrk. In the group *verbasci*, which lacks scent glands at the base of the abdomen, the scent apparatus of sternite VIII is brush-shaped and the cavity deep. The same situation is observed among members of Hadeninae; in genera with scent glands at the base of the abdomen, sternite VIII is simple or with a simple scent apparatus, while genera devoid of lateral scent organs, for example *Cardepia* Hmps., carry a well-developed brush on sternite VIII. Among members of Quadrifinae and in the subfamily Erastriinae, paired scent glands occur on sternite VIII, for example in some species of *Plusia* auct., *Tarache* Hb., *Emmelia* Hb., and some other

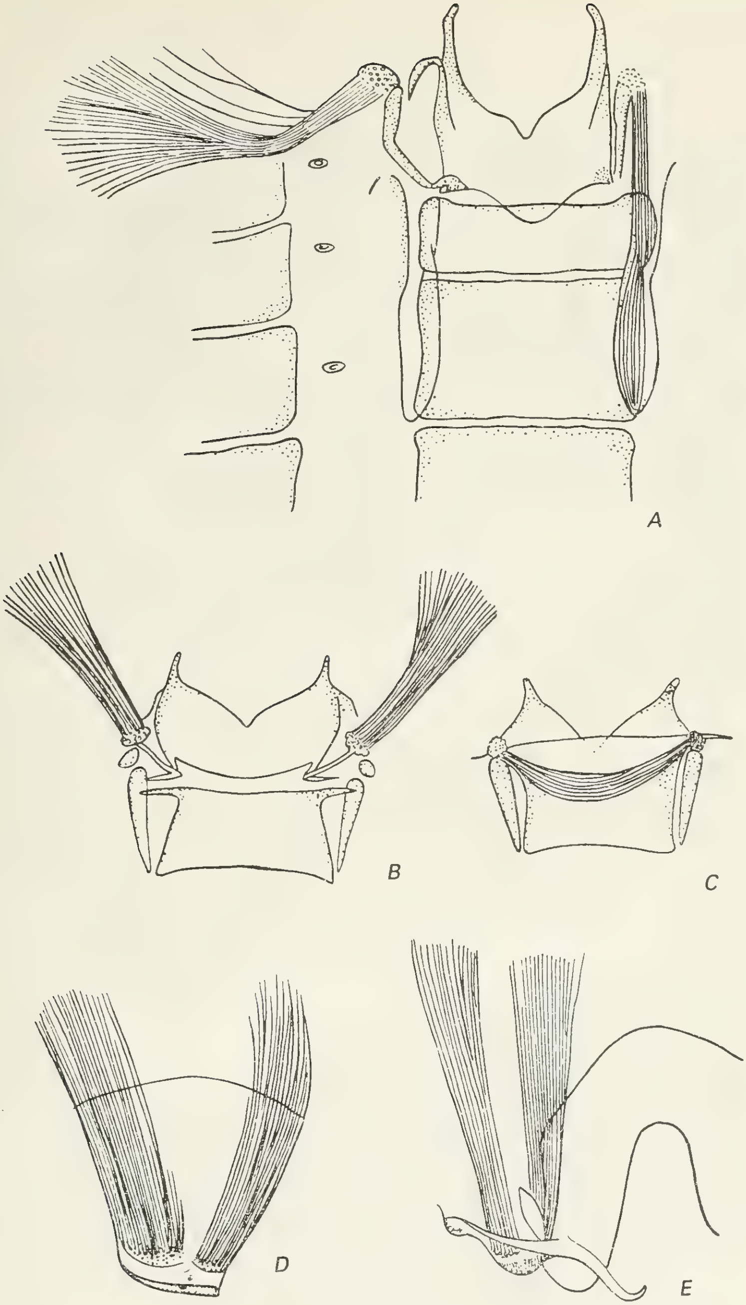


Figure 6. Androconial structures of males.

A — *Peridroma saucia* Hb., brushes of setae in lateral pockets near abdominal base; B — *Mythimna alopecuri* B., brushes of setae between fused sternites I plus II and III of abdomen; C — same, in folded condition; D — *Chrysoptera c-aureum* Knoch., paired brushes on abdominal sternite VIII; E — *Callopistria juventina* Cr., paired gland and brush along sides of abdominal sternites I and II.

groups; in individual members of Herminiinae such organs cover tergite VIII or localize on its sclerite (Figure 6, D).

Dense scales and, apparently, their corresponding glandular fields are also typical of the copulatory apparatus of both males and females. Their position is variable in males; in females they concentrate around the ostium, often filling the subvaginal sinus, sometimes isolated in the small intersegmental folds at the base of the anterior apophysis, and rarely occur on the posterior margin of sternite VII. Finally, in several cases the intersegmental membrane between segments VIII and IX of the male carries paired brushes of piliform glandular scales, for example in *Laphygma* Gn. These structures play an important role in attracting the opposite sexes and may definitely be considered scent organs.

Special glands in the copulatory apparatus of males located in broad, deep, saccate or conical structures with a dense pubescent cover situated at the base of the valves or on their outer surface, are not rare among members of Quadrifinae and functionally may be included also under the category of scent glands (Figure 7, C).

Shape of sclerites of segment VIII: In several cases tergite VIII, like the sternite, has a unique outline in both sexes. This character is readily observed during the usual maceration after careful removal of the covering scales, and may be used for differentiation of large groups. At present, however, it is not used in the taxonomy of owlet moths. The use of the configuration of the sclerites of segment VIII is well known in the taxonomy of Lepidoptera in the work of Petersen (1900) pertaining to the genus *Eupithecia* Curt. (Geometridae).

GENITALIA

The primary importance of the genital characters in the taxonomy of owlet moths is universally accepted (Smith, 1890; McDunnough, 1928; Kozhanchikov, 1937). Sometimes the genitalia are less suitable for identification of species, for example, in the genus *Euxoa* Hb. (specific differences in the structure of the genitalia are less in magnitude viewed against significant individual variability). In such cases external characters such as the legs, antennae of males, and color and pattern of the wings predominate in differentiation of species. The same is true of some groups of the genus *Apamea* O.

A study of the copulatory system divides composite genera and often leads to the establishment of new genera. This is well exemplified in the division of the genus *Ochropleura* auct. In some cases the similarity in the structure of the copulatory system in owlet moths is relatively great and convergent. This is true generally only of males. In several cases sharp differences have been noted in the structure of the antennae in males, legs in both sexes, frons, shape of wings, color, pattern, and general size of the moths. In the description presented below for the copulatory system of males, I follow the terminology established to date with minor personal comments.

Male genitalia: The ring of segment IX of the abdomen consists of the dorsal half or tegumen and the ventral half or vinculum.

The tegumen in owlet moths varies in width from narrow to almost linear in most members of Quadrifinae, to a type with large lateral lobes of varying shape in many members of Trifinae. The lateral lobes of the tegumen are generally pubescent or even strigose and the setae dislodged from the lobes with great difficulty, indicating that this armature is without doubt of special physiological importance. However, species are often found in which the pubescence of the lobes is weak, consisting of almost nonmodified piliform scales of the outer cover. These peculiarities of the lateral lobes as well as their size and shape are characters typical of a genus or group of genera, and only rarely of individual species. The uncus or unpaired process of tergite X is rigidly attached to the tegumen in owlet moths and directed caudally. It is usually single, more or less falciform, and almost glabrous. Any deviation from this simple structure of the uncus—bifurcation, expansion with flat apex, S-shaped curve, strigosity of any area—is primarily a generic and rarely only specific character.

The narrow and generally fork-shaped vinculum usually forms an unpaired expansion on the lower side directed into the body, which is called the saccus; rarely both branches of the vinculum converge without expanding. Both halves of the ring of segment IX are connected laterally by sclerites, probably of pleural origin. The general structure and shape of the pleural sclerites in most cases are characteristic of large groups. The anal papilla is located under the uncus; its apex serves as the anal opening or anus and is membranous. In some groups of owlet moths simple or paired sclerites (usually in the form of ribbons connected basally with the tegumen) occur on the dorsal surface of the anal papilla. A bifurcated scaphium is distinctly developed in the genus *Heliothis* O. In many owlet moths a grooved sclerite, bifurcate at the base, is located on the lower surface of the anal papilla and is called the subscaphium; the distal part of the subscaphium reaches the apex of the papilla. Some genera, for example *Emmelia* Hb. and *Tarache* Hb., are characterized by lateral processes on the subscaphium which vary in shape. The anal papilla is sometimes poorly sclerotized and the outline of the sclerotized area indistinct.

The aedoeagus, or more precisely its tube, usually provides good taxonomic characters in owlet moths because of sclerotizations on the vesica (pars inflabilis) or structure of the outer wall. The structure of the tube is uniform even though it varies in size, and often also in degree of sinuousness; greater variations from the usual shape are rare. The armature of the tube per se consists of spines at or near the apex (on the outer wall), predominantly on the ventral side. In some cases the tube is armed with a single spine, while in others with a cluster of smaller spines. This series of spines often moves directly onto the vesica; rarely are the spines of the vesica not complemented by spines on the outer side of the tube. The wall at the apex of the aedoeagus is sometimes highly sclerotized in some part and extends caudally in the form of a large process that varies in shape and may be even acute (Figure 7, A; Figure 8, A, B). All such spines and processes are subject to individual variability, which is sometimes significant; caution must be exercised in their use as a character in species differentiation.

The armature of the vesica in its simplest form may be restricted to granules or minute streaks on individual sections but more often consists of larger, sometimes very large isolated spines (cornuti) accompanied by spinose areas, clusters, ligaments, or ribbons of smaller spines. Smooth areas of any shape are rare. The large cornuti can be differentiated as simple spines with a narrow base and spines with an inflated base, the so-called "bulbous cornuti" (Pierce, 1909). The development of sclerotization on the vesica sometimes varies sharply at the individual level, right down to total disappearance (as seen in *Eurois occulta* L.).

The ridge surrounding the tube of the aedoeagus that forms a diaphragm is often membranous and usually granular or minutely spinose on top. In many species a group of minute setae is seen on each side of the aedeagus, which in some cases are modified or notably better developed; some may be elongated (*Chersotis* B. s. str.) or form a spinose crest (*Cerastis* O.). In many members of Quadrifinae the upper and lower fulturae are involved in the formation of the ridge, sometimes forming a continuous sclerotized canal through which the aedeagus moves.

In many owlet moths the sclerite of the upper fultura represents (probably, even in most members of Trifinae) a direct continuation of the fold of the dorsal cord of the valve, which converts into a diaphragm. The degree of sclerotization and general development of the sclerites ranges from barely discernible to distinctly pigmented ribbons adjoining the diaphragm and extending further along the wall of the

Figure 7. Male genitalia.

A — *Oligia latruncula* Schiff.; B — *Chrysaspidia bractea* Schiff.; C — *Mythimna loreyi* Dup., scent gland located on outer surface of valve.

ridge (Figures 7 to 9). Usually the two sclerites are separate, rarely contiguous or fused with the aedoeagus, sometimes forming an indistinct scutum. These sclerites are the longest in Quadrifinae, but their relationship to the dorsal cord is not clear; on the contrary, in several cases they are connected with the lower fultura and form a continuous or almost continuous canal open on the upper side. In individual cases both sclerites are modified and closely related to the strigose sections of the ridge of the aedoeagus, which are also modified (genus *Cerastis* O., Figure 8, C).

