TAXONOMY OF THE LARVAE AND PUPAE OF ECONOMICALLY IMPORTANT PYRALIDAE IN HONDURAS

By
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This thesis is dedicated most of all to my family for their everlasting love and support throughout my life as a student; also to the late Dr. Mankins, friend of all, and "father of entomology in Honduras"; and to the hope that someday universities will be ranked on the support and quality of the programs offered to students instead of the number of pages published in journals.

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A. Keene typed this work while it suffered numerous format changes. She translated my handwriting into English, followed hundreds of arrows all over the pages, and is living proof that minor miracles can occur with a typewriter.

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As a final gesture, now that the thesis is done, I send a "thumbs up" and "O.K." symbol to those people who showed me such great faith at Florida.

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Abstract of Thesis Presented to the Graduate School
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TAXONOMY OF THE LARVAE AND PUPAE OF ECONOMICALLY
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By

STEVEN CLIFFORD PASSOA

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Chairman: Dr. D. H. Habeck
Major Department: Entomology and Nematology

Sixty economically important species of Pyralidae in Honduras were studied based on three years of collecting, a review of the published literature, and an examination of Honduran insect collections. The diagnostic features of each species were described and illustrated. A key to larvae and pupae, color photographs of many larvae, common names, hosts, distribution, pest status and brief notes on the biology were also included.

The following species were studied: Nymphulinae: *N. depunctalis* Gn., *P. diminutalis* Snellen; Glaphyriinae: *H. phidilealis* (Wlk.); Evergestinae: *E. rimosalis* (Gn.); Pyraustinae: *A. bifidalis* (F.), *A. gordialis* Gn., *Azochis* sp. (*gripusalis* Walker complex), *C. hirtalis* (Gn.), *D. hyalinata* (L.), *D. nitidalis* (Stoll), *Eulepte* sp. (probably *concordalis* Hbn., *G. cannalis* (Quaintance), *H. bipunctalis* (F.), *H. phaeopteralis* (Gn.), *H. perspectalis* (Hbn.), *L. integra* (Zeller), *L.*

tripunctata (F.), M. trapezalis (Gn.), M. testulalis (Geyer), M. sp. (near pusialis Snellen), M. anormalis (Gn.), N. nearctica Munroe, N. elegantalis (Gn.), O. indicata (F.), P. flegia (Cr.), P. periusalis (Wlk.), P. elevata (F.), S. recurvalis (F.), U. rubigalis (Gn.); Schoenobiinae: R. albinella (Cr.); Crambinae: C. plejadellus Zincken, D. lineolata (Wlk.), D. saccharalis (F.), E. loftini (Dyar), Fissicrambus sp. or genus near, M. decolorata (H.-S.); Pyralinae: P. manihotalis Gn.; Chrysauginae: B. munitalis (Lederer); Epipaschiinae: C. picata Schaus, J. sp. (conspicualis (Lederer) complex), P. atramentalis Lederer; Galleriinae: C. cephalonica (Stainton), G. mellonella (L.); Phycitinae: A. kuehniella (Zeller), A. transitella (Wlk), A. stercorea (Zeller), C. cautella (Wlk.), D. caricae (Dyar), D. sp. (abitiella group), Dioryctria erythropasa (Dyar), E. ceratoniae (Zeller), E. lignosellus (Zeller), E. elutella (Hbn.), E. zinckenella (Treit.), F. pellucens (Zeller), H. electellum (Hulst), H. grandella (Zeller), M. bisinuella Hampson, O. fossulatella Ragnot, P. interpunctella (Hbn.).

The above list includes all known pests from Honduras as well as potential pests, species of reported but doubtful occurrence, and one potential biological control agent. Many of the above species are also pests in the United States.

A cladogram of the Pyraloidea based on the adult, larva, and pupa is presented. The Pterophoridae is considered to be in the Pyraloidea. The Pyralidae is best left as a single family, not divided into the Crambidae and Pyralidae.

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Chairman

INTRODUCTION

Honduras lies between Guatemala, El Salvador, and Nicaragua to form, as a Comayagua radio station used to advertise, the heart of Central America. The physical characteristics, economy, and population structure of Honduras were summarized by Crosbie (1970). The following information is modified from his review.

Honduras occupies an area of 12,090 square kilometers and is the second largest Central American republic. There are 4 major divisions: the North Coast, the North-East Coast or La Mosquitia, the Central Highlands, and the Pacific Lowlands. Approximately 20% of Honduras is flatlands and the vast majority of this terrain is found on the North Coast. The Mosquitia is essentially an unexplored lowland pine savannah with coastal marshes. The Central Highlands area has a mean annual temperature of about 21°C (Wise, 1958); this is relatively low compared to other areas. In addition, the Central Highlands includes a dry valley called the Honduran Depression. The Pacific Lowlands make up only 2% of the total area in Honduras and this region is charcterized by higher mean annual temperatures.

The climate of Honduras consists of two seasons. The wet season, or winter, lasts from May to November while the dry season, or summer, lasts from November to April. There may be a short dry season in July or August called the "canicula" or "veranillo" that is of agricultural importance.

The predominant ethnic group is the mestizo, a mixture of Spanish, Negro, and Indian blood. Most of the population lives in the rural areas.

The soil of Honduras is relatively poor compared to other Central American republics but the country still depends on its agriculture. Two thirds of the economically active portion of the population is engaged in agriculture. Almost all the available farm land (90%) is planted to food crops for domestic consumption such as corn, beans, rice, plantains, cassava, sweet potato, and sorghum. The banana export companies, United Fruit in La Lima and Standard Fruit in La Ceiba, are located on the North coast. Bananas and coffee are extremely important to the economy of the country since they historically account for over 50% of the total exports. Other important cash crops are coffee, tobacco and sugarcane. Livestock and forest trees (mostly pines and precious hardwoods) are also exported.

Agriculture in Honduras faces many problems. The lack of roads and storage facilities result in very serious post-harvest losses. Many farmers are not educated in modern methods of production. Credit can be difficult to obtain which prevents the aquisition of modern machinery needed to become more efficient (Crosbie, 1970).

Pineda (1970) divided Honduras into various agricultural sectors based on the similarity of farming types instead of political boundaries. Another review of agricultural production in Honduras was given by Wise (1958). The animal habitats of Honduras were classified by Carr (1950).

The history of entomology in Honduras may be summarized as follows. In the late 1880's to the early 1900's Goodman and Salvin edited a series of volumes on the flora and fauna of Central America called the Biologica

Centrali-Americana. Unfortunately, very little collecting was done in Honduras compared to the other Central American countries like Costa Rica and Panama. The work still remains useful today largely because of the excellent illustrations. One of the first books to deal with the economic entomology of Honduras was published by Bates (1932). Dr. J. Mankins lived and collected in Honduras for over 22 years. His impressive collection was the source of information for many projects and his entomology course was among the first ever to be given in Honduras on a regular basis. Dr. T. Hubbell, now at the University of Michigan, undertook two expeditions to Honduras in the 1920's and 1940's which resulted in the description of some new species. Another worker was H. Koone. In spite of his brief stay in Honduras he was able to coauthor a book with the Honduran entomologist A. Banegas on the economic entomology of Honduras (Koone and Banegas, 1958). This book continues to be the standard reference work for students of entomology in Honduras. The United Fruit Company, until recently, maintained an entomologist on their staff. Dr. E. Ostmark published regularly on integrated pest management of bananas and Dr. C. Evers has continued this work. The Peace Corps sends many entomologists to Honduras and two booklets have been published by former volunteers (MacGregor, 1976; Passoa, 1983). Ministry of Natural Resources personnel have also published surveys of the pest fauna (Peairs, 1980) but certainly the best survey of Central American pests was carried out by Dr. A. King stationed at CATIE, Costa Rica (King and Saunders, 1984). Current projects in Honduras include a study of forest insects (Escuela Nacional Forestal), a study of the integrated pest management of agronomic pests by Andrews (1984), and the taxonomy of the Lepidoptera of Honduras (by the author).

Insects and diseases cause serious losses to crops in Honduras. McGuire and Crandall (1967) estimated that in field damage to corn, beans, and rice in Central America averages about 20%. Stored product pests also ruin a similar amount of the harvest. These figures show the need for the development of management programs.

During a recent workshop on the development of appropriate pest management technology for small farmers, Honduran entomologists (Navarro et al., 1979) listed three impediments to the development of integrated pest management programs. These were: a lack of professionals capable of insect identification; a lack of laboratory facilities; and the inability to gain access to research done by private corporations.

In another report, Lattin and Knutson (1982) considered the Lepidoptera associated with the basic grains in Honduras to be a major research need in the Americas. These authors stressed the need for illustrated keys and comprehensive surveys of the crop fauna. The lack of taxonomic services, they warned, would be a major roadblock in many projects if emphasis is not placed on taxonomic research.

A similar plea was made by McGuire and Crandall (1967). They suggested the establishment of a permanent insect collection and Central American diagnostic laboratory at the Panamerican Agriculture School, Honduras. This laboratory would have a great impact throughout Latin America and routine identifications could be performed there.

A few examples can be cited to prove the above authors are correct in their evaluation of the situation. Misidentifications are common, such as MacGregor's (1976) citation of *H. electellum* as a pest in sunflower. Later examination of these larvae proved they were *Pococera atramentalis*. These kinds of errors falsely enlarge the range of North

American pests and mislead Central American economic entomologists in their search for previously published control recommendations. Another common error involves mispelling the scientific name or placement of the name in the wrong family. An example of the latter is Mancia and Cortes (1975) who placed a pyralid, Etiella zinckenella, in the Noctuidae. Finally, synonyms can each be cited separately which gives the impression of a pest complex even though in reality only one species is present. Saunders et al. (1983) listed Zinckenia fascialis and Spoladea recurvalis as pests in Central America. Actually, the former is a synonym of the latter. Worse yet, some farmers are not familar with even the major pests of their crops. Only 20-35% of farmers surveyed in Nicaragua could recognize E. lignosellus, the lesser corn stalk borer (Huis et al., 1982).

This study helps meet the above deficiencies by reviewing the Pyralidae of economic importance in Honduras. Keys are provided to the larval and pupal stages. Each species is illustrated and basic information on biology and taxonomy is discussed. Koone and Banegas (1958) recorded only five species of pyralids in Honduras. This list was amplified by Passoa (1983) to include 20 species. The present study lists 60 species of real or potential economic concern to Honduran entomologists. Many of these species are pests in the USA while others are of quarantine significance to North American agriculture.

MATERIALS AND METHODS

The selection of species to include in this revision was based on three sources of information: a review of the published literature; a survey carried out by the author of agriculturally important insects in Honduras; and a study of insect collections, especially in Honduras.

Fortunately, two good lists of Central American pests exist. The first, by McGuire and Crandall (1967), listed the pests of Central America with their distribution by country. The second list, by Saunders et al. (1983), cataloged the common names of Central American pests but gave no distributional data. Both works included host information. The pyralids mentioned by the above two authors were combined with lists of Honduran pests (Passoa, 1983; Koone and Banegas, 1958; MacGregor, 1976) to form a tentative list of economically imported pyralids in Honduras. Field collecting added some additional species and raised doubts about the existence of other pests reported from Honduras. All doubtful records are discussed in the text. In some species of Pyraustinae and Phycitinae there were no specimens available for study. These minor pests were never collected in Honduras and their existence in Central America is discussed in the introduction to their respective subfamilies. Many genera that do not occur in Honduras are mentioned in the introduction section of some subfamilies especially when the study of these exotic genera were useful in characterizing the group.

A map of collecting sites is presented in Figure 66. A limited survey of the pyralids of Honduras was made from 1979-1980, based in

Comayagua, as part of a joint project involving the Peace Corps and the Honduran Ministry of Natural Resources. This was followed by an intensive survey of the pyralid pests of the Zamorano area under the guidance of Dr. K. Andrews during August to December, 1981.

Most collecting was done by hand but some females were caged to obtain eggs. All reared material from females in captivity were labeled "ex ova on (name of test plant)" to distinguish them from field collected material. The term "test plant" was used when rearings were not carried out under natural conditions. Most rearing was done in glass petri dishes. Fresh food was added every 2-3 days and no supplemental moisture was provided. The same procedure was followed for field collected material. Immatures were killed and fixed in a 9:1 mixture (by volume) of 100% isopropyl alcohol and glacial acetic acid. After 24 hours the solution was changed to 80% alcohol for permanent preservation. Some pupal cases were pinned to prevent damage to the cremaster spines. When a large series of specimens was available, pupae were preserved in alcohol. If preserved larvae could be associated with reared adults then the designation "Larval # S. Passoa collection" was used for these specimens. Pests of vegetable and grain crops were emphasized in this study but other pests of ornamentals, forest trees, and stored products were also included.

Most of the specimens used in this study came from the author's personal collection. Another important source of material was the collection of Dr. D. H. Habeck at the University of Florida. A small, but nevertheless very important, amount of material was received from the Florida State Collection of Arthropods, United States National Museum, University of California at Riverside, Ministry of Natural Resource collection at Comayagua (Honduras), Escuela Agricola Panamericana (Honduras), United Fruit Company (now Fundacion Hondurina de Investigacion Agricola)(Honduras), Universidad Nacional Agraria (Peru), Centro Internacional de Agricultura Tropical (Colombia), Centro Agronomico Tropical de Investigacion y Ensenanza (Costa Rica), and the International Rice Research Institute (Philippines). Collections outside Florida could not be consulted due to a lack of travel funds. The author is fully aware of the value of museum collections and very strongly regrets this omission.

The collection of the Ministry of Natural Resources at Comayagua and the former United Fruit Company's collection both use a system of index cards to record specimen data. These cards were sometimes cited in the text under material examined.

Each species was treated in the following format: scientific name, common names, distribution, hosts, material examined, larval diagnosis, larval description, pupal diagnosis, pupal description, biology, and pest status. Each of these sections will be discussed in turn.

When possible the scientific name followed the catalog of the Moths of North America (Hodges et al., 1983). The most recent taxonomic revision of the group was consulted in the case of Neotropical species that are absent from the North American fauna. Only the most common and widely used synonyms were listed. Two general works that give information on synonomy, besides the various subfamily revisions listed at the beginning of each chapter, are Schaus (1940) and Wolcott (1948). The Biologica Centrali-Americana (Druce, 1881-1900) is an excellent source of many early synonyms.

The section on common names was based on the lists of Saunders et al. (1983) and Werner (1982). If an appropriate common name for a pest already existed then this usage was followed. New names were suggested to replace previous names found to be inappropriate. One problem was the lack of modifiers. Terms such as leaf tier or stem borer are not distinctive enough to be useful. Many such terms were found in Saunders et al. (1983). If no common name existed, and the pest was of economic importance, then a new common name was coined. Factors taken into consideration to name an insect included the distribution, color, morphology, and life history. An ideal common name should allow immediate recognition of the pest while describing the major habits. English equivalents of Spanish common names were used in the text. A future summary of this thesis in Spanish will contain the Spanish common names in their proper form.

The distribution of each pest was based on the specimens examined and the published literature. No effort was made to list Old World localities except to note the zoogeographical region in general terms. New World localities were listed by country except when the distribution covered almost the whole region. In that case only the Central American countries were listed and the source of the complete distribution cited. The term cosmopolitan was used for species that occur throughout the world wherever the proper conditions for their survival are found.

The hosts of each pest were based on the specimens examined and a review of the published literature. Records were cited exactly as they appeared and no effort was made to update the botanical nomenclature. Languages other than English were scanned for scientific names of the hosts but some records listed by common name only in a language other than English may have been overlooked. Emphasis was placed on New World hosts.

In the case of distribution and hosts there was a great deal of repetition from author to author so that only part of the available information listed in a particular work was cited here. The choice of whom to cite for what records was often arbitrary, based on which work was seen first.

The section entitled "material examined" lists the number of specimens with their locality. A "+" after a number indicates that not every specimen in the series was examined and the total number given is an estimate. In order to save space in the material examined section, a colon was utilized to indicate a series of specimens from the same locality. "HONDURAS: Comayagua, 11-X-1981, S. Passoa; Comayagua, 22-V-1983, S. Passoa" means that both specimens were collected in Honduras on the indicated dates. The semicolon separates each record. No attempt was made to summarize the records in the Florida State Collection of Arthropods card file since there were frequent errors in determinations and labeling. This study emphasized material collected by the author and by Dr. Habeck that could be backed by preserved larvae, hosts determined by botanists, and reared adults. The card files found in the former United Fruit Company and the Comayagua collection, when backed by specimens determined at the National Museum, were also utilized.

All specimens were determined by the author unless otherwise indicated. The following abbreviations were used: USA = United States of America; EAP = Escuela Agricola Panamericana (Panamerican Agriculture School), El Zamorano, Honduras; SPC = S. Passoa collection; USNM = National Museum of Natural History collection; FSCA = Florida State

Collection of Arthropods; em. = emerged; and ex = reared from. Sometimes the thorax and abdomen were abbreviated with the term T or A followed by a segment number. Thus, A1 refers to the first abdominal segment; T3 refers to the metathorax. The setae were abbreviated in the following manner: D (= dorsal seta), SD (= subdorsal seta), L (= lateral seta), SV (= subventral seta) and V (= ventral seta). Thus the designation SV1 refers to the first subventral seta.

Reference is often made to mandible slides in the sections marked adults or pupae. This refers to a slide of the larval mouthparts of the cast skin. Frequently only the mandible was mounted but sometimes the labrum, hypopharyngeal complex, epicrania, and the cast skin were included also. All cast skins were mounted in balsam and rarely were stained.

The larval descriptions varied from one species to another based on the economic importance of the pest and the available literature. If the species was a serious pest, and was undescribed, then a full larval description was prepared. Potential pests, pests of questionable occurrence, and minor pests were not completely described although the distinctive features were illustrated to allow identification. If the pest was previously described, then reference was made to the description and only the important identification characteristics were drawn.

All larval drawings were made with the aid of a projection microscope. This method, although subject to inaccuracies, was the fastest and most practical way to draw the setal maps and larval mouthparts. No effort was made to draw the larval structures to scale with respect to one another. Their size was often a compromise between the desire for a uniform treatment combined with what was possible on the projection microscope. The mouthparts were mounted in balsam and studied under a compound microscope. The orientation of the mandibles and hypopharyngeal complex sometimes varied slightly from one specimen to another based on how they dried in the balsam slide. Larvae were prepared for drawing by first soaking them in 10% potassium hydroxide overnight. They were then washed in water and alcohol after being slit laterally on the right side. All excess tissue was removed and the skins were flattened in absolute alcohol after being weighed down with pieces of broken microscope slides. The midline of the larval skin was lined up with the top of the rectangle used in each setal map while the bottom was lined up with the midventral line of the larval skin. Sometimes it was necessary to use different magnifications with different segments to achieve a standard size with each rectangle. This may introduce an error in pinacula size when one segment is compared to another. In addition, the placement of the pinacula in relation to the lateral margins of each segment may be slightly inaccurate. The final, and most important source of error was due to the crumpling and wrinkling of the larval skin. This changes the shape of the pinacula and their location. Therefore, the projection microscope was used to plot the approximate position of each seta and the approximate size and shape of the pinacula. Then whole untreated preserved larvae were used to draw the final shape and position of each seta. Sometimes the treatment in potassium hydroxide revealed a pinaculum shape that was very difficult to see in untreated larvae. Variation in the placement of the setae was discussed only where this variability would lead to doubt about the identification. Setal size may vary also due to breakage and this consideration must always be kept in mind.

The pupal descriptions were based on both cast skins and specimens preserved in alcohol. Drawings were made with an ocular micrometer grid or traced from photographs of pinned pupae. The cremaster spines were generally drawn in an extended position to show their size and relationship to each other. Often specimens have one or more spines wrapped around each other, this can be slightly misleading when compared to the drawings with the spines extended. Cremaster spines, like setae, may break. The texture of the pupal skin and the pupal setae were usually not illustrated unless they were needed for identification.

The larval and pupal descriptions were made with the specimen's head facing left. In the case of dorsal and ventral views the head of the specimen was oriented toward the top of the page.

The larval and pupal diagnosis sections summarized the identification characteristics of each species. Comments were often made to prevent confusion with species that closely resemble the species discussed, and with other species occuring on the same host.

The biological information consists of oviposition site, damage, pupation site, and very basic information on the behavior of each pest. The information presented varies from species to species reflecting the inconsistency of the knowledge of Neotropical pyralids. References to illustrations of the eggs and adults, if any, are listed in this section.

The pest status is provisional in that generalizations based on only a few years data can be misleading. Three factors are taken into consideration: geographical distribution, severity of attack, and frequency of the outbreaks. Widespread is used if the pest occurs throughout Honduras wherever its hosts are grown. A local pest is only common in certain areas of Honduras and absent in others. The severity of attack is classified as serious, moderate, and minor depending on the estimated yield loss. Constant pests frequently pass above the economic threshold while sporadic pests only occasionally do so. A potential pest has never been recorded to reach damaging levels in Honduras even though it may be a serious pest elsewhere in the world. This term is also used for pests that do not as yet occur in Honduras even though their known distribution surrounds or comes close to Honduras.

No effort was made to review the vast literature associated with these world-wide pests. The emphasis of this study was on the New World literature and especially the regional economic entomology works of Latin America. It was not possible to obtain translations of some important German and Russian papers. Much useful information probably can be found in Gerasimov (1947) and Hasenfuss (1960).

MORPHOLOGY AND TERMINOLOGY

Pyralid larvae show relatively little variation in body shape. Three pairs of thoracic legs and four pairs of abdominal prolegs are found on all species included in this study. The head is hypognathous except for a few borers. Most pyralids are eruciform but one genus of European Schoenobiinae is stout in shape and apodous (Bollman, 1955). Some North American genera are grub-like.

Coloration is extremely variable. Many Pyraustinae have transparent skin which gives the larvae a light green color due to the stomach contents showing through. The body may be longitudinally or transversely striped, spotted with black or brown, or unicolorous. Color may vary from light to dark within a population, between wet and dry season forms, or from instar to instar. Many species turn pink before pupation. The pattern of markings on the head and prothoracic shield frequently aid in identifiction. The skin texture is variable and may be granulate, spinose, or smooth.

Pyralid larvae never have secondary setae except for the anal segment of a few Crambinae (Hasenfuss, 1960) and an extra seta found on the prothoracic shield of some Pyraustinae (Allyson, 1981b). Chalazae are sometimes present. The nomenclature of setae used in this work follows various authors depending on the subfamily. The works of Allyson (1981a, 1981b), Neunzig (1979), and Hasenfuss (1960) were consulted for the Pyraustinae, Glaphyriinae, Phycitinae, and other subfamilies, respectively.

The chaetotaxy of the head was not extensively utilized in this study. More important characters were found in the stemmata (= ocelli) and the length of the frontal area. There is some controversy surrounding the nomenclature of the cranial area in Lepidoptera larva. The front, in most taxonomic publications, is the large triangular area ventrad of the adfrontals and dorsad of the labrum. This traditional usage is retained here although the actual homology of this region is unclear. Snodgrass (1947) claimed the front was actually the clypeus. Hinton (1947) disagreed and named the same area the fronto-clypeus. The latter terminology was also followed by Matsuda (1965). Six stemmata are present in most species but a reduction in the number of stemmata is found in some Galleriinae. The top of the head is named the epicranial notch (= vertical triangle, vertical angle) and the distance occupied by the front or adfrontal sutures, measured from the clypeus to the epicranial notch, is an important feature. In some genera the adfrontal area extends to the epicranial notch but in other cases they may only extend half this distance or less.

Mouthparts were frequently utilized. The most important structures are the labrum, mandible, and hypopharyngeal complex. The chaetotaxy of the labrum is constant from species to species but the spination of the undersurface, called the epipharynx, was sometimes distinctive. Mandibles assume a wide variety of shapes and were especially useful in the Pyraustinae. Three kinds of teeth are found in pyralid mandibles: scissorial teeth (usually called just teeth), inner teeth, and outer teeth. The scissorial teeth are found on the distal portion of the mandible and are responsible for cutting the food. The first tooth always lies above the mandibular setae. In pyralids there are only two lateral mandibular setae although more than two can be found in other families. Inner teeth are defined as any teeth found on the inner surface of the mandible; usually they lie on the molar ridge. The number of inner teeth is variable. The retinaculum is a large, modified inner tooth that takes the form of a ridge in the center of the mandible. A retinaculum is rarely present in pyralids. Any tooth on the outer margin of the mandible is called an outer tooth. The texture of the mandible is usually smooth but sometimes reticulated patches occur on the dorsal or ventral surface.

Terminology of the hypopharyngeal complex follows Godfrey (1972). The spinneret is usually an elongate, pointed structure but the relative length compared to the basal segment of the labial palps varies from species to species. Sometimes two small setae are found at the apex of the spinneret. Stipular setae are almost always minute. The spination of the proximomedial and proximolateral area can sometimes be distinctive. Rarely a series of ridge-like blades are found. The pigmentation and shape of the mentum also varies but this pigmentation is difficult to discern in material treated in potassium hydroxide.

The chaetotaxy of the thorax shows some important features. Most prespiracular setae are arranged vertically but occasionally they are horizontal. The prespiracular sclerite assumes a wide variety of shapes. Sometimes it extends below and behind the spiracle. In other genera the prespiracular sclerite completely surrounds the spiracle. A few Pyraustinae have a prespiracular sclerite that extends below and behind the spiracle to fuse with the posterior lateral corner of the prothoracic shield. The most common shape is circular or oblong. The number of setae in the subventral group of the mesothorax and metathorax is useful to distinguish among genera in the Crambinae and Galleriinae. It may be unisetose or bisetose. Some very important modifications may be found on the mesothorax. A single genus in the Pyraustinae has the D and SD pinacula fused. Almost all Phycitines can be recognized by the sclerotized ring that surrounds the SD1 seta.

The chaetotaxy of A1-8 contains some important taxonomic characters. The D setae vary in both position and length. Sometimes these setae are in a horizontal line but D2 can be posteroventrad of D1. All combinations of setal lengths can be found: D1 equal to, shorter than, or longer than D2. The SD1 seta of A1 has a sclerotized ring in most Galleriinae while the same seta may be ringed on A8 in the Phycitinae and the Epipaschiinae. The number of setae (1-3) in the SV group on A1 was useful to identify Pyraustinae genera.

In some genera the SD pinacula on A2 and A7 may be smaller than the same pinacula on other segments. The relative distance of the SD2 seta from the spiracle on A8 is useful to identify some stored products pests.

Higher classification is reflected in the number of L setae on A9. This group is trisetose in the Pyraliformes but unisetose or bisetose in the Crambiformes. The spacing of the V setae on A7-10 was also utilized to define the higher taxa (Allyson, 1977a) as was their shape on A3-A6.

Pyralid pupae showed a surprising amount of structural variation. They are usually colored light tan after the last larval ecdysis but this soon darkens to a reddish-brown color. The adult can usually be recognized under the pupal skin just before emergence when the appendages frequently are raised. Sometimes comparisons made between pupae in the early stages of development with pupae about to eclose can be misleading since the mouthparts and legs undergo minor changes in shape. Some pyralid pupae are covered with a waxy bloom. a silken cocoon may be present or absent.

The head of pyralid pupae has some useful taxonomic characters. Paired horns and conical projections are two modificaitons of the vertex. Only Galleria mellonella lacks pilifers. The homology of this structure is not clear but Scott (1984) stated that the pilifers are probably only madible remnants. A postgenae (= glazed eyepiece) is found in almost all species. Maxillary palps are usually present in the Crambiformes but are frequently absent in the Pyraliformes. The relative length of the maxillae is an important taxonomic feature. Sometimes it extends only 3/5 the distance to the caudal wing margin while in other genera it extends to the caudal wing margin. In certain Pyraustinae the maxillae may extend past the caudal wing margin as far as the tip of the abdomen or slightly beyond. A tubercle is sometimes present on the antennae of some species.

Many important features are found on the thorax of pyralid pupae. Most have the prothoracic femur exposed; only the Schoenobiinae also have the mesothoracic femur exposed. The length of the metathoracic leg varies in a similar manner to the maxillae listed above. Some Pyraustinae have paired dorsal pits on the mesothorax and metathorax. The thorax texture is typically smooth, rough, or punctate but in rare cases it may be spinose. A wide variety of modifications were noted in the mesothoracic spiracle. Phycitinae pupa have the spiracle located more anterior than normal in that the spiracular opening lies in front of the suture that divides the prothorax from the mesothorax. Some Pyraustinae pupae have a complex spiracular opening that is fringed with hairs. A pit or hood-like covering may be adjacent to the spiracle in some genera. Sometimes the mesothoracic spiracle is nothing more than a slit or darkened spot and is absent in the Galleriinae and a few Phycitinae.

Useful taxonomic features found in pyralid pupal abdomens include the spiracles, dorsal processes if any, and the cremaster. Spiracles may be elevated, sunken, tubular, or unmodified. Elevated spiracles are defined as those in which the rim of the spiracle is much higher than the surrounding cuticle. Sunken spiracles are the exact opposite in that the pit is much lower than the surrounding cuticle. Tubular spiracles are those in which the spiracle protrudes outward like a tube. The aquatic Nymphulinae are unusual in that the spiracles of the anterior abdominal segments are much enlarged. The most obvious abdominal modifications are the processes found on the dorsal surface. These may be blunt, flattened, or curved spine-like projections. Certain Pyaustinae have a hook-like projection that is set in a pit on some segments similar to the illustration of P. silicalis by Needham (1955). The intersegmental membrane between A9 and A10 in the Phycitinae, Epipaschiinae, Pyralinae, and Chrysauginae is modified to form a groove lined with fine spines or large teeth. A gibba may be found on the dorsum of A10 in the Pyralidiformes. This structure usually consists of a raised area of a slightly different color and texture than the surrounding cuticle. Gibbas are generally oblong or occasionally trapezoidal. Sometimes the gibba may be divided by a groove. Deep lateral grooves on A10 are common on Crambinae pupae. The cremaster is found on the terminal segment and may be U-shaped, broad and truncate, or absent. Some cremaster spines have an appendage attached at their base. The texture of the cremaster and the number of spines varies and was sometimes utilized for diagnosis. Most cremaster spines are curved but they may also be straight.

No effort was made to distinguish between spines and setae on the cremaster largely because some genera had thickened spine-like setae that seemed to intergrade between the two extremes. More important, it was difficult in some cases to accurately study the articulation of the cremaster with the appendage especially when the setae were wrapped around each other. Therefore the term cremaster spine was used throughout this work even though in some Phycitinae the term seta is probably more technically correct. The few species examined in this study with a scanning electron microscope revealed large differences in the sockets of the cremaster "spines" that were not apparent under the dissecting microscope. Further studies on this topic should utilize the scanning electron microscope.

The above account is general in nature and has introduced the morphology of pyralid immatures. Future morphologcial and taxonomic studies will probably disclose other useful taxonomic structures in addition to those mentioned above.

Key to the Pyralidae Larvae of Economic Importance in Honduras

The following key includes all known Pyralidae larvae of economic importance in Honduras for which material was available. The larvae of *O. fossulatella* and *P. manihotalis* are unknown.

When using the key, care must be taken to distinguish between the sclerotized rings found in the series Pyraliformes and the aveolar rings found at the base of all setae (Neunzig, 1979). The sclerotized rings are sometimes only faintly pigmented and are best seen after clearing the larva in 10% potassium hydroxide and lightly staining in mercurochrome or chlorozal E black. Minute detail, such as inner teeth on the mandible for example, may require mounting a cleared larva in balsam on a microscope slide. Sometimes changing the background from white to black, changing the angle and intensity of the light source, or changing the alcohol in the petri dish can strongly affect the ease in which a particular character is observed. Setae sometimes break off so examination of both sides of the larva may be necessary.

The works of Hinton (1943), Aitken (1963), Neunzig (1979), Capps (1963, unpublished notes), Weisman (in press), Allyson (1981b, 1984) and the draft key of the pyralids of economic importance in El Salvador (Habeck and Andrews, unpublished) were all freely consulted to prepare the key. No effort was made to study the early instars but information, when available, was included in the key especially when the identification characteristics of the mature larvae were not valid for the early instars. Since pigmentation varies from black to brown in preserved larvae no color was assigned to the dark spots or lines found on the head and body of pyralid larvae.

Pyralid larvae are difficult to characterize. They are the largest family of Ditrysian microlepidoptera to have a bisetose prespiracular group on the prothorax. A few aquatic pyralids have a unisetose prespiracular group (Peterson, 1962) but a trisetose condition never occurs. Crochets are very variable. They may be uniordinal, biordinal, or triordinal and can be arranged in a transverse band, mesopenellipse, or closed circle. A key to North American families of Lepidoptera larvae was presented by Peterson (1962) and another key will soon be published

(Stehr and Martinat, in press). The only other microlepidopteran superfamily with a bisetose prespiracular group is the Copromorphoidea and the characteristics of these larvae are being summarized by Heppner (in press). All known Copromorphoidea are borers, as are some pyralids. Tubular abdominal spiracles are common in the Copromorphoidea but are rare in the Pyralidae (Talulla is the only known example). Within the superfamily Pyraloidea confusion can occur with the Thyrididae, Hyblaeidae, and Pterophoridae. Thyridids may be separated from pyralids in that the former family lacks the L3 seta on the mesothorax and metathorax (Stehr and Martinat, in press). Hyblaeids are distinguished from many pyralids in that the SD1 seta of the mesothorax is much longer than SD1 of the metathorax (Stehr and Martinat, in press). Singh (1955) noted that the SV group on A3-6 is ventrad of the normal position in the hyblaeids and illustrated this character. Many pterophorids are easily separated from pyralids by their trisetose prespiracular group on the prothorax. Among pterophorids with a bisetose prespiracular group the location of secondary setae is distinctive. Pyralids have secondary setae only on the prothorax or A10. In pterophorids secondary setae cover the body. Further information was given by Fracker (1915).

Allyson (1977a), Bollman (1955), and Hasenfuss (1960) presented information to separate pyralid subfamilies based on the larvae.

1. L group of A9 trisetose (Fig. 458)(series Pyraliformes: subfamilies Epipaschiinae, Phycitinae, Chrysauginae, Galleriinae, and Pyralinae).................................. 2

1'. L group of A9 unisetose (Fig. 77), rarely bisetose (Fig. 309) (series Crambiformes: subfamilies Nymphulinae, Glaphyriinae, Evergestinae, Pyraustinae, Schoenobiinae, and Crambinae)....... 24

2. SD1 never with a sclerotized ring.............................. 3

2'. SD1 with a sclerotized ring on either the mesothorax (Fig. 454), A1 (Fig. 392), or A8 (Fig. 379)......................... 4

3. Prothoracic shield with four dark spots along the posterior margin and a V-shaped mark in the center (Fig. 35); if black and unmarked (early instars) then D2 equal in length to D1 .... Etiella zinckenella (Treitschke)

3'. Prothoracic shield without four dark spots and never with a V-shaped mark; D2 longer than D1 (Fig. 361)........ .... Bonchis munitalis (Lederer)

4. SD1 of the mesothorax without a sclerotized ring.............. 5

4'. SD1 of the mesothorax with a sclerotized ring (Fig. 454) (Phycitinae).. 10

5. SD1 of A1 without a sclerotized ring......................... 6

5'. SD1 of A1 with a sclerotized ring (Fig. 392)(Galleriinae)...... 23

6. Four stemmata present (Fig. 393); head and body uniform in color, without contrasting longitudinal stripes and tonofibrillary platelets; V1 on A9 separated from each other by at least 3/4 the distance between V1 on A7........ ..Pyralis spp. (farinalis Linnaeus and perhaps manihotalis Guenee)

6'. Six stemmata present (Fig. 389); head and/or the body usually with longitudinal stripes and contrasting tonofibrillary platelets (Fig. 28); V1 on A9 separated by about 1/2 the distance between V1 on A7 (Epipaschiinae)...................... 7

7. Epicrania unmarked except for a dark stripe that extends from the stemmatal area to the gena (Fig. 364).......... .... Calybitia picata Schaus

7'. Epicrania without a stripe from the stemmatal area to the gena.. 8

8. Prothoracic shield (in dorsal view) with two longitudinal lines of dark spots, those on the anterior margin largest; skin texture of the abdominal segments with pigmented granules absent in the subdorsal area except for a clump of granules that surrounds the SD1 pinaculum (Fig. 372)........ .... undetermined Epipaschiinae (perhaps Stericta sp.)

8'. Prothoracic shield not marked with two longitudinal rows of dark spots; skin texture with pigmented granules present throughout the subdorsal area so that the SD1 pinaculum of the abdominal segments does not appear surrounded by a clump of these granules.. 9

9. Spines on the proximomedial area of the hypopharyngeal complex peg-like (Fig. 371); prothorax with XD2 and SD1 separated by 1/2 the distance between XD1 and XD2 (Fig. 368); mandible lacks a notched inner tooth (Fig. 369)........ .... Jocara sp. [conspicualis (Lederer) complex]

9'. Spines on the proximomedial area of the hypopharyngeal complex long and thin, not peg-like (Fig. 383); prothorax with XD2 equidistant from SD1 and XD1 (Fig. 375); first molar ridge of the mandible, and sometimes the second, with a notched inner tooth (Fig. 382)................... Pococera atramentalis Lederer

10. SD1 on A1-7 with crescent-shaped sclerotized rings (Fig. 433) .... Ectomyelois ceratoniae (Zeller)

10'. SD1 on A1-7 without crescent-shaped sclerotized rings (ring fragments may be present in A. transitella, Fig. 402).......... 11

11. Prothoracic shield with the lateral margins black; epicrania with a broad black band from the stemmatal area to the gena (Fig. 451)......................... Homoeosoma electellum (Hulst)

11'. Prothoracic shield markings variable, usually not with the lateral margins dark; epicrania not marked with a broad dark band... 12

12. Prothoracic shield with a characteristic pattern of two middorsal curved lines and a triangular or curved spot posterior to XD2 (Fig. 448); mandible with an inner tooth (Fig. 449); D2 four times the length of D1........ .... Fundella pellucens (Zeller)

12'. Prothoracic shield not marked with two curved middorsal lines and a triangular or curved spot posterior to XD2; mandible and D setae variable, if an inner tooth is present then D2 is not four times the length of D1............ 13

13. Head with pale areas around the setal bases (Fig. 437); anterior portion of most body segments with a series of alternating dark and light longitudinal dashes (Fig. 34) .... Elasmopalpus lignosellus (Zeller)

13'. Head without pale areas around the setal bases; anterior portion of most body segments without a series of alternating dark and light longitudinal dashes................. 14

14. D2 posteroventrad of D1 on A1-7 (for example, Fig. 456)........ 15

14'. D2 and D1 in a horizontal line on A1-7 (for example, Fig. 468)... 18

15. Sensilla styloconica of the maxillae simple, not forked; SD1 with a U-shaped sclerotized ring on the mesothorax that almost never completely surrounds the SD1 seta dorsally (Fig. 400)......................... Amyelois transitella (Walker)

15'. Sensilla styloconica of the maxillae forked; SD1 with circular ring on the mesothorax that is completely closed dorsally to surround the SD1 seta (Fig. 454).............................. 16

16. Anterior spines of the proximolateral region of the hypopharyngeal complex short, none equal in length to the seta borne by the first segment of the labial palpus; prothoracic shield with at least a pair of dark spots, usually two pairs of triangular spots are present on the posterior margin (Fig. 404)................ Ancylostomia stercorea (Zeller)

16'. Anterior spines of the proximolateral region of the hypopharyngeal complex long, their length subequal to the seta born by the first segment of the labial palpus (Fig. 423); prothoracic shield not marked with two pairs of triangular spots on the posterior margin..................... 17

17. SV group of A9 unisetose (Fig. 458) .... Hypsipyla grandella (Zeller)

17'. SV group of A9 bisetose (Fig. 420).............. Dioryctria spp.

18. L1 posterior or posteroventrad of L2 on A3 (Fig. 413); epicrania usually marked with a characteristic pattern of light and dark bands posterior to the stemmata except in early instars which have the epicrania completely reddish-

brown (Figs. 410, 411, 412); body usually with a longitudinal subdorsal stripe.......................... *Davara caricae* (Dyar)

18'. L1 ventrad or very slightly posteroventrad of L2 on A3 (Fig. 467); epicrania never marked with a pattern of light and dark bands posterior to the stemmata; body without longitudinal subdorsal stripes........................ 19

19. Mandible with an inner tooth (Fig. 397)...................... 20

19'. Mandible without an inner tooth.............................. 21

20. Mandible with two scissorial teeth (Fig. 397); area enclosed by the spiracle on A8 subequal to or greater than the area enclosed by the sclerotized ring around SD1 on that segment (Fig. 396).......................... *Anagasta kuehniella* (Zeller)

20'. Mandible with three scissorial teeth (Fig. 472); area enclosed by the spiracle on A8 smaller than the area enclosed by the sclerotized ring around SD1 on that segment (Fig. 469) .... *Mooda bisinuella* Hampson

21. Abdominal segments without obvious pinacula (Fig. 39); pinacula if present, are concolorous with the body; front extends at least 2/3 the distance to the epicranial notch .... *Plodia interpunctella* (Hubner)

21'. Abdominal segments with obvious and pigmented pinacula (Fig. 33); front short, extends only 1/2 the distance to the epicranial notch 22

22. A8 with SD2 separated from the spiracle by a distance approximately equal to the horizontal diameter of the spiracle (Fig. 407).............................. *Cadra cautella* (Walker)

22'. A8 with SD2 separated from the spiracle by two to three times the horizontal diameter of the spiracle (Fig. 441) .... Ephestia elutella (Hubner)

23. SV group on the mesothorax and metathorax bisetose; four stemmata present (Fig. 393); peritreme of the spiracles without their posterior margin thickened .... Galleria mellonella (Linnaeus)

23'. SV group on the mesothorax and metathorax unisetose; six stemmata present (Fig. 389); peritreme of the spiracles with their posterior margin thickened (Fig. 388)........ .... Corcyra cephalonica (Stainton)

24. Tracheal gills present except in the first instar (Figs. 1, 71); larva aquatic in cases made of leaf fragments.................. 25

24'. Tracheal gills absent; larva terrestrial and not found in cases formed of leaf fragments................................ 26

25. SD2 ventrad of XD2; thus XD2, SD2, and SD1 lie in a vertical line (Fig. 67)........................ Nymphula diminutalis Guenee

25'. SD2 posteroventrad of XD2; thus XD2, SD2, and SD1 form a triangle (Fig. 68).................. Parapoynx diminutalis Snellen

26. A membranous sac present between the prothoracic coxae (Fig. 313); anal shield longer than broad in dorsal view and crenulate in lateral view (Fig. 318).... Rupela albinella (Cramer)

26'. A membranous sac between the prothoracic coxae absent; anal shield not crenulate in lateral view.......................... 27

27. V setae half as far apart on A10 as on A9; diapausing forms often have inconspicous pinacula but a sclerotized

mesothoracic bar is frequently present posterior to the D setae (Figs. 24, 26)(Crambinae)................................ 28

27'. V setae farther apart on A10 than on A9; extra pinacula on the mesothorax and metathorax posterior to the D setae, if present, never fused along the midline to form an oval bar (Fig. 214).. 33

28. Each segment, except the prothorax, with a pinkish band that extends vertically from one spiracle to the other spiracle by forming a semicircle on the dorsal surface (Fig. 348)....... .... prob. Myelobia decolorata (Herrich-Schaffer)

28'. Each segment of the body without a semicircular pinkish band dorsally, sometimes a longitudinal pinkish band is present..... 29

29. Prothorax with the prespiracular pinaculum extending below and behind the spiracle (Fig. 350)........ .... Fissicrambus or genus near

29'. Prothorax with the prespiracular pinaculum sometimes extending below the spiracle but never behind it............... 30

30. SV group of the mesothorax and metathorax unisetose (Fig. 344).............................. Eoreuma loftini (Dyar)

30'. SV group of the mesothorax and metathorax bisetose (Fig. 325).. 31

31. Crochets of A3-A6 with the lateral portion uniordinal and the mesal portion triordinal (Fig. 319); L setae of the prothorax anterodorsad of the SV setae (Fig. 320)........ .... Chilo plejadellus Zincken

31'. Crochets of A3-A6 evenly triordinal; L setae of the prothorax dorsad, or rarely slightly anterodorsad, of the SV setae (Fig. 324).. 32

32. Paraproctal setae reduced, their length never greater than 1/2 the length of SV1 (Fig. 336)...... <u>Diatraea lineolata</u> (Walker)

32'. Paraproctal setae equal in length to SV1 on A10 (Fig. 335) .... <u>Diatraea saccharalis</u> (Fabricius)

33. A3-A6 with a sclerotized pit posterior to SD1; D1 longer than D2 (Fig. 75).................... <u>Hellula phidilealis</u> (Walker)

33'. A3-A6 usually without a sclerotized pit posterior to SD1, if a pit is present then D1 never longer than D2................. 34

34. Mesothorax, metathorax, and A1-A8 with the D and SD setae on conical pinacula; V1 pinaculum on A3-A6 round (Fig. 86); prothoracic shield margined with black (Fig. 87)........ .... <u>Evergestis rimosalis</u> (Guenee)

34'. Mesothorax, metathorax, and A1-8 with the SD and D setae usually on flat pinacula; if the D and SD pinacula are conical then the V1 setae of A3-A6 are on elongate band-like pinacula; prothoracic shield variable, rarely margined with black (Pyraustinae)... 35

35. Prespiracular pinaculum extends below and behind the spiracle to fuse with the prothoracic shield (Fig. 94)................. 36

35'. Prespiracular pinaculum never fused with the prothoracic shield although it may extend below and behind the spiracle.... 37

36. SD1 pinaculum more strongly pigmented than the D1 pinaculum, D1 and D2 pinacula unpigmented or pigmented around their edges only (Fig. 96); V1 setae of A9 separated by a distance

equal to 3/4 the diameter of the pinaculum or greater (Fig. 97) .... *Achyra bifidalis* (Fabricius)

36'. SD1 and D1 pinacula strongly pigmented and equal in intensity, D2 pinaculum variable (Figs. 91, 92); V1 setae of A9 separated by a distance equal to 1/2 the diameter of the pinaculum or less (Fig. 93)........ .... *Archyra rantalis* (Guenee) and perhaps some darkly marked *Achyra bifidalis* (Fabricius)

37. Posterior margin of the mesothorax with an extra pair of pinacula without setae (for example, Fig. 214)................. 38

37'. Posterior margin of the mesothorax lacks an extra pair of pinacula without setae.. 40

38. D1 pinacula of A1-8 fused and ringed with black around their edges (Fig. 210).................... *Marasmia trapezalis* (Guenee)

38'. D1 pinacula of A1-8 separate...................................... 39

39. Extra pinacula absent on A3-6 posterior to the spiracle............................. *Maruca testulalis* (Geyer)

39'. A single crescent shaped pinaculum without setae present on the abdominal segments posterior to the spiracle (Fig. 139) .... *Compacta hirtalis* (Guenee)

40. SV group of A1 unisetose (Fig. 261)........ .... *Neoleucinodes elegantalis* (Guenee)

40'. SV group of A1 bisetose or trisetose.............................. 41

41. SV group of A1 trisetose (Fig. 118)............................ 42

41'. SV group of A1 bisetose (Fig. 222)............................ 48

42. D and SD pinacula of the mesothorax fused (Fig. 184)........... 43

42'. D and SD pinacula of the mesothorax not fused................. 44

43. Prothoracic shield shaded up to, and including, the D2 seta (Fig. 183).................. Herpetogramma bipunctalis (Fabricius)

43'. Prothoracic shield unmarked.. Herpetogramma phaeopteralis (Guenee)

44. Crochets in two triordinal bands (Fig. 238), a membranous pad present on the mesal aspect of the proleg (Fig. 235)........ .... Microthyris anormalis (Guenee)

44'. Crochets in a mesal penellipse or a circle, no membranous pad present.. 45

45. Mandible with only three teeth (Fig. 123); prespiracular pinaculum of the prothorax extends below and behind the spiracle (Fig. 116); SD2 pinaculum on A1-8 at least 1/2 the size of the spiracle (Fig. 118); anal shield never with a middorsal stripe................ Azochis gripusalis Walker complex

45'. Mandible with more than three teeth; prespiracular group never extends behind, although it may be below, the spiracle; anal shield with or without a middorsal stripe; SD2 pinaculum minute, always less than 1/2 the size of the spiracle.......... 46

46. SD1 pinaculum on A2 and A7 reduced in diameter when compared to the other abdominal segments (Figs. 239, 240)........ .... Nomophila nearctica Munroe

46'. SD1 pinaculum on A2 and A7 subequal to the other abdominal segments in diameter.. 47

47. Prothoracic shield with the lateral margins dark, no large rectangular spot on the posterior margin (Fig. 190); stemmata six posterior to stemmata five...... Hymenia perspectalis (Hubner)

47'. Prothoracic shield with the anterior and lateral margins dark, a large rectangular spot present on the posterior margin;

stemmata six posterodorsad of stemmata five (Fig. 264)........
.... Palpita flegia (Cramer)

48. Crochets in a complete or nearly complete circle (less than three crochets needed to close the circle) on A3-6............. 49

48'. Crochets of A3-6 in a mesal penellipse........................ 52

49. Mesothoracic D and SD pinacula marked with a row of tonofibrillary platelets (Fig. 178)...Geshna cannalis (Quaintance)

49'. Mesothoracic D and SD pinacula not marked with a row of tonofibrillary platelets.. 50

50. An extra pinaculum without setae present directly posterior to the prothoracic spiracle; SV pinaculum curved around the anterior portion of the prothoracic coxa (Fig. 280)........
.... Polygrammodes elevata (Fabricius)

50'. An extra pinacula without setae directly posterior to prothoracic spiracle absent; anterior portion of the prothoracic coxa not surrounded by the SV pinculum............. 51

51. Crochets triordinal mesally, uniordinal laterally (Fig. 303); prespiracular pinaculum circular, not crescent shaped, and not extending below the spiracle (Fig. 300)........
.... Udea rubigalis (Guenee)

51'. Crochets biordinal; prespiracular pinaculum of the prothorax crescent shaped and extending below the spiracle (Fig. 196)
.... Lineodes spp. [integra (Zeller) and hieroglyphalis Guenee]

52. A3-A6 has three extra pinacula without setae posterior to the spiracle. (Fig. 223)........... Megastes near pusialis Snellen

52'. A3-A6 without extra pinacula posterior to the spiracle......... 53

53. Lateral portion of the prothoracic shield shaded with black up to the D1 seta (Fig. 266).......... Pilemia periusalis (Walker)

53'. Prothoracic shield not shaded with black as above, a dark spot may be present.. 54

54. A dark spot present posterior to seta XD2 on the lateral portion of the prothorax (Fig. 244)............................ 55

54'. No dark spot present posterior to seta XD2 on the lateral portion of the prothorax.. 59

55. SD pinaculum of A3-6 with a notch posteriorly (Fig. 176)....... .... Eulepte sp. (probably concordalis Hubner)

55'. SD pinaculum of A3-6 circular, without a notch................. 56

56. Front extends less than 1/2 the distance to the epicranial notch; mandible triangular in shape and usually without teeth although one to three small teeth may be present (Fig. 251).... .... Omiodes indicata (Fabricius)

56'. Front extends more than 1/2 the distance to the epicranial notch; mandible with four or more teeth, shape is never triangular.. 57

57. SD1 pinaculum of A2 and A7 subequal in diameter when compared to the other abdominal segments; prothoracic shield usually with two dark spots on each side (Fig. 295)........... .... Spoladea recurvalis (Fabricius)

57'. SD1 pinaculum of A2 and A7 reduced in diameter compared to the other abdominal segments; prothoracic shield without two dark spots on each side.. 58

58. Tonofibrillary platelets of the head obvious and strongly contrasting; prespiracular pinaculum of the prothorax extends

almost to the middle of a vertical line drawn through the spiracle or beyond (Fig. 102).......... Asciodes gordialis Guenee

58'. Tonofibrillary platelets of the head faint and not contrasting; prespiracular group of the prothorax does not extend to the middle of a vertical line drawn through the spiracle........................ Lygropia tripunctata (Fabricius)

59. Genal spot absent; mandible with an outer tooth (Fig. 164).... .... Diaphania hyalinata (Linnaeus)

59'. Genal spot present; mandible without an outer tooth (Fig. 163)... 60

60. C2 shorter than C1 (Fig. 259); SD1 posteroventrad of D1 on A9 (Fig. 260)................. Neoleucinodes elegantalis (Guenee)

60'. C2 subequal in length to C1 (Fig. 160); SD1 and D1 on A9 almost form a horizontal line (Fig. 156)........ .... Diaphania nitidalis (Stoll)

Key to the Pyralidae Pupae of Economic Importance in Honduras

The following key includes all known pyralid pupae of economic importance in Honduras for which material was available. The pupae of M. decolorata and O. fossulatella are undescribed. In certain cases the lack of material forced a substitution of one species for another. Pest species in Honduras were inserted in the key based on other members of the same genus that are assumed to share a similar set of features. The characteristics of P. manihotalis were based on P. farinalis and a Fissicrambus sp. from the United States was substituted for the

Fissicrambus or genus near that actually occurs in Honduras. More material is needed to evaluate these assumptions.

In many cases the cast larval skin could be dissected for mandibles which can help confirm an identification after using the pupal key. Another valuable clue is the host. Certain species that are similar morphologically have very different hosts and biology that would help separate them.

The pupa should be oriented horizontally with the head facing left to facilitate use of the key. Cast skins can also be identified by this key but care must be taken to find the vertex since this head sclerite frequently is separated from the remainder of the pupal case upon adult emergence. This is especially important in the genera Diatraea, Dioryctria, and Marasmia where identification is based on the vertex. The location of the mesothoracic spiracle can sometimes be misleading. In some genera the suture separating the prothorax and mesothorax is curved so that the opening appears to lie on the prothorax. Careful examination will show the spiracle is actually on the mesothorax. Examination of a few genera of Phycitinae is recommended to help clarify couplet three. The deep lateral grooves of the Crambinae should not be confused with the very shallow indentations found on A10 when the cremaster texture is roughened. The spines on the cremaster are frequently covered with silk that can be removed with a hooked insect pin to allow examination. Broken cremaster spines can usually be recognized by looking for a stub at the setal base.

Pyralidae pupae are difficult to define. Mosher (1916) separated most of the Pyraloidea and the Papilionioidea from the rest of the Lepidoptera by the presence of pilifer lobes. Unlike the butterflies, pyralids never have clubbed antennae. Pyralidae pupae are most likely to be confused with the families Thyrididae, Hyblaeidae, and Pterophoridae. The Thyridids may be distinguished by the apex of the forewing which extends to the 5th abdominal segment. In the Pyralidae the apex extends only to the 4th segment (Nakamura, 1981). These characters, based on Asian genera, need to be confirmed in the New World. The absence of the L2 setae was used to separate the Hyblaeidae from the Pyralidae (Nakamura, 1981). This character does not hold in the Nearctic region where many Phycitines have the L2 seta present (Neunzig, 1979). Hyblaeid pupae are best distinguished by the enlarged anterior peritreme of each abdominal spiracle which is 4-5 times as thick as the posterior portion. This thickened peritreme is unique among the pyralid species studied here. Hyblaeids also have a short antenna which is unusual compared to other pyralids (Forbes, 1933). Pterophorid pupae are separated from all pyralids, except the Schoenobiinae by the prothoracic and mesothoracic legs that project cephalad of the maxillae. However, those pyralids with this condition never possess a hourglass shape or spines on the abdomen which is common in pterophorids.

1. Maxillae short, not reaching more than 3/5 the distance to the caudal wing margin (Fig. 50), and mesothoracic spiracle absent (Figs. 390, 394)(subfamily Galleriinae).................. 2

1'. Maxillae variable, if short then the mesothoracic spiracle present... 3

2. Paired dorsal processes present on the abdominal segments near the midline (Fig. 391); thorax lacks a middorsal crest; texture of abdomen smooth.......... *Corcyra cephalonica* (Stainton)

2'. Paired dorsal processes on the abdominal segments absent although a divided middorsal crest is present (Fig. 395); large middorsal crest present on the thorax; texture of abdomen spinose.................... *Galleria mellonella* (Linnaeus)

3. Mesothoracic spiracle anterior of the normal position so that the opening lies above the suture dividing the prothorax and mesothorax which gives the impression of a prothoracic spiracle (Fig. 476), if the mesothoracic spiracle is faint or absent then the cremaster spines lie almost perpendicular to the body (Fig. 406).. 4

3'. At least part of the mesothoracic spiracle clearly lies posterior to the suture dividing the prothorax and mesothorax (Fig. 115); if the mesothoracic spiracle is absent then the cremaster does not have spines perpendicular to the body; if the mesothoracic spiracle appears to lie in the suture dividing the prothorax and mesothorax then the cremaster consists of two sclerotized spheres joined by a plate-like extension at their center (Fig. 90).......................... 18

4. Gibba absent.. 5

4'. Gibba present (~~for example,~~ Fig. 52).......................... 13

5. Cremaster consists of six spiny tubercles (Fig. 60)......................... *Amyelois transitella* (Walker)

5'. Cremaster lacks six spiny tubercles.......................... 6

6. Cremaster consists of two curved hooks (Fig. 436); dorsal surface of the thorax with a median ridge (Fig. 434); dorsal surface of A1-8 with a pair of median processes (Fig. 435)..... .... _Ectomyelois_ _ceratoniae_ (Zeller)

6'. Cremaster without two curved hooks; thoracic ridge and median processes on A1-8 both absent.................................. 7

7. Texture of abdominal segments strongly punctate (Fig. 477)..... 8

7'. Texture of abdominal segments smooth, not punctate............. 10

8. Posterior margin of prothorax irregular, a pair of indentations present (Fig. 452)..... _Homoeosoma_ _electellum_ (Hulst)

8'. Posterior margin of the prothorax straight except for a slight median indentation (Fig. 398); paired indentations never present.. 9

9. Six cremaster spines present in dorsal view (Fig. 475), not much thicker than the body setae; length of pupa approximately 10 mm or less; mesothoracic spiracle strongly tubular (Fig. 476)...................... _Moodna_ _bisinuella_ Hampson

9'. Eight cremaster spines present in dorsal view (Fig. 464), clearly thicker than the other body setae; length of pupa always greater than 10 mm; mesothoracic spiracle slightly tubular (Fig. 463).................. _Hypsipyla_ _grandella_ (Zeller)

10. Texture of the vertex and prothorax strongly wrinkled (Fig. 398).......................... _Anagasta_ _kuehniella_ (Zeller)

10'. Texture of the vertex and prothorax smooth or very slightly wrinkled (Fig. 480).. 11

11. Maxillae extend to the caudal wing margin; metathoracic legs not exposed (Fig. 408)................... *Cadra cautella* (Walker)

11'. Maxillae do not extend to the caudal wing margin; metathoracic legs exposed (Fig. 442)...................................... 12

12. Mesothoracic spiracle separated from the antenna by 1/4 the diameter of the spiracular opening or more (Fig. 444)......... .... *Ephestia elutella* (Hubner)

12'. Mesothoracic spiracle nearly touches the antenna (Fig. 480)....................... *Plodia interpunctella* (Hubner)

13. Gibba shaped roughly like a trapezoid, the anterior margin may be straight or curved and sometimes a groove is present, the posterior margin may have two sharp projections (Figs. 439, 440)........................... *Elasmopalpus lignosellus* (Zeller)

13'. Gibba a long thin oval, much longer than wide, not trapezoidal in shape and never with sharp projections..................... 14

14. Outer cremaster spines curved (Fig. 447)...................... 15

14'. Outer cremaster spines straight, never curved (Fig. 450)....... 16

15. Prothoracic femur very narrow, not equal in width to the labial palps; frons never with a conical projection .... *Etiella zinckenella* (Treitschke)

15'. Prothoracic femur wider than the labial palps; frons with a conical projection (Fig. 429).................... *Dioryctria* spp.

16. Cremaster spines almost perpendicular to the body (Fig. 406)...................... *Ancylostomia stercorea* (Zeller)

16'. Cremaster spines almost parallel to the body (Fig. 414)........ 15

17. Outer cremaster spines separated from inner spines by about the diameter of their base (Fig. 414)....... *Davara caricae* (Dyar)

17'. Outer cremaster spines separated from inner spines by more than the diameter of their base (Fig. 450)..................... .... _Fundella pellucens_ (Zeller)

18. Intersegmental membrane between A9 and A10 has a dorsal groove of ten lined with setae (Figs. 53, 54)......................... 19

18'. Intersegmental membrane between A9 and A10 lacks a dorsal groove 23

19. Maxillary palps absent or at most faintly visible.............. 20

19'. Maxillary palps clearly delineated (Fig. 474).................. 21

20. Posterior margin of the dorsal groove dentate (Figs. 53, 54); lateral and posterior margins of the prothorax meet to form an acute angle of about 15 degrees (Fig. 385).................. .... _Pococera atramentalis_ (Lederer)

20'. Posterior margin of the dorsal groove not dentate; lateral and posterior margins of the prothorax meet to form an angle of 30 degrees or greater (Fig. 362)... _Bonchis munitalis_ (Lederer)

21. Posterior margin of the dorsal groove strongly dentate (Fig. 358)... .... _Pyralis_ spp. [_farinalis_ and perhaps _manihotalis_ (Guenee)]

21'. Posterior margin of the dorsal groove not dentate.............. 22

22. Mesothoracic spiracle touching the anterior margin of the mesothorx and often surrounded by a large shallow pit, its diameter equal to about two or more times the verticla diameter of the spiracle on A2 (Fig. 366)..................... .... _Calybitia picata_ Schaus

22'. Mesothoracic spiracle appears as a round black spot widely separated from the anterior margin of the mesothorax and never surrounded by a shallow pit, its diameter subequal to the vertical diameter of the spiracle of A2 (Fig. 370)......... .... Jocara sp. [conspicualis (Lederer)]

23. Spiracles of A2-4 greatly enlarged when compared to the remaining segments, their diameter about three times that of the others (Fig. 70)(subfamily Nymphulinae)................... .... Nymphula depunctalis Guenee, Parapoynx diminutalis Snellen

23'. Spiracles of A2-4 not greatly enlarged when compared to the remaining segments, their diameter never three times that of the others.. 23

24. Mesothoracic femur exposed (subfamily Schoenobiinae) (Fig. 315)............................ Rupela albinella (Cramer)

24'. Mesothoracic femur not exposed.................................... 25

25. Lateral grooves on A10 present (Fig. 354)...................... 26

25'. Lateral grooves on A10 absent..................................... 28

26. Cremaster spines absent (Fig. 323)...... Chilo plejadellus Zincken

26'. Cremaster spines present.. 27

27. Cremaster spines curved and closely spaced to one another (Fig. 243)........................... Nomophila nearctica Munroe)

27'. Cremaster spines straight and widely spaced in two pairs (Fig. 354)............... Fissicrambus sp. (based on USA material)

28. Paired appendages present either on the vertex (Figs. 50, 62) or on the dorsal surface of the abdominal segments (Fig. 346) (subfamily Crambinae).. 29

28'. Paired appendages absent on the vertex or the dorsal surface of the abdominal segments....................................... 31

29. Dorsal surface of each abdominal segment with paired spines (Fig. 346)................................ Eoreuma loftini (Dyar)

29'. Paired spines absent on the dorsal surface of each abdominal segment, only the vertex has paired appendages................. 30

30. Paired appendages on the vertex pointed (Figs. 50, 342)........ .... Diatraea saccharalis (Fabricius)

30'. Paired appendages on the vertex blunt (Figs. 62, 338).......... .... Diatraea lineolata (Walker)

31. Cremaster consists of two sclerotized spheres joined at their center by a plate-like extension, each sphere bearing a stout spine (Fig. 90)(subfamily Evergestinae)....................... .... Evergestis rimosalis (Guenee)

31'. Cremaster not as above, never with two sclerotized spheres..... 32

32. Maxillary palps absent (subfamily Glaphyriinae)(Fig. 83)....... .... Hellula phidilealis (Walker)

32'. Maxillary palps present (Fig. 199), usually with a shouldered appearance (Fig. 202)(subfamily Pyraustinae).................. 33

33. Maxillae short, not extending to the caudal wing margin (Fig. 290)... 34

33'. Maxillae long, extending to the caudal wing margin or beyond (Fig. 51).. 36

34. Cremaster consists of five setae in a depression surrounded by a sclerotized lip (Fig. 232).............................. .... Megastes sp. near pusialis Snellen

34'. Cremaster without a depression containing five setae.......... 35

35. Cremaster with a stout spine at each apical corner (Fig. 293)...................... Polygrammodes elevata (Fabricius)

35'. Cremaster without a spine at each apical corner, at most a blunt tubercle is present (Fig. 149)... Compacta hirtalis (Guenee)

36. Labrum located on the dorsal surface of the head above the eyes and far anterior of the normal position (Fig. 173)........ 37

36'. Labrum located on the ventral surface of the pupa or at the apex of the anterior end, location never dorsal (Fig. 180)..... 39

37. Pilifers with a large tubercle on the ventral surface (Fig. 265), skin texture of thorax weakly granulate .... Palpita flegia (Cramer)

37'. Pilifers lack a tubercle on the ventral surface (Fig. 173), skin texture of the thorax roughened or punctate............... 38

38. Skin texture of thorax punctate (Fig. 170) .... Diaphania hyalinata (Linnaeus)

38'. Skin texture of the thorax roughened (Fig. 171)............... .... Diaphania nitidalis (Stoll)

39. Cremaster with seven straight spines (Fig. 101)............... .... Achyra bifidalis (Fabricius)

39'. Cremaster with curved spines, if spines straight then seven are not present.. 40

40. Hood-like protuberances present on A2 and A3 dorsad of the spiracles (Fig. 263)........... Neoleucinodes elegantalis (Guenee)

40'. No hood-like protuberances present on A2 and A3................ 41

41. Dorsal surface of the mesothorax and metathorax with two elongate pits dorsally (Fig. 302)......... Udea rubigalis (Guenee)

41'. Elongate pits on the dorsal surface of the mesothorax and metathorax absent.. 42

42. Mesothoracic spiracle a U-shaped pit (Fig. 217), cremaster long and slender, about four times longer than wide (Fig. 219)............................ Maruca testulalis (Geyer)

42'. Mesothoracic spiracle not a U-shaped pit, cremaster, if long and slender, never four times longer than wide................. 43

43. At least one abdominal spiracle in an elevated pit (Figs. 63, 64).. 44

43'. No abdominal spiracles in an elevated pit...................... 48

44. All abdominal spiracles elevated (Fig. 177).................... .... Eulepte sp. (prob. concordalis Hubner)

44'. Only the abdominal spiracle of A4 elevated..................... 45

45. Frons with a deep median groove and appearing to be bilobed (Fig. 211).................. Marasmia trapezalis (Guenee)

45'. Frons without a groove, not bilobed........................... 46

46. Mesothoracic spiracle adjacent to two pits, one dorsal and the other ventral (Fig. 298)...... Spoladea recurvalis (Fabricius)

46'. Mesothoracic spiracle lacks pits.............................. 47

47. Dorsal surface of the cremaster smooth, spiracles of A2, A3, and A5-7 subequal in diameter, spiracle of A4 twice the diameter of the others (Fig. 237)............................ .... Microthyris anormalis (Guenee)

47'. Dorsal surface of the cremaster roughened, spiracles of A2-4 larger than the others, spiracle of A3 about 3/4 the diameter of A4 (Figs. 63, 64)............ Lygropia tripunctata (Fabricius)

48. Mesothoracic spiracle adjacent to a pit either dorsally or ventrally (Fig. 113).. 49

48'. Mesothoracic spiracle without a pit........................... 54

49. Scape of the antenna with a prominent tubercle (Fig. 278)........................... <u>Pilemia</u> <u>periusalis</u> (Walker)

49'. Scape of the antenna lacks a prominent tubercle................ 50

50. The cremaster in dorsal view has two setae with hooks at their bases (Figs. 194, 195)........ <u>Hymenia</u> <u>perspectalis</u> (Hubner)

50'. None of the cremaster spines in dorsal view have hooks at their bases.. 51

51. Ventral surface of the cremaster paired knob-like appendages present (Fig. 179).................. <u>Geshna</u> <u>cannalis</u> (Quaintance)

51'. Paired appendages on the ventral surface of the cremaster ventrad of the cremaster absent................................ 52

52. Maxillae extend past the caudal wing margin (Fig. 114), spiracular openings on A2-7 sunken in shallow pits.. <u>Asciodes</u> <u>gordialis</u> Guenee

52'. Maxillae end at the caudal wing margin, spiracular openings of A2-7 not sunken in shallow pits........................... 53

53. Ventral surface of the cremaster with a deep slit (Fig. 187) .... <u>Herpetogramma</u> <u>phaeopteralis</u> (Guenee)

53'. Ventral surface of the cremaster without a slit (Fig. 185) .... <u>Herpetogramma</u> <u>bipunctalis</u> (Fabricius)

54. Maxillae extend to nearly the tip of the abdomen or slightly beyond (Fig. 201)... <u>Lineodes</u> spp. [<u>integra</u> (Zeller) and <u>hieroglyphalis</u>]

SUBFAMILY NYMPHULINAE

The Nymphulinae are worldwide in distribution (Lange, 1956) and adults are common at lights throughout Honduras. The hind wings of many genera have a row of metallic spots along the termen (Munroe, 1972). Sexual dimorphism is found in some species (Agassiz, 1978). Hampson (1897) reviewed the subfamily long ago under the name Hydrocampinae while Munroe (1972) revised the North American fauna. The literature on the aquatic Lepidoptera of Central and South America was listed by Munroe (1981, 1982).

Characteristics that distinguish Nymphulinae pupae from other subfamilies of Pyralidae are not available. Based on the few genera seen (*Synclita*, *Parapoynx*, and the published figures of *Nymphula*) the pupae of the aquatic Nymphulinae may be recognized by the enlarged spiracles of either A2, A3, and/or A4 contrasted with the minute spiracles of the remaining segments. In the semiaquatic Pyraustinae (*Samea* and *Sameodes*) the spiracles are approximately equal in size to one another. *Acentria nivea* appears to be an exception to the above definition of the Nymphulinae. This species has been placed in its own subfamily, the Acentropinae (Leraut, 1980), in the Schoenobiinae (Hodges et al., 1983), or in the Nymphulinae (Hasenfuss, 1960). The anterior spiracles of *Acentria* pupa are greatly enlarged thus supporting Hasenfuss' (1960) placement of the genus in the Nymphulinae based on larval features. Both Schoenobiinae genera examined (*Rupela* and *Donacaula*) have the spiracles equal in size unlike *Acentria*. The close similarity in structure could be a case of convergent evolution to an aquatic environment rather than a measure of true phylogenetic distance. Acentria larvae lack a membranous sac between the prothoracic coxae which is a major difference between it and the Schoenobiinae genera examined.

Another exception to the generalization that Nymphulinae pupae have enlarged spiracles is the terrestrial genus Undulambia. The pupa has all spiracles of equal size. It may be easily distinguished by the semicircular serrate lateral flanges of A5-A7 along with the bifurcate pointed cremaster. This supports Munroe's placement of the genus in a new tribe, the Ambiini, and shows that it is not closely related to the Nymphulini.

The Nymphulinae (except Acentria as it is currently placed) includes the only truly aquatic members of the Pyralidae although the Crambinae, Schoenobiinae, Pyraustinae, and Phycitine all have species associated with aquatic plants. Lange (1956) divided the family into two biological categories. One tribe, the Nymphulini, feed on plant parts. The other tribe, the Argyractini, feed on algae, and diatoms on rocks. The larvae of the third tribe, the Ambiini, feed on ferns (Munroe, 1972). Many Nymphulinae larvae live inside cases of leaf fragments. The presence of tracheal gills are distinctive for the larvae of the Nymphulinae but not all genera have them. The remaining genera of Nymphulinae without gills may be recognized by the bisetose L group of A9. Larval keys to the Nymphulinae of Florida can be found in Habeck (1975).

Only two species of Nymphulinae are of potential concern to Honduran entomologists. One is the rice pest Nymphula depunctalis Gn. The other, Parapoynx diminutalis Snellen, is a potential biological control agent for the aquatic weed hydrilla. Neither have been collected in Honduras to date.

Nymphula depunctalis Guenee

(Fig. 67)

Synonyms

Nymphula stagnalis Zeller.

Common Names

Rice caseworm and paddy case-bearer have been used but the former is more descriptive and readily understood.

Distribution

Asia, Africa, introduced into parts of South America (Venezuela, Brazil, Uruguay, and Argentina), not known from Central America (Hill, 1978; Grist and Lever 1969).

A distribution map was given by Hill (1978).

Hosts

Rice and several genera of grasses, especially *Eragrostis*, *Panicum*, and *Paspalum* (Hill, 1978).

Rice is the main host (Hill, 1978) but a wide variety of Gramineae are eaten under laboratory conditions (Viraktamath et al., 1974).

Material Examined

PHILIPPINES: International Rice Research Institute, Los Banos, 8-II-1984, A. Barrion, rice, greenhouse lab culture (4 pupae, 6 larvae).

Larval Diagnosis

Branched tracheal gills present; seta SD2 of the prothoracic shield ventrad of XD2.

The branched tracheal gills will separate N. depunctalis from other terrestrial larvae while the position of SD2 on the prothoracic shield will distinguish this species from P. diminutalis.

Larval Description

The larva was illustrated by Breniere (1979) and Fletcher (1914).

Pupal Diagnosis

The enlarged spiracles of A2, A3, and A4 will allow recognition of the Nymphulinae. No characters were found separate N. depunctalis and P. diminutalis as pupae.

Pupal Description

The pupa was illustrated by Viraktamath et al. (1974) and Fletcher (1914). Maxillary palps are present on the pupae of N. depunctalis, the figures by Viraktamath et al. (1974) are in error.

Biology

Hill (1978) summarized the biology and illustrated the life cycle. The eggs were laid singly on the leaves. After a few days the larvae constructed a case and filled it with water to surround their body in liquid. Therefore they were able to feed high on the plant above the water line. The larval stages lasted 15-30 days. The adult photograph by Agassiz (1982) labeled as P. "stagnalis" is actually N. crisonalis (Agassiz, personal communication).

Pest Status

Nymphula depunctalis is a potential pest. It has shown the ability to feed on a wide variety of native grasses and has already extended its range into the New World.

Comments

The larvae of most Nymphula lack branched gills unlike Parapoynx which has these structures present (Lange, 1956). Therefore, N. depunctalis seems to be misplaced if only larval features are considered.

Parapoynx diminutalis Snellen

(Figs. 1, 68-71)

Synonyms

Nymphula diminutalis (Snellen)

Common Names

There is no common name for this insect. An appropriate name would be hydrilla caseworm.

Distribution

Asia, Europe, USA (Florida), Panama (Buckingham, 1982; Ghani, 1971-1976).

Host

Hydrilla appears to be the main host in the New World. Other genera of aquatic plants suitable for development included Vallisneria, Najas, Nymphaea, and Potamogeton. A wide variety of aquatic plants may be eaten under laboratory conditions (Buckingham, 1982).

Material Examined

USA: Florida, Gainesville, 1-VIII-1982, S. Passoa, hydrilla, United States Department of Agriculture lab culture (1 pupa, 1 larva); PANAMA: Gamboa (near Gorgona Islands), 19-VIII-1981, W. Murdoch, Jr. and D. Habeck, hydrilla (10+ pupae, 16+ larvae); many adults and larvae seen from various localities in Panama and various dates in Gainesville.

Larval Diagnosis

Branched tracheal gills present; SD2 posteroventrad of XD2 on the prothoracic shield.

The first instar larvae of *P. diminutalis* lacks spots on the head and the branched gills.

Larval Description

The larva is of minor economic importance and thus does not justify a full description.

Pupal Diagnosis

The enlarged spiracles of A2, A3, and A4 will allow recognition of the subfamily Nymphulinae but there are no characters available to separate *N. depunctalis* and *P. diminutalis* pupae.

Pupal Description

The pupa was illustrated by Ghani (1971-1976).

Biology

The biology was given by Buckingham (1982). Eggs were laid on the hostplant at the water's surface. The second and succeeding instars constructed cases made of leaf fragments. Pupation took place in a cocoon usually attached tightly to the stem. The larval-pupal period lasted from 15-66 days depending on the water temperature.

Pest Status

P. diminutalis is sometimes considered a pest of aquatic plants in nurseries (Agassiz, 1978) but the real economic importance of this species lies in its value as a potential biological control agent of the aquatic weed hydrilla in Florida. The aquatic weeds of Honduras are unexplored and Honduran entomologists need to be aware of this species in the event it occurs in Honduras also.

SUBFAMILY GLAPHYRIINAE

This is a small group of mostly New World moths, only the genus Hellula reaches the Old World. The North American species were revised by Munroe (1972).

Pupae of the Glaphyriinae differ from the Pyraustinae in lacking maxillary palps which are present in all Pyraustinae examined so far. The only other subfamily of Crambiformes to lack maxillary palps is the Schoenobiinae. Three genera of Glaphyriinae pupae were available for study (Hellula, Dicymolomia, and Chalcoela).

Larval habits in the United States are quite varied. Allyson (1981a) listed Upiga on cactus, Lipocosoma on lichens, Chalcoela as a predator of vespid larva, and Dicymolomia on a wide variety of plants. The genus Hellula contains three pest species of crucifers (rogatalis of the United States, phidilealis of Tropical America, and undalis of the Old World). The record by Willie (1952) of Hellula undalis in Peru, later copied by Holle and Montes (1981), is a misidentification and refers to H. phidilealis. Allyson (1981a) gave the plant families Cruciferae (=Brassicaceae) and Amaranthaceae as hosts of H. phidilealis. There are no characters at present to separate larvae of the subfamilies Glaphyriinae and Pyraustinae but the former is unusual in that D2 is half the length of D1 on A1-A8 which contrasts with the vast majority of the Pyraustinae that have these two setae equal. Those Pyraustinae that have D2 half the length of D1 can usually be recognized by the elongate V1 pinacula of A3-6. The V1 pinaculum is always a round spot in the

Glaphyriinae. Extra pinacula not bearing setae, common in the Pyraustinae, are never present in the Glaphyriinae. Both subfamilies share the following general characteristics: L group of A9 unisetose, V1 on A10 farther apart from each other than the V1 setae on A9.

The Glaphyriinae were considered part of the Pyraustinae until Forbes (1923) separated the two groups. Larval and pupal characteristics support this split.

Hellula phidilealis (Walker)

(Figs. 2, 72-85)

Synonyms

None in common usage.

Common Names

Saunders et al. (1983) used the common name stem borer which is neither distinctive nor descriptive enough to be useful. Fennah (1947) listed *H. phidilealis* under the common name cabbage budworm which is far more appropriate. This is similar to the name suggested by Passoa (1983), cabbage borer.

Distribution

Southern USA, Central and South America, West Indies, and Hawaii (Munroe, 1972); Trinidad, St. Vincent, Grenada, Santa Lucia, Puerto Rico, Virgin Islands, Barbados, Montserrat, Jamaica, Bahamas, Venezuela, Guyana, Surinam, and probably introduced into Sierra Leone, Africa (Sommeijer, 1974); Trinidad and Tobago (Gooding, 1980); Brazil (Costa Lima, 1950); El Salvador (Berry and Vaquero, 1957; Berry 1959a); Nicaragua (McGuire and Crandall, 1967); Honduras (Passoa, 1983).

A distribution map of *H. phidilealis* was prepared by the Commonwealth Institute of Entomology (Anonymous, 1951-1977).

Hosts

Cabbage, cauliflower, mustard, radish, turnip, chinese cabbage, broccoli (Alam, 1982; Fennah, 1947) and unspecified genera of the family Amaranthaceae are also attacked (Munroe, 1972). The latter host record needs confirmation as does the citation of *H. phidilealis* on lettuce taken from McGuire and Crandall (1967) by Passoa (1983).

Cleome spinosa, *Cleome viscosa*, and *Gynandropsis gynandra* are probably the native hosts in the Carribean (Alam, 1982).

Material Examined

PERU: no locality, VIII-1958, F. Cisneros (1 adult); HONDURAS: EAP, 25-IV-1983, J. Dick, ex larva on broccoli (4 adults, 2 pupae); EAP, 6-X-1981, em. 18-X-1981, S. Passoa, ex larva on cabbage (1 adult); EAP, 19-IX-1979, J. Inashima, ex larva on cabbage, larval mandible slide #127 SPC (1 adult); EAP, 26-V-1980, Orellana and Paguaga, cabbage, larval mandible slide # 243 SPC, det. Habeck as *Hellula* sp. (1 larva); EAP, 24-II-1981, D. Habeck, no host recorded, larval mandible slide #39 FSCA (14 larvae); EAP, no date or collector recorded, broccoli, larval mandible slide #253 SPC (5 larvae); EAP, 8-IV-1981, Ferryros, turnip, (2 larvae); PUERTO RICO: Santa Isabel, 14-III-1983, D. Green, *Cleome* pods, larval mandible slide #249 SPC (2 larvae).

Larval Diagnosis

A3-A6 with a sclerotized pit posterior to the SD1 seta; and general characteristics of the subfamily Glaphyriinae.

H. phidilealis can be separated from H. rogatalis (not in Honduras) by the fact that S3 is posterior to a line drawn through L1 and S2 on the epicrania in lateral view (Allyson, 1981a).

Capps (1963) used the pink longitudinal stripes and large size of stemmata 1 to distinguish Hellula. Both these characters are variable. The longitudinal stripes are sometimes brownish (Dinther, 1960) or blackish and very often they are absent in preserved larvae. In a few specimens stemmata 1 is only very slightly, if at all, larger than stemmata 2. Bollman (1955) first noticed the sclerotized pit posterior to seta SD1 and this is a much safer character to rely on for identification.

Larval Description

General. Live larva with a blackish head faintly mottled with brown patches, prothoracic shield black, body cream with a middorsal and two pair of subdorsal brown to pink lines.

Skin granulate under high magnification; crochets in a triordinal penellipse, all pinacula pale, concolorous with the body; mature larva approximately 12 mm long.

Head. Front extends 3/4 way to epicranial notch; Adf2 below the apex of the front; Adf1 midway between the clypeus and the top of the front; F1 in the lower quarter of the front, dorsad of C1; C2 almost ventrad of Adf1; P1 three times the length of P2; A2 dorsad of A1; A3 in a horizontal line with A2; L1 slightly dorsad of a horizontal line with Adf1.

Six stemmata present; stemma 1 usually larger than stemma 2; distance between stemmata 2 and 3 much greater than that between stemmata 3 and 4; stemma 5 ventrad of stemma 4; stemma 6 posterior to stemma 5.

Labrum with L1 and L2 in a horizontal line; L3 shorter than L2; M1, M2, and M3 subequal in length.

Mandible with 5 scissorial teeth, molar ridge of the first tooth with an inner tooth, 2 lateral mandibular setae present, the posterior seta longer.

Hypopharyngeal complex with an elongate blunt spinneret; first segment of the labial palps elongate, equal in length to the spine-like third segment, two minute stipular setae present; proximolateral spines in a single row above each premental arm, above them is another patch of spines.

Thorax. Prothoracic shield with XD2 closer to SD1 than XD1; SD2 near SD1; D1 closer to XD1 than D2; L1 and L2 on an oblong pinaculum; SV1 and SV2 on a small oval pinaculum; V1 posteroventrad of the coxa, closer to the midline than V1 on the mesothorax.