The lower fultura of owlet moths is simple. In most members of Trifinae it represents a flat, angularly bent or convex scutum variable in size and outline and often is not well defined. An unpaired middle process is sometimes present and directed upward or anally; in individual cases it is sclerotized (Figures 7 to 9). The complex structure of the lower fultura may serve as a specific as well as a generic character. In most members of Quadrifinae the lower fultura is diverted at the base and fused with the in-curved ventral margin of the valve.

Valve: The largest number of distinguishing characters of taxonomic importance are found in the valves of owlet moths. The structure of the valve and the terminology of its individual parts have been detailed by Pierce (1909) and Kuznetsov (1915). However, Pierce's morphological study provides no information on the homology of various structures on the valve or about their functions. I studied the anatomical structure and function of the copulatory apparatus directly during copulation as well as in freshly decapitated individuals with outwardly extruded genitalia. Although in the latter case the work of the apparatus carried all the symptoms of agonizing motion, the main movements of any part can only increase its amplitude but not change the nature of the movement.

In observing the genitalia in action I came to the conclusion that there are significant differences in the function of the valves in Trifinae and Quadrifinae. These groups also differ significantly in the morphological structure of the valves, although the muscles of the valves per se functionally remain the same. The muscle inside the valve is a continuation of the broad, sclerotized basal fold of the clasper (sacculus) toward the arc of the harpes. Contraction of this muscle causes the clasper to bend (completely or partially) in a transverse direction and the harpes to incline (Forbes, 1939). In the simplest case the arc of the harpes carries a rigidly attached falcate appendage—the harpes. Until recently the "harpes" was a composite concept meaning the falcate processes on the outer surface of the valve. Since the publication of articles by I.V. Kozhanchikov, the harpes has come to mean the

Figure 8. Male genitalia.

A — *Arenostola phragmitidis* Hb.; B — *Mamestra pisi* L.; C — *Cerastis leucographa* Schiff.

appendage of an arc which crosses through the valve in a more or less transverse direction. During the course of mating the male grips the female from the dorsal side with the bent uncus (which has its own muscles) and resting on her abdomen, grips the lateral sides with hooks, the harpes, as well as with strong bristles of the corona when such are present. This seizure of the female abdomen is probably essential only at the commencement of mating; later, when the vesica is inserted into the copulatory bursa, the tone of the corresponding muscle is significantly reduced. The transverse bend of the valve is ensured in many species by a dilatation on the dorsal edge before the harpes, and on the ventral side in all members of Trifinae by the presence of a membranous region between the sacculus and the arc of the harpes [for example, in all members of Noctuinae (Agrotinae) (Figure 9, A)], or the presence of a ridge (*Cardepia* Hmps.), sometimes by thinning of the chitin in the distal part of the sacculus [*Cucullia* Schrk. some groups of *Caradrina* O. (Figure 9, B, C)], and rarely by some other method.

Thus, aside from some exceptions relating to the simplification or particularly unique structure of the valve, consistency of structure is evident in the genitalia of Trifinae. This provides data for comparative morphology of the valve, and in the group Trifinae enables us to drop homology, at least in its structure. In a review of the general structure of the valve it is more convenient to accept the arc of the harpes as a departure point, which can be considered the result of gradual sclerotization of the dorsal and ventral regions of the valve inward from the margins.

Initially the membranous saccate process of the valve evolved in two directions: the *Hepialus* F. type (entire valve sclerotized, processes on the inner surface absent), and the *Zygaena* F. and *Procris* F. type (progressive sclerotization from the anterior and posterior margins of the valve inward to the middle and giving rise to a fold in species of these genera, which is membranous even today). These examples illustrate the two directions in sclerotization of the valve. The harpes muscles attached to the arc make it possible to identify it without mistake in almost all members of Trifinae, even if the appendage of this arc (the harpes) is poorly developed or absent. The dorsal edge is located above the arc along the upper margin of the valve (Kozhanchikov, 1937), which often has a process. The ventral edge is usually developed only toward the basal side of the arc. The clavus, modified in shape and usually covered with bristles or setae, lies between the sacculus and lower fultura (often in the fold between them). In some groups the clavus is more closely associated with the

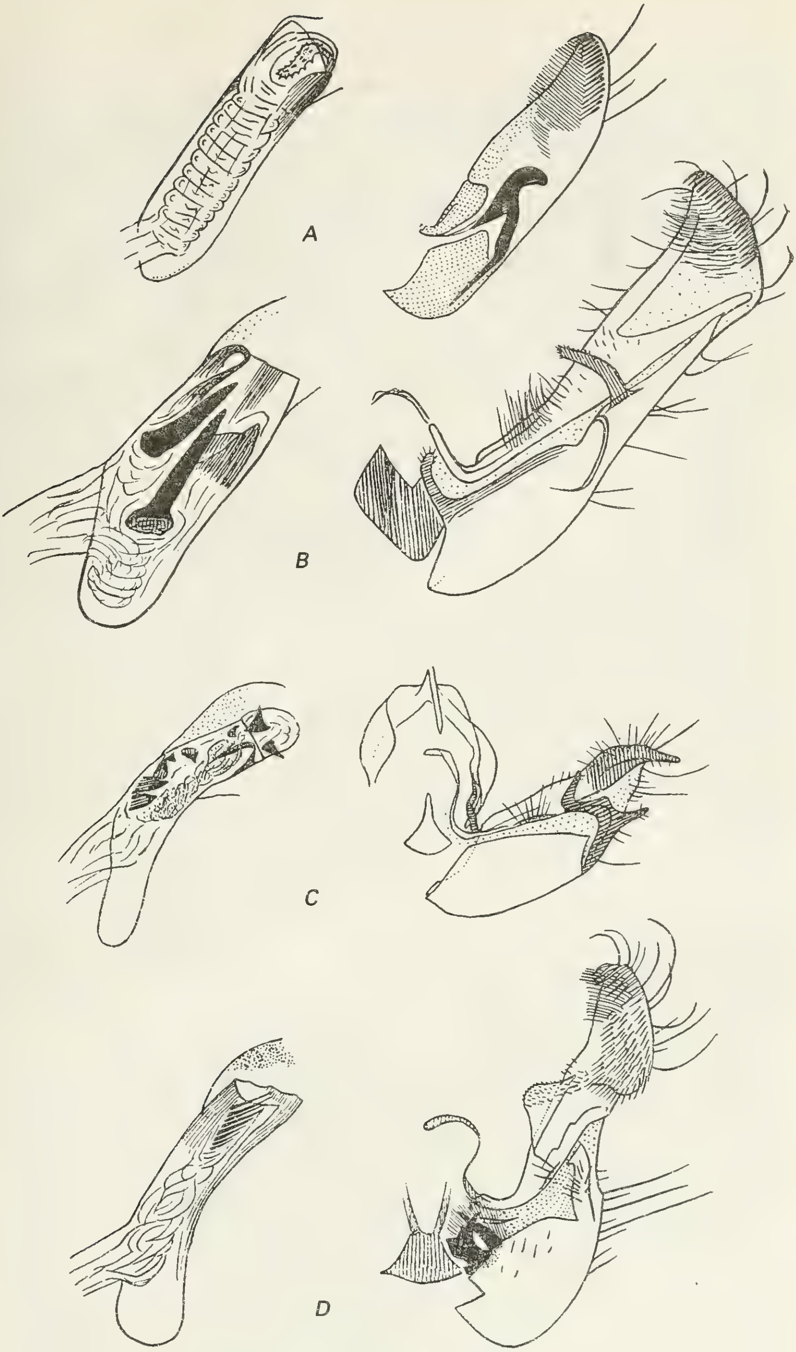


Figure 9. Male genitalia.

A — *Scotia* (*Agrotis*) *segetum* Schiff.; B — *Cucullia tanaceti* Schiff.; C — *Caradrina grisea* Ev.; D — *Amphipoea crinanensis* Burr.

fultura, in other cases with the sacculus—sometimes shifted to the middle part of the anterior margin of the sacculus, or even onto its anterior outer corner. The arc of the harpes may form processes which are often paired: One formed by the apex of the arc (the harpes in this case is shifted dorsally) and the other a free process on the ventral margin of the valve, common with the sacculus (for example, in *Euxoa* Hb.) or without it. The process at the apex of the arc of the harpes may resemble a sclerite located entirely in the plane of the valve or free over a greater or lesser distance. This was detailed by me earlier (Ryabov, 1951). Subsequent studies have shown that the foregoing is equally applicable to most Caucasian and European members of Trifinae. The only doubt concerns the correctness of drawing an homology between all the structures on the anterior margin of the sacculus with the clavus.

With relatively few exceptions, the valve of Trifinae carries yet one more structure—the editum or a strigose spot. This is located at the point of contact between the dorsal end of the arc of the harpes and the dorsal edge. Usually it is a membranous fold parallel to the margin of the edge (on the basal side of the arc) and covered with bristles of equal length and density. This structure is particularly evident in species such as *Amphipoea crinanensis* Burr. (Figure 9, D), in which the fold carrying the spot is high and sclerotized. The taxonomic position of a group of genera or an entire subfamily is decided by the structure of the main parts of the clasper valve described above; other structures are significant only at the generic or specific level.

All of the foregoing is applicable to the group Trifinae, but certain genera such as *Allophyes* Tams., *Metopoplus* Alph., *Haemassia* Hmps., *Amphiphyra* O., and others do not fit into this scheme, in which the valve is unique in structure. The former subfamily Erastriinae is also divided into two groups; some of the species are identical to Trifinae, while others are common to Quadrifinae.

The Quadrifinae group is variable: part of this group. Plusiinae for example, is undoubtedly closer to Trifinae, and tropical forms present isolated cases (*Scoliopteryx* Germ., *Calpe* Tr., and others). Nycteolinae (Sarrothripinae) as such can be excluded from the group of owlet moths that constitute the independent family Cymbidae.

At the same time, in spite of the tendency of some authors to do so, the study of the genitalia of both sexes does not provide a basis for separating Hypeninae into a distinct family.

Female genitalia: In examining the female genitalia of Lepidoptera, a distinction should be made between the copulatory and ovipositing organs. If the former provides a large number of morphological characters of a conservative nature, the latter has assumed adaptive changes associated with the surrounding environment and mode of life of an insect which, in several cases, differs sharply in closely related groups with an almost identical copulatory apparatus. Among owlet moths fairly convincing examples in this respect are *Cirrhia icteritia* Hfn. and *C. gilvago* Schiff. (Figure 10, A, B). Nevertheless, in biologically monotypic genera and groups the ovipositing apparatus provides fairly typical and suitable characters which have not been used sufficiently by taxonomists. Considering the peculiarity of both apparatuses, a separate description of the copulatory and ovipositing organs is given here.

The copulatory apparatus of female owlet moths is less complex than that of the male and exhibits several conservative properties. There are cases in which small but constant differences in the copulatory apparatus of the male of closely related species are observed, while the genitalia of the female of the same species are morphologically similar (or individual variability in structure greater than the interspecific range).