Mesothorax with D1 and D2 on a small pinaculum; SD1 and SD2 slightly anteroventrad of the D pinaculum; L3 separated from L1 and L2 by about the distance of its pinaculum; SV1 ventrad of L3; V1 ventrad of the coxa.

Abdomen. A1 with D2 almost half the length of D1; SD1 dorsad of the spiracle; L3 closer to the bisetose SV group than to L1 and L2; V1 ventrad of SV3 and SV1.

A6 with the D setae as in A1; a sclerotized pit posterior to the SD1 seta; L3 close to the trisetose SV group, the latter dorsad of the proleg; V1 slightly anteroventrad of the proleg.

A8 with the D setae as in A1; SD1 slightly anterodorsad of the spiracle; L1 and L2 ventrad of the spiracle on their own pinaculum; L3, SV1, and V1 equally spaced in a vertical line.

A9 with both D2 setae on a sclerotized dorsal plate; SD1 much thinner than D2, both on an oval pinaculum; SV1 slightly posteroventrad of L1; V1 ventrad of SV1.

Anal shield rounded, SD1 close to D2; D1 dorsad of D2.

Pupal Diagnosis

Maxillary palps absent; cremaster distinctive, composed of four spines in two separated pairs.

The cremaster spines are fragile and easily broken so care must be taken to search for the setae remnants. The pupa of *H. rogatalis* is very similar to that of *H. phidilealis*.

Pupal Description

General. Pupa with a shouldered appearance like the Pyraustinae due to the narrow head and wider prothorax. There is sometimes a cream-colored waxy bloom covering the tan-brown body.

Head. Vertex with two small setae; labrum triangular; labial palps shaped like an inverted tear drop; maxillary palps absent; maxillae extends to the caudal margin of the wings; pilifers present; antenna ending before the caudal margin of the wings, approximately equal to 3/4 the length of the maxillae.

Thorax. Prothoracic femur exposed; prothoracic leg equal to 1/2 length of the maxillae; mesothoracic leg extends to the caudal wing margin; mesothoracic spiracle an inconspicuous slit; dorsal surface of the prothorax and mesothorax with a weak crest; skin texture of the thoracic segments smooth.

Abdomen. Abdominal spiracles tubular and slit-like, those of A2 and A3 with furrows; A5 and A6 with proleg scars ventrally; texture of all abdominal segments smooth; cremaster consists of four curved setae arranged in two pairs separated from each other.

Biology

The biology was studied by Fennah (1947) and Dinther (1960). Eggs were laid singly near the midrib of the young leaves. The larva entered the host and tunneled downward. Frass was expelled from the entrance hole. Larval development took about 2 weeks and pupation usually occurred on the host, sometimes in the soil. The pupal stage lasted 12-14 days.

Margheritis and Rizzo (1965) noted that H. phidilealis preferred to attack young plants.

A photograph of the eggs was given by Peterson (1963) while the adults were illustrated in color by Munroe (1972). The damage was illustrated by Andrews (1984) and by Creighton and Halfhill (1980).

Pest Status

H. phidilealis is a major pest of cabbage and cauliflower in the Lesser Antilles (Fennah, 1947) and the Carribean (Gooding, 1980). In Honduras it is locally common and serious at the Escuela Agricola Panamericana where damage to the leaf axil of cabbage and broccoli is common. Andrews (1984) characterized H. phidilealis as a sporadic pest of cabbage and Chinese cabbage. It has also caused damage in El Salvador (Berry and Vaquero, 1957).

Alam (1982) noted that the seedling stage is the critical period to protect because the growing point is exposed. Damage to the terminal bud prevents head formation or causes multiple heads of unmarketable size to form. As the plant grows it covers the terminal bud with leaves so the almost mature plant suffers little damage.

SUBFAMILY EVERGESTINAE

This is a small group of about 100 species worldwide, the great majority being Holarctic. They were considered part of the Pyraustinae previously. Adults are similar to the Pyraustinae at first glance but differ from them in genitalic morphology, especially in the male gnathos and female signum (Munroe, 1974).

The close relationship between the two subfamilies is demonstrated by the pupae which exactly fit Mosher's (1916) definition of the Pyraustinae except for the well developed cremaster which is present in the latter subfamily. This difference in the form of the cremaster may be significant. Two species of Evergestis illustrated by Khot'ko and Molchanova (1975) from Europe as well as the two Nearctic members of the Evergestinae available for study (Evergestis and Trischistognatha) all differ from the Pyraustinae in sharing a cremaster composed of two shpheres with setae. A similar structure was mentioned by Carter (1984) for Evergestis forficalis. The distinctive cremaster of the known Evergestinae readily separates them from the Pyraustinae and Glaphyriinae which also have a shoulders appearance.

Larval foodplants are usually species of Cruciferae but Trischistognatha pyrenealis feeds on Drypetes (Euphorbiaceae). Evergestis rimosalis was collected on cabbage in Honduras. Evergestis pallidata is another pest of cabbage, especially in Canada, the United States, and Europe (Morris, 1960; Munroe, 1974). Symphysa amoenalis was recorded as a pest of cabbage in Surinam (Dinther, 1956, 1960) and Puerto

Rico (Wolcott, 1948). In the Old World *Crocidolomia binotalis* Zeller is a pest of crucifers (Anonymous, 1982) as is *Evergestis forficalis* (L.) in England (Carter, 1984; Emmett, 1980). There are no good structural characteristics to separate larval Pyraustinae from the Evergestinae but the presence of dorsal and subdorsal setae on conical black chalazae should signal the possibility of having a species of Evergestinae. Unfortunately, many common Pyraustinae share this feature (*Uresphita* and *Loxostege*). These two subfamilies may then be separated by the shape of the V1 pinacula on A3-A6. Pyraustinae have the V1 pinaculum elongate and band-like while the V1 pinaculum is a round dot in the Evergestinae. Only two Evergestinae larvae were available for study (*Trischistognatha* and *Evergestis*).

Both subfamilies share the following general features: L group on A9 unisetose; V1 setae on A10 farther apart from each other than the V1 setae on A9.

Evergestis rimosalis (Guenee)

(Figs. 3, 86-90)

Synonyms

None in common usage.

Common Names

The accepted Entomological Society of America common name is cross-striped cabbageworm (Werner, 1982).

Distribution

New York south to Florida, Texas, and Mexico (Munroe, 1974); Venezuela (Klima, 1939); El Salvador (Berry, 1959a); Honduras (Passoa, 1983); Panama (McGuire and Crandall, 1967).

Hosts

Cabbage and other Cruciferae (Munroe, 1974); collards, rutabagas, cauliflower, radish, mustard, turnips, and chinese cabbage (Cain, 1931); brussel sprouts (Berry and Vaquero, 1957).

Cabbage and collards are preferred (Cain, 1931).

Material Examined

USA: Florida, Gainesville, 5-VI-1972, em. 27-VI-1972, M. Kirby, ex cabbage (1 adult); Gainesville, 20-X-1982, em. 4-XI-1982, collector unknown, ex larva on brussel sprouts (1 adult); HONDURAS: EAP, no date or collector recorded, ex cabbage (2 adults); EAP, 19-IX-1979, em. ?, J. Inashima, ex larva on cabbage (1 adult); EAP, 17-XI-1981, pupa killed 21-XI-1981, S. Passoa, cabbage (1 larva, 1 pupa); EAP, 30-X-1979, J. Inashima, cabbage (1 larva); Comayagua, 18-II-1976, no collector recorded, broccoli, larval mandible slide #251, 252 SPC (7 larvae); no locality, date, or collector recorded, probably from Santa Rosa de Copan, received with a lot of insects from that locality (1 larva).

Larval Diagnosis

Dorsal and subdorsal setae of the abdominal segments on strongly conical black chalazae, prothoracic shield mottled as illustated.

King and Saunders (1984) note the larva of *Leptophobia aripa*, a common crucifer feeding Pieridae, is colored superficially like *E. rimosalis*. Pyralids lack secondary setae which are present in pierid larvae.

Larval Description

The larva was illustrated by Creighton and Halfhill (1980), Peterson (1962) and Cain (1931).

Pupal Diagnosis

The distinctive cremaster will separate *Evergestis rimosalis* from all the other species in this study.

Another member of this subfamily found in Central America, *Trischistognatha pyrenealis*, has a cremaster very similar to *E. rimosalis*. The species can be separated by the shape of the maxillary palps. In *T. pyrenealis* they are almost rectangular while in *E. rimosalis* the maxillary palps are triangular and not as elongate. The hosts also differ, *T. pyrenealis* does not feed on crop plants.

Pupal Description

General. The pupa has been illustrated by Cain (1931). It has a shouldered appearance like the Pyraustinae and is tan-brown.

Head. Frons elevated slightly, two small setae present; labrum squarish; labial palps elongate; pilifers present; maxillary palps triangular in shape; maxillae and antennae both reaching the caudal margin of the wings.

Thorax. Prothoracic femur exposed, equal to 1/3 maxillae in length; mesothoracic legs reach almost 2/3 the way to the caudal wing margins; prothoracic spiracle an inconspicous slit; prothorax and mesothoracic with a middorsal crest; metathorax leg extends to the caudal margin of the wing; skin texture of thorax smooth.

Abdomen. Spiracles of A2 and A3 with furrows; A5 and A6 with proleg scars ventrally; cremaster consists of two sclerotized spheres joined at their center by a plate-like extension, each sphere bearing a stout seta; skin texture of abdomen smooth.

Biology

The biology was given by Munroe (1974) and Cain (1931). The eggs were laid in a flattened mass, one overlapping another. Larvae may bore into the host (Munroe, 1974) but in Honduras they more commonly behaved as leaf feeders. The pupae were formed in the ground and there are probably three generations a year, at least in the northeastern United States (Munroe, 1974). This species needs study under tropical conditions. Creighton and Halfhill (1980) noted that *E. rimosalis* preferred the tender terminal buds of cole crops. The adult was illustrated in color by Munroe (1974).

Pest Status

King and Saunders (1984) considered *E. rimosalis* a local and sporadic pest throughout Central America. This matches Passoa's (1983) evaluation of *E. rimosalis* in Honduras. Serious damage was also recorded from El Salvador (Berry and Vaquero, 1957).

SUBFAMILY PYRAUSTINAE

The subfamily Pyraustinae is a large group found throughout the world. Two tribes are recognized, the Pyraustini and the Spilomelini. This subfamily is a member of the series Crambiformes and therefore the adults possess a well developed praecinctorium (Munroe, 1976). Adult coloration is variable but many are yellow-brown or some shade of tan. A few are brightly marked. Nearly half of the economic species included in this work belong to the Pyraustinae. Hampson (1898, 1899) reviewed the world fauna. Klima's (1939) catalog of the subfamily is incomplete, but remains useful. The North American members of the tribe Pyraustini were recently studied by Munroe (1976).

Mosher (1916) characterized the Pyraustinae pupae by their narrow head and prothorax which gives the impression of a shouldered appearance. However, this feature is not restricted to the Pyraustinae. The pupae of the Evergestinae and the Glaphyriinae also have a shouldered appearance. The former subfamily may be distinguished by the distinctive shape of the reduced cremaster while the latter is easily separated from the Pyraustinae by the lack of maxillary palps. Some Pyraustinae, for example Megastes and Azochis, have only a weak "shoulder". The cephalad position of the labrum, when this condition exists, is also helpful in the recognition of the Pyraustinae. An extreme case is found in the genus Diaphania where the labrum is on the dorsal surface of the head. Many Pyraustinae have long maxillae and mesothoracic legs that extend past the caudal wing margin, a feature also found in some Nymphulinae and Schoenobiinae. The mesothoracic spiracle is sometimes a simple slit but frequently it may be a complex structure fringed with hairs or adjacent to pits. The abdominal spiracles may also be modified. In Asciodes they are sunken in a pit. Other genera, Spoladea and Lygropia, have elevated spiracles that are surrounded by a raised ring. The abdominal dorsal surface of a few genera, Sylepta and Pleuroptya, have hook-like structures. The cremaster is always well developed and may be a series of stout spines in Loxostege (Heppner, 1975) or Achyra but a U-shaped structure is more common (Maruca, Herpetogramma, etc.). Pupation usually occurs in a rolled leaf although the larval burrow is sometimes utilized by those species feeding internally.

Pyraustinae larvae feed on a wide variety of hosts. Allyson (1981b) described most species as stem borers, leaf rollers, or fruit borers. The borers include Diaphania (in cucurbits), Azochis (in figs), and Megastes (in sweet potato). Some feed on corn and other grasses (Herpetogramma, Marasmia). Solanaceous plants are attacked by Pilemia and Lineodes. Lygropia and Microthyris are leaf rollers on sweet potato. Maruca and Omiodes are found on legumes such as snap beans and soybeans. Spoladea and Nomophila are polyphagous. The above list, although incomplete, gives an idea of the range of crops attacked by the Pyraustinae. Some genera, Samea and Sameodes, are associated with aquatic plants (Center et al., 1982).

No effort was made to include all the species attacking ornamentals. The species discussed in this work include Asciodes on bougainvillea, Geshna on canna lilies, and Eulepte on Tabebuia. Agathodes designalis, a pest of the ornamental Erythrina crista-galli in Puerto Rico (Wolcott, 1948; Martorell, 1976) was omitted since it is a minor problem in

Honduras. Its life cycle was illustrated by Bourquin (1939). No material of Lamprosema olivia, Cyclocena lelex, Phlyctaenodes bifilalis or Acrospila iguinalis was available for study. These were listed as vegetable pests in Central America by Saunders et al. (1983) but their importance is assumed to be minor in Honduras. Several other species associated with economic plants are not included in this study. Epipagis huronalis was reared from corn in Honduras at the Escuela Agricola Panamericana. Phostria martyralis fed on beans in Costa Rica. More study is needed to fully characterize the fauna associated with crops.

Keys to the North American larvae of the tribes Pyraustini and Spilomelini were presented by Allyson (1981b, 1984). The general characteristics of the subfamily include L group on A9 unisetose and the V1 setae of A10 farther apart from each other than the V1 setae on A9. These are also the general characteristics of the Evergestinae and Glaphyriinae. Pyraustinae larvae may usually be distinguished from these subfamilies by the presence of an elongate band-like pinaculum on A3-6. The V1 pinaculum is a round spot in the Evergestinae and Glaphyriinae. The only Pyraustinae with a round V1 pinaculum is Polygrammodes elevata but it may be recognized by the extra non-setae bearing pinacula on the body. Such extra pinacula are never found in the Evergestinae or Glapyriinae so far examined. The prolegs of many Pyraustinae have a series of very fine unpigmented spines anterior to the crochets.

Achyra bifidalis (Fabricius)

(Figs. 4, 94-101)

Synonyms

Loxostege bifidalis (Fabricius); *Phlyctaenodes bifidalis* (Fabricius).

Common Names

Saunders et al. (1983) used the name leaf worm. This lacks a modifier and is not appropriate. The name Neotropical garden webworm is distinctive and also reflects the fact that *A. bifidalis* is part of the webworm complex. The larva has also been called the green potato worm (Rizzo, 1972).

Distribution

Canada (Alberta), Arizona to Texas in the USA, widely distributed in the tropics from Mexico to Argentina including the West Indies (Munroe, 1976); Mexico, Guatemala, Panama, Venezuela, Colombia, Brazil, Paraguay, Argentina, St. Croix, Puerto Rico, and Jamaica (Capps, 1967); Surinam (Dinther, 1960); Honduras.

Hosts

A wide variety of plants are probably utilized, cotton, purslane, *Amaranthus* (Munroe, 1976); *Amaranthus cordatus*, *A. hibridus*, *A. spirosus* (Silva et al., 1968); *Amaranthus patens* (Costa Lima, 1950); yuca (Saunders et al., 1983); soybean (Rizzo, 1972); eggplant; beets; cabbage; and perhaps corn.

Material Examined

HONDURAS: Comayagua, 15-IV-1980, S. Passoa, light trap, parental female of larva #188 SPC; 15-IV-1980, em. 10-V-1980, S. Passoa, ex ova on

Portulaca as test plant, larva #188, mandible slide #346 SPC (2 adults, 1 cast pupal skin); 9 larvae (7 1st instar); Comayagua, 24-IV-1980, S. Passoa, light trap (1 adult); Comayagua, 6-IV-1980, S. Passoa, light trap (1 adult); Comayagua, 26-IV-1957, A. Banegas, corn, det. Capps, Comayagua card file #209, the card file doesn't specify if the adult was reared on corn or if it was merely resting on the plant; Comayagua, 30-IV-1975, E. M. de Vasquez, Amaranthus (10 larvae); HONDURAS: EAP, 11-V-1983, J. Dick, ex larva on beets (1 adult); EAP, no date or collector, cabbage (1 larva); EAP, 1981, no collector or host (1 larva); EAP, no date, collector, or host (1 larva); EAP, 25-VIII-1980, Ordone, beets (1 larva); PUERTO RICO: no locality, 1-VII-1983, D. Green, eggplant (2 larvae).

Larval Diagnosis

Prespiracular group of the prothorax extends behind and below the spiracle to fuse with the posteroventral corner of the prothoracic shield; V1 setae on A9 separated from each other by at least 3/4 the diameter of the V1 pinacula; SD1 pinaculum is usually more strongly pigmented than the D pinacula, the latter are usually weakly pigmented or pigmented around their edges only; the extension of the prespiracular group on the prothorax is usually weakly pigmented.

A. bifidalis is the most common member of the genus in Honduras. The larva is very difficult to separate from A. rantalis (= Loxostege similalis). All specimens with widely spaced V1 setae on A9, weakly pigmented D pinacula, strongly pigmented SD pinaculum, and a weakly pigmented extension of the prespiracular group on the prothorax can be named A. bifidalis. If the V1 setae are far apart and the SD and D pinacula are strongly pigmented then the larva is probably A. bifidalis, if the material is from Central America (but not Mexico or the West

Indies). Some North American _A. rantalis_ also have these characters. Specimens with the V1 setae closely spaced (1/2 the diameter of each pinacula or less), and the SD, D, and extension of the prespiracular group strongly pigmented, are probably _A. rantalis_.

Larval Description

The larva of _A. bifidalis_ was completely described and well illustrated by Allyson (1981b). Her statement that Capps (1967) illustrated the species was in error, only a verbal description was published. The illustration in Capps was of _A. rantalis_. _A. bifidalis_ was superficially illustrated by Rizzo (1972).

Pupal Diagnosis

The distinctive cremaster will separate _A. bifidalis_ from all other species in this study. The pupae of _A. rantalis_ and _A. similis_, both unknown to me, are likely to be quite similar.

Pupal Description

General. Pupa is light tannish-brown, similar to other Pyraustinae pupae in general appearance but somewhat more stout.

Head. Vertex projecting slightly, armed with two setae; labrum oval and bilobed on the posterior margin; maxillary palps triangular; maxillae extend past the caudal wing margin; antennae extend to the mesothoracic legs and maxillae; labial palps long and slender.

Thorax. The form of the prothoracic femur, if present, was not visible on the single available cast skin; prothoracic legs about 3/4 the length of the maxillae; mesothoracic legs long and reaching the antenna; mesothoracic spiracle an irregular orange patch; skin texture of thorax granulate.

Abdomen. Abdominal spiracles slit-like, those of A2 and A3 with furrows; cremaster consisting of seven straight spines arranged in four groups of 1, 1, 3, and 2 setae each; texture of the abdominal segments granulate.

Biology

Not much is known about *A. bifidalis*. Wolcott (1948) found it inhabiting the xerophytic portions of Puerto Rico. Moths were common at lights in Comayagua, also a fairly dry region. As the common name implies, the larvae web leaves together and feed on the foliage. Several North American species were mixed with *A. bifidalis* by Metcalf et al. (1962), who gave notes on the biology of these species. The adult was illustrated by Munroe (1976) in color. It flies throughout the year but exact dates depend on the locality.

Dinther (1960) noted that larvae prefer young yuca leaves on the top of the plant. Pupation was in the ground.

Pest Status

Munroe (1976) considered *A. bifidalis* to be an economic pest in the tropics. Costa Lima (1950) listed it as a pest of cotton. Serious attacks on soybean were recorded in Argentina (Rizzo, 1972). No outbreaks were ever seen in Honduras (Passoa, 1983); therefore *A. bifidalis* is a potential pest.

Comments

This is probably the only Pyraustinae to be collected in Honduras with the L pinaculum and the prothoracic shield joined behind the spiracle. Saunders et al. (1983) recorded *A. similis* from Central America but Capps (1967) listed only South American localities for this species. The larva of *A. similis* is unknown to me but it is likely to be very similar to *A. bifidalis*. *A. rantalis* occurs in the West Indies and Mexico and could be a possible stray into Honduras. Rearing the larva to adult is the best method of obtaining a positive species identification.

Allyson (1981b) used the pigmentation of the pinacula above the spiracle (D and SD setae) to separate *A. bifidalis* from *A. rantalis*. The former was supposed to have weakly pigmented pinacula while the latter had strong pigmentation. This statement, based on larvae reared from the eggs of a female *A. bifidalis*, does not appear totally correct. Larvae from Honduras have a strongly pigmented SD1 pinaculum. The D pinacula are pigmented only around the edges which agrees with Capps' (1967) description. In addition, a series of field collected larvae from Honduras on *Amaranthus* had both weakly and strongly pigmented pinacula. Three possibilities emerge for the larvae with a strongly pigmented pinacula. First, they are *A. rantalis* according to Allyson's key. Second, they are the unknown *A. similis* from Central America as suggested by Saunders' et al. (1983) list. Lastly, they represent variation in the pinacula of *A. bifidalis*. The latter explanation is most acceptable. Many larvae of *A. rantalis* can be separated from *A. bifidalis* by a comparison of the distance between the V1 setae of A9. *A. rantalis*, based on larvae from New Jersey, have the V1 pinacula larger in diameter than *A. bifidalis* and closer together so that they are separated by only half the diameter of a single pinaculum. *A. bifidalis* in contrast, has the V1 pinacula smaller and widely separated by a distance equal to 3/4 the size of the pinacula or greater. The size difference, but not the correct location, was illustrated by Allyson (1981b). The strongly pigmented *Achyra* from Honduras agree with *A. bifidalis* in their V1 setae. Since *A. bifidalis* vary in the pigmentation of the D and SD pinacula, even on the same individual, it may be best to accept the idea that the series of strong and weakly pigmented specimens belong to one species. I do not see the difference in the pigmentation of the extension of the prothoracic shield between the species mentioned by Capps (1967) and Allyson (1981b). More work is needed to characterize the variation in the pinacula of *Achyra* spp. In addition, the range of *A. similis* needs study to confirm its presence in Central America.

Asciodes gordialis Guenee

(Figs. 5, 57, 102-115)

Synonyms

Sylepta gordialis (Guenee)

Common Names

Saunders et al. (1983) did not list an entry for this species in their compilation of Central American pests. The common name bougainvillea leaf tier is proposed for *A. gordialis* since this pest did not appear to have an accepted common name.

Distribution

USA, Florida (Kimball, 1965); Tropical America, Puerto Rico, St. Croix, and the Virgin Islands (Schaus, 1940); Mexico, Panama, Bahamas, French Guiana, Brazil (Klima, 1939); El Salvador (Berry, 1959b); Venezuela (Amsel, 1956); Honduras.

The record of a pyralidae larva attacking *Bougainvillea* sp. in Guatemala by Bates (1932) likely refers to *A. gordialis*.

Hosts

Pisonia aculeata (Dyar, 1901); *Bougainvillea buttiana*, *Bougainvillea* sp.

Bougainvillea is the principal foodplant.

Material Examined

USA: Florida, Sanibel Island, 22-X-1972, em. 30-X-1972, D. Habeck, reared ex larva on Bougainvillea sp., genitalia slide #1 FSCA (1 adult with pupal skin); Fort Myers, 1-X-1979, G. Frantz, reared ex larva on Pisonia sp., det. Kimball (1 adult and pupal skin); Homestead, 14-X-1978, B. Gregory, Bougainvillea sp. (1 larva); Sanford, 9-XI-1980, A. Wilkining, Bougainvillea sp. (5 larvae); HONDURAS: EAP, 1-VIII-1981, em. 17-IX-1981, reared ex larva on Bougainvillea sp., larval #283, mandible slides #184, 255, SPC (1 adult with pupal skin, 2 larvae); EAP, 21-X-1981, S. Passoa, Bougainvillea sp., mandible slide #281 SPC (3 larvae); Tegucigalpa, 7-X-1981, em. 28-X-1981, S. Passoa, reared ex larva on Bougainvillia buttiana, larval #297, genitalia slide #243, mandible slide #256, 337 SPC (1 adult, 3 pupae, 3 larvae).

Larval Diagnosis

SV group of A1 bisetose, crochets in a mesal penellipse, SD1 pinacula of A1-8 lack a posterior notch and those of A2 and A7 are reduced, mandible with five large teeth and three smaller ones if not worn, and general characteristics of the subfamily Pyraustinae.

The SD pinaculum of the mesothorax and the SD1 pinacula of A7 and A8 are frequently pigmented which might be confused with the sclerotized rings found in the Pyraliformes. A. gordialis is the only species in this study found on Bougainvillea.

Larval Description

General. Living specimens light green, mostly due to the plant material showing through the transparent cuticle; head light tan, mottled with brown tonofibrillary platelets; pinacula of the body pale, concolorous, and difficult to see; SD pinaculum of the mesothorax and that of A7 and A8 frequently pigmented in the form of a dot or ring especially in the early instars.

The larva was described by Dyar (1901) and (Allyson, 1984).

Skin texture weakly granulate under high magnification; crochets in a triordinal penellipse; mature larva 25 mm long.

Head. Front extends about 3/4 the distance to the epicranial notch; Adf2 lies just above the apex of the front; Adf1 lies slightly above a horizontal line connecting the L setae; F1 in a horizontal line with A2; C1 close to C2; P1 about 3 times the length of P2; A2 dorsad of A1; A3 about two times the length of L1.

Six stemmata present, all equal in size except stemma 1 which is slightly larger than the rest; distance between stemmata 1 and 2 less than that between stemmata 2 and 3; stemmata 3, 4, and 5 evenly spaced by about 1/4 the diameter of each stemmata; a horizontal line drawn through stemma 6 passes between stemmata 4 and 5.

Labrum with M2 above M3, in a horizontal line with M1; L2 much longer than L1 or L3.

Mandible with 8 teeth, the first five larger than the last three, size of last three teeth variable, inner teeth usually absent although three teeth are sometimes present on the first molar ridge, two lateral mandibular setae present, the posterior one almost twice the length of the anterior one.

Hypopharyngeal complex with an elongate spinneret twice the length of the basal segment of the labial palps, two minute stipular setae present, proximomedial area with a series of fine spines dorsally, the proximolateral area bears a ridge of longer spines on each side of the midline.

Thorax. Prothoracic shield with the distance between XD2 and SD1 about 1/5 the distance between XD1 and XD2; D1 slightly more than half the length of D2; an elongate brown band or patch of spots is present posterodorsad of XD2; SD2 slightly posteroventrad of D1; L1 about 1.5 times as long as L2, prespiracular pinaculum extends ventrad of the spiracle; SV pinaculum large, its width equal to that of the prothoracic shield; V1 pinaculum of the prothorax larger in diameter than the V1 pinaculum on the mesothorax.

Mesothorax with D2 twice the length of D1; SD1 about three times as long as SD2, frequently the pinaculum is pigmented; L3 pinaculum circular, separated from the L1 and L2 pinaculum by about 1/2 the diameter of the L3 pinaculum; SV group unisetose and dorsad of the coxa; V1 posterior to the coxa and near the midline.

Abdomen. A1 with the D setae on a transversely elongate pinacula, D1 subequal to D2 in length; SD1 seta posterodorsad of the spiracle and twice the length of the D setae; SD2 absent; L2 anteroventrad of L1; L3 ventrad of D2; SV group bisetose; V1 pinaculum posteroventrad of the SV group.

A6 with the D setae in a horizontal line; SD1 as in A1; SD2 absent; L group as in A1; SV group trisetose; V1 seta on a band-like transverse pinaculum.

A8 with the D setae on roughly square pinacula; SD1 pinaculum oblong and frequently pigmented; L2 anteroventrad of L1; L3, SV1, and V1 in a vertical line.

A9 with D2 on the posterior edge of a large plate-like pinaculum; D2 and SD1 on the same pinaculum; SV1 and V1 posterioventrad of L1.

Anal shield with D1 dorsad of a horizontal line connecting the SD2 setae; SD1 twice the length of D2.

Pupal Diagnosis

Mesothoracic spiracle with a deep pit ventrad of the spiracular opening; maxillae extend past the caudal wing margin, spiracular opening on A2-7 sinken in a shallow pit; and general characteristics of the subfamily Pyraustinae.

A similar pit on the mesothoracic spiracle also occurs in other Pyraustinae, for example, Herpetogramma spp. and Desmia funeralis.

Pupal Description

General. Pupa with a shouldered appearance; colored reddish-brown; length about 12 mm.

Head. Vertex with two small setae; labrum triangular; labial palps elongate; maxillary palps rectangular; maxillae extend past the mesothoracic legs to almost the posterior edge of the sixth abdominal segment; pilifers present; postgenae obvious; antennae end with the mesothoracic legs at the caudal wing margin.

Thorax. Prothoracic femur exposed, equal to 1/2 the size of the mesothoracic legs; metathoracic legs reach the caudal wing margin; mesothoracic spiracle consists of two ridges each fringed with long setae, ventral to this is a round pit; skin texture of thorax weakly granulate.

Abdomen. Spiracles sunken, those of A2 and A3 with furrows; A5 and A6 with proleg scars ventrally; cremaster rounded with six setae at its apex and two setae arising from tubercles; texture of abdomen weakly granulate.

Biology

The biology has not been studied in Honduras. Larvae are leaf tiers on Bougainvillea leaves and flowers. This species is widely distributed throughout Tropical America and probably will be found wherever its host is present. The adult and larva were illustrated by Johnson and Lyon (1976) and by Maxwell (1979). The adult has been collected throughout the year, except in June, in Florida (Kimball, 1965).

Pest Status

A. gordialis is a serious pest of Bougainvillea in Florida (Maxwell, 1979), Guatemala (Bates, 1932), and Cuba (Bruner et al., 1975). It is a general, serious but sporadic pest in Honduras. Outbreaks in Cuba are also considered sporadic.

Azochis sp. [gripusalis (Walker) complex]

(Figs. 6, 116-135)

Synonyms

None in common use.

Common Names

Saunders et al. (1983) did not include a common name for this species. The name spotted fig borer for A. "gripusalis" would distinguish it from other insects (for example, Cerambycids) that attack figs but lack pinacula.

Distribution

Mexico, Guatemala, El Salvdor, Costa Rica, Panama, Ecuador, Brazil (Klima, 1939); Honduras (Passoa, 1983).

Hosts

Ficus carica (Ballou, 1934); wild and cultivated species of *Ficus* (Silva et al., 1968).

Material Examined

HONDURAS: Danli, 1-X-1956, A. Banegas, ex larva from figs, genitalia slides #356, 514 SPC, det. Capps (2 adult); COSTA RICA: San Jose, 3-XII-1981, A. King, fig branch, mandible slides #258, 259, 260 SPC (3 pupae, 5 larvae); BRAZIL: Sao Paulo, 26-XII-1931, no collector recorded, fig fruits and stems (4 larvae).

Larval Diagnosis

SV group on A1 trisetose, SD2 pinaculum on A1-8 equal to at least 1/2 the vertical diameter of the spiracle or greater; mandible with three teeth; and general characteristics of the subfamily Pyraustinae.

This is the only species included in this study that attacks figs. Central American specimens have two extra lateral pinacula without setae on the posterior margin of A1-7.

Larval Description

General. Preserved specimens have gold-colored pinacula on a cream colored body; head dark reddish-brown with faint tonofibrillary platelets.

Skin texture weakly granulate under high power; crochets in a triordinal mesal penellipse; mature larva approximately 25 mm long.

Head. Front extends 2/3 the distance to the epicranial notch; Adf2 slightly above the apex of the front; Adf2 lies about 3/5 the distance from the clypeus to the front; a horizontal line drawn through the F1 setae lies between A2 and A1; C1 close to C2; P1 about twice the length of P2; A2 about half the length of A1 or A3; a horizontal line connecting the L setae passes slightly above Adf2.

Six stemmata present, distance between stemmata 1 and 2 equal to that between stemmata 2 and 3; stemmata 3 and 4 closely spaced; stemmata 4 and 5 separated by almost twice the diameter of stemma 4; stemma 6 posterodorsad of stemma 5.

Labrum with M2 dorsad of M3, M1 anteroventrad of M2; L2 almost twice the length of L1 or L3.

Mandible with three teeth, the first two much longer than the third; a molar ridge present on the first two teeth; the anterior mandibular seta longer than the posterior one.

Hypopharyngeal complex with a blunt spinneret equal to about the length of the labial palps; dorsum covered with fine spines, those on the distal area the longest; two minute stipular setae present.

Thorax. Prothorax with the distance between XD1 and XD2 three times that between XD2 and SD1; SD2 ventrad of D1; D2 slightly longer than D1; prespiracular group extends below and behind the spiracle; L1 posteroventrad of L2; two SV setae present on the anterior 1/3 of an elongate pinaculum; V1 pinaculum of the prothorax twice the area of V1 on the mesothorax.

Mesothorax with D2 twice the length of D1; SD1 anteroventrad of SD2; L3 pinaculum twice the area of the L1 and L2 pinaculum; ventrad of L3 is an elongate extra pinacula without setae; SV group unisetose; ventrad of L3 is an elongate mesothoracic V1 pinaculum half the area of the V1 pinaculum of the prothorax.

Abdomen. A1 with the D setae on transversely elongate pinacula, D2 posteroventrad of D1; SD1 pinaculum large, about three times the diameter of the spiracle; SD2 pinaculum equal to the vertical diameter of the spiracle or slightly less; two extra lateral pinacula without setae present on the posterior margin; L2 anteroventrad of L1; L3 pinaculum horizontally elongate, longer than the pinaculum of L1 and L2; SV group of A1 trisetose; V1 on a circular pinaculum, ventrad of the SV group.

A6 with D2 posteroventrad of D1; SD1 pinaculum large, about four times the horizontal diameter of the spiracle; SD2 pinaculum about equal to the area enclosed by the spiracle or slightly greater; two lateral pinacula without setae present on the posterior margin; pinaculum of L1 and L2 slightly smaller than that of L3; SV group trisetose; V1 on an elongate band-like pinaculum.

A8 with the D2 pinaculum more elongate than D1; SD1 and SD2 pinacula usually fused together in a single curved pinaculum, rarely SD2 is only slightly fused; L2 anteroventrad of L1; L3 posterior of a vertical line drawn through the SV and V pinacula.

A9 with both D setae on a large pinaculum almost equal in width to the segment itself; SD1 much thinner than D1; SV1 dorsad of V1.

Anal shield with D1 close to the midline; SD1 closer to D2 than SD2.

Pupal Diagnosis

Cremaster broader than long; seven cremaster spines present; mesothoracic spiracle not adjacent to a pit; abdominal spiracles not elevated.

This is the only species in this study to attack figs.

Pupal Description

General. Pupa with a shouldered appearance; deep reddish-brown; length about 18 mm.

Head. Vertex with two setae; labrum triangular; labial palps very small; maxillary palps elongate; maxillae as long as the prothoracic legs; pilifers present; postgenae obvious; antennae end with the mesothoracic legs slightly past the caudal wing margin.

Thorax. Prothoracic femur exposed, about 1/2 the size of the prothoracic legs; mesothoracic legs end with the maxillae; mesothoracic spiracle in the form of a slightly raised tubercle, its posterior surface modified into a thickened rim; skin texture of thorax weakly granulate.

Abdomen. Spiracles tubular, those of A2 and A3 with furrows; proleg scars present on A6 and A6 ventrally; cremaster broadly truncate with seven curved cremaster spines arranged in a group of three setae flanked by a pair of setae on each side; the inner setae of this pair arising slightly more distal than the others; texture of abdomen weakly granulate.

Biology

References dealing with *A. gripusalis* were listed by Silva et al. (1968). A good summary of the biology of the Brazilian species or form (see comments section) was presented by Costa Lima (1950). Eggs were generally laid on the leaf petiole or stem axil in October and November. Newly emerged larvae first fed on the outer bark, later they bored downward into the middle of the stem. The galleries were lined with silk. Frass was usually expelled from the gallery. Pupation occurred mostly in the stem but the larvae sometimes left to pupate in other protected locations.

Moreira (1921) studied the biology of *A. gripusalis* in Brazil and superficially illustrated the larva, pupa, and adult. He found larvae most common in March and April with pupation occurring in June.

Garcia (1978, 1979) studied the morphology of the adult in detail.

Pest Status

A. gripusalis is a widespread, serious, but sporadic pest of figs. Costa Lima (1950) noted wilting leaves followed by the death of the stem and fruit in Brazil. Berry and Vaquero (1957) found many fig trees killed by this insect in El Salvador but his 1959a publication contradicted this by noting few trees were heavily attacked. Damaged branches were weakened and blown down in the wind.

Comments

Azochis gripusalis may actually represent a complex of species. The card file in the Comayagua collection contains the following note from Capps: "Walker's species gripusalis is the one referred to in the literature as a pest of figs in Central and South America. Several different species attacking figs have been erroneously identified as gripusalis and an examination of the type will be required to determine to which the Walker name correctly applies". Capps identified the Honduran specimen as Azochis sp. in the gripusalis complex based on the reared adult.

Larval characteristics support the possibility of a species complex. Specimens from Brazil lack the extra lateral pinacula of Central American larvae and, in addition, the pinacula are reduced and more circular. The D2 pinaculum is especially smaller.

The male genitalia of the Honduran specimen closely matches the illustration of Amsel (1956) based on adults collected in Venezuela. However, the figures of Garcia (1979) from Brazil area very different. In particular, the process on the inner face of the value is lacking in the Central America specimen. His drawing also does not show any spine-like projections on the transtilla.

Compacta hirtalis (Guenee)

(Figs. 7, 8, 136-150)

Synonyms

Polygrammodes hirtalis (Guenee)

Common Names

Saunders et al. (1983) listed the name sweet potato borer. This name is adequate but not distinctive. Compacta hirtalis ranges farther north than M. pusialis so the name northern sweet potato borer is appropriate. Polygrammodes elevata has a range similar to C. hirtalis but the unusual adult coloration of the former aids in forming a suitable common name.

Distribution

USA, Mexico, Guatemala, Honduras, Costa Rica, Panama, Brazil (Klima, 1939); Venezuela (Amsel, 1956).

Material Examined

HONDURAS: EAP, 17-XI-1981, em. 10-II-1982, S. Passoa, reared ex larva on sweet potato, genitalia slide #248 SPC. det. Ferguson (1 adult with pupal skin); EAP, 20-XI-1981, em. 2-II-1982, S. Passoa, reared ex larva on sweet potato, mandible slide #262 SPC, det. Ferguson (1 adult with cast pupal skin); EAP, 14-XI-1981, S. Passoa, parasitized larva on sweet potato, mandible slide #261 SPC (1 larval skin); COSTA RICA: Turrialba, 3-III-1976, no collector recorded, at lights (1 adult); Turrialba, 31-X-1981, A. King, sweet potato, mandible slide #208 SPC (1 larva).

Larval Diagnosis

An oblong pinaculum without setae present on the posterior margin of the mesothorax behind the D pinaculum; prespiracular group of the prothorax extends behind and below the spiracle; the front extends only about 1/2 the distance from the clypeus to the epicranial notch; A1-7 with a single pinaculum lacking setae posterior to the spiracle; and general characteristics of the subfamily Pyraustinae.

The single pinaculum on A1-7 posterior to the spiracle and the extra mesothoracic pinaculum will readily separate *C. hirtalis* from the other sweet potato borers in this study.

Larval Description

Live larvae are cream colored with bluish-gray pinacula and a tan head. Preserved larvae change color and become white with brown pinacula.

Skin texture spinose under high magnification; crochets in a biordinal mesal penellipse, mature larva approximately 20 mm long.

Head. Front extends half way to the epicranial notch; Adf2 near the apex of the front; Adf1 slightly above a horizontal line drawn through A3; F1 in a horizontal line with A1; C2 close to C1, almost directly below F1; P1 twice the length of P2; A2 and A3 in a horizontal line.

Six stemmata present; stemmata 1 slightly larger than stemmata 2; the distance between stemmata 1 and 2 half that of the distance between stemmata 2 and 3; stemmata 3 and 4 closely spaced; the distance between stemmata 4 and 5 greater than the distance between stemmata 3 and 4; stemmata 5 and 6 separated by almost the horizontal diameter of stemmata 5.

Labrum with M2 half the length of M1 or M3; L2 almost twice as long as L1 or L3.

Mandible with four teeth, a small inner tooth present on the first molar ridge; another molar ridge present on the third tooth; anterior mandibular seta longer than the posterior one.

Hypopharyngeal complex with the spinneret elongate and twice the length of the basal segment of the labial palps; distal area with a patch of minute spines laterally; proximolateral area strongly spined; two small stipular setae present.

Thorax. Prothoracic shield with XD1 longer than XD2 or SD1; D2 twice as long as D1; SD2 dorsad of the spiracle; L1 almost three times the length of L2; prespircular pinaculum extends below and behind the spiracle; SV1 three times the length of SV2, both on the anterior edge of an elongate pinaculum; V1 posterior to the coxa.

Mesothorax with D2 twice the length of D1; an oblong pinaculum without setae present posterior to the D pinaculum; SD pinaculum with a notch on the dorsal surface; L1 twice the length of L2; L3 and and SV1 in a vertical line; V1 farther from the midline than the V1 setae of the prothorax.

A1 with D2 posteroventrad of D1; SD1 pinaculum large, irregular in shape, and almost twice the diameter of the spiracle; SD2 on a small pinaculum separated from the spiracle by about the diameter of the SD2 pinaculum; a pinaculum without setae present posterior to the spiracle; L2 and L1 in a vertical line; L3 posterodorsad of the bisetose SV group (see comments section); SV and V setae in a vertical line.

A6 with the D2 pinaculum smaller in area than the D1 pinaculum; SD1 pinaculum extends slightly in front of the spiracle; SD2 anteroventrad of the spiracle; a cresent-shaped pinaculum without setae present posterior to the spiracle; L1 and L2 in a vertical line; L3 slightly anterior to a vertical line drawn through the D2 pinaculum; SV group trisetose; V1 on a squarish pinaculum.

A8 with D1 and D2 almost in a horizontal line, D2 on an elongate transverse pinaculum; SD1 and SD2 on a curved transversely elongate pinaculum anterior to the spiracle; L2 anteroventrad of L1; L3, SV1, and V1 almost form a vertical line.

A9 with both D2 setae on a large squarish pinaculum; SD1 posteroventrad of D1, both on the same pinaculum; L group unisetose; SV1 dorsad of V1.

Anal shield with D1 close to the midline; SD1, SD2, and D2 equally spaced from each other. Unfortunately, the SD1 setae are missing and only their setal bases remain.

Pupal Diagnosis

Maxillae short, not extending to the caudal wing margin; cremaster without a spine at each apical corner, at most only a tubercle is present; and general characteristics of the subfamily Pyraustinae.

The pupa of *P. elevata* is identical to that of *C. hirtalis* except that the former species has spines on the apical corners of the cremaster.

Pupal Description

General. Pupa with a shouldered appearance; deep reddish-brown; length about 10-14 mm.

Head. Vertex without setae; labrum semicircular; labial palps small; maxillary palps rectangular; maxillae short, reaching only half the distance to the caudal wing margin; pilifers large; postgenae obvious; antennae extend almost to the caudal wing margins.

Thorax. Prothoracic femur present but apparently missing from the cast pupal skins; prothoracic legs slightly less than half the length of the mesothoracic legs; metathoracic legs barely visable; mesothoracic spiracle a sclerotized slit, the posterior rim crenulate; skin texture of thorax weakly granulate.

Abdomen. Spiracles tubular, those of A2 and A3 with furrows; proleg scars present on A5 and A6 ventrally; cremaster short and broadly truncate, six cremaster spines arranged in two groups of three each; skin texture of the abdomen weakly granulate.

Biology

Not much is known about the biology of *C. hirtalis*. The larvae bore in the stems and tubers of sweet potato. King and Saunders (1984) remarked that stems are more frequently attacked than tubers. Adults have been collected on sweet potato foliage in Mexico which indicates they remain associated with their host (Martell, 1974). The larvae from Honduras pupated in a tough silk cocoon after an emergence hole in the sweet potato skin was cut and sealed.

Pest Status

King and Saunders (1984) considered the larvae of *C. hirtalis* to be uncommon in Central America. Blacklight surveys indicated that the adults are not common in Honduras either. However, the larvae are difficult to sample and could easily go undetected. *C. hirtalis* is best considered a rare, sporadic, and potential pest in Honduras.

Comments

Compacta hirtalis was placed in the genus Polygrammodes previously. The close relationship between the two genera is demonstrated by similar pupal morphology, especially with regard to the shortened maxillae found in both cases. The larvae, in contrast, are very different. Compacta hirtalis has a prespiracular group which extends below and behind the spiracle and an extra pinaculum without setae on the mesothorax. Both these features are absent in P. elevata. Azochis gripusalis shares a similar prespiracular group with C. hirtalis.

The condition of the SV group on A1 could not be determined with certainty. Only a single preserved larva was available and the SV group was bisetose on one side and trisetose on the other. An examination of the cast skins supported the bisetose condition as most common but setae often fall out of shed skins so more material is needed to be absolutely sure how many setae are present.

Diaphania hyalinata (Linnaeus)

(Figs. 9, 10, 164, 165, 167)

Synonyms

Margaronia hyalinata (Linn.), Eudioptis hyalinata (Linn.), and Glyphodes hyalinata (Linn.).

Common Names

The accepted Entomological Society of America common name is melonworm (Werner, 1982). A Spanish translation of this was used by Saunders et al. (1983) and Passoa (1983).

Distribution

Puerto Rico, widely distributed throughout Tropical America (Schaus, 1940); Mexico, Honduras (McGuire and Crandall, 1967); origin believed to be South America, known from Brazil, Haiti, Columbia, French Guiana, West Indies, Canada, and the U.S.A. (Smith, 1911); Costa Rica; Guatemala (Bates, 1932); Uruguay (Biezanko et al., 1957); Dominican Republic, Jamaica (Anonymous, 1972); Trinidad, Tobago, and Santa Lucia (Gooding, 1980); Cuba (Bruner et al., 1975).

Hosts

The favored host is summer squash but cucumbers, cantaloupes, muskmelon, gourds, watermelon, and pumpkins are also attacked (Smith, 1911); Clerodendrum fragrans (Ogilvie, 1928); beans (Anonymous, 1972); Ipomoea sp. (Martorell, 1976); Xanthosoma sp. (Martorell, 1976).

The records of D. hyalinata on beans (see comments section), Ipomoea, and Clerodendrum are all far outside the normal foodplant range.

Material Examined

USA: Florida, various localities, reared on Cucurbito pepo (20+ adults with cast pupal skins); HONDURAS: Comayagua, no date, S. Passoa, reared ex larva on summer squash, larva #136, mandible slide #79 SPC (1 adult with cast pupal skin, 3 larvae); Comayagua, 20-VIII-1979, S. Passoa, reared ex larva on summer squash (1 adult with cast pupal skin); Comayagua, 10-IX-1979, S. Passoa, ex larva on summer squash (1 adult with cast pupal skin); EAP, 8-VIII-1981, em. 28-VIII-1981, S. Passoa, reared ex larva on acorn squash, genitalia slide #18 FSCA, genitalia slide #251 SPC (7 adults with cast pupal skins); EAP, 27-X-1981, collector unknown, zucchini squash, det. Chaves (2 pupae); EAP, 14-VIII-1981, em. 2-IX-1981, S. Passoa, reared ex larva on acorn squash, larva #277 SPC (4 adults with cast pupal skins, 10 larvae); COSTA RICA: San Isidro, 24-VII-1977, A. King, light trap (1 adult).

The United Fruit Company (Fundacion Hondurena de Investigacion Agricola) contains a card (no. 367-V-1) in their file citing D. hyalinata (mixed with D. elegans) from lights in January at La Lima. The Comayagua collection (card no. 244) states the following: Diaphania hyalinata, La Ceiba, IX-2-1957, from melons, A. Banegas, commonly found on the North Coast attacking the melon family.

Larval Diagnosis

SV group of A1 bisetose; genal spot absent; mandible with an outer tooth; crochets of A3-6 in a mesal penellipse; no black spot present posterior to the XD2 seta on the prothorax; and general characteristics of the subfamily Pyraustinae.

The lack of a genal spot, presence of two subdorsal white bands in the living larvae, and the outer tooth on the mandible will separate D. hyalinata from D. nitidalis. So far no characters have been found to separate D. indica from D. hyalinata although the position of the substemmatal and stemmatal setae may differ. In D. indica SS2 and SS3 are spaced closer than SS3 and S3 to form an acute triangle when these three setae are connected with lines. In D. hyalinata the distance between SS2 and SS3 is subequal to that between SS3 and S3 which forms a right triangle when these setae are connected. More material is needed to evaluate the variability of this character but accurate identifications can still be made by rearing since the female genitalia and pupal morphology are very different.

Sometimes the mandibles of D. hyalinata show through the transparent head before molting to superficially give the impression of a genal spot which could cause the larva to be wrongly identified as D. *nitidalis*.

Larval Description

The larva of D. *hyalinata* is structurally very similar to the illustrated D. *nitidalis* except for the position of the L pinaculum on A8. In D. *hyalinata* L1 is separated from the spiracle by the vertical diameter of the spiracle. The larva was described and illustrated by Smith (1911) and Peterson (1962). The illustration of D. *indica* by Mathur and Singh (1963) will serve equally well for D. *hyalinata* in most features.

Pupal Diagnosis

Labrum located on the dorsal surface of the head; maxillae very long, arising posterior to a line that connects the anterior margins of the eyes; skin texture of the thorax and abdomen punctate; and general characteristics of the subfamily Pyraustinae.

The punctate texture of the thoracic and abdominal segments separates D. *hyalinata* and D. *indica* from D. *nitidalis*. The pilifers of D. *hyalinata* are much longer than broad which gives the head a long and slender appearance while in D. *indica* the pilifers are broader than long causing the head to appear stouter. This difference is often visible on cast skins.

Pupal Description

The pupa of D. *hyalinata* is very similar to that of the illustrated D. *nitidalis* except as noted above.

Biology

The biology of D. *hyalinata* was studied by Smith (1911) in North Carolina. The larva lives inside a sheet of silk and was primarily a foliage feeder although cucumber and cantaloupe fruit was also attacked.

Oviposition and egg morphology were similar to D. nitidalis. Feeding usually occurred on the underside of the leaf. Pupation was in a thin cocoon, often in a rolled leaf. When exposed to strong light the pupa usually darkened to brown or almost black. The life cycle of D. hyalinata was illustrated by Smith (1911).

Pest Status

Passoa (1983) considered D. hyalinata a serious and widespread pest of cucurbits in Honduras. Most of the damage from this pest occurs during the dry season (Margheritis and Rizzo, 1965). At the Panamerican Agriculture School, Honduras, D. hyalinata does not attack the growing tip of its host like D. nitidalis often does (K. Andrews, personal communication).

Comments

D. hyalinata is closely related and morphologically similar to D. indica, the exotic pumpkin caterpillar. New World localities for D. indica include Florida, Jamaica, and Santa Lucia (Gooding, 1980) but it is widespread throughout Africa, Asia, and Australia (Gentry, 1965). The preferred hosts are cucumbers and other cucurbits but beets, cotton, soybeans, eggplant, hibiscus, hollyhock, and Arabian jasmine are also attacked (Annoymous, 1982). The citation of D. hyalinata on beans (Anonymous, 1972), assuming the larva was a Diaphania probably refers to D. indica. Berry's (1959a) record of D. nitidalis on eggplant in El Salvador may have represented an introduction of D. indica to Central America. Eggplant is a known host of D. indica but not D. nitidalis.

The adults of D. indica and D. hyalinata were illustrated by Kimball (1965). In D. indica the brown band along the termen is wider at the tornus and the female genitalia has the bursa copulatrix spinose without two depressions. *D. hyalinata*, in contrast, has the brown band along the termen of equal width throughout and has the bursa copulatrix reticulated, not spinose. In addition there are two depressions present, each with a sclerotized lower lip. No males of *D. indica* from the Old World were available for examination. Accurate identification of *D. indica* will depend on the reared adults. Honduran entomologists will need to be aware of the possibility of collecting *D. indica* in Honduras. Another complicating factor is the presence of many similar looking white and brown *Diaphania* known from South America (Amsel, 1956) with unknown foodplants.

Diaphania nitidalis (Stoll)

(Figs. 11-13, 46, 51, 151-163, 169, 171, 172, 175)

Synonyms

Margaronia nitidalis (Stoll), *Eudioptis nitidalis* (Stoll), *Glyphodes nitidalis* (Stoll).

Common Names

The accepted Entomogical Society of America common name is pickleworm (Werner, 1982). Saunders et al. (1983) listed melonworm but this name applies only to *D. hyalinata* and is thus incorrect.

Distribution

United States, Tropical America, Puerto Rico (Schaus, 1940); Mexico, El Salvador, Nicaragua, Costa Rica, Panama (McGuire and Crandall, 1967); Guatemala (Bates, 1932); Honduras (Passoa, 1983); Surinam (Dinther, 1960); Colombia (Posada et al., 1976); Peru (Willie, 1952); Brazil (Costa Lima, 1950); Uruguay (Biezanko et al., 1957); Argentina (Hayward, 1960); Trinidad and Tobago (Gooding, 1980).

Hosts

Summer squash, cucumber, cantaloupe, musk melon, and some gourds (Lockwood, 1959); *Lagenaria siceraria*, *Melothria pendula* (Reid and Cuthbert, 1956); chayote, watermelon, and eggplant (McGuire and Crandall, 1967).

Passoa (1983) listed McGuire and Crandall's (1967) records of chayote, watermelon, and eggplant. The record for eggplant needs confirmation (see comments) but the United Fruit Company contains a card (number 350-24) citing "*Glyphodes*" *nitidlis* on chayote (= patastillo) in Costa Rica. Lockwood (1959) stated pumpkins were rarely attacked in California but Bates (1932), citing work done in the United States, recommended pumpkins as a trap crop.

Material Examined

USA: Illinois, Decatur, 18-VIII-1943, C. Compton, pumpkin (2 larvae); Florida, Gainesville, 12-X-1972, D. Habeck, *Cucumis melo* (1 adult); HONDURAS: Tegucigalpa, 30-X-1981, S. Passoa, at lights (1 adult); Comayagua, 24-VIII-1979, S. Passoa, reared ex larva on summer squash (1 adult with cast pupal skin); Comayagua, XI-1979, S. Passoa, reared from cucumber fruit (1 adult with cast pupal skin, 1 pupa); Comayagua, 20-VIII-1979, S. Passoa, reared ex larva on summer squash, larval #135, mandible slide #84 SPC (1 adult with cast pupal skin); Comayagua, 28-X-1979, S. Passoa, cucumber fruit (3 larvae); Comayagua, 30-XII-1980, S. Passoa, cucumber fruit (2 larvae); EAP, 11-IX-1981, em. 26-IX-1981, S. Passoa, reared ex larvae on cucumber, larva #288, mandible slides #265, 266, 267 SPC (3 adults with 3 cast pupal skins, 3 pupae, 10 larvae); EAP, 27-X-1981, Chaves, zucchini squash, det. Chaves (3 pupae); EAP, no date, host or collector, mandible slide #268 SPC (4 larvae); EAP, 20-X-1980, no collector recorded, cucumber (4 larvae); EAP, 17-II-1981, D. Habeck, squash flower, det. Habeck (21 larvae); PERU: Lima, 17-X-1968, A. Terrones, ex larva on squash, UA 821.68 (1 adult).

Larval Diagnosis

SV group of A1 bisetose; genal spot present; mandible without an outer tooth; crochets of A3-6 in a mesal penellipse; no black spot present posterior to the SD2 seta on the prothorax; and general characteristics of the subfamily Pyraustinae.

D. nitidalis may be separated from *D. hyalinata* and *D. indica* by the absence of an outer tooth on the mandible above the lateral setae and by the presence of a genal spot. Live larvae of *D. nitidalis* lack the white subdorsal longitudinal stripes found on *D. hyalinata*.

Larval Description

General. Early instar larvae are cream-colored with shiny black pinacula; later (after the fourth instar) the larvae turn green with a tan head; before pupation the dorsum turns pink. All instars have a black genal spot. The larva was illustrated by Peterson (1962) and Smith (1911).

Skin texture smooth; crochets in a biordinal, weakly triordinal, mesal penellipse; mature larva approximately 25 mm long.

Head. Front extends 3/4 the way to the epicranial notch; a line drawn through Adf2 passes slightly below the tip of the front; a line drawn through Adf1 passes between A3 and L1; F1 located about 1/3 the distance from the clypeus to the top of the front; C1 close to C2; P1 nearly three times the length of P2; A2 posterodorsad of A1; A3 almost equidistant between A2 and L1.

Six stemmata present; stemma 1 slightly larger than the others; stemma 2 closer to stemma 1 than stemma 3; stemmata 3, 4, and 5 closely spaced; stemma 6 posterodorsad of stemma 5.

Labrum with M2 almost horizontal to L1, M1 close to M3; L2 almost three times the length of L1 or L3.

Mandible with four teeth, the fourth one only 1/2 the size of the other three, the first molar ridge bears three blunt inner teeth, two lateral mandibular setae present, the posterior seta longer than the anterior one.

Hypopharyngeal complex with an elongate pointed spinneret; first segment of the labial palps equal to 3/4 the length of the spinneret; proximomedial area covered with fine spines; two minute stipular setae present.

Thorax. Prothoracic shield with D1 only 1/3 to 1/2 the length of D2; SD1 equidistant from SD2 and XD2; distance between XD2 and SD1 equal to 1/2 the distance between SD1 and XD2; L2 and L1 on a small pinaculum, slightly larger in area than the spiracle; SV group bisetose, on an oval pinaculum; V1 posterior to the coxa and near the midline.

Mesothorax with D2 almost three times the length of D1; SD1 about twice the length of SD2; L3 widely spaced from L1 and L2, the distance between the two pinacula equal to the diameter of the L3 pinaculum; SV group unisetose, close to the coxa, separated by less than the vertical diameter of the coxae; setae of T2 more widely spaced than the setae of T1.

Abdomen. A1 with D2 shorter than D1; SD1 slightly posterodorsad of the spiracle; SD2 on a small pinaculum separated from the spiracle by slightly less than the horizontal diameter of the spiracle; L2 anteroventrad of L1; L3 dorsad of a bisetose SV group; V1 ventrad of SV1.

A6 with D1 on an elongate pinaculum; D2 pinaculum circular; SD1 posterodorsad of the spiracle; SD2 separated from the spiracle by about the horizontal diameter of the spiracle; L group as in A1; SV group trisetose; V1 on an elongate pinaculum ventrad of the proleg.

A8 with the D2 seta twice as long as D1, a reversal from segments A1-7; SD1 anterodorsad of the spiracle; SD2 anterior to the spiracle; L2 anterodorsad of L1; L3 and SV1 pinacula equal in area, both in a vertical line with V1.

A9 with both D2 setae on a large square pinaculum; D1 much thinner and longer than SD1; L group unisetose; SV1 and V1 widely spaced when compared to A8, the two pinacula separated by a distance slightly greater than the diameter of the SV1 pinaculum.

Anal shield with SD1 closer to D2 than SD2, D1 and D2 setae equal in length.

Pupal Diagnosis

Labrum located on the dorsal surface of the head; maxillae arise posterior to a line that connects the anterior margin of the eyes; skin texture of the thorax and abdomen roughened; and general characteristics of the subfamily Pyraustinae.

D. nitidalis can be separated from both *D. hyalinata* and *D. indica* by the roughened texture of the thorax and abdomen since the latter two species have a punctate texture. The presence of a tubercle on the ventral surface of the pilifers separates *Palpita* from *Diaphania*.

Pupal Description

General. Pupa with a shouldered appearance; light tan to deep reddish-brown; length approximately 21 mm.

Head. Vertex with 2 setae; labrum semicircular and labial palps minute, both located on the dorsal surface of the head; pilifers large, covered by a patch of fine spines, these spines larger on the ventral margin; maxillary palps rectangular; maxillae very long, arising from behind the head, and usually extending to the middle of the sixth abdominal segment, sometimes extending to A8; postgenae obvious; antennae end slightly before the maxillae.

Thorax. Prothoracic femur equal to 3/4 the length of the prothoracic leg; mesothoracic legs end slightly anterior to the antenna; metathoracic legs hidden; mesothoracic spiracle a crenulate transverse slit; skin texture of thorax rugose, not punctate.

Abdomen. Spiracles tubular, those of A2 and A3 with furrows; proleg scars present on A5 and A6 ventrally; a sclerotized ridge present on A2-7 dorsally that extends laterally through the spiracle on A5-7; cremaster variable in shape, usually twice as long as broad, with 7 curved setae evenly spaced at the apex; skin texture rugose, not punctate.

Biology

The general biology of *D. nitidalis* is known but no detailed studies have been done in Honduras. The following life history was reported by Reid and Cuthbert (1956) based on field studies in South Carolina. The adults were rarely attracted to lights and were not common in cultivated fields during the daytime. Instead, they probably rested on vegetation surrounding the fields and entered the fields only at night to oviposit.

The eggs were laid one at a time or in small groups on flowers and leaf buds. Early instar larvae were found on the flowers or foliage but late instar larvae were borers in the flowers, stems, and fruits. The growing point may be destroyed and damaged fruit often rotted. Pupation was usually in the detritus under the plant.

The life cycle of *D. nitidalis* was illustrated by Canerday and Dilbeck (1968).

Pest Status

Passoa (1983) listed *D. nitidalis* as a serious, widespread pest that was capable of killing the host. This species prefers to bore into the fruit and stem so damage from *D. nitidalis* is more serious than from the primarily foliage feeding *D. hyalinata*. The pickleworm is widely distributed throughout Latin America and is a concern whenever curcubits are grown. Late season plantings and plants in flowering are the most susceptible to attack in the United States. *D. nitidalis* is a pest of chayote in Puerto Rico (Martorell, 1976).

Comments

The record of *D. nitidalis* on eggplant is interesting because Berry (1959a) noted that attacks were frequent. Other *Diaphania*, such as *D. indica*, are known to have a host range that includes cucurbits and solanaceous plants (Anonymous, 1982). Such a range could be possible for *D. nitidalis* but verification of any unusual hosts needs to be based on reared adults. The larva of *D. nitidalis* lacks an outer tooth on the mandible which is present on *D. indica*. Superficially the preserved larvae of the two species could be confused if the mandible is not examined. Another possible source of confusion could occur with *Neoleucinodes elegantalis*. Usually this species can be separated from other Pyraustinae due to the unisetose SV group on A1. However, some specimens have a bisetose SV group. In that case *D. nitidalis* may be separated from *N. elegantalis* because *D. nitidalis* has SD1 and D1 almost in a horizontal line on A9 and the setae subequal in length. In *N. elegantalis* SD1 is posteroventrad of D1 on A9 and C2 is much smaller than C1. *Neoleucinodes elegantalis* also has faint pinacula and a genal spot.

Negm (1960) compared the morphology of three *Diaphania* spp. His drawings are crude and the differences in color and length of the leg sheaths are not consistent enough to be useful aids in identificaiton.

Eulepte sp. (probably *concordalis* Hubner)

(Figs. 14-16, 176-177)

Synonyms

Mesocondyla concordalis (Hubner).

Common Names

There is no official common name for this species (Werner, 1982; Saunders et al., 1983) but the name roble leaf-webber was used in Puerto Rico (Wolcott, 1948).

Distribution

Tropical America and the Virgin Islands (Schaus, 1940); West Indies, South America (Hampson, 1898); Costa Rica (Ballou, 1934); Mexico, Guatemala, Panama, Haiti, Dominican Republic, Trinidad, Venezuela, Ecuador, and Brazil (Klima, 1939); Honduras.

Hosts

Crescentia cujete, *Enalagma latifolia*, *Spathodea campanulata*, *Tabebuia argentea*, *T. rigida*, and *T. heterophylla* (Martorell, 1976); *Tabebuia rosea* (Ballou, 1934).

The record of *E. concordalis* on *Psidium* in Brazil (Silva et al., 1968) needs confirmation.

Material Examined

HONDURAS: EAP, 12-X-1981, em. 30-X-1981, S. Passoa, ex larva on *Tabebuia rosea*, larva #301 SPC (2 adults with pupal skins, 1 pupa, 1 larva); EAP, X-198?, Velasquez, reared leaf tier (2 adults with broken pupal skins); EAP, 16-IX-1981, S. Passoa, at lights (1 adult); EAP, 21-IX-1981, S. Passoa, at lights (1 adult); EAP, 24-IX-1981, S. Passoa, at lights (1 adult); EAP, 27-IX-1980, no collector recorded, ornamental tree (9 larvae); EAP, 20-IX-1983, J. Dick, leaf roller on *Tabebuia rosea* (4 larvae); EAP, 3-IX-1981, S. Passoa, *Tabebuia rosea* (1 pupa, 10+ larvae).

Larval Diagnosis

SV group of A1 bisetose; prothoracic shield with a black spot slightly posteroventrad of the SD1 seta; SD1 pinaculum on A3-6 with a notch posteriorly; and general characteristics of the Pyraustinae.

Larval Description

The larva was partially described by Martorell (1945).

Pupal Diagnosis

A4-7 with spiracles elevated and general characteristics of the subfamily Pyraustinae.

Pupal Description

The pupa was partially described by Martorell (1945).

Biology

The biology of *E. concordalis* was studied in Puerto Rico (Wolcott, 1948). Damage was sometimes conspicuous and all known hosts were trees of the family Bignoniaceae. Some parasites were listed. The moths were common at lights in some areas.

In Honduras, *E.* sp. (probably *concordalis*) larvae rolled and tied leaves of *T. rosea* forming a conspicuous shelter on the trees. Moths were common at lights in September and a month later larvae were collected. The number of generations per year is unknown.

Pest Status

E. concordalis was not considered a pest in Honduras or Central America (Passoa, 1983; Saunders et al., 1983) although Martorell (1976) and Ballou (1934) reported damage in Puerto Rico and Costa Rica respectively. At present this species can be considered a potential pest.

Comments

The adult specimens collected in Honduras differ slightly in wing pattern from the illustration of *E. concordalis* by Wolcott (1948). The thorax of Honduran specimens have only the pronotum dark and concolorous with the costa of the forewing while the Puerto Rican specimens illustated by Wolcott (1948) have the entire thorax dark. The extent of intraspecific variation found in this species is unknown.

Geshna cannalis (Quaintance)

(Figs. 178-179)

Synonyms

None in common usage.

Common Names

The official Entomological Society of America common name is lesser canna leafroller (Werner, 1982).

Distribution

USA (Hodges et al., 1983); Cuba (Bruner et al., 1975); Honduras.

Hosts

Canna indica (Bruner et al., 1975); *Canna flaccida* (Kimball, 1965); *Zantedeschia* sp.

Material Examined

USA: Florida, Gainesville, 2-IV-1972, T. Neal, *Canna indica*, det. Neal (2 larvae, 2 pupae); Santa Rosa Co., Milton, 14-VIII-1958, R. Albritton, *Zantedeschia* sp., det. Dekle (3 adults, 1 pupa); HONDURAS: La Lima, VIII-1956, R. Bullock, leaf tier on Canna lillies, genitalia slide #331 SPC, United Fruit Company (Fundacion Hondurena de Investigation Agricola) card file #268-I (1 adult).

Larval Diagnosis

Crochets in a complete circle, uniordinal anteriorly and biordinal posteriorly; D and SD pinacula of the mesothorax enlarged and roughly shaped like an oval or square, each one with a row of tonofibrillary platelets.

Larval Description

The larva was partially described by Quaintance (1898) and more fully by Allyson (1984).

Pupal Diagnosis

Mesothoracic spiracle with a pit dorsally and ventrally; A10 with paired knob-like processes in ventral view.

Pupal Description

The pupa was superficially described and illustrated by Quaintance (1898).

Biology

The biology was studied by Quaintance (1898) in Florida. First instar larvae were leaf miners but changed to leaf folders as the mine became too small to contain the growing larva. Pupation occurred among the rolled leaves. The life cycle took about 35 days.

Pest Status

Serious damage was reported by Quaintance (1898) in Florida but *G. cannalis* was considered rare in Cuba (Bruner et al., 1975). The lesser canna leafroller is best considered a potential pest in Honduras.

Comments

A series of larvae and a single pupa were collected by D. Habeck in Costa Rica. The maxillae extends beyond the apex of the abdomen in this pupa unlike all the other pupae of *G. cannalis* examined from the United States where the maxillae never reaches the apex of the abdomen. Otherwise, the mesothoracic spiracle and mouthparts agree well with nearctic *G. cannalis*. The larvae are paler than normal and some lack the dark markings on the mesothoracic D and SD pinacula. These specimens are probably *G. cannalis* or a closely related species but the extremely long maxillae of the pupae, combined with slight larval differences, raise enough doubt that identification should be delayed until adults can be reared.

Herpetogramma bipunctalis (Fabricius)

(Figs. 17, 180-186)

Synonyms

Psara bipunctalis (Fabricius), *Pachyzancla bipunctalis* (Fabricius).

Common Names

The accepted Entomological Society of America common name of *H. bipunctalis* is southern beet webworm (Werner, 1982). Saunders et al.

(1983) listed only webworm which is not distinctive enough. McGuire and Crandall (1967) coined the name San Salvador webworm.

Distribution

Puerto Rico, widely distributed throughout the New World (Schaus, 1940); El Salvador (McGuire and Crandall, 1967); Honduras; Brazil (Costa Lima, 1950); widespread in the Lesser Antilles, Greater Antilles (Fennah, 1947).

Hosts

Beets and many other crops (McGuire and Crandall, 1967); Amaranthus, Acyryanthes aspera (=indica), Borreria ocimoides, eggplant, and swiss chard (Schaus, 1940); carrots, sword beans (Fennah, 1947); pepper (Wolcott, 1948); water hyacinth (Center et al., 1982); alligator weed; Portulaca sp., Amaranthus hybridus.

Material Examined

USA: Florida, Lee County, 13-X-1980, em. 17-21-X-1980, D. Doggett, reared ex larva on alligator weed (2 adults, 1 larva); Florida, Palma Sola, 2-XI-1972, em. 13-XI-1972, D. Habeck, reared ex larva on Portulaca sp. (2 adults with cast pupal skins); Florida, Newnan's Lake, 2-X-1972, D. Habeck, reared ex larvae on water hyacinth (3 adults with cast pupal skins); Florida, Gainesville, 30-VIII-1982, em. 15-IX-1982, R. Sailer, reared ex larva on Amaranthus sp. (1 adult); HONDURAS: Linaca, 19-VII-1983, S. Passoa, Amaranthus sp. (2 larvae); EAP, 8-IV-1981, Cueva-Diaz, beets (3 pupae, 2 larvae); EAP, 18-VIII-1981, em. 30-VIII-1981, S. Passoa, reared ex larva from beets, genitalia slide #324 SPC, det. Habeck (5 adults with cast pupal skins); EAP, no date recorded, reared ex larva on Amaranthus sp., larva #253 SPC (2 adults); EAP, 19-VIII-1981, em. 3-IX-1981, S. Passoa, reared ex larva on beets, mandible slide #274, larva

#278 SPC (3 adults with cast pupal skins, 4 pupae. 6 larvae); EAP, 18-IX-1981, em. 1-X-1981, S. Passoa, reared ex larva on Amaranthus hybridus, larva # 293 SPC (1 adult); EAP, 18-IX-1981, em. 28-IX-1981, S. Passoa, ex larva on beets (1 adult); EAP, 31-VIII-1981, S. Passoa, Amaranthus sp., larva #284 SPC (1 larva); EAP, 28-X-1981, S. Passoa, Amaranthus sp. (1 larva).

Larval Diagnosis

D and SD pinacula of mesothorax fused; black shading of prothoracic shield includes the D2 seta; prespiracular pinaculum of the prothorax surrounds the spiracle; SV group of A1 trisetose; and general characteristics of the subfamily Pyraustinae.

Larval Description

The larva was described and illustrated by Peterson (1962), Capps (1963), and Allyson (1984).

Pupal Diagnosis

Mesothoracic spiracle with a pit ventral to the spiracle; cremaster twice as long as wide, with eight cremaster spines, and no slit ventrally; and general characteristics of the subfamily Pyraustinae.

The pupa of H. bipunctalis is similar to that of H. phaeopteralis except that the cremaster lacks a ventral slit.

Pupal Description

A lateral view of the pupa and cremaster was reproduced by Wolcott (1948).

Biology

The biology was studied by Fennah (1947) in the Lesser Antilles. Eggs were laid on the underside of the leaf. The larvae were leaf feeders and hid inside a rolled leaf or within two leaves tied together. The pupa was usually found inside the larval shelter.

In Honduras, *H. bipunctalis* formed a nest composed of frass and silk at the terminal bud. Larvae were attacked by various parasites such as *Brachymeria* sp., *Spilochalchis* sp., *Eiphosoma* sp., and *Coccygonimum* sp.

The life cycle of *H. bipunctalis* was illustrated by Wolcott (1948) and the eggs were photographed by Peterson (1963).

Pest Status

Passoa (1983) considered *H. bipunctalis* a common insect in Honduras that causes sporadic but serious damage. Fennah (1947) listed the southern beet webworm as a major pest of beets. Similar attacks on beets were mentioned by Costa Lima (1950) in Brazil.

Amaranthus, a frequent host of *H. bipunctalis*, is cultivated in parts of Mexico (Marx, 1977) and rarely in Honduras as a pot herb (Williams, 1981). The genus was used by the Aztecs as a source of high-protein grain and has potential as a protein source even today (Marx, 1977). If this crop ever becomes widely utilized in Honduras then *H. bipunctalis* will likely be a major pest.

Herpetogramma phaeopteralis (Guenee)

(Figs. 187-189)

Synonyms

Pachyzancla phaeopteralis (Guenee), *Psara phaeopteralis* (Guenee).

Common Names

The accepted Entomological Society of America common name for this insect is tropical sod webworm (Werner, 1982).

Distribution

Puerto Rico, tropical zones of the world (Schaus, 1940); common throughout Florida, wide tropical distribution (Kerr, 1955); Asia, Neotropical and Ethiopian regions (Hampson, 1896); Costa Rica (McGuire and Crandall, 1967); Honduras.

Hosts

Bermuda grass, Saint Augustine grass, centipede grass, carpet grass, Zoysia sp. (Kerr, 1955); rice, grasses (King and Saunders, 1984).

The records of H. phaeopteralis on Gomphrena globosa (Amaranthaceae) by Wolcott (1948) and on beans by Gooding (1980) both need confirmation. Martorell (1976) noted that H. phaeopteralis was almost always associated with Saint Augustine grass in Puerto Rico.

Material Examined

USA: Mississippi, Gulfport, 6-IX-1957, no collector recorded, lawn grass, det Capps (4 larvae, 3 pupae); Florida, Gainesville, 30-IX-1973, em. 1-6-X-1973, F. Mead, reared ex larva on St. Augustine grass, A-1170 DHC, mandible slide #16, genitalia slide #22 FSCA (4 adults with 4 cast pupal skins); Gainesville, 26-XI-1982, S. Passoa, at lights (1 adult); Gainesville, 10-XII-1982, S. Passoa, at lights (1 adult); Fort Lauderdale, 19-IX-1983, ex ova on grass as test, C. L. Tan, mandible slide #275 SPC (1 pupa); Palatka, 10-I-1946, no collector or host recorded (1 larvae, 1 pupa); BELIZE: Cayo District, central farm, 23-V-1968, no collector recorded, at lights (1 adult); HONDURAS: EAP, 31-VII-1983, S. Passoa, under mulch (1 cast pupal skin); COSTA RICA: Turrialba, em. 15-VII-1981, A. King, ex larvae on rice, genitalia slide #255 SPC (1 adult).

Larval Diagnosis

D and SD pinacula of the mesothorax fused; prothoracic shield mottled and without shading; prespiracular group of the prothorax does not surround the spiracle; SV group of A1 trisetose; and general characteristics of the subfamily Pyraustinae.

A small percentage of early instar larvae may not show a fused SD and D pinacula on the mesothorax.

Larval Description

The larva of *H. phaeopteralis* was described by Allyson (1984) and Tan (1984). Maxwell (1979) presented a photograph of the larva, damage, and adult.

Pupal Diagnosis

Mesothoracic spiracle with a ventral pit; cremaster usually tapering to a point, almost as long as wide, with a median groove ventrally; and general characteristics of the subfamily Pyraustinae.

The pupa is very similar to *H. bipunctalis* except for small differences in the cremaster.

Pupal Description

See section on *H. bipunctalis*.

Biology

The biology was studied by Kerr (1955) in Florida. The eggs were usually laid in clusters. Damage appeared to start near the borders of the field. Larval feeding caused the lawn to have a ragged appearance. Concentrations of larvae sometimes caused brown and yellow spots on the lawn. The pupae were found on the soil surface or in a flimsy coccoon of silk and grass fragments. Toads, birds, and lizards are all natural enemies of the larvae in Puerto Rico (Wolcott, 1948). Maxwell (1979) noted that scouting should be done in early morning when the presence of dew droplets on the larval silk webs makes them highly visible.

Pest Status

Saunders et al. (1983) listed H. phaeopteralis as a pest in Central America. King and Saunders (1984) considered the tropical sod webworm to be a minor pest of rice. Wolcott (1948) recorded outbreaks on lawns in Puerto Rico as did Kerr (1955) in Florida. In Honduras, H. phaeopteralis has never been reported to cause damage to agricultural crops but no published literature exists on insects associated with soil or lawns.

Comments

Herpetogramma licarsisalis also has a median groove on the ventral surface of the pupa like H. phaeopteralis.

Hymenia perspectalis (Hubner)
(Figs. 190-195)

Synonyms

Zinckenia perspectalis (Hubner).

Common Names

The accepted Entomological Society of America common name is spotted beet webworm (Werner, 1982).

Distribution

Puerto Rico, Virgin Islands, almost universally distributed (Schaus, 1940); Nearctic, Neotropical, Ethiopian, and Australian regions (Hampson, 1898); Brazil (Costa Lima, 1950); Mexico, Guatemala, Honduras, Costa Rica, Panama, Colombia, Venezuela, Ecuador, Bahamas, Haiti, Dominican Republic, Jamaica, Trinidad (Klima, 1939).

Hosts

Eclipta prostrata, Eleutheranthera ruderalis, Melanthera canescens, Synedrella nodiflora, Wedelia trilobata (Martorell, 1976); beets (Costa Lima, 1950); Amaranthus hybridus (Brown and Allen, 1974); Hamelia patens; Rivina humilis; Amaranthus australis, spinach.

The record of "Hymenia" sp. on beans by Gooding (1980) probably refers to Spoladea (=Hymenia) recurvalis.

Material Examined

USA: Florida, Gainesville, 17-V-1982, S. Passoa, at lights, parent of larva #371 SPC (1 adult, larvae died upon hatching); Gainesville, 23-VIII-1973, em. 10-IX-1973, D. Habeck, reared ex larva on Amaranthus australis, mandible slide #37 FSCA (1 adult); Alachua Co., 6-X-1976, em. 30-31-X-1976, D. Habeck, K. Regas, P. Perun, reared ex larva on A. australis, A-2091-L DHC, mandible slide #38 FSCA (2 adults with cast pupal skins); Goulds, 20-III-1945, no collector recorded, spinach, mandible slide #40 FSCA (1 larva); Gainesville, 24-VIII-1981 (1 larva).

Larval Diagnosis

Lateral margins of the prothoracic shield black; D and SD pinacula of the mesothorax separate; prespircular group of the prothorax not extending behind the spiracle to fuse with the prothoracic shield; SV group of A1 trisetose; and general charcteristics of the subfamily Pyraustinae.

The larvae of H. perspectalis can be confused with H. bipunctalis, S. recurvalis, A. bifidalis, or P. periusalis. Mixed series of one or more species of the former three can occur on the same host so a careful examination of each individual is often necessary.

Larval Description

The chaetotaxy of the mature larvae was illustrated by Forbes (1923).

Pupal Diagnosis

Dorsal surface of the cremaster with 2 spines that have a hook at their base; spiracle of A4 subequal in diameter to the spiracle of A5, the former not in a pit.

The pupa is similar to *Spoladea recurvalis* except for differences in the spiracle of A4.

Pupal Description

See section on *S. recurvalis*.

Biology

Excluding Brazil, *H. perspectalis* has received little attention in the Neotropical region. Larvae are common on various genera of weeds, especially on the north coast of Honduras (La Lima card file numbers 203-2, 203-14).

The eggs are probably laid on the host and the larvae web leaves together. Frass and leaf particles may be mixed with silk. *Amaranthus* spp. are frequently attacked in Florida. The pupation site is probably on the host.

Pest Status

H. perspectalis can be considered a widespread, potential pest. Neither Saunders et al. (1983) nor McGuire and Crandall (1967) considered the spotted beet webworm a pest in Central America. Larvae have never been collected from agricultural crops in Honduras. They seem to prefer native weeds over crops.

In spite of the above, *H. perspectalis* is a potential pest because the host range includes economically important plants.

Comments

H. perspectalis and *S. recurvalis* were once placed together in the genus *Zinckenia*. This close relationship is confirmed by the similar cremaster in the two species. Larval morphology supports this separation, an especially noteworthy difference is in the SV group of A1.

The shape of the hooks on the cremaster spines and the long spinneret resemble one of the Evergestinae.

Lineodes integra (Zeller)

(Figs. 196-202)

Synonyms

None in common usage.

Common Names

Saunders et al. (1983) used the name budworm. This common name is already widely applied to noctuid moths of the genus *Heliothis* and thus is not appropriate. Peterson (1962) used nightshade leaf tier which is more descriptive.

Distribution

USA (Kimball, 1965); Brazil (Costa Lima, 1950); Honduras.

McGuire and Crandall (1967) recorded a *Lineodes* sp. from Nicaragua.

Hosts

Plants of the family Solanaceae, tomato, eggplant, potato, pepper, and the nightshade (Compton, 1937); *Solanum incarceratum* (Silva et al., 1968); *Solanum torvum*.

Material Examined

USA: Florida, Gainesville, 2-X-1980, D. Habeck, tomato, A-2708a DHC (10 larvae, 4 pupae); various localities from California, Texas, and Florida (10+ adults); HONDURAS: Comayagua, 5-X-1979, S. Passoa, reared ex larva on *Solanum torvum*, mandible slide #88 SPC (1 adult); Comayagua, 23-X-1980, em. 11-XI-1980, S. Passoa reared ex larva on tomato, mandible slide #132 SPC (1 adult).

Larval Diagnosis

SV group of A1 bisetose; crochets in a complete or nearly complete biordinal circle; prespiracular group of the prothorax on a nearly crescent-shaped pinaculum; prothoracic shield with a black spot posterior to seta XD1; and general characteristics of the subfamily Pyraustinae.

The larva of *L. hieroglyphalis* is similar to *L. integra* but lacks the black spot on the prothoracic shield.

Larval Description

The larva of *L. integra* was described by Peterson (1962), Okumura (1974), Dyar (1901), and Allyson (1984).

Pupal Diagnosis

Maxillae, antennae, and mesothoracic legs extend almost to the tip of the abdomen; prothoracic legs extend to the caudal wing margin; and general characteristics of the subfamily Pyraustinae.

The pupa of *L. integra* is easily recognized by the elongate appendages.

A single crumpled cast pupal skin of *L. hieroglyphalis* differs from *L. integra* in that the prothoracic legs extend past the caudal margin of the wings. The maxillae also appears to reach beyond the cremaster. A larger series of preserved pupae in needed to evaluate the above characters.

Pupal Description

General. Pupa with a shouldered appearance; golden-yellow to tan-brown; length about 11 mm. long.

Head. Vertex with two minute setae; labrum triangular; labial palps in the form of an inverted tear drop; pilifers pointed; maxillary palps rectangular; maxillae very long, reaching the middle of A8 or sometimes past A8 to the apex of the cremaster; postgenae faint; antenna ends near the maxillae.

Thorax. Prothoracic femur equal to 1/10 the length of the maxillae; prothoracic legs extend to the caudal wing margin; mesothoracic legs end slightly before the maxillae; metathoracic legs hidden; mesothoracic spiracle a thin oval slit; skin of thorax smooth.

Abdomen. Spiracles oval, those of A2 and A3 with furrows; proleg scars present on A5 and A6 ventrally; cremaster almost twice as long as broad, four curved spines arranged in two groups at the apex, below them are four additional spines evenly spaced; skin texture smooth.

Biology

The biology of *Lineodes integra* has not been studied in Central America. The following summary is based on the work of Compton (1937) in Illinois. Eggs were deposited on the leaves, sepals, and stems. Early instar larvae skeletonized the leaves. Leaves and fruit were both attacked but the larvae, unlike *Neoleucinodes*, never bored into the fruit. The mature larvae were leaf rollers. Pupation was always on the plant.

Pest Status

Compton (1937) considered L. integra to be a pest in the United States, especially when the fruit is attacked. The situation is probably similar in Florida where the larvae are also common on tomato. Both McGuire and Crandall (1967) as well as Saunders et al. (1983) included the genus in their lists of Central American pests. Costa Lima (1950) listed L. integra as a potato pest.

No outbreaks of L. integra have been recorded in Honduras. This species is a general, potential pest.

Comments

In addition to L. integra, a single specimen of L. hieroglyphalis was reared from peppers at Comayagua in December. Not enough information is available to determine which of the two is more important but the latter has never been mentioned as a pest. The early stages of the two species are similar but the adults are readily distinguished. Costa Lima (1950) illustrated adults of L. integra while Hampson (1899) illustrated L. hieroglyphalis.

Berry (1959b) recorded two species of Lineodes, near encystalis and near aztecalis, from El Salvador. One or both of these could be found on economic crops when the larvae become known.

Lygropia tripunctata (Fabricius)

(Figs. 18, 203-208)

Synonyms

Pilocrocis tripunctata (Fabricius), Acrospila tripunctata (Fabricius).

Common Names

The common name sweet potato leaf-folder has been used by some authors (Saunders et al., 1983; Jones, 1917) but the accepted Entomological Society of America common name is sweet potato leafroller (Werner, 1982).

Distribution

United States to Venezuela, West Indies, Puerto Rico (Schaus, 1940); Mexico, Costa Rica, Jamaica, Cuba, Grenada (Jones, 1917); Bahamas, Dominican Republic, Haiti, Guatemala, El Salvador, Colombia, Brazil (Klima, 1939); Honduras.

Hosts

Sweet potato, *Ipomoea* spp. (Jones, 1917); *Ipomoea alba* (Martorell, 1976).

Material Examined

USA: Florida, Gainesville, various localities and dates (22+ adults with 12 cast pupal skins); Gainesville, 29-IX-1975, D. Habeck, sweet potato, A-1608 (10+ larvae); HONDURAS: Comayagua, 8-IX-1981, em. 23-IX-1981, S. Passoa, reared ex larva on sweet potato, mandible slide #189, 279 SPC (1 adult with cast pupal skin; 1 larva); Department of El Paraiso, Linaca, 19-VI-1983, S. Passoa, *Ipomoea* sp. (1 larva); EAP, 11-VII-1980, A. Lopez, sweet potato, mandible slide #295 SPC (1 larva); EAP, 26-IX-1983, S. Passoa, sweet potato (2 larvae); EAP, 7-X-1981, S. Passoa, sweet potato, mandible slide #308 SPC (1 larva); EAP, 24-VIII-1984, S. Passoa, sweet potato (1 parasitized larva).

In the United Fruit Company's card file (card #203-24) there is a record of *L. tripunctata* larvae on *Ipomoea* sp. from La Lima in March, 1976.

Larval Diagnosis

SV group of A1 bisetose; SD pinaculum of the mesothorax bar-shaped, pigmented; genal spot and outer tooth on the mandible both absent; crochets in a mesal penellipse; and general characteristics of the subfamily Pyraustinae.

Early instar larvae have the SD pinaculum of the metathorax strongly pigmented in addition to the pigmented pinaculum of the mesothorax. The pigmented SD pinaculum of the mesothorax and the lack of a genal spot and an outer tooth on the mandible will distinguish *L. tripunctata* from *Diaphania* spp.

Larval Description

The larva was described and illustrated, somewhat diagramatically, by Jones (1917) and more recently by Allyson (1984).

Pupal Diagnosis

Spiracle of A4 elevated, spiracles of A2 and A3 at least 3/4 the diameter of the spiracle on A4; and general characteristics of the subfamily Pyraustinae.

The pupa of *L. tripunctata* is similar to *M. anormalis* except for the differences in spiracle size discussed under the latter species.

Pupal Description

The pupa was described and illustrated by Jones (1917).

Biology

The biology was studied by Fennah (1947) in the Lesser Antilles and Jones (1917) in the United States. Their results are similar. Oviposition occurred on the leaf surface. The larvae formed a shelter by rolling the leaf edge or by tying two leaves together. A life cycle normally took 25 days but in the United States the mature larva diapaused in the last generation to pass the winter. Pupation was usually within the larval shelter. Feeding damage by the larvae caused large irregular holes in the leaves.

Pest Status

L. tripunctata was a minor pest of sweet potato in the Lesser Antilles (Fennah, 1947) but attacks were serious in the United States (Jones, 1917). In Honduras, this insect is a widespread, minor, and sporadic pest of sweet potato.

Marasmia trapezalis (Guenee)

(Figs. 209-213)

Synonyms

None in common usage.

Common Names

Saunders et al. (1983) listed the common name leaf tier. This is not distinctive enough. Hill (1978) used the name maize webworm. This would be appropriate except that label data from Honduran specimens indicates the larvae is a leaf tier and not a webworm. A proper name would be corn leaf tier.

Distribution

Asia, Africa, Central America, and Peru (Hill, 1978); USA: Florida (Kimball, 1965); Belize, Haiti, Puerto Rico, Dominica, Peru, Venezuela, Guyana, Argentina (Breniere, 1979); Honduras.

Hosts

Corn is the main host. Other alternate hosts included millet, sorghum, sugarcane, rice, wheat, and wild grasses (Hill, 1978); Eriochloa polystachya, Panicum purpurascens (Allyson, 1984); Bracharia sp.

Material Examined

USA: Florida, Glades County, 12-XI-1979, em. 28-XI-1979, D. Habeck, reared ex larvae on *Bracharia* sp., A-2553, det Kimball (5 adults with cast pupal skins); PUERTO RICO: Vega Baja, 4-IV-1983, D. Green, rice (1 larva); HONDURAS: EAP, 23-IV-1982, B. Jones, reared ex leaf tier on corn (1 adult with cast pupal skin); EAP, 16-VI-1980, no collector recorded, corn leaves, mandible slide #264 SPC (1 larva).

Larval Diagnosis

D pinacula of the abdominal segments pigmented around their edges, the pigmented area thickest dorsally; D1 pinacula fused to form a middorsal line between the two pinacula; extra pinacula without setae present on the posterior margin of the mesothorax and metathorax; and general characteristics of the subfamily Pyraustinae.

The pigmentation and fusion of the D1 pinaculum is distinctive among the Pyaustinae included in this study. The few specimens of larvae examined more closely resemble the figures of Breniere (1979) with respect to the pigmentation than those of Allyson (1984).

Larval Description

The larva was described and illustrated by Fletcher (1914), Breniere (1979), and Allyson (1984).

Pupal Diagnosis

Spiracle of A4 elevated; front bilobed, each lobe with a seta; and general charcteristics of the subfamily Pyraustinae.

Pupal Description

The pupa was illustrated by Breniere (1979) but his figures do not agree with the reared material examined in this study. The drawings showed a shortened maxillae but on cast pupal skins the maxillae extends to the caudal wing margin. In addition, only six cremaster spines are illustrated while there are apparently seven spines visible in the pupal specimens. The number of setae on the cremaster can be difficult to determine when they are twisted around each other.

Biology

The biology was summerized by Hill (1978). Females oviposited on the young leaves. The larva tied the leaves together and pupated in the rolled leaf after feeding. The damage was illustrated by Fletcher (1914).

Pest Status

Hill (1978) considered outbreaks common in some seasons although damage usually was not serious. *Marasmia trapezalis* has been reported as a major pest of corn (Bottrell, 1979) but in Honduras it can be considered a rare pest.

Comments

An Old World species, *Marasmia latimarginalis*, has a very similar pupal morphology to *M. trapezalis* in that the front is bilobed and the maxillae extend to the caudal wing margin (Yoshiyasu, 1980).

Maruca testulalis (Geyer)

(Figs. 19, 214-219)

Synonyms

Crochiphora testulalis Geyer; *M. anboinalis* is also probably synonymous (Taylor, 1978).

Common Name

The official Entomological Society of America common name for *M. testulalis* is bean pod borer (Werner, 1982). Other common names used by

Saunders et al. (1983) included pod borer. Hill (1978) listed just the genus name, Maruca as the common name. Mung moth and spotted borer are other infrequent designations (Singh, 1977).

Distribution

Widespread in tropical and subtropical regions of the world (Hill, 1978); a country by country list can be found in Klima (1939). Central American localities included Guatemala, Honduras, Costa Rica, and Panama; El Salvador (Mancia and Cortes, 1975).

Although *M. testulalis* has been intercepted in Florida (Kimball, 1965), California (Klima, 1939), and Texas (Williamson, 1943) it is not considered part of the North American fauna (Hodges et al., 1983). A distribution map can be found in Hill (1978).

Hosts

Vigna, *Cajanus*, *Arachis*, *Dolichos*, *Phaseolus*, *Vicia*, and other papilionaceous plants (Taylor, 1978). Other recorded hosts are *Poinciana*, *Sesamum*, *Esclerona*, and *Hibiscus* (Taylor, 1978). Hill (1978) listed castor (bean?), tobacco, and rice as alternate foodplants but these records all probably need confirmation. A complete list of recorded hosts can be found in Taylor (1978).

Material Examined

HONDURAS: EAP, 22-X-1982, reared ex larva from bean pod (1 adult); EAP, 16-IX-1981, S. Passoa, at lights, genitalia slide #244 SPC (1 adult); EAP, 10-XII-1981, S. Passoa, bean pods, mandible slide #283 SPC (1 larvae); Dept. Cortes, La Trinidad, 13-V-1980, S. Passoa, at lights (1 adult); Comayagua, 10-XI-1981, S. Passoa, reared ex larva on bean pod, mandible slide #190, genitalia slide #240 SPC (1 adult with cast pupal skin); CUBA: Anoya Arena, 22-X-1925, G. Moznette, host unknown (1 pupa, 5 larvae); HAWAII: Oahu, 4-XII-1939, W. Cook, pole beans (14 larvae).

Larval Diagnosis

A pair of pinacula without setae present on the mesothorax and metathorax posterior to the D pinaculum and general characteristics of the subfamily Pyraustinae.

The larva of *Maruca* cannot be confused with other Pyralids in this survey but confusion can occur with *Cydia* (=*Laspereysia*) *fabivora* (=*leguminis*), a common pod feeding Tortricid. The larva illustrated by Ospina et al. (1979) is *Maruca testulalis* and not *Cydia*. The latter, according to MacKay's (1959) drawing, has round dorsal pinacula on the abdominal segments and no extra pinacula on the thorax. The figures by Ospina et al. (1979) and Schwartz et al. (1978) clearly showed extra pinacula on the thorax and elongate dorsal abdominal pinacula, both characteristic of *Maruca*. Tortricids have a trisetose prespiracular group, in the pyralids this setal group is bisetose. These family characteristics represent another important difference between the two species.

Larval Description

The larvae was described by Fletcher (1914), Capps (1963), and Usua (1977). Other illustrations of the larvae and damage were given by Ospina et al. (1979), Schwartz et al. (1978), Singh and Taylor (1978) and Bohlen (1973).

Pupal Diagnosis

Mesothoracic spiracle "U"-shaped; cremaster very elongate, four times longer than wide.

The cremaster is distinctive among Pyraustinae in this survey.

Pupal Description

The pupa was illustrated by Fletcher (1914).

Biology

The biology was reviewed by Taylor (1978) and Hill (1978). The eggs were laid on the flowers, buds, or pods of the host. All parts of the host were attacked but damage to the pods was more serious. The importance of *Maruca* as a pest was due, in part, to its early establishment on the crop. Pods in contact with the stem, leaves, or flowers were especially susceptible to attack (Ospina et al., 1979). The larvae were pod borers like *Etiella* and *Fundella* of the Phycitinae. Pupation usually occurs in the pod, rarely in the soil. The adult was illustrated by Hill (1978), Costa Lima (1950), Zimmerman (1958), and Schmid and Endicott (1968).

Pest Status

Taylor (1978) considered *M. testulalis* to be the key pest of some grain legumes in Africa. Hill (1978), on a worldwide basis, characterized this insect as a regular but minor pest of legumes throughout the tropics. King and Saunders (1984) ranked *M. testulalis* as a potentially serious pest that is usually of minor importance. Serious damage was never reported from Honduras where Passoa (1983) considered it a potential pest. Since the publication of the latter work a serious outbreak of *M. testulalis* was noted in the El Zamorano area on beans (Andrews, personal communciation).

Megastes sp. (near *pusialis* Snellen)

(Figs. 220-233)

Synonyms

None in common use.

Common Names

Saunders et al. (1983) did not record *M. pusialis* in their list of Central American pests. The common name of a related species, *M. grandalis*, was given as sweet potato moth. Unlike *C. hirtalis* and *P. elevata*, *M. pusialis* does not occur in the United States. To emphasize this difference a suitable common name could be southern sweet potato borer. The other species, *M. grandalis*, could be named giant sweet potato borer due to its larger size.

Distribution

Colombia, Guyana, Brazil (Klima, 1939); Costa Rica.

Hosts

Sweet potato is the only known host.

MATERIAL EXAMINED

COSTA RICA: Platanares, 10-VI-1977, A. King, at lights, genitalia slide #365 SPC (1 adult); Turrialba, 28-X-1981, emergance date unknown, A. King, reared ex larva on sweet potato, mandible slides #204, 309, 310, genitalia slide #241 SPC (1 adult with cast pupal skin, 1 unassociated cast pupal skin, 4 larvae); San Pedro, 30-III-1944, sweet potato, lot #44-16570 USNM coll. (1 larva); TRINIDAD: 28-III-1943, no collector recorded, ,sweet potato, lot #43-2614 USNM coll. (1 pupa).

Larval Diagnosis

Prespiracular group of the prothorax extends below and behind the spiracle, a pinaculum without setae present on the posterior portion of the mesothorax, three extra pinacula without setae present posterior to the spiracle on A3-6, and general characteristics of the subfamily Pyraustinae.

If the published figures of Cowland (1926) are correct, then *M. grandalis* differs from *M.* near *pusialis* in the shape of the prespiracular group, the number of extra pinacula, and in the frontal pores. The prespiracular group of *M. grandalis* was illustrated as a half moon, the posterior portion not extending past the middle of the spiracle. In *M.* near *pusialis* the posterior portion of the prespiracular group extends almost to the top of the spiracle. Only one extra pinaculum was illustrated for *M. grandalis* posterior to the spiracle on the abdominal segments but two or three are present in *M.* near *pusialis*. The frontal pores are in line with seta F1 according to Cowlands's (1926) figure. In *M.* near *pusialis* the F1 seta is above the frontal pores.

Larval Description

General. Preserved larvae with a reddish-brown head, black stemmatal area, and a black genal spot. Pinacula golden brown, body greyish-white.

Skin texture spinose under high power. Crochets in a triordinal mesal penellise. Mature larvae about 35 mm long.

Head. Front extends 2/3 the distance to the epicranial notch; Adf2 just above the apex of the front; Adf1 about 2/3 the distance from the clypeus to the apex; a line drawn through the F1 setae passes above the frontal pores; C2 directly below F1; C1 close to C2; P1 about twice the length of P2; A2 closer to A3 than A1; a line passing through L1 falls slightly above Adf1.

Six stemmata present; stemma 2 closer to stemma 1 than stemma 3; stemma 3 closer to stemma 4 than stemma 2; stemma 6 slightly larger than stemma 5.

Labrum with M2 dorsad of M3, M1 anteroventrad of M2; L2 almost twice the length of L1 or L2.

Mandible with four teeth, the second tooth slightly larger than the others, the first three teeth with molar ridges.

Hypopharangeal complex with the spinneret blunt, proximomedial area with a single row of spines, two minute stipular setae present.

Thorax. Prothoracic shield with SD1 twice the length of XD2; distance between SD1 and XD2 equal to 1/2 the distance between XD2 and XD1; D1 and SD2 both shorter than D2; prespiracular group extends below the spiracle to surround the ventral portion; L2 dorsad of L1; SV1 longer than SV2; V1 on an elongate pinaculum.

Mesothorax with D1 and D2 on a round pinaculum, an oval pinaculum without setae present posterior to these setae; SD setae on a rectangular pinaculum; L1 twice the length of L2; L3 setae short, on a round pinaculum, directly ventrad is a pinaculum without setae equal to 1/2 the size of the former pinaculum; SV1 posterior to a vertical line bisecting the coxa; one V1 seta present on a small oval pinaculum; posterior to the V1 seta is an elongate pinaculum without setae.

Abdomen. A1 with D1 longer than D2; SD1 and SD2 both on the same pinaculum, the pinaculum extending above and behind the spiracle to surround the dorsal half, SD1 dorsad to the spiracle, SD2 anterior; an oval pinaculum equal to about two times the vertical diameter of the spiracle present posterior to the spiracle; ventrad is a smaller pinaculum; L2 anteroventrad of L1; L3, SV1, and V1 in a vertical line, or SV1 slightly posterior of the other two.

A6 with the D setae as in A1; both SD1 and SD2 anterior to the spiracle; two pinacula without setae present posterior to the spiracle; one pinacula without setae posterior to L1 and L2; L3 above the coxa; SV group trisetose; V1 on an elongate pinaculum.

A8 with the D seta as in A1; SD1 anterior to the spiracle, SD2 anteroventrad of the spiracle; L1 and L2 on a pinaculum equal to twice the horizontal diameter of the spiracle; L3, SV1, and V1 in a vertical row; SV group usually unisetose, rarely bisetose.

A9 with D2 on a large pinculum; D1 and SD1 pinaculum about equal in size to the pinaculum of L1; SV1 dorsad of V1.

Anal shield with SD1 longer than D1, D2, or SD2.

Pupal Diagnosis

Maxillae short, not reaching the caudal wing margin; cremaster consists of five setae in a depression surrounded by a sclerotized lip; and general characteristics of the subfamily Pyraustinae.

Two cast skins of *M.* near *pusialis* from Costa Rica are morphologically identical to the illustrated specimen from Trinidad (probably *M. grandalis*). Unfortunately, the pupae from both localities are damaged so a comparison of distinguishing features is difficult. Specific identification of *Megastes* pupae should not be attempted at the present time.

Pupal Description

The following description was based in part on a *Megastes* pupa from Trinidad and Cowland's (1926) brief description of *M. grandalis*.

General. Pupa with a weak shouldered appearance; chestnut-brown, length about 18 mm (Cowland, 1926).

Head. Vertex without setae; labrum triangular; labial palps oval, minute; maxillary palps present (Cowland, 1926); maxillae extends 1/2 the distance to the caudal wing margin; pilifers present; postgenae obvious; antenna extends 7/8 the distance to the caudal wing margin.

Thorax. Prothoracic femur exposed, equal in length to 1/3 the maxillae; prothoracic legs end slightly before the maxillae; mesothoracic legs extend to just before the caudal wing margin; metathoracic legs exposed; mesothoracic spiracle with heavily sclerotized thick curved ridges, each one fringed with fine setae apically; skin texture of thorax smooth.

Abdomen. Spiracles raised, tubular, those of A2 and A3 with furrows; proleg scars present on A5 and A6 ventrally; cremaster consists of five slightly curved setae in an oval depression; skin texture of abdomen smooth.

Biology

The biology of *M. pusialis* in Central America has not been studied. The following is based on Cowland's (1926) study of *M. grandalis*. The female oviposited on the leaf undersurface or petiole. The first instar fed for a short time on the leaves but soon bored into the stem and tubers. Frass was ejected which left a clean tunnel in the stem. Plant growth was stunted, especially during the dry season, and leaves sometimes were shed. The accumulation of frass near the crown was a good field characteristic of pyralid borers in the tubers. The pupal case was surrounded by a tough silken cocoon. The whole life cycle took approximately two months.

Pest Status

No surveys of sweet potato pyralids were carried out in Honduras so it is impossible to say which species are present. Members of the genus *Megastes* occur in the West Indies and Brazil so Honduras could lie within the range of this pest. *Megastes* should be considered a potential pest in Honduras.

Cowland (1926) noted that *M. grandalis* is "undoubtedly responsible for the high price of sweet potatoes in Trinidad".

Comments

Megastes grandalis was also reported from Central America. Sommeijer (1974) gave the distribution as Trinidad, Venezuela, Costa Rica, Peru, French Guiana, and Brazil. Gooding (1980) added Santa Lucita, Trinidad and Tobago to the above localities.

Microthyris anormalis (Guenee)

(Figs. 234-238)

Synonyms

Sylepta helcitalis (Walker); *Asciodes anormalis* (Guenee).

Common Names

No common name has been recorded for this species. The name Caribbean sweet potato leafroller would emphasize the fact that *M. anormalis* rarely causes damage outside the Caribbean.

Distribution

USA (Hodges et al., 1983); South America and the West Indies (Schaus, 1940); Greater Antilles, Virgin Islands, Montserrat (Fennah, 1947); Bahamas, Jamaica, Honduras, Colombia, Brazil (Klima, 1939); Peru.

Hosts

Sweet potato and possibly other wild Convolvulaceae (Fennah, 1947); Tabernamontana coronaria (Silva et al., 1968).

Material Examined

PERU: Lima, 14-V-1969, V. Razuri, ex larva on sweet potato, genitalia slide #327 SPC, det. Ferguson (1 adult with cast pupal skin); HONDURAS: EAP, 24-VIII-1981, em. 13-IX-1981, S. Passoa, ex larva on sweet potato, genitalia slide #375, mandible slide #186 SPC, det. Ferguson (1 adult with cast pupal skin); USA: Florida, Key West, VIII-1945, no collector recorded, sweet potato, lot #45-8813 USNM coll., mandible #46 FSCA (2 larvae); Key West, 4-IV-1945, no collector recorded, sweet potato, lot #45-10189 USNM coll. (5 larvae); VIRGIN ISLANDS: Saint Thomas, 8-VI-1948, no collector recorded, lot #48-1118 USNM coll., det. Capps (5 larvae).

Larval Diagnosis

SV group on A1 trisetose; crochets in two triordinal bands, a membranous pad present on the mesal aspect; and general characteristics of the subfamily Pyraustinae.

Larval Description

A photograph of the larva and its damage was given by Alam (1976). The larva was partially described by Dyar (1901).

Pupal Diagnosis

Spiracle of A4 elevated; spiracles 2, 3, 5, 6, and 7 subequal in size and usually quite narrow, all half the size of spiracle 4; and general characteristics of the subfamily Pyraustinae.

The pupa of *M. anormalis* is quite similar to *L. tripunctata* except for differences in the spiracle size. Spiracles A2 and A3 are 3/4 as large as spiracle 4 and often rounded in L. tripunctata. This gives the pupa an appearance of three large anterior spiracles contrasted with three smaller posterior ones. In M. anormalis, the pupa appears to have only one large spiracle because the others are subequal in size. Usually all spiracles except A4 are narrow with their ends pointed.

Pupal Description

Based on the examination of two damaged cast pupal skins, the pupa of M. anormalis is very similar to L. tripunctata as illustrated by Jones (1917).

Biology

The biology was studied by Fennah (1947) and Alam (1976). The eggs were flat, pale yellow, and laid on the leaves. Early instars fed exposed but later they hid inside rolled leaves. The larvae were often clumped in their distribution. Damaged leaves were brownish with clear patches where the epidermis had been eaten away. Pupation was on the host.

Pest Status

Neither Saunders et al. (1983), McGuire and Crandall (1967), nor Passoa (1983) reported this insect as a pest in Central America despite the fact it occurs in Honduras. M. anormalis is a minor pest in the Lesser Antilles (Fennah, 1947) but has caused serious damage to sweet potato in the Virgin Islands (Wolcott, 1948).

Neoleucinodes elegantalis (Guenee)

(Figs. 259-263)

Synonyms

Leucinodes elegantalis Guenee.

Common Names

Saunders et al. (1983) used the name eggplant moth. No common name was listed by Werner (1982). The name tomato borer describes the major host and habits of this pest and thus is more appropriate.

Distribution

Cuba, Puerto Rico, Jamaica, Grenada, Trinidad, Mexico, Guatemala, Costa Rica, Panama, Ecuador, Venezuela, Colombia, Peru, French Guiana, Guyana, Brazil, Paraguay, Argentina (Capps, 1948); El Salvador (McGuire and Crandall, 1967).

Hosts

Tomato, eggplant, *Solanum sisymbriifolim*, and *Cyphomandra betacea* (Capps, 1948); pepper (Saunders et al, 1983); various *Solanum* spp. (Silva et al., 1968); *Solanum quitonse*.

Material Examined

VENEZUELA (via Orlando, Fla.): 14-XII-1981, C. Ramire, tomato fruit, mandible slide #17 FSCA (2 larvae); ECUADOR: 30-IV-1957, R. Ferrell and B. Sugarman, *Solanum quitonse*, det. Capps, mandible slide #44 FSCA (4 larvae).

Larval Diagnosis

SV group of A1 unisetose; and general characteristics of the subfamily Pyraustinae.

Capps (unpublished notes) stated that the SV group on A1 is normally bisetose but frequently only one seta is present. Most of the six larvae in this study showed a unisetose arrangement. Recent keys have also used the single seta on A1 to distinguish this taxon (Weisman, in press). When *N. elegantalis* has a bisetose condition then confusion could occur with *Diaphania* and *Lygropia*. *D. hyalinata* is readily separated from *N.*

elegantalis by the outer tooth on the mandible. According to figures by Capps (1948) the larva of N. elegantalis has the C2 seta much smaller than C1 and SD1 posteroventrad of D1 on A9. In D. nitidalis the C setae are subequal in length and the SD1 and D1 setae of A9 almost form a horizontal line. L. tripunctata has no genal spot and frequently a pigmented SD pinaculum is present on the mesothorax. In contrast, N. elegantalis always has a strong genal spot and never has a strongly pigmented SD pinaculum on the mesothorax.

The records for Diaphania (see comments section under that genus) on eggplant may refer to a N. elegantalis specimen with a bisetose SV group on A1.

Larval Description

Capps (1948) described and illustrated the larva of N. elegantalis.

Pupal Diagnosis

Maxillae and mesothoracic legs extend past the caudal wing margin; hood-like protuberances present above the spiracles on A2 and A3; and general characteristics of the subfamily Pyraustinae.

A similar pair of protuberances are present on Pyrausata tyralis. This species ranges from the USA south to Venezuela (Munroe, 1976). It differs in that neither the maxillae nor mesothoracic legs extend past the caudal margin of the wings.

Pupal Description

The pupa was described and illustrated by Capps (1948).

Biology.

The following is based on Capps (1948). Soon after hatching the larvae bored into the fruit of the host. The entrance hole was then sealed which made scouting for larvae difficult. While as many as 18 larvae per fruit have been found, three is normal. The pupa was collected among dried leaves or other debris. Costa Lima (1950) noted two generations per year in the south of Brazil.

Pest Status

Passoa (1983) did not report *N. elegantalis* as a pest in Honduras. Up to 80% of the tomato fruit were damaged in Brazil (Capps, 1948). Since *N. elegantalis* occurs in Central America it is best considered a potential pest.

Nomophila nearctica Munroe

(Figs. 239-243)

Synonyms

N. noctuella (in part, New World records only).

Common Names

N. noctuella has been called the celery webworm by Munroe (1973) and the lucerne moth by Bohart (1947).

Distribution

USA, Mexico, Guatemala, and Costa Rica (Munroe, 1973), based on *N. nearctica* .

Hosts

General feeder on low plants (Forbes, 1923); knotweed, polygonum, buckwheat, rotting tomatoes, *Dichondra* sp. (MacKay, 1972a); hosts mainly legumes, especially red clover, sweet clover, and alfalfa, also fed on blue grass, purslane, corn, wild mustard, cinquefoil, white clover, foxtail, and soybeans when clover was plowed under (Flint, 1922).

Material Examined

USA: North Carolina, Beaufort, 3-VIII-1966, D. Habeck, under rotting tomatoes (2 larvae); California, Riverside, 13-IX-1971, P. Morishita, Dichondra sp. (4 larvae).

Larval Diagnosis

SV group of A1 trisetose; SD and D pinacula not fused; SD1 pinaculum of A2 and A7 reduced; and general characteristics of the subfamily Pyraustinae.

Larval Description

N. nearctica larvae were described and illustrated by Bohart (1947), MacKay (1972a), and Allyson (1984).

Pupal Diagnosis

Maxillae extend to the caudal wing margins; cremaster with lateral depressions and six closely spaced curved setae; and general characteristics of the subfamily Pyraustiinae.

The lateral depressions on the cremaster are also found in the Crambinae but they lack the shouldered appearance characteristic of the Pyraustinae.

Pupal Description

The pupa was superficially described by Felt (1893). Figures of a very closely related species, N. noctuella were given by Khot'ko and Molchanova (1975).

Biology

The following is based on the Flint's (1922) observations in Illinois. The larvae made a shallow burrow in the ground. First instar larvae skeletonized the leaves but later the whole leaf, except the midrib, was consumed. Frequently the stem was cut off and parts of the host was carried into the burrow. This damage was similar to the Crambinae and some noctuids (cutworms, etc.). Munroe (1973) noted the adults were migratory.

The eggs of N. nearctica were illustrated by Peterson (1963), adult figures were presented by Bohart (1947) and Munroe (1973).

Pest Status

Flint (1922) recorded outbreaks of N. nearctica on clover and alfalfa. Munroe (1973) considered this insect an occasional pest. No outbreaks have been seen in Honduras and neither Saunders et al. (1983) nor Passoa (1983) listed this species. At present, N. nearctica is best considered a widespread, potential pest. It was one of the commonest moths on grassy fields in Bermuda (Ogilvie, 1928).

Comments

No Nomophila are recorded from Honduras. Other species of Nomophila occur throughout Latin America, mostly in South America, that are possible members of the Honduran fauna. N. neartica is recorded from both north and south of Honduras and therefore could be collected from Honduras in the future.

Omiodes indicata (Fabricius)

(Figs. 20, 244-258)

Synonyms

Hedylepta indicata (Fabricius); Lamprosema indicata (Fabricius).

Common Names

Saunders et al. (1983) used the name leaf tier. A more distinctive common name is bean leaf tier, modified from Fennah's (1947) usage.

Distribution

Africa, Asia (Gentry, 1965; Park et al., 1978); USA (Hodges et al., 1983); Colombia and other areas of South America (Schoonhoven, 1978); Surinam (Dinther, 1960); Antigua, Barbados, Belize, Grenada, Jamaica, Trinidad and Tobago (Buckmire, 1978); Puerto Rico (Ruppel and Idrobo, 1962); Brazil (Costa Lima, 1950); Cuba, Haiti, Virgin Islands, Mexico, Guatemala, Honduras, Panama, Venezuela, and Guyana (Klima, 1939); Peru.

Hosts

Bean, soybean and other legumes (Schoonhoven, 1978); lima bean (Dinther, 1960); forage legumes, peanut, pea (Gentry, 1965); *Vigna luteola*, *Meibomia tortuosa*, and *Lantana camara* (Schaus, 1940); *Calopogonium mucunoides* (Silva et al., 1968); *Desmodium tortuosum*, *Pueraria phaseoloides*, *Vigna unguiculata* (Martorell, 1976); *Dolichos* sp.

The records for corn (Sarmiento, 1981), *Lantana* (Schaus, 1940), and chrysanthemum (Kapoor et al., 1972) need confirmation. Wolcott (1948) stated that the adult reared in Puerto Rico from lantana was not *O. indicata*.

Material Examined

USA: Louisiana, Edgard, 20-X-1979, V. Brou, at lights (1 adult); PERU: Huaura, 2-VI-1967, J. Sarmiento, genitalia slide #367 SPC (1 adult); HONDURAS: Comayagua, 5-VI-1979, S. Passoa, at lights, genitalia slide #372 SPC (1 adult); EAP, 7-II-1984, R. Caballero, reared ex larva on beans (1 adult with cast pupal skin); EAP, 12-IX-1981, em. 23-IX-1981, S. Passoa, ex larva on soybeans, mandible slides #284, 286 SPC (2 adults with cast pupal skins); EAP, 10-X-1981, S. Passoa, ex larva on soybeans, genitalia slide #246 SPC (1 adult with cast pupal skin); EAP, 16-VIII-1981, S. Passoa, soybean leaf (1 pupa); EAP, 19-IX-1981, S. Passoa, soybean, mandible slide #335 SPC (1 larva); EAP, 12-IX-1981, S. Passoa, beans (1 larva); EAP, 17-IX-1981, S. Passoa, Dolichos sp., mandible slide #290 SPC (1 larva); Jutiapa (near Danli), 9-XI-1978, E. de Vasquez, beans, (1 larva); Jutiapa, 3-X-1978, M. Torres, beans, mandible slide #292 SPC (1 larva).

In the United Fruit Company's (Fundacion Hondurena de Investigacion Agricola) card file (#461-3) there is a record of O. indicata from soybeans. The larvae were collected in Guaruma (near La Lima?) during April, 1976.

Larval Diagnosis

Apex of the front does not extend above a horizontal line drawn through the P1 setae; mandible never with more than three teeth, frequently with only one tooth at the apex; and general characteristics of the subfamily Pyraustinae.

This species has been confused with Udea (see comments section under the latter species). The two may be distinguished by the mandible and front. The coloration of O. indicata, green with a tan head, is common to many microlepidoptera larvae so special care must be made to heed structural characters in the key.

Larval Description

General. Live larvae pale green with a tan head, genal spot present, stemmatal area black, pinacula pale, concolorous with the body, prothoracic shield with an oval black spot composed of tonofibrillary platelets joined by a black dash.

Preserved larvae frequently have the thoracic pinacula more strongly pigmented than the pinacula of the abdominal segments.

Skin texture smooth. Crochets in a triordinal mesal penellipse. Mature larva about 15 mm long.

The larva was partially illustrated by Allyson (1984).

Head. Apex of front does not extend above a horizontal line drawn through the P1 setae; coronal suture slightly longer than the front; Adf1 below the apex of the front; Adf2 widely separated from Adf1, the former setae fall just below a horizontal line drawn through the P2 setae; a line drawn through the F1 setae passes above the frontal pores, C2 twice as long as F1, close to C1; P1 twice the length of P2; setae A2 and L2 shorter in length than A1 or A3.

Six stemmata present; stemmata 1-3 evenly spaced, 3, 4 and 5 almost touch; stemma 6 posterior to stemma 5, both stemmata 1 and 6 larger than 2-5.

Labrum with M2 dorsad of M3, M1 anteroventad of M2; L2 three times the length of L1, twice the length of L3.

Mandible with three teeth, usually worn smooth to only a single apical tooth in the mature larva; first tooth with a curved molar ridge.

Hypopharyngeal complex with an elongate pointed spinneret; labial palps with the basal segment equal to 3/4 the length of the spinneret; proximomedial area spinose.

Thorax. Prothoracic shield with XD1, XD2, and SD1 in a vertical row, XD2 shorter than the other two setae; SD2 equidistant from D2 and SD1; a black spot formed by the fusion of two groups of tonofibrillary platelets present posterior to seta XD2; D2 twice the length of D1; L setae on a square pinaculum, the posterior edge extends below the spiracle; L2 about 3/4 the size of L1; the position of the SV pinaculum varies, sometimes it lies closer to the prespiracular group than the coxa, often the opposite is true; V1 posterior to the coxa, both setae on the same pinaculum.

Mesothorax. D2 twice the length of D1; SD pinaculum ventrad of the D pinaculum; SD1 twice the length of SD2; L3 variable, usually in a horizontal line with L1 but sometimes more dorsal than illustrated; V1 anteroventrad of L3; V1 on a small pinaculum posterior to the coxa.

Abdomen. A1 with D2 posteroventrad of D1, the pinaculum smaller and more narrow than D1; SD1 ventrad of D1; SD2 anterodorsad of the spiracle; distance between the spiracle and the pinaculum of L1 and L2 twice that of SD1 to the spiracle; SV group bisetose, the pinaculum twice the size of the L3 pinaculum; V1 ventrad of the SV pinaculum.

A6 with the setae arranged as in A1 except the SV group is trisetose, V1 seta is on an elongate curved pinaculum, and SD2 is farther from the spiracle.

A8 with D2 only very slightly posteroventrad of D1; SD1 anterodorsad of the spiracle; SD2 anterior of the spiracle; L2 anteroventrad of L1; L3, SV1, and V1 form a vertical line.

A9 with D2 posterodorsad of D1; SD1 and D1 on the same pinaculum, almost as wide as the D2 pinaculum; L3 seta almost equal in length to the D2 seta; SV1 pinaculum elongate, dorsad of V1.

Anal shield with SD1 mesad of the normal position, much closer to D2 than SD2, D1 seta half the length of SD1.

Pupal Diagnosis

Dorsal abdominal setae long; maxillae extend past the caudal wing margin; cremaster three times longer than broad; and general characteristics of the subfamily Pyraustinae.

Only the posterior portion of the mesothoracic spiracle lies below the suture dividing the prothorax and mesothorax which could cause confusion with Phycitinae pupae.

A single specimen of *Phostria martyralis* was reared from beans in Costa Rica. Its pupa is similar to *O. indicata* except for a spur which is present on the posterior margin of the abdominal spiracles. *O. indicata* lacks this spur.

Pupal Description

General. Pupa with a shouldered appearance; reddish-brown; length approximately 10 mm.

Head. Vertex with two small setae; labrum semicircular; labial palps elongate, minute; pilifers meeting at the meson, a small patch of fine bumps present at the base of each pilifer; maxillary palps rectangular; the maxillae extend to the middle of the fifth abdominal segment; postgenae obvious; antennae extend to the maxillae.

Thorax. Prothoracic femur equal to about 1/3 the length of the maxillae; prothoracic legs extend slightly past the middle of the maxillae; mesothoracic legs reach the maxillae and antennae; mesothoracic spiracle a thin slit, the posterior edge thickened and sclerotized; skin texture of thorax weakly granulate except for the metathorax dorsum which is lined with fine ridges.

Abdomen. Spiracles tubular, those of A2 and A3 with furrows; proleg scars present on A5 and A6 ventrally; dorsal abdominal setae at least twice as long as the vertical diameter of the spiracles, longest on A2-4 if not broken; cremaster three times longer than wide, with four closely spaced hooked setae at the apex, a pair of setae laterally; skin texture of abdomen weakly granulate laterally, each dorsum lined with fine ridges, the first one near the anterior end of each segment the thickest.

Biology

The biology in South America was briefly summarized by Dinther (1960) and Schoonhoven (1978). Larvae fed on the leaf parenchyma inside a chamber formed by tying two leaves together. The life cycle took 20 days. Parasitism by *Lycorina apicalis*, an ichnuemonid, reached 85% in some areas. Damage to legumes by *O. indicata* occurred in Puerto Rico in spite of heavy parasitism (Wolcott, 1948). This species is common all year round in Brazil (Costa Lima, 1950). Kapoor et al. (1972) studied the biology in India. The adult color is quite variable (Schaus, 1940) from orange to a light brown.

The larva and damage was illustrated in color by Schwartz et al. (1978) and Schwartz and Galvez (1980).

Pest Status

Although *O. indicata* is a pest of beans in Latin America (Schoonhoven, 1978) there is a record of a severe outbreak on soybeans (United Fruit card file #461-3) near La Lima. This species was considered a potential pest in Honduras (Passoa, 1983).

Palpita flegia (Cramer)

(Figs. 264-265)

Synonyms

Diaphania flegia (Cramer); *Margaronia flegia* (Cramer); *Paradosis flegia* (Cramber).

Common Names

P. flegia has been called the yellow oleander caterpillar (Saunders et al., 1983; Dekle, 1963).

Distribution

Florida, Mexico to South America, Puerto Rico and the West Indies (Dekle, 1963); Honduras, Panama (Klima, 1939); Belize.

The distribution of *P. flegia* by country was listed in Klima (1939).

Hosts

Thevetia peruviana (= *T. thevetia*), (Schaus, 1940; Martorell, 1976).

Material Examined

USA: Florida, Miami, 14-IV-1949, O. Calkins, "*Cerbera*" *thevetia*, det. Dekle (2 pupae, 2 larvae); Palm Bay, 11-IX-1981, F. Smith, *Thevetia peruviana*, det. Habeck (3 larvae); BELIZE: Cayo District, 26-II-1968, no collector recorded, at light (1 adult); HONDURAS: Tegucigalpa, 30-X-1981, S. Passoa, at lights (1 adult); EAP, 22-VIII-1984, S. Passoa, at lights, genitalia slide #387 SPC (1 adult).

Larval Diagnosis

SV group of A1 trisetose; stemmata 6 posterodorsad of stemmata 5.

The stemmatal arrangement is unusual among those Pyraustinae with a trisetose SV group.

Larval Description

The larva was illustrated by Dyar (1901), Dekle (1963) and Allyson (1984).

Pupal Diagnosis

Labrum located on the dorsal surface; pilifers with a large tubercle on the ventral surface; skin texture of thorax and abdomen weakly granulate, and general characeristics of the subfamily Pyraustinae.

The pupa of P. flegia is very similar to D. nitidalis but the latter species lacks the tubercle on the pilifer and has the skin texture roughened.

Agathodes designalis is a common Neotropical species with a similar pupa to P. flegia. The two may be distinguished by the scape. A. designalis has a flattened scape but in P. flegia a rounded tubercle is present.

The similar pupal morphology of Palpita, Diapphania, and Agathodes indicates that these genera are probably closely related.

Pupal Description

Since this species is of minor economic importance it does not jultify a description.

Biology

The biology of P. flegia has not been well studied. Larvae webbed the leaves of the host plant and fed on foliage in Puerto Rico (Wolcott, 1948). Young larvae are gregarious (Dyar, 1899).

Pest Status

P. flegia was listed as a pest in Central America by Saunders et al. (1983) and was considered of quarantine significance as a pest of oleander (Anonymous, 1982). No outbreaks were seen in Honduras and P. flegia is thus a potential pest of ornamentals.

Pilemia periusalis (Walker)

(Figs. 266-279)

Synonyms

Psara periusalis (Walker), Pachyzancla periusalis (Walker).

Common Names

Saunders et al. (1983) listed leaf roller and leaf tier but a more distinctive common name, tobacco leaf tier, was given by Wolcott (1948). Tomato leaf folder was used in Bermuda (Oligvie, 1928).

Distribution

United States and Tropical America, Puerto Rico (Schaus, 1940); Guyana, Dominican Republic (Anonymous, 1972); Panama (McGuire and Crandall, 1967); Brazil (Hampson, 1899); Costa Rica, Honduras.

Hosts

Eggplant, onion, tomato (McGuire and Crandall, 1967); red pepper, tobacco, *Solanum melongena*, *Solanum nodiflorum*, *Solanum torvum* (Martorell, 1976); potato, *Solanum nigrum* (Ogilvie, 1928).

The record for onion is suspect since all confirmed host plants are in the Solanaceae. Cotton (1916-1917) found *P. periusalis* abundant on *S. torvum* in Puerto Rico.

Material Examined

USA: Florida, Gainesville, 9-VIII-1941, no collector recorded, det. Heinrich (1 adult); Gainesville, 2-X-1980, em. 17-X-1980, D. Habeck, ex larva on tomato foliage, A-2708b DHC, det. Kimball, genitalia slide #2 FSCA (1 adult with cast pupal skin); Dade County, Castellow Hammock, 10-XI-1979, em. 17-XI-1979, D. Habeck, reared ex larva on Solanaceae, A-2546 DHC, det. Ferguson, larval mandible slide #45 FSCA (1 adult with cast pupal skin); PUERTO RICO: Cidra, 4-I-1984, D. Green and R. Santos, folding tobacco leaves, mandible slide #293 SPC (1 larva); COSTA RICA: Turrialba, em. 24-IX-1978, A. King, reared on tomato, genitalia slide #249 SPC (1 adult); Turrialba em. 15-IX-1981, A. King, reared on tomato (1 adult); HONDURAS: Comayagua, 10-XI-1980, em. 2-XII-1980, S. Passoa, reared ex larva on tomato, mandible slide #138 SPC (1 adult with cast pupal skin); Comayagua, 10-XI-1980, em. 1-XII-1980, S. Passoa, reared ex larva on tomato, mandible slide #139, genitalia slide #255 SPC (1 adult with cast pupal skin); Comayagua, 30-VI-1979, S. Passoa, tomato leaf roller, mandible slide #291 SPC (1 larva).

Larval Diagnosis

Prothoracic shield shaded with black almost to the D1 seta; SV group bisetose on A1; D1 pinaculum on the abdominal segments with a black spot anterodorsad to the D1 seta; and general characteristics of the subfamily Pyraustinae.

Larval Description

General. Fennah (1947) described the larva as pale green with two reddish-brown longitudinal stripes.

Preserved larvae are unmarked except for the dark prothoracic shield. The SD pinaculum of the abdominal segments, as well as the D and SD pinacula of the mesothorax and metathorax, are more strongly pigmented than the other pinacula.

Skin texture smooth, crochets in a triordinal mesal penellipse. Mature larvae about 20 mm long.

Head. Front reaches about 3/4 the distance to the epicranial notch; a horizontal line connecting the Adf2 setae passes through the P2 setae; Adf1 half the length of Adf2; F1 dorsad of the frontal pores; C2 dorsad of a horizontal line through C1; P2 about four times longer than P1; A2 dorsad of a diagonal line drawn through L1, A1, and A3.

Six stemmata present; distance between stemmata 1 and 2 subequal to distance between stemmata 2 and 3; stemmata 3, 4, and 5 closely spaced; stemma 6 posterior to stemmata 4 and 5.

Labrum with M2 anterodorsad of M1, the former slightly posterior to a vertical line drawn thorugh M3, L2 three times the length of L1, L3 posterior to a vertical line drawn through L2.

Mandible with four teeth, the second one largest, each tooth with a molar ridge, two inner teeth present, lateral mandibular setae near the condyle.

Hypopharyngeal complex with an elongate pointed spinneret about 1/3 longer than the basal segment of the labial palps, proximomedial area covered with fine spines, two minute stipular setae present.

Thorax. Prothorax with SD1 posterior to a vertical line drawn thorugh XD1 and XD2; SD2 posterior to a vertical line drawn thorugh D1; D2 seta twice the size of D1; prothoracic shield shaded with black except for the anterior edge and the region slightly below the D1 seta; pinaculum of the prespiracular group extends below the spiracle, L1 twice the length of L2; SV2 seta anterodorsad of SV1 and twice the length; V1 posterior to the coxa, close to the midline.

Mesothorax with the D setae on a rectangular pinaculum; the SD pinaculum of a similar shape but much wider; L1 longer than L2; position of L3 variable, sometimes posterodorsad of L1, but often in a horizontal line with L1; SV1 ventrad of L3; V1 seta further from the midline than V1 on the prothorax.

Abdomen. A1 with D2 on a round pinaculum, posteroventrad of D1; SD1 dorsad of the spiracle; L1 and L2 setae approximately equal in length; L3 slightly anterior to a vertical line drawn through D2; SV group of A1 bisetose; V1 ventrad of SV1.

A6 with D1 on a triangular pinaculum, a black tonofibrillary platelet present anterodorsad of the seta; D2 posteroventrad of D1, the pinaculum elongate; SD1 dorsad of the spiracle L1 longer than L2; L3 ventrad of D2; SV group trisetose; V1 ventrad of SV1.

A8 with the D pinacula as in A6; SD1 dorsad of the spiracle; L1 ventrad of the spiracle, L2 anteroventrad of L1; L3 slightly posterior to a vertical line drawn though the spiracle; position of SV1 and V1 variable, sometimes anterior to L3 but often ventrad to L3.

A9 with D2 on a large pinaculum; SD1 ventrad of D2; D1 anterodorsad of SD1; L1 on an elongate oblique pinaculum; SV1 anterior to a vertical line drawn through V1.

Anal shield with D1 dorsad of D2, SD1 equidistant from D2 and SD2; a horizontal line drawn through the D1 setae passes above SD2.

Pupal Diagnosis

Vertex bilobed; scape of antennae with a prominent tubercle; and general characteristics of the subfamily Pyraustinae.

This is the only species in this survey with a tubercle on the antenna scape.

Pupal Description

General. Pupa reddish-brown with a shouldered appearance; length approximately 10 mm.

Head. Vertex bilobed, each lobe with a long seta; labrum large, T-shaped; labial palps with the basal portion square, the distal portion long and thin; pilifers present; maxillary palps elongate; maxillae extend to the caudal wing margin; postgenae obvious; antennae extend almost to the maxillae.

Thorax. Prothoracic femur equal to about 1/5 the length of the maxillae; prothoracic legs short, about 2/3 as long as the maxillae; mesothoracic legs reach the caudal margin of the wings; mesothoracic spiracle with a large pit ventrally, the anterior rim much thicker than the posterior rim; skin texture of thorax weakly granulate except for fine ridges on the thorax.

Abdomen. Spiracles of A2 and A3 with furrows, spiracle of A4 in a slightly elevated pit; spiracles of A5 and A6 somewhat sunken; spiracle of A7 tubular; cremaster almost as long as wide with two curved setae dorsally near the midline and four setae ventrally that form a pair in the center with a widely spaced seta on each side; skin texture of the abdomen weakly granulate.

Biology

The biology was studied by Fennah (1947) in the Lesser Antilles and Cotton (1916-1917) in Puerto Rico. Young larvae were reported to be blotch leaf miners while later instars were leaf folders. Pupation took place on the host and the entire larval stage lasted from 18 to 27 days.

Wolcott (1948) noted a preference for tobacco grown under shade. Young tobacco leaves were attacked more frequently than older ones (Wolcott, 1955).

Pest Status

Fennah (1947) considered *P. periusalis* a serious pest on young eggplants. Damage to tobacco in the Dominican Republic occurred especially during the winter and spring months (Santoro, 1960).

Passoa (1983) did not record *P. periusalis* from Honduras although it is probably not uncommon on tomato. In spite of the serious damage done in the Caribbean region, *P. periusalis* is only a potential pest of solanaceous crops in Honduras.

Polygrammodes elevata (Fabricius)

(Figs. 280-294)

Synonyms

Astura elevalis (Guenee); *Sylepta elevata* (Fabricius).

Common Names

This pest has no common name. Saunders et al. (1983) used sweet potato moth and stem borer. Neither is distinctive enough. The adult coloration is quite unusual among pest species so an appropriate name would be spotted sweet potato moth.

Distribution

Cuba, Puerto Rico, South America (Schaus, 1940); USA (Hodges et al., 1983); Mexico (McGuire and Crandall, 1967); Guatemala, Costa Rica, Panama, Jamaica, Haiti (Klima, 1939); Brazil (Costa Lima, 1950); Honduras, Colombia, Trinidad.

Hosts

Sweet potato is the only known host.

Material Examined

TRINIDAD: 13-II-1960, no collector recorded, sweet potato, lot #60-5272, USNM coll. (9 larvae); COSTA RICA: Turrialba, 6-XI-1981, A King, sweet potato, mandible slides #312, 313 SPC (6 larvae, 1 pupa); COLUMIBA: Las Marias, 20-VIII-1977, R. W. Hutchings (1 adult); HONDURAS: EAP, 20-X-1981, S. Passoa, at lights (1 adult); EAP, 20-III-1983, R. Caballero, ex larva on sweet potato, genitalia slide #303 SPC (1 adult).

Larval Diagnosis

SV group of A1 bisetose; crochets in a triordinal circle; an extra pinaculum without setae present posterior to the prothoracic spiracle; SV group of the prothorax surrounds the anterior portion of the coxa; and general characteristics of the subfamily Pyraustinae.

Larval Description

Preserved larvae are bluish-green to cream with tan pinacula, the prothoracic shield is concolorous with the pinacula and marked with brown especially on the posterior margin, and a black genal spot is present on the reddish-brown head.

Skin texture spinose, each spine on a raised tubercle, crochets in a triordinal circle, mature larva about 26 mm long.

Six stemmata present and arranged in three groups of two stemmata each, stemmata 1 and 2 separated by about the horizontal diameter of stemma 2; stemmata 3 and 4 touching; distance between stemmata 5 and 6 much greater than the distance between the other two stemmatal pairs.

Labrum with all M setae subequal in length, L2 longer than L1, both dorsad of L3.

Mandible with four teeth, only the fourth tooth lacks a molar ridge; anterior mandibular seta longer than the posterior seta.

Hypopharyngeal complex with a short blunt spinneret; the third segment of the labial palps slightly longer than the first; anterior portion of the prementum square, the posterior portion long and thin; proximodorsal area and proximolateral area with fine spines.

Head. Front extends 3/4 the distance to the epicranial notch; Adf2 not in a horizontal line, the right seta is dorsad of the left; Adf1 lies in the center of the adfrontal area; F1 dorsad of the frontal pores; C2 much longer than C1; P1 anteroventrad of P2 and twice its length; A2 and L1 shorter than A1 or A3, A2 dorsad to a diagonal line connecting A1 and L1.

Thorax. Prothorax with XD1, XD2, and SD1 in a vertical row, SD1 slightly posteroventrad of XD2; SD2 dorsad of the spiracle; D2 twice the length of D1; L2 half as long as L1; SV1 and SV2 ventrad of L1 and L2; V1 close to the midline on an oval pinaculum.

Mesothorax with the SD pinaculum larger than the D pinaculum; all the L setae short, both L pinacula elongate and oval, L3 pinaculum wider and longer; SV1 ventrad of L3 and twice its length; V1 on a small round pinaculum behind the coxa.

Abdomen. A1 with D1 longer than D2, the latter on an elongate pinaculum; SD1 dorsad of the spiracle; SD2 on a small pinaculum anterodorsad to the spiracle; L2 usually anteroventrad of L1, sometimes ventrad of L1; L3 twice the length of L2; SV group bisetose; V1 ventrad of SV1.

A6 with the D1 pinaculum almost twice the size of D2; SD1 anterodorsad of the spiracle, the pinaculum may be more circular than shown; SD2 pinaculum anterior to the spiracle; L1 and L2 ventrad of the spiracle; SV group trisetose; V1 on a small circular pinaculum near the midline, posteroventrad of the coxa.

A8 with D1 longer than D2, the D2 pinaculum elongate and oval; SD and L setae anterior to the spiracle; the spiracle of A8 twice the size of A1-7; L3 anterior to a vertical line connecting SV1 and V1.

A9 with D2 on a plate-like pinaculum, posterior to a vertical line connecting the L, SV, and V setae; SD1 longer and thinner than D1; L group unisetose; SV1 on an elongate pinaculum; V1 as in A8.

Anal shield with the D1 setae short, 1/2 the length of the other setae, SD1 anterior to a line joining SD2 and D2.

Pupal Diagnosis

Maxillae short, not reaching the caudal margins of the wings; cremaster with a stout spine at each apical corner; and general characteristics of the subfamily Pyraustinae although the shouldered appearance is very slight.

Pupal Description

Head. Vertex with two short frontal setae, two ridges present; labrum semicircular; pilifers with both a punctate and spinose area; labial palps minute; postgenae obvious; maxillary palps rectangular; maxillae reach 1/2 the distance to the caudal margins of the wings.

Thorax. Prothoracic femur half the size of the maxillae; prothoracic legs short, not extending to the maxillae; mesothoracic legs extend to the caudal margin of the wings, their tips diverging; metathoracic legs exposed. mesothoracic spiracle consists of two thickened rims, the posterior portion with a smooth shiny area; skin texture of thorax weakly granulate, all segments with a middorsal crest.

Abdomen. Spiracles narrow and slit-like, those of A2 and A3 with furrows; proleg scars present on A5 and A6 ventrally; cremaster much wider than high, covered with deep grooves and two pointed curved spines at the tip, cremaster spines arranged in a line of six ventral setae and two widely spaced dorsal setae shorter than the others; a semicircle of setae also present below the cremaster ventrally; skin texture of the abdomen weakly granulate; A1-7 with a middorsal crest.

Biology

The biology was studied in Central America by King and Saunders (1984). The eggs were white, later turning red, and were laid on the stem near the ground or on the leaves. Larvae mined the stems which caused them to swell and sometimes rot. Later instars then bored into the stem and tuber. Attacked stems were often utilized for oviposition. Pupation was on the host in a tough cocoon.

Adults were collected at lights in May, August, and October (Passoa, 1983).

Pest Status

Passoa (1983) considered *P. elevata* a potential pest of sweet potato in Honduras because no outbreaks have ever been reported. King and Saunders (1984) recorded this species as a minor pest of sweet potato throughout Central America although serious losses can occur if the crop is attacked at a critical period (early or very late in its development). *P.elevata* attack can sometimes kill the host.

Comments

Polygrammodes lucusalis (=*histrionalis*) was recorded as a pest of sweet potato in Central America (Saunders et al., 1983) although other workers give only Mexico as the range (McGuire and Crandall, 1967). This species needs confirmation as a pest in Central America. Hampson (1899) listed only Australia without any New World localities. No information is available on the early stages.

Polygrammodes elevta does not seem closely related to the rest of the Pyraustinae based on the immatures. The round V1 pinaculum on A3-6 and the weak shoulder of the pupa are especially unusual.

Spoladea recurvalis (Fabricius)

(Figs. 21, 295-299)

Synonyms

Hymenia recurvalis (Fabricius); *Zinkenia fascialis* auctorum, not Cramer.

Common Names

The accepted common name for this insect is Hawaiian beet webworm (Werner, 1982). Saunders et al. (1983) listed webworm for *S. recurvalis* but only its synonym, *Z. fascialis*, was associated with its correct common name.

Distribution

Widely distributed in tropical, semitropical, and temperate regions, Neotropical, Oriental, Ethiopian, and Australian regions, Asia from Syria to Japan (Mathur, 1959); Hawaii (Zimmerman, 1958); Virgin Islands, Puerto Rico (Schaus, 1940); Santa Lucia (Gooding, 1980); Jamaica, Haiti (Marsh, 1911); USA (Hodges et al., 1983); Nicaragua (McGuire and Crandall, 1967); Costa Rica (Fulton, 1966); Brazil (Costa Lima, 1950); Honduras.

Hosts

Achyranthes aspera, *Amaranthus* sp., *Amaranthus spinosus*, *Celosia argentina*, *Celosia cristata*, *Chenopodium album*, *Gomphrena* sp., maize, probably many wild plants, beets and mangels (a variety of beets), swiss chard, spinach, *Impatiens* sp. (Mathur, 1959); *Euxolus* sp., *Portulaca* sp., saltbush, cockscomb (Marsh, 1911); cotton (Hargreaves, 1948); *Colocasia* sp. (Saunders et al., 1983); beans, carrots (Gooding, 1980); *Alternanthera sessilis*, *Batis maritima*, *Nototrichum* sp., *Sesuvium portulacastrum* (Zimmerman, 1958); *Portulaca oleracea*, *Amaranthus hybridus*

(Ogilvie, 1928); squash, Gomphrena decumbens, tomato (Martorell, 1976); Amaranthus australis, Amaranthus viridis, cabbage.

Material Examined

USA: numerous localities in Florida, mostly Gainesville (50+ adults with cast pupal skins); Gainesville, 7-XI-1972, D. Habeck, Amaranthus viridis (10+ pupae); Gainesville, 18-IX-1978, J. Tseng, cabbage (9 larvae); Gainesville, 30-VIII-1982, S. Passoa, mandible slide #280, larva #407 SPC (1 larva, 1 pupa); PUERTO RICO: Santa Isabel, 5-VI-1983, D. Green (6 larvae); Quebradellas, 6-IV-1981, J. Reinert, Chenopodium sp. (11 larvae); HONDURAS, Comayagua, 25-III-1979, S. Passoa, at lights (1 adult); Comayagua, 6-V-1979, S. Passoa, at lights (1 adult); EAP, 18-X-1980, no collector recorded, reared ex larva on bean leaves (1 adult); EAP, 18-IV-1981, Diaz, beets (1 larva); EAP, 20-VIII-1980, S. Passoa, beets, larvae #280, mandible slide #194 SPC (1 larva).

Larval Diagnosis

Prothoracic shield mottled as shown with a pair of black dots; SV group of A1 bisetose; SD pinaculum of the mesothorax and sometimes the metathorax pigmented; and general characteristics of the subfamily Pyraustinae.

A pigmented mesothoracic SD pinaculum occurs in three species: S. recurvalis, A. gordalis, and L. tripunctata. However, S. recurvalis may be separated from the above two species since it shows no reduction of the SD1 pinaculum on A2 when compared to A1. The SD1 pinaculum of A2 is reduced in both A. gordialis and L. tripunctata (Allyson, 1984).

Larval Description

The larva was described by Dyar in Marsh (1911), Mathur (1959), and Peterson (1962). The life cycle of *S. recurvalis* was illustrated by Walker and Anderson (1939).

Pupal Diagnosis

Spiracle of A4 elevated; mesothoracic spiracle with a dorsal and ventral pit; frons not bilobed; and general characteristics of the subfamily Pyraustinae.

Pupal Description

The pupa was illustrated by Marsh (1911) but his figure of the cremaster spines was incorrect. They are curved, not branched. The cremaster of *S. recurvalis* greatly resembles that of *H. perspectalis*, especially in the form of the dorsal setae with a spine at the base.

Biology

The biology was summarized by Zimmerman (1958). The flattened egg was laid on the leaf surface. The larvae often formed webs at the terminal bud but Marsh (1911) noted a high percentage of individuals were free living without a web. Pupation occurred within a folded leaf. The life cycle took about two weeks. Zimmerman (1958) gave excellent figures of the adults and their genitalia. Peterson (1963) illustrated the eggs.

Moths were common at lights in Puerto Rico (Wolcott, 1948).

Pest Status

S. recurvalis was one of the most common Hawaiian Lepidoptera and has caused serious injury to beets (Zimmerman, 1958). Although the moth is common at lights in Honduras, Passoa (1983) did not record damage to agricultural crops. King and Saunders (1984) characterized *S. recurvalis* as a minor pest in Central America although some outbreaks were reported in the Caribbean region. In Honduras, *S. recurvalis* is a widespread and potential pest.

Udea rubigalis (Guenee)

(Figs. 300-303)

Synonyms

Phlyctaenia ferrugalis in part, New World records only; *Phlyctaenia rubigalis* (Guenee).

Common Name

The Entomological Society of America listed two common names for this insect, celery leaftier and greenhouse leaftier (Werner, 1982). Both are frequently used. Other more obscure names for *U. rubigalis* include parsnip webworm (the accepted name for the oecophorid *Depressaria pastinacella*), chyrsanthemum leaf skeletonizer, and celery borer (Weigel et al., 1924).

Distribution

North, Central, and South America (Munroe, 1966). There are no specific records of this pest from any Central American country known to me at this time.

Hosts

Celery, corn, cotton, potato (Okumura, 1961); many ornamentals and herbaceous plants (Weigel et al., 1924), beans (Wolcott, 1948).

The preferred ornamental hosts are chrysanthemum, cineraria, violet, rose, carnation, calendula, sweet pea, marguerite, geranium and snapdragon (Weigel et al., 1924). A complete list of hosts can be found in Okumura (1961) and Weigel et al. (1924).

Material Examined

USA: California, Riverside, 5-X-1963, no collector recorded, lab colony (1 pupa, 4 larvae).

Larval Diagnosis

Crochets in a complete circle, triordinal mesally and uniordinal laterally; prespiracular pinaculum of the prothorax almost circular; and general characteristics of the subfamily Pyraustinae.

The larva of U. rubigalis may be confused with Lineodes spp. and O. indicata. The former species may be separated from U. rubigalis by the biordinal crochets and the crescent-shaped prespiracular pinaculum. The shape of the mandible and shortened front easily separate O. indicata from U. rubigalis.

Larval Description

The larva has been described by Weigel et al. (1924), Peterson (1962), and Allyson (1984).

Pupal Diagnosis

Mesothorax and metathorax with paired dorsal elongate pits dorsally, there may be two pairs on the mesothorax in some specimens.

The pits on the thorax readily distinguish this species from all others in this study. The single specimen examined has two pits on the mesothorax but only one pit is shown in the figures by Weigel et al. (1924).

Pupal Description

The pupa was described by Weigel et al. (1924).

Biology

The biology was described by Weigel et al. (1924). Eggs were laid on the leaf surface. The larvae first skeletonized the leaf but later they tied leaves together and sometimes ate the entire leaf except for the veins. Damaged plants had a silvery appearance.

The larvae also may bore into celery stems (Peterson, 1962). Ball et al. (1935) studied the ecology and life history in Florida.

Pest Status

U. rubigalis was not listed in the two standard lists of Central American pests (Saunders et al., 1983; McGuire and Crandall, 1967). Passoa (1983) did not collect this insect in Honduras. However, damage in the United States was serious and defoliation sometimes killed many plants in greenhouses (Weigel et al., 1924). There is an unidentified *Udea* sp. from Peru in the Universidad Nacional Agraria collection at Lima that caused serious damage to celery . Honduran entomologists should consider *U. rubigalis* a potential pest.

Comments

Udea prunalis from Europe also has the dorsal mesothoracic and metathoracic pits (Khot'ko and Molchanova, 1975) like *U. rubigalis*.

SUBFAMILY SCHOENOBIINAE

This is a small subfamily distributed throughout the world. They are similar in overall appearance to the Crambinae and some genera may have a tuft of scales at the end of the abdomen. Munroe (1972) speculated that the close resemblance of the above two subfamilies could be an adaptation to the grass-borer mode of life. Structural differences exist in the viniculum and seventh sternite of the male genitalia. The primitive nature of this group is shown by the presence of a tubular anal vein in the forewing (Munroe, 1972). Hampson's (1895) concept of the subfamily included a great many unrelated forms (Munroe, 1958). There are currently seven genera in the United States north of Mexico, but as noted in the Nymphulinae section, Acentria doesn't belong in the Schoenobiinae when larval and pupal characters are considered. However, the bisetose L group of A9 and the long appendages of the pupa found in Rupela, if this is typical of the Schoenobiinae, may indicate that the Nymphulinae and Schoenobiinae are closely related.

Based solely on the genera Rupela and Tryporyza, the pupae of the Schoenobiinae are readily distinguished from other subfamilies by having the mesothoracic femur exposed and the cremaster absent.

The larvae of the Schoenobiinae are very distinctive and may be readily recognized by the presence of a membranous sac anterior to the prothoracic coxae on the midline. Rupela and Tryporyza have elongate cream-colored larvae with a reduced head and anal shield. This body shape, combined with the short setae, give them a distinctive appearance.

An undetermined species of "Schoenobius" (sensu lato) reared from Paspalum sp. in Florida resembles a Phycitinae or Epipachiinae with its pigmented head and prothoracic shield. The crenulate anal shield of Rupela albinella is not found in the other two above genera. An unusual feature common to all three genera examined, in addition to the prothoracic sac, is the posterior placement of the D and SD setae behind the spiracle on the abdominal segments. These features were also illustrated by Hasenfuss (1960) for Schoenobius sp. from Europe.

This subfamily includes some serious rice pests in Asia (Tryporyza) and some New World stem borers (Rupela). Most larvae are borers in sedges, weeds, and other aquatic grasses (Pinhey, 1975).

Rupela albinella (Cramer)

(Figs. 49, 304-318)

Synonyms

None in common usage.

Common Names

Various names were given by Saunders et al. (1983) but the most widely used name in Honduras is rice sweetheart (Passoa, 1983; Koone and Banegas, 1958). R. albinella was called the white rice borer by Hummelen (1974).

Distribution

Mexico, Belize, Guatemala, Honduras, Costa Rica, Panama, Trinidad, French Guiana, Guyana, Surinam, Brazil, Colombia, Ecuador, Peru (Heinrich, 1937); El Salvador, Nicaragua (McGuire and Crandall, 1967).

Hosts

Rice is the only known host. Records for corn and sugarcane need confirmation (see comments section).

Material Examined

COLOMBIA: Cali, IV-1983, no collector recorded, rice, mandible slides #314, 315, 316, genitalia slide #299 SPC (1 adult, 2 pupae, 9 larvae); HONDURAS: La Ceiba, 10-IV-1975, no collector recorded, rice, genitalia slide #308 SPC (1 adult); La Ceiba, IX-1975, no collector recorded, genitalia slide #309 SPC (1 adult); EAP, 4-XI-1981, S. Passoa, rice, genitalia slide #295, 297 SPC (7 adults, female with eggs preserved); Comayagua, 24-XI-1979, S. Passoa, rice, 1st instar ex ova (5 larvae).

The United Fruit Company card file has two records of a *Rupela* sp. collected near La Lima on rice and at lights. These are most likely *R. albinella*.

Larval Diagnosis

Setae very short, none longer than the width of the epicrania from L1 to L1; anal shield crenulate; and general characteristics of the subfamily Schoenobiinae.

The short setae, membranous sac, and crenulate anal plate are quite distinctive and will allow easy recognition of this species.

Larval Description

General. Preserved larvae are cream with a light tan prothoracic and anal shield, head reddish-brown.

Skin texture spinose, each spine stellate in cross section; crochets in a uniordinal circle; mature larvae approximately 30 mm long.

Head. Front extends only 1/3 the distance to the epicranial notch; Adf setae closely spaced, Adf2 just above the front, Adf1 slightly below; frontal pores lie midway between a vertical line through F1 and C2; C2 slightly longer than C1; P1 three times the length of P2; A2 and L1 shorter than A1 and A3; the front has a sclerotized flange that extends from the clypeus to the posterior third of the adfrontal area.

Six stemmata present; stemmata 1-3 evenly spaced; stemmata 3 and 4 touch; stemma 6 posterodorsad of stemma 5.

Labrum with M1 longer than M2 or M3; L1 shorter than L2 or L3, the latter two setae almost equal in length.

Mandible with three teeth, each tooth with a molar ridge, anterior mandibular seta minute.

Hypopharyngeal complex with an elongate spinneret equal to three times the length of the basal segment of the labial palps, distal area with long thin spines dorsally, proximolateral and proximodorsal area with smaller spines, a ridge on each side of the midline present; stipular setae very long, equal in length to the spinneret.

Thorax. Prothoracic shield with a raised area on the posterior margin; XD2 closer to SD1 than XD1; D1 slightly posterodorsad of XD1; D2 and XD1 in a horizontal line; SD1 anterodorsad of the spiracle; L1 twice the length of L2; distance between SV1 and SV2 about equal to the distance between L1 and L2; V1 posterior to the coxa, close to the midline; a membranous sac present anterior to the coxa.

Mesothorax with D2 twice the length of D1; SD1 twice the length of SD2; all three L setae in a slanted line; SV group unisetose; V1 posterior to the coxa and twice the distance from the midline as V1 on the prothorax.

Abdomen. First abdominal segment with all setae posterior to the spiracle except SD2; D2 posteroventrad of D1; SD2 anterodorsad of the spiracle; SD1 ventrad of D1; L2 longer than L1 or L3; SV group on A1 unisetose and dorsad of V1.

Sixth abdominal segment with D2 posteroventrad of D1; SD1 ventrad of D1; SD2 anterodorsad of the spiracle; L2 longer than L1; L3 much closer to the coxa than L1; SV group triserose, subequal in length, and arranged in an equilateral triangle; V1 below the posterior edge of the coxa.

Eighth abdominal segment with the D, SD, and L setae as in A6; SV group bisetose; V1 near the midline.

Ninth abdominal segment with D2 about four times the length of D1, the latter seta closer to SD1 than D2; L group bisetose, L2 half the length of L1 position of L1 variable, sometimes ventrad of L2; SV1 dorsad of V1, both posteroventrad of L1.

Anal shield with SD2 half the length of D1 and anteroventrad of the latter seta; SD1 much closer to SD2 than D2.

Pupal Diagnosis

Prothoracic femur very wide, almost equal to the horizontal diameter of the head; mesothoracic femur exposed; a round tubercle present on the frons dorsad of the labrum; metathoracic legs almost extend to the tip of the abdomen.

The pupa is very distinctive and cannot be confused with any other species examined during this study.

Pupal Description

General. Pupa with a slight shouldered appearance, white to golden tan; length approximately 20 mm.

Head. Vertex without setae; labrum U-shaped; frons with a circular tubercle dorsad of the labrum; labial palps thin and elongate, their length about equal to the vertical diameter of the labrum; maxillary palps absent; maxillae very short, the length equal to only 1/2 that of the prothoracic femur; pilifers present; postgenae obvious; antennae extend 2/3 the distance to the caudal wing margin.

Thorax. Prothorax femur very wide and long, their width subequal to the width of the head, length twice the vertical diameter of the head; prothoracic legs and antennae extend an equal distance compared to the caudal wing margin; mesothoracic femur exposed; mesothoracic legs about 1/3 longer than the prothoracic legs; metathoracic legs equal in length to the prothoracic legs; mesothoracic spiracle absent, or perhaps hidden, by a deep pit in the mesothorax dorsally; skin texture of the thorax smooth.

Abdomen. Spiracles oval, those of A1-2 and A4-8 with furrows, spiracle of A3 hidden, only a few furrows can be seen, spiracle of A1 in a deep pit; proleg scars present on A5 and A6 ventrally; cremaster absent, terminal segment rounded; skin texture of the abdomen smooth except around the spiracles.

Biology

Little work has been done with *R. albinella* in Central America although Koone and Banegas (1958) mentioned this pest in Honduras. An introduction to the biology and control, including natural enemies, was given by Arregoces et al. (1980). The following summary is based on studies done in Surinam (Hummelen, 1974). The female oviposited on either side of the leaf surface and covered the eggs with scales from her body. First instar larvae dispersed and then bored into the stem after

24 hours. The five larval instars and pupal stage were passed within the stem. A small percentage of the larvae diapaused.

Since the stem must be thick enough to accommodate the stem borer inside, a rice plant is not susceptible to attack until 60 days after planting. Certain early maturing varieties can escape attack because R. albinella needs at last 50 days to complete development. Rice plants that mature in 105 days are available (Hummelen, 1974).

Arregoces et al. (1980) reported six larval instars and a life cycle of 54-77 days in Columbia.

Pest Status

Adults, larvae, and damage were illustrated in color by Cheaney and Jennings (1975). Damage by R. albinella to rice is minor in most countries although serious outbreaks were recorded in the Caribbean (Gooding, 1980), Central America (King and Saunders, 1984), Peru (Torre, 1961), and upland rice in Colombia (Cheaney and Jennings, 1975). Koone and Banegas (1958) reported minor damage from this pest in Honduras. Passoa (1983) considered R. albinella to be a potential pest.

Comments

The record of R. albinella on sugarcane by Willie (1952) in Peru needs confirmation. At first glance this would appear to be a case of confusion betwen Diatraea (common on sugarcane) and R. albinella. However, Willie (1952) noted that the eggs of this species were covered with scales. This is a distinctive feature of Rupela. The eggs of Diatraea are naked. This insect was probably a species of Rupela but not albinella. Heinrich (1937) discussed the separation of species in this genus.

The Comayagua collection contained a vial of *Rupela* larvae collected from corn. However, there is a pin hole with rust in the center of the locality and host labels indicating the labels were once on a pin. Therefore, this vial is best considered mislabeled until the host can be confirmed.

In contrast to *R. albinella*, the *Schoenobius* illustrated by Hasenfuss (1960) had the L group of A9 unisetose.

SUBFAMILY CRAMBINAE

The subfamily Crambinae is large and distributed throughout the world. Adults frequently have a longitudinal stripe on the forewing which can be an obvious silver dash or as inconspicous as a series of lines or dots. The Peoriinae and many Schoenobiinae also share such a "reduction in transverse elements". This pattern could have arisen as a response to visually hunting predators selecting for a pattern which helped camouflage the insect on its foodplant, in this case grasses (Shaffer, 1976). The same author also mentions long porrect palpi and slender wings as other adaptations. The Crambinae belong to the series Crambiformes as defined by Munroe (1972). All these subfamilies share a praecinctorium in the tympanic bullae. The Palearctic and Neotropical Crambinae were reviewed by Blesynzki (1965, 1967). The Nearctic species were listed by Klots (in Hodges et al., 1983) who also revised a part of the Chilini (Klots, 1970). Fernald's (1896) revision of the Nearctic Crambinae is somewhat outdated but is useful largely due to the excellent color plates. Hampson (1895) was the last one to review the world fauna.

The pupa of the Crambinae divide into two series based on the length of the maxillae. In the Crambini (Fissicrambus and Parapedesia) and Argyriini (Argyria) the maxillae extend to the caudal margin of the wings. The shortened maxillae seems to be characteristic of the Chilini where Chilo, Diatraea, and Eoreuma all share this feature. The deep lateral grooves on A10 mentioned by Mosher (1916) as a characteristic of this subfamily are not always present. They are found in many Crambini

(Crawford, 1961), some Chilini (*Chilo plejadellus*) and in some Pyraustinae (*Ostrinia* and *Nomophila*). The cremaster may take the form of a flattened plate in some *Chilo* and *Eoreuma* or a U-shaped structure in some Crambini. Pupation usually occurs close to the larval feeding site. Root feeders such as the Crambini often mix frass, plant debris, and silk to form a tough cocoon. Stem borers often pupate in the larval galleries after cutting an emergence hole in the stem of the host plant.

Most larvae are concealed feeders associated with the stems and roots of graminaceous plants. A distinguishing characteristic of this subfamily is the presence of an extra sclerotized transverse pinaculum without setae on the posterior margin of the dorsum of the mesothorax and metathorax (Capps, 1963). Unfortunately, this pinaculum is absent from diapausing forms in some genera thereby limiting its usefulness. Allyson (1976) defined the subfamily as having a unisetose L group on A9 and the ventral setae twice as far apart on A9 as on A10. *Crambus murellus* is an exception because of its bisetose L group on A9 (Anonymous, 1982).

The larva of the Crambinae can be divided on the basis of the prespiracular group and partly by the crochet arrangement. Crambini larvae have the prespiracular group elongated to extend below and behind the spiracle. This distinguishes them from the Chilini and Argyriini. The latter two tribes also can be divided on the basis of the crochets. The Argyriini (*Argyria* examined) and part of the Chilini (*Chilo* and *Eoreuma*) both share a similar crochet arrangement in that the lateral portion is uniordinal and shorter in length than the longer triordinal mesal portion. *Diatraea* is an exception in that the crochets are all equal in size and arrangement.

Certain Crambinae genera vary in appearance according to the season and the physiological state of the larva. Summer or wet season forms of *Diatraea* spp. are heavily pigmented, while the winter or dry season form has unpigmented pinacula.

The two most important species in this subfamily from an economic standpoint in Honduras are *D. saccharalis* and *D. lineolata*. Certain species of minor importance and some questionable records are included to allow for confirmation of the species involved. McGuire and Crandall (1967) listed a *Chilo* sp. from Central America. The Comayagua collection had a larva collected from rice determined as probably *Chilo* sp. Examination of the latter larva proved it was *Diatraea saccharalis*. No doubt errors such as the above are to blame for the listing of *C. plejadellus* from Central America. Saunders et al. (1983) listed *Xubida dentilineatella* from Central America. Klots (1970), who revised the genus *Xubida*, recorded the distribution as Arizona and Baja California. The larva is unknown to me but Riess (1981) described the coloration as "creamy-yellow without spots".

This subfamily also includes many Old World pests of rice in the genus *Chilo* of great economic importance as stem borers. They were revised by Bleszynski (1970).

Chilo plejadellus Zincken

(Figs. 319-323)

Synonyms

None in common usage.

Common Names

The accepted Entomological Society of America common name is rice stalk borer (Werner, 1982).

Distribution

Canada to southern USA (Bleszynski, 1970); Mexico (Paddock, 1978a). The record of C. plejadellus in Central America by Saunders et al. (1983) needs confirmation (see comments section).

Hosts

Rice, Zizania aquatica, Zizaniopsis miliacea, Spartina cynoruroides (Paddock, 1978a).

Material Examined

USA: Louisiana, no date or collector recorded, rice (9 larvae, 5 pupae).

Larval Diagnosis

SV group of the prothorax and mesothorax bisetose; lateral portion of crochets on A3-6 uniordinal, mesal portion triordinal; SV setae of the prothorax posteroventrad of the L setae and general characteristics of the subfamily Crambinae.

Larval Description

The larvae has been illustrated by Peterson (1962), Mutuura (1980), and Fernald (1896).

Pupal Diagnosis

Maxillae shortened; cremaster broad and truncate, the distal end with four widely spaced points; A10 with a deep groove laterally; frons with a blunt projection.

Pupal Description

The pupa was illustrated by Fernald (1896).

Biology

A summary of the biology in the United States was given by Paddock (1978a). Females laid about 200 eggs on either side of the leaves. The larvae hatched in 4-11 days and fed on the leaf surface before entering the stem. Heavy larval feeding early in the season prevented panicle emergence. Damage later in the season caused the panicle to emerge with unfilled grains called a whitehead. Pupation occurred in the larval tunnel.

The adult was illustrated by Paddock (1978a) and the eggs by Peterson (1963).

Pest Status

Passoa (1983) did not collect *C. plejadellus* in Honduras. There are no certain records in the literature of this pest causing damage in Latin America.

Comments

C. plejadellus is included here based on Saunders et al. (1983) list of Central America pests. The presence of this species in Central America needs confirmation.

Diatraea lineolata (Walker)

(Figs. 23, 24, 48, 62, 324-333, 336-341)

Synonyms

Zeadiatraea lineolata (Walker).

Common Name

Saunders et al. (1983) used the name Neotropical cornstalk borer which is unambiguous (listed as cornestalk borer, a misprint).

Distribution

A country by country list with a map was given by Box (1931); USA (Texas), the Caribbean, south to Venezuela (Peairs and Saunders, 1980); and Honduras (Passoa, 1983).

Hosts

Corn is the principal host, teosinte, sorghum, sugarcane, Tripsacum australe, Tripsacum laxum, wheat, Coix lachrymajobi, and rice (Peairs and Saunders, 1980); Sorghum halpense (Gilstrap, 1979).