Long experience in the study of Lepidoptera enables me to assume that changes in the structure of the copulatory apparatus at a much later stage of evolution reflect the differentiation of species that has taken place. The latter apparently began with physiological changes which, in turn, constituted the total progress of the initial shifts to a purely chemical nature. I support such a "chemical" concept of species, at one time postulated by botanists, from considerations related to the well-known role of smell in bringing the sexes together, with the distribution of scent organs of varying complexity in lepidopterans, primarily in higher groups which evolved at a more rapid rate, especially in the tropics (only tortrice and owlet moths are considered here).

The most significant organ in the female genitalia is the bursa copulatrix. In the vast majority of species of owlet moths the membrane of this bursa is rounded, saccate, or cylindrical, and either with or without sclerotizations. These sclerotizations are called signa (laminae dentatae) and consist of spots, ribbonlike, mainly longitudinal stripes, or aggregate spots on the wall of the bursa, but sometimes inside the bursa also (*Rivula* Gn.). Among members of the Hypeninae and Herminiinae, and rarely in other subfamilies, the bursa copulatrix is entirely or partly armed on the inner surface with minute, dense spinules. The dentate nature of the bursa copulatrix often included in descriptions, disappears in most cases when the bursa is filled (distended).

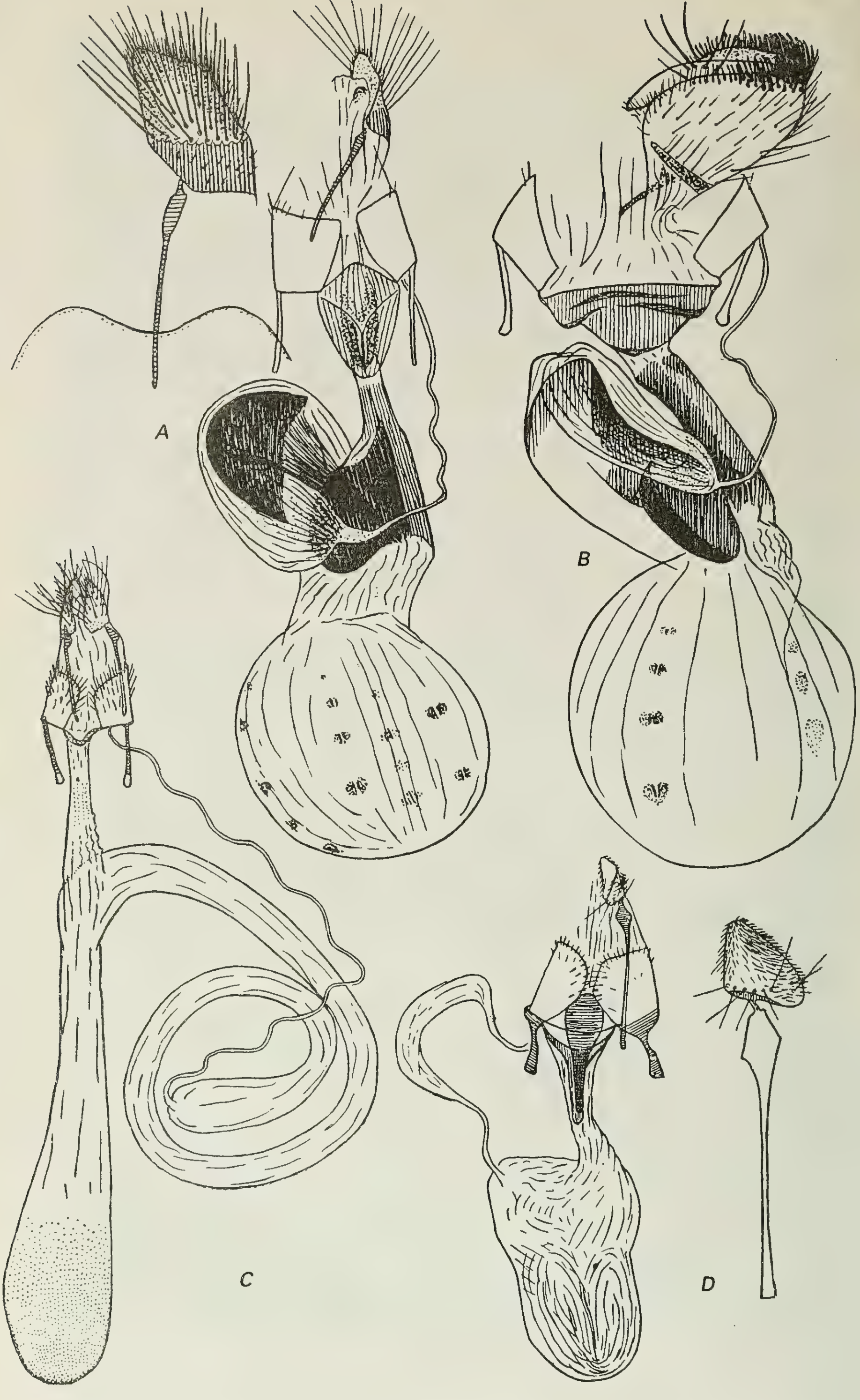


Figure 10. Female genitalia.

A — *Cirrhia gilvago* Schiff.; B — *Cirrhia icteritia* Hfn.; C — *Scotia* (*Agrotis*) *trifurca* Ev.; D. — *Euxoa cursoria* Hfn.

The other essential organ of the female genitalia is the ductus bursae. It is usually sclerotized, partially pigmented, and often with longitudinal wrinkles and folds; sometimes such parts of the duct are more dense than the usual membrane but not pigmented. The ductus bursae is often attached to the sclerite adjoining the ostium and forms its outer part. In such cases the border between the sclerite and the sclerotized parts of the duct of the copulatory bursa is delineated by a complete or incomplete membranous ring. In other cases the ductus bursae originates from the narrow isthmuslike membranous outer end—the collar of the bursa. However, a distinctly developed collar is relatively rare in owlet moths.

In the taxonomy of owlet moths the most important part of the genitalia is the dilation of the seminal duct at the point of entrance into the copulatory bursa. This dilation is variable: only a dilation may occur, as in many species of *Euxoa* Hb. (Figure 10, D) or a well-developed and isolated duct may be distinguishable, which is often sclerotized and straight, or coiled like a snail's shell; sometimes these coils are fixed, exceed the pouch in length, broad, and usually with a membranous sleeve, remaining spiraled in a normal position as seen in *Agrotis* O. (Figure 10, C). In rare cases the dilation of the seminal duct is even more unique in shape and size. In several groups the dilation is uniform and constitutes a characteristic feature of the species in the group, and in other cases its peculiarities serve only as characters for species identification. Sometimes there is no dilation and the narrow seminal duct proceeds directly from the bursa. The seminal duct resembles a membranous rope, sometimes with "knots". Its length and thickness are variable.

According to Petersen (1904), the place of origin of the seminal duct (more precisely, the degree of its separation from the ostium) is an indicator of a more or less archaic structure in Lepidoptera. This principle is just as applicable to owlet moths as to other families of Lepidoptera. Variations in the origin of the seminal duct range from a point on the copulatory bursa that is close to the ostium (in *Scoliopteryx* Germ.) (Figure 11, A), to right up to the base of the bursa (in most species of *Cucullia* Schrk. and also some other species) (Figure 11, B). This important character, which combines large groups of owlet moths and facilitates identification of their relationships, is given less importance in taxonomy. Among the other structures of the copulatory bursa, I shall mention only the membranous processes, which may be saccate, vesicular, or clavate, but always hollow. Such structures are often confined to the neck of the bursa and fairly similar to those on the dilation of the seminal duct.

Figure 11. Female genitalia.

A — *Scoliopteryx libatrix* L.; B — *Cucullia santonici* Hb.

The sclerites surrounding the ostium and the ostium per se are significant specific characters. The location of the ostium varies within the limits of segments VII to VIII; its slit may be almost exposed or sunk in the sinus between sternites VII and VIII. More often the slit is membranous; a longitudinal slit is found almost exclusively among members of Quadrifinae. Prevaginal sclerites are represented in owlet moths by a prevaginal plate or the highly sclerotized outer margin of the ostium, a postvaginal sclerite is rare (sternite VIII), and the sclerites still rarely isolated along the sides of the ostium. The prevaginal sclerite exhibits maximum variability, and is often fused with the margins of tergite VIII. If the postvaginal sclerite is developed, it is poorly defined, even though in some genera of Quadrifinae it has a very unique structure (Figure 12, C). In some cases, the parts of tergite VIII adjoining the ostium are modified. Sternite VII is slightly inflated and highly sclerotized along the posterior margin (Figure 13, B) or with a deep slitlike notch (Figure 12, A). Its covering scales are often modified and probably located on a glandular surface. Modified scales often cover pleurite VII also, especially in the anterior part around the spiracle. The intersegmental membrane between segments VII and VIII sometimes has a fold that is simple, palmate, or some other form, and is also covered with modified scales. All these structures are mostly ignored in the taxonomy of owlet moths, but in time will no doubt be taken into consideration.

To conclude, the exceptional significance of the structural peculiarities of the genitalia should be noted.

Ovipositor. The postvaginal sclerite of sternite VIII is rarely developed. In most owlet moths sternite VIII is membranous and narrow compared to the sternites of other segments. At the same time tergite VIII is relatively better developed and covers a greater part of the segment, especially in owlet moths with a telescopic ovipositor. The anterior apophyses are connected with tergite VIII and are usually in the form of rather long straight stems which serve as the place of attachment of the muscles regulating movement of the ovipositor. The length and shape of the anterior apophyses vary in different groups. In species characterized by an ovipositor with an open surface the ovipositor is poorly developed, the anterior apophyses reduced, sometimes even absent, and most probably their function different.

Even with relatively long apophyses, segment VIII of owlet moths has little mobility. The major parts of the ovipositor are the anal papillae, posterior apophyses (segment IX), and the membrane between segments VIII and IX. The posterior apophyses and the corresponding intersegmental membrane of segments VIII and IX, sometimes reach exceptional length (for example in *Hadena* Schrk.), and the eggs are laid deep in the floral tubes of Caryophyllaceae. In those cases when the female lays eggs while crawling or during flight (for example in *Episema* O., *Tholera* Hb., and others) the ovipositor is poorly developed, and the posterior apophyses and intersegmental membrane short.

Figure 12. Female genitalia.

A — *Mamestra suasa* Schiff.; B — same, ostium; C — *Pericyma albidentaria* Frr.

Figure 13. Structure of the ovipositor.

A — *Orthosia incerta* Hfn.; B — same, posterior margin of sternite VII; C — *Xylina ornithopus* Rott., anal papillae; D — *Tholera cespitis* Schiff.; E — same, anal papillae; F — same, posterior margin of sternite VII; G — *Dryobota monochroa* Esp., anal papillae.