Material Examined

TRINIDAD: no locality recorded, 7-X-1968, S. Morris, det. Hensley (1 larva); Costa Rica: Ministry of Agriculture Experimental Station, 4-X-1966, D. Habeck, corn (6 larvae); Alajuela, 5-X-1966, D. Habeck, corn (9 larvae, 1 pupa); Honduras: Talgua, 1-VII-1982, G. Evans (2 larvae); Dept. of Olancho, El Buqueron, 5-X-1981, K. Andrews, corn (1 larva); Jutiquile, 26-II-1979, R. Jones, corn, mandible slide #229 spc (1 larva); Jutiquile, 26-X-1979, R. Jones, ex corn, mandible slide #317 SPC, det. Weisman (1 larva); Jutiquile, 17-X-1979, R. Jones, corn stalk, mandible slides #318, 336 SPC (2 larvae, 1 cast pupal skin); EAP, 7-IX-1981, em. 28-X-1981, S. Passoa, ex ova on corn as test, genitalia slide #302, larva #294 SPC (3 adults, 2 cast pupal skins, 8 larvae); EAP, 28-VII-1983, no collector, date, or host reported (2 larvae); EAP, 26-X-1980, J. Torres (1 larva); EAP, 25-X-1980, no collector recorded, sorghum (1 larva); EAP, 2-X-1981, S. Passoa, ex ova (15+ eggs and 1st instar larvae); EAP, 24-IX-1981, S. Passoa, genitalia slide #301 SPC (1 adult with eggs); Comayagua, no collector, date or host recorded (3 larvae); Comayagua, 10-X-1979, S. Passoa, at lights (1 adult); Comayagua, 18-VIII-1960, no collector recorded, ex corn (1 adult).

Passoa (1983) also recorded *D. lineolata* from Choluteca, Jamastran, and El Rosario. In the Comayagua collection there is a card (#120) which may be summarized as follows: *D. lineolata*, collected in Choluteca, 6-11-1958, reared from corn, a very important pest; heavily infests corn, sorghum, sugarcane, and Guatemala grass. Strong outbreaks found in the zones of Catacamas and Jutigalpa.

Larval Diagnosis

SV group of the thoracic segments bisetose; both the L and SV pinacula lie anterior to a vertical line drawn through the spiracle; crochets of A3-6 evenly triordinal throughout; paraproctal setae reduced, their length never greater than 1/2 that of SV1 on A10; and general characteristics of the subfamily Crambinae.

No reliable characters were found in this study to separate *D. lineolata* from *D. grandiosella* (see comments section). *D. saccharalis* may be separated from *D. lineolata* by the length of the paraproctal setae. They are 1/2 the length of SV1 on A10 or greater in *D. saccharalis* but never greater than 1/2 that of SV1 in *D. lineolata*.

Larval Description

General. Early instar larvae, but not the first instar, are cream colored with shiny black pinacula. The head varies from a light reddish-brown to a honey-brown color. The prothoracic shield is blackish-brown. Mature larvae are also cream colored but the head and prothoracic shield are honey-brown. The body pinacula are dark brown instead of black.

Skin texture consists of minute raised bumps under high power; mature larvae approximately 33 mm long.

Head. Front extends slightly more than 1/2 the distance to the epicranial notch; Adf2 above the apex of the front; Adf1 slightly dorsad of a horizontal line through A3; F1 slightly dorsad of the frontal pores; C2 twice as long as C1; P2 dorsad of P1; A2 closer to A1 than A3; L1 and P2 in a horizontal line.

Six stemma present; distance between stemma 1 and 2 about twice the distance between stemmata 2 and 3; stemmata 3 and 4 touching; stemma 6 posterodorsad of stemma 5.

Labrum with all M setae subequal in size; L2 twice the length of L2 and L3.

Mandible with four teeth, each with a molar ridge, inner tooth present below the first molar ridge, anterior mandibular seta twice the length of the posterior seta.

Hypopharyngeal complex with an elongate spinneret equal to four times the length of the basal segment of the labial palps; proximomedial area spinose; apex of spinneret usually with two microsetae; two minute stipular setae present.

Thorax. Prothorax with the distance between XD2 and SD1 less than the distance between XD1 and XD2; D2 almost ventrad of D1; SD2 posterodorsad of the spiracle; L1 twice the length of L2; SV group bisetose; V1 behind the coxa; the skin anterior to the prothoracic shield is pigmented and strongly granulate.

Mesothorax with an extra transverse pinacula without setae posterior to the D pinaculum; SD pinaculum elongate, oval; L3 pinaculum twice the size of the L1 and L2 pinacula; SV group bisetose, dorsad of the coxa; V1 as in T1, except farther from the midline.

Abdomen. A1 with D2 posteroventrad of D1, the D2 pinaculum more elongate; SD1 anterodorsad of the spiracle; SD2 minute, anteroventrad of the spiracle; L2 slightly longer than L1; L3 posteroventrad of L1 and L2 on an oval pinaculum; SV group trisetose, directly dorsad of V1.

A6 with the D setae as in A1; SD1 anterodorsad of the spiracle; SD2 separated from the spiracle by almost one and a half the vertical diameter of the spiracle; L setae as in A1; SV group trisetose; V1 ventrad of the proleg on an elongate pinaculum.

A8 with D1 twice the length of D2; SD1 anterior to the spiracle; SD2 almost in a horizontal line with L2; L3, SV1, and V1 in a vertical line.

A9 with D2 on an elongate pinaculum; SD1 and D1 on the same pinaculum; L group unisetose, on an oval, conical pinaculum; SV1 dorsad of V1.

Anal shield with D1 anterior to SD1; D1 shorter than SD1, SD2, or D2.

Pupal Diagnosis

Maxillae short, equal to 1/3 the distance from the labrum to the caudal wing margins; caudal horns blunt, not pointed or curved; mesothoracic spiracle widely separated from the antenna.

The pupae of *D. lineolata* is easily separated from *D. saccharalis* by the characters listed under the latter species. No characters were found to distinguish *D. lineolata* from *D. grandiosella*. However, there is a tendency for the pupa of *D. lineolata* to have a more rugose texture, especially on the abdominal segments. The spines on *D. grandiosella* tend to be shorter and more widely spaced from each other.

Pupal Description

General. Pupa deep reddish-brown; length about 15 mm.

Head. Vertex with two small setae and with two blunt horns, the latter about twice as long as high and with a rough texture; labrum almost square, the distal end notched; labial palps in the form of a tear drop; pilifers present, rounded; maxillary palps rectangular; maxillae short, only 1/3 the distance to the caudal wing margin; postgenae obvious; antennae reach about 3/4 the distance to the caudal wing margin; two tubercles; or sometimes only one, present on the scape.

Thorax. Prothoracic femur about 1/2 the length of the prothoracic leg; prothoracic legs extend about 2/3 the distance to the caudal wing margin; mesothoracic legs extend to the caudal wing margin; only the tips of the metathoracic legs visible; mesothoracic spiracle a thin slit fringed with fine setae, the anterior portion does not extend to the antenna; skin texture of the thorax rough and spiny except for the metathorax which is smooth on the lateral portions.

Abdomen. Spiracles elliptical, those of A2 and A3 with furrows; A5 and A6 with proleg scars ventrally; cremaster absent but A10 bears eight plate-like spines arranged in a circle from a caudal view; skin texture of A1-3 rough and spiny in the center, lateral portions smooth; A4-7 with the anterior portion of each segment rough and spiny, the posterior section is granulate; A8, except anteriorly, rough and spiny with six plate-like spines in a vertical line ventrad of the spiracle, additionlly a single spine anterior to each spiracle; A9 skin smooth or slightly roughened with six plate-like spines arranged in a vertical line.

Biology

The biology of D. lineolata on corn was reviewed by Peairs and Saunders (1980). Oviposition occurred on the leaf surface and the eggs were banded with red (unlike the eggs of D. saccharalis which lack red bands). First and second instars skeletonized the leaves but third instar larvae bored into the stems. The larval stage consisted of seven instars and lasted about 31 days. Feeding in the stem was the major cause of damage.

Up to eight larvae per plant were found in Nicaragua (Estrada, 1960) and in Honduras the life cycle, from egg to adult, took 60 days (Mohr et al., 1981).

Some larvae diapaused in the stem of the host. These diapausing forms were recognized by their unpigmented pinacula concolorous with the body. The diapause was broken by spring rains and afterwards the larvae pupated. Adult emergence from the stem left a characteristic exit hole (King and Saunders, 1984).

The major difference in the life cycles of *D. lineolata* and *D. saccharalis* involved the time of attack and the nature of the damage. In general, *D. lineolata* fed on the ear more frequently and attacked corn later than *D. saccharalis*. Their location on the stem also differed; *D. lineolata* was found lower on the stem (Painter, 1955; Peairs and Saunders, 1980).

The taxonomy of the adults was discussed by Dyar and Heinrich (1927), Box (1931), and Bleszynski (1969). Genital characters and the shape of the frons were the only reliable means of identification.

Pest Status

D. lineolata was ranked as the third most important corn pest in Central America where the abuse of insecticide was considered a major cause of the frequent outbreaks (McGuire and Crandall, 1967). Serious damage was recorded from Nicaragua (Estrada, 1960) and Guatemala (Painter, 1955). Koone and Banegas (1958) considered *D. lineolata* to be an important pest of corn in Honduras. More recently, infestations were considered widespread, but sporadic, throughout the corn growing regions of Honduras (Passoa, 1983).

Comments

D. grandiosella was listed as a pest in Central America (Saunders et al., 1983) but its inclusion is doubtful. None of the four taxonomists who studied the genus Diatraea (Dyar and Heinrich, 1927; Box, 1931; Bleszynski, 1969) cited records for this species south of Mexico. D. grandiosella, if it even occurs in Central America, is rare south of Mexico while D. lineolata does not occur farther north than Texas. Therefore, nearly all Diatraea with short paraproctal setae from Honduras should be D. lineolata.

D. lineolata and D. grandiosella are very difficult to separate as larvae. One problem is the variability in chaetotaxy and mouthparts. The mandible illustration of D. grandiosella in Peterson (1962) lacked an inner tooth but in a large series of larvae this tooth is often present. A similar amount of variability could be found in D. lineolata but only a small number of specimens were studied. The location of the SO2 seta is also highly variable. Nevertheless, a tentative determination can be made by examining the position of the SO2 seta, the condition of a spinose area between the anal shield and anus, the color of the larva, and the locality.

The SO2 seta usually lies closer to stemma 6 than stemma 5 in D. grandiosella (Peterson, 1962). The opposite is often true for D. lineolata. Unfortunately, on many larvae this seta is midway between the two stemmata. This character remains useful because SO2 is never very close to stemma 6 in D. lineolata and never very close to stemma 5 in D. grandiosella.

Another possible way to separate these two species is found in the spinose area between the anal shield and the anus. The spines of D. grandiosella appear slightly more stout and usually cover a wider area than in D. lineolata. In both species the spines can be quite faint.

Color is useful in distinguishing young larvae (second and third instar). In young D. lineolata larvae the prothoracic shield is blackish-brown while in D. grandiosella the shield is light tan.

Box's (1955) contention that D. grandiosella and D. lineolata belong together in the genus Zeadiatraea would be supported if the short paraproctal setae consistantly separate these two species from the other Diatraea spp. The two are very closely related to each other.

Diatraea saccharalis (Fabricius)

(Figs. 25, 26, 47, 50, 335, 342, 343)

Synonyms

None in common usage.

Common Name

The accepted Entomological Society of America common name is sugarcane borer (Werner, 1982). Among the other alternative names perhaps the most widely used is small sugarcane borer. A complete list can be found in Guagliumi (1962).

Distribution

A country by country list included an area from the southern USA to Argentina except Tobago, Costa Rica, and Panama (Box, 1931); Costa Rica, Panama (McGuire and Crandall, 1967); Trinidad (Anonymous, 1972).

This is the most widely distributed member of the genus (Box, 1931). The Old World records from Africa, India, and Indonesia (Hill, 1978) are errors in identifiction. Jepson (1954) noted a tendency for early workers to assume their pests were conspecific with the New World D. saccharalis.

A distribution map for D. saccharalis was prepared by the Commonwealth Institute of Entomology (Anonymous, 1951-1977).

Hosts

Cultivated foodplants include sugarcane, corn, rice, wheat, bamboo, sorghum, Guatemala grass, Tripsacum latitifolium, and about 30 grasses of economic importance (Box, 1935; Peairs and Saunders, 1980); original and ruderal foodplants include species of Andropogon, Digitaria, Echinochloa, Hymenachne, Panicum, Paspalum, and Sorghum (Box, 1935); Cyperus, Scleria (Guagliumi, 1962).

More detailed host information can be found in Box (1935), Jepson (1954), Guagliumi (1962), Peairs and Saunders (1980), and Martorell (1976).

The record by Kimball (1965) of D. saccharalis on sycamore trees is surely an error. Dekle et al. (1971) illustrated D. saccharalis from specimens collected on Cortaderia selloana. The illustrated larva is unusually colored and has the D setae spaced at the wrong angle for the sugarcane borer.

Material Examined

USA: Louisiana, Houma, 1964?, R. Mathes, sugarcane (1 larva, 1 pupa); COLOMBIA: Dept. of Valle, Cerrito, IX-1981, J. Raigosa, ex larva on sugarcane, EF-014-82, genitalia slides #385, 386 SPC, det. Ferguson (4 adults); HONDURAS: Dept. of Olancho, Punare, 20-III-1979, R. Jones, corn stalk (4 larvae); EAP, 16-XI-1979, A. King, rice (1 pupa); EAP, 25-X-1980, no collector recorded, sorghum, mandible slide #230 SPC (1 larva);

EAP, 21-IX-1981, em. 2-X-1981, S. Passoa, ex larva on corn (1 adult); EAP, 29-X-1980, no collector recorded, sorghum (1 larva); Comayagua, 10-X-1979, S. Passoa, at lights (1 adult); Comayagua, 19-II-1980, S. Passoa, at lights (1 adult); Comayagua, 10-III-1980, S. Passoa, reared ex ova on corn as test, larva #172, genitalia #216 SPC (3 adults with cast pupal skins, 15 larvae); Comayagua, no date, collector, or host recorded (10 larvae); Comayagua, 10-X-1968, A. Balint, rice stem, "prob *Chilo* sp." det. Balint, "*D. saccharalis*", det. Passoa, mandible slide #297 SPC (1 larva).

Larval Diagnosis

SV group on the thoracic segments bisetose; mandible with an inner tooth; paraproctal setae large, equal to 3/4 length of SV1 on A10; and general characteristics of the subfamily Crambinae.

The only other species of *Diatraea* included in this study with large paraproctal setae is *D. crambidiodes*. However, the mandible of *D. crambidiodes* lacks an inner tooth that is present in *D. saccharalis* (Peterson, 1962).

Larval Description

The larva was described and illustrated by Pastrana and Hernandez (1978-1979), Holloway et al. (1928), and Peterson (1962).

Pupal Diagnosis

Maxillae short, equal to 1/3 the distance from the labrum to the caudal wing margins; caudal horns curved and pointed; and general characteristics of the subfamily Crambinae.

The pointed caudal horns will distinguish *D. saccharalis* from *D. crambidiodes*, *D. grandiosella* (Peairs and Saunders, 1980), and *D. lineolata*.

The pupa illustrated by Koone and Banegas (1958) as D. saccharalis cannot be this species due to the long creamaster and lack of the caudal horns.

Pupal Description

The pupa was described and illustrated by Holloway et al. (1928).

Biology

The biology of D. saccharalis was reviewed by Peairs and Saunders (1980) in relation to corn and by Guagliumi (1962) in relation to sugarcane. A bibliography of D. saccharalis was prepared by Roe et al. (1981). The biology of the sugarcane borer was studied in the USA by Holloway et al. (1928). A review of the parasites was published by Gilstrap (1979).

Oviposition took place on the leaf surface. The eggs of D. saccharalis were creamy-white at first but later turned orange. They lacked the red bands found on the eggs of D. lineolata at maturity. After a short period of leaf feeding the larvae entered the stem. The life cycle, excluding diapause, took about 40 days with a range of 35-53 days in Colombia (Peairs and Saunders, 1980; Dinther, 1960; Arregoces et al. 1980).

The sugarcane borer damages its host in many ways. The growing point may be killed (called a deadheart), the stem may be weakened or broken (causing lodging), or the sugar content of the harvested stem may be reduced. Damaged stalks may be invaded by bacteria, fungi (the cause of red rot), or other insects (Paddock, 1978c). Damage to corn is similar to the above except the ear may be attacked (Peairs and Saunders, 1980). In rice the damage depends on the time of attack. Early season attack leads to deadhearts but late season attacks lead to empty rice grains (Arregoces et al., 1980).

Pupation occurred in the larval tunnel (Arregoces et al., 1980) but some larvae diapaused. This diapausing form is apparently rare in certain areas including Trinidad and Guatemala (Kevan, 1943; Painter, 1955).

The parasites of the sugarcane borer were intensively studied. Most of this effort involved the tachinids Lixophaga diatraea (Cuban fly), Metagonistylum minense (Amazon fly), Paratheresia claripalpis (Venezuelan fly)(Gilstrap, 1979), and recently the braconid Cotesia flavipes (Fuchs et al., 1979).

Pest Status

Diatraea saccharalis caused more damage to sugarcane than any other Diatraea spp. (Guagliumi, 1962). In addition, damage to corn and rice was frequent (Peairs and Saunders, 1980; Arregoces et al., 1980).

D. saccharalis was considered a widespread pest causing sporadic outbreaks in Honduras (Passoa, 1983). A similar evaluation was presented by other workers in Honduras who mentioned the sugarcane borer as a serious pest of sugarcane and a minor pest of corn (Koone and Banegas, 1958). The abundance and pest status apparently varied with the locality and season. In Guatemala, D. saccharalis was considered a common corn pest (Painter, 1955) but this was not the case in Nicaragua (Estrada, 1960) or Cost Rica (Fernandez, 1960) where it was rare. Attacks during the dry season were more serious because the water stressed plants were not able to tolerate damage and because the larvae must eat more plant material to achieve a favorable water balance (Jepson, 1954). This same author characterized D. saccharalis as an internode borer.

Comments

So far only *D. lineolata* and *D. saccharalis* have been collected from Honduras. Using Saunders et al. (1983) list of pest insects in Central America and Box's (1931) revision (to select those species which occur in neighboring countries) it is possible to form a list of the *Diatraea* most likely to be introduced or discovered in Honduras. At the present time these species seem unimportant and rare. Identifications should be based on genitalia since many of the other *Diatraea* spp. appear very similar to *saccharalis* or *lineolata*. Keys for the identification of adult *Diatraea* and its relatives may be found in Box (1931), Dyar and Heinrich (1927), and Bleszynski (1969).

Other species of *Diatraea* which could be collected in Honduras include (nomenclature and distribution follows Bleszynski, 1967, 1969): *D. centrella* (=*Eodiatraea centrellus*, *D. cannella*) from the West Indies and northern South America; *D. considerata* from Mexico; *D. evanescens* from the southern USA and Guatemala; *D. fuscella* from Costa Rica; *D. grandiosella* (see comment section under *D. lineolata*); *D. guatemalella* from Mexico to Costa Rica; *D. magnifactella* from Mexico; *D. muellerella* from Mexico; *D. morobe* from Mexico; *D. postlineella* from Guatemala; *D. schausella* from Guatemala; *D. tabernella* from Belize to Colombia; and *D. veracruzana* from Mexico.

D. crambidoides (=*zeacolella*) was considered a pest in Central and South America (Saunders et al., 1983; Paddock, 1978b) but Bleszynski (1969) listed only North American localities. It is included in the above list with doubt. Demandable of *D. crambidoides* lacks an inner tooth (Dekle, 1976).

Some *Diatraea* larvae have been described in detail but many others are undescribed. Guagliumi's (1962) illustration of *D. centrella* showed a triangular mesothoracic and metathoracic bar in contrast to the usual elongate oval shape. The D1 pinaculum on A1-8 in *D. tabernella* appears squarer than normal and 2-3 times as high as the D2 pinaculum on the same segments (Fernandez, 1960). In *D. lineolata*, *D. guatemalella*, and *D. impersonatella* the D1 and D2 are more nearly equal in shape and size (Fernandez, 1960; Guagliumi, 1962). The larvae of *D. saccharalis*, *D. grandiosella*, and *D. crambidoides* were compared and contrasted by Hensley (1960) and Peterson (1962). Box (1935, 1956) also discussed some larval characteristics and foodplants.

Many *Diatraea* spp. have very restricted ranges for a relatively well sampled group. This indicates that careful studies of the ranges of each species could provide valuable clues useful in identification.

Eoreuma loftini (Dyar)

(Figs. 344-347)

Synonyms

Acigona loftini (Dyar); *Chilo loftini* Dyar.

Common Names

This insect has been called the rice borer (Sosa, 1981) but this name is very similar to rice stalk borer which is used for *Chilo plejadellus*. A major distinguishing feature of *E. loftini* is the striped pattern. Therefore, striped sugarcane borer would be more appropriate.

Distribution

Arizona, Texas, California, and Mexico (Johnson, 1981; Bleszynski, 1967). Klots (1970), in his review of the genus *Eoreuma*, listed Arizona, California and probably Mexico.

This species was listed from Central America but some of these records may need confirmation especially since all life stages of *E. loftini* closely resemble *Diatraea* spp. McGuire and Crandall (1967) listed Mexico and Guatemala. King and Saunders (1984) recorded Mexico, Guatemala, Nicaragua, and Costa Rica. Preserved larvae were available from U.S.A., Mexico, and Nicaragua only.

Hosts

Sugarcane, corn, Johnson grass, sorghum, wheat, rice, barley, sudan grass, pampas grass, bristle grass, bullrush, lemon grass, and other Graminae (Johnson, 1981).

Material Examined

USA: California, Holtville, 4-II-1945, no collector recorded, corn, USNM #45-6040 (4 larvae); Texas, Weslaco, 10-V-1981, lab colony, K. Johnson (1 pupa, 1 larva); Mission, 27-III-1981, R. Baranowski, sugarcane (4 larvae); MEXICO: Las Mochis, XI-1921, R. Van Zwaluwengurg, sugarcane (2 cast pupal skins); Marin, Nuevo Leon, 23-V-1981, F. Bennett (6 larvae); NICARAGUA: Managua, 12-VII-1971, E. Vogel, rice (5 larvae).

Larval Diagnosis

SV group on the mesothorax and metathorax unisetose; and general characteristics of the subfamily Crambinae.

Larval Description

The larva was illustrated by Johnson (1981) and by Capps (1963) as *Chilo* sp.

Pupal Diagnosis

Paired curved hooks on the dorsum of A1-8 present, cremaster consists of a flattened plate-like structure with 2 points at each end.

The pupa somewhat resembles *Corcyra cephalonica* in that both species have a shortened maxillae and paired dorsal abdominal appendages. However, *E. loftini* differs from *C. cephalonica* in that the appendages are pointed and not located so close to the midline.

Pupal Description

The pupa was superficially illustated by Johnson (1981). Sometimes the apex of the cremaster is notched.

Biology

The biology was given by Johnson (1981). The eggs were yellow and arranged in a mass, but unlike *Diatraea saccharalis* do not overlap. The preferred oviposition site was usually between the leaf sheath and stalk. The eggs may be laid on dry plants. *E. loftini* was an internode borer like other *Diatraea* spp. except that a higher percentage of their tunnels were transverse (across the internode) in addition to the normal longitudinal ones. King and Saunders (1984) stated that pupatopm occurred in the stem of the host but Johnson (1981) found pupae in the soil also.

Pest Status

No specimens were collected in Honduras (Passoa, 1983). However, this species caused serious damage to sugarcane in Texas where yields were reduced up to 64% (Roseff, 1981). A discussion following the above paper produced comments such as "during the 30 years I have been traveling throughout the world, I had never seen a problem as serious as the one caused by this borer (*E. loftini*)" (Flores in Roseff, 1981). *E. loftini* is considered a potential pest in Honduras because of the serious damage this pest can cause in sugarcane.

Fissicrambus sp. or Genus Near

(Figs. 349-357)

Synonyms

None in common usage.

Common Name

The identity of this species remains in doubt so no common name will be proposed. One species, *Crambus caliginosellus* of the United States, is called the corn root webworm (Werner, 1982).

Distribution

The following records were cited as *Crambus* sp.: El Salvador (McGuire and Crandall, 1967); Costa Rica, Panama (King and Saunders, 1984); Honduras.

Hosts

Corn (McGuire and Crandall, 1967); rice, sorghum (Saunders et al., 1983). The record of *Crambus* sp. on beans by Mancia and Cortes (1975) needs confirmation since *Crambus* spp. are generally associated with the Graminaceae.

Material Examined

COSTA RICA: Turrialba, 10-I-1982, A. King, reared ex larva in a corn stalk (seedling), genitalia slide #374 SPC (1 adult). HONDURAS: Dept. of Copan, Plano Grande, 30-IV-1982, G. Evans, inside corn stalk, mandible slide #218, 219 SPC (6 larvae); San Juan (de Opoa?), 10-IV-1982, G. Evans, label data reads "on corn foliage/in the soil", mandible slides #287, 288 SPC (3 larvae); EAP, 25-VII-1983, S. Passoa, sorghum seedlings, mandible slide #235 SPC (2 larvae); Comayagua, 30-IV-1980, S.

Passoa, mating pair at lights, genitalia slide #401, mandible slide #325 SPC (2 adults, eggs and 10+ first instar larvae).

Some of the specimens collected at lights from Comayagua and El Zamorano that await genitalic dissection may be in the genus *Fissicrambus*.

Larval Diagnosis

Prespiracular group of the prothorax extends below and behind the spiracle; and general characteristics of the subfamily Crambinae.

Larval Description

The larvae available to me from Honduras were either poorly preserved or early instars.

The general coloration of a "*Crambus*" sp. described by King and Saunders (1984) is in fairly close agreement to the specimen illustrated here.

Pupal Diagnosis

Maxillae almost reach the caudal wing margin; lateral groove present on A10; cremaster spines straight, not hooked; and general characteristics of the subfamily Crambinae.

Pupal Description

The pupa is unknown to me.

Biology

The biology was briefly studied in Central America by King and Saunders (1984). Larval usually fed at the base of the stem and pupated in the soil or plant debris.

Pest Status

Passoa (1983) did not collect this species in Honduras but King and Saunders (1984) noted serious stand reductions in some areas of Costa

Rica. The plants were more susceptible during the dry months of the year.

Comments

The genus Crambus was large and included many unrelated species prior to Bleszynski's (1967) list. New genera were created as the genus Crambus was restricted and split. This classification was only recently adapted for the North American fauna (Hodges et al., 1983).

The reared adult from Costa Rica on corn resembles Fissicrambus profanellus, a species distributed from the USA to Guatemala (Bleszynski, 1967). Some of the citations for Crambus sp., or perhaps all, refer to this genus. F. profanellus was also placed in the genus Crambus prior to 1963. The genitalia of the Costa Rican specimen is illustrated in the hope that an exact identification and comparison with any future reared Honduran material will be possible.

The characteristics listed in the larval diagnosis section are general and thus will fit any member of the Crambus genus complex. The SD1 seta on the Honduran larvae does not surround the spiracle on A1-8. In addition, the spinneret has two microsetae at the apex and there are no oval pinacula without setae posterior to V1 on the thoracic segments. These features, based on larval Crambinae in Florida, show the larvae are closely related to Fissicrambus, if not actually this genus (Tan, 1984). Most Honduran specimens have weak tonofibrillary platelets but in one larva they are deeply pigmented. This may not be conspecific with the others. Many larvae show pigmented setal bases, especially on SD1.

The pupa is unknown and the illustrated specimen is of a Fissicrambus sp. from Florida. Honduran material should be very similar.

Other North American pupae were illustrated by Crawford (1961) and Ainslie (1923).

Myelobia decolorata (Herrich-Schaffer)

(Figs. 348)

Synonyms

Morpheis decolorata Herrich-Schaffer.

Common Name

This species has no common name. None will be proposed here due to its minor importance .

Distribution

Colombia, Venezuela, Brazil (Bleszynski, 1967); Mexico, Honduras.

Hosts

Bamboo (Forbes, 1926); possibly corn (see comments section).

Material Examined

MEXICO: 18-III-1948, no collector recorded, in green bamboo, USNM #48-4710, det. Capps with doubt (1 larva); HONDURAS: Tegucigalpa, 30-IV-1957, A. Banegas, corn (1 adult).

Larval Diagnosis

Each segment, except the prothorax, with a pinkish transverse band that extends from one spiracle to the other across the dorsal surface.

The coloration of this species is distinctive.

Larval Description

The larva was determined with doubt, and is of minor economic importance in Honduras, so no description will be given.

Pupal Diagnosis

The pupa of *M. decolorata* is unknown.

Pupal Description

Not available.

Biology

Little is known about this species other than taxonomic descriptions of the adults (Hampson, 1917; Forbes, 1926; Bleszynski, 1967; Whalley, 1964). The larva is a borer in bamboo (Forbes, 1926).

Pest Status

No outbreaks of this insect were recorded in Honduras (Passoa, 1983).

Comments

The Comayagua collection card file (#136) lists the host as "from corn". It is not known whether the specimen was reared or was just resting on the plant.

This genus was placed in the Galleriinae until Forbes (1926) transferred it to the Crambinae. The larvae have traces of a faint mesothoracic bar and the chaetotaxy fits Allyson's (1976) definition of the subfamily. Myelobia decolorata has the V setae of A9 twice as far apart from each other as the V setae on A10. In addition, the L setae is unisetose on A9. The short row of crochets on the lateral portion of A3-6 ally this species with the Argyriini or the Chilini and not the Crambini.

The larval determination of this species needs confirmation. I have accepted it on the basis of the host data.

Bleszynski (1967) does not list the author's name in parenthesis even though the original description cited by Hampson (1917) used the genus Morpheis. The USNM larval specimen and the Comayagua card file both use parenthesis around the author's name so this usage is followed here in the absence of access to the needed literature.

SUBFAMILY PYRALINAE

The subfamily Pyralinae is a small group distributed worldwide. Hampson (1896) associated the Pyralinae with the Endotrichinae and the Epipaschiinae but the Endotrichinae are now considered part of the Pyralinae (Fletcher and Nye, 1984). Dyar (1908) studied the american fauna.

Little information is available on the pupae of the Pyralinae. Mosher (1916) characterized this subfamily by the presence of maxillary palps, by the slit-like mesothoracic spiracle, and by the crenulate margin of the dorsal furrow. Both maxillary palps and a crenulate dorsal furrow also occur within the Epipaschiinae although the margin on the Pyralinae is more deeply crenualte and spine-like. Sometimes the dorsal furrow is absent (*Hypsopygia*). Pupation, at least in the case of *Pyralis*, occurs in a tough cocoon of silk and debris.

Pyralinae larvae usually feed on dead or dried plant matter. *Pyralis*, *Aglossa*, and *Hypsopygia* are pests of stored products (Hinton, 1943). *Herculia* fed on baled alfalfa hay during late autumn in Puerto Rico (Wolcott, 1948). One neotropical species is said to be parasitic on saturniid caterpillars in Brazil (Costa Lima, 1950).

The simpliest diagnosis of the subfamily was given by Allyson (1977a). Pyralinae larvae were recognized by the sclerotized ring around the SD1 seta of A8, the trisetose L group on A9, and the distance between the V1 setae on A7 is subequal to the distance between the same setae on A9. The ratio of the V1 setae on A7 and A9 is subequal in *A. glossa* but not in *P. farinalis*. The latter of 8:5 on A7 and A9. The fauna of Europe was treated by Hasenfuss (1960) and Carter (1984) while many of the economically important species were studied by Hinton (1943). Dyar's (1908) placement of *omphalocera* in the Pyralinae seems justified because the larvae fit Allyson's (1977a) diagnosis of the subfamily. As mentioned under the subfamily Galleriinae, the larvae of *omphalocera* lack the characteristic sclerotized ring round SD1 of A1. The long maxillae, somewhat slit-like mesothoracic spiracle, and the shallow groove on A9 with irregular margins are consistant with the pupal characteristics of some Pyralinae.

The only species of possible economic concern to Honduran entomologists is *Pyralis manihotalis* but at present this species appears quite rare throughout its range.

Pyralis manihotalis (Guenee)

(Figs. 358-360)

Synonyms

None in common usage.

Common Name

Saunders et al. (1983) listed the name market moth.

Distribution

Widely distributed (Schaus, 1940); Indoaustralian region, Africa, tropical America, Hawaii (Corbet and Tams, 1943); South America and the West Indies (Zimmerman, 1958); Bermuda (Ogilvie, 1928); Central America (Saunders et al., 1983).

There are no records of *P. manihotalis* from any specific Central American countries.

product Pyralids in that it prefers damp and spoiled grain (Cotton and Good, 1937a; Anonymous, 1958). This may also be true of *P. manihotalis*. Both insects are stored products pests.

Pest Status

Saunders et al. (1983) considered *P. manihotalis* to be a pest in Central America but the insect has never been collected in Honduras (Passoa, 1983). Wolcott (1948) recorded minor damage to grains in Puerto Rico. *P. manihotalis* is therefore considered to be a potential pest in Honduras.

SUBFAMILY CHRYSAUGINAE

The subfamily Chrysauginae is almost exclusively Neotropical in distribution. Adults are unusual in that the costa of the forewing shows marked sexual dimorphism (Hampson, 1897). The costal margin is modified and sinuate in the males while the females have a straight wing edge. Structural modifications of the wing margin also may involve changes in wing veination (Forbes, 1923). The North American members of this subfamily were recently revised by Cashatt (1968) while the world fauna was reviewed long ago by Hampson (1897).

The pupae of this subfamily were not studied by Mosher (1916). Based on very limited material (5 cast skins and one preserved pupa from 3 genera) the pupa of the Chrysauginae are distinguished from all other Pyralidiformes subfamilies, except many of the Epipaschiinae, by the lack of maxillary palps. Some Chrysauginae (*Caphys*) are then separated from the Epipaschiinae in that the former lacks a well developed dorsal groove lined with setae between segments A9 and A10.

Larval habits are varied. Forbes (1923) stated that many species are leaf rollers. *Bonchis munitalis* occurs in the fruits of the Bignoniaceae, especially *Crescentia*. *Caphys bilineata* was reared as a scavenger on dried mango fruit at the Panamerican Agriculture School, El Zamorano. A Florida species, *Parachma ochracealis*, was reared from moist wood shavings used as a mulch. *Potosa* sp. is commonly associated with orchids in Mexico (Capps, 1952).

Larval morphology is also variable. Some species have large plate-like pinacula (Caphys) while in others a sclerotized ring is present on the SD1 seta of the metathorax and A8 (Parachma). Bonchis lacks both rings and has normal sized pinacula. Allyson (1977a) distinguishes the Chrysauginae by their sclerotized rings on the metathorax and A8 in addition to a trisetose] group on A9. This definition of the subfamily will hold as long as the larva does indeed possess rings. Rings may be difficult to locate against a black ground color as in Parachma. The crochets of some Chrysauginae are uniordinal (Forbes, 1923) which is unusual among the Pyralidae. Pelasgis has the L group on A9 bisetose (Anonymous, 1982) in contrast to the other know Pyraliformes.

Only two genera were encountered in Honduras. Caphys bilineata is a scavenger of no known importance. Bonchis munitalis attacks Crescentia which has the Spanish common name "jicaro". This tree has little cash value: the dried fruit still are commonly used as scoops and plates Hondurans (Williams, 1981) and the seeds are the essential ingredient in "horchata", a very popular drink. Both insects are common members of the pyralid fauna.

Bonchis munitalis (Lederer)

(Figs. 361-363)

Synonyms

Ethnistis munitalis Lederer.

Common Names

B. munitalis does not have a common name (Werner, 1982; Saunders et al., 1983). A distinctive and appropriate name is calabash fruit borer.

Distribution

Tropical America, Puerto Rico (Schaus, 1940); USA (Kimball, 1965); Cuba (Bruner et al., 1975); West Indies (Hampson, 1897); Antilles, Honduras, Panama, Venezuela (Druce, 1881-1900); Mexico (Martell, 1974); Brazil (Costa Lima, 1950).

Hosts

Tabebuia heterophylla (Martorell, 1976); *Crescentia cujete* (Bruner et al., 1975); *Crescentia* sp. (Martell, 1974); *Parmentiera "cereifera"* (sic) *cerifera* (Kimball, 1965), *P. edulis*, and probably *P. aculeata*.

The Comayagua card file has a citation for *B. munitalis* on guajilote. Guajilote is not listed in Williams' (1981) annotated list of useful plants in Central America although cuajilote used for *Parmentiera aculeata*. Since this genus is a known host plant of *B. munitalis* it seems logical to assume that guajilote is cuajilote misspelled.

Material Examined

USA: Florida, Homestead, 12-XI-1979, em. 9-XII-1979, D. Habeck, ex larva on *Crescentia cujute*, A-2552, mandible slide #23, genitalia slide #46 FSCA (= slide #1031 Cashatt coll.), det. Cashatt (2 adults with cast pupal skins, 7 larvae); Homestead, 10-XI-1979, J. Keularts, *Crescentia cujete* fruit, det. Habeck (1 larva); MEXICO: no locality, 23-X-1943, no collector recorded, seed pods of *Parmentiera edulis*, lot 43-20377, det. ? (4 adults, 5 pupae, 3 larvae); HONDURAS: Comayagua; 8-XI-1980, em. 28-XI-1980, S. Passoa, ex fruit of *Crescentia* sp., mandible slide #136, genitalia slide #300 SPC (1 adult); Comayagua, 16-VIII-1979, S. Passoa, at lights (1 adult).

Larval Diagnosis

L group of A9 trisetose; sclerotized ring around the SD1 seta absent; D2 longer than D1.

B. munitalis and *E. zinckenella* are the only two species in this study that have a trisetose L group on A9 and lack sclerotized rings around the SD1 setae. *E. zinckenella*, except early instars, can be recognized by the characteristic pattern of black spots on the prothorax. *E. zinckenella* and *B. munitalis* can be separated in all instars by the length of the D setae on A1-7. In the former species the two are subequal, in the latter species D2 is longer than D1.

There is much variation in the arrangement of the L setae on A9 in *B. munitalis* but three setae are always present on at least one side of each specimen.

Larval Description

The host plant is of minor importance so a larval description is not justified.

Pupal Diagnosis

Intersegmental membrane between A9 and A10 with a dorsal groove lined with setae, the posterior margin of this groove straight, not dentate; maxillary palps absent; lateral and posterior margin of the prothorax meet at an angle of about 45 degrees.

Pupal Description

The host plant is of minor importance so a pupal description is not justified.

Biology

The biology of *B. munitalis* has never been studied in Honduras. The larvae are borers in the fruit of their host. The adult size varies, Honduran specimens are much larger than those from Florida.

Pest Status

Neither Saunders et al. (1983) nor McGuire and Crandall (1967) considered *B. munitalis* a pest in Central America. The Comayagua collection had a card that stated "Tegucigalpa, VI-3-1957, guajilote, Banegas, det. Capps - an important pest of this fruit [guajilote (sic) = cuajilote?], said fruit has not commercial value at present. A. D. Banegas, 1959". This species can damage its host and therefore could be considered a pest of *Crescentia* spp.

SUBFAMILY EPIPASCHIINAE

The subfamily Epipaschiinae is found throughout the world. Adults often have tufts of scales on the forewing below the discal cell and either the basal segment of the antennae, or the labial palps, upturned beyond the vertex in the males of some genera (Pinhey, 1975; Munroe, 1972). The fauna of the Western Hemisphere was partially catalogued by Holland and Schaus (1925) while the world fauna was last reviewed by Hampson (1896).

The pupae of some Epipaschiinae may be identified by the absence of maxillary palps and the presence of a dorsal groove between segments A9 and A10 although the situation is clouded by exceptions. Both *Jocara* and *Calybitia* have a dorsal groove, but the maxillary palps are well developed. Confusion can occur with the Chrysauginae which share a similar set of features. Mosher (1916) could not decide if the dorsal furrow was lined with fine striations or setae. A scanning electron micrograph shows that, at least in *Pococera*, the groove is lined with setae. Most species pupate among host debris and form a tough cocoon of silk and frass.

The larval habits of many species are unknown. Certain larva in India "live in webs and make social cocoons" (Hampson, 1896). One unidentified Honduran species feeds on *Conocarpus erectus*. *Pococera atramentalis* is usually associated with corn and sorghum grain while *Jocara*, *Calybitia*, and *Stericta* are leaf tiers on avocado. In the FSCA there are six genera from a wide variety of hosts including trees

(Tetralopha on oak), poison ivy (Epipaschia), conifers (Tetralopha robustella). Tetralopha gelidalis feeds on Mimosa pigra (Habeck and Passoa, 1983).

Allyson (1977a) separated the Epipaschiinae larvae from other subfamilies by the trisetose L setae on A9; the presence of a sclerotized ring on SD1 of A8; and by the V1 setae being only half as far apart on A9 as they are on A7. Most Epipaschiinae larvae have obvious tonofibrillary platelets and longitudinal stripes on the body.

The Epipaschiinae associated with avocado need study especially with regard to distribution and identification characteristics of the immatures.

Calybitia picata Schaus

(Figs. 28, 364-367)

Synonyms

None in common usage.

Common Names

C. picata has no common name (Werner, 1982; Saunders et al., 1983). The name avocado leaf tier is descriptive of both the habits and the host of this pest.

Distribution

Guatemala (Holland and Schaus, 1925); Costa Rica, Honduras.

Hosts

Avocado is the only known host.

Material Examined

COSTA RICA: Turrialba, 17-XI-1953, C. Fleschner, avocado (1 larva); HONDURAS: EAP, 18-II-1981, em. 14-III-1981, D. Habeck, avocado, larva #274 SPC (4 adults with cast pupal skins); EAP, 14-XI-1981, em. 14-X-1981, S. Passoa, avocado (1 adult with cast pupal skin); EAP, 19-XI-1983, R. Caballero, avocado (1 adult with cast pupal skin); EAP, 21-IX-1981, S. Passoa, avocado (1 larva); EAP, 3-III-1981, Ochoa and Chaves, avocado, mandible slide #233 SPC (2 larvae); EAP, 12-I-1984, R. Caballero, avocado (2 larvae); EAP, 30-I-1981, Suira, avocado (2 larvae); EAP, 17-II-1981, D. Habeck, avocado, mandible slide #36 FSCA (30+ larvae).

Larval Diagnosis

Epicrania unmarked except for a black stripe that extends from the stemmatal area to the gena and beyond to pass between the prothoracic shield and the spiracle; and general characteristics of the subfamily Epipaschiinae.

The coloration of the head is distinct among the Epipaschiinae larvae included in this study.

Larval Description

The larva is of minor economic importance and does not justify a description.

Pupal Diagnosis

Intersegmental membrane between segments 9 and 10 with a dorsal groove; maxillary palps present; mesothoracic spiracle large, about two times the diameter of the spiracle on A2, and often surrounded by a shallow pit.

The pupa of *C. picata* is similar to *Jocara* sp. (*conspicualis* complex) except for a difference in the size of the mesothoracic spiracle. The mesothoracic spiracle is subequal to the diameter of the spiracle on A2 in *J. conspicualis* complex and there is no pit.

Pupal Description

C. picata is of minor economic importance and does not justify a pupal description.

Biology

The biology of *C. picata* in Honduras was never studied. Larvae were leaf tiers and pupation occurred on the host. Collection dates ranged from September to March with an apparent peak abundance in January or February.

Pest Status

C. picata was not considered a pest in Honduras or Central America (Koone and Banegas, 1958; Passoa, 1983; Saunders et al., 1983; McGuire and Crandall, 1967) even though larvae were present throughout most of the year on avocado. Damage from the leaf feeding was minor and this species is only known from one Honduran locality, the Panamerican Agriculture School.

Jocara sp. [*conspicualis* (Lederer) complex]

(Figs. 41, 55, 56, 368-371, 373, 374)

Synonyms

None in common usage.

Common Names

This insect has no common name (Werner, 1982; Saunders et al., 1983) and none will be proposed until the specific identity of this species becomes known.

Distribution

Brazil (Holland and Schaus, 1925); Honduras.

Hosts

Avocado is the only known host.

Material Examined

Honduras, Dept. de Francisco Morazan, Cerro Uyuceca, 6-VIII-1983, em. 28-VIII-1983, S. Passoa, ex larva on Persea americana variety nubigena, mandible slides #244, 307, genitalia slides #393, 394, 511, 512 SPC, det. Solis (13 adults, 20+ pupae, 40+ larvae).

Larval Diagnosis

Distance between XD2 and SD1 one half the distance between XD2 and XD1; hypopharyngeal complex with a series of peg-like spines; and general characteristics of the subfamily Epipaschiinae.

The peg-like spines on the hypopharyngeal complex readily separate the Jocara conspicualis complex from other species of Epipaschiinae included in this study. Other distinctive features include a large white rectangular patch anteroventrad of the SD1 setae on the prothorax in living larvae and the gregarious habits. Some Epipaschiinae are gregarious also but the larval damage of Jocara readily separates it from the other avocado feeder in this study, Calybitia, which is solitary.

Larval Description

This species is of minor economic importance and does not justify a description.

Pupal Diagnosis

Intersegmental membrane between A9 and A10 with a dorsal groove lined with setae; maxillary palps present; mesothoracic spiracle subequal to the vertical diameter of the spiracle on A2, pit never present.

The pupa of Jocara is similar to Calybitia except for the difference in size of the mesothoracic spiracle.

Pupal Description

This species is of minor importance and does not justify a description.

Biology

The biology of J. conspicualis complex is unknown. The larvae formed a dense nest of silk, frass, and leaves at the apex of an avocado branch. This species is only known from a single collection in a cloud forest near El Zamorano.

Pest Status

J. conspicualis was not considered a pest by Saunders et al. (1983) or McGuire and Crandall (1967). The damage from a single nest is not significant but high populations could probably strip an entire tree of leaves. Jocara conspicualis should be considered a potential pest until such damage is observed.

Comments

Other species of Jocara are also associated with avocado in the New World. Some of these include J. perseella in Florida (Kimball, 1965); J. majuscula in Cuba (Bruner et al., 1975); J. claudalis in Costa Rica (Ballou, 1934); and J. subcurvalis in Colombia (Posada et al., 1976) and Costa Rica (Ballou, 1934). The larvae of these species are unknown but they are very likely to be similar to J. conspicualis complex in structure and habits.

Another common avocado pest is Stericta albifasciata (Costa Lima, 1950; Kaye and Lamont, 1927) but this species is also unknown from Honduras at present (Passoa, 1983).

Preserved larvae of an unknown Epipaschiinae on avocado in Honduras were studied. They may be readily distinguished by the presence of a patch of pigmented granules around the SD1 seta of A1-8. These pigmented granules are also found in preserved larva of Stericta but a final determination of the Honduran larvae will depend on associating them with reared adults.

Unknown larve from avocado collected in El Salvador were also examined. They have a similar pattern on the prothoracic shield to a North American Jocara sp.

Pococera atramentalis Lederer

(Figs. 27, 29, 30, 43, 53, 54, 375-387)

Synonyms

None in common usage.

Common Names

P. atramentalis has no official common name (Saunders et al., 1983; Werner, 1982) but the names corn apex worm, corn worm, mature cornworm and cotton square borer were used in Peru (Sarmiento, 1981; Hoyle, 1961). These names are not distinctive since there are other caterpillars also found in the corn ear. Brown striped corn borer would help emphasize the color differences that exist between P. atramentalis and the other microlepidoptera larvae found in the corn ears. Cotton square borer is preoccupied by Strymon melinus, a lycaenid butterfly (Werner, 1982) and is not available.

Distribution

USA (Kimball, 1965), Central America, Puerto Rico, West Indies (Schaus, 1940); Costa Rica, Guatemala, Bolivia, Brazil, Colombia, Peru (Holland and Schaus, 1925); Uruguay (Biezanko et al., 1957); Honduras (Passoa, 1983); El Salvador.

Hosts

Corn, sorghum, loquat (Kimball, 1965); cotton, sunflower, castor bean, corn, sorghum, and pacae in Peru (Hoyle, 1961); Delonix regia, Terminalia catappa (Wolcott, 1948); Clerodendrum squamatum, Mangifera indica (Martorell, 1976); coffee (Silva et al., 1968).

Material Examined

USA: Florida, Miami, 23-IX-1980, em. 7 to 10-X-1980, K. Martin, ex larva on Eribotrya japonica, A-2700 DHC, det. Kimball (3 adults, 3 cast pupal skins); PERU: Lima, 7-VI-1965, K. Raven, SNA 118-65 (2 adults); Zarumilla, 12-X-1965, J. Lamas (1 adult); Pacasmayo, 17-VIII-1965, K. Raven (1 adult); La Molina, 14-VI-1980, G. Sanchez (1 adult); COSTA RICA: Turrialba, 15-IX-1980, A. King, ex larva from corn ear, det. Ferguson (1 adult); EL SALVADOR: probably Santa Cruz Porrillo, V-1979, no collector recorded, sorghum (15+ larvae); HONDURAS: Choluteca, 10-XI-1980, em. 28-XII-1980, R. Nolasco, ex larva on sorghum (panicle), larva #263 SPC, det. Ferguson (2 adults with pupal cases, 3 pupae, 6 larvae); La Paz, 18-VII-1979, S. Passoa, ex larva in corn ear, genitalia slide #136, mandible slide #114 SPC, det. Ferguson as Pococera sp. (1 adult in poor condition); El Zamorano, 15-XII-1981, S. Passoa, ex larva from sorghum panicle (1 adult, 2 pupal cases, 1 pupa); El Zamorano, 2-IX-1981, em. 15-XII-1981, S. Passoa, ex larva from sorghum panicle (1 adult, 2 pupal cases, 1 pupa); El Zamorano, 2-IX-1981, em. 15-IX-1981, S. Passoa, ex larva from corn silk, mandible slide #183, 197, 306, larva #305 SPC (3 adults with pupal skins, 1 larva); El Zamorano, 31-VIII-1981, em. 13-IX-1981, S. Passoa, ex larva from corn silk, larva #282 SPC (1 adult with cast pupal skin, 5 larvae); El Zamorano, 20-VIII-1982, R. Jones, ex larva from sorghum panicle (1 adult with pupal case); Comayagua, 28-VI-1980, no collector recorded, sunflower (5 larvae); Comayagua, 12-VII-1980, no collector recorded, castor bean (7 larvae).

Larval Diagnosis

First and sometimes the second molar ridge with an inner tooth; XD2 equidistant from SD1 and XD1; and general characteristics of the subfamily Epipaschiinae.

Larval Description

General. Ground color varies from a light tan-brown to a deep chocolate-brown. Five longitudinal stripes are present, each side has a subdorsal and lateral stripe along with the single middorsal one. The subdorsal stripe is twice as wide as the others. Tonofibrillary platelets present on the head and body.

Skin texture strongly granulate; crochets in a biordinal circle; mature larva approximately 15 mm long.

Head. Front extends 1/2 the distance from the clypeus to the epicranial notch; Adf2 lies above the apex of the front; Adf1 subequal in length to Adf2; F1 seta about twice the length of the Adf seta; C2 shorter than C1; P1 three times the length of P2; A1 twice the length of A2, A3 three times the length of L1.

Six stemmata present; stemmata 1, 2, and 3 equally spaced; stemma 1 larger than stemma 2; stemmata 3 and 4 almost touch; stemmata 5 and 6 nearly in a horizontal line.

Labrum with M2 longer than M1 or M3, L2 longer than L1 or L3, length of L1 twice that of L3.

Mandible with three teeth, sometimes worn smooth, first and sometimes the second molar ridges with an inner tooth, both mandibular setae subequal in size.

Hypopharyngeal complex with an elongate pointed spinneret equal to slightly less than two times the length of the basal segment of the labial palps, proximomedial area with a series of fine spines dorsad of two ridges on each side of the midline.

Thorax. Prothoracic shield with XD1, XD2, and SD1 equidistant from each other in a vertical line, XD2 half the length of XD1 and SD1; D1 only 1/3 the length of XD1; SD2 seta 1/4 the length of D2; L1 and L2 on an elongate semicircular pinaculum; SV1 twice the length of SV2; V1 posteroventrad of the coxa and close to the midline.

Mesothorax with D1 1/3 the length of D2; SD setae slightly anteroventrad of the D pinaculum; L3 separated from the L1 and L2 pinaculum by almost the vertical diameter of the latter pinaculum; SV1 ventrad of L3; V1 farther from the midline on the mesothorax than V1 on the prothorax.

Abdomen. A1 with the D setae in a horizontal line, D2 longer than D1; SD1 posterodorsad of the spiracle; SD2 anterodorsad of the spiracle; L1 posteroventrad of L2, L3 subequal to L1 in length; SV group trisetose, SV1 longer than SV2 or SV3; V1 ventrad of SV2.

A6 with the D setae as in A1; SD1 dorsad of the spiracle; SD2 anterodorsad of the spiracle; L setae as in A1; SV group trisetose; V1 posteroventrad of the proleg.

A8 with the D setae in a horizontal line; SD1 seta long, three times the length of D1 and surrounded by a sclerotized ring at the base; L1 and L2 in a horizontal line; L3 separated from the bisetose SV group by about the diameter of the L3 pinaculum; V1 anteroventrad of the SV setae.

A9 with the D2 setae fused on an elongate pinaculum; SD1 twice as long as D1; L group of A9 trisetose; SV1 dorsad of V1.

Anal shield with D2 and SD2 longer than SD1, a horizontal line drawn through the D1 seta passes above SD2.

Pupal Diagnosis

Intersegmental membrane between segments 9 and 10 with a groove, the posterior margin of this groove dentate; maxillary palps absent.

The dentate margin of the dorsal groove is distinctive among the pupae in this study. *Pyralis* has a similar posterior margin except that the teeth are much larger and more strongly pointed. In addition, *Pyralis* has maxillary palps which are lacking in *Pococera*.

Pupal Description

General. Pupa reddish-brown, length about 8 mm.

Head. Vertex without setae; labrum semicircular; labial palps shaped like an inverted tear drop; maxillary palps absent; postgenae obvious; maxillae and antennae extend to the caudal wing margin.

Thorax. Prothoracic femur exposed, equal to about 1/3 the length of the prothoracic leg; length of prothoracic leg about 3/4 that of the maxillae; mesothoracic spiracle indicated by a dark rectangular spot; texture of the thorax slightly roughened.

Abdomen. Spiracles slightly tubular, those of A2 and A3 with furrows; proleg scars present on A5 and A6; dorsum of the intersegmental membrane of A9 and A10 with a groove lined with fine yellow setae, posterior margin of the groove dentate; cremaster consists of 6 curved spines, 4 are oriented in a horizontal line dorsally, the other two are ventrad.

Biology

The biology was studied by Hoyle (1961) in Peru. Corn silk was a frequent oviposition site but eggs were placed on the leaves of the host if no flowers or fruits were available. Corn was considered the most suitable food followed by castor bean and cotton. No preconditioning effect was demonstrated; even if the larvae first fed on corn they were able to complete development on cotton or castor bean. The total life cycle varied from 19-43 days depending on the season and 7 to 9 generations per year were suspected.

Jones (personal communication) noted that the peak larval density for P. atramentalis in corn occurred from mid-August to early September while the peak density in sorghum occurred in early December. These data were taken at the Panamerican Agriculture School in Honduras. P. atramentalis is often associated with Pyroderces probably rileyi (Walshinghan) on the sorghum panicle where the two species fed on the grain (Passoa, 1983).

Pest Status

Hoyle (1961) and Willie (1952) reported outbreaks of P. atramentalis on corn, sorghum, and cotton in Peru. Two species of Pococera are pests in Central America (Saunders et al., 1983). Passoa (1983) considered P. atramentalis a sporadic pest capable of causing serious damage to sorghum. Most of the damage to corn ear tips is probably not significant at normal population levels.

Comments

Pococera dryospila Meyrick was considered to be a pest in Central America according to Saunders et al. (1983). No information is available on this species but most specimens of Pococera from Honduras were determined as P. atramentalis. Adults should be reared occasionally to confirm that larval populations do not represent a mixture of two species.

P. atramentalis and *Mescina* spp. were frequently confused until Hoyle (1961) gave superficial characters to separate the two. At present *Mescina* sp. has not been reported from Central America as a pest.

SUBFAMILY GALLERIINAE

The Galleriinae are a small but distinct subfamily found world wide. They were recently catalogued by Whalley (1964) who divided them into three tribes: Galleriini, Megarthridiini, and the Tirathabini. At that time he noted the Macrothecinae were doubtfully distinct as a separate subfamily. This opinion was shared by the editors of the Moths of North America checklist who sunk the subfamily Macrothecinae to a tribe, the Macrothecini (Hodges et al., 1983).

The pupae of the Galleriinae (except the Megarthridiini) may be characterized by their shortened maxillae that only reaches about 3/5 the distance to the caudal wing margin and by the lack of a mesothoracic spiracle. Both *Corcyra cephalonica* and a pupa, tentatively determined as *Trachylepidia fructicassiella* from *Cassia* pods in Honduras, have paired abdominal processes. In *Corcyra* these processes are parallel to each other but in *Trachylepidia* they are above one another in a vertical arrangement. The abdominal texture of *Galleria melonella* is spinose and there are no processes.

Mosher (1916) doubted that the subfamily Galleriinae should be included in the Pyralidae because of the poorly developed pilifers, median thoracic crest, and shortened maxillae. A study of other species has shown these characters are not so unusual. The pilifers vary and are well developed in *C. cephalonica*. A shortened maxillae can be found in the Crambinae (*Diatraea*), some Pyraustinae (*Polygrammodes*) and rarely in the Phycitinae (Ectomyelois). The latter genus also has a well developed thoracic crest.

Most larvae of the Galleriinae may be recognized by the presence of a sclerotized ring surrounding the SD1 setae on A1 and a lack of a sclerotized ring on SD1 of the mesothorax. The larval characteristics conflict with the adult classification in two respects. Omphalocera and Thyridopyralis, both in the tribe Megarthridiini, lack a sclerotized ring around SD1 of A1. The pupa of Omphalocera is also unlike other Galleriinae especially with regard to the well developed mesothoracic spiracle and the maxillae that reach the caudal wing margin. As stated previously, Omphalocera belongs in the Pyralinae based on larval and pupal features. The tribe Macrothecini could deserve more than tribal status since the fusion of the prespiracular group with the prothoracic shield is a major difference that readily separates their larvae from the other Galleriinae. Whalley (1964) thought the whole subfamily Galleriinae deserved family status so clearly there is room for more studies on the higher classification of this interesting group. The larva of Thyridopyralis, although poorly preserved, appears to have the L3 seta present on the mesothorax and metathorax which confirms its placement in the Pyralidae instead of the Thyrididae.

Larval habits are quite varied. Many are associated with the nests of Hymenoptera such as honeybees, vespids, bumblebees, or ants (Hampson, 1917). Others are pests of palms, graminaceous crops, or stored products (Whalley, 1964). Macrotheca angulalis was found in Cupressus cones (Allyson, 1977b) while M. unipuncta was collected under the bark of Vitis (Liebherr, 1977). In this study only C. cephalonica and G. melonella were encountered. None of the regional lists in Latin America mention other potential pests in this subfamily such as Paralipsa or Aphomia which attack stored products. However, A. grisella (the lesser wax moth) was found in beehives in Uruguay (Biezanko et al., 1957) and Puerto Rico (Wolcott, 1948) but not in Central America (Saunders et al., 1983). Capps (1963) recorded Alpheias conspirata as a pest of pineapple in Mexico. A key to Lepidoptera found in beehives was given by Okumura (1955) while Hinton (1943) discussed the Galleriinae of importance in stored products.

Corcyra cephalonica (Stainton)

(Figs. 32, 388-391)

Synonyms

None in common usage.

Common Name

The Entomological Society of America common name list does not include this species. Rice moth was used by both Saunders et al. (1983) and Hodges (1979). This name is appropriate as C. cephalonica frequently attacks rice and other stored products. Australian dried fruit bug was listed by McGuire and Crandall (1967) but the name in no way relates to this moth.

Distribution

Throughout tropical America (Schaus, 1940); cosmopolitan including Africa, Asia, and the Far East (Hodges, 1979); Mexico, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama (McGuire and Crandall, 1967).

A country by country list was given by Hodges (1979).

Hosts

Stored cereals and grains (corn, rice, sorghum, and wheat), chocolate, cake, dried fruit, pigeon pea, cowpea, and even rat bait (complete list in Hodges, 1979); *Simaruba glauca* (Berry and Vaquero, 1957); animal feed, cocoa, nutmeg (Gooding, 1980); cotton seed (Hargraves, 1948); garbanzo beans, chickpea, *Prosopis juliflora* (Wolcott, 1948); *Lactuca scariola*, *Bertholletia excelsa*, chicory, mustard, turnip, and *Papauer somniferum* (Silva et al., 1968); sesame, tamarind and other legumes (Martorell, 1976).

Rice is the main host (Hodges, 1979).

Material Examined

HONDURAS: Comayagua, 8-IV-1980, em. 20-IV-1980 to 16-V-1980, S. Passoa, stored sorghum seed from Choluteca, larva #192, mandible slide #121, genitalia slide #144 SPC (6 adults, 3 cast pupal skins, 1 pupa, 18+ larvae); Comayagua, 11-XII-1981, K. Carroll and J. Zeller, wheat flour (1 larva).

Larval Diagnosis

Six stemmata present; peritreme of the spiracles thickened on the posterior margin; and general characteristics of the subfamily Galleriinae.

The spiracles, strongly sclerotized ring on the SD1 seta of A1, and the six stemmata will easily distinguish this species from *Galleria melonella*.

Larval Description

The larva was illustrated by Hinton (1943), Ensminger (1958), Nicol (1935), Piltz (1977), and Carter (1984).

Pupal Diagnosis

Maxillae short, less than 3/5 the distance to the caudal wing margin; mesothoracic spiracle absent; dorsal surface of A1-8 with paired processes arranged horizontally near the midline.

The pupa is distinctive and cannot be confused with any other species in this study.

Pupal Description

The pupa was described by Carter (1984) and illustrated by Nicol (1935).

Biology

The biology was reviewed by Hodges (1979). Larval damage was caused by direct feeding on the grain or by contamination of the grain with frass and silk. Males sometimes had one fewer larval molts than the females. The physical form of the grain (kernels broken or whole), temperature, and relative humidity all affected larval survival. Low carbohydrates limited larval growth. The food must contain a source of biotin or linoleic acid to be suitable. Adults lived anywhere from 11-22 days.

Piltz (1977) noted that *C. cephalonica* needed a minimum 18 C and a relative humidity of 30% to survive.

Pest Status

C. cephalonica was considered a serious local pest in Honduras (Passoa, 1983) but further collecting might show this insect to be widespread throughout Honduras. The few attacks seen involved heavy damage due to consumption of the grain as well as fouling of the substrate with silken webs.

Nicol (1935) recorded serious damage to cocoa in Venezuela.

Galleria mellonella (Linneus)

(Figs. 31, 392-395)

Synonyms

None in common usage.

Common Name

The accepted Entomological Society of America common name is greater wax moth (Werner, 1982). Other names include bee moth, bee miller, wax miller, webworm (Whitcomb, 1965), and honeycomb moth (Carter, 1984).

Distribution

Universally distributed (Schaus, 1940); Europe, North America, Africa, Australia (Watson et al., 1975); Honduras.

Hosts

Wax in beehives is the major food (Whitcomb, 1965).

Material Examined

USA: Florida, Gainesville, 24-IV-1982, S. Passoa, on artificial diet in lab culture (6 larvae, 30+ pupae); Gainesville, 26-III-1982, S. Passoa, at lights (1 adult); HONDURAS: EAP, no date or collector, ex larva from beehive (1 adult); Agua Fria (near Choluteca), 2-III-1981, S. Passoa, attached to walls of beehive (10 cast pupal skins); Comayagua, 10-VIII-1975, no collector or host recorded (3 larvae).

Larval Diagnosis

Four stemmata present; peritremes of spiracles not thickened on the posterior margin, and general characteristics of the subfamily Galleriinae.

The four stemmata separate this species from the lesser wax moth which usually has no stemmata [Hinton (1943) reported a vestigeal stemma-like structure in a few specimens of the lesser wax moth]. C. cephalonica, the only other Galleriinae treated in this study, has six stemmata and the peritreme of the spiracles thickened on the posterior margin.

The ring on A1 can be quite thin and faint in some specimens (Okumura, 1955) and varies from a crescent to a circle.

Larval Description

The chaetotaxy of the larva was illustrated by Peterson (1962), Forbes (1923), and Carter (1984); the head and mouthparts were described by Hinton (1943).

Pupal Diagnosis

Maxillae short; mesothoracic spiracle absent; dorsal surface of the abdominal segments spinose and without processes.

Pupal Description

The pupa was illustrated by Mosher (1916).

Biology

The biology was summarized by Whitcomb (1965) and Beck (1960). The eggs were usually laid in cracks between the hive parts, especially in areas of darkness. First instar larvae fed on the surface of the wax and later bored into the comb. The larval period varied from 30 to 150 days. The pupae was formed in a tough white cocoon that was very obvious in the case of serious outbreaks.

The eggs of G. mellonella were illustrated by Peterson (1963) and the adult was illustrated in Watson et al. (1975) in color.

Pest Status

Serious damage from G. mellonella was reported in Puerto Rico (Wolcott, 1948) and Bermuda (Ogilvie, 1928). The greater wax moth can be considered a widespread, serious, and sporadic pest of beehives in Honduras. Healthy hives can defend themselves against attacks of the greater wax moth but an already weakened hive may be destroyed (Whitcomb, 1965). Inspecting the hive, especially during times of stress, will help to maintain the colony before damage becomes severe.

SUBFAMILY PHYCITINAE

The Phycitinae are a large group distributed throughout the world. Heinrich (1956) reviewed the American fauna while Roesler (1973) treated a portion of the Palearctic species. A catalogue of the subfamily was prepared by Whalley (1970). Most species have elongate triangular forewings colored with grayish lines or dots.

Several genera of Phycitinae are pests of stored products which prompted intensive studies on their biology (Benson, 1973) and identification (Corbet and Tams, 1943; Hinton, 1943; Aitkin, 1963). The most important pests are *Plodia*, *Ephestia*, *Anagasta*, and *Cadra*.

Two genera of Phycitinae were utilized in successful biological control programs against weeds. *Cactoblastis* controlled *Opuntia* cactus in Australia and Hawaii (Zimmerman, 1958). *Vogtia* was used in the southern United States against alligator weed (Coulson, 1977). The status of the many Phycitinae associated with cactus will depend on the locality. *Opuntia* is cultivated in certain parts of Latin America (Williams, 1981) which means that the same insect can be a pest in one area or a useful biological control agent in another. *Opuntia* is of no importance in Honduras either as a weed pest or as a crop. The cactus feeding Phycitinae were studied by Mann (1969).

Most phycitine pupae may be recognized by their characteristic mesothoracic spiracle which has the opening dorsad of the suture that divides the prothorax from the mesothorax. This placement causes the spiracle to appear prothoracic instead of the usual mesothoracic position found in all other subfamilies. In addition, the mesothoracic spiracle of the Phycitinae is frequently tubular. This feature is not distinctive because some Asian Crambinae may also have tubular mesothoracic spiracles. However, this type of spiracle is not known, as yet, from the Epipaschiinae or Chrysauginae, the other two subfamilies with a gibba. Certain genera of Phycitinae lack a mesothoracic spiracle (Neunzig, 1979) which could cause confusion with the Galleriinae. However, the Galleriinae have a shortened maxillae which is rare in the Phycitinae (except for Cactoblastis and Ectomyelois). A gibba, found in many Phycitinae, is never found in the Galleriinae. Finally, confusion could occur with certain Pyraustinae that have the opening apparently on the prothorax. They may be separated from the Phycitinae due to the slit-like nature of the spiracle, the lack of a gibba, and by the fact that at least the posterior half of the spiracle still lies on the mesothorax. Care should be taken to carefully follow the course of the suture between the prothorax and the mesothorax since it frequently curves anteriorly to give the spiracle a prothoracic appearance even though its location is still mesothoracic.

The illustration of a Vitula pupa by Okumura (1966) shows a mesothoracic spiracle in contrast to specimens in the Illinois Natural History survey collection which have the spiracle in the normal Phycitinae location on the prothorax.

Most Phycitinae larvae may be recognized by the presence of a sclerotized ring around the SD1 seta of the mesothorax but the ring is sometimes absent (Heinrich, 1956) or unpigmented. Only the subfamilies Chrysauginae and Phycitinae, among pyralid larvae with a trisetose L group on A9, lack sclerotized rings. When rings are absent there are no characters available to separate these two groups but a major problem is the scarcity of material in the Chrysauginae which prevents generalizations. Allyson (1977a) characterized the Chrysauginae by the presence of a sclerotized ring around the SD1 seta of the metathorax which is a distinctive feature when rings are present. Gerasimov (1947), based on the European fauna, noted that the Phycitinae may be recognized by the fact that SD2 is anterior or anterodorsad of SD1 on the mesothorax. Although this setal placement is not found in all Phycitinae it is unknown from the Chrysauginae at present. The latter subfamily has SD2 dorsad of SD1 in a vertical line (Gerasimov, 1947).

At the present time it is difficult to correlate Heinrich's (1956) revision of the adults with the larval morphology. However, the genera *Anagasta*, *Cadra*, *Ephestia*, *Plodia*, *Ephestiodes*, and *Moodna* (all members of Heinrich's group II, division C and E) group together by virtue of their granulate skin and D setae on A1-7 in a horizontal line.

Larval habits are quite varied and include stem feeders (*Elasmopalpus*), stored product pests, forest pests (*Dioryctria*, *Hypsiplyla*), borers in the pods of legumes (*Etiella*, *Fundella*), and species associated with corn and sorghum (*Moodna*). Leaf tiers are also commonly encountered (Neunzig, 1979). Some members of the genus *Acrobasis* live in a silken cone-shape tube (Neunzig, 1972). A very few Phycitinae are predators on scale insects (Costa Lima, 1950).

Amyelois transitella (Walker)

(Figs. 60, 400-403)

Synonyms

Paramyelois transitella (Walker); *Myelois venipars* Dyar.

Common Name

The accepted Entomological Society of America common name is navel orangeworm (Werner, 1982).

Distribution

USA, Mexico, Cuba, Dominican Republic, Guatemala, Panama, Colombia, Peru, Brazil (Heinrich, 1956).

Neunzig (1979) observed that the larvae may be transmitted to the cooler regions of the world in dried or partially dried fruit where they may survive for a short period.

Hosts

Jujube, loquat, prunes, and quince (Ebeling, 1959); *Gleditsia triacanthos*, *Acacia farnesiana*, *Cassia grandis*, *Pithecellobium flexicaule*, *Robinia* sp., peach, grapefruit, orange, figs, dates, apple, walnut, and almond (Neunzig, 1979); *Aesculus glabra*, *Cassia grandis*, *Genipa americana*, *Sapindus drummondii*, *Yucca* sp. (Heinrich, 1956); lemons (Simmonds and Nelson, 1975); apricots, pears, and pecans (Ensminger, 1958); *Erythrina cristagalli* (Hayward, 1941); cocoa, coffee, *Licania rigida* (Silva et al., 1968); pistachios (Andrews and Barnes, 1982); *Yucca aloifolia*.

Material Examined

USA: Florida, St. Augustine, 23-II-1975, D. Habeck, em 21-28-III-1975, reared ex larva on yucca (3 adults with 1 cast pupal skin); St.

Augustine, 23-II-1975, D. Habeck, Yucca aloifolia (50+ larvae); Merritt Island, 9-I-1977, em 22-III-1977 to 19-IV-1977, reared ex fruit of Yucca aloifolia, A-2113 DHC (8 adults); California, 11-X-1968, T. Ashley, carob seed pod (1 pupa).

Larval Diagnosis

SD1 on the mesothorax with an incomplete U-shaped sclerotized ring; D2 posteroventrad of D1; sclerotized crescent-shaped rings surrounding the SD1 pinacula of A1-7 absent (sometimes ring fragments in the form of an elongate-oval pigmented spot may be present touching the aveolus of SD1); sensilla styloconica of the maxillae simple, not forked; and general characteristics of the subfamily Phycitinae.

This species normally can be recognized by the characters given above but can be confused with E. ceratoniae when there is a pigmented spot above the SD1 pinaculum on A1-7. A. transitella larvae rarely have this pigmented spot. The form of the spot (not crescent shaped) and the position (touching SD1) will allow recognition of A. transitella. Neunzig (1979) discussed the separation of A. transitella from E. ceratoniae. Wade (1961) illustrated the variation in the shape of the sclerotized rings surrounding the SD1 setae on the mesothorax and A8.

Larval Description

The larva was described and illustrated by Hinton (1943), Wade (1961), Aitken (1963) and Neunzig (1979).

Larval coloration depends on age and the color of the food eaten (Wade, 1961).

Pupal Diagnosis

Maxillae shortened, extends only 4/5 the distance to the caudal wing margins; gibba absent; cremaster consists of 6 curved spines that arise from enlarged conical bases.

The cremaster of this species is distinctive.

Pupal Description

The pupa was illustrated by Neunzig (1979), Wade (1961), and by Goodwin and Madsen (1964).

Biology

The biology was discussed by Neunzig (1979). Development was continuous in tropical regions. Oviposition occurred on the fruit of the host. The larvae entered through minute cracks that developed as the fruit dried and matured. Sometimes the exit holes of various bruchids were utilized. The seed and surrounding tissues were consumed. Pupation occurred within the damaged pod in a silken tunnel.

The life cycle was illustrated by Simmonds and Nelson (1975) and Wade (1961).

Pest Status

No specimens have been collected from Honduras (Passoa, 1983). The wide distribution of this species throughout Latin America indicates it should occur there. Saunders et al. (1983) listed *A. transitella* as a pest in Central America as did McGuire and Crandall (1967). The larvae are a minor pest of oranges (Heinrich, 1956) although some damage has been reported from walnuts because the larvae attacked undamaged fruit (Wade, 1961). Mummified, dried, and damaged fruit are preferred over healthy fruit (Heinrich, 1956). In California, it is the key pest of almonds and pistachios (Andrews and Barnes, 1982). Damage to crops from *A. transitella* will likely be very minor in Honduras.

Anagasta kuehniella (Zeller)

(Figs. 396-399)

Synonyms

Anagasta kuhniella (Zeller); *Ephestia kuehniella* Zeller; *Ephestia sericarium* auctorum, not Scott.

Common Names

The accepted Entomological Society of America common name is Mediterranean flour moth (Werner, 1982). Other names listed by Saunders et al. (1983) are not appropriate.

Distribution

Nearly cosmopolitan (Heinrich, 1956); Nearctic, Palearctic, Ethiopian regions (Roesler, 1973); Africa and the Middle East (Gentry, 1965; Pinhey, 1975); New Zealand (Wise, 1955).

The only published Central American record for this pest was from El Salvador (Berry, 1959a). McGuire and Crandall (1967) listed only Mexico in a list of Central American pests and their distribution.

Hosts

Flour, grains, nuts, dried fruits, chocolate, seeds, biscuits, cakes, jellies, candies, and many other stored products (Heinrich, 1956); beans (Schoenherr and Rutledge, 1967); corn and pollen in beehives (Ensminger, 1958); citrus (Ebeling, 1959); barley, oatmeal, rice, rye, peas, soup powder, soybean, walnuts (Wise, 1955); buckwheat, cottonseed meal, dead insects (Richardson, 1926); wheat (Biezanko et al., 1957); spices, chamomile, roselle, cinnamon, licorice, ginger (Abd El Wahab et al., 1978); pepper, almond, walnut, acorn, soybean, mushroom, hemp seed, sesame seed, and stored potato (Carter, 1984).

Wheat and other flour grains are the preferred hosts (Heinrich, 1956). Richardson (1926) noted that legume grains, except peas, are not suitable for larval growth even though the adults readily oviposit on them. The records for beans and other legumes given above need confirmation in light of this conclusion.

Material Examined

USA: Florida, Gainesville, 20-XII-1982, S. Passoa, reared on artificial diet, larva #434, mandible slide #323, genitalia slide #294 SPC (14 adults, 20+ pupae, 1 larva).

Larval Diagnosis

D1 and D2 in a horizontal line on A1-7; L1 ventrad of L2, or nearly so, on A3; area enclosed by the SD1 pinaculum subequal to or greater than the area enclosed by the spiracle on A8; mandible with an inner tooth; and general charcteristics of the subfamily Phycitinae.

Larval Description

The larva was described and illustrated by Hinton (1942, 1943); Ensminger (1958); Hasenfuss (1960) and Peterson (1962).

Pupal Diagnosis

Maxillae extend 4/5 the distance to the caudal wing margin; texture of prothorax and mesal portion of mesothorax rough; texture of abdominal segments smooth, not punctate; cremaster composed of 8 curved spines; gibba absent; and general characteristics of subfamily Phycitinae.

The roughened texture of the thorax sets *Anagasta* apart from both *Plodia* and *Ephestia* (Heinrich, 1956).

Mosher's (1916) diagnosis of "*Ephestia*" *kuehniella* was incorrect and her specimens must have been misidentified. The maxillae do not extend to the caudal wing margin and the abdominal segments are not punctate.

Pupal Description

The pupa was described and illustrated by Metcalf et al. (1962); Fen (1959); Schoenherr and Rutledge (1967); and Silvestri (1951).

Biology

The biology was summarized by Schoenherr and Rutledge (1967). Eggs were usually laid when suitable larval food was available. The damage consisted of direct consumption and webbing of the substrate. In the case of flour, pupation occurred near the surface of the grain. The life cycle normally took 9-10 weeks but this was accelerated by high temperatures to only 45 days.

The life cycle of *A. kuehniella* was given by Linsley and Michelbacher (1943) as well as Michelbacher and Ortega (1958). Similar but more detailed studies were performed by Noyes (1930) and Richardson (1926).

The genitalia were illustrated by Heinrich (1956) and Roesler (1973). The latter author also included a color drawing of the adult wing pattern.

The eggs of *A. kuehniella* were illustrated by LeCato and Flaherty (1974).

Pest Status

No specimens have been collected from Honduras (Passoa, 1983). The few records of this pest from Central America reflects its rarity as a pest. Bienzanko et al. (1957) considered *A. kuehniella* common in Uruguay.

The occurrence and distribution of this insect in Central America is in need of further documentation. At one time _A. kuehniella_ was considered the number one problem in flour mills (Schoenherr and Rutledge, 1967). This species was considered Ebeling (1959) to be a scavenger on citrus and not a pest.

Comments

The separation of _Anagasta_ from _Ephestia_ by Heinrich (1956) is supported by larval and pupal characteristics. None of the _Ephestia_ spp. have an inner tooth on the mandible like _A. kuehniella_. In addition, the roughened texture of the thorax in the pupa is unusual. _Moodna_ and _Anagasta_ larvae are similar except for minor structural differences in the granulation of the skin and the size of the sclerotized ring on A8.

Ancylostomia stercorea Zeller

(Figs. 404-406)

Synonyms

None in common usage.

Common Name

This pest has no common name. The name pigeon pea pod borer is suggested to emphasize the preference of _A. stercorea_ for that host.

Distribution

USA (Hodges et al., 1983); Cuba, Haiti, Dominican Republic, Puerto Rico, Jamaica, Bahamas, Virgin Islands, Grenada, St. Kitts, Mexico, Guatemala, Costa Rica, Panama, Colombia, French Guiana, Brazil (Heinrich, 1956); Montserrat, Santa Lucia, Tobago, St. Vincent (Buckmire, 1978); Antigua (Neunzig, 1979).

Hosts

Pigeon pea, chickpea, pea, and *Dolichos* sp. (Neunzig, 1979); *Crotolaria* sp. (Costa Lima, 1950).

Pigeon pea is the principal foodplant (Neunzig, 1979).

Material Examined

PANAMA: Canal Zone, 9-IV-1957, A. Mason, chickpea, det. Capps (1 pupa); JAMAICA: No locality recorded, 5-IV-1957, J. Buff, pea, det. Dekle (4 larvae); No locality recorded, 3-II-1957, J. Buff, pea, det. Capps (2 larvae).

Larval Diagnosis

D2 posteroventrad of D1; anterior spines of the proximolateral region of the hypopharyngeal complex short, none equal in length to the seta borne by the first segment of the labial palpus; prothoracic shield with a characteristic pattern of dark pigmentation; lightly marked specimens have a single dark patch posterior to the SD1 seta; darkly pigmented specimens have two such patches, one posterior to the SD1 seta, the other ventrad of D2.

Certain specimens of *E. zinckenella* and *A. stercorea* can be confused due to similarity in the pattern of the prothoracic shield. This is especially true of lightly marked *A. stercorea* that lack a complete pattern of two dark patches. On the other extreme, darkly marked *E. zinckenella* larvae may lose their characteristic pattern of spots when these spots fuse into patches. The two are easily distinguished by the presence or absence of sclerotized rings around the SD1 setae of the mesothorax and A8. These are present in *A. stercorea* but absent in *E. zinckenella*. *F. pellucens*, another common pod borer, is easily separated from the above two species by the presence of an inner tooth on the mandible.

Larval Description

The larva was described by Neunzig (1979).

Pupal Diagnosis

Gibba present on A10; cremaster composed of two widely spaced spines oriented almost perpendicular to the body.

The cremaster of this species is distinctive. Most cremasters have spines or setae oriented parallel to the body.

Pupal Description

The pupa has not been described. Some distinctive features include the probable absence of the mesothoracic spiracle (see comments) and the very thin hair-like prothoracic femur that is just barely exposed.

Biology

The biology was summarized by Neunzig (1979). Normally one or two eggs were placed on each pod or flower. First instar larva fed for a short time on the pod of the host before they bored into the seed cavity. Usually one seed provided sufficient food to complete larval development. Pupation occurred in the soil or rarely in debris on the surface of the soil.

Pest Status

A. stercorea is not known from Honduras although there are records from other Central American countries (Heinrich, 1956). Damage can be heavy in the Caribbean where Buckmire (1978) reported 90% infestation of pigeon pea. Pigeon pea is a minor crop in Honduras so *A. stercorea* should be considered a potential pest there.

Comments

The condition of the mesothoracic spiracle is unclear on the single preserved pupa available. One side appears to have a faint trace of an opening while the other side has the mesothoracic spiracle completely absent. Perhaps the pupa was damaged near the suture dividing the prothorax from the mesothorax which caused a split in the integument. A larger series of pupae is needed to evaluate this.

Cadra cautella (Walker)

(Figs. 33, 45, 407-409)

Synonyms

Ephestia cautella (Walker).

Common Name

The accepted Entomological Society of America common name is almond moth (Werner, 1982). The name used by Hill (1978), tropical warehouse moth, is probably more suitable than almond moth but the latter has many years of unambiguous usage behind it and thus should be conserved. Fig moth and dried current moth have also been used (Heinrich, 1956; Saunders et al., 1983).

Distribution

Cosmopolitan in the tropical and warmer temperate regions of the world (Hill, 1978); Mexico, El Salvador, Nicaragua, Costa Rica (McGuire and Crandall, 1967); Honduras (Passoa, 1983).

The distribution was mapped by Hill (1978).