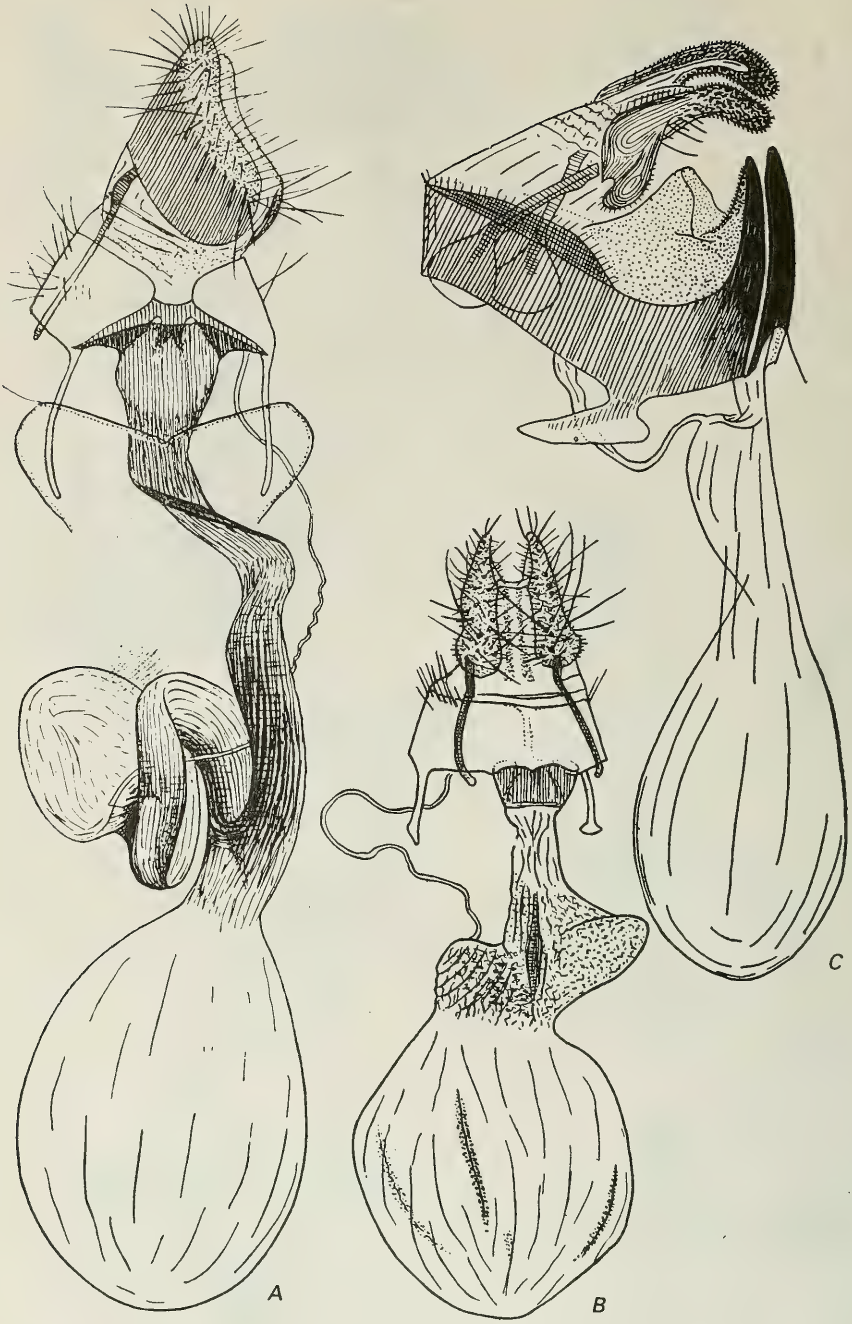


Figure 14. Structure of the ovipositor.

A — *Mythimna ferrago* F.; B — *Amphipoea oculea* L.; C — *Archanara sparganii* Esp.

The anal papillae of the ovipositor are very important in taxonomy. They completely reflect the peculiarities of oviposition in a given species or entire group of species. The simplest and most common type of anal papillae (Figures 12, A and 13, A, D, E) are typical of species which lay eggs in the open and of species which cover eggs. The anal papillae differ in length and width and consist, here, of a sclerotized base from which the posterior apophyses originate with the usual broad membranous or poorly sclerotized penniculus. The latter is covered with setae of varying length, with the long setae sparser and mostly basal, and the short ones denser and apical. The apices of the setae are mainly directed toward the apex of the papilla, although individual setae may be perpendicular to the papillary surface. The anal papillae are usually elongated, rounded, or truncated, and rarely with a shallow notch (*Episema* O.). Sometimes folded pockets develop on the inner surface of the papilla. Species laying eggs in cracks in the soil and rocks, or in tree trunks or branches, have anal papillae of the usual type—truncated (Figure 13, C) or elongated (Figure 13, G), and with long posterior and anterior apophyses. Species laying eggs in the soil do not generally differ in shape and size of anal papillae; the setae for the most part, especially the apical ones, are directed either backward toward the base of the papillae (*Euxoa* Hb.) or perpendicular to the papillary surface (some species of *Dichagyris* Ld.). Only the unique, long setae located almost exclusively in a single row at the base of the papilla (during movement of the ovipositor) are directed toward the apex and, probably, perform a tactile function. When the ovipositor penetrates the soil, these long setae bend downward. Species which oviposit under the leaf sheath and in the tissue of stems (cereals) have the most variable and specialized papillae, which are modified into a cutting or piercing organ and are often very well built (Figure 14, A, B). It should be remembered that females of this group have excellent control over oviposition depending on circumstances. Thus, species of *Hydraecia* Gn. oviposit freely under leaf sheaths and in the cavity of stems of stubble. Finally, species which oviposit in actively ruptured tissues are armed with strong spines along the outer margin of the papillae, for example *Archanara sparganii* Esp. (Figure 14, C).

It is quite clear that the differences in the structure of the ovipositor are invaluable in the systematics of this group.

REFERENCES

Börner, C. 1939. Die Grundlagen meines Lepidopteren Systems. *VIII Intern. Kongress Entom*. Weimar, vol. 2, pp. 1372–1424.

Crumb, S. 1929. Tobacco cutworms, *U.S. Dept. Agricult. Techn. Bull.*, no. 88, pp. 1–179.

Eggers, F. 1923. Ergebnisse von Untersuchungen am Johnstokschen Organ der Insecten und Ihre Bedeutung für die allgemeine Beurteilung der stiftführenden Sinnesorgane, *Zool. Anz.*, vol. 57, pp. 224–240.

Eggers, F. 1928. Die Stiftführenden Sinnesorgane, Morphology und Physiology der Chordotonalen und der tympanelen Sinnesapparate der Insecten. *Zool. Bausteine*. Berlin, vol. 2, pp. 1–354.

Forbes, W.T.M. 1939. The muscles of the Lepidopterous male genitalia, *Ann. Entom. Soc. America*, 32, 1, 10.

Gerasimov, A.M. 1952. Gusenitsy. Chast' I (Caterpillars. Part I). *Fauna SSSR. Nasekomye Cheshuekrylye*. Izd. AN SSSR, Moscow-Leningrad, vol. I, 2, nov. ser., 56, pp. 1–338.

John, O. 1910. Eine Revision der Gattung *Leucanitis* Gn., *Horae Soc. Entom. Ross.*, vol. 39, pp. 1–49 and 585–633.

Kozhanchikov, I.V. 1937. Sovki (podsem. Agrotinae) [Owlet moths (subfam. Agrotinae)]. *Fauna SSSR. Nasekomye Cheshuekrylye*. Izd. AN SSSR, Moscow-Leningrad, vol. XIII, 3, nov. ser., 15, pp. 1–675.

Kozhanchikov, I.V. 1950. Volnyanki (Orgyidae) [Vapor moths (Orgyidae)]. *Fauna SSSR. Nasekomye Cheshuekrylye*. Izd. AN SSSR, Moscow-Leningrad, vol. XII, nov. ser., 42, pp. 1–581.

Kozhantschikov, I.W. [Kozhanchikov, I.V.]. 1933. Ein neues Merkmal zur Begründung der Familien Trifidae und Quadrifidae, *Iris*, vol. 47, pp. 32–35.

Kuznetsov, N.Ya. 1915. Nasekomye cheshuekrylye (Insecta, Lepidoptera). *Fauna Rossii i Sopredel'nykh Stran*. Izd. Peterb. Akad. Nauk, 1, 1, 1–336.

MacDunnough, I. 1928. A generic revision of North American Agrotid moths, *Nat. Mus. Canada Bull.*, vol. 55, pp. 1–78.

Petersen, W. 1900. Beiträge zur Morphologie derLepidopteren, *Mem. Akad. Sci., St. Petersbourg*, pp. 1–144.

Petersen, W. 1904. Die Morphology der Generationsorgane der Schmetterlinge und ihre Bedeutung für Artbildung, *Mem. Akad. Sci., St. Petersbourg*, pp. 1–84.

Pierce, F.N. 1909. The Genitalia of the Group Noctuidae of the Lepidoptera of the British Islands. Liverpool, pp. xii + 1–85.

Richards, A.G. 1933. Comparative skeletal morphology of the noctuid tympanum, *Entom. Amer.*, vol. 13, pp. 1–43.

Ryabov, M.A. 1951. Osnovnye morfologicheskie osobennosti zemlyanykh nodgryzayushchikh sovok (Lepidoptera, Agrotinae) [Main morphological peculiarities of cutworms (Lipidoptera, Agrotinae)]. *Entom. Obozr.*, 31, 3–4, 479–494.

Smith, I. 1890. A revision of the species of the genus *Agrotis*, *Bull. U.S. Nat. Museum*, vol. 38, pp. 1–237.

Noctuid Moths (Lepidoptera, Noctuidae) from Forest Reserves of the Ukrainian Steppes

Z.F. Klyuchko

About 40% of the Ukrainian SSR lies in the steppe zone. The flora and fauna have been preserved in steppe biotopes in areas unsuitable for agriculture (ravines, steep slopes, saline soils, etc.) and in forest reserves such as the Ukrainian steppe, Black Sea, and Askaniya-Nova national parks.

The material for the present article comprised insects collected from 1964 to 1966 by entomological expeditions undertaken by Kiev University in two areas of the Ukrainian steppe forest reserves—Strel'tsovskaya and Khomutovskaya. Moths were collected on light traps with filament lamps (300 and 500 W) and mercury-quartz lamps (PRK-2, SVDSH-250-3), or reared from larvae. The collection included 27,500 specimens of 242 species of the owlet family (Noctuidae). Identification was based on collections of the Institute of Zoology, Academy of Sciences of the USSR (Leningrad). Data is also included on 67 owlet species of the Proval'skaya steppe (Voroshilovgrad District) and Askaniya-Nova by Medvedev (1928, 1929, 1950) and N.S. Obraztsov (1936–1937).

Literature on the owlet fauna of forest reserves of the Ukrainian steppes is limited to the above-mentioned publications by S.I. Medvedev and N.S. Obraztsov and articles by me (Klyuchko, 1966, 1970); the latter include a faunistic list of 241 species of owlet moths collected in the Strel'tsovskaya and Khomutovskaya steppes. As of now 262 species of owlet moths have been recorded in the forest reserves of the Ukrainian steppes, including 211 species of the group Trifinae[1]: subfamilies Noctuinae—31 species, Hadeninae—57,

---

[1] The group Trifinae as a whole and as individual subfamilies, as well as the taxonomy and nomenclature are described later according to Boursin (1964), with some additions and modifications.