Hosts

Many kinds of dried vegetable products (Heinrich, 1956); *Caryocar nuciferum* (Dinther, 1960); tonka bean, Persian walnut, pecan, peanut, fig, chickpea, rice, oatmeal (Chittenden, 1911); corn, wheat, dried fruit, beans, nuts, banana, and groundnuts (Hill, 1978); cocoa, nutmeg, pigeon pea (Gooding, 1980); Malvaviscus drummondii (Bottimer, 1926); currants, raisins, apple, pear, pomegranate, citrus, soybean, carob, and almond (Carter, 1984); scavenger in beehives (Okumura, 1955); cottonseed (Hargreaves, 1948); Chrysobalanus icaco, Terminalia catappa (Wolcott, 1948).

Corn, wheat and other grains are preferred (Hill, 1978). Other host records can be found in Abreu and Williams (1978) as well as Chittenden (1911).

Material Examined

USA: Florida, Gainesville, 26-IV-1982, S. Passoa, ex larvae reared on artificial diet, genitalia slide #272 SPC (2 pupae, 6 adults); Gainesville, 9-XI-1982, S. Passoa, corn grain (1 larva); HONDURAS: Catacamas, 26-IV-1980, S. Passoa, corn grain, mating pair, parents of larva #190, genitalia #130 SPC, det. Ferguson (2 adults); Catacamas, 26-IV-1980, em 7-VI-1980, S. Passoa, ex ova on corn grain as test, larva #190, det. Ferguson (1 adult with cast pupal skin, 1 larva); EAP, 12-X-1981, S. Passoa, corn grain, mating pair, genitalia slide #262, larva #302 SPC (2 adults); EAP, 12-X-1981, in stored corn grain, parent of larva #303 SPC (1 adult); EAP, 12-X-1981, em. 30-XI-1981, S. Passoa, reared ex ova on corn grain as test, genitalia slide #250, larva #303 SPC (3 adults, 4 pupae, 4 larvae); EAP, 6-I-1984, R. Caballero, ex larva on corn flakes (1 pupa); Danli, 31-I-1979, no collector recorded, soybean grain (3 larvae); Comayagua, 11-XII-1981, K. Carroll and J. Zeller, wheat flour (1 larva).

Larval Diagnosis

D1 and D2 on A1-7 in a horizontal line; body with pigmented pinacula; mandible lacks an inner tooth; SD2 on A8 separated from the spiracle by about the horizontal diameter of the spiracle; D2 of A8 about twice the length of D1; and general characteristics of the subfamily Phycitinae.

The separation of C. caudella from other closely related Cadra spp. was discussed by Aitken (1963).

Larval Description

The larva was described and illustrated by Hinton (1942, 1943), Ensminger (1958), Hasenfuss (1960), Aitken (1963), and Hill (1978).

Pupal Diagnosis

Cremaster composed of six curved setae; maxillae extends to the caudal wing margin, texture of thorax smooth, metathoracic legs not exposed; and general characteristics of the subfamily Phycitinae.

The pupae of C. cautella could be confused with any stored product Phycitinae. The smooth texture of the prothorax will distinguish C. cautella from A. kuehniella. Both P. interpunctella and E. elutella have the maxillae shortened and the metathoracic legs exposed. In C. cautella the maxillae reaches the caudal wing margin and the mesothoracic legs are not exposed.

The pupal drawing in Hill (1978) is incorrect. C. cautella does not have a strong shouldered appearance and the metathoracic legs are not exposed.

Pupal Description

General. Pupa light yellow to dark brown; length about 11 mm.

Head. Vertex with two setae; labrum and maxillary palps rectangular; labial palps in the form of an inverted tear drop; pilifers rounded and joined at the meson; maxillae reach the caudal wing margin; postgenae clearly delineated; antennae end just before the maxillae.

Thorax. Prothoracic femur equal to about 1/4 the length of the maxillae; prothoracic legs extend about 1/2 the distance to the caudal wing margin; mesothoracic legs end with the maxillae at the caudal wing margin; metathoracic legs hidden; mesothoracic spiracle almost circular; skin texture of the thorax smooth.

Abdomen. Spiracles round and inconspicous, those of A2 and A3 with furrows; cremaster composed of six equally spaced curved spines except for the two apical ones which are 1/2 as far apart from each other as the distance between the outer four; skin texture of abdomen smooth.

Biology

The biology was described by Hill (1978). Females laid about 250 eggs near the potential larval food. Larvae moved freely throughout the grain to feed. Strands of silk mixed with grain were an obvious damage symptom. Pupation frequently occurred in crevices near the larval food source. The life cycle was completed in 6-8 weeks.

A more detailed study of the biology was made by Chittenden (1911). The latter paper is noteworthy because it traced infestations into the USA from Asia and suggested methods of control to reduce the pest population at the source. Figs drying on the ground were frequently attacked while the figs in the warehouse or on the tree were relatively uninfested.

The eggs of *C. cautella* were figured by LeCato and Flaherty (1974). Adults characteristics were illustrated by Heinrich (1956) and Roesler

(1973). A bibliography of the almond moth was published by Abreu and Williams (1978).

Pest Status

C. cautella is considered a serious pest of stored products throughout the world (Hill, 1978) and on corn in Honduras (Passoa, 1983). Heinrich's (1956) observation that the pest status of *C. cautella* is underated reflects the situation in Honduras where it is equal to *P. interpunctella* in economic importance. The almond moth is a widespread, moderate, and constant pest in Honduras. Heavy damage has also been reported from El Salvador (Berry and Vaquero, 1957).

Davara caricae (Dyar)

(Figs. 410-414)

Synonyms

None in common usage.

Common Name

This pest has no official common name (Saunders et al., 1983; Werner, 1982). Bruner et al. (1975) used the name papaya bud borer. A more suitable name would be papaya borer since both buds and fruit are attacked.

Distribution

Florida, Central and South America (Grimes and Neunzig, 1984); Puerto Rico, Cuba, Haiti, Dominican Republic, Trinidad, Guatemala, Costa Rica, and Ecuador (Heinrich, 1956).

Hosts

Papaya is the only known host.

Material Examined

USA: Florida, Fort Myers, 24-V-1967, F. Robinson, papaya, det. Weisman (7 larvae); Virginia Gardens, 21-II-1980, L. Howerton, papaya, det. Habeck (8 larvae).

Larval Diagnosis

D1 and D2 in a horizontal line on A1-7; L1 posterior or posteroventrad of L2 on A3; head and body usually striped; and general characteristics of the subfamily Phycitinae.

The position of the L setae on A3, the striped head and body, and the host are distinctive among Phycitinae with the D setae in a horizontal line. The epicrania varies from a solid to a mottled pattern.

Larval Description

The larva was described and illustrated by Grimes and Neunzig (1984).

Pupal Diagnosis

Gibba present; outer cremaster spines straight and separated from the inner ones by about the diameter of its setal base; and general characteristics of the subfamily Phycitinae.

Pupal Description

The pupa was described and illustrated by Grimes and Neunzig (1984).

Biology

The biology of _D. caricae_ was summarized by Grimes and Neunzig (1984). Adults were found throughout the year. Larvae preferred to feed in crevices either between fruits, between the leaf petiole and the stem, or between the fruits and stem. Thick mats of frass often covered several larvae. Pupation was in the soil.

Pest Status

Bruner et al. (1975) considered D. caricae an occasional pest in Cuba. So far this insect is not known from Honduras (Passoa, 1983) and therefore D. caricae is considered a potential pest of papaya.

Comments

Heinrich (1956) noted that D. caricae may be a junior synonym of D. columnella. This conclusion awaits further study.

Dioryctria sp. (abietella group)
(Figs. 415, 425, 432)

Synonyms

Those species with reduced scale tufts were placed in the genus Pinipestis but Ragonot later synonomized this with Dioryctria (Heinrich, 1956).

Common Names

Dioryctria has no common names in Central America (Saunders et al., 1983). None will be proposed until the specific identity of the pest is clarified.

Distribution

Honduras and perhaps other New World localities. The exact distribution varies with each species.

Hosts

Pinus caribaea cones infested with Cronartium conigenum (Tantalean, in press); P. pseudostrobus (Becker, 1973); Pinus sp.; P. oocarpa cones infested with Cronartium conigenum.

O. Ochoa (personal communication) noted that Dioryctria damage in Honduras is more serious in Pinus maximinoi than in other pine species although *P. oocarpa*, *P. pseudostrobus*, and *P. caribaea* are all attacked. The species to which this information applies is unknown.

Material Examined

HONDURAS: El Zamorano, 6-VIII-1983, S. Passoa, pine cones (1 cast pupal skin); Comayagua, 25-V-1984, em. 5-VI-1984, A. Tantalean, ex *P. oocarpa* cones infested with *Cronartium conigenum*, mandible slides #322, 329, SPC (4 adults, 3 larvae).

Larval Diagnosis

D2 posteroventrad of D1 on A1-7; sensilla styloconica of the maxillae forked; anterior spines of the proximolateral region of the hypopharyngeal complex long, their length subequal to the seta born by the first segment of the labial palps; SV group of A9 bisetose; and general characteristics of the subfamily Phycitinae.

The above characters are general and apply to all members of the genus *Dioryctria* examined during this study. *D. abietella* group larvae may be distinguished from *D. erythropasa*, at least in the mature larva, by the darkened prothoracic shield along with the faint tonofibrillary platelets. The spines on the epipharynx of *D. abietella* group larvae are not found posterior to the L2 seta. In addition, larvae of *D. abietella* group have an inner tooth on the mandible. However, preserved larvae of *D. erythropasa* are needed to confirm the suspected distinguishing features.

Larval Description

General. Preserved larvae are light brown to pink dorsally, (the latter color probably indicates the larvae were close to pupation) and pale white ventrally. The prothoracic shield is shaded with dark brown up to the D1 seta. Anal shield shaded with brown laterally. Mature larvae about 18 mm. long.

Head. Front extends 1/2 the distance to the epicranial notch; Adf2 just below the apex of the front; Adf1 located one half the distance from the clypeus to the epicranial notch; a line drawn through the F1 setae lies dorsad of the frontal pores; C2 longer than C1; P1 twice the length of P2; A2 closer to A1 than A3; L1 half the length of A3.

Six stemmata present; stemma 2 closer to stemma 3 than stemma 1; stemma 4 closer to stemma 3 than stemma 5; stemma 6 separated from stemma 5 by a distance equal to its own horizontal diameter.

Labrum with M1 and M3 subequal in length, M2 longer than M3 or M1; L2 about three times the length of L1 and almost twice the length of L3.

Mandible with three scissorial teeth and an inner tooth on the first molar ridge, the distal margin is usually notched, first mandibular seta shorter than the second.

Hypopharyngeal complex with a blunt spinneret equal to slightly more than twice the length of the basal segment of the labial palps, proximolateral area with long spines subequal to those found on the basal segment of the labial palps, a sclerotized ridge frequently present posterior to the proximolateral spines.

Thorax. Prothoracic shield with SD1 twice as long as XD2, distance between SD1 and XD2 equal to 1/2 that between XD2 and XD1; D2 twice as long as D1; SD2 almost equal in length to D1; prespiracular pinaculum extends anteroventrad of the spiracle; L1 twice as long as L2; SV group bisetose; V1 posterior to the coxa and close to the midline.

Mesothorax with D2 twice as long as D1; SD2 about 1/4 the length of SD1; a closed sclerotized ring surrounds the SD1 seta; L3 separated from

L1 and L2 by about the vertical diameter of the former pinaculum; position of SV1 variable, may be anterior, posterior, or ventral to a vertical line drawn through L3; V1 posterior to the coxa, situated about twice the distance from the midline as V1 on the prothorax.

Abdomen. A1 with D2 longer and posteroventrad of D1; SD1 slightly posterodorsad of the spiracle; SD2 anterodorsad of the spiracle; L1 posteroventrad of L2 and twice its length; L3 ventrad of D2; SV group trisetose; V1 ventrad of the SV group.

A6 with D2 longer and slightly posteroventrad of D1; SD1 dorsad of the spiracle; SD2 separated from the spiracle by almost the horizontal diameter of the spiracle; L setae posteroventrad of the spiracle; SV group trisetose, arranged in a triangle; V1 posterior to the coxa.

A8 with the D setae in a horizontal line; SD1 dorsad of the spiracle and surrounded by a closed sclerotized ring; SD2 anterior to the spiracle; L1 and L2 in a horizontal line, L1 twice the length of L2; L3 dorsad of the bisetose SV group; V1 setae on A8 separated from each other by about the same distance as the V1 setae on A9.

A9 with D2 on a large rectangular pinaculum; SD1 longer than D1, L group trisetose; SV2 anteroventrad of SV1; V1 ventrad of SV2.

Anal shield with D1 close to SD2 and only 1/2 its length; SD1 about equidistant from D2 and SD2.

Pupal Diagnosis

Gibba present; outer cremaster spines curved; prothoracic femur wider than the labial palps; and general characteristics of the subfamily Phycitinae.

The relatively broad gibba and lack of a bulbous projection portion will separate this species from *D. erythropasa*. The single cast skin available lacked the vertex and frons so the condition of the conical projection, if present, is not known.

Pupal Description

Not available.

Biology

The biology of the D. abietella group larva in Honduras is unknown. Collection data indicates that it may occur mixed with D. erythropasa on the same host.

Pest Status

It is not possible to determine the pest status until a positive identification is obtained.

Comments

Although the specific identity of the D. abietella group larva and pupa remain in doubt, there are a number of possibilities to consider. Becker (1973) recorded D. abietella from Honduras but there are reasons to doubt this identification. The true D. abietella occurs only in Europe and was listed in North America by early workers (Heinrich, 1956) until Mutuura and Munroe (1979) clarified the error by describing some new species. Therefore, Becker's specimen was either a new species, the true abietella of Europe, or one of the sibling species from North America. D. majorella is the most likely possibility for Becker's specimens especially since his larval photo closely resembles the larvae collected by A. Tantalean and associated with the D. majorella adults (see material examined). Unfortunately, Becker had only females and the larvae, pupae, and adults here examined are associated only very loosely because each was not reared individually. A complete sample of adult, pupal skin, and larval skin is needed if a female cannot be induced to lay eggs on a cone infested with _Cronartium_ fungus.

Ebel (personal communication) listed some possible _Dioryctria_ spp. which may occur in Honduras. These included: _D._ new species in the _baumhoferi_ group; _D. sysstratiotes_; _D. abietiella_ (see above); _D. horneana_; _D. clarioralis_, and _D. albovitella_. Given the lack of knowledge of tropical forms the above list is extremely tentative. However, the light tonofibrillary platelets of the larva and the gibba of the pupa, compared to the true _D. abietella_ illustrated by Patocka (1979), show that the Honduran specimens do belong in the _abietella_ group.

The egg and the pupa of a sibling species of _D. abietella_ in North America was illustated by Peterson (1963) and by Neunzig and Merkel (1967) respectively.

Dioryctria erythropasa (Dyar)

(Figs. 52, 426-431)

Synonyms

Those species with reduced scale tufts were placed in the genus _Pinipestis_ but Ragonot later synonomized this with _Dioryctria_ (Heinrich, 1956).

Common Names

Dioryctria has no common names in Central America (Saunders et al., 1983) but the North American species are called pine coneworms (Werner, 1982). Therefore a suitable common name for _D. erythropasa_ would be southern red pine coneworm. The reddish ground color of the moth, although somewhat variable, is unusual among Phycitine pyralids in Honduras.

Distribution

Arizona (Heinrich, 1956), Nicaragua (Hedlin et al., 1981); Honduras (Becker, 1973).

Hosts

Pinus chihuahuana (Heinrich, 1956); *P. oocarpa* (Becker, 1973); *P. caribaea*, *P. maximinoi* (Tantalean, in press).

O. Ochoa (personal communication) noted that *Dioryctria* damage in Honduras is more serious in *Pinus maximinoi* than in other pine species although *P. oocarpa*, *P. pseudostrobus*, and *P. caribaea* are all attacked. The species of *Dioryctria* to which this information applies is unknown.

Material Examined

HONDURAS: Siguatepeque, 29-VII-1983, S. Passoa, at lights, genitalia slide #341 SPC (1 adult); Siguatepeque, 8-VI-1980, S. Passoa, ex larva on pine, genitalia slide #247, mandible slide #115, larva #208 SPC (1 adult); Siguatepeque, 30-VII-1983, S. Passoa, in pine cones, mandible slides #241, 243 SPC (4 cast pupal skin fragments); El Zamorano, 6-VIII-1983, S. Passoa, in pine cone, dead pupa with parasitic wasp, probably an Ichneumonidae, associated, mandible slide #242 SPC (1 pupa); Comayagua, 25-V-1984, em. 5-VI-1984, A. Tantalean, ex *P. oocarpa* cones infested with the fungus *Cronartium conigenum* (2 adults); no locality or date, adult died before eclosion, genitalia slide #339 SPC (1 pupa).

Larval Diagnosis

D2 posteroventrad of D1 on A1-7; sensilla styloconica of the maxillae forked; anterior spines of the proximolateral region of the hypopharyngeal complex long, their length subequal to the seta borne by the first segment of the labial palps; SV group of A9 bisetose; and general characteristics of the subfamily Phycitinae.

The above characters are general and apply to the few members of the genus Dioryctria examined during this study. No preserved larvae of D. erythropasa were available for study but the of cast larval skins did show some differences from larvae of a member of the abietella group collected in Honduras. The tonofibrillary platelets of D. erythropasa are dark black (in the late instars at least) while they are faint and concolorous in the abietella group larva. A darkening of the tonofibrillary platelets with age also occurs in D. amatella. The prothoracic shield of D. erythropasa does not appear heavily shaded with dark brown or black laterally as in the D. abietella group. However, this also may vary with larval age. The presence of spines on the edge of the epipharynx separates D. erythropasa from the other North American species illustrated by Neunzig et al. (1964).

Larval Description

The larva of D. erythropasa was not available. Hedlin et al. (1981) illustrated the larva in color.

Pupal Diagnosis

Gibba present; outer cremaster spines are curved; prothoracic femur wider than the labial palps; frons with a conical projection; and general characteristics of the subfamily Phycitinae.

The conical projection on the frons will be absent in cast skins unless an effort is made to collect the tiny sclerite, composed of the vertex and frons, which separates from the rest of the pupal case upon adult emergence.

D. erythropasa may be separated from the other species in the abietella group by the more narrow gibba and by the presence of a projecting bulbous terminal abdominal segment.

Pupal Description

General. Pupa reddish-brown; length approximately 12 mm.

Head. Vertex with a conical projection; labrum semicircular; labial palps shaped like an inverted tear drop; pilifers present; maxillary palps somewhat rectangular; maxillae and antennae extend to the caudal wing margin.

Thorax. Prothoracic femur exposed, about 1/2 the length of the prothoracic legs; mesothoracic legs extend to the caudal wing margin; mesothoracic spiracle present on the posterior margin of the prothorax.

Abdomen. Spiracles of A2 an A3 with furrows; spiracles of A4-A8 tubular; texture of abdominal segments coarsely punctate, especially dense on the anterior half; proleg scars present on A5 and A6; gibba oblong, dark blackish-purple, contrasting against the reddish-brown pupa; six cremaster spines present, all curved; terminal segment of the abdomen with a projecting bulbous portion.

Biology

Not much is known about the biology of D. erythropasa in Honduras. Becker (1973) noted that larvae bored into the cones and fed upon the seeds. They were chestnut colored. Damaged cones frequently had an exit hole filled with frass, resin, and plant particles. Young cones were deformed. Pupation occurred in the larval tunnel.

Tantalean (in press) considered D. erythropasa to be widespread throughout Honduras. Adults flew from May through August and a larva was collected in July.

The remains of an Ichneumonidae were found in the pupa of one individual. *D. erythropasa* is sometimes associated with the fungus *Cronartium conigenum* which should be investigated as a possible attractant. Some *Dioryctria* in the United States are attracted to rust infested cones (Schmidt and Wilkinson, 1979).

The adult was illustrated by Hedlin et al. (1981) in color.

Pest Status

D. erythropasa can be considered a widespread, sporadic pest of pine cones in Honduras.

Comments

Becker's (1973) illustration of *D. erythropasa* needs confirmation. The cast larval skins of *D. erythropasa* examined in this study all have a light prothoracic shield and dark tonofibrillary platelets. In Becker's figure the larva shows a dark black prothoracic shield and no tonofibrillary platelets. These are features of *Dioryctria* sp. (*abietella* group), an unidentified species collected in Honduras.

Neunzig et al. (1964) listed some important characters used to separate species of larval *Dioryctria*. These included the general body color, texture of the integument, color of the tonofibrillary platelets, and the spination of the labrum and hypopharyngeal complex. The labrum spination of *D. erythropasa* appears to be distinctive compared to the North American species illustrated by Neunzig et al. (1964). No North American species have spines near the edge of the labrum like *D. erythropasa*. The labrum of the larva of *D. abietella* also lacks spines posterior to the L2 seta. However, setae and spines frequently break off in cast skin preparations so a larger series of specimens are needed to fully evaluate the above.

The mandibles of *D. erythropasa* and *D. abietella* group are different in that the former species lacks an inner tooth. If this difference holds in a series of larvae then it would be the easiest method of identification.

From time to time a small (about 7 mm.) lead colored *Dioryctria* larva has been collected from shoots and cones in pine trees. It was never reared but the spination of the epipharynx indicates it may be an immature *D. erythropasa*. The lack of an inner tooth on the mandilbe also suports this determination.

Ectomyelois ceratoniae (Zeller)

(Figs. 44, 433-436)

Synonyms

Spectrobates ceratoniae (Zeller).

Common Name

The Entomological Society of America did not list a common name for this insect (Werner, 1982) but various authors have used the name carob moth (Neunzig, 1979; Heinrich, 1956). This name reflects the host preference of *E. ceratoniae* and therefore should be the accepted name. Locust bean moth was used in Europe (Carter, 1984).

Distribution

USA, Puerto Rico, Jamaica, Argentina (Heinrich, 1956); parts of Europe, Africa, and Asia (Neunzig, 1979); Honduras.

Heinrich (1956) noted that the recorded distribution of this species is perhaps only a small portion of its actual range in the Neotropics. Larvae may be transported by man in the dried fruit of the host (Neunzig, 1979).

Hosts

Pigeon pea (Swezey, 1944); *Ceratonia siliqua*, *Acacia farnesiana*, *Tamarindus indica*, *Eriobotrya japonica*, almond chestnut, citrus, quince, fig, apple, date, pomegranate, *Ziziphus spina-christi* (Neunzig, 1979); *Carissa grandiflora*, *Cassia bicapsularis*, *Livistona chinensis*, *Robinia* sp., raisins and nuts in storage (Heinrich, 1956); almonds (Carter, 1984); mahogany.

E. ceratoniae feeds mostly on legumes and prefers *Ceratonia siliqua*, the carob tree (Heinrich, 1956).

Material Examined

USA: Florida, Homestead, 21-VI-1967, D. Habeck, *Tamarindus* sp. (24 pupae, 13 larvae); HONDURAS: Comayagua, 3-VII-1979, em 8-VII-1979, ex pupa on mahogany seeds, larva #107, genitalia slides #118, 296 SPC (4 adults, 3 pupae, 15+ larvae); Dept. of La Paz, La Paz, 30-V-1979, em 4-VI-1979, S. Passoa, ex pupa on mahogany seeds, genitalia slide #115 SPC (2 adults, 1 pupa, 13 larvae).

Larval Diagnosis

SD1 of A1-7 surrounded by a crescent-shaped sclerotized ring; and general characteristics of the subfamily Phycitinae.

E. ceratoniae can be confused with *A. transitella* when the latter species has deeply pigmented ring fragments around SD1 also. However, the rings of *E. ceratoniae* are usually crescent shaped and farther from the SD1 setal base than in *A. transitella* where the ring fragments, if present, are not crescent shaped and very often touch the SD1 setal base (Neunzig, 1979).

Larval Description

The larvae was described and illustated by Neunzig (1979), Aitken (1963), Ensminger (1958), and Hinton (1943), and Balachowsky (1972).

Pupal Diagnosis

Gibba absent; dorsal surface of the thorax with a median ridge; dorsal surface of A1-8 with a pair of median proceses; cremaster composed of two curved spines; and general characteristics of the subfamily Phycitinae.

The pupa of *E. ceratoniae* cannot be confused with any other species in this study.

Pupal Description

The pupae was described and illustrated by Neunzig (1979).

Biology

The biology of *E. ceratoniae* was summarized by Neunzig (1979). Oviposition occurred on the fruit of the host plant. Larvae entered the pod through minute cracks or tissue damaged by other insects. In this respect the biology is similar to *A. transitella*. Damaged pods were preferred over healthy ones for ovipositon.

Damage to mahogany seeds in Honduras by *E. ceratoniae* consisted of frass and plant debris mixed with silk. The seeds, as well as part of the surrounding seed coat, were eaten. Pupation occurred on the host.

Carter (1984) noted that about 60-100 eggs were laid per female. There may be overlapping broods in North Africa. Pupation sometimes was in the ground.

The adult coloration and genitalia were described by Heinrich (1956).

Pest Status

Neither McGuire and Crandall (1967) nor Saunders et al. (1983) recorded *E. ceratoniae* as a pest. Mahogany seeds were attacked in Honduras but presumably this attack was secondary in nature because it followed an attack of *Hypsipyla grandella* which was also found in the pods. The most important impact of this insect is likely to be as a potential pest of *Tamarindus* in Honduras. The pulp of the seeds from this tree are used to make a very popular drink (Williams, 1981). *Tamarindus* is the primary host of *E. ceratoniae* in the southern USA (Neunzig, 1979) so attacks by this pest in Honduras probably are not rare. No surveys of *Tamarindus* insects were made. Beetles frequently infest the pods in the market (Williams, 1981) so conditions would be right for the entry of *E. ceratoniae* larvae. The importance of this plant is shown by the fact that it is sold in paractically every market throughout Central America (Williams, 1981).

Elasmopalpus lignosellus (Zeller)

(Figs. 34, 61, 437-440)

Synonyms

None in common usage.

Common Name

The accepted Entomological Society of America common name is lesser cornstalk borer (Werner, 1982). Another common name in wide use is "coralillo" (Peairs, 1980). The final recommendation of a common name for *E. lignosellus* in Latin America will depend on how many countries use the Spanish common name and whether a deviation from the standard list of common names is justified. Both names are readily understood in Honduras.

Hayward (1943) listed E. lignosellus under the name sugarcane borer while Saunders et al. (1983) recorded the name rice stalkborer. Both are preoccupied by other pest pyralids.

Distribution

Widespread from the southern USA to Argentina, Guatemala, El Salvador, Nicaragua, Costa Rica, Panama (Anonymous, 1951-1977); Honduras (Passoa, 1983).

The distribution of E. lignosellus includes most areas in Latin America (Anonymous, 1951-1977). There is a noticeable gap in the distribution around central Brazil but this may merely reflect a lack of collecting and/or reporting of the pest situation. It has been collected repeatedly in Brazil (Silva et al., 1968).

Hosts

Forty agricultural crops and forest trees (Dixon, 1982); peanut, soybean, alfalfa, lima bean, mung bean, snap bean, pea, cowpea, also members of the families Cruciferae, Chenopodiaceae, Convolvulaceae, Cucurbitaceae, Cyperaceae, Gramineae, Iridaceae, Linaceae, Malvaceae, Rosaceae, Rutaceae, and Solanaceae (Neunzig, 1979); tomato (McGuire and Crandall, 1967); rice, cotton, corn, sugarcane (Estrada, 1960).

E. lignosellus is primarily a grass feeder (Neunzig, 1979; Dixon, 1982).

Material Examined

USA: Florida, Gainesville, XII-1968, K. Stone, lab colony, det. Stone (50+ pupae, 50+ larvae); Gainesville, 24-VIII-1981, no collector recorded (2 larvae); PERU: Lima, 27-IX-1968, V. Razuri, U.A. #895.68

(1 adult); HONDURAS: Comayagua, reared but no host, date, or collector recorded, genitalia slide #259 (1 adult); EAP, 2-X-1981, K. Andrews, sorghum (1 larvae); EAP, 21-VII-1983, S. Passoa, in soil (1 larva).

Larval Diagnosis

Head with pale areas around the setal bases; body coloration characteristic, the anterior portions of A1-8 with a series of alternating pale white and gray-green bands; and general characteristics of the Phycitinae.

A few individuals do not have the dorsum clearly marked and this pattern may be faint in alcoholic material. The characteristic extension of the prespiracular group on the prothorax cited by Capps may also be difficult to observe.

Larval Description

The larva was illustrated by Neunzig (1979), Peterson (1963), Capps (1963) and in color by Schwartz et al. (1978).

Pupal Diagnosis

Gibba roughly an irregular trapezoid, not oval, a groove may be present on the anterior margin, usually the posterior margin has two sharp tooth-like projections.

The gibba, although subject to a great deal of variation, is distinctive.

Pupal Description

The pupa was described and illustrated by Neunzig (1979). His illustration does not show any trace of the groove on the gibba.

Biology

The biology was summarized by Ospina et al. (1979) in Colombia. Pale green eggs were laid individually on the leaf surface or near the stem in contact with the soil. The larvae fed upon the roots and sometimes tunneled into the stem. A characteristic symptom of damage was the presence of a silken tube formed of soil and frass. Six larval instars were usually completed in 13-24 days and pupation occurrred in the soil.

Other important references on the biology of *E. lignosellus* were listed by Heinrich (1956), Neunzig (1979), Anonymous (1951-1977), and Razuri (1974).

The adult was illustrated by Dixon (1982) and Costa Lima (1950). There is a strong sexual dimorphism in color (Heinrich, 1956). Photographs of the eggs were presented by Peterson (1963).

Pest Status

Passoa (1983) recorded serious damage from *E. lignosellus* in Honduras and considered the outbreaks sporadic and localized. The Comayagua card file (#215) also reported an outbreak on cotton seedlings. *E. lignosellus* caused heavy damage to corn in Honduras (Koone and Banegas, 1958). *E. lignosellus* devastated plantings of maize, sorghum, soybeans, cotton and other crops throughout Honduras in 1985 when precipitation was well below normal (K. L. Andrews, personal communication). Sandy soils and dry conditions found in the Pacific coastal areas of Central America favored outbreaks of *E. lignosellus* especially in late planted corn (Calvo, 1966). Bean seedlings were killed in Peru and Brazil (Ospina et al., 1979). Sugarcane was damaged in Cuba (Plank, 1928) and Argentina (Hayward, 1943). Late planted soybeans, like corn, were seriously attacked especially when the soybeans were planted adjacent to corn, sugarcane, and other small grains (Irwin, 1978). Larva moved from one plant to another thus completely destroying a section of each soybean row (Turnipseed and Kogan, 1976). *E. lignosellus* bored into young soybean plants but damage to older plants consisted of girdling which caused the plants to lodge (Irwin, 1978). Tree seedlings were also attacked (Dixon, 1982).

Outbreaks in Cuba were confined to sugarcane fields in which the stubble was burned after harvest (Plank, 1928).

Ephestia elutella (Hubner)

(Figs. 441-444)

Synonyms

None in common usage.

Common Name

The accepted Entomological Society of America common name is tobacco moth (Werner, 1982). Cocoa moth (Saunders et al., 1983) and chocolate moth (Linsley and Michelbacher, 1943) have also been used.

Distribution

Practically cosmopolitan (Heinrich, 1956); Nearctic, Oriental, and Ethiopian regions (Roesler, 1973).

A country by country list of the Old World localities was given by Roesler (1973). There are no records of *E. elutella* in the various regional lists of Central American pests except for Saunders et al. (1983).

Hosts

Dried fruits, seeds, nuts, chocolate, cocoa, tobacco, and a number of other dried vegetable products (Heinrich, 1956); chicory, figs, currants, raisins, coffee, cake, cayenne pepper, walnuts, flour biscuits (Noyes, 1930); beans, cereal products, spices (Ensminger, 1958); corn

(Sarmiento, 1981); sunflower (Rajamohan, 1976) citrus (Okumura, 1956); dried grapes, dates, prunes, dried apples, dried cherries, pomegranate root, rhubarb root, almond, leather, dried insects, and sugarbeet seeds (Herford, 1933).

Heinrich (1956) noted that foodplant records based only on larval identifications in the early literature could be misidentifications since good characters to separate the species were not available.

Material Examined

USA: Florida, Gainesville, 20-XII-1982, S. Passoa, lab colony, mandible slide #338 SPC (1 adult, 15+ pupae, 1 larva).

Larval Diagnosis

D1 and D2 in a horizontal line, mandible without an innner tooth; SD2 separated from the spiracle by 2-3 times the horizontal diameter of the spiracle; area enclosed by the spiracle only 2/3 that of the membranous area enclosed by the SD1 sclerotized ring; and general characteristics of the subfamily Phycitinae.

Hinton (1942, 1943), Aitken (1963), Hasenfuss (1960), and Ensminger (1958) have discussed separation of *E. elutella* from other species.

Larval Description

The larva was described and illustrated by Hinton (1942, 1943), Hasenfuss (1960), Aitken (1963), and Ensminger (1958).

Pupal Diagnosis

Maxillae do not reach the caudal wing margin; mesothoracic spiracle separated from the antenna by 1/4 the horizontal diameter of the spiracle or more; cremaster composed of 6 curved spines, the 4 apical spines closely spaced in two groups of two spines each.

The pupa of E. elutella is very similar to P. interpunctella except for the placement of the mesothoracic spiracle relative to the antenna. The vast majority of P. interpunctella have the mesothoracic spiracle almost touching the antennal margin. Pupae of C. figulilella are not available for study but there are no obvious differences between C. figulilella and E. elutella based on the figures of the former species in Donohoe et al. (1949).

Pupal Description

The pupa was illustrated by Reed et al. (1933) and by Freeman and Turtle (1947).

The maxillae end slightly before the caudal wing margins, this was not illustrated correctly in the above two works.

Biology

The biology was summarized by Metcalf et al. (1962). Elliptical eggs were usually laid on the host. The larval damage included direct consumption and fouling of the food source by mixing excrement and silk webs with the host material. Pupation occurred in any suitable crevice. The life cycle took about 50 days.

The adult was illustrated by Roesler (1973) and Heinrich (1956). Egg morphology was studied by LeCato and Flaherty (1974).

Freeman and Turtle (1947) noted that E. elutella survived best in foods with a high vitamin B content. Heavily attacked grain had a sour smell.

Detailed studies on the biology of E. elutella were carried out by Noyes (1930); Reed et al. (1933); Waloff and Richards (1946); Waloff (1948); and Richards and Waloff (1946).

Pests Status

No specimens of *E. elutella* were collected in Honduras (Passoa, 1983). McGuire and Crandall (1967) also did not list this insect from Central America. The inclusion of this species is based mainly on Saunders et al. (1983). Heinrich (1956) noted that *E. elutella* is less numerous than either *C. cautella* or *P. interpunctella* which reflects the situation in Honduras. Serious damage was recorded from cocoa (Heinrich, 1956) and tobacco (Reed et al., 1933). Intensive sampling of these crops in Honduras might confirm the presence of *E. elutella*.

Etiella zinckenella (Treitschke)

(Figs. 35, 36, 445-447)

Synonyms

None in common usage.

Common Name

The accepted Entomological Society of America common name is the lima bean pod borer (Werner, 1982). Legume pod moth, pod inch worm, pea pod borer, and pigeon pea borer have also been listed (Saunders et al., 1983; Hill, 1978; Stone, 1965).

Distribution

Almost completely pantropical (Hill, 1978); presumably found in every Central and South American country (Heinrich, 1956); Mexico, Guatemala, El Salvador (McGuire and Crandall, 1967); Nicaragua Anonymous, 1951-1977); Honduras (Passoa, 1983).

The distribution was mapped by Hill (1978) and the Commonwealth Institute of Entomology (Anonymous, 1951-1977).

Hosts

Pigeon pea, hyacinth bean, locoweed, vetch, lupine, lima bean, cowpea, soybean, pea, bean (Stone, 1965).

A complete list can be found in Qu and Kogan (1984) and Neunzig (1979). Most hosts belong to the Fabaceae.

Material Examined

USA: Florida, no other data reported, genitalia slide #346 SPC (3 adults, 2 pupal fragments, 3 larvae); California, Riverside, 30-IX-1949, L. Anderson, det. Anderson (2 pupae, 1 cast pupal skin, 2 larvae); HONDURAS: Comayagua, 27-III-1980, S. Passoa, beans (2 larvae); Comayagua, 15-IV-1980, S. Passoa, ex larva from bean seeds, mandible slide #32 Comayagua coll. (1 adult with cast pupal skin); Comayagua, 8-IV-1980, S. Passoa, reared ex larva from bean seeds, mandible slide #108 SPC (2 adults with cast pupal skin); EAP, no date, collector, or host reported (1 adult); PERU: Lima, 15-IV-1969, R. Gazani, U.A. #802.69 (1 adult); PUERTO RICO: Isabela, 19-I-1981, J. Correa, pigeon pea (3 larvae).

Larval Diagnosis

No sclerotized rings around SD1 on any body segment; L group of A9 trisetose; prothorax with a characteristic pattern of dark spots in later instars.

Early instars do not have the characteristic pattern of dark spots but instead the prothoracic shield is colored solid black. This would cause confusion with *Bonchis munitalis* of the Chrysauginae. They may be separated by the size of the D setae on A1-7. The D setae are approximately equal in length on *E. zinckenella* but *B. munitalis* has D2 slightly longer than D1. Their hosts are also very different.

The differences between _F. pellucens_, another pod borer in legumes, and _E. zinckenella_ are discussed under the former species.

Larval Description

The larvae was described by Neunzig (1979), Forbes (1923), Peterson (1962), Hasenfuss (1960), Wolcott (1948), and Stone (1965).

Pupal Diagnosis

Gibba oval, much longer than wide, all cremaster spines curved; prothoracic femur very narrow, not equal in width to the labial palps; and general characteristics of the subfamily Phycitinae.

The pupa of _E. zinckenella_ could be confused with _F. pellucens_. They may be separated by the shape of the outer cremaster spines. In _E. zinckenella_ these are curved at their apex but in _F. pellucens_ they are straight.

The pupal figure in Hill (1978) gives the impression that the maxillae are short. They are not; the maxillae extend to the caudal wing margin. In addition, the frons is not as pointed as the figure shows.

Pupal Description

The pupa was illustrated by Neunzig (1979) but his figure does not show any trace of a groove dividing the gibba.

Biology

The biology was summarized by Neunzig (1979). Oviposition occurred on flowers or pods where the larvae fed. Other than a tiny entrance hole, no obvious external symptom of damage was usually present. At times a slight discoloration of the inside of the pod was evident where the frass touched the pod wall. When the larva needed to feed on more than one pod to complete development, as in the case of legumes with small pods, entrance and exit holes were found. After the seeds were consumed the larvae pupated in the soil.

Hill (1978) stated that cannibalism occurred when two larvae occupied the same pod but Neunzig (1979) cited examples of larvae coexisting together. The larval period lasted from 3-5 weeks (Hill, 1978).

E. zinckenella was present throughout the year in Puerto Rico but was more abundant during the wet season. Damaged pods which become watery and wrinkled were easily distinguished them healthy pods (Scott, 1940).

The adult was illustrated by Heinrich (1956), Whalley (1973), Wolcott (1933), Scott (1940) and Hill (1978).

The literature of *E. zinckenella* on legumes was reviewed by Qu and Kogan (1984).

Pest Status

E. zinckenella is a serious pest of legumes in some parts of the world (Hill, 1978).

Passoa (1983) considered this species a rare pest in Honduras because outbreaks were localized and sporadic in occurrence. In Puerto Rico the pest status varies from season to season. *E. zinckenella* caused more damage than *M. testulalis* during some years (Wolcott, 1933) but not in others (Scott, 1940). Damage from *E. zinckenella* is especially serious in shipments destined for export since infested pods can ruin the whole shipment (Scott, 1940).

Comments

Neunzig (1979) observed that *E. zinckenella* and *Pima* spp. are frequently confused as larva. The adfrontals reach the epicranial notch in *E. zinckenella* but not in *Pima* spp. This character will hold as long as the larvae are mature. My early instar larva of *E. zinckenella*, if they are correctly determined, have adfrontal sutures that end slightly before the epicranial notch.

Fundella pellucens (Zeller)

(Figs. 448-450)

Synonyms

Fundella cistipennis (Dyar).

Common Name

The accepted Entomological Society of America common name is Caribbean pod borer (Werner, 1982).

Distribution

USA, Barbados, Haiti, Montserrat, Cuba, Virgin Islands, Puerto Rico, Brazil, Bolivia (Heinrich, 1956); Honduras (Passoa, 1983).

Hosts

Abrus precatorius, *Acacia* sp., *Bauhinia albiflora*, *B. purpurea*, *B. variegata*, *Caesalpina pulcherrima*, *Cajanus cajan*, *Canavalia ensiformis*, *C. gladiata*, *C. maritima*, *Cassia fasciculata*, *C. occidentalis*, *Phaseolus lunatus*, *Phoradendron* sp., *Tamarindus indica*, *Vigna luteola*, and *V. unguiculata* (Neunzig, 1979); *Crotalaria*, *Mucuna* (Silva et al., 1968); *Pisum sativum* (Martorell, 1976); *Pisus* sp., *Cassia beareana*.

Material Examined

USA: Florida, Homestead, 24-IV-1957, R. Swanson, Florida orchid tree (1 larva); Homestead, 23-V-1955, D. Wolfenbarger, *Pisus* sp., det Dekle (3 larvae); Miami, 28-X-1983, L. Chang, *Bauhinia* sp., det Heppner

(2 larvae); Miramar, 16-II-1984, L. Daigle, Cassia beareana, det Heppner with doubt, identification appears correct (2 larvae).

Larval Diagnosis

Prothoracic shield with characteristic pattern of two middorsal lines and a triangular or curved spot posterior to XD2; mandible with an inner tooth; SD1 seta of the mesothorax 1.5 times as long as the SD1 seta on the metathorax; D1 1/4 the length of D2 on A1, and general characteristics of the subfamily Phycitinae.

Most specimens of F. pellucens are easily separated from E. zinckenella by differences in the pattern of the prothoracic shield, the presence of an inner tooth, and by the presence of sclerotized rings around SD1 of the mesothorax and A8.

The length of the SD and D setae help separate F. pellucens from F. argentina, a neotropical species found in Cassia pods (Neunzig, 1979).

Larval Description

The larva was described by Neunzig (1979).

Pupal Diagnosis

Gibba round and oval; outer cremaster spines straight, arranged parallel to the body, separated from the inner ones by a distance greater than the diameter of its setal base, and general characteristics of the subfamily Phycitinae.

The pupa of F. pellucens is similar to E. zinkenella but differs in the outer cremaster spines. E. zinkenella has these spines curved at their apex.

Biology

The biology was summarized by Neunzig (1979). Oviposition occurred on or near the flowers of the host. First instar larvae fed on the flowers and then bored into the pods. Frass was expelled from the pod and frequently the pods were more susceptible to attack when they touched one another. Pupation occurred in the soil.

Pest Status

F. pellucens was considered the least important of the three pod borers in Puerto Rico (Scott, 1940; Wolcott, 1933). Passoa (1983) considered this insect a rare pest because outbreaks were not frequent. E. zinckenella is far more common and widespread in Honduras.

Homoeosoma electellum (Hulst)

(Figs. 451, 452)

Synonyms

None in common usage.

Common Name

The accepted Entomological Society of America common name is sunflower moth (Werner, 1982). Sunflower worm has also been used (MacGregor, 1976).

Distribution

USA, Cuba, Guatemala, Bermuda (Heinrich, 1956).

Hosts

Flower heads of various Compositae, flowers of Opuntia, flowers of cotton, fruit of orange trees (Heinrich, 1956).

Heinrich (1956) listed the Compositae hosts and noted that sunflower was preferred.

Material Examined

USA: Florida, Gainesville, 10-VI-1982, S. Passoa, ex larva on sunflower, genitalia slide #278 SPC (2 adults, 2 cast pupal skins, associated with 2 pupae and 4 larvae); MEXICO: Piedras Negras, no date or collector recorded, chrysanthemum flowers, det Weisman, USNM #66-765 (19 larvae).

Larval Diagnosis

This species is not economically important enough in Honduras to justify a complete description. The larva was illustrated by Carlson (1968).

Pupal Diagnosis

Posterior margins of the prothorax with a pair of lateral indentations; and general characteristics of the subfamily Phycitinae.

Pupal Description

This species is not economically important enough in Honduras to justify a pupal description.

Biology

The biology was summarized by Rogers (1979). Females fed and laid eggs on the flowers of the host. Larvae first fed on the pollen, then on the petals and other flower parts, and by the third instar they bored into the developing seeds. Damaged heads were sometimes affected by Rhizopus sp., a fungus.

Pest Status

H. electellum is a serious pest of sunflowers capable of destroying whole fields of this crop in the United States. There are no confirmed records of the sunflower moth in Honduras so it is considered a potential pest at present.

Comments

MacGregor (1976) recorded H. electellum from Honduras in her booklet on the common insects of the Comayagua valley. Later examination of these insects proved they were actually *P. atramentalis* of the Epipaschiinae. The two larvae very closely resemble each other in general habitus but differ greatly in morphology.

The genus *Homoeosoma* includes pests of sunflower in both the Old World and South America (Rajamohan, 1976). The life history and range of many Neotropical *Homoeosoma* needs study. Some of these species may also be associated with sunflower.

Hypsipyla grandella (Zeller)

(Figs. 37, 65, 453-464)

Synonyms

None in common usage.

Common Name

This insect has no common name (Werner, 1982; Saunders et al., 1983) although both shootborer and mahogany shootborer have been used (Whitmore, 1976). The latter name emphasizes that *H. grandella* is a pest of mahogany and thus is more appropriate than the former which is not distinctive enough.

Distribution

Generally distributed thoughout Latin America wherever its foodplant occurs, USA, Mexico, Guatemala, Honduras, Costa Rica, Panama, Cuba, Puerto Rico, Haiti, Trinidad, Colombia, Venezuela, Ecuador, Guayana, Peru, Brazil, Paraguay, Argentina (Heinrich, 1956); Barbados, Belize, Surinam and other Caribbean Islands (Becker, 1976).

The record of a borer in *Cedrela* by Bates (1932) in Guatemala likely refers to *H. grandella*.

Hosts

Carapa guianensis, *C. procra*, *C. angustifolia*, *Cedrela odorata*, *C. salvadorensis*, *C. fissilis*, *C. tubiflora*, *C. lilloi*, *C. tonduzii*, *Swietenia macrophylla*, *S. mahogani*, *Guarea caoba*, *G. trichilioides*, *Khaya nyasica*, *K. senegalensis*, and *Trichilia* sp. (Becker, 1976).

The record for *H. grandella* on *Erythrina* sp. probably represents a misidentification of *Terastia meticulosalis* (Becker, 1976). *Cedrela* is preferred over *Swietenia* (Dinther, 1960). *H. grandella* was reported on *Jacaranda subrhombea* (Silva et al., 1968) but this may need confirmation.

Material Examined

USA: Florida, Miami, 29-IV-1967, em. ?, D. Habeck, ex larva on mahogany seed pods, det. Habeck, A-14 (3 adults, 1 larva); Miami, 10-V-1967, em. ?, D. Habeck, reared ex twig borer, det Kimball, A-166 (1 adult); HONDURAS: Comayagua, 3-VIII-1979, em. 16-VIII-1979, S. Passoa, ex seeds of *Swietenia humilis*, genitalia slide #105, larva #138 SPC; Comayagua, 3-VIII-1979, em. 10-IX-1979, S. Passoa, ex larva on seeds of *Swietenia humilis*, genitalia #113, larva #138 SPC (2 adults, 2 cast pupal skins, 1 larva); EAP, no date recorded, R. Caballero, no host data (1 pupal skin); Dept. La Paz, La Paz, 30-V-1979, em. ?, S. Passoa, ex larva on *Swietenia humilis*, genitalia slide #107, mandible slides #298, 299, larva #105a SPC (3 adults, 1 cast pupal skin, 5 larvae).

Larval Diagnosis

D2 posteroventrad of D1; anterior spines of the proximolateral region of the hypopharyngeal complex subequal in length to the seta born by the first segment of the labial palps; SV group of A9 unisetose; and general characteristics of the subfamily Phycitinae.

A single specimen of *H. grandella* has the SV group on A9 unisetose on one side and bisetose on the other side.

Larval Description

General. Preserved larvae white to cream-colored with a red-brown head (except for a black genal spot), brown prothoracic shield, and dark brown pinacula.

Skin texture granulose, crochets in a triordinal circle, mature larva from 20-35 mm long.

Head. Front extends about 2/3 the distance from the clypeus to the epicranial notch; Adf2 lies just dorsad to the apex of the front; Adf1 is dorsad to a horizontal line drawn through L1; F1 lies slightly ventrad to a horizontal line drawn through A2; C2 seta equal in length to C1; P2 only 1/3 the length of P1; A1 twice the length of A2; A3 and L1 almost in a horizontal line.

Six stemmata present; stemma 1 slightly larger than stemma 2; distance between stemmata 2 and 3 three times the distance between stemmata 3 and 4; distance between stemmata 2 and 3 subequal to the distance between stemmata 4 and 5; stemma 6 directly ventrad of stemma 1.

Labrum with M2 dorsad of M3, M3 shorter than M1 or M2; length of L2 twice that of L1, L3 slightly longer than L1.

Mandible with 3 teeth, each with a molar ridge; anterior mandibular seta half the size of the posterior one; dorsal surface of the mandible with a patch of reticulation near the base.

Hypopharyngeal complex with a blunt spinneret almost equal to twice the length of the basal portion of the labial palps; proximomedial area spinose, the anterior spines slightly longer than the posterior ones;

proximolateral region with a series of faint blade-like projections; two stipular setae present.

Thorax. Prothorax with XD1 twice the length of D1; XD2 much closer to SD1 than XD1; D2 almost twice the length of SD2; L setae arranged vertically, L2 half the length of L1; SV group bisetose; V1 posterior to the coxa and close to the midline.

Mesothorax with D1 a third the length of D2; SD1 four times the length of SD2 and surrounded by a heavy sclerotized ring; L3 closely spaced to L1 and L2, the distance equal to less than the diameter of the L3 pinaculum; SV1 slightly posterior to L3; V1 close to the coxa, much farther from the midline than V1 on T1.

Abdomen. A1 with D2 posteroventrad of D1; SD1 dorsad of the spiracle; SD2 anterodorsad of the spiracle; L2 one third the length of L1; L3 closer to the trisetose SV group than L1 and L2; V1 ventrad of the SV setae.

A6 with the D and SD setae as in A1; L1 and L2 anterior to the spiracle; L3 ventrad of D2; all SV setae anterior to a vertical line drawn through the spiracle; V1 ventrad of the coxa.

A8 with the D2 pinaculum more elongate than D1; SD1 setae long, twice the length of D1; SD2 anterior to the spiracle; L1 and L2 as in A6; L3 posteroventrad of L1 and L2; SV group bisetose; V1 ventrad of the SV setae.

A9 with D2 on a large square pinaculum; SD1 four times as long as D1; L group trisetose; SV1 dorsad of V1.

Anal shield with SD2 twice the length of D1, SD1 longer than D2.

Pupal Diagnosis

Gibba absent; texture of thorax punctate; thorax without a pair of indentations; eight cremaster spines present in dorsal view, all much thicker than the body setae.

The pupa of *Moodna bisinuella* is similar to *H. grandella* except that the former species is smaller (about 10 mm or less) and has two fewer cremaster spines which are not thickened.

Pupal Description

The pupa was described by Salvatierra (1971), Sliwa and Becker (1973), and illustrated by Grijpma (1974).

Biology

Each stage in the life cycle of *H. grandella* was illustrated by Holsten (1976). Eggs were white but later turned red. Larvae fed on the shoots, seeds, and pods of the host. The life cycle took about 30 days for the 5 larval instars. Pupation usually occurred on the host but some larvae pupated in the soil. Adults emerged and usually laid about 300 eggs in 5 days.

There is a large amount of literature available on the biology and control of *H. grandella*. These were compiled in a 3 volume set but only volumes number 2 and 3 are readily available (Whitmore, 1976). A bibliography was included in the 3rd volume (Moreno and Whitmore, 1976). Information on biology and control was summarized in Grijpma (1974).

Pest Status

H. grandella is an widespread pest in Latin America capable of causing serious damage. Damage is constant in some areas of Costa Rica (Grijpma, 1974) but no detailed surveys of forest insect pests have been carried out in Honduras.

Comments

The larvae and pupae of *H. grandella* closely resemble *H. robusta*, an Old World species attacking a similar range of hosts (Beeson, 1919; Sharma and Singh, 1980). The biology of *H. ferrealis*, reared from *Carapa guianensis* in Costa Rica, was studied by Becker (1973) but the larva was not described morphologically.

Moodna bisinuella Hampson

(Figs. 38, 465-478)

Synonyms

None in common usage.

Common Names

This insect has no common name (Werner, 1982; Saunders et al., 1983). An appropriate common name would be granulated corn caterpillar. The term earworm should be avoided as this applies to noctuids of the genus *Heliothis*. The granulated skin of *Moodna* larvae will help separate this species from other caterpillars found in corn ears throughout the American Tropics except for heavily pigmented individuals of *C. cautella*.

Distribution

USA, Mexico (Heinrich, 1956); Honduras (Passoa, 1983); El Salvador (Berry and Vaquero, 1957).

The record for *M. bisinuella* from Belize cited, by Heinrich (1956) as needing confirmation, is probably correct.

Hosts

Corn (Heinrich, 1956); *Tripsacum* sp. (Neunzig, 1985); sorghum.

Material Examined

HONDURAS: Comayagua, XI-1980, em. ?, S. Passoa, ex corn ear, mandible slides #173, 302, genitalia slide #201 SPC (2 adults, 2 cast pupal skins); Comayagua, 24-IX-1980, S. Passoa, corn ear, det. Weisman, mandible slide #303 (2 larvae); El Rosario, 6-X-1979, S. Passoa, ex larva on corn ear, mandible slide #174, genitalia slide #322 SPC (1 adult); EAP, 18-V-1983, no collector recorded, on corn (1 cast pupal skin); EAP, 12-XI-1982, no collector recorded, corn ear (1 cast pupal skin); EAP, 16-V-1977, no collector recorded, corn ears (1 larva); EAP, no date, collector, or host recorded, mandible slide #305 SPC (1 larva); EAP, 26-II-1981, C. Patt, corn (1 larva); EAP, 26-XI-1982, R. Jones, sorghum (grain-filling stage), mandible slide #304 SPC (2 larvae); La Lima, 8-VIII-1968, D. Habeck, corn (1 larva).

Larval Diagnosis

D setae of A1-7 in a horizontal line; L1 and L2 in a vertical line on A3; mandible with an inner tooth on the first molar ridge and three scissorial teeth; area enclosed by the spiracle on A8 smaller than the area enclosed by the sclerotized ring around the SD1 seta on that segment; and general characteristics of the subfamily Phycitinae.

Larval Description

General. Living larva purplish-pink. Preserved specimens white to cream yellow. Head reddish-brown to reddish-yellow.

Skin texture strongly granulate; crochets in a biordinal circle; mature larva approximately 17 mm long.

Head. Front nearly extends to the epicranial notch; Adf2 ventrad to the apex of the front; a horizontal line drawn through Adf1 lies dorsad of the A3 seta; F1 seta longer than normal, subequal in length to C1; C2 shorter than C1; P1 twice the length of P2; A2 anterodorsad of A1, A3 twice as long as L1.

Six stemmata present; stemmata 1, 2, and 3 equally spaced and separated from each other by about 1/2 the diameter of each stemma; stemmata 3 and 4 almost touching, both smaller than stemma 1; stemma 6 posterior to stemma 5.

Labrum with M1 amd M2 longer than M3, L2 twice as long as L1 or L3.

Mandible with three scissorial teeth and a small inner tooth on the first molar ridge, posterolateral corner of the cutting margin with a depression and ridge; anterior mandibular seta shorter than the posterior seta.

Hypopharyngeal complex with an elongate pointed spinneret equal to about twice the length of the third segment of the labial palps, transverse cleft deep, two stipular setae present, proximomedial and proximolateral area spinose, the spines above the premental arm larger than the rest.

Thorax. Prothoracic shield with XD2 shorter than XD1 or SD1, only slightly longer than 1/2 the length of the former two setae; D1 1/3 the length of XD1; D2 near the posterior edge of the prothoracic shield, the distance between XD1 and D1 only 1/3 the distance between D1 and D2; SD2 posterodorsad of SD1; L setae arranged vertically on a square-shaped pinaculum, a weaky sclerotized extension present from the ventral portion of the prespiracular pinaculum that extends below and behind the spiracle; SV group bisetose; V1 behind the coxa and close to the midline.

Mesothorax with D2 about three times the length of D1; SD1 surrounded by a sclerotized ring that is thicker on the posterior margin; SD2 lies anterodorsad of SD1; L3 separated from L1 and L2 by almost three times the diameter of the L3 pinaculum; SV group unisetose; V1 lies posteroventrad of a vertical line drawn through the middle of the coxa.

Abdomen. A1 with D1 and D2 in a horizontal line; SD1 posterodorsad of the spiracle; SD2 anterodorsad of the spiracle; L1 and L2 in a vertical line ventrad of the spiracle; L3 below D2; SV group trisetose; V1 ventrad of the SV setae.

A6 with the D and SD setae as in A1; L1 and L2 anteroventrad of the spiracle; L3 posterodorsad of the coxa; SV group trisetose; V1 below the coxa.

A8 with D2 posterodorsad of D1; SD1 surrounded by a sclerotized ring thicker on the anterior margin; SD2 anterodorsad of the spiracle and separated from the spiracle by the horizontal diameter of the spiracle; L2 anterodorsad of L1; length of L3 equal to L2; SV group bisetose; V1 ventrad of the SV setae.

A9 with the D setae fused on a sclerotized plate; SD1 four times the length of D1; L group trisetose; SV group bisetose; V1 as in A8.

Anal shield with D1 close to SD1, D2 slightly longer than SD1.

Pupal Diagnosis

Gibba absent; texture of the abdominal segments punctate; cremaster consists of six setae in dorsal view which are not much thicker than the other body setae; and general characteristics of the Phycitinae.

The pupa of *M. bisinuella* is similar to *Hypsipyla grandella* except for the smaller size (about 10 mm long) and the 2 fewer cremaster setae which are not thickened.

Pupal Description

General. Pupa reddish-brown, length about 10 mm.

Head. Vertex with two setae; labrum U-shaped; labial palps shaped like an inverted tear drop; maxillary palps large and rectangular; maxillae extend about 4/5 the distance to the caudal wing margin; pilifers present; postgenae obvious; antennae end slightly before the mesothoracic legs.

Thorax. Prothoracic femur equal to about 1/2 the size of the prothoracic leg; prothoracic leg extends about 1/2 the distance to the caudal wing margin; mesothoracic leg extends to the caudal wing margin; metathoracic legs exposed; mesothoracic spiracle rounded, tubular; skin texture of thorax roughened.

Abdomen. Spiracles tubular, those of A2 and A3 with furrows; proleg scars present on A5 and A6; cremaster consists of six setae which are not thicker than the other body setae; skin texture of the abdomen punctate.

Biology

The biology of *M. bisinuella* has never been studied in detail. Larvae are commonly intercepted on corn sent to the United States via Mexico (Capps, 1963). Passoa (1983) noted that the larvae were frequently seen during the harvest of corn ears and that damage included consumption of the silk at the tip of the ear along with damage to the kernels.

The behavior of *M. bisinuella* on sorghum is quite different. Jones (personal communication) observed that larvae webbed the kernels of the sorghum panicle together at grain filling stage. Late November and early December were peak periods of abundance for the larvae at the Panamerican Agriculture School and throughout Honduras.

The larva and damage was partially illustrated by Neunzig (1985). Gama grass and sorghum probably are used by *M. bisinuella* as a reservior to infest corn later.

Pest Status

The pest status of *M. bisinuella* is difficult to evaluate. This species is often found in corn ears with both *Pyroderces rileyi* (Cosmopterigidae) and *Pococera atramentalis* where the three insects form a complex of pests. If *M. bisinuella* were considered alone then the attacks probably are not economically important since only the tip of the ear is eaten. Actual field trials with artificially infested plants are needed to determine whether yield loss occurs. Damage to sorghum is probably significant, the webbing of the grains ruins more kernels than the larvae consume.

Saunders et al. (1983) considered *M. bisinuella* to be a pest in Central America.

Comments

Berry and Vaquero (1957) listed a "*Moodna* sp. probably *nova*" from El Salvador on corn. There is no *Moodna* "nova" listed in the catalog of the Phycitinae (Heinrich, 1956) so the term "nova" probably comes from the latin term for new. Berry and Vaquero's (1957) citation raises the question of an undescribed species of *Moodna* on corn in addition to *bisinuella*.

Oryctometopia fossulatella Ragonot

Synonyms

None in common usage.

Common Names

Saunders et al. (1983) listed green pod borer, bean pod borer, and pod moth. Green pod borer is probably the most suitable common name if this does reflect the larval coloration.

Distribution

USA, Mexico, Guatemala, Costa Rica, Panama, Venezuela, Brazil, Puerto Rico, Virgin Islands (Heinrich, 1956); El Salvador (Berry and Vaquero, 1957).

Hosts

Bauhinia mexicana (Heinrich, 1956); *Crotalaria* and beans (Berry and Vaquero, 1957).

Material Examined

No adults, pupae, or larvae were available for study.

Larval Diagnosis

Unknown. The larva of *Oryctometopia* sp. lacks a sclerotized ring around SD1 on the mesothorax (Heinrich, 1956).

Larval Description

Unknown.

Pupal Diagnosis

Unknown.

Pupal Description

Unknown.

Biology

The life cycle of *O. fossulatella* is unknown but the host records indicate a wide variety of legumes are probably attacked. Larvae bore inside the pods (Berry and Vaquero, 1957).

Pest Status

No specimens of *O. fossulatella* were collected in Honduras (Passoa, 1983) so this insect is best considered a potential pest. McGuire and Crandall (1967) and Saunders et al. (1983) considered *O. fossulatella* to be a pest in Central America. Outbreaks of this pest are rarely reported in the literature.

Plodia interpunctella (Hubner)

(Figs. 39, 479-480)

Synonyms

None in common usage.

Common Names

The accepted Entomological Society of America common name is Indian meal moth (Werner, 1982). Dried fruit moth has also been used (Schoenherr and Rutledge, 1967).

Distribution

Cosmopolitan (Heinrich, 1956); Oriental, Neotropical, Palearctic, and Ethiopian regions (Roesler, 1973); Mexico, El Salvador, Honduras, Nicaragua, Costa Rica (McGuire and Crandall, 1967); Guatemala (Bates, 1932).

P. interpunctella is widespread throughout the tropical and temperate regions of the world (Piltz, 1977).

Hosts

All kinds of stored products (Heinrich, 1956); biscuits, cereals, figs, nuts (Noyes, 1930); grain, chocolate, corn meal (also called Indian meal), flour, bean, dried raisin, fruits and fruit refuse, mulberry, cherry, apricot, dates (Simmonds and Nelson, 1975); almond, candies, chili, powdered milk, red pepper, walnut (Ensminger, 1958); coffee (Bates, 1932); pea, Caryocar nuciferum (Dinther, 1960); Prosopis juliflora (Ward et al., 1977); honeybee combs (Okumura, 1955); citrus (Okumura, 1956); wheat, walnut, and peach (Biezanko et al., 1957); chamomile, roselle, cinnamon, licorice, ginger (Heykal et al., 1978); dandelion roots, garlic heads, dried insect and botanical specimens (Hamlin et al., 1931); soybean, nutmeg, mustard seed, barley, oats, buckwheat, rye, sorghum, hazel, currant, carob, lentil, cowpea (Carter, 1984); alfalfa seeds (Hayward, 1960).

Material Examined

USA: Vermont, Hartland, IX-1978, S. Passoa, ex larva in chocolate bar originally from Guatemala, mandible slide #53, genitalia slide #114, larva #162 SPC (1 adult); Florida, Gainesville, 26-VII-1982, S. Passoa, on artificial diet, lab culture (5 adults, 40+ pupae, 1 larva); HONDURAS: EAP, 17-XI-1981, S. Passoa, corn grain (4 larvae); EAP, 12-X-1981, S. Passoa, stored corn grain, larva #304 SPC (1 adult, 4 larvae).

Larval Diagnosis

D setae in a horizontal line on A1-7; L setae of A1 in a vertical line; no obvious pinacula present; and general characteristics of the subfamily Phycitinae.

Lightly sclerotized larvae with faint SD1 rings may be difficult to key to the correct subfamily. P. interpunctella is the only Phycitinae on stored products without obvious pinacula. Pinacula, if present, are concolorous with the body and not pigmented. With the exception of some Anagasta, P. intenpunctella is the only stored product pyralid with a front that extends 2/3 the distance to the epicranial notch (Aitken, 1963).

Larval Description

The larvae was illustrated by Peterson (1962); Hinton (1943); and Ensminger (1958).

Pupal Diagnosis

Gibba absent; texture of vertex and abdominal segments nearly smooth, wrinkles, if present, are shallow and faint; metathoracic legs exposed; mesothoracic spiracle nearly touches the antenna; and general characteristics of the subfamily Phycitinae.

P. interpunctella pupae are very similar to *E. elutella* but the mesothoracic spiracle of *P. interpunctella* nearly touches the antenna while in *E. elutella* the distance separating these two structures is equal to at least 1/4 the diameter of the spiracular opening or more. Some confusion can also occur between *A. kuhniella* and *P. interpunctella* due to the faint wrinkles that some individuals of the latter species may have on the vertex and prothorax. The wrinkles on *A. kuhniella* are strong and obvious, never faint as in *P. interpunctella*.

Pupal Description

The pupa was illustrated by Schoenherr and Rutledge (1967), Silvestri (1951), and by Simmonds and Nelson (1975).

Biology

The biology was summarized by Piltz (1977). Each female laid 20-400 eggs. A dense mat of silk was produced by the larvae as they fed and laid down silk trails. Pupation occurred on the substrate in a tough cocoon. The minimum developmental conditions were 40% humidity and 18°C and a life cycle took from 24-200 days depending on the temperature. Dormancy was prevented with a photoperiod of 13 hours.

The egg was illustrated by LeCato and Flaherty (1974). Roesler (1973) and Heinrich (1956) gave adult descriptions.

The life cycle of *P. interpunctella* was illustrated by Michelbacher and Ortega (1958) and by Linsley and Michelbacher (1943). Hamlin et al. (1931) studied the biology of *P. interpunctella* in California.

Pest Status

Outbreaks of *P. interpunctella* in Honduras were reported by Koone and Banegas (1958). McGuire and Crandall (1967) as well as Saunders et al. (1983) considered the Indian meal moth a pest in Central America. Corn and dried fruit were frequently attacked (Piltz, 1977). *P. interpunctella* can be considered a widespread, serious, and sporadic pest in Honduras.

Infestations occur both in the field and in the warehouse (Simmonds and Nelson, 1975).

CONCLUSIONS

Several classifications of the Pyralidae and definitions of the Pyraloidea have been proposed throughout the years. These were summarized in a table by Fletcher and Nye, 1984. The major source of disagreement on the superfamily level centers around the Pterophoridae. Some workers exclude them as a separate superfamily, the Pterophoroidea (Hodges et al., 1983) while others include them as a family in the Pyraloidea (Fletcher and Nye, 1984). At present, based on the immature stages exmained during this study, they are best placed in the superfamily Pyraloidea. The presence of pilifers in the pupa of the pterophorids (Mosher, 1916) indicates that they are closely related to pyralids. Both Mosher (1916) and Nakamura (1981) used the projection of the prothoracic and mesothoracic legs cephalad of the maxillae to distinguish the Pterophoridae. However, such a condition is also found in the Pyralidae (Rupela). Mosher (1916) noted that pterophorid pupae always lacked maxillary palps but if pyralids lacked maxillary palps then a dorsal groove was present on A10. This statement is generally true but Hellula lacks both maxillary palps and a dorsal groove. Pyralids rarely have spines on the pupal abdomen like pterophorids although exceptions occur in the Crambinae and some Galleriinae. Pyralids are difficult to separate from pterophorids as pupa (see introduction to pupal key) which indicates that the two taxa are related.

A similar blending of characters is also seen in the larval stage. Fracker (1915) noted that the long thin abdominal prolegs combined with secondary setae and verrucae were distinctive for pterophorids. This is true but many Pyraustinae have a similar type of proleg. The first instar larval proleg of _H_. _phaeopteralis_ is especially elongated. Most pterophorids, if not all, have secondary setae. However, extra setae are found in a few Pyraustinae (Allyson, 1981b) and some Crambinae (Tan, 1984; Hasenfuss, 1960). The only character which supports the placement of the pterophorids in their own superfamily is found in the prespiracular group of the prothorax. As yet there are no known Pyraloidea with a trisetose prespiracular pinaculum. This readily distinguishes pterophorid larva from other Pyraloidea when it occurs but unfortunately many pterophorids also have a bisetose prespiracular group (Peterson, 1963). A trisetose prespiracular group is pleisiomorphic and thus should not be used to define a taxa.

This placement of the Pterophoridae as a primitive member of the Pyraloidea was suggested by Kuznetzov and Stekolnikov ((1979) based on the male genitalia. This is supported by the lack of a tympanum and a strongly developed first anal vein in the forewing (Munroe, 1972) which are two pleisiomorphic features. The Thyrididae and Hyblaeidae also lack a tympanum but as shown by Minet (1983) these taxa are not closely related to pyralids or each other. As with the pterophorids, the differences between these families and the Pyralidae do not justify raising them to a superfamily (see introduction to larval and pupal keys for distinguishing characteristics). Singh (1955) stated that hyblaeids lack pilifers. Forbes (1933) disagreed and considered the Hyblaeidae to be in the Pyraloidea. The single cast skin examined supports the latter view. Forbes (1933) mentioned the labial palps in between "lobes of the labrum". The lobes are actually the pilifers. Singh's (1955) list of reasons to exclude Hyblaeidae pupa from the Pyraloidea (labrum, antenna, dorsal groove, abdominal spines, dorsal crest, cephalad appendages, and exposure of labial palps) are all found in the pyralids illustrated here. The larval prolegs are quite variable in pyralids, this is also not a sufficient reason to exclude Hyblaeidae. More work is needed to distinguish mandible lobes from pilifers but Forbes (1933) statement that the lobes are "not unlike a normal pyralid" appears correct regardless of what these lobes are called. The similarity between Diatraea grandiosella and Hyblaea puera is an example. The presence of verrucae and a trisetose prespiracular group on pterophorid larvae agrees with Heppner's (1977) figure since the Zygaenoidea and Pyraloidea are closely related. If the Pterophoridae are considered a primitive member of the Pyraliodea then these larval features are not suprising. Verrucae and a trisetose prespiracular pinaculum are found in the Zygaenoidea.

The second area of disagreement among specialists involves the relative ranking of pyralid taxa in the taxonomic hierarchy. Some workers, for example Hannemann cited in Fletcher and Nye (1984), split the Pyralidae into the families Galleriidae, Pyralidae, Phycitidae, Crambidae, Acentropidae, and Pyraustidae which is a modification of Meyrick's classification of the Pyralidina. Most workers consider these groups as subfamilies (Hodges et al., 1983; Fletcher and Nye, 1984). Based on larval morphology, Hasenfuss (1960) sunk most of these subfamilies to tribes. Both Hasenfuss (1960) and Minet (1982) considered the Pyralidae to be composed of two families, the Pyralidae and the Crambidae.

Based on the species examined during this study, the family Pyralidae is best considered a unit composed of two or perhaps three series. Unfortunately, the immature stages of the Midiliformes were not available so this discussion will be restricted to the Pyraliformes and the Crambiformes.

Hasenfuss (1960) separated the Pyraliformes (called the Pyralinae) from the Crambiformes (called the Crambinae) based on the L and SV groups of A8 and A9. In addition, the Pyraliformes had a sclerotized ring. Adult features support this division, especially with regard to the tympanum (Munroe, 1972; Minet, 1982). Unfortunately, there are no pupal characteristics to match this division in the adults and larvae. In general, Crambiformes pupae have appendages which extend past the caudal wing margin while in the Pyraliformes the appendages end at the caudal wing margin. Many Pyraliformes have a dorsal groove between A9 and A10 or a gibba. These are never found in the Crambiformes. The above are general guidelines, but exceptions are numerous. Hasenfuss's (1960) contention that the Pyralidae are composed of two lines appears sound but the pupae and certain larval exceptions argue that this division is best expressed in between the the family and subfamily level. The fusion, or close approximation, of the Sc and Rs vein beyond the end of the discal cell in the hindwing unites the Pyraliformes and the Crambiformes as a unit. They could still be united if the Pyraloidea were defined to include only the Pyralidae and the Crambidae. The problem with this classification is it fails to recognize that pterophorids are actually more closely related to pyralids in the immature stages than has been realized and that these families are united by the presence of pilifers. The division of a large family into two units is not rare in the Lepidoptera. Munroe (1972) mentioned the case of the trifids and the quadrifids in the Noctuidae as one example. Crumb (1956) noted a similar division of Noctuidae Geometridae and Arctiidae larvae into "confluentae" and "liberae". Therefore, this division of a large family into two groups appears widespread in the Lepidoptera. In order to keep the classification of the Lepidoptera balanced these differences are best expressed above the subfamily, as is the case with the Noctuoidea. Finally, Murphy and Ehrlich (1984) have correctly noted that higher classifications carry the most information when they are conservative and not overly split.

In summary, the Pyraloidea is made of four very different, but related families. Pterophorids are probably the most primitive, Pyralidae are the most advanced.

A third area of disagreement among specialists involves the relationships of the various subfamilies to one another. Two attempts have been made to diagram this problem. Kuznetzov and Stekolnikov (1979) studied male genitalia while Roesler (1973) analyzed both larval and adult characteristics. Some comments on these studies are made below starting first with the Crambiformes.

Both workers have the Schoenobiinae well separated from the Nymphulinae but these two subfamilies are apparently closely related. They are linked by the presence of a tubular first anal vein in the forewing and a bisetose L group on A9 in the larvae. Some Schoenobiinae have a unisetose L group on A9 but more study is needed to see which condition is typical for the subfamily. The controversy over the systematic position of <u>Acentria</u> is proof that intermediate forms apparently exist between these subfamilies. The relatively exarate pupa of most Nymphulinae and the Schoenobiinae is also unusual. The exposed mesothoracic femur of Schoenobiinae pupa and the appendages projecting cephalad of the maxillae are probably pleisiomorphic. The membranous prothoracic sac of the larval Schoenobiinae is apomorphic.

The phylogency of the Nymphulinae was studied by Lange (1956). The three tribes are readily distinguished by the pupa which goes from the Ambiini (no enlarged spiracles, cremaster present) to the Argyractini (two spiracles enlarged, cremaster present) to the Nymphulini (three spiracles enlarged, cremaster absent). Most Nymphulini larvae possess branched tracheal gills which are apomorphic. Ambiini adults have Scoparia-like genitalia (Munroe, 1972) and terrestrial larva which are both primitive features.

Two genera of Scopariinae were illustrated by MacKay (1972b). The larva appear distinctive due to the extremely small spiracles of A1-8 which are scarcely as large in diameter as the SD2 setal length of that segment. Munroe (1972) noted that the Scopariinae were intermediate to the Crambiinae and the Nymphulinae based on adult features. Larval morphology confirms this. Small spiracles are found in some Nymphulinae while there is a small pinaculum without setae present on the mesothorax in Scoparona (McKay, 1972b). Such pinacula are common in the Crambinae and some Pyraustinae. Roesler's (1973) contention that the Scopariinae are not the most primitive member of the Crambiformes is supported by their close relationship to the Crambinae and by their reduced first anal vein in the forewing which is only a fold.

The Crambinae are placed before the Pyraustinae with some doubt. Munroe (1972) noted the close relationship between the Crambinae and the Scopariinae while Roesler (1973) and Kuznetzov and Stekolnikov (1979). The exposed labial palps of some pupa support this (Mosher, 1916). The Pyraustinae and the Crambinae sometimes share the following larval and pupal features including the shape of the prespiracular group, extra pinaculum without setae on the mesothorax and metathorax, grooves on A10 of the pupa, and a shortened maxillae. However, it is difficult to define a lineage of Crambinae plus Pyraustinae and relatives apomorphically. Roesler (1973) considered Acentria and the Crambinae to be related in an Acentropinae-Crambinae complex. The immature stages do not support this view.

If the Scopariinae are considered to be the ancestor of the Nymphulinae then a non-parsimonious classification is produced where the first anal vein of the forewing is strong in the ancestor, then reduced in the Scopariinae, then partially tubular in the Nymphulinae. Extra pinacula without setae are also present, absent, and then once again revived. Classifying the Schoenobiinae, Nymphulinae, Crambinae and Scopariinae as a unit has the disadvantage of separating the Pyraustine and the Crambine too widely as mentioned below.

The fusion of the thoracic extra pinacula without setae in the Crambinae is apomorphic and would fit best after the Pyraustinae since the latter family and the Scopariinae both have these pinacula unfused. The pupal appendages such as abdominal spines and caudal horns in the Crambinae are also specialized features. However, removing the Crambinae leaves the Pyraustinae, Evergestinae, and Glapyriinae closely associated. These can be little doubt these three are related.

The limits of the Pyraustinae have been unclear. Amsel (1956) recommended a wide definition of the subfamily to include the Nymphulinae, Pyraustinae, and Scopariinae. The larval and pupal morphology contradicts this view since these groups are easily separated as immatures (pupa of the Scopariinae are not available). Neither

Bollman (1955) nor Hasenfuss (1960) could find characters to separate Old World species of Pyraustinae, Evergestinae, or Glaphyriinae. This separation is justifiable based on the New World fauna and thus supports studies on the male genitalia. Amsel's (1956) study, like the present one, found the Pyraustinae to be the dominant subfamily in the Neotropics in terms of species richness.

The other lineage within the Pyralidae is called the Pyraliformes. Although firm evidence is lacking, it appears as if the Pyraliformes are probably more advanced than the Crambiformres. Primitive members of the Pyraloidea such as the Thyrididae and Hyblaeidae have a unisetose or rarely bisetose (Heinrich, 1921) L group on A9 (Fracker, 1915; Singh, 1955). This would make the trisetose condition derived. When larval and pupal features of the pterophorids appear in pyralids (secondary setae, etc.), these appear in the Crambiformes and are assumed to be plesiomorphic. The secondary reductions of the Galleriinae and the Chrysauginae seem to indicate these taxa are rather specialized. The relationship is by no means clear because the Crambiformes have a specialized tympanum with a praecinctorium present. Swezey's observation (cited in Zimmerman, 1958) that Scoparia has a gibba-like structure may indicate that the Pyraliformes evolved from a Scopariinae-like ancestor. The scenario would be as follows. The Scopariinae-like ancestor with a simple tympanum developed a gibba and a trisetose L group, this led to to the Pyraliformes. The rest of this ancestoral taxon underwent three specializations. First a praecinctorium was developed, this led to the Crambidiformes. An extra L setae was added, this led to the Nymphulinae-Schoenobiinae line. The final nodal point involved a loss of the chaetosema and the development of a shouldered pupa. This led to the

Pyraustinae and relatives. The development of sclerotized rings in the Pyraliformes is probably a specialization but such rings also occur in the lower Ditrysia such as the Gelechoidea (Blastobasidae especially).

Roesler (1973) along with Kuznetzov and Stekolnikov (1979) considered the Phycitinae to be primitive and widely separated from the other Pyraliformes. This view appears correct and is supported on larval and pupal characters. Mosher (1916) considered the Pyralinae to be closely related to Ephestia and Plodia of the Phycitinae since the pupa were hardly distinct, even on the generic level. A major difference between these groups is the mesothoracic spiracle and the presence of a dorsal groove which readily separates them from each other. The mesothoracic spiracle of the Phycitinae has moved to the prothorax, when present, and this is an apomorphic feature. Mosher (1916) considered the location to be primitively on the mesothorax. The possession of sclerotized rings on the thorax is unusual for most Pyraliformes although they are also present in some Chrysauginae and some Pyralinae. Phycitinae have chaetosema (Roesler, 1973) and this is a primitive feature if a parallel is drawn between the Crambiformes and Pyraliformes. This subfamily is also characterized by its cubital pectan. The number of setae in the SV group on A9 used to define this subfamily is inconsistent. Both Bonchis (Chrysauginae) and Etiella (Phycitinae) have a setal formula of 2:2:1 in the SV group of A7:A8:A9. Dioryctria has a bisetose SV group on A9.

The position of the Chrysauginae is difficult to determine. Most forms share a sclerotized ring around the SD1 setae with the Phycitinae although in this case it is on the metathorax. When sclerotized rings are found on the thorax in Pyralinae larva it involves the D setae, therefore no relationship is indicated. Some larva lack sclerotized rings on all body segments, a trait also found in the Phycitinae. They are also rather specialized due to a loss of the maxillary palps and first anal vien in the hindwing. In addition, the veination shows sexual dimorphism (Roesler, 1973). The first two traits are secondary reductions, similar to the trend in the Galleriinae. The larval features of the Crysauginae indicate a similarity to the Phycitinae although the mesothoracic spiracle is similar to the rest of the Pyraliformes (except the Galleriinae and some Pyralinae).

The Pyralinae and the Epipaschiinae are closely related. The larvae share a sclerotized ring on A8 only, except for the Hypotiini which have a sclerotized ring on the D2 seta of the mesothorax. This is probably an apomophic trait. The Epipaschiinae are barely separated from most Pyralinae except for a minor difference in the spacing of the V setae. Adults are similar in that both have maxillary palps present and the first anal vein of the hindwing well developed (Munroe, 1972). Pyralinae and Epipaschiinae pupa differ only in the form of the mesothoracic spiracle, a character which awaits confirmation. Chrysauginae pupa, like the Epipaschiinae, sometimes lack maxillary palps. Mosher (1916) noted that the Epipaschiinae never have the epicranial suture exposed. Although not investigated here, this character may help separate them from related taxa. Adult characters such as the modification of the basal segment of the antenna, tufts of scales, and the fusion of the Sc and Rs vein in the hindwing define this subfamily (Munroe, 1972).

The Galleriinae appear to be the most advanced of the Pyraliformes. Their apomorphic features all seem to involve secondary reductions such as the loss of the gnathos, the loss of the mesothoracic spiracle in the pupa, the shortened maxillae of the pupa, and the loss of sclerotized rings on the thoracic segments. The absence of pilifers is only secondary, the opinion of Mosher (1916) that they do not belong in the Pyralidae is incorrect. The larva and adults are normal Galleriinae pyralids in structure. Sclerotized rings are also found on the abdominal segments of Phycitinae, these are distinguished by having a sclerotized ring on the mesothorax also. This contradicts the contention of Roesler (1973) that the Galleriine deserve family status. As stated above, the Pyralinae are closely related to the Epipaschiinae, not to the Galleriine as shown by Kuznetzov and Stekolnikov (1979).

It must be emphasized that the above discussion is speculative in nature since only 60 of the 30,000 or so pyralids were examined. Nevertheless, it is hoped that this information will stimulate interest on the immature stages of this group and will provide a series of hypotheses to be rejected or confirmed during future studies. I echo Munroe's (1972) wish that future students "derive as much pleasure from their studies on the Pyralidae as I have from mine".