Cuculliinae—36, Apatelinae—15, Amphipyrinae—61, and Melicleptriinae—11; 51 species of the group Quadrifinae[2]: subfamily Jaspidiinae—13, Euteliinae—1, Nycteolinae—2, Pantheinae—1, Plusiinae—11, Catocalinae—11, Otherinae—8, and Hypeninae—4.

Zonal and ecological adaptations, food associations, and origin and formation of steppe owlet moths are considered in this article on the basis of their modern geographic distribution.

The Strel'tsovskaya, Proval'skaya, and Khomutovskaya steppes belong to the hygrophyte, mesophyte, and xerophyte variants of mixed grass–sheep's fescue–feather grass steppes (Lavrenko, 1940; Sochava, 1964; Osychnyuk and Bilyk, 1969). The Strel'tsovskaya steppe (*steppa genuina herboso-graminosa*) (area, 484 hectares) is located in the extreme northeastern part of Ukrainian SSR in Melovoe region, Voroshilovgrad District, watershed of the Kamyshnaya and Kalitva Rivers, which is a typical example of the Donets-Don steppe. The Khomutovskaya steppe (*steppa genuina caespitoso-graminosa)* (area, 1,028 hectares) is located in Novoazovsk region, Donets District, along the Georgian-Elanchik River, 20 km north of the Azov Sea; compared to the Strel'tsovskaya steppe, the xerophyte vegetation here is more variable. The Proval'skaya steppe is located in Sverdlovsk region, Voroshilovgrad District, in the highest part of the Donets range; today this territory is under intense grazing. The Askaniya-Nova forest reserve belongs to the xerophyte type of vegetation of the subzone of sheep's fescue–feather grass steppes, and is distinguished by a further xerophytization and reduction in the role of motley grass; the latter has also become more xerophytic and the grass cover sparser (Lavrenko, 1940).

In terms of food associations most owlet moths are polyphagous, feeding on plants of at least two families (137 species, or 52.5% of the total species of owlet moths from steppe forest reserves). Oligophages are trophically associated with plants of a single family, while monophages (or narrowly polyphagous) feed on plants of a single genus only, and are represented by 62 and 33 species (23.7 and 12.6% of the total species) respectively. Food plants of herbaceous steppe and meadow-steppe vegetation from the families Poaceae, Compositae, Labiatae, Leguminosae, Scrophulariaceae, and Chenopodiaceae predominate. If one considers that the trophic associations of 30 species of owlet moths have not been established, of the 232 species of owlet moths from the steppe forest reserves, about 77.6% live on herbaceous vegetation. The southern xerophytic variants of the mixed grass–

---

[2] From Dufay (1961).

sheep's fescue–feather grass steppes have a higher owlet moth population (up to 91% in the Khomutovskaya steppe).

In the steppe plains cereal grasses predominate in the vegetation associations. In addition, members of Lobiatae (in particular, Jerusalem sage), Compositae (especially Austrian wormwood and milfoil), Leguminosae, Caryophyllaceae, Scrophulariaceae, and others are found. A shrub belt, pea shrub and, to a lesser extent, almond also is present. In the grass-covered steppes one encounters the following moths: on cereals (*Tholera cespitis* Schiff., *Ulochlaena hirta* Hb., *Thalpophila matura* Hfn., *Mesoligia furuncula* Schiff., *Oria musculosa* Hb.); wormwood and other members of Compositae (*Cucullia dracunculi* Hb. and other species of *Cucullia* Schrk., *Phyllophyla obliterata* Rbr., *Orthosia porosa* Ev.); Leguminosae (*Ectypa triquetra* Schiff., *E. glyphica* L., *Callistege mi* Cl., *Lygephila craccae* L.); Euphorbiaceae (*Oxicesta geographica* F.); Caryophyllaceae (*Heliophobus reticulata* Goeze and species of the genus *Hadena* Schrk.); Liliaceae (*Episema glaucina* Esp.); and Serophulariaceae (*Calophasia lunula* Hfn.). Insects living in turf or the upper soil layer are common (cutworms of the subfamily Noctuinae), some steppe polyphages (*Sideridis evidens* Hb., *Omphalophana antirrhini* Hb.), and species of unknown food specialization (*Apamea ferrago* Ev., *Mythimna alopecuri* B.).

These species are found in meadows on slopes: *Mythimna ferrago* F., *M. albipuncta* Schiff., *Calamia tridens* Hfn., *Hoplodrina blanda* Schiff., and others.

Eogena contaminei Ev., which feeds on sea lavender is common on saline soils, while *Epimecia ustula* Frr. is frequently found on *Cephalaria* on limestone.

In depressions of plateaus, along the base and slopes of ridges, and in ravines, shrub associations comprise black thorn with an admixture of maple, pear, apple, elder, buckthorn, briar, and rarely lilac, greenweed, and elm. The snow cover is quite delayed and creates favorable conditions near shrubs for the growth of herbaceous mesophytes. At such places many polyzonal mesophytes are common, including feeders on turf shrub vegetation: *Pachetra sagittigera* Hfn., *Mamestra w-latinum* Hfn., *Xylomyges conspicillaris* L., *Orthosia incerta* Hfn., *O. gothica* L., *Allophyes oxyacanthae* L., *Aleucanitis caucasica* Kol.

In the Proval'skaya steppe, where residues of bairach forests are preserved, *Griposia convergens* Schiff. and *Dryobotodes monochroma* Esp. are often found on leaves of oak (Medvedev, 1950).

In the floodplains of the rivulets Georgian-Elanchik and Cherepakha willow forests, outgrowths of cane with an admixture of sweet grass, sedge, hedgehog, nightshade and hops are distributed. The floodplain cenoses are characterized by owlet moths feeding inside the stems of cane (*Mythimna obsoleta* Hb., *M. pudorina* Schiff., *Archanara geminipuncta* Haw., *A. dissoluta* Tr., *Rhizedra lutosa* Hb., *Arenostola phragmitidis* Hb., *Chilodes maritima* Tausch.). Some moths are water-loving and inhabitants of wet and swampy forests (*Athetis pallustris* Hb., *Eustrotia candidula* Schiff., *Sedina buettneri* Hering); and others feed on willows (*Enargia ypsillon* Schiff., *Earias chlorana* L., *Catocala nupta* L., *C. elocata* Esp., *Scoliopteryx libatrix* L., *Colobochyla salicalis* Schiff.).

In the steppe-forest reserves dendrophils constitute on the average about 22% of the fauna of owlet moths, and xerophytic variants of the steppes about 8.5%. Four species of the genus *Cryphia* Hb. feed on lichens.

An analysis of the present geographic distribution of owlet moths in the steppe-forest reserves reveals two major complexes—boreal and Mediterranean. Within the boreal complex the following groups have been isolated: circumboreal or Holarctic, Trans-Palearctic, western Palearctic, and European. The Mediterranean complex includes the Mediterranean per se, eastern Mediterranean, and Pontian subgroups (see Table).

Based on adaptation to landscape zones and major types of vegetation, the areas of distribution[3] of the 262 species of owlet moths can be divided into three ecological subgroups—steppe, forest, and polyzonal. The last subgroup combines species with great ecological elasticity, in most cases polyphages, and is widely distributed in forest, forest-steppe, and steppe zones.

Cosmopolitan: Five polyvoltine, polyphagous, polyzonal species are world-wide in distribution, and often damage cultivated plants, mainly in the steppe, semidesert, and subtropical zones of the world: *Scotia ipsilon* Hfn., *Peridroma saucia* Hb., *Spodoptera exigua* Hb., *Chloridea armigera* Hb., and *Trichoplusia ni* Hb.

Holarctic or circumboreal group: Includes 16 species, mainly polyzonal and polyphagous, which consume herbaceous vegetation: *Amathes c-nigrum* L., *Anaplectoides prasina* Schiff., *Discestra trifolii* Hfn., *Mythimna pallens* L., *Simyra albovenosa* Goeze, *Dypterygia scabriuscula* L., *Amphipyra tragopoginis* L., *Athetis lepigone* Moeschl., *Pyrrhia umbra* Hfn., and *Autographa gamma* L. Food

---

[3] The areas of distribution and their zoogeographic groupings are based on information available in Soviet literature (Kuznetsov, 1960; Sukhareva, 1967; Fal'kovich, 1969; and others) and on material in the collection of the Institute of Zoology, Academy of Sciences of the USSR and Kiev University, since data on the distribution of owlet moths in the territory of the Asian of the USSR presented in foreign literature is not precise.

Ratio of major zoogeographic groups of owlet moths of the forest reserves of the Ukrainian steppes

Group and subfamily	Cosmo-politan	Holarctic	Trans-Palearctic	Western Palearctic	European	Mediter-ranean	Pontian	Turanian	Tropical and subtropical	Total no. of species
TRIFINAE										
Noctuinae	2	2	13	8	—	6	—	—	—	31
Hadeninae	—	2	25	8	—	21	—	1	—	57
Cuculliinae	—	1	9	7	—	19	—	—	—	36
Apatelinae	—	1	7	1	1	4	1	—	—	15
Amphipyrinae	1	6	21	14	3	15	1	—	—	61
Melicleptriinae	1	2	3	—	—	4	—	—	1	11
QUADRIFINAE										
Jaspidiinae	—	—	5	2	—	6	—	—	—	13
Euteliinae	—	—	—	—	—	1	—	—	—	1
Nycteolinae	—	—	1	—	—	1	—	—	—	2
Pantheinae	—	—	—	1	—	—	—	—	—	1
Plusiinae	1	1	7	—	—	2	—	—	—	11
Catocalinae	—	—	5	2	—	3	—	—	1	11
Othreinae	—	1	4	—	—	1	—	2	—	8
Hypeninae	—	—	3	—	—	1	—	—	—	4

specialization is narrow in the grass eaters *Apamea sordens* Hfn. and *A. lateritia* Hfn. *Chloridea scutosa* Schiff. is better adapted to the steppe and forest-steppe zones. The hygrophilic species *Hydraecia micacea* Esp. is found in large numbers in the forest zone, extending only into the northern part of the steppe where it is found in floodplains of rivers. Two mesophilic species—*Scoliopteryx libatrix* L. and *Agrochola circellaris* Hfn.—live on willow, poplar, and other arboreal-shrub vegetation, and penetrate far into the southern forest zone along floodplain forests, ravines, and artificial forest plantations.