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APPENDIX

All the figures in this thesis have been placed in the appendix. The colored photographe are arranged in groups. The first group consists of caterpillars (1-39) followed by photos of damage (40-46), eggs (47-49), and pupae (50-52). Figures 53-65 consist of scanning electrom micrographs showing pupal structures of taxonomic importance. Figure 66 is an outline map showing the major collecting sites in Honduras. Figures 67-492 are line drawings of various structures of larvae and pupae showing details which are taxonomically important. Finally, Figure 493 is a cladogram showing the relationships of the subfamilies of Pyralidae and families of the Pyraloidea.

Fig. 1. *Parapoynx diminutalis* Snellen, larva, dorsal view.

Fig. 2. *Hellula phidilealis* (Walker), larva, dorsal view.

Fig. 3. *Evergestis rimosalis* (Guenee), larva, dorsal view.

Fig. 4. *Achyra bifidalis* (Fabricius), prepupa larva, dorsal view.

Fig. 5. *Asciodes gordialis* Guenee, larva, dorsal view.

Fig. 6. *Azochis* sp. [*gripusalis* (Walker) complex], larva, lateral view.

Fig. 7. *Compacta hirtalis* (Guenee), larva, dorsal view.

Fig. 8. *Compacta hirtalis* (Guenee), larva, lateral view.

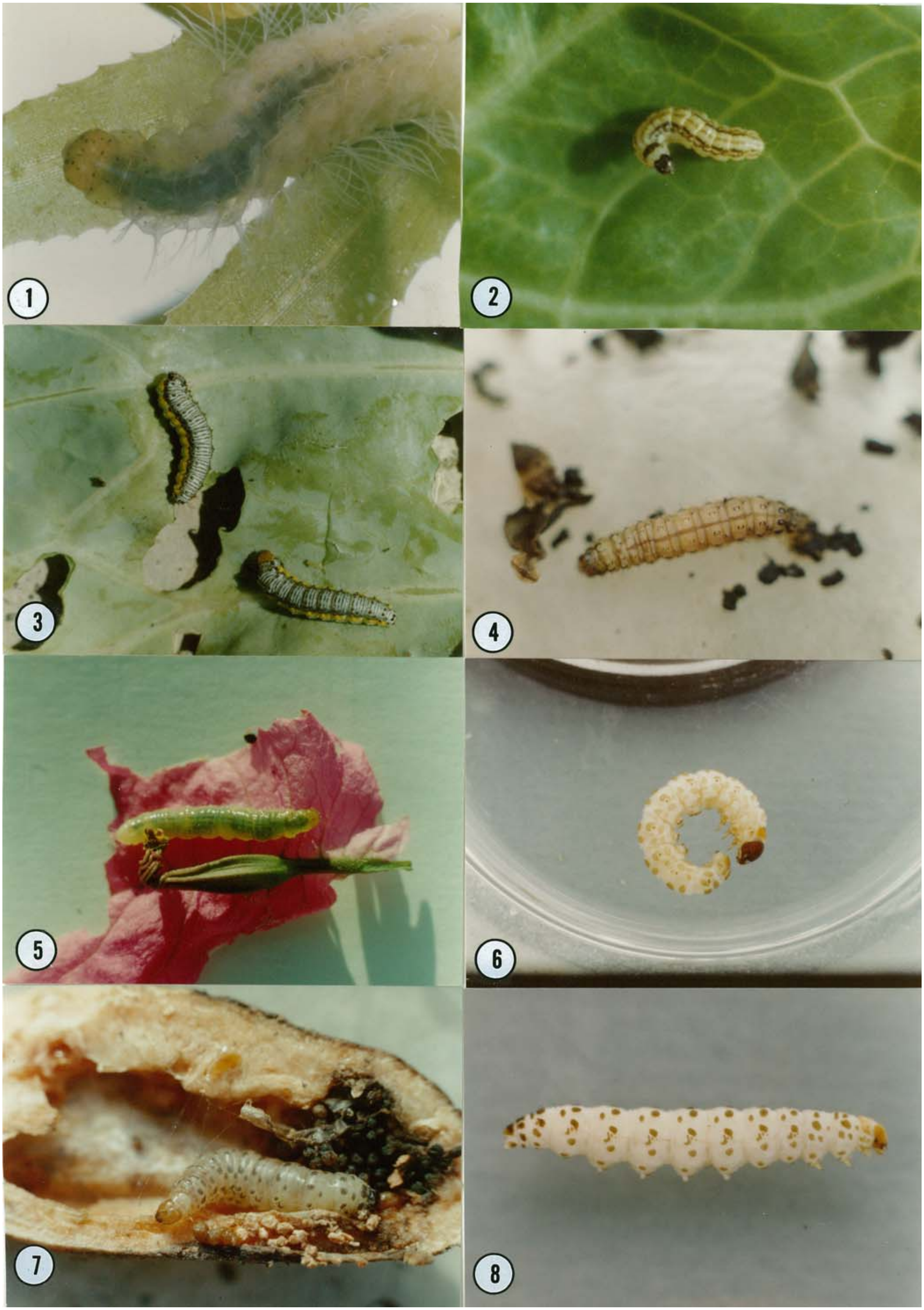
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Fig. 9. Diaphania hyalinata (Linnaeus), larva, dorsal view.

Fig. 10. Diaphania hyalinata (Linnaeus), larva in molt with a false genal spot due to the mandible showing through the transparent epicrania, lateral view.

Fig. 11. Diaphania nitidalis (Stoll), early instar larva, dorsal view.

Fig. 12. Diaphania nitidalis (Stoll), late instar lava, dorsal view.

Fig. 13. Diaphania nitidalis (Stoll), prepupa, lateral view.

Fig. 14. Eulepte sp. probably concordalis Hubner, larva, dorsolateral view.

Fig. 15. Eulepte sp. probably concordalis Hubner, epicranial tonofibrillary platelets, dorsal view.

Fig. 16. Eulepte sp. probably concordalis Hubner, larva, dorsal view.


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Fig. 17. Herpetogramma bipunctalis (Fabricius), larva, dorsal view.

Fig. 18. Lygropia tripunctata (Fabricius), larva, lateral view.

Fig. 19. Maruca testulalis (Geyer), larva, dorsal view.

Fig. 20. Omiodes indicata (Fabricius), larva, dorsal view.

Fig. 21. Spoladea recurvalis (Fabricius), larva, dorsal view.

Fig. 22. Fissicrambus sp. or genus near, larva, dorsal view.

Fig. 23. Diatraea lineolata (Walker), larva in diapause, dorsal view.

Fig. 24. Diatraea lineolata (Walker), larva, dorsal view.


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Fig. 25. Diatraea saccharalis (Fabricius), dark form of larva, dorsal and lateral views.

Fig. 26. Diatraea saccharalis (Fabricius), larva in diapause (top, without pinacula) and nondiapause form (bottom, with pinacula), dorsal view.

Fig. 27. Pococera atramentalis Lederer, dark form of larva, dorsal view.

Fig. 28. Calybitia picata Schaus, larva, dorsal view.

Fig. 29. Pococera atramentalis Lederer, dark form of larva, dorsal view.

Fig. 30. Pococera atramentalis Lederer, light form of larva, dorsal view.

Fig. 31. Galleria mellonella (Linnaeus), larva, dorsal view.

Fig. 32. Corcyra cephlonica (Stainton), larva, dorsal view.


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Fig. 33. *Cadra cautella* (Walker), larva, dorsal view.

Fig. 34. *Elasmopalpus lignosellus* (Zeller), larva, dorsal view.

Fig. 35. *Etiella zinckenella* (Treitschke), larval prothoracic shield, dorsal view.

Fig. 36. *Etiella zinckenella* (Treitschke), variation in larval color, dorsal view.

Fig. 37. *Hypsipyla grandella* (Zeller), larva, lateral view.

Fig. 38. *Moodna bisinuela* Hampson, larva, dorsal view.

Fig. 39. *Plodia interpunctella* (Hubner), larva, dorsal view.


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Fig. 40. Lygropia tripunctata (Fabricius), leaf roll of larva.

Fig. 41. Jocara sp. [conspicualis (Lederer) complex] larval tent.

Fig. 42. Eulepte sp. (probably concordalis Hubner), leaf damage of larva.

Fig. 43. Pococera atramentalis Lederer, damage to corn ear tip.

Fig. 44. Ectomyelois ceratoniae (Zeller), damage to mahogany seeds.

Fig. 45. Cadra cautella (Walker), pupal cocoons.

Fig. 46. Diaphania nitidalis (Stoll), larval entrance hole in cucumber fruit.


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Fig. 47. Diatraea saccharalis (Fabricius), egg mass.

Fig. 48. Diatraea lineolata (Walker), egg mass.

Fig. 49. Rupela albinella (Cramer), egg mass.

Fig. 50. Diatraea saccharalis (Fabricius), pupa with short maxillae, ventral view.

Fig. 51. Diaphania nitidalis (Stoll), pupa, lateroventral view.

Fig. 52. Dioryctria erythropasa (Dyar), gibba, dorsal view.


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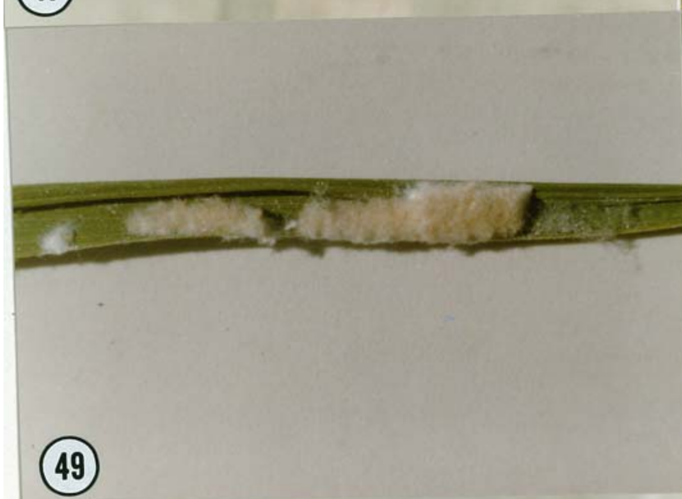
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Fig. 53. *Pococera atramentalis* Lederer, cremaster spines and dorsal grove.

Fig. 54. *Pococera atramentalis* Lederer, setae on dorsal groove.

Fig. 55. *Jocara* sp. [*conspicualis* (Lederer) complex], dorsal groove.

Fig. 56. *Jocara* sp. [*conspicualis* (Lederer) complex], setae on dorsal groove.

Fig. 57. *Asciodes gordialis* Guenee, mesothoracic spiracle adjacent to a pit, dorsal view.

Fig. 58. *Megastes* sp., mesothoracic spiracle, dorsal view.

Fig. 59. *Megastes* sp., exposed metathoracic legs of pupa, ventral view.

Fig. 60. *Amyelois transitella* (Walker), cremaster.

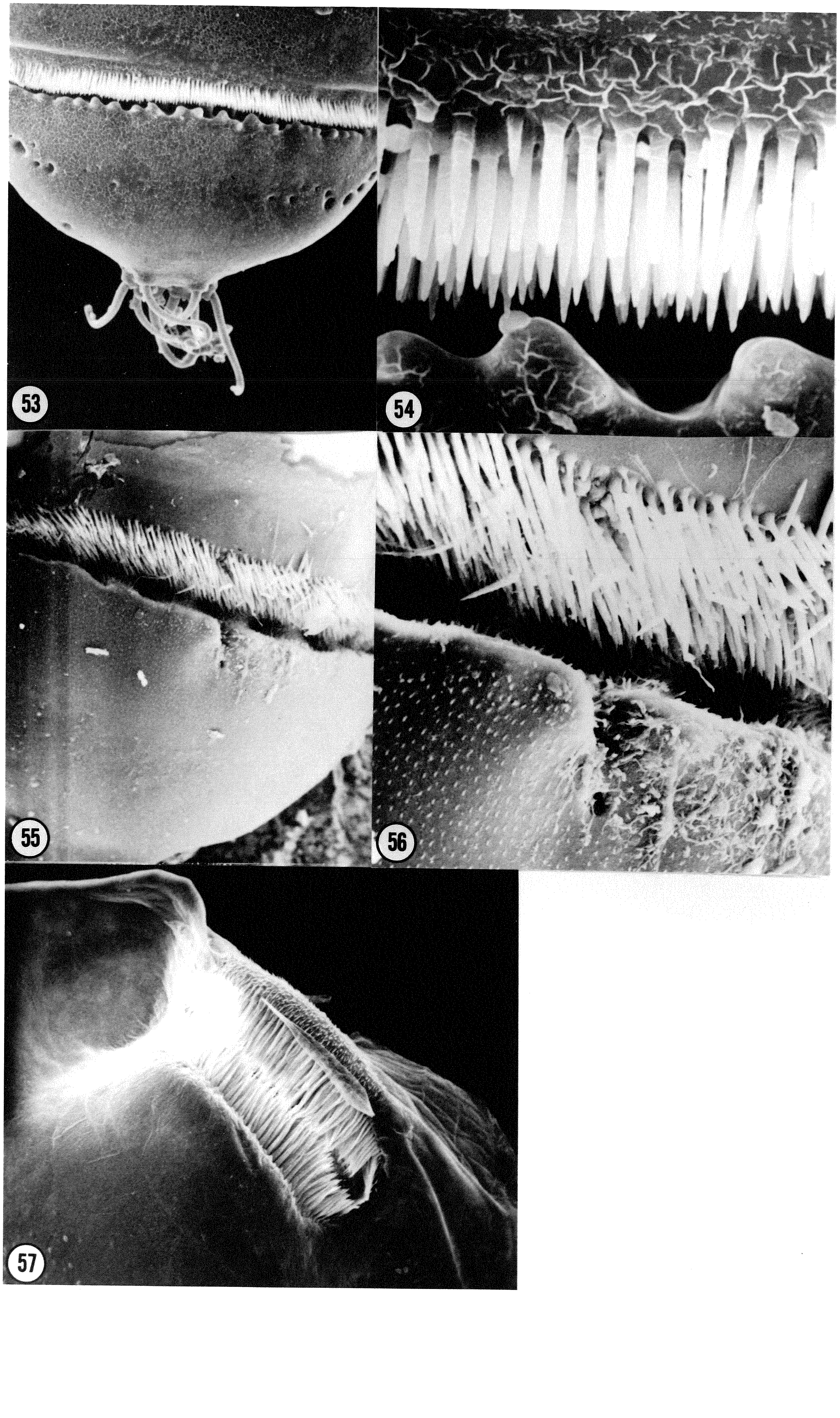
Fig. 61. *Elasmopalpus lignosellus* (Zeller), gibba, dorsal view.

Fig. 62. *Diatraea lineolata* (Walker), pupal caudal horns, dorsalateral view.

Fig. 63. *Lygropia tripunctata* (Fabricius), pupal abdominal spiracles of A3 and A4, lateral view.

Fig. 64. *Lygropia tripunctata* (Fabricius), raised rim of the A4 spiracle, dorsal view.

Fig. 65. *Hypsipyla grandella* (Zeller), pupal tubular spiracles, dorsal view.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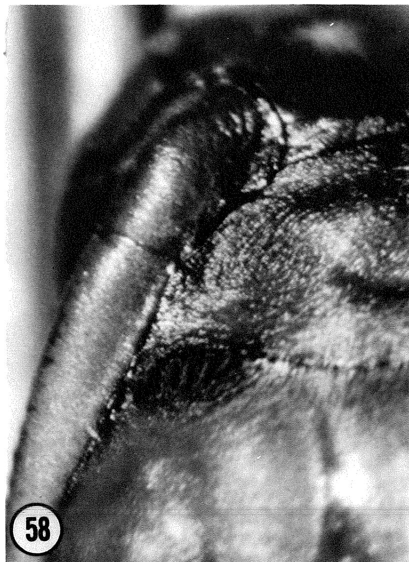
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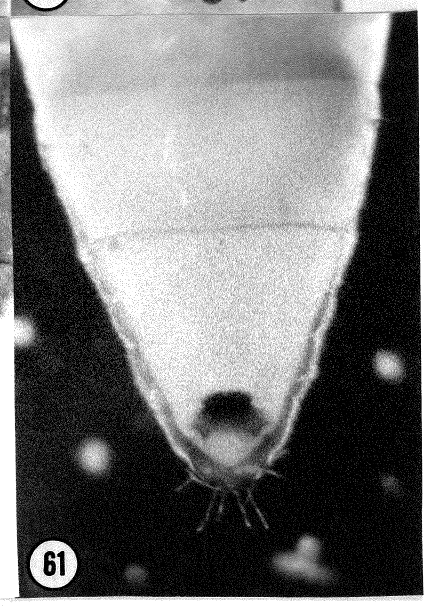
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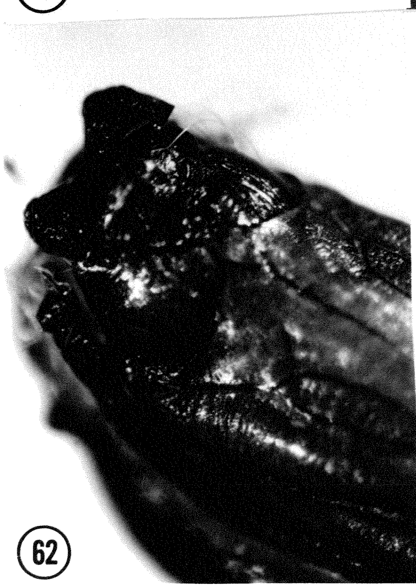
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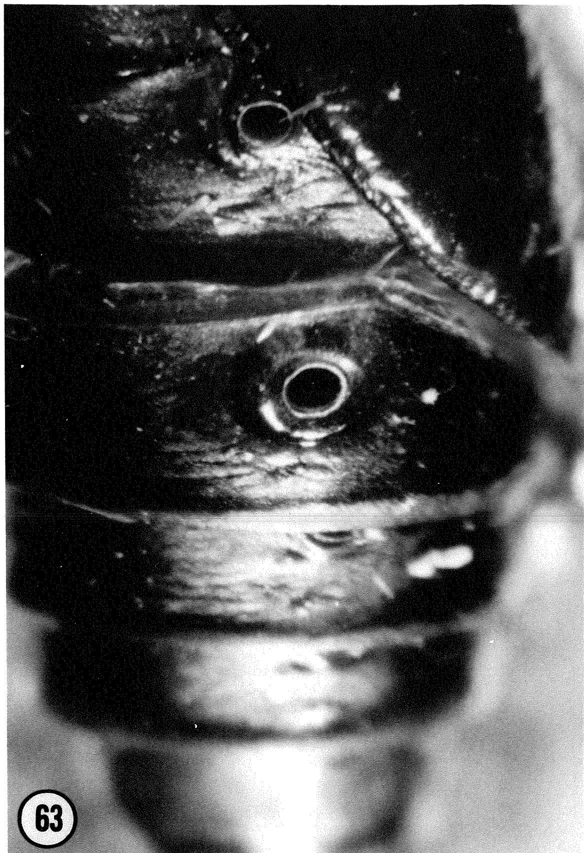
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Fig. 66. Honduras map with major collecting sites; (1) La Lima, Dept. of Cortes; (2) Siguatepeque, Dept. of Comayagua; (3) El Rosario, Dept. of Comayagua; (4) Comayagua, Dept. of Comayagua; (5) San Jeronimo, Dept. of Comayagua; (6) El Zamorano (Escuela Agricola Panamericana), Dept. of Francisco Morazan; (7) Juticalpa, Dept. of Olancho (modified from Passoa, 1983).

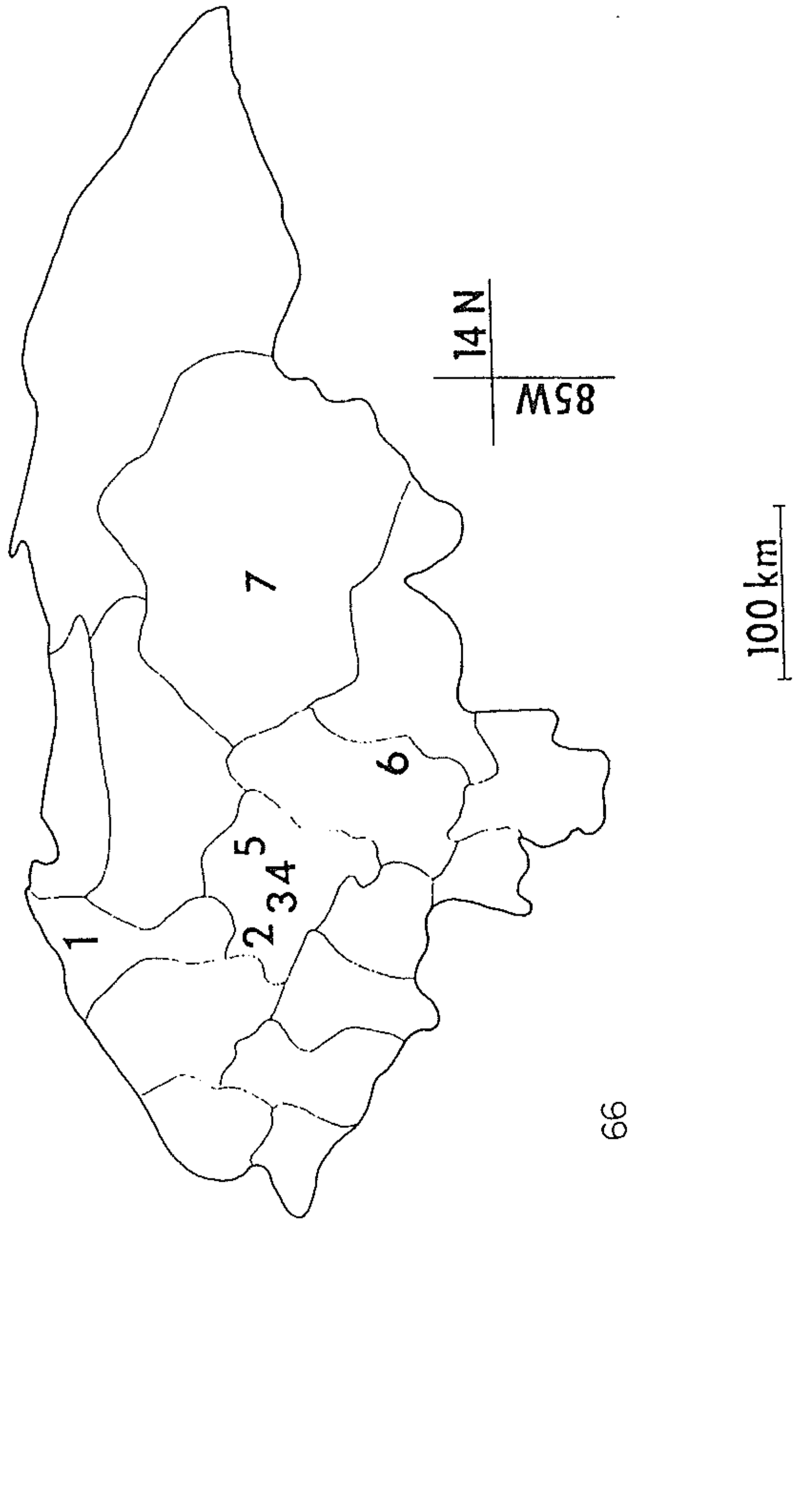
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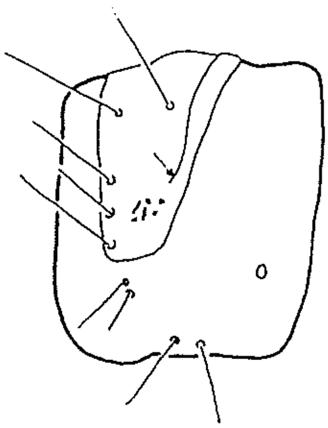
Fig. 67. *Nymphula depunctalis* Guenee, larval prothorax, lateral view.

Fig. 68. *Parapoynx diminutalis* Snellen, larval prothorax, lateral view.

Fig. 69. *Parapoynx diminutalis* Snellen, pupa, lateral view.

Fig. 70. *Parapoynx diminutalis* Snellen, pupal abdomen, lateral view.

Fig. 71. *Parapoynx diminutalis* Snellen, tracheal gill of larva.



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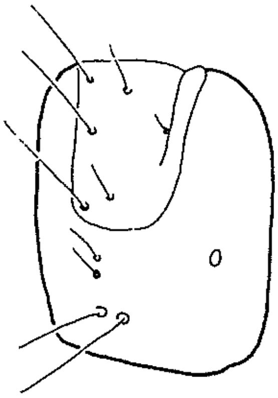

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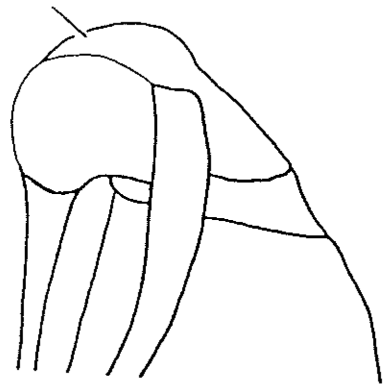

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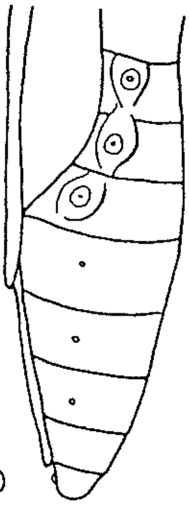

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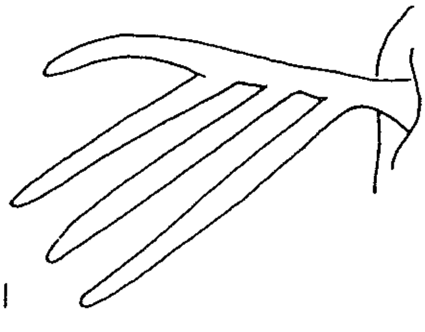

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Fig. 72. Hellula phidilealis (Walker), larval prothorax, lateral view.

Fig. 73. Hellula phidilealis (Walker), larval mexothorax, lateral view.

Fig. 74. Hellula phidilealis (Walker), A1 of larva, lateral view.

Fig. 75. Hellula phidilealis (Walker), A6 of larva, lateral view.

Fig. 76. Hellula phidilealis (Walker), A8 of larva, lateral view.

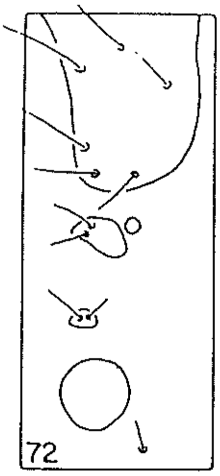
Fig. 77. Hellula phidilealis (Walker), A9 of larva, lateral view.

Fig. 78. Hellula phidilealis (Walker), larval epicrania, front, and labrum.

Fig. 79. Hellula phidilealis (Walker), hypopharyngeal complex, dorsolateral view.

Fig. 80 Hellula phidilealis (Walker), mandible, ventral view.

Fig. 81. Hellula phidilealis (Walker), lateral view of larval epicrania.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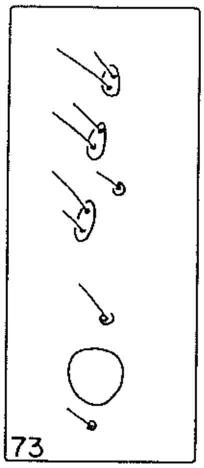
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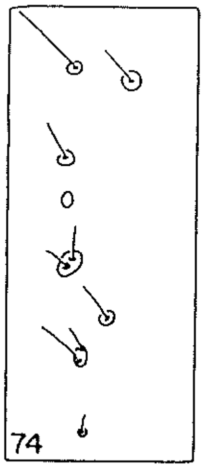
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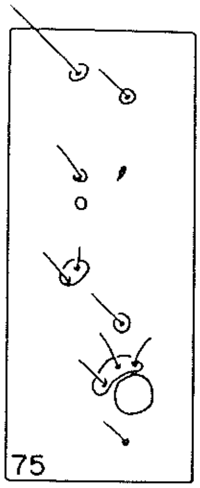
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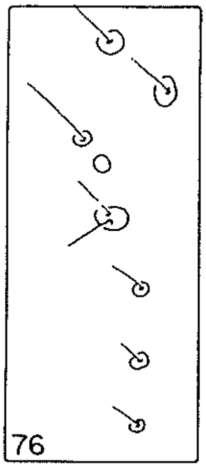
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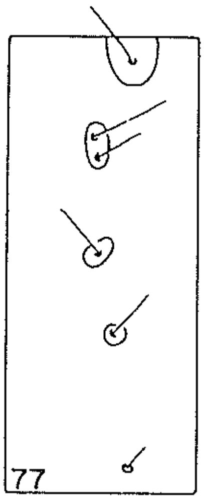
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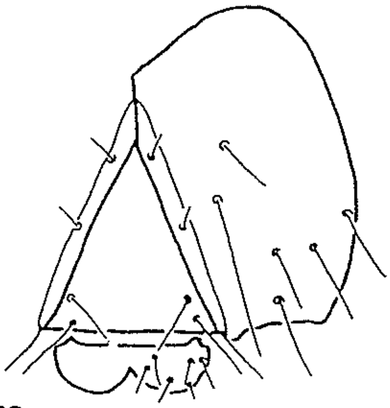
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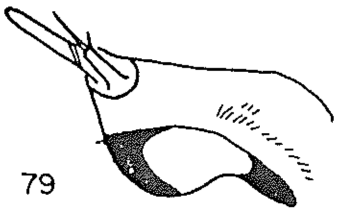
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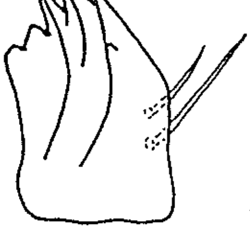
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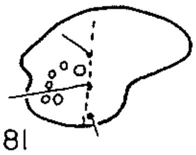
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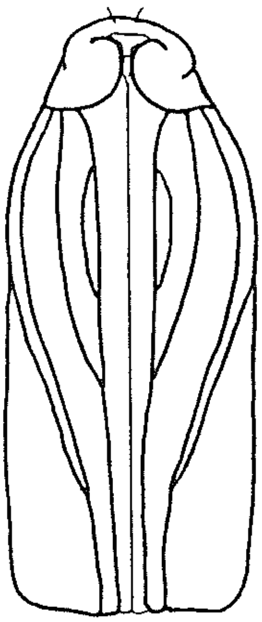
Fig. 82. *Hellula phidilealis* (Walker), pupa, ventral view.

Fig. 83. *Hellula phidilealis* (Walker), pupa, lateral view.

Fig. 84. *Hellula phidilealis* (Walker), anal shield, dorsal view.

Fig. 85. *Hellula phidilealis* (Walker), cremaster.



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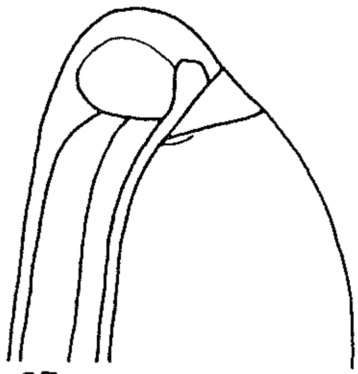

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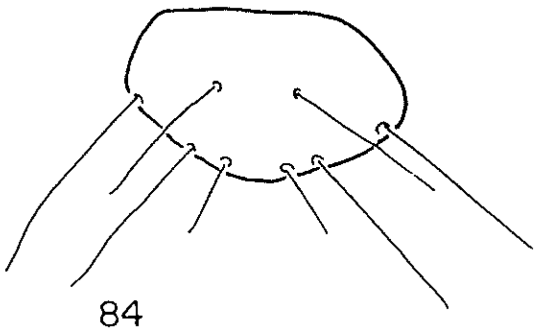

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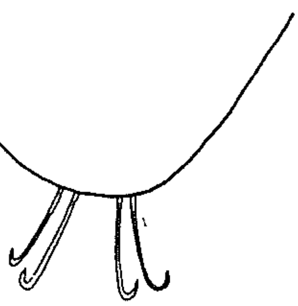

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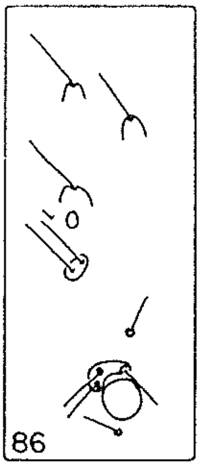
Fig. 86. *Evergestis rimosalis* (Guenee), A6 of larva, lateral view.

Fig. 87. *Evergestis rimosalis* (Guenee), prothoracic shield showing two variations in color pattern, dorsal view.

Fig. 88. *Evergestis rimosalis* (Guenee), pupa, lateral view.

Fig. 89. *Evergestis rimosalis* (Guenee), pupa, ventral view.

Fig. 90. *Evergestis rimosalis* (Guenee), cremaster.



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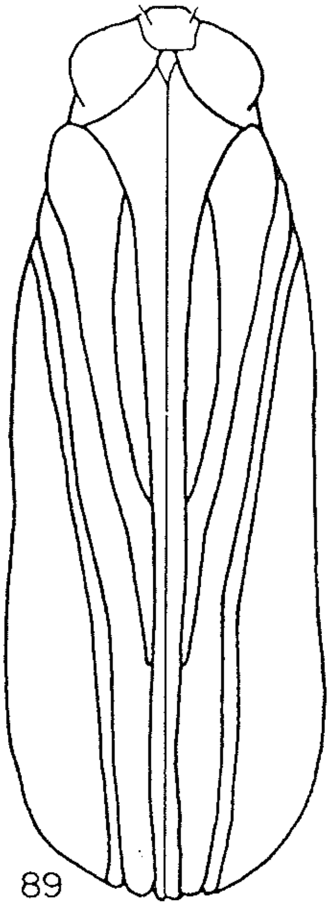

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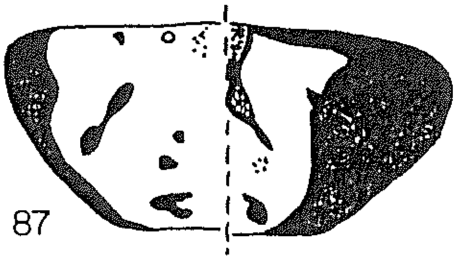

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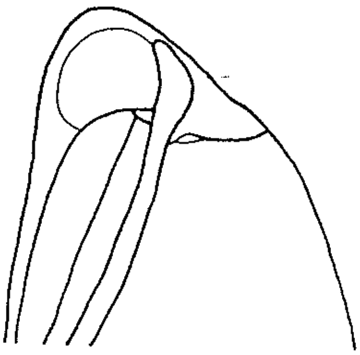

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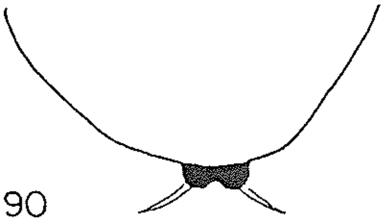

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Fig. 91. Achyra rantalis (Guenee), D and SD pinacula of larva on A3, lateral view.

Fig. 92. Achyra rantalis (Guenee), pigmented D and SD pinacula of larva on A2, lateral view.

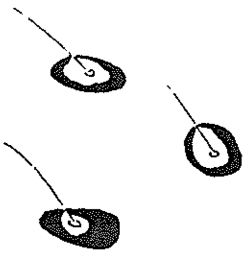
Fig. 93. Achyra rantalis (Guenee), SV and V pinacula of larva on A9, ventral view.

Fig. 94. Achyra bifidalis (Fabricius), larval prespiracular group extends behind spiracle to fuse with the prothoracic shield, lateral view.

Fig. 95. Achyra bifidalis (Fabricius), pigmented D and SD pinacula of larva on A2, lateral view.

Fig. 96. Achyra bifidalis (Fabricius), D and SD pinacula of larva on A2, lateral view.

Fig. 97. Achyra bifidalis (Fabricius), , SV and V pinacula of larva on A9, ventral view.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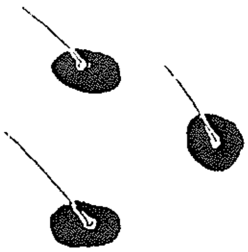
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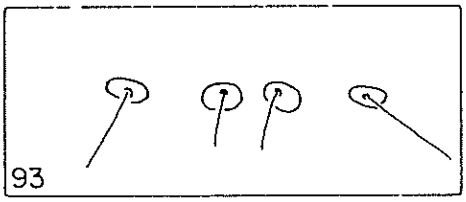
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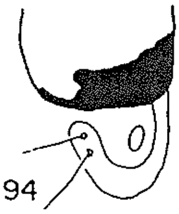
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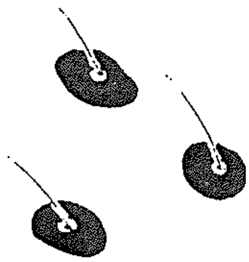
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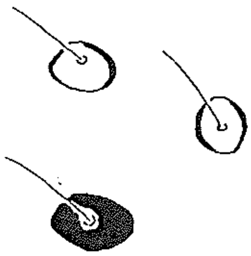
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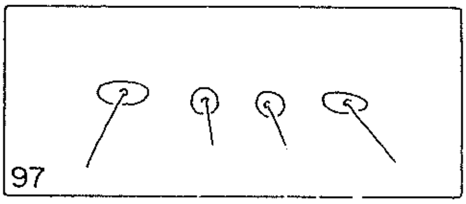
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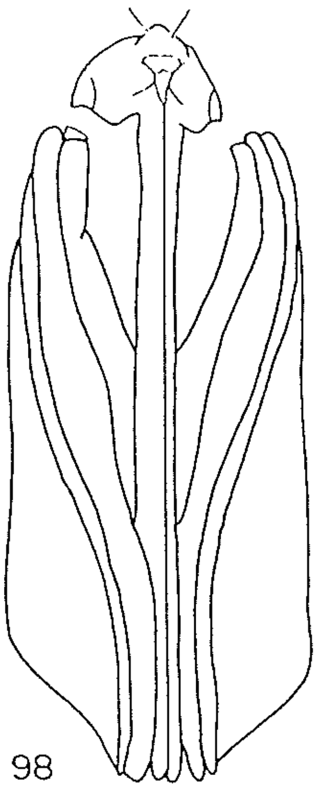
Fig. 98. *Achyra bifidalis* (Fabricius), pupa, ventral view.

Fig. 99. *Achyra bifidalis* (Fabricius), pupa, lateral view.

Fig. 100. *Achyra bifidalis* (Fabricius), mesothoracic spiracle and thorax, dorsal view.

Fig. 101. *Achyra bifidalis* (Fabricius), cremaster.



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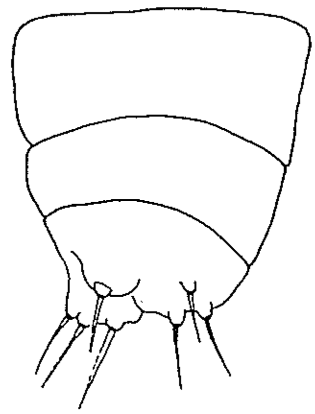

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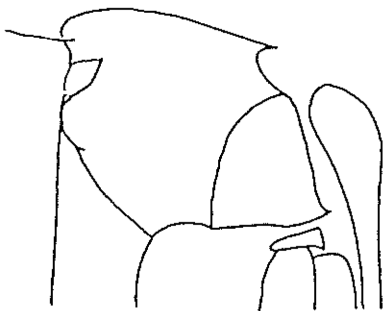

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Fig. 102. Asciodes gordialis Guenee, larval prothorax, lateral view.

Fig. 103. Asciodes gordialis Guenee, larval mesothorax, lateral view.

Fig. 104. Asciodes gordialis Guenee, A1 of larva, lateral view.

Fig. 105. Asciodes gordialis Guenee, A6 of larva, lateral view.

Fig. 106. Asciodes gordialis Guenee, A8 of larva, lateral view.

Fig. 107. Asciodes gordialis Guenee, A9 of larva, lateral view.

Fig. 108. Asciodes gordialis Guenee, larval epicrania, front, and labrum.

Fig. 109. Asciodes gordialis Guenee, mandible, ventral view.

Fig. 110. Asciodes gordialis Guenee, hypopharyngeal complex, lateral view.

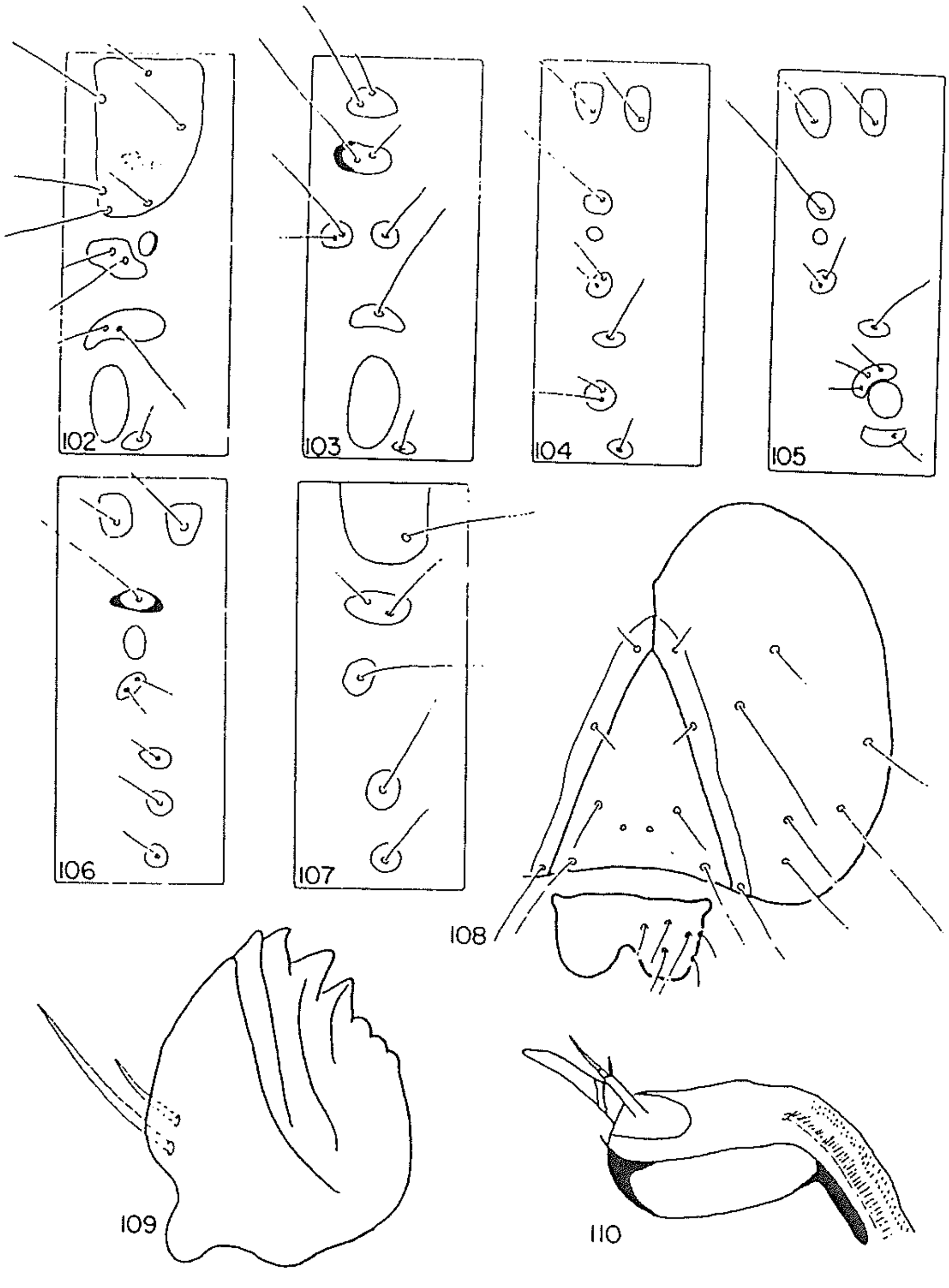
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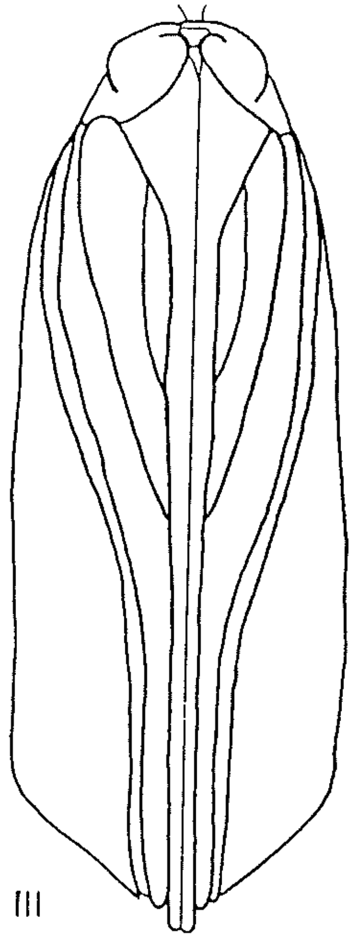
Fig. 111. _Asciodes gordialis_ Guenee, pupa, ventral view.

Fig. 112. _Asciodes gordialis_ Guenee, cremaster.

Fig. 113. _Asciodes gordialis_ Guenee, mesothoracic spiracle, dorsal view.

Fig. 114. _Asciodes gordialis_ Guenee, A5 and A6 with pupal appendages, ventral view.

Fig. 115. _Asciodes gordialis_ Guenee, pupa, lateral view.



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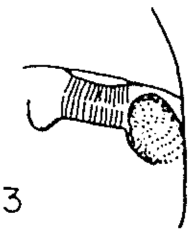

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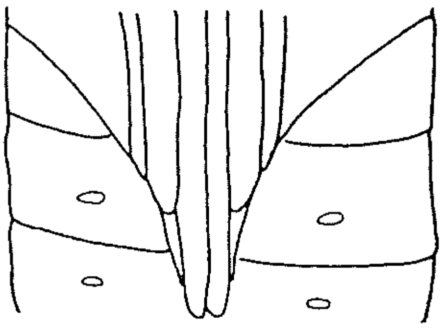

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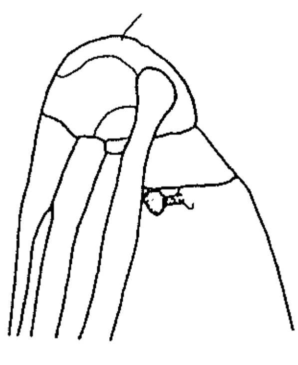

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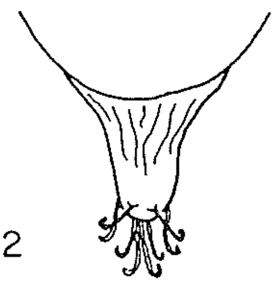

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Fig. 116. *Azochis* sp. [*gripusalis* (Walker) complex], larval prothorax, lateral view.

Fig. 117. *Azochis* sp. [*gripusalis* (Walker) complex], larval mesothorax, lateral view.

Fig. 118. *Azochis* sp. [*gripusalis* (Walker) complex], A1 of larva, lateral view.

Fig. 119. *Azochis* sp. [*gripusalis* (Walker) complex], A6 of larva, lateral view.

Fig. 120. *Azochis* sp. [*gripusalis* (Walker) complex], A8 of larva, lateral view.

Fig. 121. *Azochis* sp. [*gripusalis* (Walker) complex], A9 of larva, lateral view.

Fig. 122. *Azochis* sp. [*gripusalis* (Walker) complex], larval epicrania, front, and labrum.

Fig. 123. *Azochis* sp. [*gripusalis* (Walker) complex], mandible, ventral view.

Fig. 124. *Azochis* sp. [*gripusalis* (Walker) complex], hypopharyngeal complex, lateral view.

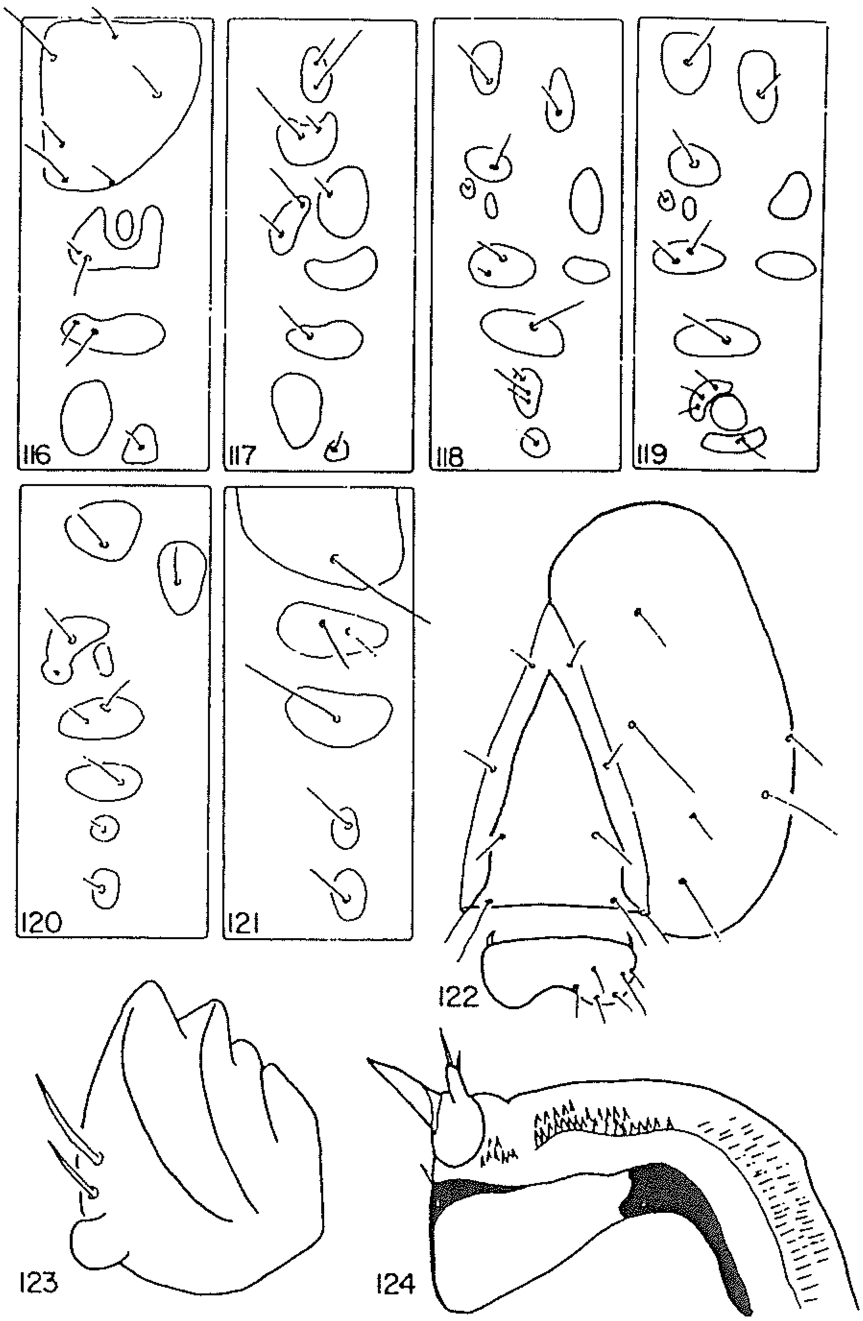
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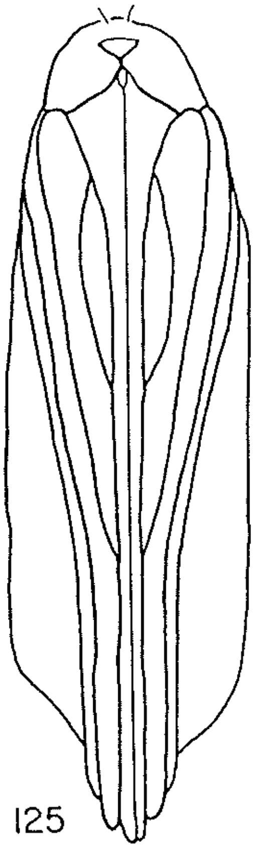
Fig. 125. *Azochis* sp. [*gripusalis* (Walker) complex], pupa, ventral view.

Fig. 126. *Azochis* sp. [*gripusalis* (Walker) complex], pupa, lateral view.

Fig. 127. *Azochis* sp. [*gripusalis* (Walker) complex], mesothoracic spiracle, dorsal view.

Fig. 128. *Azochis* sp. [*gripusalis* (Walker) complex], cremaster.

Fig. 129. *Azochis* sp. [*gripusalis* (Walker) complex], anal shield, dorsal view.



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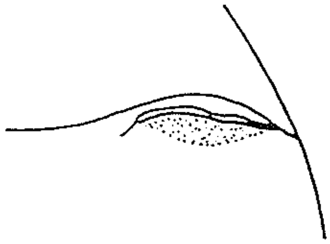

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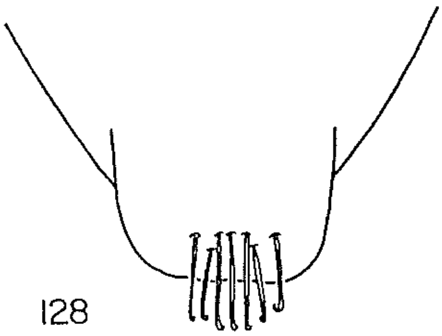

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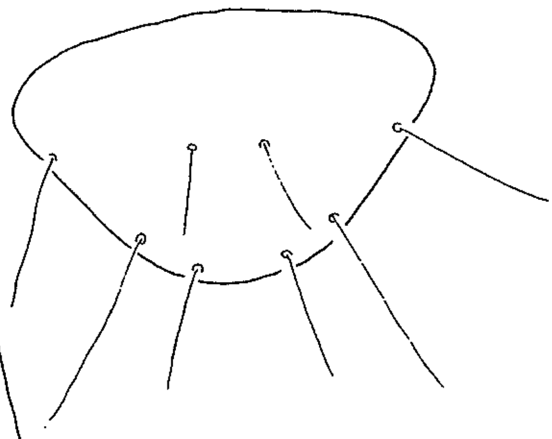

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Fig. 130. *Azochis* sp. [*gripusalis* (Walker) complex], male genitalia, ventral view.

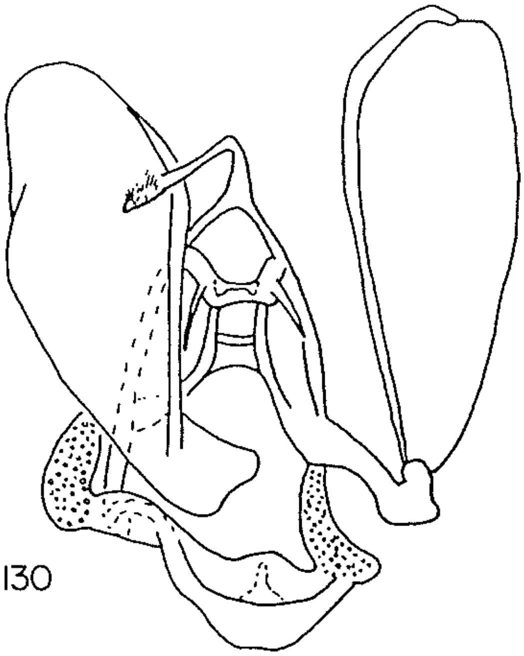
Fig. 131. *Azochis* sp. [*gripusalis* (Walker) complex], transtilla of male genitalia, ventral view.

Fig. 132. *Azochis* sp. [*gripusalis* (Walker) complex], male genitalia, tergum and sternum of A9.

Fig. 133. *Azochis* sp. [*gripusalis* (Walker) complex], aedeagus modifications.

Fig. 134. *Azochis* sp. [*gripusalis* (Walker) complex], sternum of A8.

Fig. 135. *Azochis* sp. [*gripusalis* (Walker) complex], sternum of A2 with a tuft of hair.



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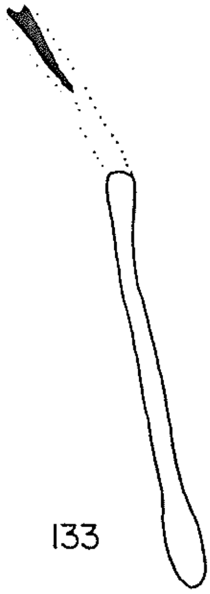

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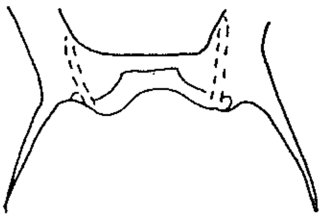

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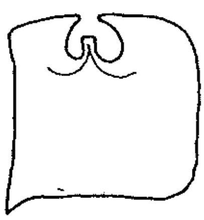

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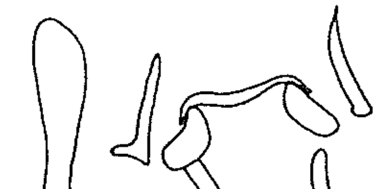

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Fig. 136. *Compacta hirtalis* (Guenee), larval prothorax, lateral view.

Fig. 137. *Compacta hirtalis* (Guenee), Larval mesothorax, lateral view.

Fig. 138. *Compacta hirtalis* (Guenee), A1 of larva, lateral view.

Fig. 139. *Compacta hirtalis* (Guenee), A6 of larva, lateral view.

Fig. 140. *Compacta hirtalis* (Guenee), A8 of larva, lateral view.

Fig. 141. *Compacta hirtalis* (Guenee), A9 of larva, lateral view.

Fig. 142. *Compacta hirtalis* (Guenee), larval epicrania, front, and labrum.

Fig. 143. *Compacta hirtalis* (Guenee), mandible, ventral view.

Fig. 144. *Compacta hirtalis* (Guenee), larval skin texture (400x).

Fig. 145. *Compacta hirtalis* (Guenee), hypopharyngeal complex, lateral view.

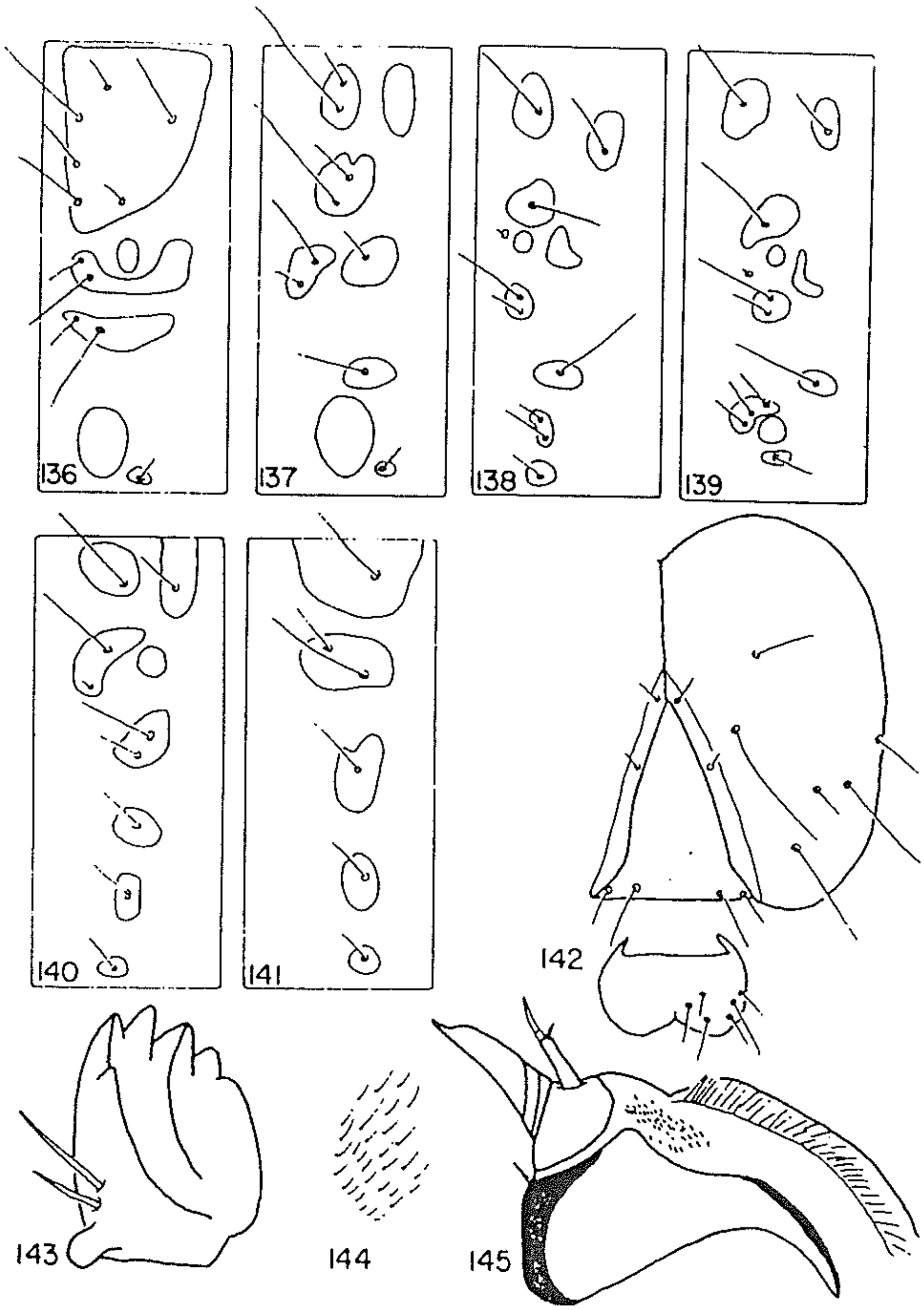
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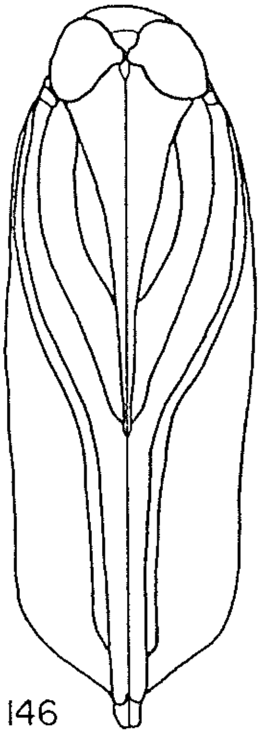
Fig. 146. _Compacta hirtalis_ (Guenee), pupa, ventral view.

Fig. 147. _Compacta hirtalis_ (Guenee), pupa, lateral view.

Fig. 148. _Compacta hirtalis_ (Guenee), mesothoracic spiracle, dorsal view.

Fig. 149. _Compacta hirtalis_ (Guenee), cremaster.

Fig. 150. _Compacta hirtalis_ (Guenee), anal shield, dorsal view.



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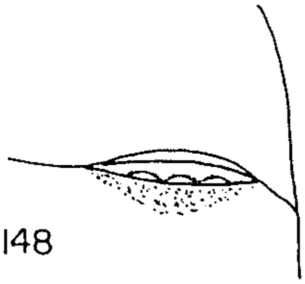

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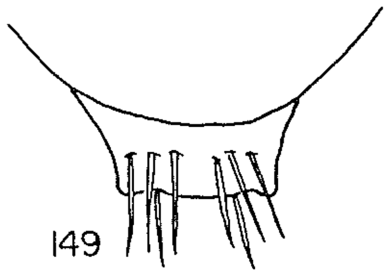

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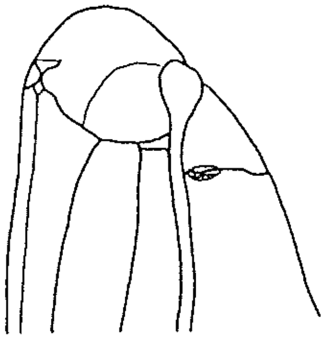

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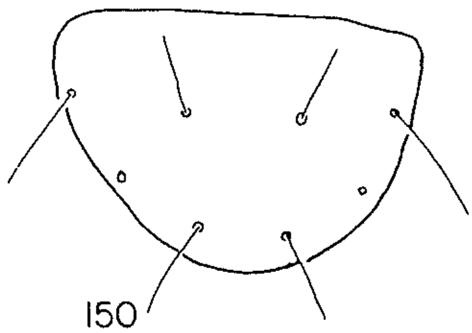

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Fig. 151. *Diaphania nitidalis* (Stoll), larval prothorax, lateral view.

Fig. 152. *Diaphania nitidalis* (Stoll), larval mesothorax, lateral view.

Fig. 153. *Diaphania nitidalis* (Stoll), A1 of larva, lateral view.

Fig. 154. *Diaphania nitidalis* (Stoll), A6 of larva, lateral view.

Fig. 155. *Diaphania nitidalis* (Stoll), A8 of larva, lateral view.

Fig. 156. *Diaphania nitidalis* (Stoll), A9 of larva, lateral view.

Fig. 157. *Diaphania nitidalis* (Stoll), early instar larval prothorax, lateral view.

Fig. 158. *Diaphania nitidalis* (Stoll), A6 of early instar larva, lateral view.

Fig. 159. *Diaphania nitidalis* (Stoll), hypopharyngeal complex, lateral view.

Fig. 160. *Diaphania nitidalis* (Stoll), larval epicrania, front, and labrum.

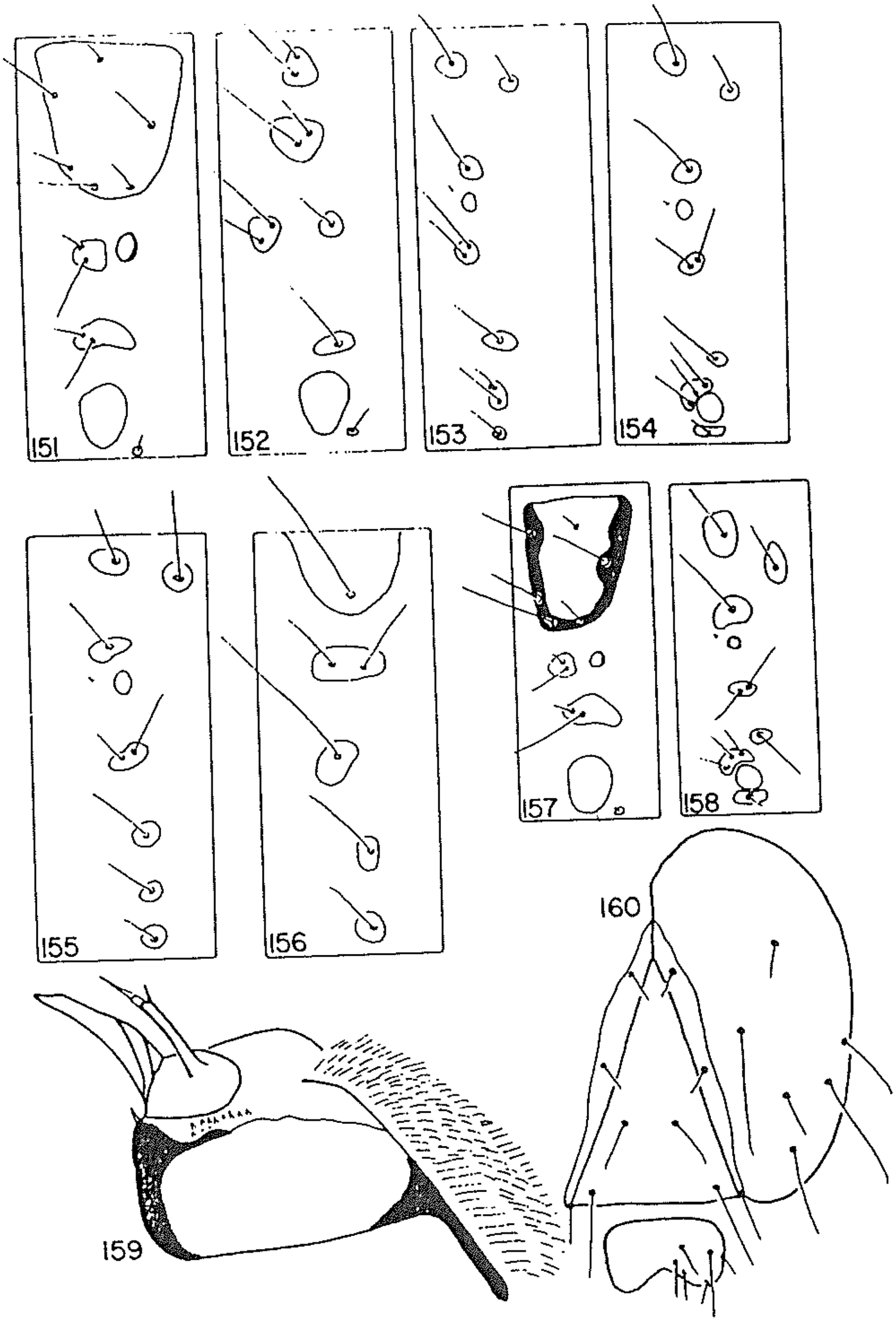
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Fig. 161. *Diaphania nitidalis* (Stoll), lateral view of larval epicrania.

Fig. 162. *Diaphania nitidalis* (Stoll), anal shield, dorsal view.

Fig. 163. *Diaphania nitidalis* (Stoll), mandible, ventral view.

Fig. 164. *Diaphania hyalinata* (Linnaeus), mandible, ventral view.

Fig. 165. *Diaphania hyalinata* (Linnaeus), wing pattern.

Fig. 166. *Diaphania indica* (Saunders), wing pattern.

Fig. 167. *Diaphania hyalinata* (Linnaeus), female genitalia, bursa copulatrix, ventral view.

Fig. 168. *Diaphania indica* (Saunders), female genitalia, bursa copulatrix, ventral view.

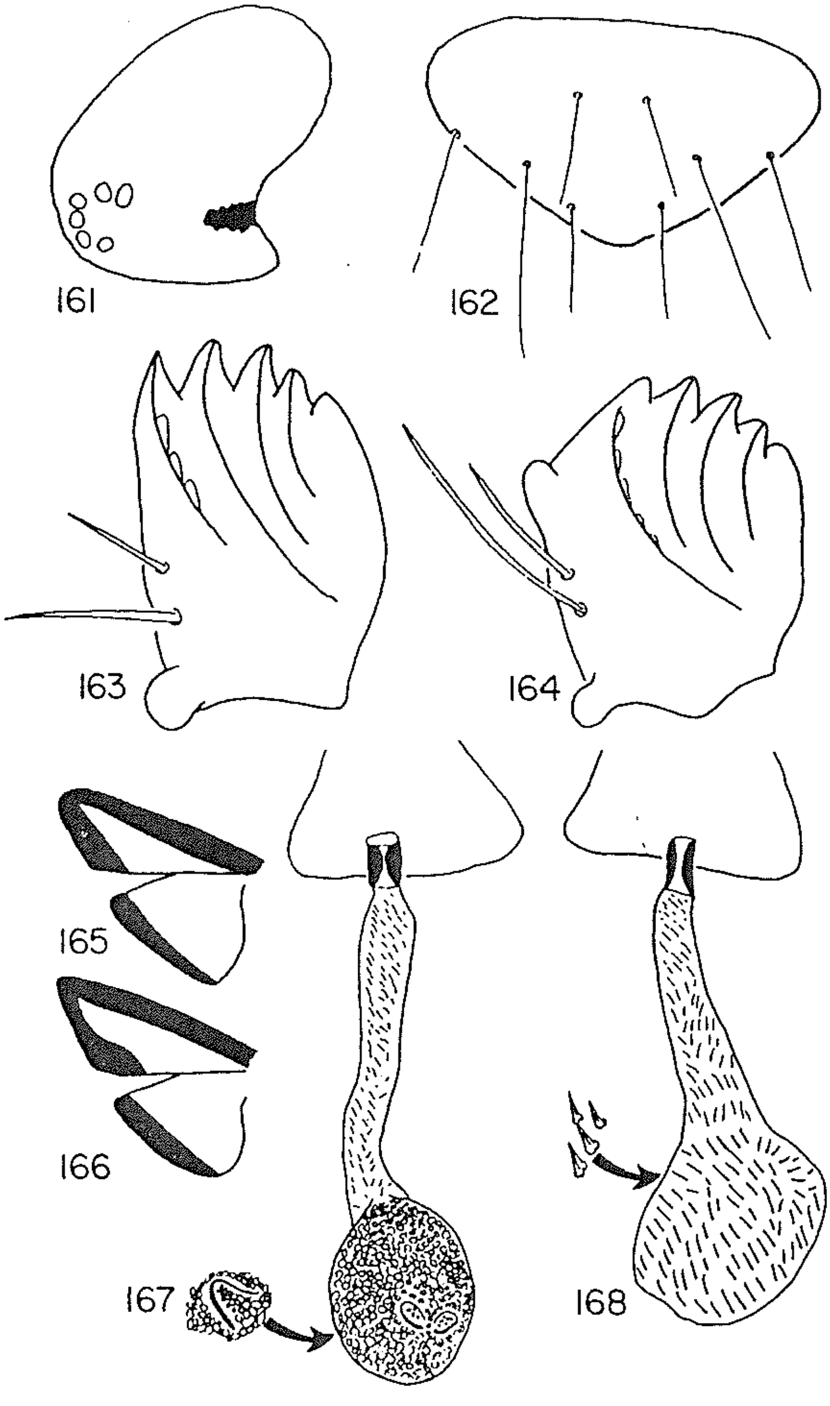
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Fig. 169. *Diaphania nitidalis* (Stoll), pupa, ventral view.

Fig. 170. *Diaphania hyalinata* (Linnaeus), pupa, lateral view.

Fig. 171. *Diaphania nitidalis* (Stoll), pupa, lateral view.

Fig. 172. *Diaphania nitidalis* (Stoll), pupa, lateral view.

Fig. 173. *Diaphania hyalinata* (Linnaeus), pupa, lateral viw.

Fig. 174. *Diaphania indica* (Saunders), pupa, lateral view.

Fig. 175. *Diaphania* spp., stemmatal area. (A) *Diaphania indicata* (Saunders); (B) *Diaphania hyalinata* (Linnaeus).

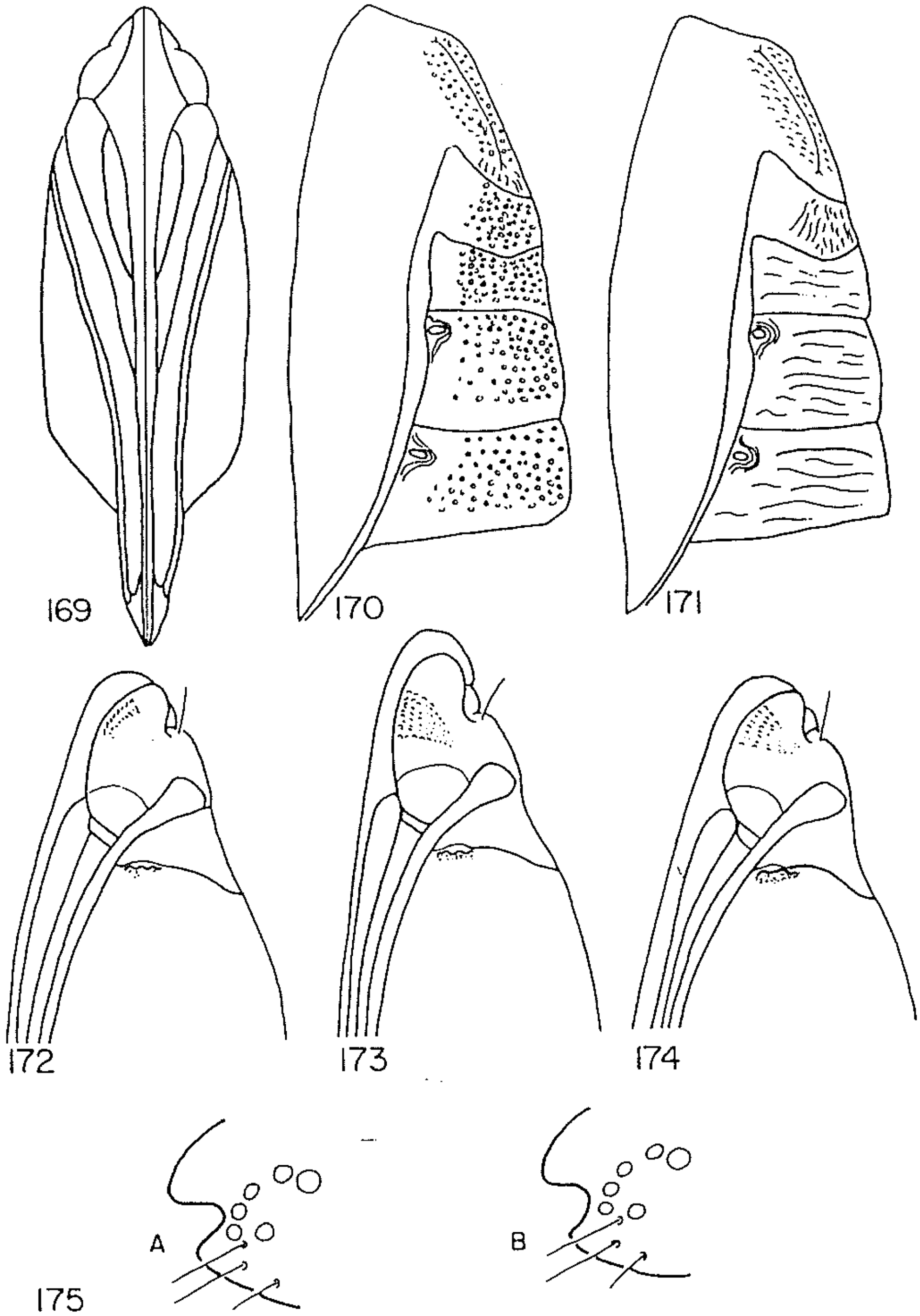
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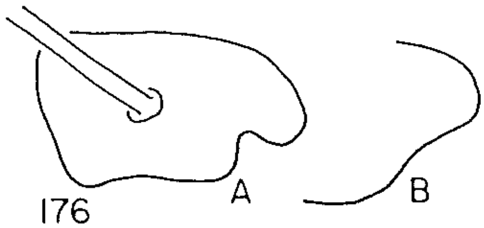
Fig. 176. *Eulepte* sp. (probably *concordalis* Hubner), SD1 pinaculum on A3. (A) Normal shape. (B) Variant with only a slight notch.

Fig. 177. *Eulepte* sp. (probably *concordalis* Hubner), A2-7 of pupa, lateral view.

Fig. 178. *Geshna cannalis* (Quaintance), D and SD pinacula of mesothorax, lateral view.

Fig. 179. *Geshna cannalis* (Quaintance), cremaster.



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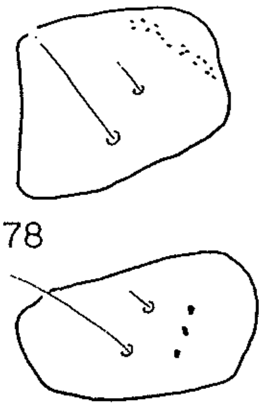

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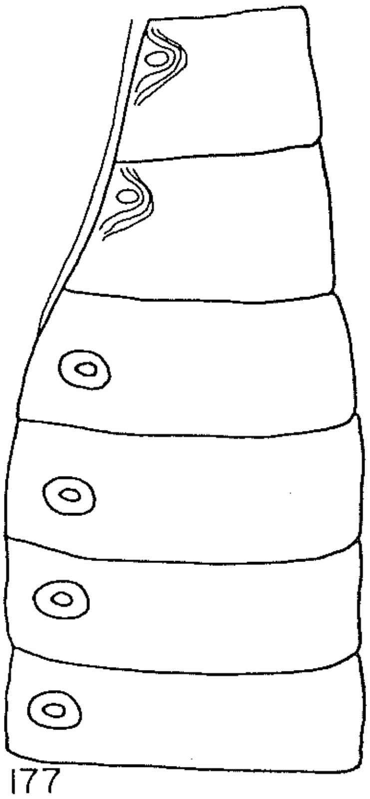

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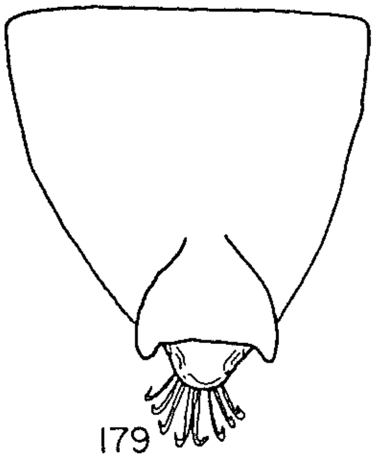

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Fig. 180. *Herpetogramma bipunctalis* (Fabricius), pupa, ventral view.

Fig. 181. *Herpetogramma bipunctalis* (Fabricius), pupa, lateral view.

Fig. 182. *Herpetogramma bipunctalis* (Fabricius), mesothoracic spiracle, dorsal view.

Fig. 183. *Herpetogramma bipunctalis* (Fabricius), larval prothorax, lateral view.

Fig. 184. *Herpetogramma bipunctalis* (Fabricius), larval mesothorax, lateral view.

Fig. 185. *Herpetogramma bipunctalis* (Fabricius), cremaster.

Fig. 186. *Herpetogramma bipunctalis* (Fabricius), mandible, ventral view.

Fig. 187. *Herpetogramma phaeopteralis* (Guenee), cremaster.

Fig. 188. *Herpetogramma phaeopteralis* (Guenee), prespiracular pinaculum of larval prothorax, lateral view.

Fig. 189. *Herpetogramma phaeopteralis* (Guenee), mandible, ventral view.

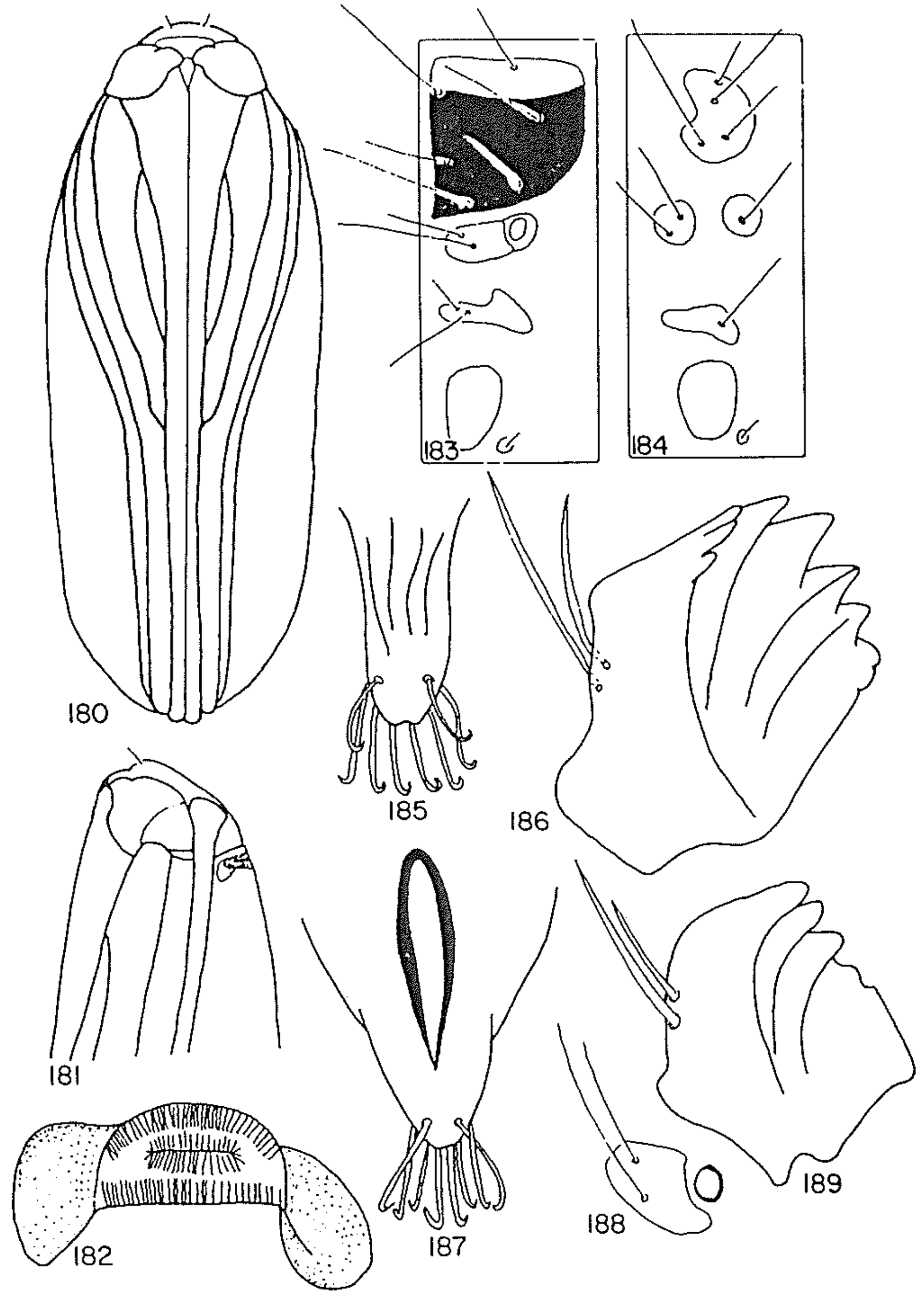
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Fig. 190. *Hymenia perspectalis* (Hubner), larval prothorax, lateral view.