Trans-Palearctic group: Based on number of species (103) this group constitutes the nucleus of the fauna of owlet moths in the forest reserves of the Ukrainian steppes. The steppe subgroup includes 23 species whose area of distribution mainly corresponds to the steppe zone of Eurasia. However, many of them reach the forest steppes and forest zones along well-lighted and well-heated glades, fringes, and wastelands. They are trophically associated with stepped and meadow-steppe herbaceous vegetation. Ten species are polyphagous: *Euxoa agricola* B., *E. aquilina* Schiff., *Scotia ripae* Hb., *Spaelotis ravida* Schiff., *Memestra aliena* Hb., *Simyra nervosa* Schiff., *Caradrina albina* Ev., *Athetis furvula* Hb., *A. gluteosa* Tr., and *Chloridea viriplaca* Hfn. Twelve species are narrowly specialized for feeding on cereals (*Mythimna l-album* L., *Mesoligia furuncula* Schiff., *Apamea anceps* Schiff.), plants of Compositae, especially various species of wormwood (*Cucullia splendida* Cr., *C. artemisiae* Hfn., *Phyllophyla obliterata* Rbr.), members of Scrophulariaceae (*Cucullia verbasci* L., *Calophasia lunula* Hfn.), Boraginaceae (*Syngrapha consona* F., *Eublemma arcuinna* Hb.), Caryophyllaceae (*Harmodia compta* Schiff.), and Asclepiadaceae (*Abrostola asclepiadis* Schiff.).

The forest subgroup consists of 13 species which are widely distributed in the forest zone of the Palearctic and penetrate together with the vegetation of the floodplains and bairach forests right up to the subzone of sheep's fescue–feather grass steppes. Most of the species of the forest subgroup are monovoltine polyphages feeding on leaves of willow, polar, black thorn, raspberry, and rarely oak and other arboreal shrub species. Some of these insects may also develop on herbaceous vegetation: *Diarsia rubi* View., *Polia bombycina* Hfn., *P. nebulosa* Hfn., *Moma alpium* Osbeck., *Cosmia trapezina* L., *Orthosia incerta* Hfn., *O. gothica* L., *Cirrhia icteritia* Hfn., *Ipimorpha retusa* L., and *Bena prasinana* L.

Among species with a narrow food specialization are feeders on willow (*Colobochyla salicalis* Schiff.) and Rosaceae (*Catocala hymenaea* Schiff.). In the floodplains per se sometimes *Celaena* *leucostigma* Hb. is also found; the larvae live in the stems and roots of coastal and water plants (yellow flag, great willow herb, manna grass).

The polyzonal subgroup is the largest (67 species). These insects are primarily polyphagous and exhibit great ecological plasticity, permitting inhabitation of different biotopes of the forest and steppe zones. Many are well-adapted to life in anthropogenic biotopes, feed on different agricultural crops and rough vegetation, and even multiply en masse: *Euxoa tritici* L., *Scotia segetum* Schiff., *S. exclamationis* L., *S. vestigialis* Hfn., *Mamestra brassicae* L., *M. suasa* Schiff., *M. oleracea* L., *M. w-latinum* Hfn., *Apatele rumicis* L., *Macdunnoughia confusa* Steph., *Emmelia trabealis* Scop., and others.

Species with a narrow food specialization (17) live on common cane (*Mythimna pudorina* Schiff., *Rhizedra lutosa* Hb.), grasses (*Apamea monoglypha* Hfn., *A. remissa* Hb.), sedges (*Eustrotia uncula* Cl.), members of Caryophyllaceae (*Heliophobus reticulata* Goeze, *Hadena rivularis* F., *H. confusa* Hfn.), Compositae (*Cucullia asteris* Schiff., *Mamestra bicolorata* Hfn.), Leguminosae (*Lygephila craccae* F., *Ectypa glyphica* L., *Callistege mi* Cl.), milkwort (*Phytometra viridaria* Cl.), willow (*Catocala nupta* L., *C. elocata* Esp.), and lichens (*Cryphia raptricula* Schiff.).

Western Palearctic group: Includes 43 species which are distributed throughout Europe (sometimes also northern Africa), western Siberia, Kazakhstan, Altai, and right up to eastern Siberia and China.

The steppe subgroup consists of eight species that feed on herbaceous vegetation; four species are polyphagous (*Sideridis evidens* Hb., *Calamia tridens* Hfn., *Acontia lucida* Hfn., *A. luctuosa* Esp.); and four species exhibit a narrow food specialization for Compositae, especially wormwood (*Conisania leineri* Frr., *Cucullia absinthii* L., *C. tanaceti* Schiff.), and Caryophyllaceae (*Hadena albimacula* Bkh.).

Six mesophytic species constitute the forest subgroup, are rarely found in the steppes, and are tropical. These species are either associated with the turf shrub vegetation of Fagaceae (*Mormonia sponsa* L., *Catocala promissa* Schiff.), or Rosaceae (*Allophyes oxyacanthae* L.), or Ulmaceae (*Cosmia diffinis* L.), or are polyphagous (*Apatele aceris* L., *Diloba coeruleocephala* L.).

The polyzonal subgroup includes 29 species distinguished by their monovoltine nature (*Mythimna obsoleta* Hb. and *Caradrina clavipalpis* are bivoltine), which live primarily on meadow-steppe herbaceous vegetation. Feeding on leaves of trees and shrubs of Rosaceae, Fagaceae, Salicaceae, Barberidaceae, Ulmaceae is characteristic of some species (*Mesogona acetosellae* Schiff., *Xylomyges conspicillaris* L., *Agrochola lota* Cl.); however, their larvae may also develop on herbaceous plants. Most species are polyphagous. Eight species have a narrow food specialization for cereals (*Tholera cespitis* Schiff., *Thalpophila matura* Hfn., *Oligia strigilis* L., *O. latruncula* Schiff.), small reed (*Photedes fluxa* Hb.), common reed (*Mythimna obsoleta* Hb., *Arenostola phragmitidis* Hb., *Chilodes maritima* Tausch.), and two species for plants of Caryophyllaceae (*Hadena perplexa* Schiff. and *H. luteago* Schiff.).

European group: Comprises four monovoltine species with a narrow food specialization. *Enargia abluta* Hb. feeds on leaves of poplar and is common in the forest and steppe zones of Europe. *Archanara neurica* Hb. feeds on common cane and other marshy grasses and occurs singly near reservoirs (marshes, rivulets, rivers, etc.). Habitat adaptation is likewise characteristic of *Sedina buettneri* Hering living on cereals and sedges. *Cryphia fraudatricula* Hb. feeds on lichens and is distributed in steppe and forest-steppe zones of Europe.

Mediterranean group: Comprising 84 species, this group together with the Trans-Palearctic group constitutes the second nucleus in the fauna of owlet moths in the forest reserves of the Ukrainian steppes, especially in grass-covered steppes. The typical area of distribution for 56 species covers southern Europe, northern Africa, the Caucasus, western and Central Asia right up to the Himalayas, and western China.

Saragossa siccanorum Stgr., *Mamestra praedita* Hb., *M. literata* F.-W., *Cardepia helix* Brsn., *Cucullia scopula* F.-W., *C. biornata* F.-W., *Blepharita leuconota* H.-S., *Mycteroplus puniceago* Bsd., *Hydraecia cervago* Ev., *Caradrina hypostigma* Brsn., *Porphyrinia rosea* Hb., *P. pusilla* Ev., *P. griseola* Ersch.; *Aedophron rhodites* Ev. or a total of 28 species (10.7% of the population) are restricted in distribution to the western Balkan Peninsula and constitute a characteristic eastern Mediterranean group in the Ukrainian steppes, which confirms my assumption about the close genetic relationship between steppe fauna and eastern Mediterranean fauna.

The steppe subgroup (70 species) is the largest in the forest reserves of the Ukrainian steppe. This group differs from similar subgroups of the boreal complex in its well-developed xerophytic nature, by feeding exclusively on meadow-steppe and herbaceous-steppe vegetation, by its precise phenological correspondence in development of feeding phases of the life cycle with the period of vegetative growth of food plants, and by the associated monovoltine nature of most (58 species), summer estivation, and other peculiarities. Information on food specialization is available for only 44 species, of which 17 are polyphagous, 16 oligophagous, and 11 monophagous.

Species with a narrow food specialization include: cereal grasses (*Ulochlaena hirta* Hb., *Oria musculosa* Hb.), members of Compositae, especially wormwood, cotton thistle, stemless thistle, and Jurinea (*Cucullia santonici* Hb., *C. dracunculi* Hb., *C. argentina* F., *Porphyrinia respersa* Hb., *P. purpurina* Schiff., *P. rosea* Hb.), Chenopodiaceae (*Mamestrablenna* Hb.-G., *Mycterolus puniceago* Bsd.), Caryophyllaceae (*Hadena laudeti* B., *H. luteocincta* Rbr. *H. magnolii* B.), Scrophulariaceae (*Cucullia lychnitis* Rbr.), Leguminosae, in particular milk vetch (*Ectypa triguetra* Schiff.), Labiatae, especially Jerusalem sage (*Aedophron rhodites* Ev.), Ranunculaceae, especially larkspur and meadow rue (*Mamestra cappa* Hb., *Aegle koekeritziana* Hb., *Plusia deaurata* Esp., *Periphanes delphinii* L.), Euphorbiaceae (*Oxicesta geographica* F.), Liliaceae (*Episema glaucina* Esp.), Dipsacaceae, especially cephalaria (*Epimecia ustula* Frr.), Iridaceae (*Oxytrypia orbiculosa* Esp.), and St. John's wort (*Actinotia hyperici* Schiff.).

The forest subgroup includes only seven species. Some are trophically associated with an arboreal-shrub vegetation such as: oak (*Griposia convergens* Schiff. *Dryobotodes monochroma* Esp., *Minucia lunaris* Schiff.), willow (*Earias chlorana* L.), and members of Anacardiaceae (*Eutelia adulatrix* Hb.). Two species are monophagous consumers of the foliage of trees and shrubs (*Atethmia centrago* Haw.) or arboreal lichens (*Cryphia algae* F.). All of these species live in bairach and floodplains–arboreal–shrub associations and are almost totally absent in grass-covered steppes.

Species of the polyzonal subgroup (seven) are trophically associated with herbaceous meadow-marsh vegetation: *Amathes xanthographa* Schiff., *Mythimna albipuncta* Schiff., *Hoplodrina ambigua* Schiff., *Aedia funesta* Esp., *Schrankia costaestrigalis* Steph., *Archanara geminipuncta* Haw., and *A. dissoluta* Tr.

Pontian group: Close to the Mediterranean group, these species are distinguished by a more restricted area of distribution, covering the steppes north of the Black Sea, northern Caucasus, lower Volga, and southern Ural. The group includes *Luperina taurica* Kl. for which the food association is not known, and *Eogena contaminei* Ev., which feeds on pubescent sea lavender.

Turanian group: Represented by three species: *Orthosia porosa* Ev. (larvae on plants of Compositae, wormwood, and tansy), *Drasteria caucasica* Kol. (larvae on leaves of *Elaeagnus*), and *Lygephila lubrica* Frr. (food specialization not known).

Tropical and subtropical groups: Represented by two omnivorous species, *Chloridea peltigera* Schiff. and *Prodotis stolida* F.