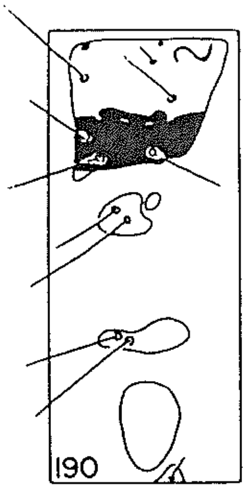
Fig. 191. *Hymenia perspectalis* (Hubner), hypopharyngeal complex, lateral view.

Fig. 192. *Hymenia perspectalis* (Hubner), mandible, ventral view.

Fig. 193. *Hymenia perspectalis* (Hubner), A3, A4, and A5 of pupa, lateral view.

Fig. 194. *Hymenia perspectalis* (Hubner), cremaster.

Fig. 195. *Hymenia perspectalis* (Hubner), cremaster spine.



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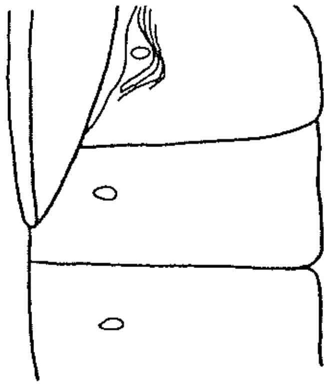

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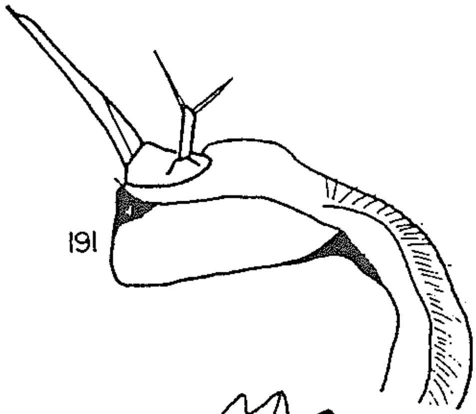

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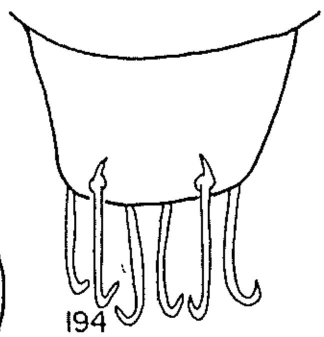

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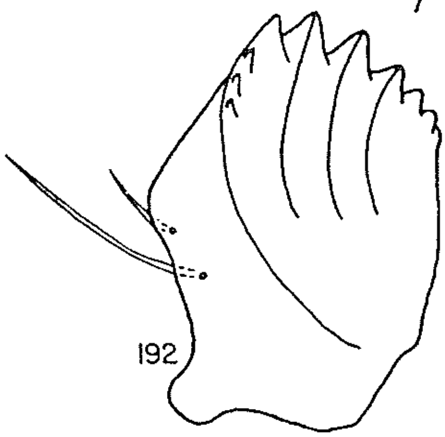

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Fig. 196. *Lineodes integra* (Zeller), larval prothorax, lateral view.

Fig. 197. *Lineodes integra* (Zeller), mandible, ventral view.

Fig. 198. *Lineodes integra* (Zeller), hypopharyngeal complex, lateral view.

Fig. 199. *Lineodes integra* (Zeller), pupa, lateral view.

Fig. 200. *Lineodes integra* (Zeller), cremaster.

Fig. 201. *Lineodes integra* (Zeller), pupa, lateral view.

Fig. 202. *Lineodes integra* (Zeller), pupa, ventral view.

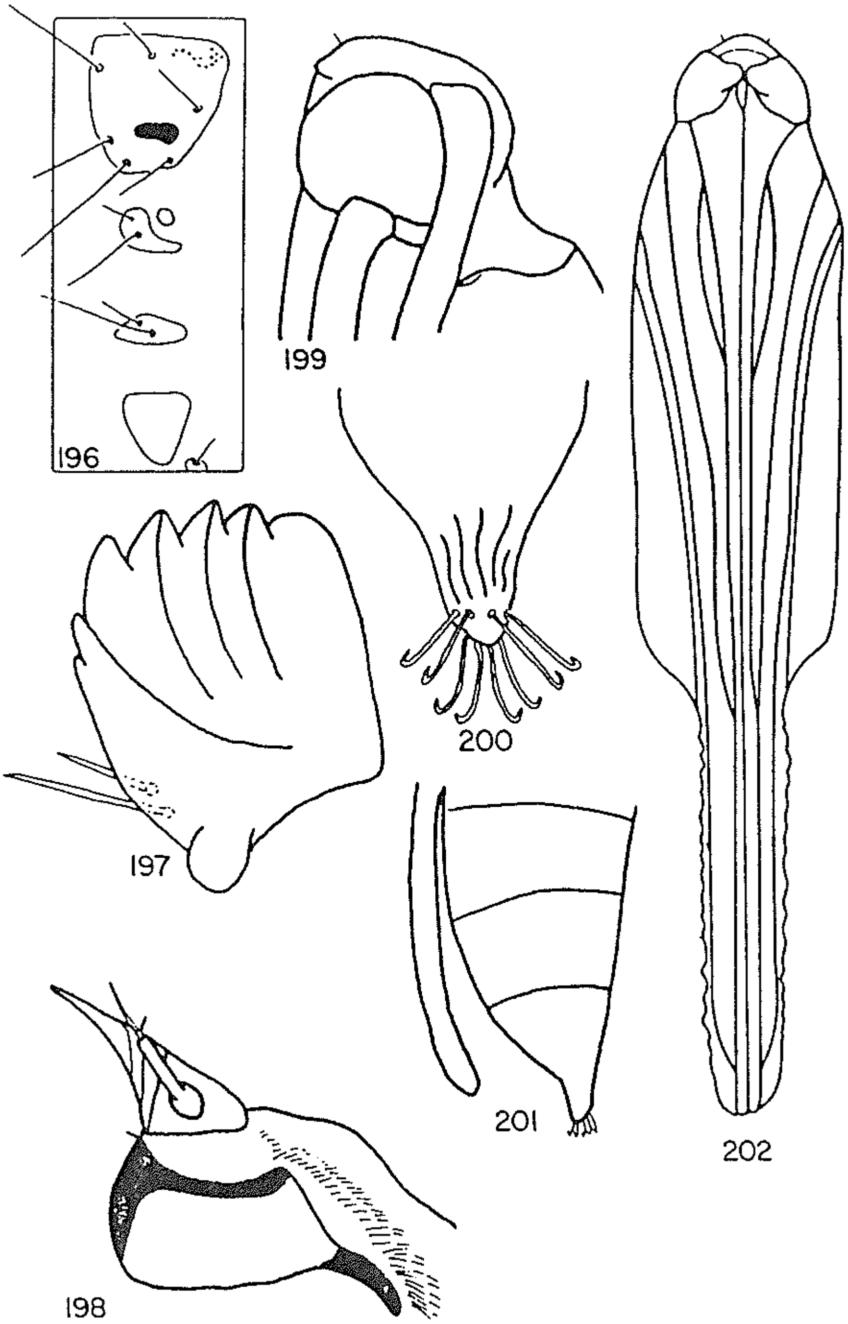
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Fig. 203. *Lygropia tripunctata* (Fabricius), larval mesothorax, lateral view.

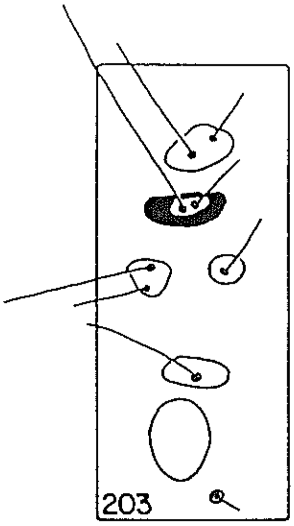
Fig. 204. *Lygropia tripunctata* (Fabricius), A6 of larva, dorsal view.

Fig. 205. *Lygropia tripunctata* (Fabricius), hypopharyngeal complex, lateral view.

Fig. 206. *Lygropia tripunctata* (Fabricius), mesothoracic spiracle, dorsal view.

Fig. 207. *Lygropia tripunctata* (Fabricius), larval spiracle of A4, lateral view.

Fig. 208. *Lygropia tripunctata* (Fabricius), mandible, ventral view.



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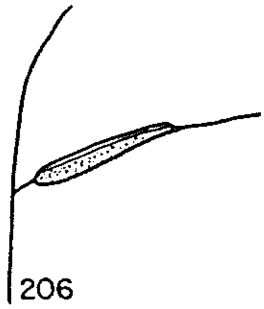

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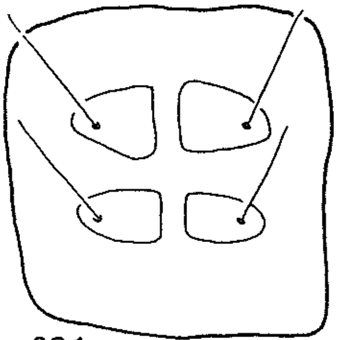

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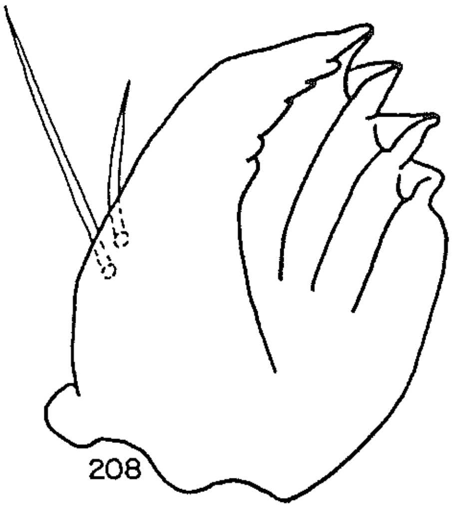

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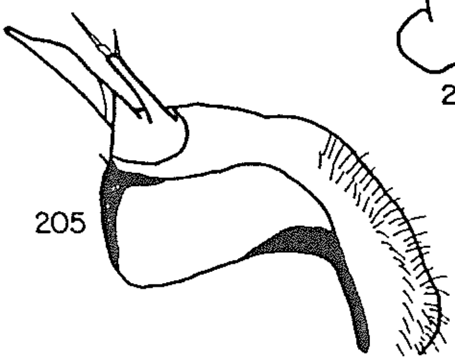

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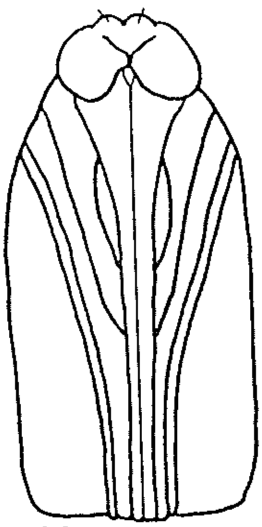
Fig. 209. *Marasmia trapezalis* (Guenee), pupa, ventral view.

Fig. 210. *Marasmia trapezalis* (Guenee), A4 of larva, dorsal view.

Fig. 211. *Marasmia trapezalis* (Guenee), pupal vertex, ventral view.

Fig. 212. *Marasmia trapezalis* (Guenee), cremaster.

Fig. 213. *Marasmia trapezalis* (Guenee), mandible, lateral view.



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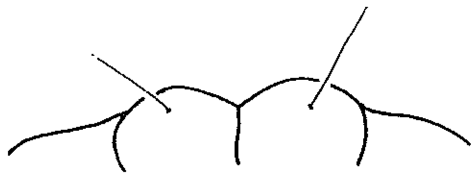

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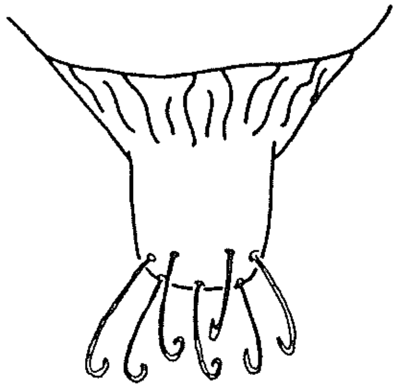

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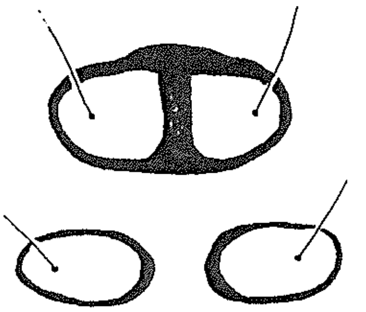

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Fig. 214. _Maruca testulalis_ (Geyer), mesothorax, metathorax, and A1 of larva, dorsal view.

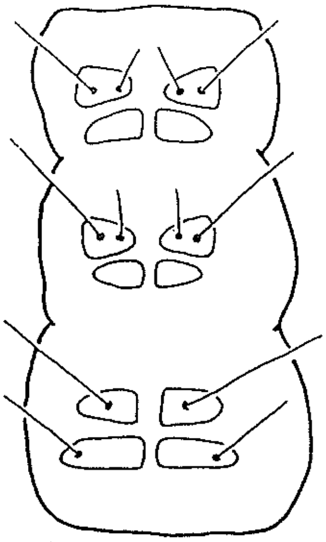
Fig. 215. _Maruca testulalis_ (Geyer), hypopharyngeal complex, lateral view.

Fig. 216. _Maruca testulalis_ (Geyer), mandible, ventral view.

Fig. 217. _Maruca testulalis_ (Geyer), mesothoracic spiracle.

Fig. 218. _Maruca testulalis_ (Geyer), pupa, ventral view.

Fig. 219. _Maruca testulalis_ (Geyer), cremaster.



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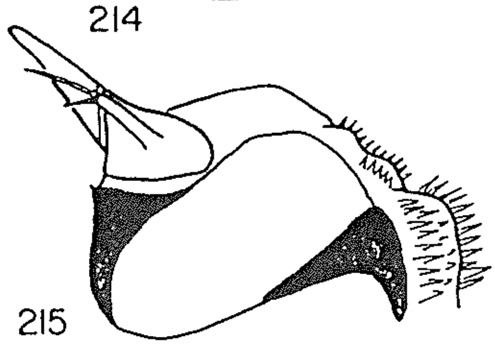

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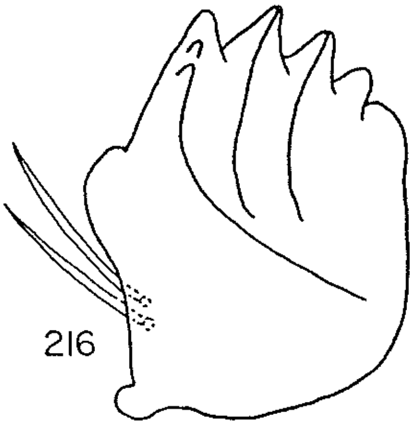

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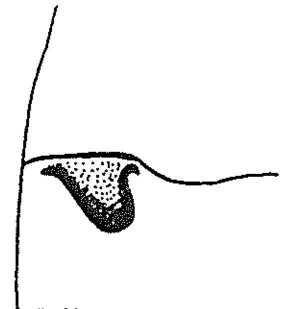

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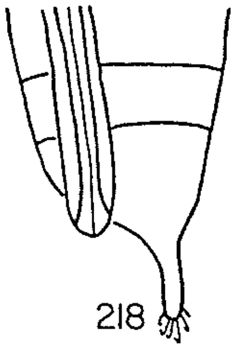

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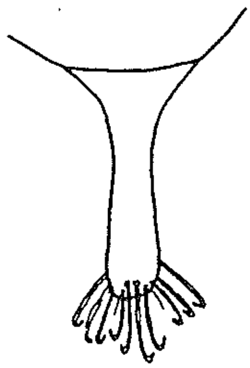

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Fig. 220. *Megastes* sp. (near *pusialis* Snellen), larval prothorax, lateral view.

Fig. 221. *Megastes* sp. (near *pusialis* Snellen), larval mesothorax, lateral view.

Fig. 222. *Megastes* sp. (near *pusialis* Snellen), A1 of larva, lateral view.

Fig. 223. *Megastes* sp. (near *pusialis* Snellen), A6 of larva, lateral view.

Fig. 224. *Megastes* sp. (near *pusialis* Snellen), A8 of larva, lateral view.

Fig. 225. *Megastes* sp. (near *pusialis* Snellen), A9 of larva, lateral view.

Fig. 226. *Megastes* sp. (near *pusialis* Snellen), larval epicrania, front, and labrum.

Fig. 227. *Megastes* sp. (near *pusialis* Snellen), mandible, ventral view.

Fig. 228. *Megastes* sp. (near *pusialis* Snellen), hypopharyngeal complex, lateral view.

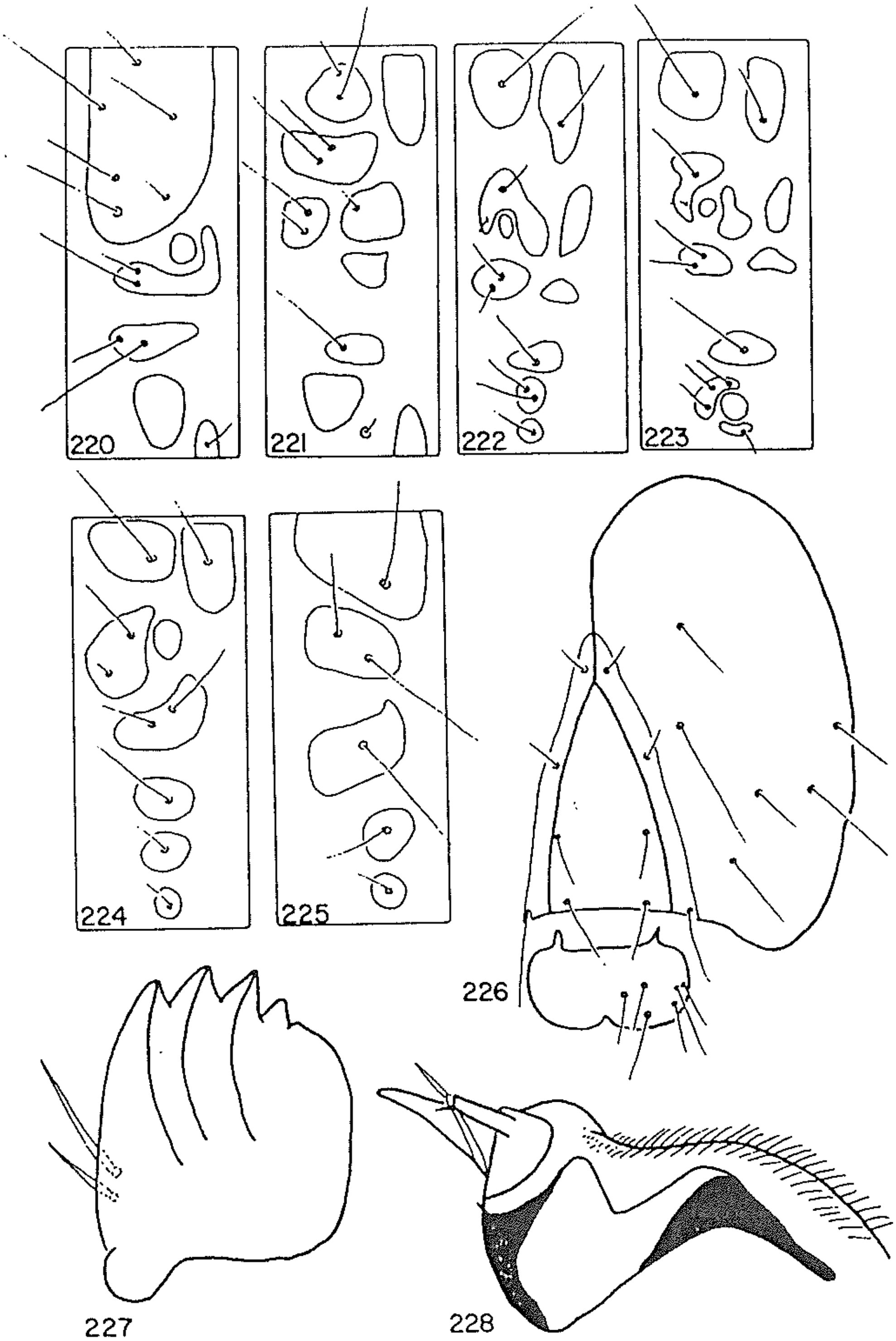
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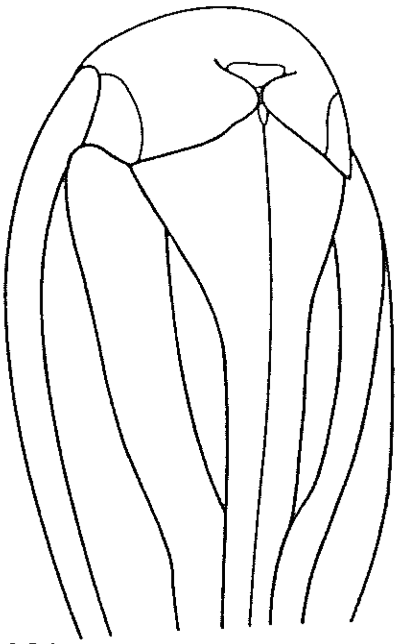
Fig. 229. *Megastes* sp. (near *pusialis* Snellen), pupa, lateroventral view.

Fig. 230. *Megastes* sp. (near *pusialis* Snellen), pupa, ventral view.

Fig. 231. *Megastes* sp. (near *pusialis* Snellen), mesothoracic spiracle, dorsal view.

Fig. 232. *Megastes* sp. (near *pusialis* Snellen), cremaster.

Fig. 233. *Megastes* sp. (near *pusialis* Snellen), anal shield, dorsal view.



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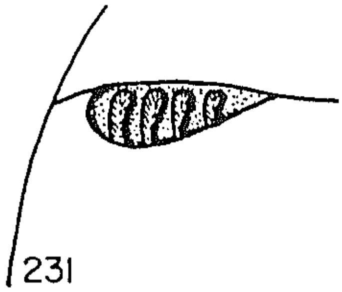

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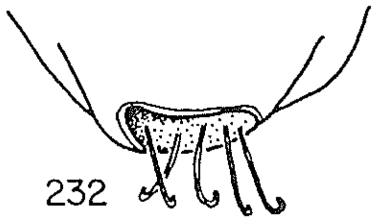

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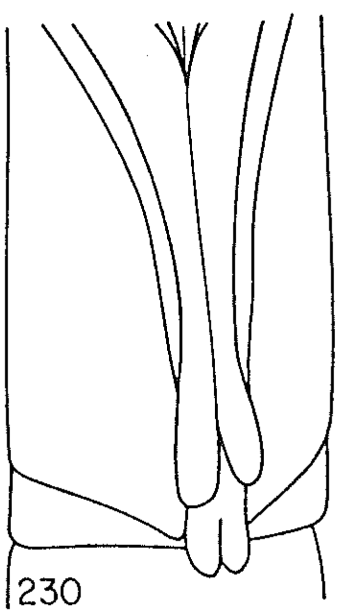

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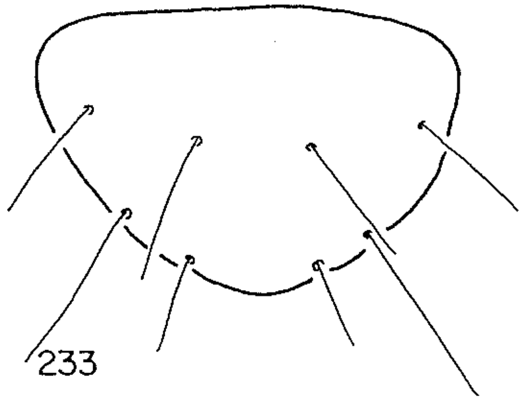

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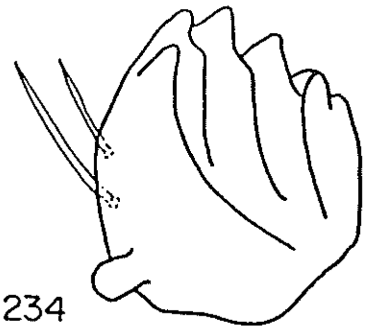
Fig. 234. *Microthyris anormalis* (Guenee), mandible, ventral view.

Fig. 235. *Microthyris anormalis* (Guenee), proleg, lateral view.

Fig. 236. *Microthyris anormalis* (Guenee), hypopharyngeal complex, lateral view.

Fig. 237. *Microthyris anormalis* (Guenee), A2, A3, A4, and A5 of pupa, lateral view.

Fig. 238. *Microthyris anormalis* (Guenee), A6 of larva, crochets.



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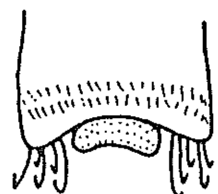

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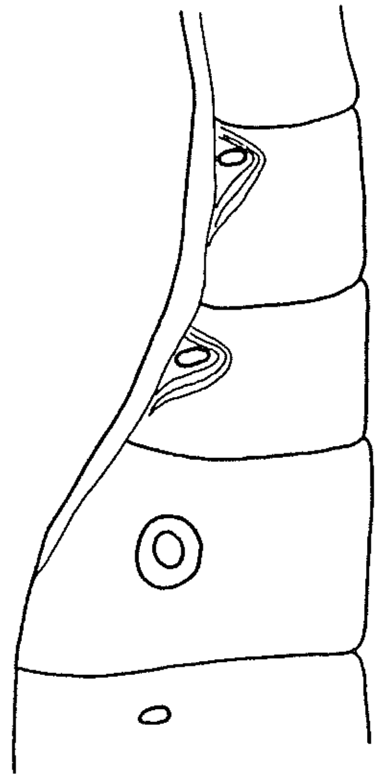

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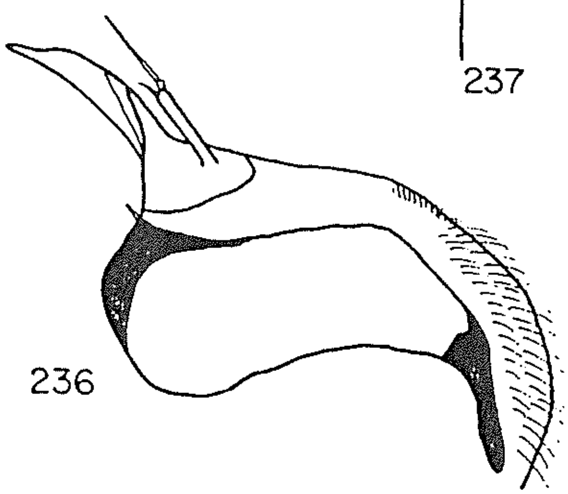

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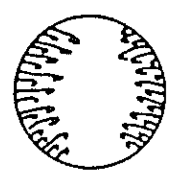

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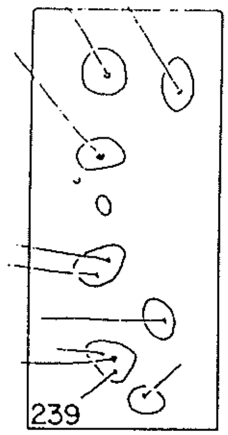
Fig. 239. *Nomophila nearctica* Munroe, A1 of larva, lateral view (modified from Allyson, 1984).

Fig. 240. *Nomophila nearctica* Munroe, A7 of larva, lateral view (modified from Allyson, 1984).

Fig. 241. *Nomophila nearctica* Munroe, anal shield, dorsal view (modified from MacKay, 1972).

Fig. 242. *Nomophila nearctica* Munroe, pupa, ventral view (modified from Khot'ko and Molchanova, 1975).

Fig. 243. *Nomophila nearctica* Munroe, cremaster.



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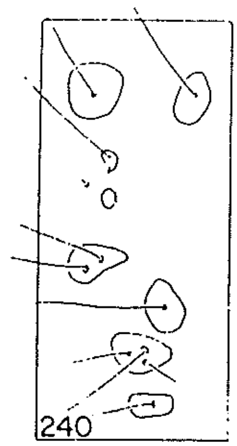

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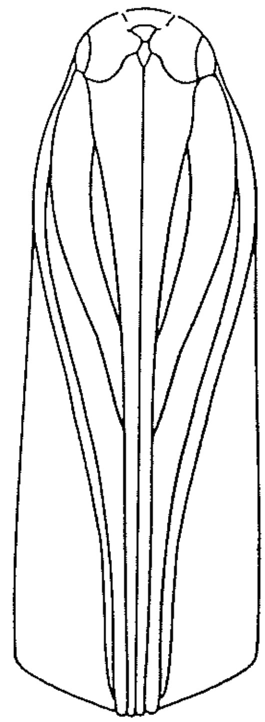

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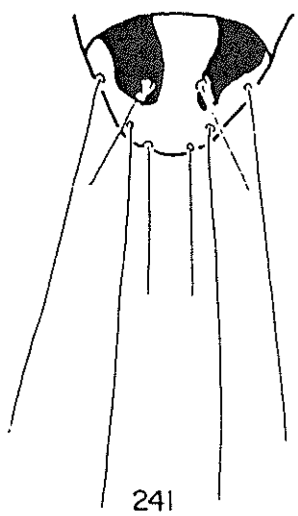

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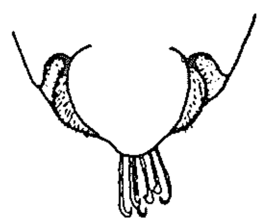

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Fig. 244. Omiodes indicata (Fabricius), larval prothorax, lateral view.

Fig. 245. Omiodes indicata (Fabricius), larval mesothorax, lateral view.

Fig. 246. Omiodes indicata (Fabricius), A1 of larva, lateral view.

Fig. 247. Omiodes indicata (Fabricius), A6 of larva, lateral view.

Fig. 248. Omiodes indicata (Fabricius), A8 of larva, lateral view.

Fig. 249. Omiodes indicata (Fabricius), A9 of larva, lateral view.

Fig. 250. Omiodes indicata (Fabricius), larval epicrania, front, and labrum.

Fig. 251. Omiodes indicata (Fabricius), mandible, ventral view.

Fig. 252. Omiodes indicata (Fabricius), hypopharyngeal complex, lateral view.

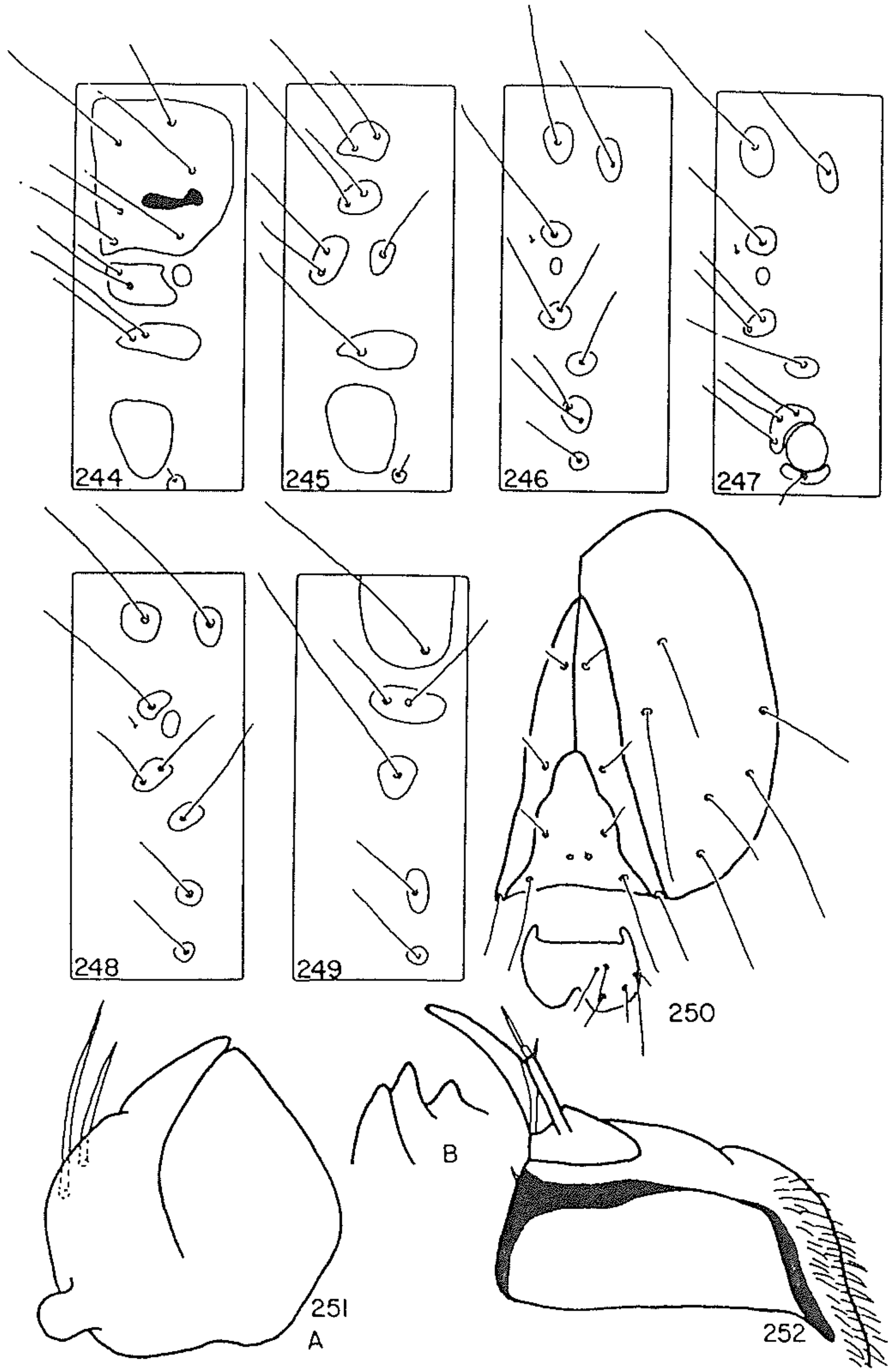
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Fig. 253. *Omiodes indicata* (Fabricius), pupa, ventral view.

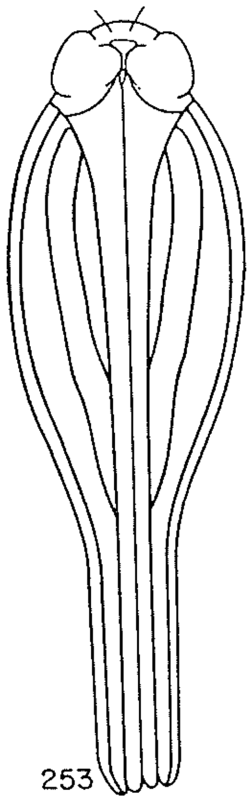
Fig. 254. *Omiodes indicata* (Fabricius), pupa, lateral view.

Fig. 255. *Omiodes indicata* (Fabricius), mesothoracic spiracle, dorsal view.

Fig. 256. *Omiodes indicata* (Fabricius), pupa, dorsal view.

Fig. 257. *Omiodes indicata* (Fabricius), cremaster.

Fig. 258. *Omiodes indicata* (Fabricius), anal shield, dorsal view.



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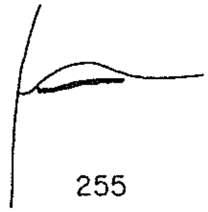

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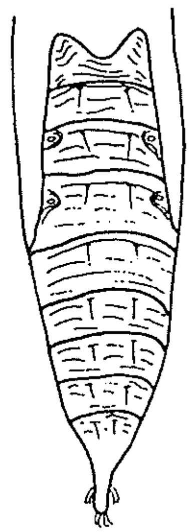

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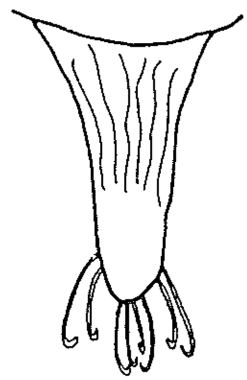

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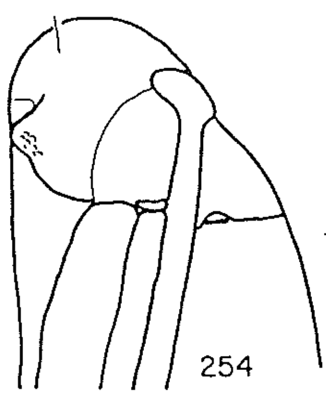

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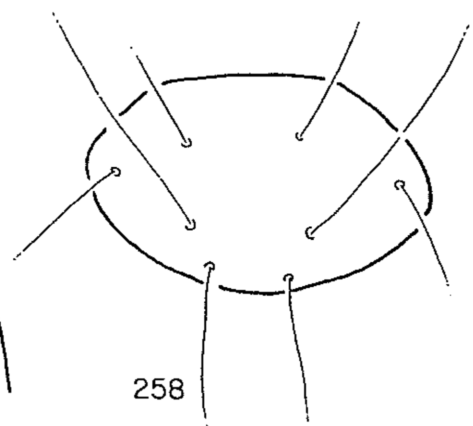

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Fig. 259. *Neoleucinodes elegantalis* (Guenee), larval front.

Fig. 260. *Neoleucinodes elegantalis* (Guenee), A9 of larva, lateral view.

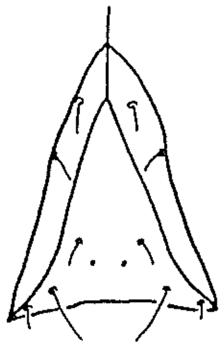
Fig. 261. *Neoleucinodes elegantalis* (Guenee), SV and V pincula of larvaon A1, ventral view.

Fig. 262. *Neoleucinodes elegantalis* (Guenee), hypopharyngeal complex, lateral view.

Fig. 263. *Neoleucinodes elegantalis* (Guenee), A2 and A3 of pupa, lateral view.

Fig. 264. *Palpita flegia* (Cramer), stemmatal arrangement.

Fig. 265. *Palpita flegia* (Cramer), pupa, lateral view.



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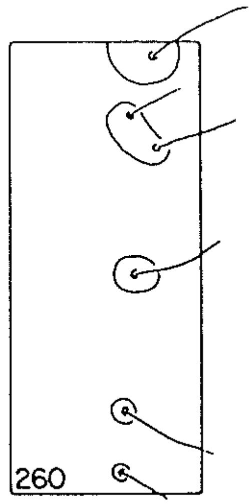

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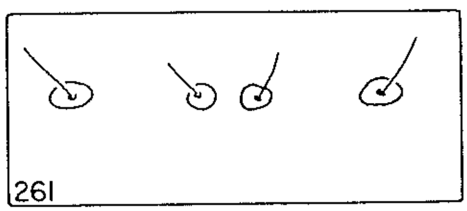

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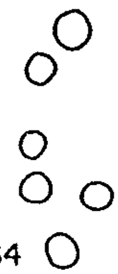

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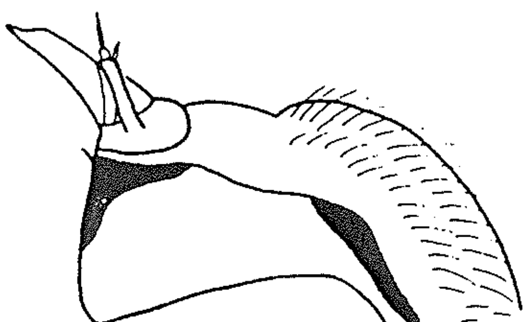

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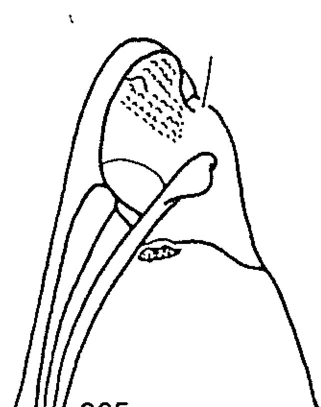

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Fig. 266. *Pilemia periusalis* (Walker), larval prothorax, lateral view.

Fig. 267. *Pilemia periusalis* (Walker), larval mesothorax, lateral view.

Fig. 268. *Pilemia periusalis* (Walker), A1 of larva, lateral view.

Fig. 269. *Pilemia periusalis* (Walker), A6 of larva, lateral view.

Fig. 270. *Pilemia periusalis* (Walker), A8 of larva, lateral view.

Fig. 271. *Pilemia periusalis* (Walker), A9 of larva, lateral view.

Fig. 272. *Pilemia periusalis* (Walker), larval epicrania, front, and labrum.

Fig. 273. *Pilemia periusalis* (Walker), mandible, ventral view.

Fig. 274. *Pilemia periusalis* (Walker), hypopharyngeal complex, lateral view.

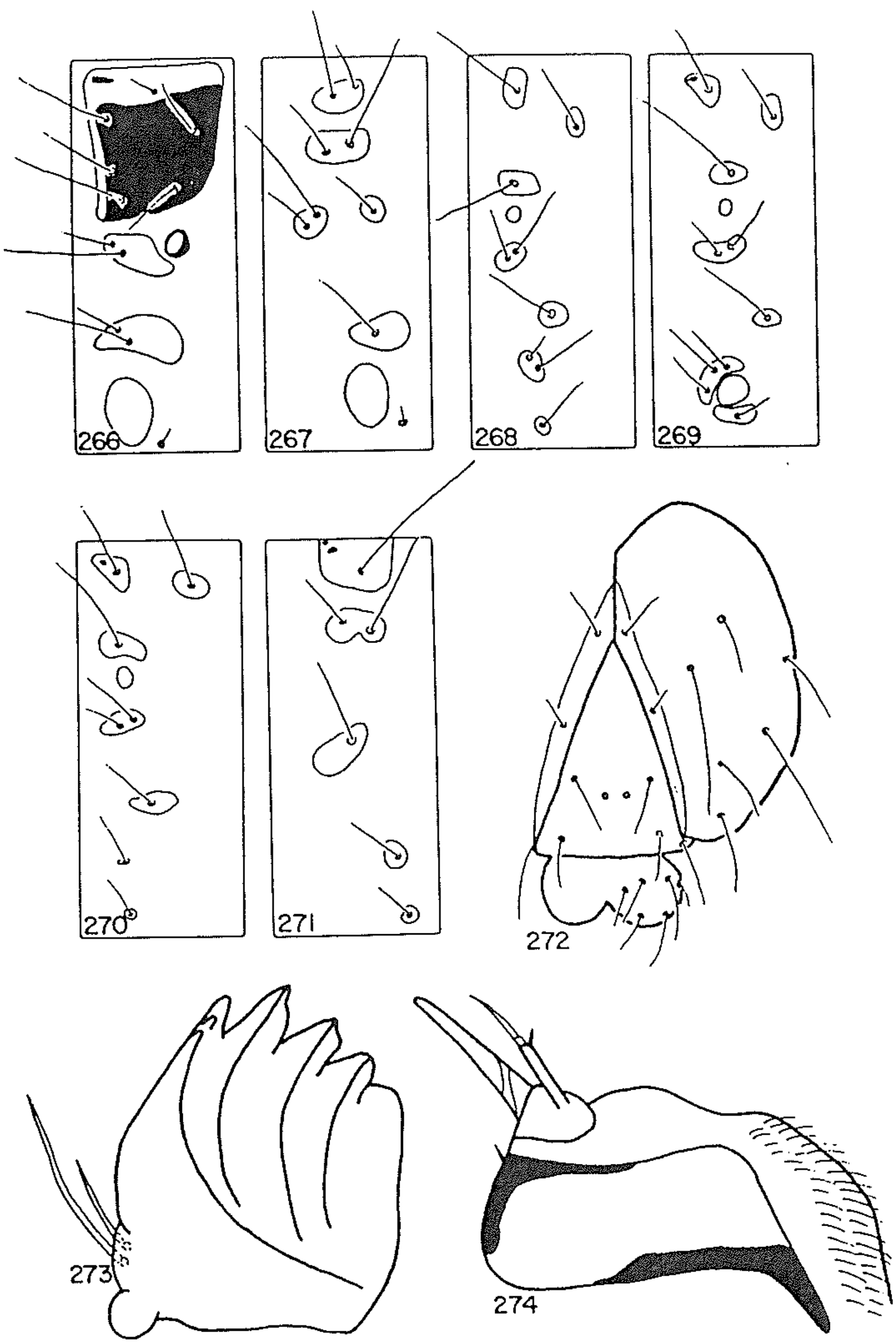
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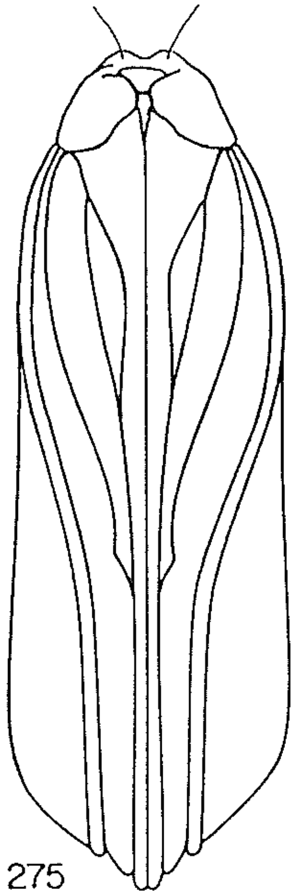
Fig. 275. *Pilemia periusalis* (Walker), pupa, ventral view.

Fig. 276. *Pilemia periusalis* (Walker), cremaster.

Fig. 277. *Pilemia periusalis* (Walker), mesothoracic spiracle, dorsal view.

Fig. 278. *Pilemia periusalis* (Walker), antennal scape, dorsal view.

Fig. 279. *Pilemia periusalis* (Walker), anal shield, dorsal view.



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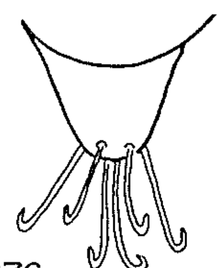

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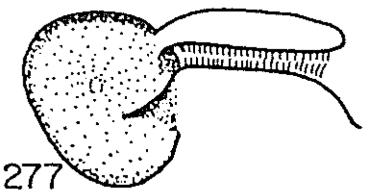

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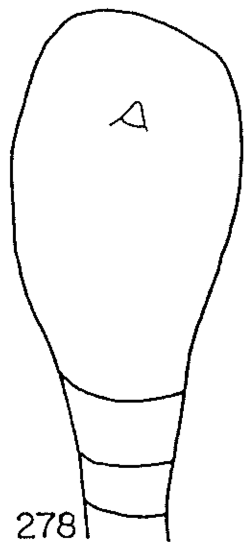

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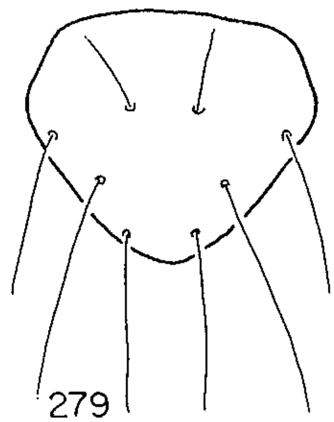

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Fig. 280. *Polygrammodes elevata* (Fabricius), larval prothorax, lateral view.

Fig. 281. *Polygrammodes elevata* (Fabricius), larval mesothorax, lateral view.

Fig. 282. *Polygrammodes elevata* (Fabricius), A1 of larva, lateral view.

Fig. 283. *Polygrammodes elevata* (Fabricius), A6 of larva, lateral view.

Fig. 284. *Polygrammodes elevata* (Fabricius), A8 of larva, lateral view.

Fig. 285. *Polygrammodes elevata* (Fabricius), A9 of larva, lateral view.

Fig. 286. *Polygrammodes elevata* (Fabricius), larval epicrania, front, and labrum.

Fig. 287. *Polygrammodes elevata* (Fabricius), mandible, ventral view.

Fig. 288. *Polygrammodes elevata* (Fabricius), skin texture (400x).

Fig. 289. *Polygrammodes elevata* (Fabricius), hypopharyngeal complex, lateral view.

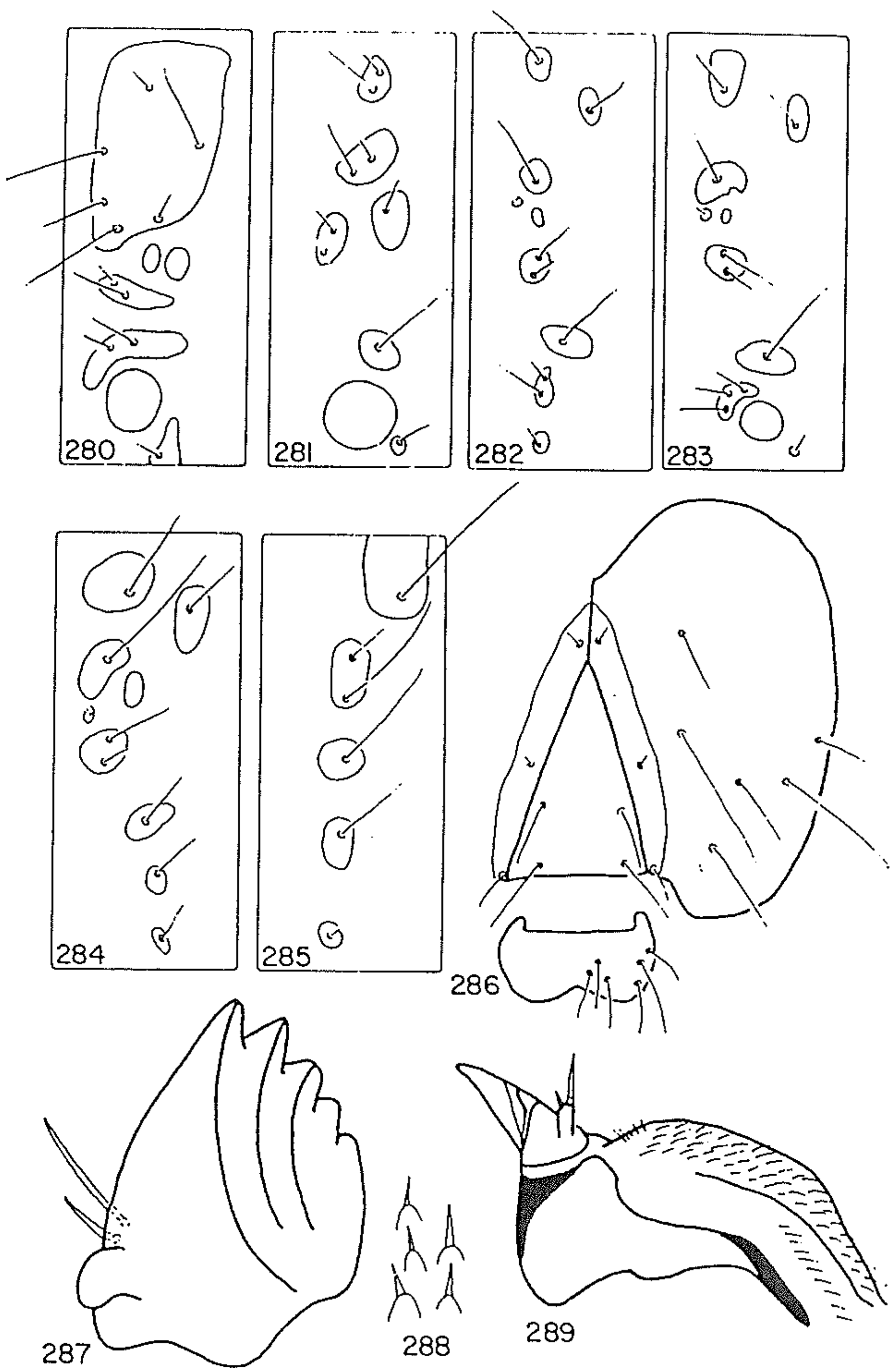
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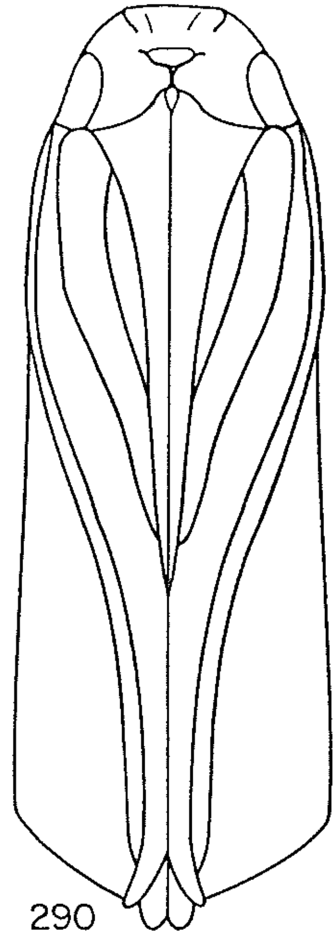
Fig. 290. *Polygrammodes elevata* (Fabricius), pupa, ventral view.

Fig. 291. *Polygrammodes elevata* (Fabricius), pupa, lateral view.

Fig. 292. *Polygrammodes elevata* (Fabricius), mesothoracic spiracle, dorsal view.

Fig. 293. *Polygrammodes elevata* (Fabricius), cremaster.

Fig. 294. *Polygrammodes elevata* (Fabricius), anal shield, dorsal view.



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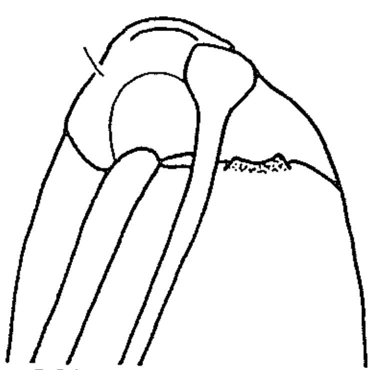

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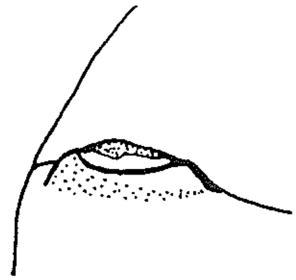

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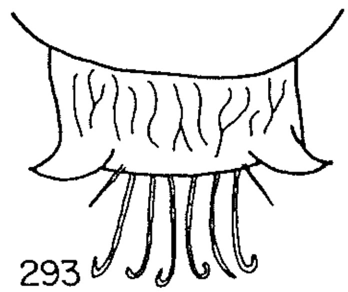

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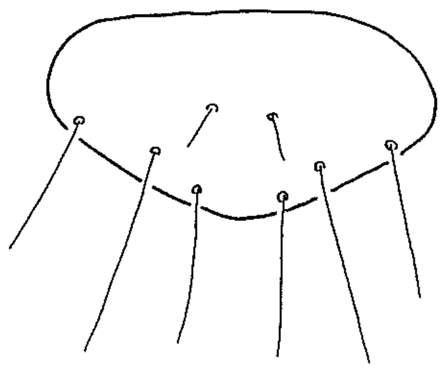

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Fig. 295. *Spoladea recurvalis* (Fabricius), larval prothoracic shield, lateral view.

Fig. 296. *Spoladea recurvalis* (Fabricius), hypopharyngeal complex, lateral view.

Fig. 297. *Spoladea recurvalis* (Fabricius), mandible, ventral view.

Fig. 298. *Spoladea recurvalis* (Fabricius), mesothoracic spiracle, dorsal view.

Fig. 299. *Spoladea recurvalis* (Fabricius), antennal scape, lateral view.

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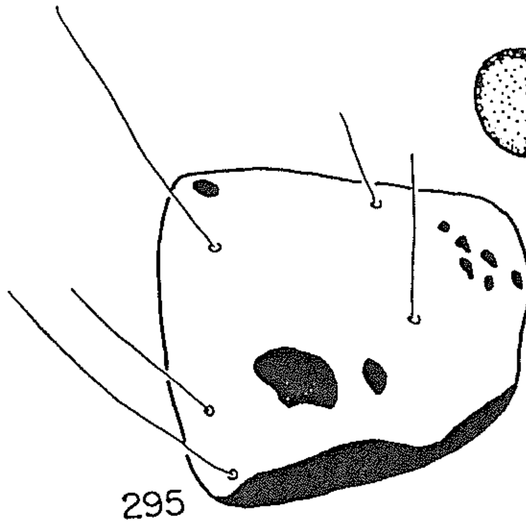

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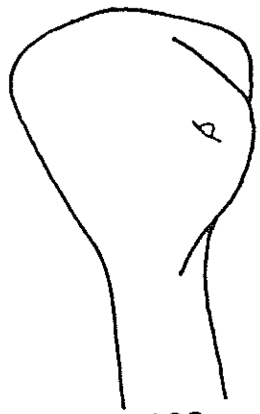

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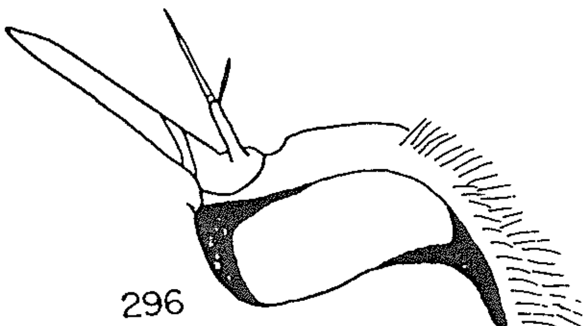

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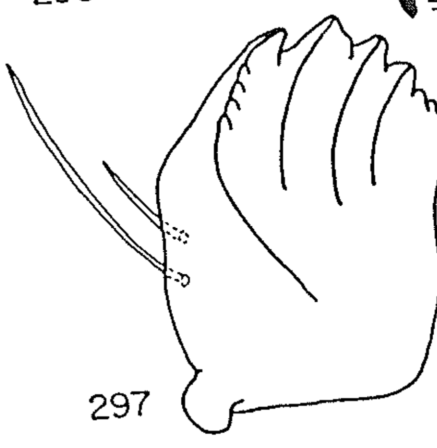

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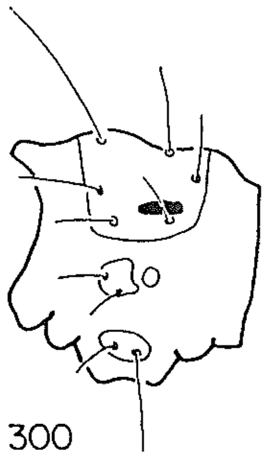
Fig. 300. *Udea rubigalis* (Guenee), larval prothorax, lateral view.

Fig. 301. *Udea rubigalis* (Guenee), mandible, ventral view.

Fig. 302. *Udea rubigalis* (Guenee), pupa, dorsal view.

Fig. 303. *Udea rubigalis* (Guenee), crochets of A6, ventral view.



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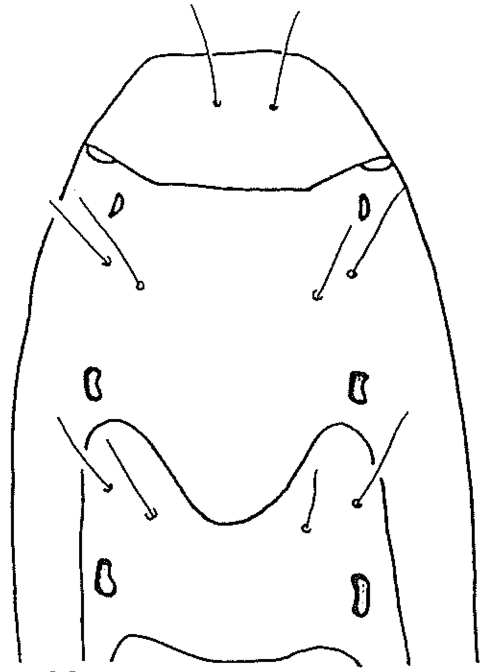

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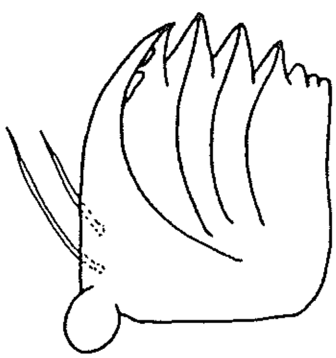

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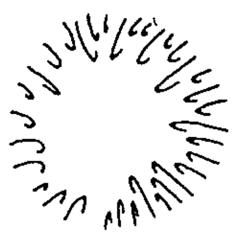

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Fig. 304. _Rupela albinella_ (Cramer), larval prothorax, lateral view.

Fig. 305. _Rupela albinella_ (Cramer), larval mesothorax, lateral view.

Fig. 306. _Rupela albinella_ (Cramer), A1 of larva, lateral view.

Fig. 307. _Rupela albinella_ (Cramer), A6 of larva, lateral view.

Fig. 308. _Rupela albinella_ (Cramer), A8 of larva, lateral view.

Fig. 309. _Rupela albinella_ (Cramer), A9 of larva, lateral view.

Fig. 310. _Rupela albinella_ (Cramer), larval epicrania, front, and labrum.

Fig. 311. _Rupela albinella_ (Cramer), mandible, ventral view.

Fig. 312. _Rupela albinella_ (Cramer), skin texture (400x).

Fig. 313. _Rupela albinella_ (Cramer), prothoracic coxae and membranous sac, ventral view.

Fig. 314. _Rupela albinella_ (Cramer), hypopharyngeal complex, lateral view.

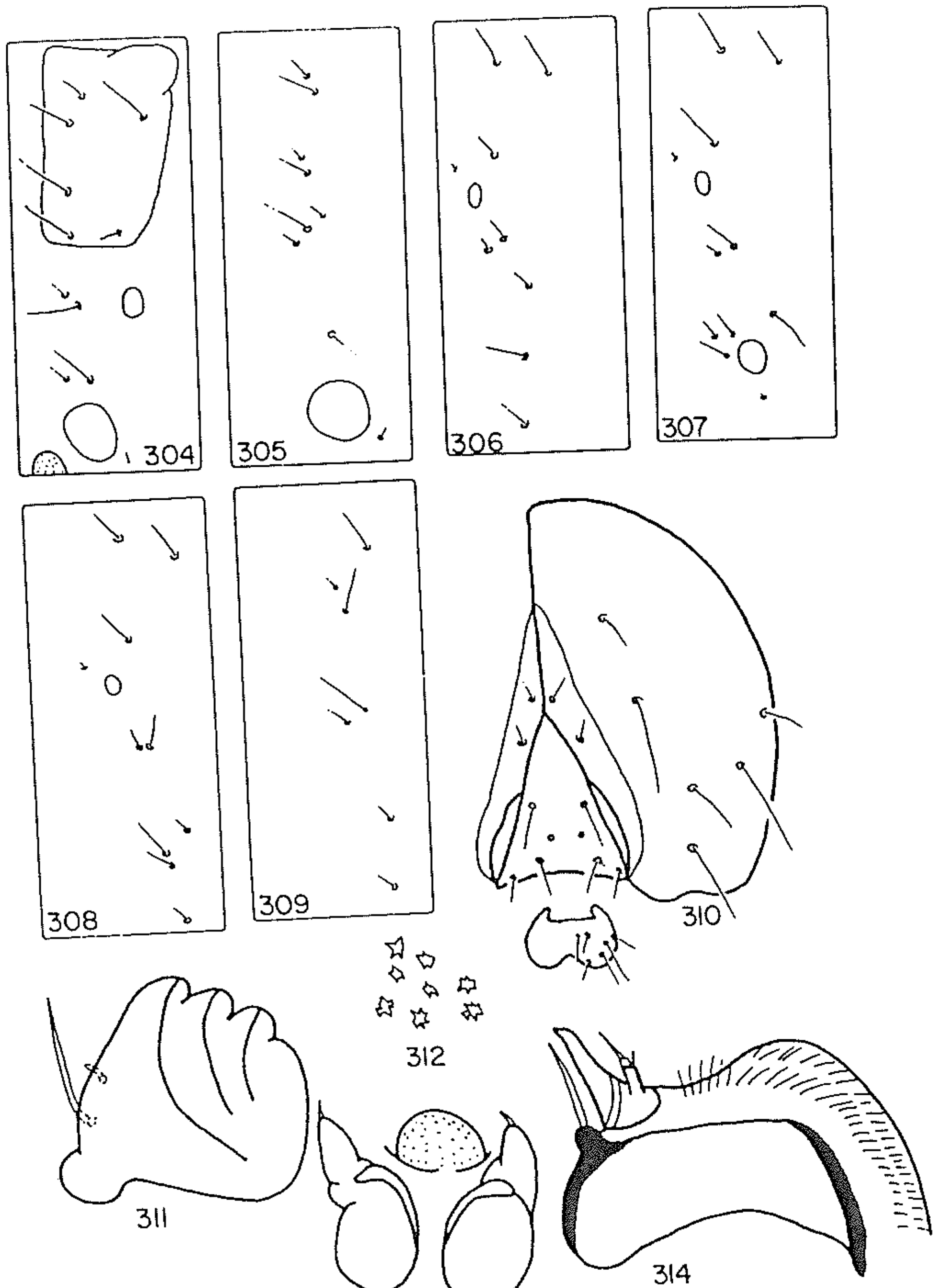
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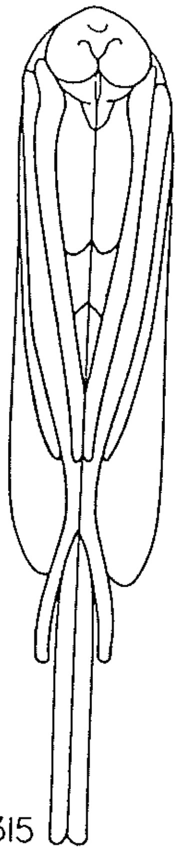
Fig. 315. *Rupela albinella* (Cramer), pupa, ventral view.

Fig. 316. *Rupela albinella* (Cramer), terminal abdominal segment of pupa, lateral view.

Fig. 317. *Rupela albinella* (Cramer), mesothoracic spiracle, dorsal view.

Fig. 318. *Rupela albinella* (Cramer), A10 of larva, lateral view.



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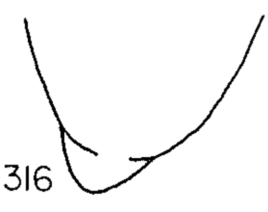

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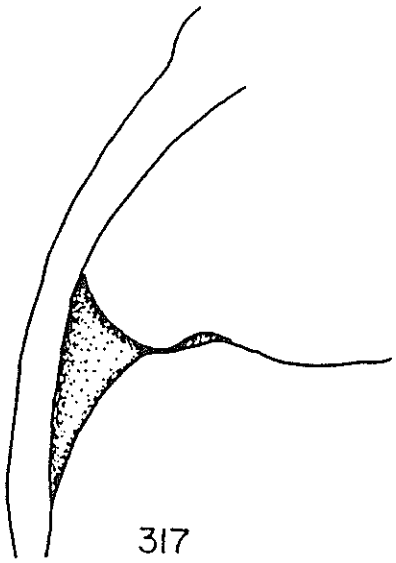

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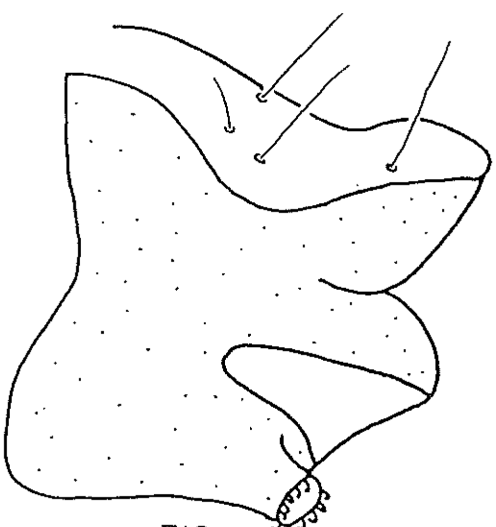

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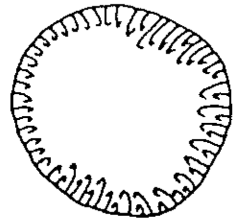
Fig. 319. _Chilo plejadellus_ Zincken, crochets of A6, ventral view.

Fig. 320. _Chilo plejadellus_ Zincken, L and SV pinacula of larva, lateral view.

Fig. 321. _Chilo plejadellus_ Zincken, pupa, lateral view.

Fig. 322. _Chilo plejadellus_ Zincken, grooves on A10 of pupa, dorsolateral view.

Fig. 323. _Chilo plejadellus_ Zincken, cremaster.



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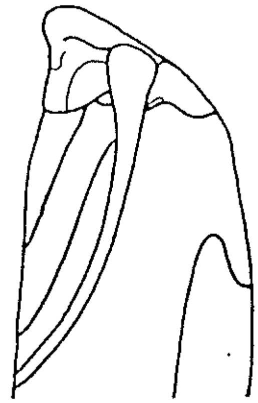

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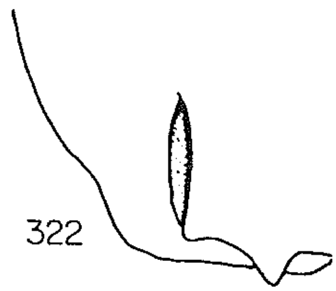

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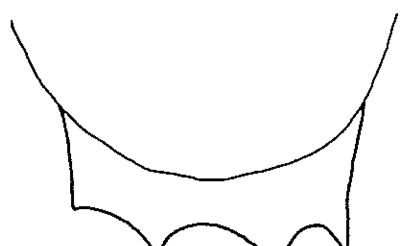

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Fig. 324. *Diatraea lineolata* (Walker), larval mesothorax, lateral view.

Fig. 326. *Diatraea lineolata* (Walker), A1 of larva, dorsal view.

Fig. 327. *Diatraea lineolata* (Walker), A6 of larva, dorsal view.

Fig. 328. *Diatraea lineolata* (Walker), A8 of larva, dorsal view.

Fig. 329. *Diatraea lineolata* (Walker), A9 of larva, dorsal view.

Fig. 330. *Diatraea lineolata* (Walker), larval epicrania, front, and labrum.

Fig. 331. *Diatraea lineolata* (Walker), mandible, ventral view.

Fig. 332. *Diatraea lineolata* (Walker), hypopharyngeal complex.

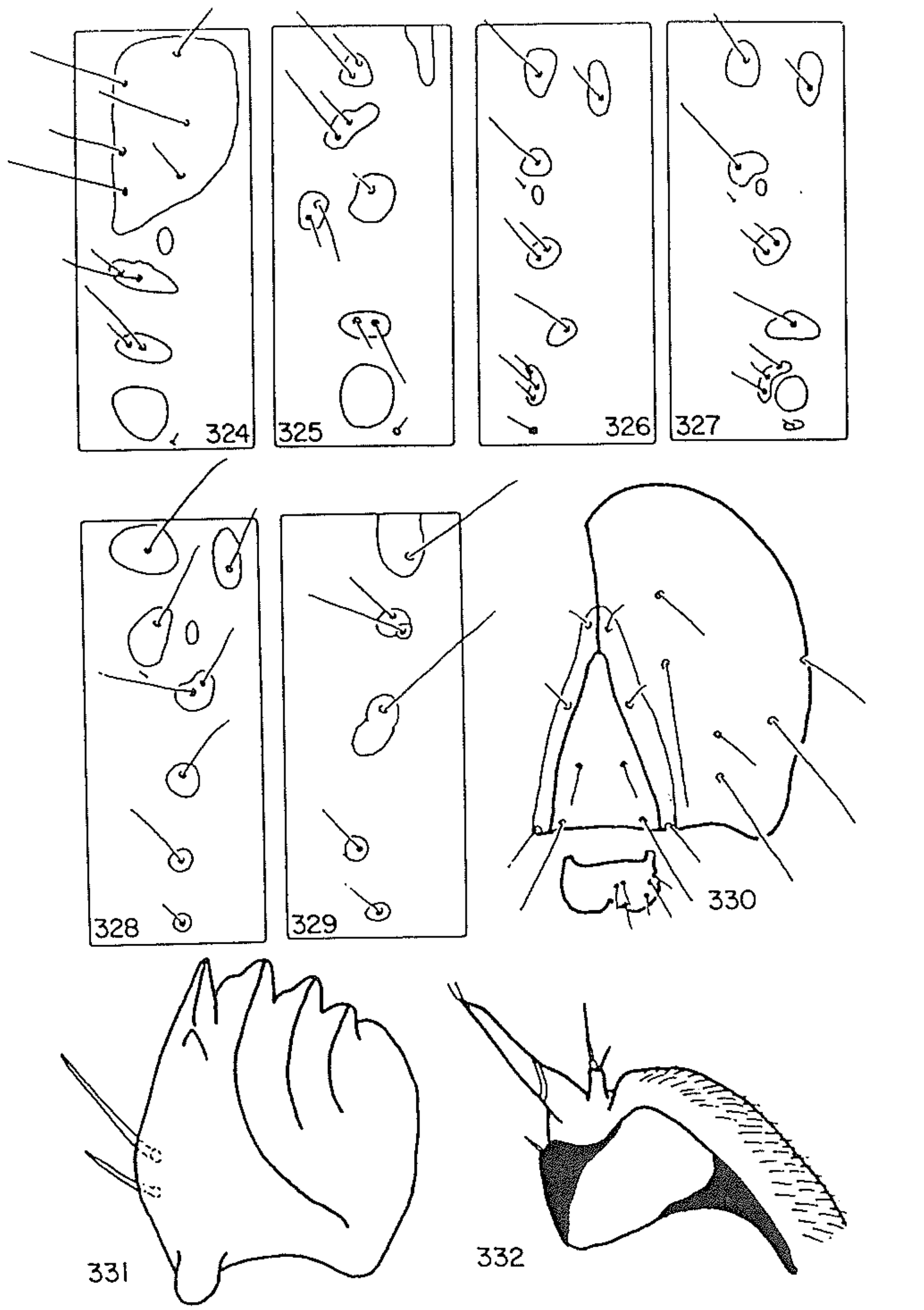
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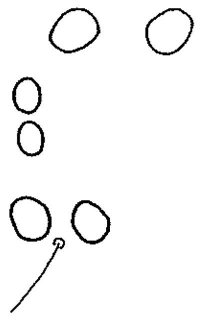
Fig. 333. *Diatraea lineolata* (Walker), stemmatal area, lateral view.

Fig. 334. *Diatraea grandiosella* Dyar, stemmatal area, lateral view.

Fig. 335. *Diatraea saccharalis* (Fabricius), anal prolegs, posterior view.

Fig. 336. *Diatraea lineolata* (Walker), anal prolegs, posterior view.

Fig. 337. *Diatraea grandiosella* Dyar, anal prolegs, posterior view.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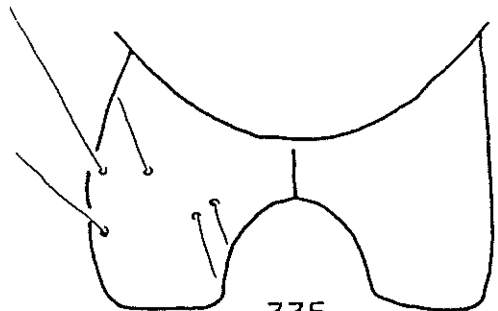
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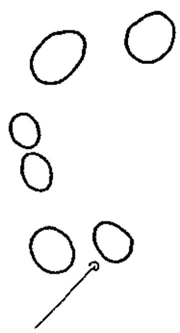
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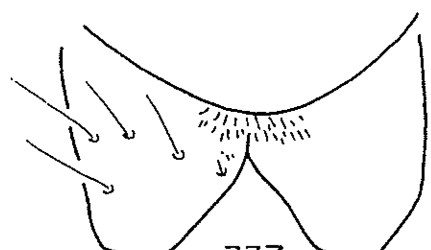
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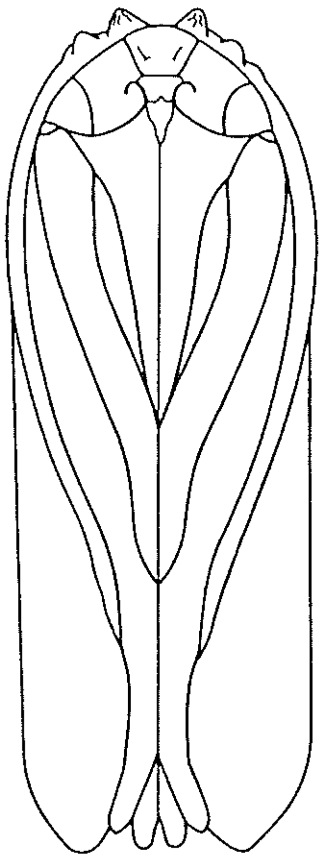

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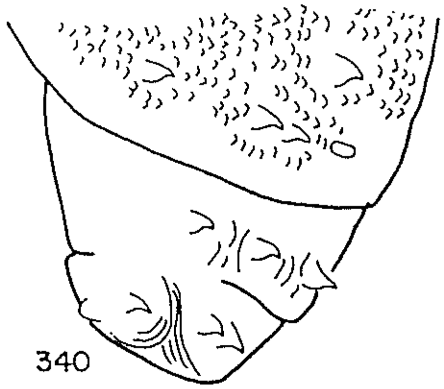

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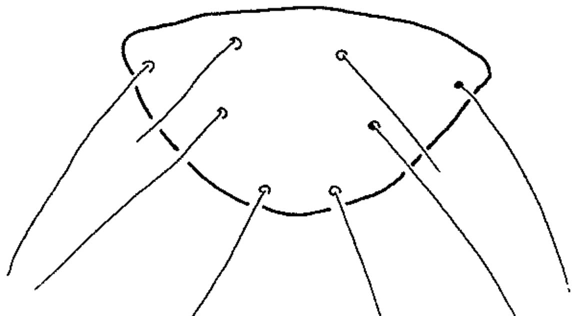

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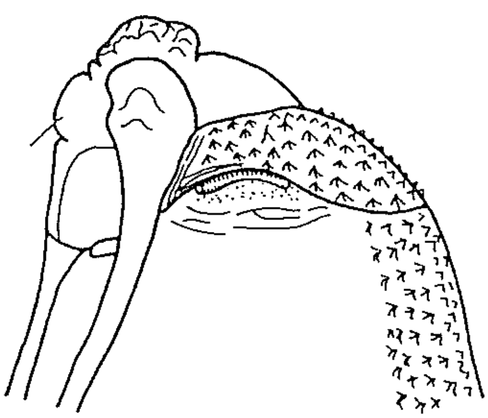

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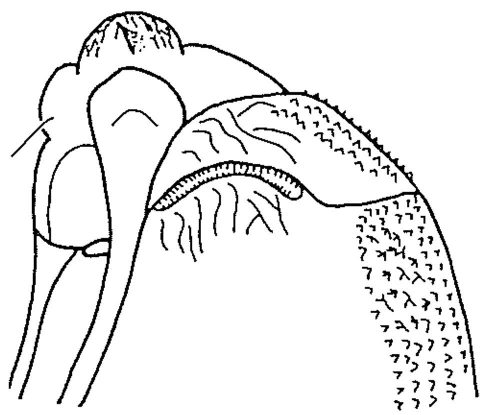

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Fig. 338. *Diatraea lineolata* (Walker), pupa, ventral view.

Fig. 339. *Diatraea lineolata* (Walker), pupa, lateral view.

Fig. 340. *Diatraea lineolata* (Walker), terminal segments of pupa, lateral view.

Fig. 341. *Diatraea lineolata* (Walker), anal shield, dorsal view.

Fig. 342. *Diatraea saccharalis* (Fabricius), caudal horn.

Fig. 343. *Diatraea saccharalis* (Fabricius), pupa, lateral view.

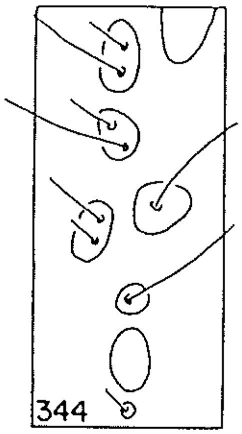
Fig. 344. *Eoreuma loftini* (Dyar), larval metathorax, lateral view.

Fig. 345. *Eoreuma loftini* (Dyar), D and SD pinacula of larvae on A6, lateral view.

Fig. 346. *Eoreuma loftini* (Dyar), A5 of pupa, dorsal view.

Fig. 347. *Eoreuma loftini* (Dyar), cremaster.

Fig. 348. *Myelobia decolorata* (Herrich-Schaffer), A1 of larva, lateral view.



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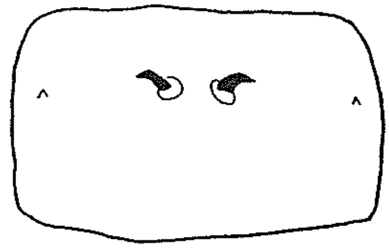

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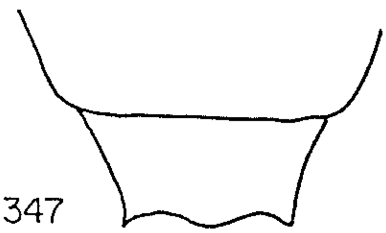

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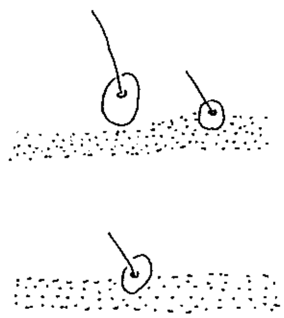

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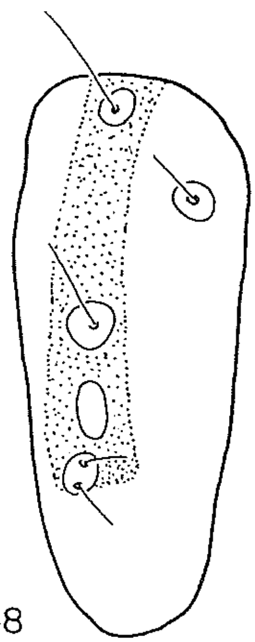

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Fig. 349. *Fissicrambus* sp. or genus near, larval SD pinaculum on A3, lateral view.