A comparison of the present areas of distribution and zonal ecological subgroupings of individual species of owlet moths attests to the dominant role of polyzonal species of the boreal complex (112 species) and steppe species of the Mediterranean complex (72 species) under conditions of forest reserves in the Ukrainian steppes. This ratio is even more impressive if large-scale species are compared separately, namely, 275 or 1.0% of the total collection. The following 28 owlet moths belong in this list:

Boreal Complex

Scotia segetum Schiff.
S. exclamationis L.
S. cinerea Schiff.
Amathes c-nigrum L.
Discestra trifolii Hfn.
Pachetra sagittigera Hfn.
Sideridis evidens Hb.
Heliophobus reticulata Goeze
Mamestra w-latinum Hfn.
M. suasa Schiff.
Orthosia gothica L.
Mythimna ferrago F.
Enargia ypsillon Schiff.
Chloridea scutosa Schiff.
Eustrotia candidula Schiff.
Emmelia trabealis Sc.
Acontia lucida Hfn.
A. luctuosa Esp.
Plusia chrysitis L.

Mediterranean Complex

Mythimna albipuncta Schiff.
M. alopecuri B.
Omphalophana antirrhini Hb.
Episema glaucina Esp.
Oxicesta geographica F.
Luperina ferrago Ev.
Mycteroplus puniceago B.
Epimecia ustula Frr.
Ectypa triquetra Schiff.

It is evident from the above lists that large-scale species of the boreal complex predominate in forest reserves of the Ukraine, with the Mediterranean complex (19 and 9 species respectively, or 57% and 22% of the total collection of owlet moths) taking second place.

An analysis of the fauna of owlet moths of individual forest reserves in the steppe regions confirms the opinion expressed by Fal'kovich (1969) about the exclusive role of the composition of vegetation in the distribution of steppe Lepidoptera.

The owlet moth fauna in the Strel'tsovskaya and Khomutovskaya steppes includes a large number of common species (126), predominantly polyzonal and polyphagous, which live in the steppes per se as well as in anthropogenic biotopes of the steppe zone (Klyuchko, 1968). The vegetation of the Strel'tsovskaya steppes is characterized by a combination of forest-steppe and meadow-forest elements with the present steppe xerophytes (Osychnyuk and Bilyk, 1969). Among the owlet moths of Strel'tsovskaya steppes, some moisture-loving species have also been found, usually under conditions of humid biotopes of the forest-steppe and forest zones: *Diarsia rubi* View., *Moma alpium* Osbeck, *Mythimna conigera* Schiff., *Hydraecia micacea* Esp., *Photedes fluxa* Hb., *Athetis pallustris* Hb. (the number of the latter is fairly high). Species which prefer arid conditions which live in grass-vegetation associations: *Ochropleura signifera* Schiff., *Cucullia scopula* F.-W., *C. argentina* F., *C. splendida* Cr., *Episema scoriacea* Esp., *Caradrina hypostigma* Brsn., *Rhodocleptria incarnata* Frr., *Porphyrinia rosea* Hb., and others.

The Mediterranean complex is better represented in the xerophytic variant of the subzone of mixed grass–sheep's fescue–feather grass steppe, which is possibly explained by a richer xerophytic vegetation in the southern Khomutovskaya steppe compared to Strel'tsovskaya. In the Khomutovskaya steppe, such arid species of the Mediterranean complex are found as *Euxoa temera* Hb., *Scotia obesa* B., *Sideridis implexa* Hb., *Mamestra praedita* Hb., *Hadena imitaria* Brandt, *H. drenovskii* Rbl., *Mythimna vitellina* Hb., *Cucullia lychnitis* Rbr., *Calophasia casta* Bkh., *Episema sareptana* Alph., *Blepharita leuconota* H.-S., *Conistra veronicae* Hb., *Craniophora pontica* Stgr., *Hydraecia cervago* Ev., *H. osseola* Stgr., *Caradrina flavirena* Gn., *Oxytrypia orbiculosa* Esp., *Porphyrinia griseola* Ersch., and others.

The fauna of owlet moths in the sheep's fescue–feather grass steppe of Askanya Nova forest reserve is poorer (67 species) than that of the mixed grass–sheep's fescue–feather grass steppe and mainly due to the less variable composition of the vegetation. Widely distributed polyzonal species predominate in grass-covered steppes where some arid Mediterranean species have also been found—*Mamestra cappa* Hb., *Cucullia santonici* Hb., *Ulochlaena hirta* Hb., *Oria musculosa* Hb.—on *Eogena contaminei* Ev.

CONCLUSIONS

Soil formation and the development of flora and fauna commenced in the steppe zone of the Ukraine in the Miocene as the Sarmatian Sea receded. As shown by Lavrenko (1940), the flora of the steppe region of the Eurasia differs from that of adjacent regions of the Mediterranean. This is mainly the result of migration of xerophytic elements from the Mediterranean, adjacent forest zone, and alpine belts; furthermore, the steppes per se were a center of flora formation.

The origin of the terrestrial insect fauna, especially the noctuid steppe fauna, is closely associated with the history of development of vegetation and changes in climate. According to the results of pollen analysis (Artyushenko, 1970), in the Azov region, at the end of the Middle Pliocene, cereal–mixed grass steppes were widespread with a predominance of cereal–wormwood–Chenopodiceae, and in the lower parts of the relief broad-leaved–coniferous forests. Hence it is understandable that the leading role in the formation of steppe fauna was played by two faunal complexes—boreal and Mediterranean.

A change in climate toward a cooler, more continental type at the end of the Pliocene and especially in the Pleistocene (Sinitsyn, 1965) caused a significant depletion in flora and in the steppe zone due to the elimination of several Tertiary hydrophils and thermophils. At present, the anthropogenic factor is very significant in the changes affecting the flora and fauna of the steppes.

The noctuid fauna of the steppe zone of the Ukraine is less unique than, for example, the montane fauna of Crimea. However, it is fairly variable in species composition, numerical ratio of individual species, their adaptation to definite biotopes, phenological and other peculiarities, and markedly differs from adjacent forest-steppe fauna. The steppe fauna is characterized by the presence of a large number of steppe endemics and subendemics (see Kryzhanovskii 1965): *Discestra dianthi* Tausch., *D. stigmosa* Christ., *Saragossa siccanorum* Stgr., *Cardepia helix* Brsn., *Mamestra praedita* Hb., *M. literata* F.-W., *Hadena imitaria* Brandt, *H. melanochroa* Stgr., *Orthosia porosa* Ev., *Cucullia scopula* F.-W., *C. argentina* F., *C. dracunculi* Hb., *C. biornata* F.-W., *C. lactea* F., *C. splendida* Cr., *Episema sareptana* Alph., *Ulochlaena hirta* Hb., *Oncocnemis confusa* Frr., *Blepharita leuconota* H.-S., *Mycteroplus puniceago* Bsd., *Luperina taurica* Kl., *Apamea ferrago* Ev., *Hydraecia cervago* Ev., *Aegle koekeritzinana* Hb., *Rhodocleptria incarnata* Frr., *Aedophron rhodites* Ev., *Porphyrinia rosea* Hb., *P. pusilla* Ev., *P. griseola* Ersch., *Acontia titania* Esp., *Lygephila lubrica* Frr., and others.

In general, the zonal endemism of steppe fauna is not high, about 13% for owlet moths and 15.2% for birds (Voinstvenskii, 1960). The typical steppe species of moths even in the sod conditions of the central Kazakhstan steppes do not reach 50% (Fal'kovich, 1969), and are not more than 40% in the mixed grass–sheep's fescue–feather grass, sheep's fescue–feather grass steppes of the Ukraine.

Polyzonal and widely distributed species in the Palearctic constitute about 43% of the fauna.

The two faunal groupings—polyzonal species of the boreal complex and steppe species of the Mediterranean complex—played an exceptionally important role in the formation of the nucleus of present-day noctuid fauna in the steppe zone of the Ukraine.

REFERENCES

Artyushenko, A.T. 1970. Rastitel'nost' lesostepi i stepi Ukrainy v chetvertichnom periode (Vegetation of the Forest-Steppe and Steppe of the Ukraine in the Quaternary Period). Naukova Dumka, Kiev, pp. 1–173.

Boursin, Ch. 1964. Les Noctuidae Trifinae de France et de Belgique, *Bull. Mens. Soc. Linnéenne Lyon*, vol. 33, pp. 204–240.

Dufay, C. 1961. Faune terresare et d'eau des Pyrènées Orientales, Fasc. 6. *Lépidoptères*. Paris, pp. 45–96.

Fal'kovich, M.I. 1969. Cheshuekrylye (Lepidoptera) gor Kokshetau i Zharkol'-Shonndykol'skogo plato (Lepidoptera of the Kokshetau mountains and the Zharkol-Shonndykol'skoe plateau). In: *Rastit. Soobshchestva i Zhivotnoe Naselenie Stepei i Pustyn' Tsentr. Kazhkhstana*. Izd. Nauka, Leningrad, pp. 444–468.

Kljutchko, S.F. [Klyuchki, Z.F.]. 1970. Beitrag zur Kenntnis der Noctuiden-fauna der Naturschutzsteppen Streletskaja und Chomutovskaja (Ukrainische SSR) (Lepidoptera, Noctuidae), *Entom. Ber.*, pp. 37–49.

Klyuchko, Z.F. 1966. Do vivcheniya fauni sovok stepovoi zoni Ukraini (On the study of the fauna of owlet moths in the steppe zone of the Ukraine). *Visnik Kiivs'kogo Universitetu, Ser. Biol.*, pp. 141–145.

Klyuchko, Z.F. 1968. K izucheniyu fauny sovok v usloviyakh antropogennykh biotopov i zapovednykh uchastkov stepi USSR (On the study of the fauna of owlet moths in the conditions of anthropogenic biotopes and protected areas of the steppes of Ukraine SSR). In: *Biologicheskaya Nauka v Universitetakh i Ped. Institutakh Ukrainy za 50 Let.* Izd. Khar'kovsk. Gos. Un-ta, pp. 248–249.

Kryzhanovskii, O.L. 1965. Sostav i proiskhozhdenie nazemnoi fauny Srednei Azii (Composition and Origin of the Terrestrial Fauna of Central Asia). Izd. Nauka, 418 pp.

Kuznetsov, V.I. 1960. Materialy po faune i biologii cheshuekrylykh (Lepidoptera) Zapadnogo Kopet-Daga (Data on the fauna and biology of Lepidoptera of western Kopet Dag). *Tr. Zool. Inst. AN SSSR*, vol. 27, pp. 11–93.

Lavrenko, E.M. 1940. Stepi SSSR (The Steppes ot the USSR). In: *Rastitel'nost' SSSR*. Izd. AN SSSR, Moscow-Leningrad, vol. 2, pp. 1–206.

Medvedev, S.I. 1928. Entomofauna askaniiskoi tselinnoi stepi (Entomofauna of the Askanian virgin steppe). *Stepnoi Zapovednik Chapli-Askaniya Nova.* Moscow-Leningrad, pp. 195–209.

Medvedev, S.I. 1929. O rasprotranenii nasekomykh v yuzhnom Zadneprov'e (Distribution of insects in the southern Dnieper region). *Izv. Gos. Stepnogo Zapovednika "Chapli"* (Askaniya Nova), vol. 7, pp. 5–27.