Fig. 350. *Fissicrambus* sp. or genus near, larval prothoracic L pinaculum, lateral view.

Fig. 351. *Fissicrambus* sp. or genus near, mandible, ventral view.

Fig. 352. *Fissicrambus* sp. or genus near, hypopharyngeal complex, lateral view.

Fig. 353. *Fissicrambus* sp. or genus near, variation in the larval SD pinaculum on A3, lateral view.

Fig. 354. *Fissicrambus* sp. or genus near, cremaster and lateral grooves.

Fig. 355. *Fissicrambus* sp. or genus near, juxta, ventral view.

Fig. 356. *Fissicrambus* sp. or genus near, male genitalia, (A) uncus and gnathos, (B) spines at the gnathos apex, lateral view.

Fig. 357. *Fissicrambus* sp. or genus near, male genitalia (uncus, gnathos, and tegumen removed), ventral view.

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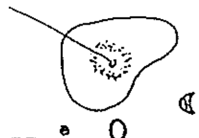

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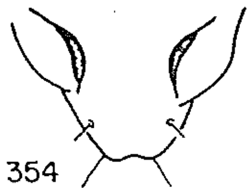

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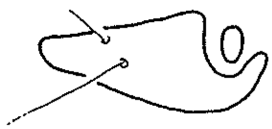

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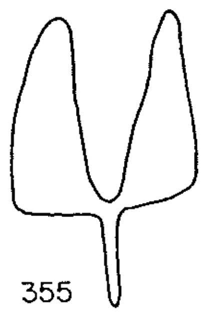

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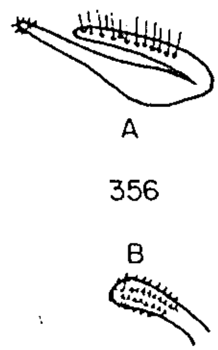

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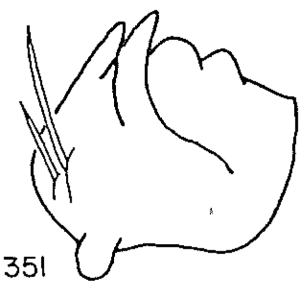

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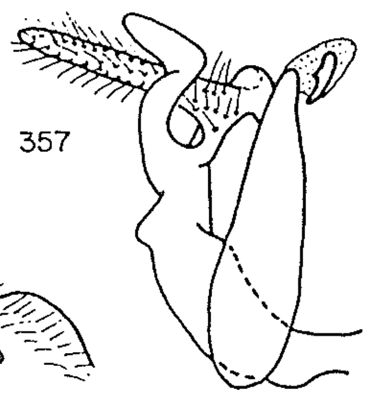

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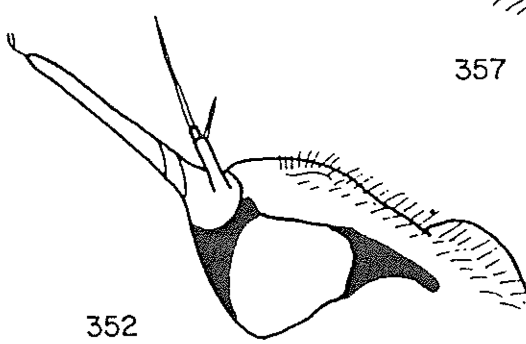

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Fig. 358. *Pyralis farinalis* Linnaeus, terminal abdominal segments of pupa with dorsal groove.

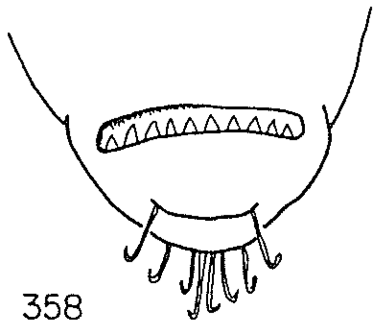
Fig. 359. *Bonchis munitalis* (Lederer), L group of A9 on larva, dotted line indicates an alternate setal arrangement, lateral view.

Fig. 360. *Bonchis munitalis* (Lederer), mandible, ventral view.

Fig. 361. *Bonchis munitalis* (Lederer), larval D setae on A3, lateral view.

Fig. 362. *Bonchis munitalis* (Lederer), mesothoracic spiracle.

Fig. 363. *Bonchis munitalis* (Lederer), gibba and cremaster, dorsal view.



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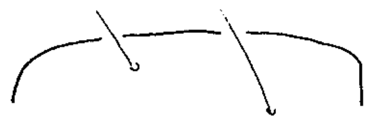

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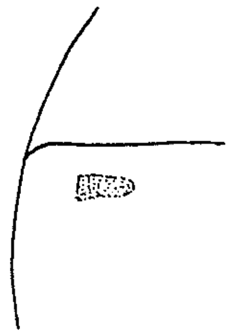

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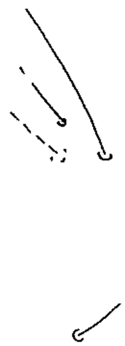

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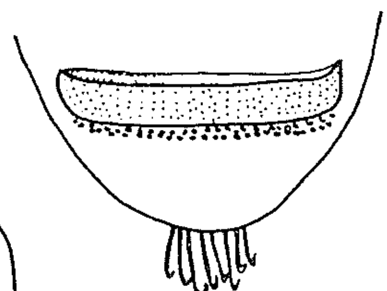

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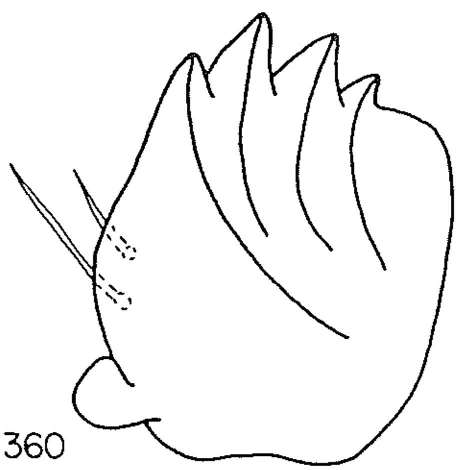

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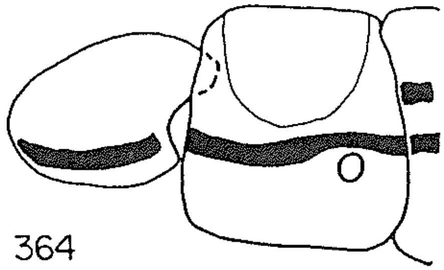
Fig. 364. *Calybitia picata* Schaus, larval epicrania and prothoracic shield, lateral view.

Fig. 365. *Calybitia picata* Schaus, mandible, ventral view.

Fig. 366. *Calybitia picata* Schaus, mesothoracic spiracle, dorsal view.

Fig. 367. *Calybitia picata* Schaus, hypopharyngeal complex, lateral view.



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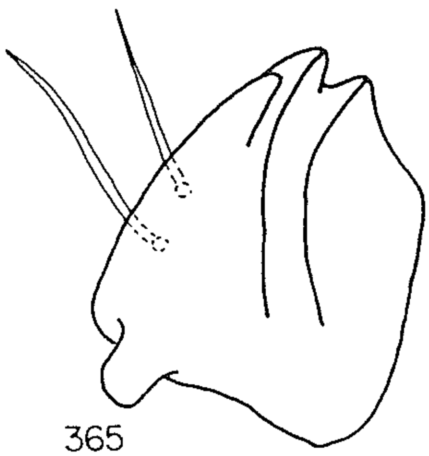

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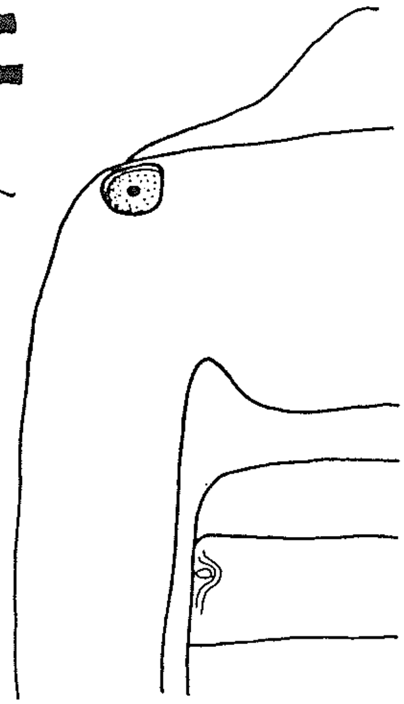

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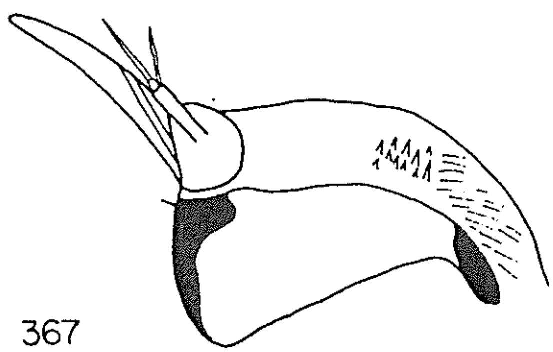

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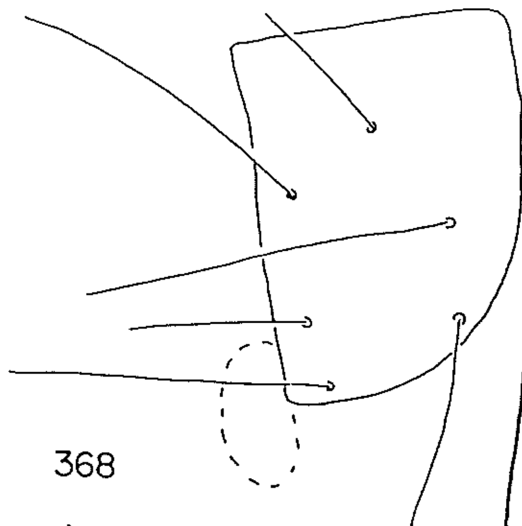
Fig. 368. *Jocara* sp. [*conspicualis* (Lederer) complex], larval prothorax, lateral view.

Fig. 369. *Jocara* sp. [*conspicualis* (Lederer) complex], mandible, ventral view.

Fig. 370. *Jocara* sp. [*conspicualis* (Lederer) complex], mesothoracic spiracle, dorsal view.

Fig. 371. *Jocara* sp. [*conspicualis* (Lederer) complex], hypopharyngeal complex, (A) lateral view, (B) peg-like spine.



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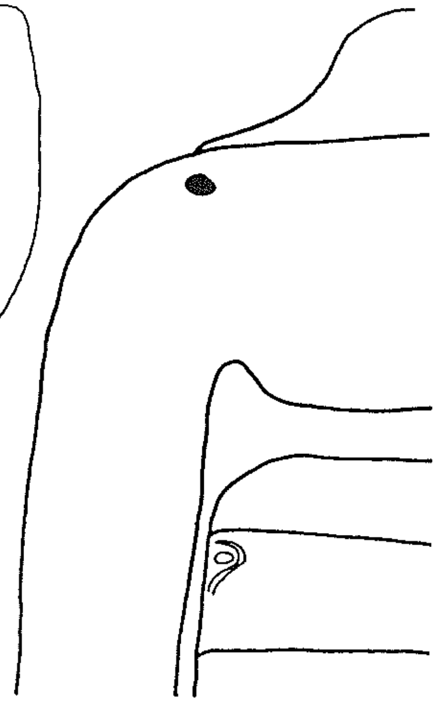

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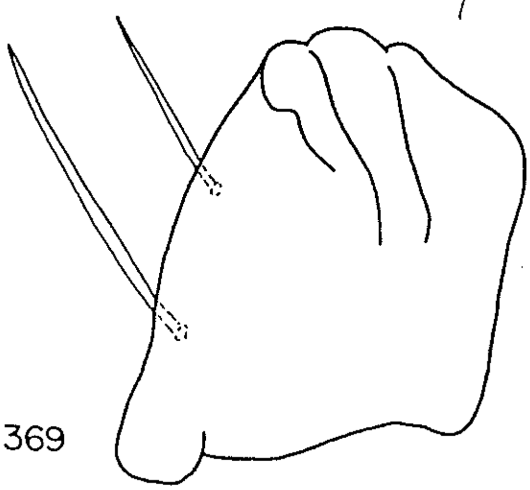

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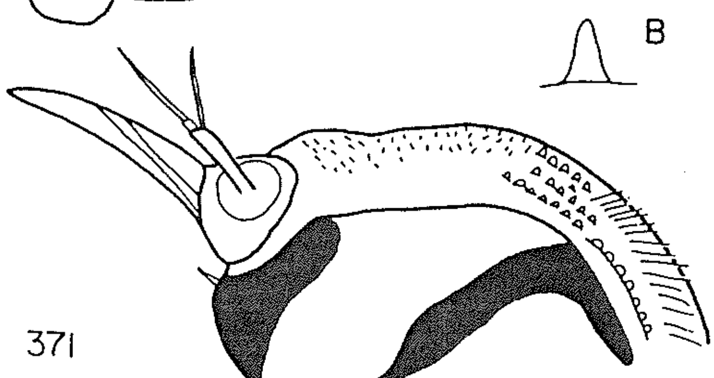

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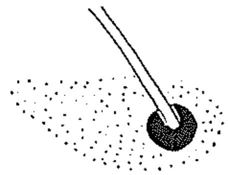
Fig. 372. Unknown Epipaschiinae, probably *Stericta* sp., SD1 seta surrounded by pigmented granules on A3, lateral view.

Fig. 373. *Jocara* sp. [*conspicualis* (Lederer) complex], male genitalia, ventral view.

Fig. 374. *Jocara* sp. [*conspicualis* (Lederer) complex], female genitalia, ventral view.



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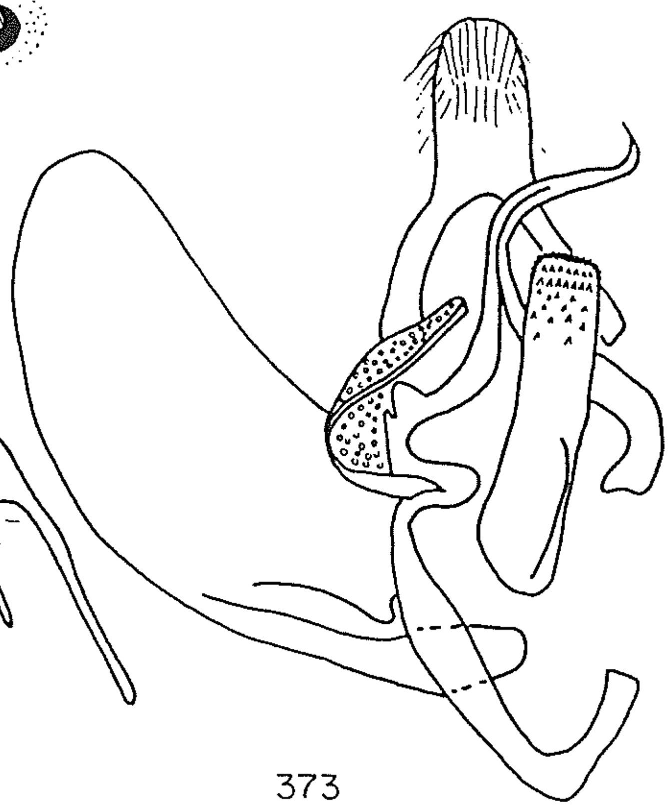

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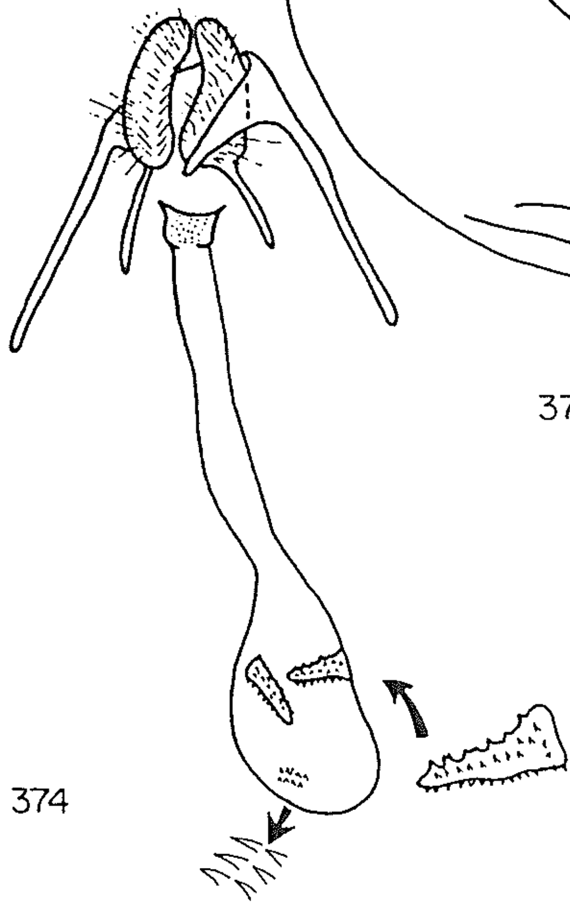

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Fig. 375. Pococera atramentalis Lederer, larval prothorax, lateral view.

Fig. 376. Pococera atramentalis Lederer, larval mesothoracic, lateral view.

Fig. 377. Pococera atramentalis Lederer, A1 of larva, lateral view.

Fig. 378. Pococera atramentalis Lederer, A6 of larva, lateral view.

Fig. 379. Pococera atramentalis Lederer, A8 or larva, lateral view.

Fig. 380. Pococera atramentalis Lederer, A9 of larva, lateral view.

Fig. 381. Pococera atramentalis Lederer, larval epicrania, front, and labrum.

Fig. 382. Pococera atramentalis Lederer, mandible, ventral view.

Fig. 383. Pococera atramentalis Lederer, hypopharyngeal complex, lateral view.

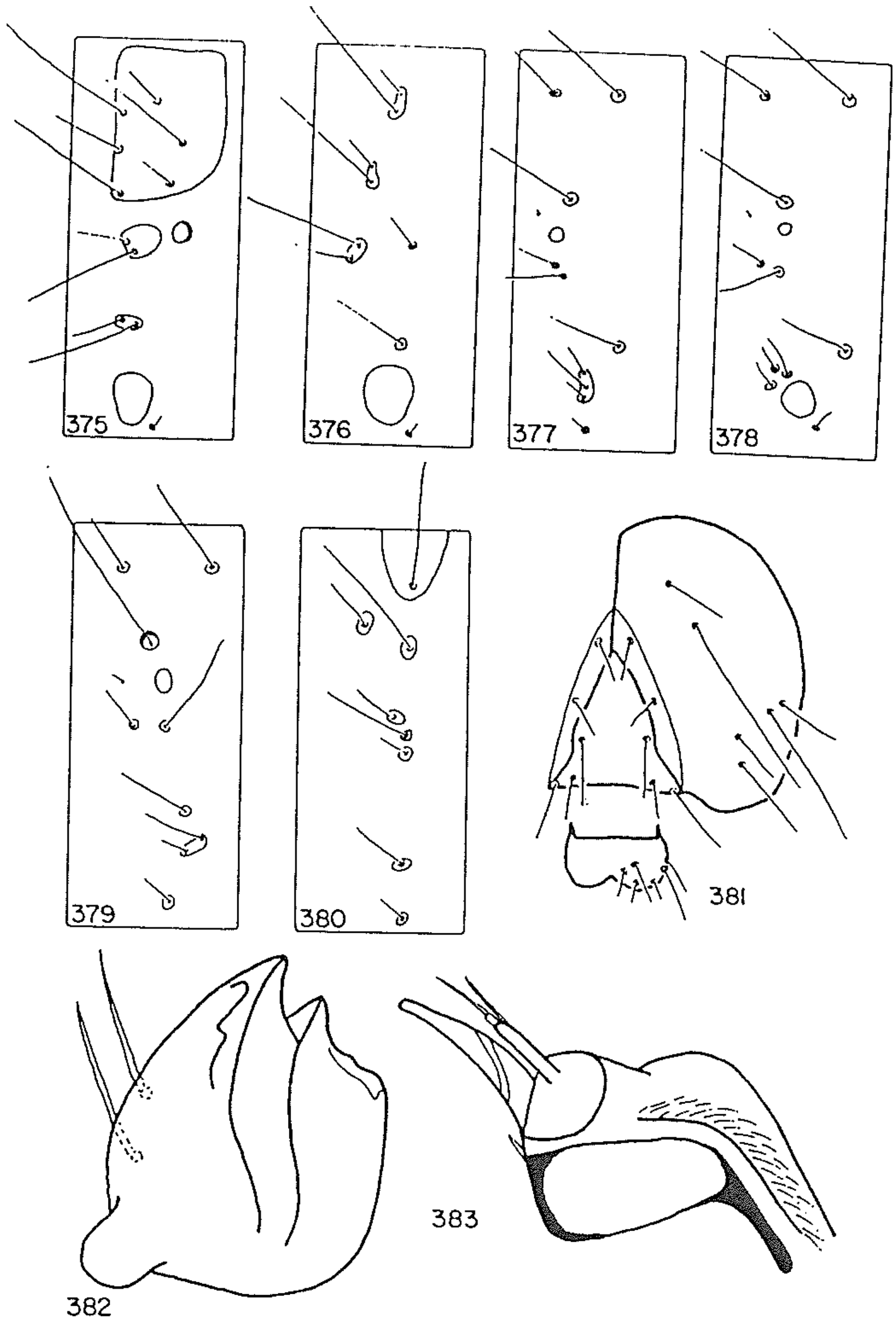
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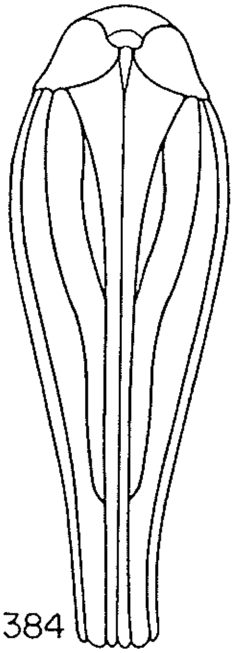
Fig. 384. *Pococera atramentalis* Lederer, pupa, ventral view.

Fig. 385. *Pococera atramentalis* Lederer, pupa, lateral view.

Fig. 386. *Pococera atramentalis* Lederer, mesothoracic spiracle, dorsal view.

Fig. 387. *Pococera atramentalis* Lederer, anal shield, dorsal view.



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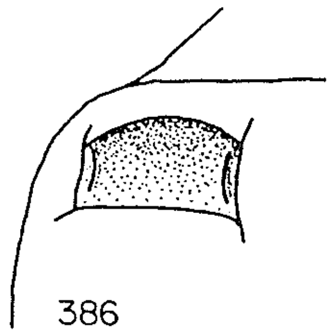

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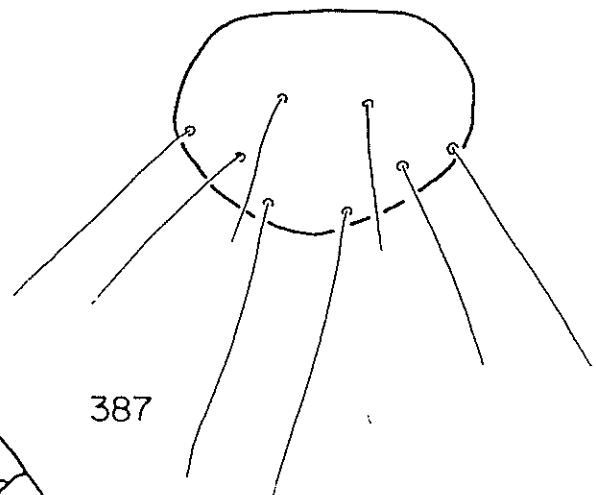

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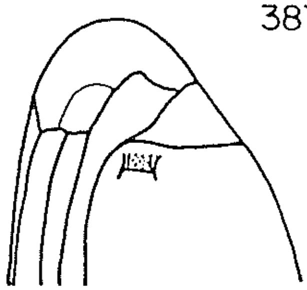

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Fig. 388. *Corcyra cephalonica* (Stainton), larval SD1 sclerotized ring and spiracle on A1, lateral view.

Fig. 389. *Corcyra cephalonica* (Stainton), stemmatal arrangement.

Fig. 390. *Corcyra cephalonica* (Stainton), pupal mesothorax, dorsal view.

Fig. 391. *Corcyra cephalonica* (Stainton), A1 of pupa, dorsal view.

Fig. 392. *Galleria mellonella* (Linnaeus), larval SD1 sclerotized ring on A1, (A) ring half closed dorsally, (B) ring closed around the SD1 seta.

Fig. 393. *Galleria mellonella* (Linnaeus), stemmatal arrangement (from Hassenfuss, 1960)

Fig. 394. *Galleria mellonella* (Linnaeus), pupal mesothorax, dorsal view.

Fig. 395. *Galleria mellonella* (Linnaeus), A1 of pupa, dorsal view.

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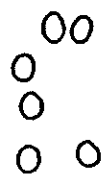

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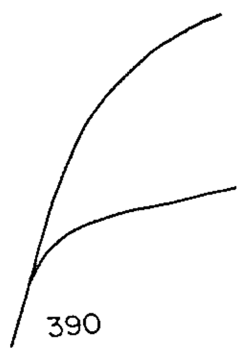

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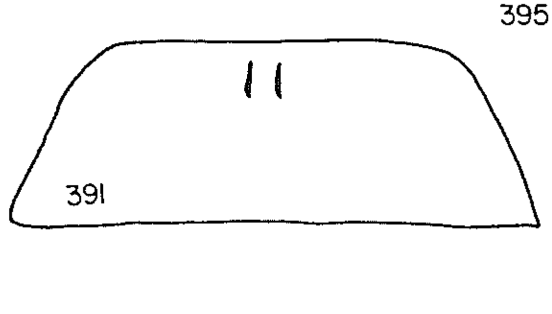

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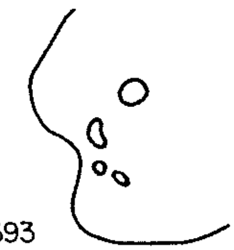

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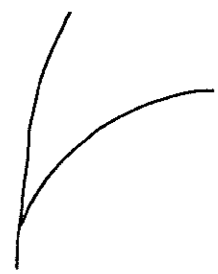

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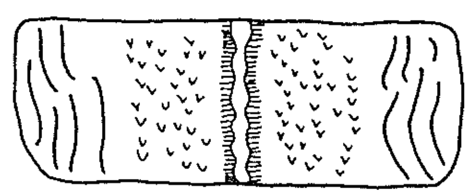

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Fig. 396. _Anagasta kuehniella_ (Zeller), A8 of larva, lateral view (modified from Hinton, 1943).

Fig. 397. _Anagasta kuehniella_ (Zeller), mandible, ventral view (modified from Hinton, 1943).

Fig. 398. _Anagasta kuehniella_ (Zeller), pupal head and thorax, dorsal view.

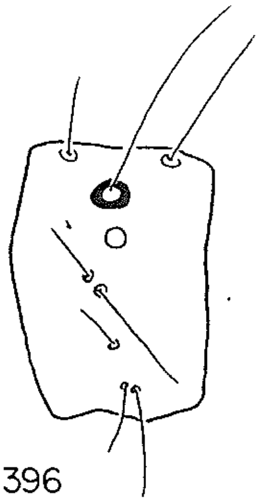
Fig. 399. _Anagasta kuehniella_ (Zeller), creamster.

Fig. 400. _Amyelois transitella_ (Walker), larval scleroitzed ring, SD1 and SD2 setae, mesothorax, lateral view.

Fig. 401. _Amyelois transitella_ (Walker), mandible, ventral view (from Neunzig, 1979).

Fig. 402. _Amyelois transitella_ (Walker), vestigeal sclerotized ring around SD1 on A1, lateral view (from Neunzig, 1979).

Fig. 403. _Amyelois transitella_ (Walker), cremaster.



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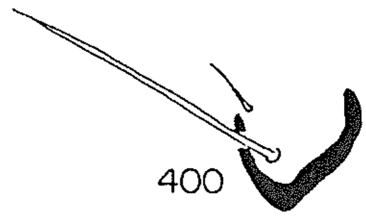

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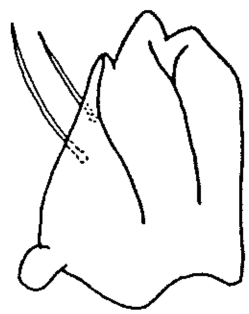

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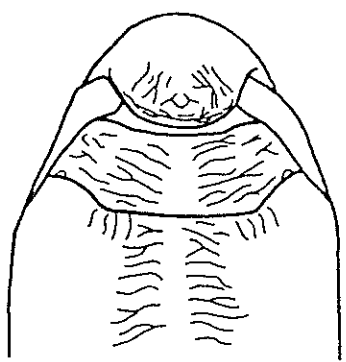

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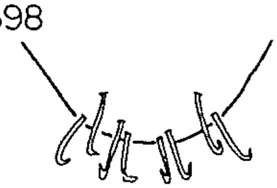

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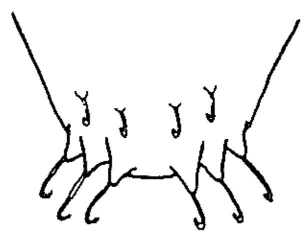

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Fig. 404. *Ancylostomia stercorea* (Zeller), larval prothoracic shield, (A) dark form, (B) light form, dorsal view.

Fig. 405. *Ancylostomia stercorea* (Zeller), pupal femur, ventral view.

Fig. 406. *Ancylostomia stercorea* (Zeller), cremaster and gibba, dorsal view.

Fig. 407. *Cadra cautella* (Walker), A8 of larva, lateral view (modified from Hinton, 1943).

Fig. 408. *Cadra cautella* (Walker), pupa, ventral view.

Fig. 409. *Cadra cautella* (Walker), cremaster.

A

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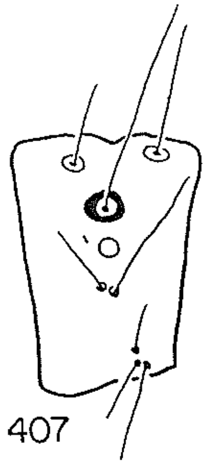
B



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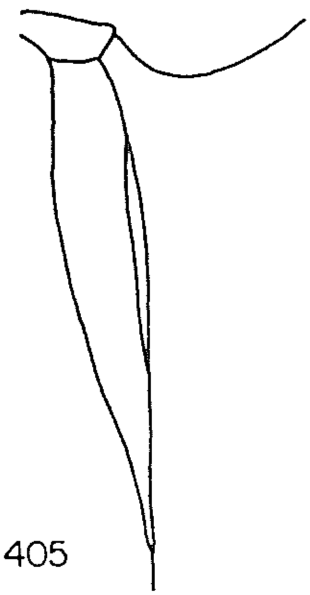

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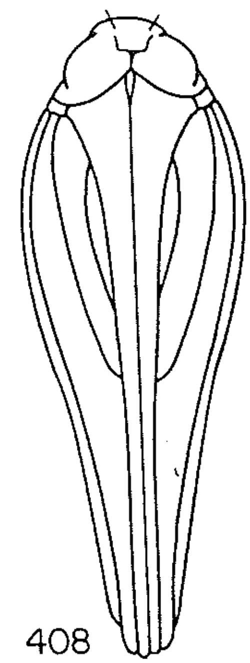

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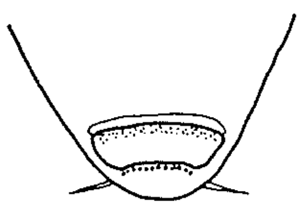

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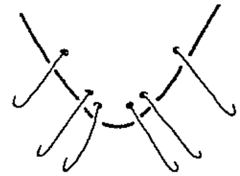

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Fig. 410. *Davara caricae* (Dyar), epicranial color pattern, light form, lateral view.

Fig. 411. *Davara caricae* (Dyar), epicranial color pattern, intermediate form, lateral view.

Fig. 412. *Davara caricae* (Dyar), epicranial color pattern, dark form, lateral form.

Fig. 413. *Davara caricae* (Dyar), larval L pinaculum on A3, lateral view.

Fig. 414. *Davara caricae* (Dyar), gibba, dorsal view.

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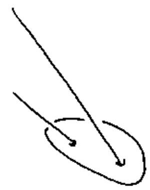

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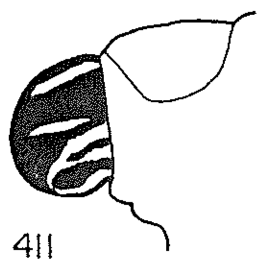

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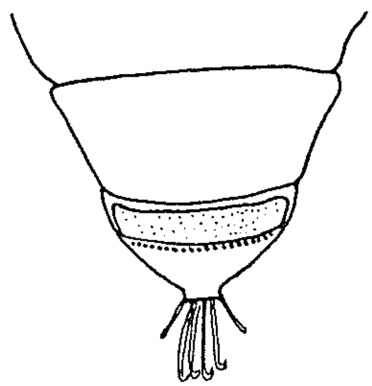

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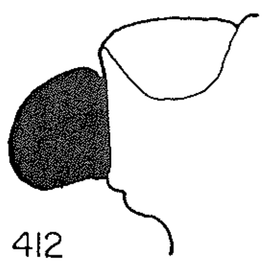

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Fig. 415. *Dioryctria* sp. (*abietella* group), larval prothorax, lateral view.

Fig. 416. *Dioryctria* sp. (*abietella* group), larval mesothorax, lateral view.

Fig. 417. *Dioryctria* sp. (*abietella* group), A1 of larva, lateral view.

Fig. 418. *Dioryctria* sp. (*abietella* group), A6 of larva, lateral view.

Fig. 419. *Dioryctria* sp. (*abietella* group), A8 of larva, lateral view.

Fig. 420. *Dioryctria* sp. (*abietella* group), A9 of larva, lateral view.

Fig. 421. *Dioryctria* sp. (*abietella* group), larval epicrania and front.

Fig. 422. *Dioryctria* sp. (*abietella* group), mandible, ventral view.

Fig. 423. *Dioryctria* sp. (*abietella* group), hypopharyngeal complex, lateral view.

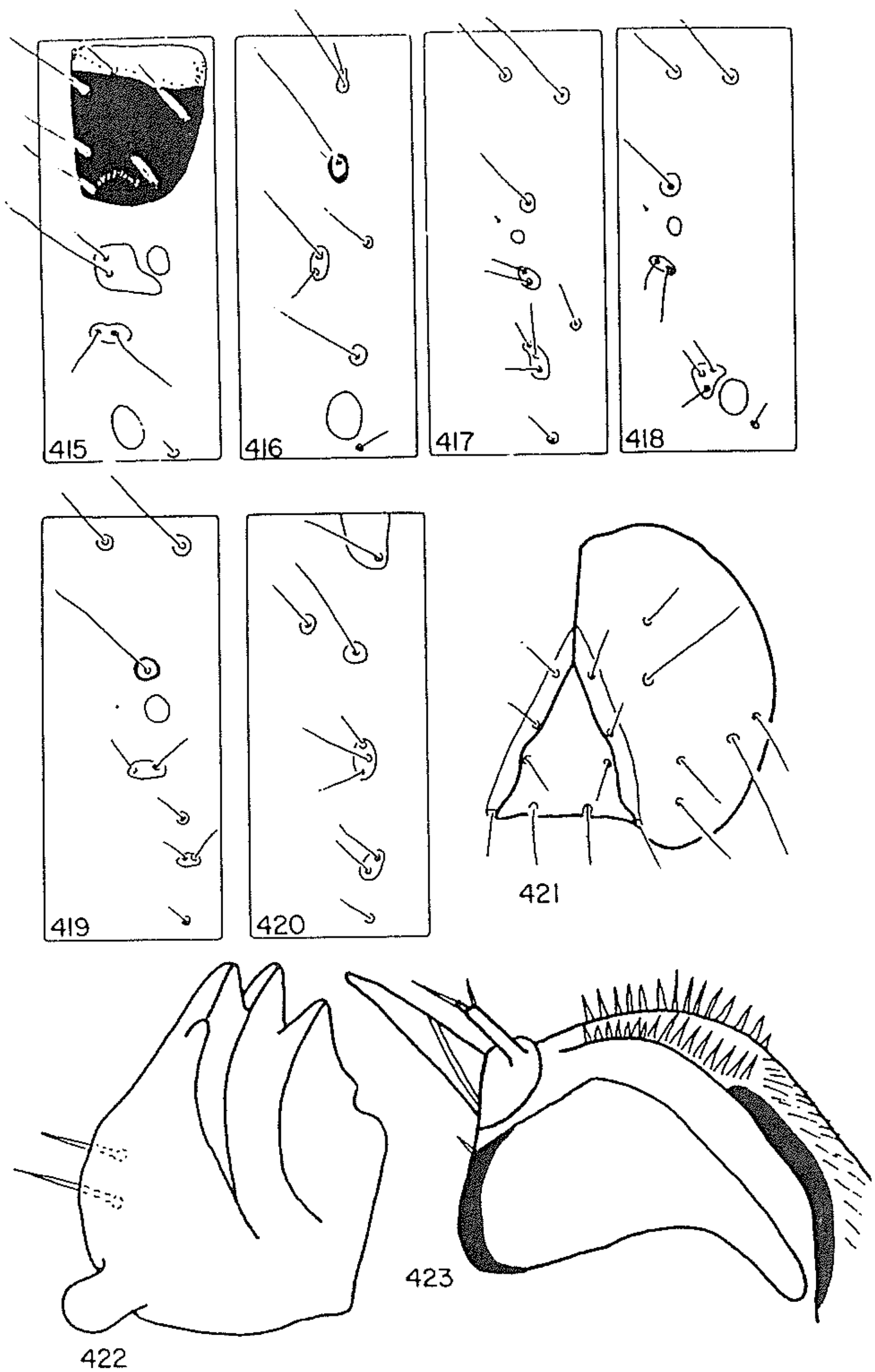
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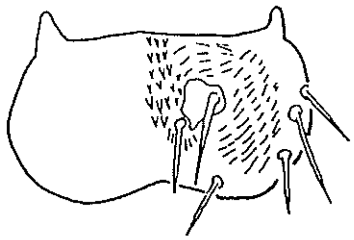
Fig. 424. *Dioryctria* sp. (*abietella* group), spines of epipharynx, ventral view.

Fig. 425. *Dioryctria* sp. (*abietella* group), anal shield, dorsal view.

Fig. 426. *Dioryctria erythropasa* (Dyar), mandible, ventral view.

Fig. 427. *Dioryctria erythropasa* (Dyar), larval prothoracic shield, lateral view.

Fig. 428. *Dioryctria erythropasa* (Dyar), spines of epipharynx, (A) reduced spination (probably damaged), (B) complete spination.



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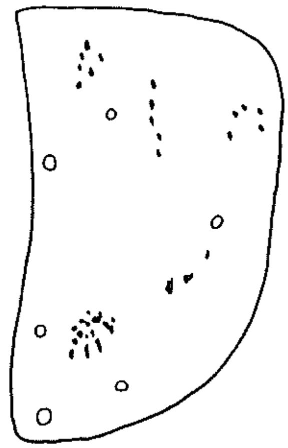

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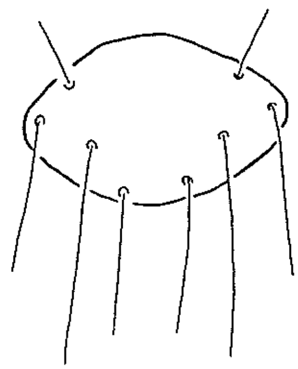

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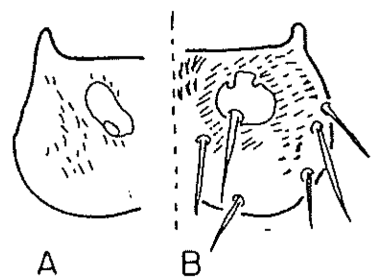

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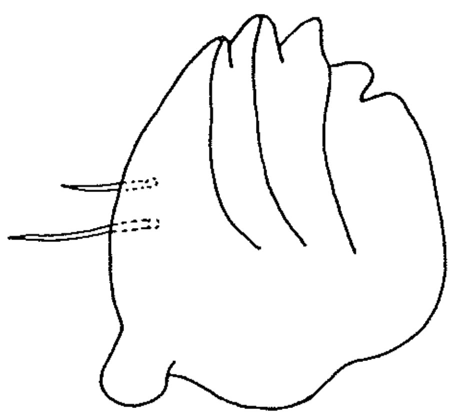

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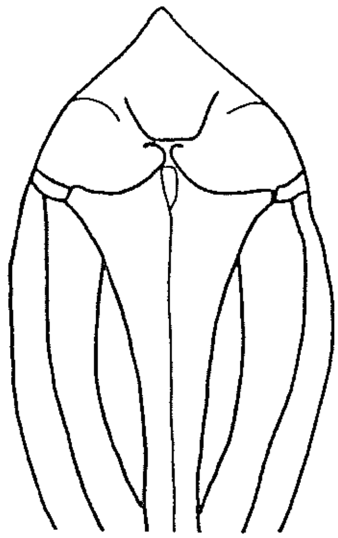
Fig. 429. *Dioryctria erythropasa* (Dyar), pupa, ventral view.

Fig. 430. *Dioryctria erythropasa* (Dyar), pupa, lateral view.

Fig. 431. *Dioryctria erythropasa* (Dyar), gibba, dorsal view.

Fig. 432. *Dioryctria* sp. (*abietella* group), gibba, dorsal view.



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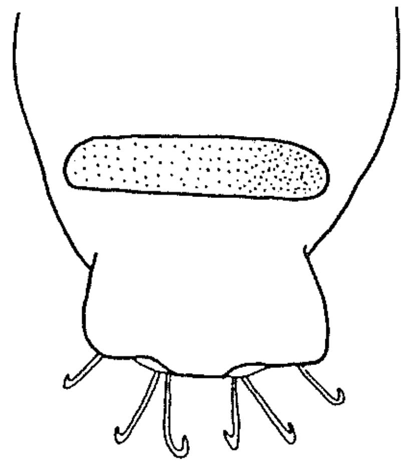

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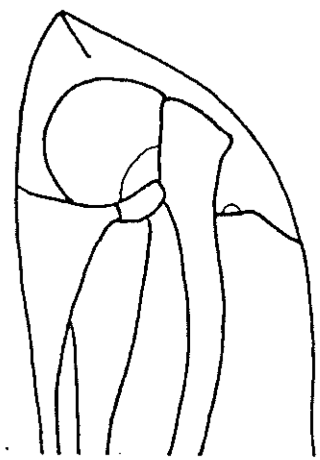

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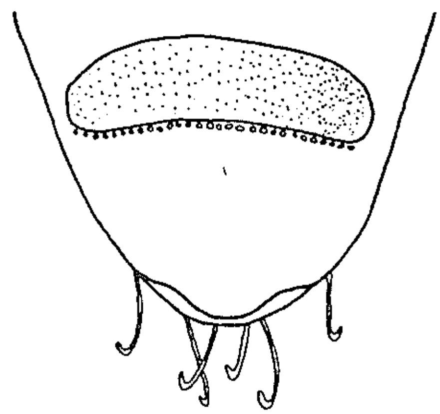

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Fig. 433. *Ectomyelois ceratoniae* (Zeller), larval SD1 sclerotized ring on A1 (from Neunzig, 1979).

Fig. 434. *Ectomyelois ceratoniae* (Zeller), pupa, lateral view (from Neunzig, 1979).

Fig. 435. *Ectomyelois ceratoniae* (Zeller), A2 of pupa, dorsal view.

Fig. 436. *Ectomyelois ceratoniae* (Zeller), cremaster.

Fig. 437. *Elasmopalpus lignosellus* (Zeller), larval epicrania and front.

Fig. 438. *Elasmopalpus lignosellus* (Zeller), prespiracular group of the larval prothorax, lateral view.

Fig. 439. *Elasmopalpus lignosellus* (Zeller), gibba with posterior margins pointed, dorsal view.

Fig. 440. *Elasmopalpus lignosellus* (Zeller), gibba with posterior margins rounded, dorsal view.

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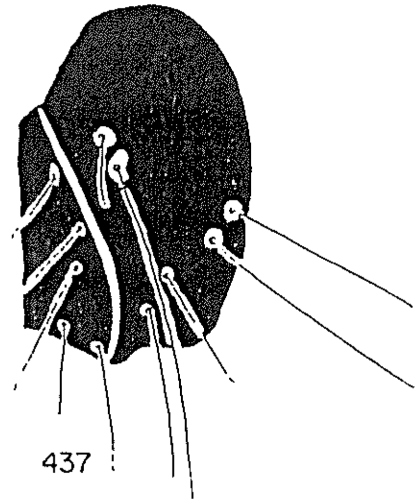

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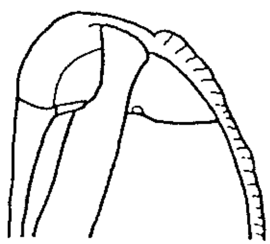

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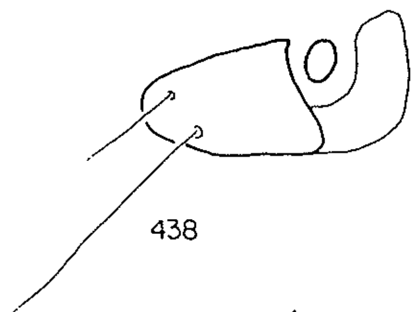

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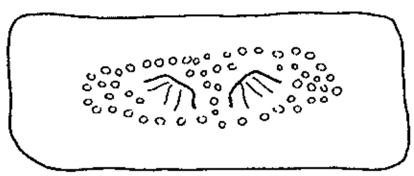

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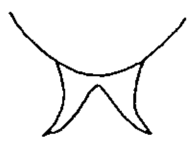

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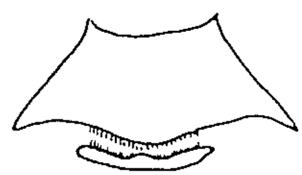

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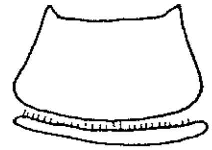

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Fig. 441. Ephestia elutella (Hubner), A8 of larva, lateral view (after Hinton, 1943).

Fig. 442. Ephestia elutella (Hubner), pupa, ventral view.

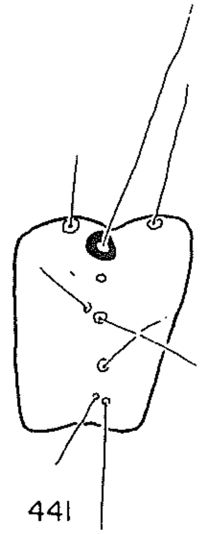
Fig. 443. Ephestia elutella (Hubner), cremaster.

Fig. 444. Ephestia elutella (Hubner), mesothoracic spiracle, dorsal view.

Fig. 445. Etiella zinckenella (Treitschke), prespiracular group of larval prothorax, lateral view.

Fig. 446. Etiella zinckenella (Treitschke), gibba, dorsal view.

Fig. 447. Etiella zinckenella (Treitschke), gibba and cremaster spines, dorsal view.



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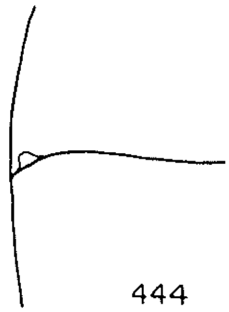

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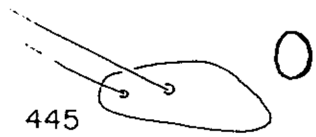

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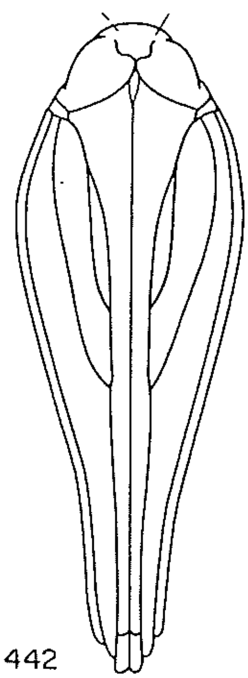

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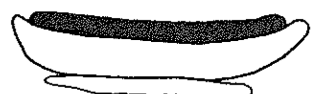

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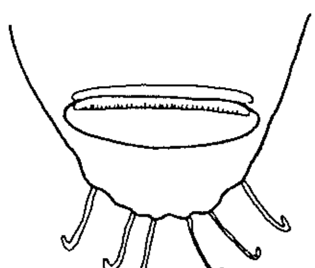

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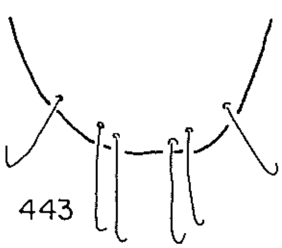

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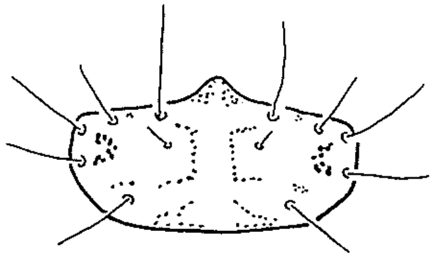
Fig. 448. Fundella pellucens (Zeller), larval prothoracic shield, dorsal view (after Capps, 1963).

Fig. 449. Fundella pellucens (Zeller), mandible, ventral view.

Fig. 450. Fundella pellucens (Zeller), gibba and cremaster, dorsal view.

Fig. 451. Homoeosoma electellum (Hulst), larval epicrania and prothoracic shield, lateral view.

Fig. 452. Homoeosoma electellum (Hulst), pupal prothorax, dorsal view.



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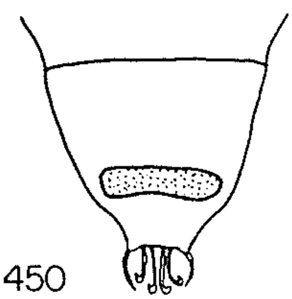

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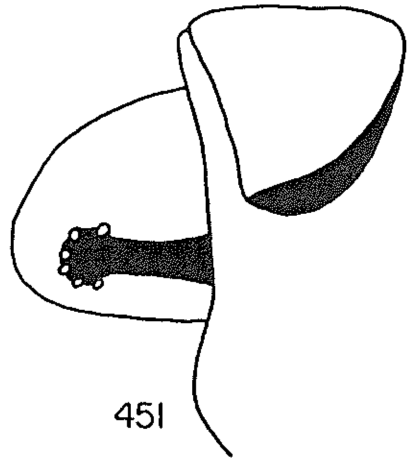

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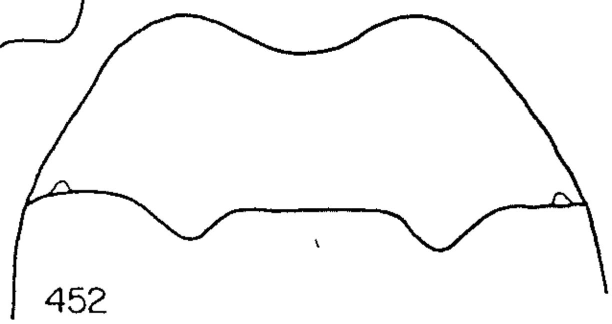

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Fig. 453. *Hypsipyla grandella* (Zeller), larval prothorax, lateral view.

Fig. 454. *Hypsipyla grandella* (Zeller), larval mesothorax, lateral view.

Fig. 455. *Hypsipyla grandella* (Zeller), A1 of larva, lateral view.

Fig. 456. *Hypsipyla grandella* (Zeller), A6 of larva, lateral view.

Fig. 457. *Hypsipyla grandella* (Zeller), A8 of larva, lateral view.

Fig. 458. *Hypsipyla grandella* (Zeller), A9 of larva, lateral view.

Fig. 459. *Hypsipyla grandella* (Zeller), larval epicrania, front, and labrum.

Fig. 460. *Hypsipyla grandella* (Zeller), mandible, ventral view.

Fig. 461. *Hypsipyla grandella* (Zeller), hypopharyngeal complex, lateral view.

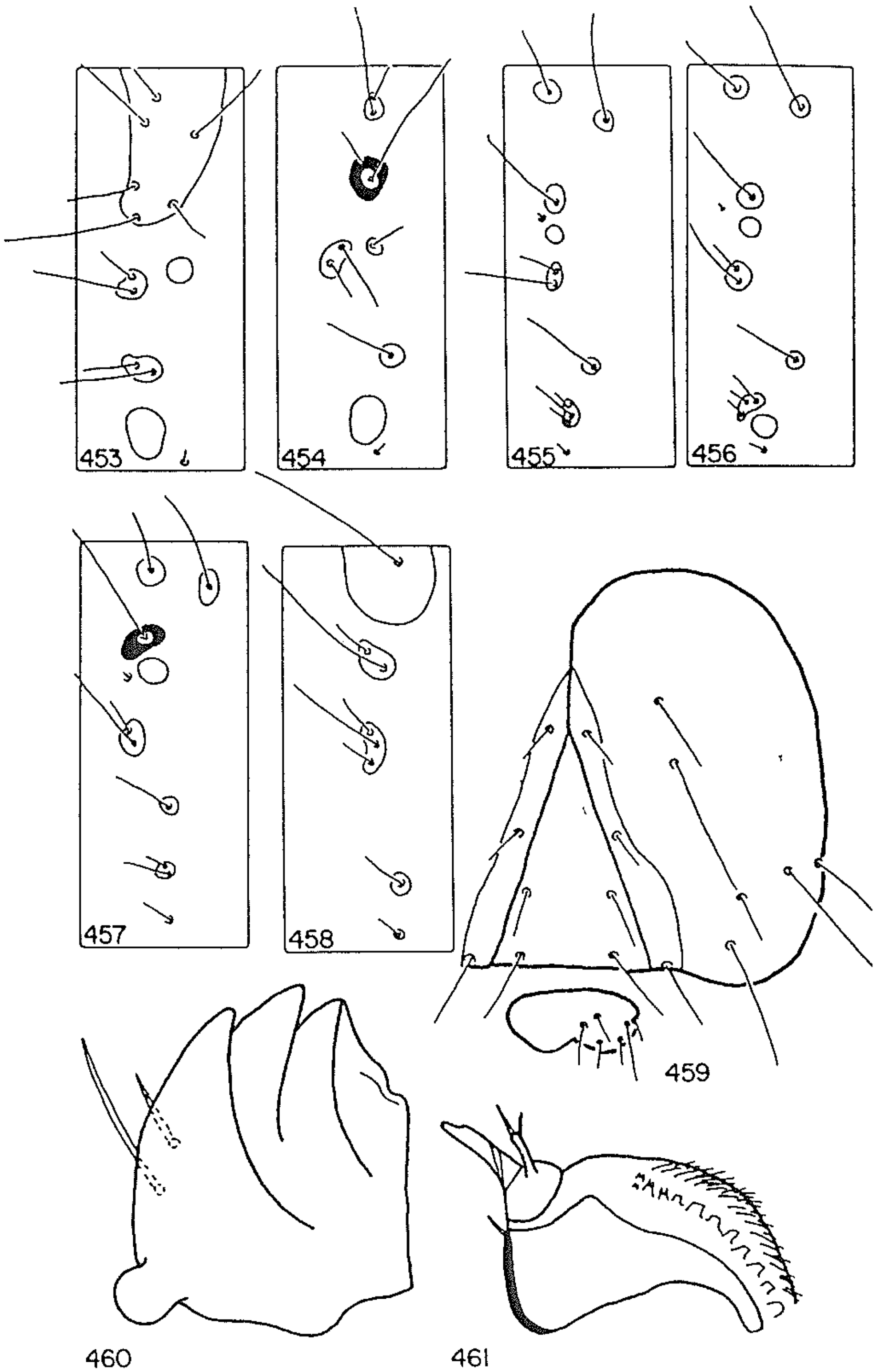
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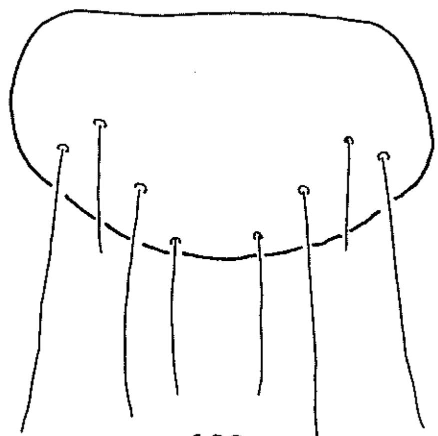
Fig. 462. *Hypsipyla grandella* (Zeller), anal shield, dorsal view.

Fig. 463. *Hypsipyla grandella* (Zeller), mesothoracic spiracle, dorsal view.

Fig. 464. *Hypsipyla grandella* (Zeller), cremaster.



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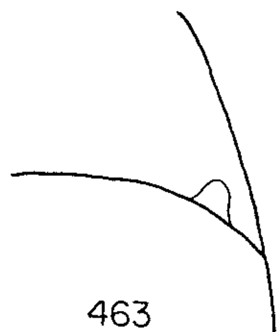

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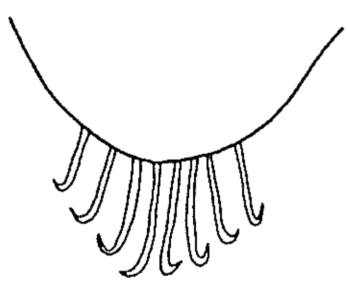

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Fig. 465. *Moodna bisinuella* Hampson, larval prothorax, lateral view.

Fig. 466. *Moodna bisinuella* Hampson, larval mesothorax, lateral.

Fig. 467. *Moodna bisinuella* Hampson, A1 of larva, lateral view.

Fig. 468. *Moodna bisinuella* Hampson, A6 of larva, lateral view.

Fig. 469. *Moodna bisinuella* Hampson, A8 of larva, lateral view.

Fig. 470. *Moodna bisinuella* Hampson, A9 of larva, lateral view.

Fig. 471. *Moodna bisinuella* Hampson, larval epicrania, front, and labrum.

Fig. 472. *Moodna bisinuella* Hampson, mandible, ventral view.

Fig. 473. *Moodna bisinuella* Hampson, hypopharyngeal complex, lateral view.

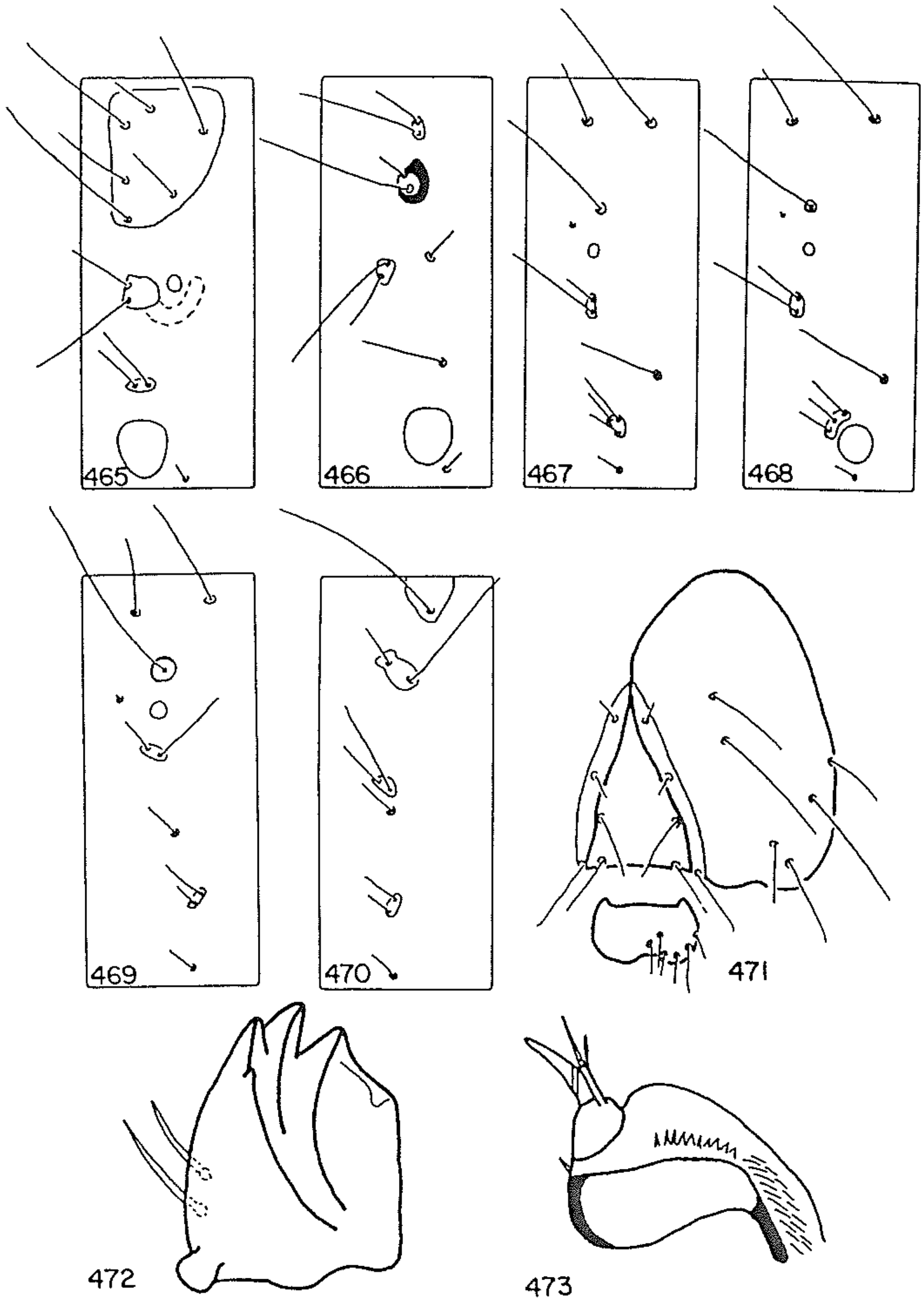
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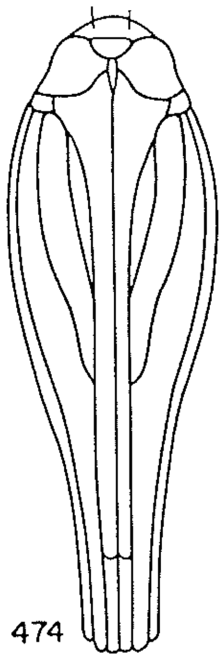
Fig. 474. Moodna bisinuella Hampson, pupa, ventral view.

Fig. 475. Moodna bisinuella Hampson, cremaster.

Fig. 476. Moodna bisinuella Hampson, mesothoracic spiracle, dorsal view.

Fig. 477. Moodna bisinuella Hampson, A1 of pupa, dorsal view.

Fig. 478. Moodna bisinuella Hampson, anal shield, dorsal view.



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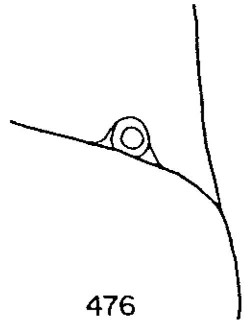

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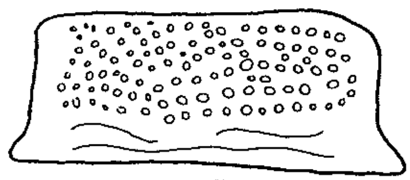

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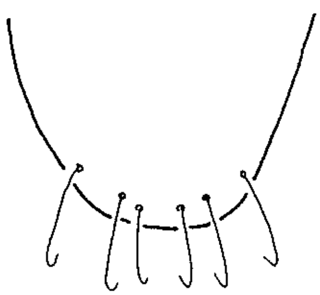

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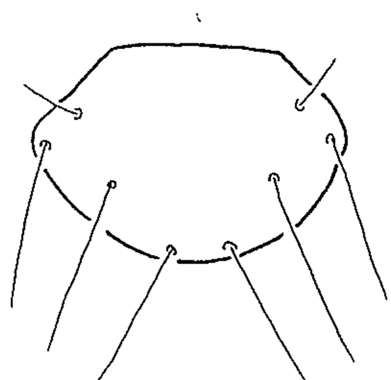
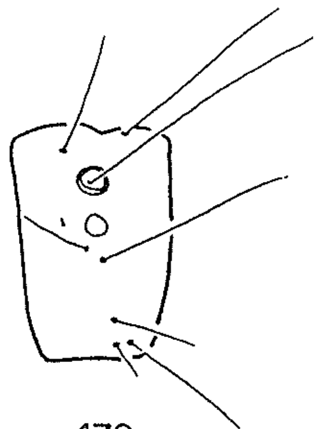


478

Fig. 479. *Plodia interpunctella* (Hubner), A8 of larva, lateral view (modified from Hinton, 1943).

Fig. 480. *Plodia interpunctella* (Hubner), mesothoracic spiracle, dorsal view.



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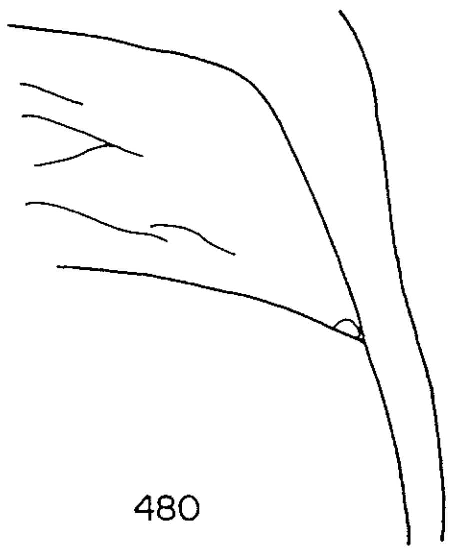

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Fig. 481. Hypothetical pyralid larva, larval prothorax, lateral view, names of setae in bold type, pts = prothoracic shield, presp = prespiracular group, sp = spiracle, c = coxa.

Fig. 482. Hypothetical pyralid larva, larval mesothorax, lateral view, names of setae in bold type, c = coxa.

Fig. 483. Hypothetical pyralid larva, A1 of larva, lateral view, names of setae in bold type, sp = spiracle.

Fig. 484. Hypothetical pyralid larva, A6 of larva, lateral view, names of setae in bold type, sp = spiracle, p = proleg.

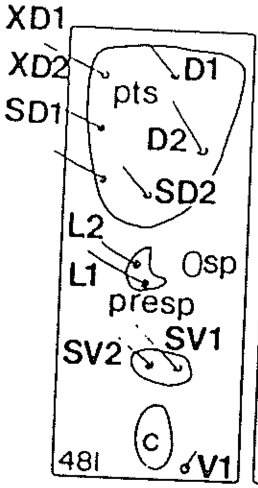
Fig. 485. Hypothetical pyralid larva, A8 of larva, lateral view, names of setae in bold type, sp = spiracle, scr = sclerotized ring.

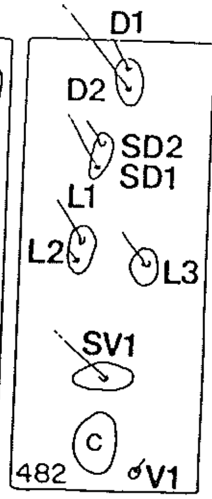
Fig. 486. Hypothetical pyralid larva, A9 of larva, lateral view, names of setae in bold type.

Fig. 487. Hypothetical pyralid, epicrania, front, and labrum, names of setae in bold type, en = epicranial notch, epic = epicrania, fr = front, fp = frontal pore, labr = labrum.

Fig. 488. Hypothetical pyralid, mandible, ventral view, s = scissorial tooth, ot = outer tooth, in = inner tooth, ret = retinaculum, mr = molar ridge, ams = anterior mandibular seta, pms = posterior mandibular seta, co = condyle.

Fig. 489. Hypothetical pyralid, hypopharyngeal complex, spr = spinneret, 1 = first segment of the labial palpus, S1 = seta borne on the first segment of the labial palpus, 2 = second segment of the labial palpus, 3 = third segment of the labial palpus, d = distal area, bl = blade on the proximolateral region, s = spines on the proximomedial region, a = arm of the prementum, pm = prementum.


XD1
XD2
SD1
pts
D1
D2
SD2
L2
L1
sp
presp
SV2
SV1
c
V1
481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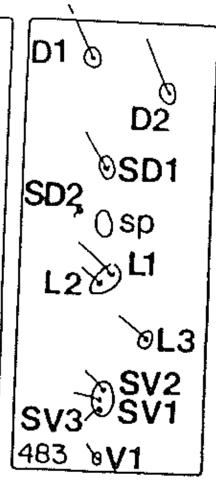
482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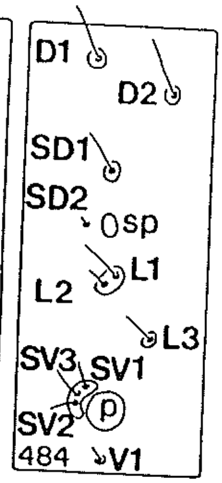
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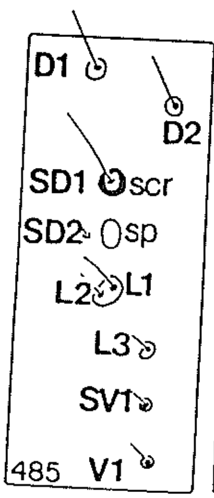
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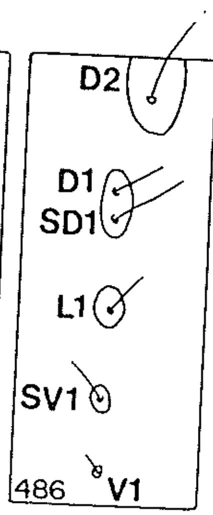
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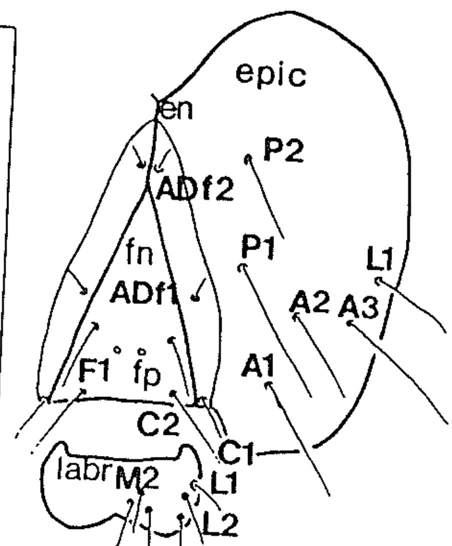
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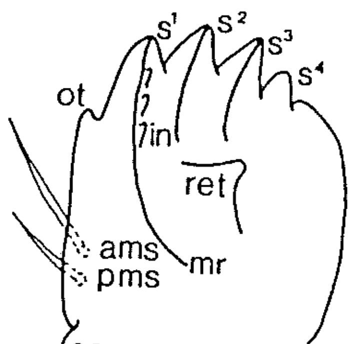
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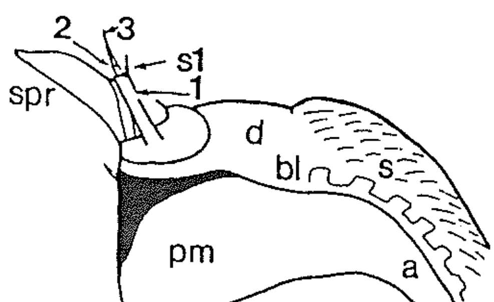
2
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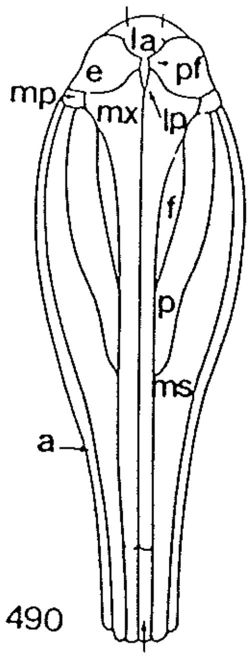
a

489

Fig. 490. Hypothetical pyralid larva, ventral view, la = labrum, pf = filifers, e = eye, mp = maxillary palps, mx = maxillae, lp = labial palps, f = prothoracic femur, p = prothoracic leg, ms = mesothoracic leg, a = antenna, mtl = metathoracic leg.

Fig. 491. Hypothetical pyralid anal shield, dorsal view, names of setae in bold type.

Fig. 492. Hypothetical pyralid pupa, lateral view, mx = maxillae, pf = pilifers, la = labrum, fr = frons, v = vertex, pg = postgenae, a = antenna, pr = prothorax, mso = mesothoracic spiracle, mt = metathorax, al = first abdominal segment, sp spiracle of A3 with furrows, a5 = fifth abdominal segment, gb = gibba, cr = cremaster, csp cremaster spines, cwm = caudal wing margin, msw = mesothoracic wing.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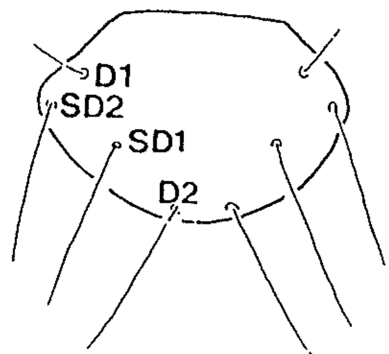
D1
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SD1
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491

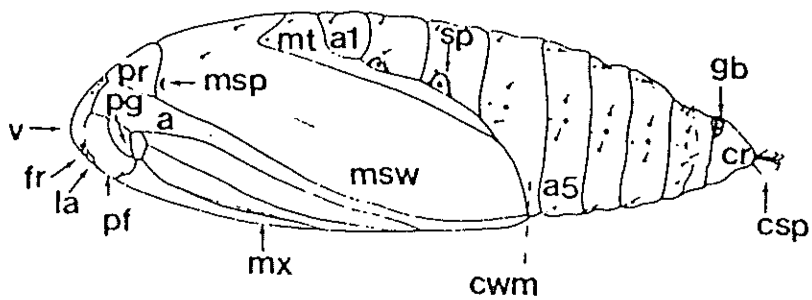
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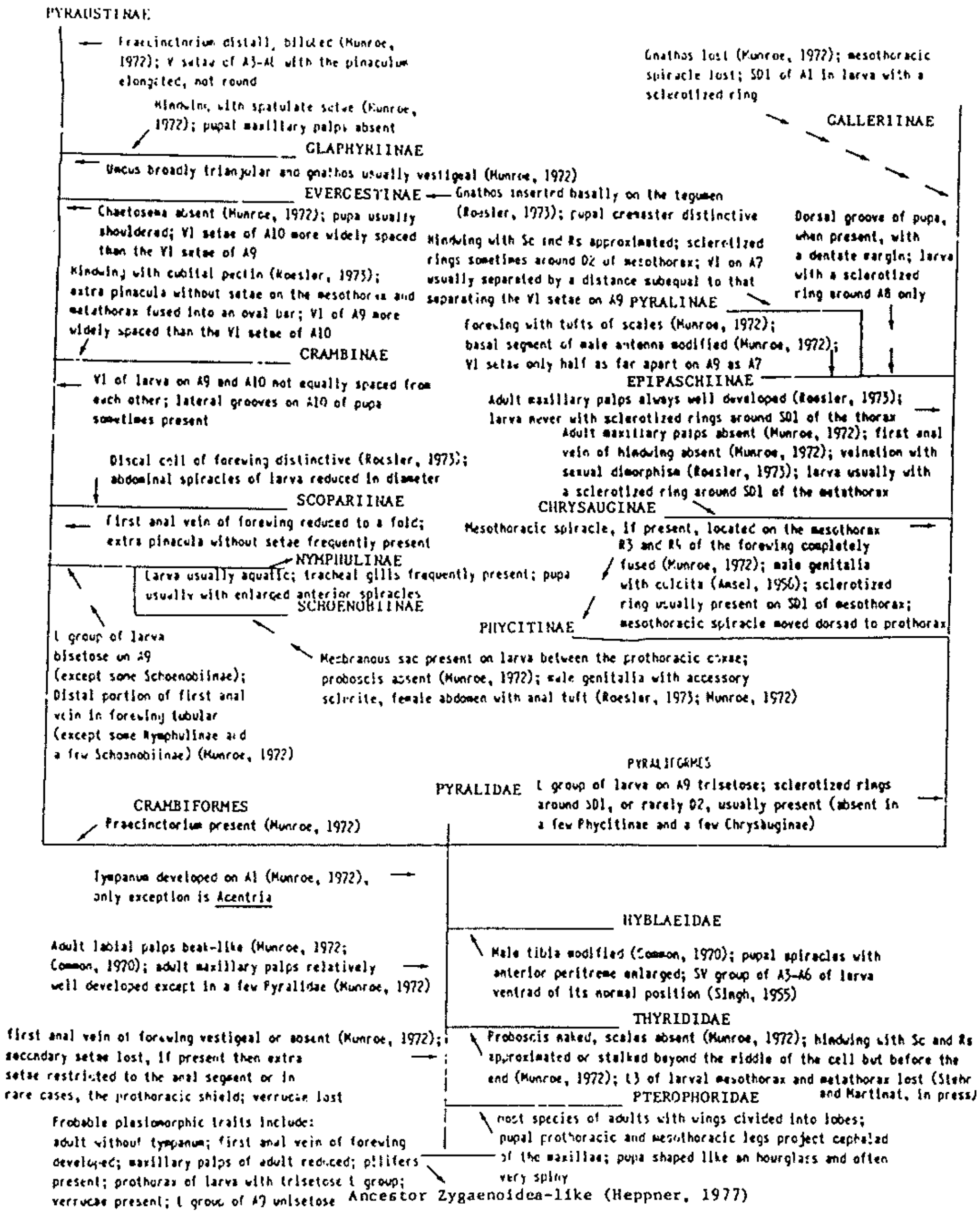
Fig. 493. Cladogram of the Pyraloidea with probable apomorphic traits of the larva, pupa, and adult indicated.


PYRAUSTINAE
Praecinctorium distall, bilobed (Munroe, 1972); V setae of A3-A6 with the pinaculum elongated, not round
Hindwing with spatulate setae (Munroe, 1972); pupal maxillary palps absent
GLAPHYRIINAE
Uncus broadly triangular and gnathos usually vestigeal (Munroe, 1972)
EVERGESTINAE
Gnathos inserted basally on the tegumen (Roesler, 1973); pupal cremaster distinctive
Chaetosema absent (Munroe, 1972); pupa usually shouldered; V1 setae of A10 more widely spaced than the V1 setae of A9
Hindwing with cubital pectin (Roesler, 1973); extra pinacula without setae on the mesothorax and metathorax fused into an oval bar; V1 of A9 more widely spaced than the V1 setae of A10
CRAMBINAE
V1 of larva on A9 and A10 not equally spaced from each other; lateral grooves on A10 of pupa sometimes present
Discal cell of forewing distinctive (Roesler, 1973); abdominal spiracles of larva reduced in diameter
SCOPARIINAE
First anal vein of forewing reduced to a fold; extra pinacula without setae frequently present
NYMPHULINAE
Larva usually aquatic; tracheal gills frequently present; pupa usually with enlarged anterior spiracles
SCHOENOBIINAE
L group of larva bisetose on A9 (except some Schoenobiinae); Distal portion of first anal vein in forewing tubular (except some Nymphulinae and a few Schoenobiinae) (Munroe, 1972)
Membranous sac present on larva between the prothoracic coxae; proboscis absent (Munroe, 1972); male genitalia with accessory sclerite, female abdomen with anal tuft (Roesler, 1973; Munroe, 1972)
Gnathos lost (Munroe, 1972); mesothoracic spiracle lost; SD1 of A1 in larva with a sclerotized ring
GALLERIINAE
Hindwing with Sc and Rs approximated; sclerotized rings sometimes around D2 of mesothorax; V1 on A7 usually separated by a distance subequal to that separating the V1 setae on A9
PYRALINAE
Dorsal groove of pupa, when present, with a dentate margin; larva with a sclerotized ring around A8 only
Forewing with tufts of scales (Munroe, 1972); basal segment of male antenna modified (Munroe, 1972); V1 setae only half as far apart on A9 as A7
EPIPASCHIINAE
Adult maxillary palps always well developed (Roesler, 1973); larva never with sclerotized rings around SD1 of the thorax
Adult maxillary palps absent (Munroe, 1972); first anal vein of hindwing absent (Munroe, 1972); veinelion with sexual dimorphism (Roesler, 1973); larva usually with a sclerotized ring around SD1 of the metathorax
CHRYSAUGINAE
Mesothoracic spiracle, if present, located on the mesothorax
R3 and R4 of the forewing completely fused (Munroe, 1972); male genitalia with culcita (Amsel, 1956); sclerotized ring usually present on SD1 of mesothorax; mesothoracic spiracle moved dorsad to prothorax
PHYCITINAE
PYRALIFORMES
PYRALIDAE
L group of larva on A9 trisetose; sclerotized rings around SD1, or rarely D2, usually present (absent in a few Phycitinae and a few Chrysauginae)
CRAMBIFORMES
Praecinctorium present (Munroe, 1972)
Tympanum developed on A1 (Munroe, 1972), only exception is Acentria
HYBLAEIDAE
Adult labial palps beak-like (Munroe, 1972; Common, 1970); adult maxillary palps relatively well developed except in a few Pyralidae (Munroe, 1972)
Male tibia modified (Common, 1970); pupal spiracles with anterior peritreme enlarged; SV group of A3-A6 of larva ventrad of its normal position (Singh, 1955)
THYRIDIDAE
First anal vein of forewing vestigeal or absent (Munroe, 1972); secondary setae lost, if present then extra setae restricted to the anal segment or in rare cases, the prothoracic shield; verrucae lost
Proboscis naked, scales absent (Munroe, 1972); hindwing with Sc and Rs approximated or stalked beyond the middle of the cell but before the end (Munroe, 1972); L3 of larval mesothorax and metathorax lost (Stehr and Martinat, in press)
PTEROPHORIDAE
Most species of adults with wings divided into lobes; pupal prothoracic and mesothoracic legs project cephalad of the maxillae; pupa shaped like an hourglass and often very spiny
Probable plesiomorphic traits include: adult without tympanum; first anal vein of forewing developed; maxillary palps of adult reduced; pilifers present; prothorax of larva with trisetose L group; verrucae present; L group of A9 unisetose
Ancestor Zygaenoidea-like (Heppner, 1977)

BIBLIOGRAPHIC SKETCH

Steven C. Passoa was born July 28, 1956, in New York City. He attended John Bowne High School where he graduated in 1974 with a specialization in vocational agriculture. From 1974 to 1978, Steven attended Cornell University where he became interested in entomology and first worked as a volunteer in an insect museum. His first entomological job was at Dartmouth College (Hubbard Brook Experimental Forest) where he studied the taxonomy and ecology of forest insects. From 1979-1981 he worked as an insect taxonomist in the Peace Corps curating the National Insect Collection in Honduras. In 1981 he entered the University of Florida to study Honduran insects more intensely for a M.S. degree.

Steven's future plans include further study at the University of Illinois for a Ph.D. degree. His hobbies include traveling, photography, sports (especially when his teams are winning), and listening to music.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

Dr. D. H. Habeck, Chairman
Professor of Entomology and Nematology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

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