Medvedev, S.I. 1950. Predvaritel'noe soobshchenie ob izucheniya entomofauny Proval'skoi stepi Voroshilovgradskoi oblasti (Preliminary report on the study of the entomofauna of the Proval'skaya steppe of Voroshilovgrad District). *Tr. Nauchn.-Issled. Inta Biologii Khar'kovsk Gos. Un-ta,* vols. 14–15, pp. 33–45.

Obraztsov, N.S. 1936–1937. Zur Lepidopterenfauna des sudlichen Trans-dneprgebietes, Festschrift zum 60. *Geburtstage von Prof. Dr. Embrik Strand,* vol. 2, pp. 229–242.

Osychnyuk, V.V. and G.I. Bilyk. 1969. Ukrainskii stepnoi zapovednik (The Ukrainian protected steppes). In: *Zapovedniki Sovetskogo Soyuza.* Izd. Kolos, Moscow, pp. 287–296.

Sinitsyn, V.M. 1965. Drevnie klimaty Evrazii (Ancient Climates of Eurasia). Izd. LGU, vol. 1, pp. 1–166.

Sochava, V.B. 1964. Rastitel'nost' (Vegetation). In: *Fizikogeograficheskii Atlas Mira.* Moscow, map p. 241.

Sukhareva, I.L. 1967. K faune sovok (Lepidoptera, Noctuidae) gubovo-listvennichnykh lesov Priamur'ya [On the fauna of owlet moths (Lepidoptera, Noctuidae) of the oak-larch forests of Priamur). *Tr. Zool. Inst. AN. SSSR,* vol. 41, pp. 73–79.

Voinstvenskii, M.A. 1960. Ptitsy stennoi polosy svroneiskoi chasti SSSR (Birds of the Steppe Zone of the European Part of the USSR). Izd. AN USSR, Kiev, 287 pp.

New Noctuid Species of *Oxytrypia* Stgr. (Lepidoptera, Noctuidae)

E.S. Milyanovskii

O. orbiculosa Esp. has long been the only species known in the genus *Oxytrypia* Stgr. It is distributed in Altai, the Caucasus, and Hungary. In other words, it is sufficiently widespread, although local. While examining material collected from eastern Trans-Caucasus, I recently discovered another species of this genus.

The new species was named in memory of my childhood friend, the famous entomologist A.S. Danilevskii. The holotype is preserved in the collection of the Institute of Zoology, Academy of Sciences of the USSR in Leningrad. The paratypes are preserved in the collections of E.S. Milyanovskii and the Laboratory of Entomology, Institute of Zoology, Academy of Sciences, Azerbaidzhan SSR.

Oxytrypia danilevskyi Milijanovsky, sp. n.

Close to *O. orbiculosa* Esp., this species differs notably in several external characters and structure of the genitalia.

External appearance of moth (male) (Figure 1): Wingspan 46 to 50 mm. Pattern mottled. Wings brighter than in *O. orbiculosa* Esp. Outer stripe with well-defined dents. Hind wings pure white. Reniform spot semicircular.

The following differences are further apparent in a comparison with *O. orbiculosa* Esp.

O. orbiculosa Esp.	*O. danilevskyi* Miljanovsky, sp. n.
Wings brownish-gray, more monochromatic. Outer dentate stripe with minute depressions.	Wings brownish-gray, variegated. Outer dentate stripe with different depressions.
Reniform spot white, large, round or rhomboid.	Reniform spot white, truncated toward outer margin, semicircular.
Round spot blue. Area near cuneiform spot brown, as also space between reniform and round spots.	Round spot brown. Space between reniform and round spot blue. Blue spot located in center of wing, and similar spot on outer margin of wing near apex.

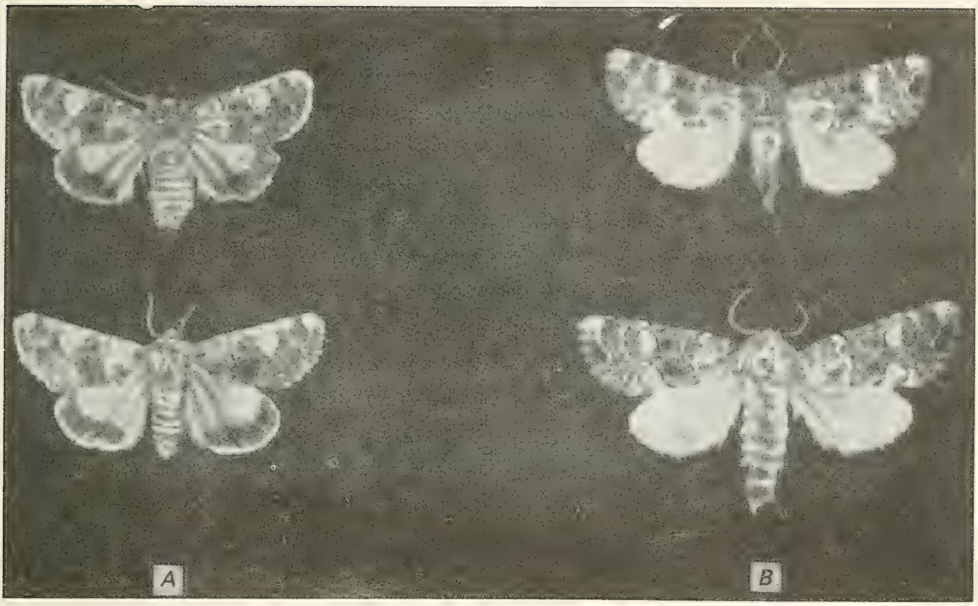


Figure 1. *Oxytrypia* Stgr.

A — *O. orbiculosa* Esp.; B — *O. danilevskyi* Miljanovsky, sp. n., paratypes.

O. orbiculosa Esp.	*O. danilevskyi* Miljanovsky, sp.n.
Inner margin of forewing brownish-gray.	White area located near inner margin of forewing.
Fimbria of forewings white, in lower part with grayish veins.	Fimbria of forewings variegated, with same coloration as wing.
Underside of forewings and hind wings with broad black marginal stripe.	Underside of forewings and hind wings with narrow middle stripe.
Small black spot occurs on underside of hind wings.	Spot on underside of hind wing round or crescent-shaped.
Hind wings with broad black band along outer margin.	Hind wings pure white.
Abdomen with alternative transverse white and grayish stripes.	Abdomen whitish-gray with longitudinal gray stripe. Tuft of setae located near base.
Male genitalia (Figure 2, A). Valves oval. Harpes straight, narrow toward end. Vertical appendage attenuates gradually toward apex, without projection.	Male genitalia (Figure 2, B). Valves with slight medial curve. Harpes curved, resembles question mark, bent and thickened at end. Vertical appendage with sharp projection in upper part.

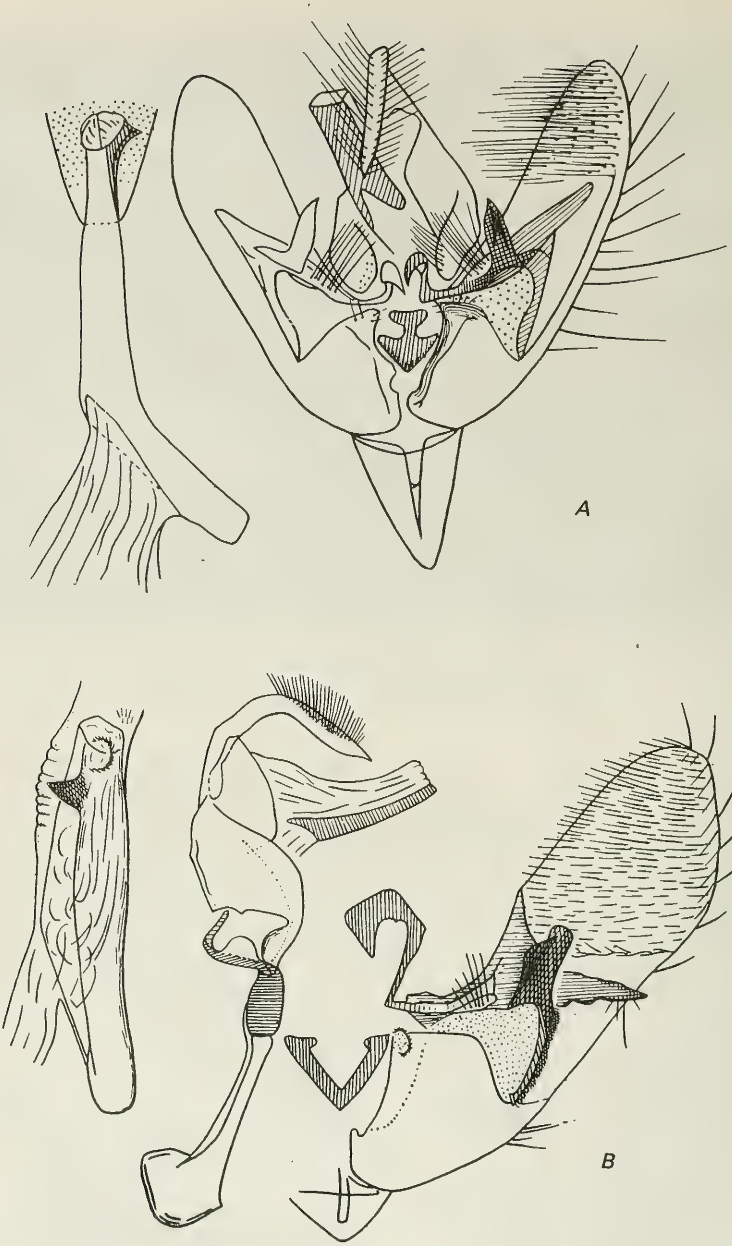


Figure 2. *Oxytrypia* Stgr., males, genitalia.

A—*O. orbiculosa* Esp.; B—*O. danilevskyi* Miljanovsky, sp. n., holotype, male.

Holotype, male, with micropreparation by M.A. Ryabov, No. 6077. Azerbaidzhan: Dzhuga (Ryabov) October 6, 1932.

Paratypes: Armenia, Goris (Milyanovskii) October 10, 1958, male. Azerbaidzhan, Talysh, Diabarskaya trough (Zuvand), Lerik (Effendi) October 16, 1971, 7 males.

Sukhumi Experimental Station of Essential Oil Crops.

Smithsonian Institution Libraries

WASHINGTON, D.C. 20560 202-357-2240

The Smithsonian Institution Libraries has selected your library to receive *gratis* copies of volumes published in our Translations Publishing Program. Under this program, significant non-English-language works that related to a field of Smithsonian research are translated and published with Special Foreign Currency funds according to the provisions of Public Law 480. We hope that you will find this publication a useful addition to your collection. We would appreciate receiving a copy of all reviews of this work.

Additional copies of this work may be purchased from the National Technical Information Service (N.T.I.S.), Springfield, Virginia, 22161. Please cite the TT (Technical Translation) number printed on the Copyright page when ordering from N.T.I.S.

Let us know if your copy of this book is incomplete or damaged.

Please direct all inquiries and address corrections to:

Translations Publishing Program
Smithsonian Institution Libraries
Natural History Building 22
Washington, D.C. 20560

202/357-1850

October 1988

TT 81-52001