

## LEPIDOPTERA

### RHOPALOCERA: Butterflies

The types of many of the butterflies of the West Indies are presumed to have been collected in the Danish Island of St. Thomas, which, in the eighteenth century was a busy free port, its harbor filled with the shipping of all nations. The Spanish colony of Puerto Rico had long been closed to the commerce of any other nation than Spain, and often long intervals elapsed between the arrival of ships from the mother country. The first record of the occurrence of well-known West Indian butterflies in Puerto Rico is of collection in 1835 by Herr C. Moritz, whose "Notizen zur Fauna der Insel Puertorico" (Wiegmann's Archiv für Naturgeschichte, 2: 373-392. Berlin, 1836) lists them largely according to the environment in which they were observed, altho "die blassgelb und schwarz geringelte Raupe" of the Monarch is noted feeding on the leaves of "die feuerroth blühende *Asclepias curassavica*". The names given by Herr Moritz were correct for the day and age in which he lived, and their modern equivalent is given here only for convenience.

<i>Papilio Steneles</i>	<i>Metamorpha</i> (or <i>Victorina</i> ) <i>stelenes</i> Linnaeus
<i>Hipp. Jatrophae</i>	<i>Anartia jatrophae</i> Johansson
<i>Heli. Charitonia</i>	<i>Heliconius charithonius</i> Linnaeus
<i>Vanillae</i>	<i>Dione vanillae</i> Linnaeus
<i>Julia</i>	<i>Dryas</i> (or <i>Colaenis</i> ) <i>iulia</i> Fabricius
<i>Van. lavinia</i>	<i>Junonia evarete</i> Cramer
<i>Hesp. hibisci</i>	?
<i>Eupl. Archippus</i>	<i>Danaus</i> (or <i>Anosia</i> ) <i>plexippus</i> Linnaeus
<i>P. Dirce</i>	<i>Colobura</i> (or <i>Gynaecia</i> ) <i>dirce</i> Linnaeus
<i>P. Hyperia</i>	<i>Biblis hyperia</i> Cramer
"Braune langgeschwänzte Hesperien"	<i>Urbanus</i> (or <i>Eudamus</i> ) <i>proteus</i> Linnaeus
"citron-gelbe <i>Colias</i> "	<i>Eurema</i> spp.
"kleine blassgelb und weissliche <i>Pontiae</i> "	<i>Ascia</i> (or <i>Pieris</i> ) <i>monuste</i> Linnaeus

The butterflies of Puerto Rico, while not nearly so abundant as in some other tropical regions, are such conspicuous and obvious members of the insular fauna that the inclusiveness of the records by Dr. Agustín Stahl and Dr. Juan Gundlach are naturally to be expected. Dr. Hermann Dewitz identified the butterflies collected by Dr. Gundlach, discovering

among them two new species and two subspecies, described in his paper on the "Tagschmetterlinge von Portorico" (Stettiner Ent. Zeitung, 38: 233-245, pl. 1. Stettin, 1877). All of these records are included by Herr Heinrich Benno Möscher in "Die Lepidopteren-Fauna von Portorico" (Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft, 16: 69-360, pl. 1, fig. 25. Frankfurt-am-Main, 1890). In more recent years, Dr. Harrison G. Dyar and Dr. Wm. Schaus have identified some additional species, and a few new ones have been described from Puerto Rico. Mr. William Phillips Comstock has prepared such an excellent and wholly satisfactory account of "The Butterflies of Porto Rico" (Scientific Survey of Porto Rico and the Virgin Islands, 12 (4): 421-622, fig. 29, pl. 12, ref. 319. New York, October 12, 1941) that the present account can be considered little more than a summary.

### Danaidae

*Danaus plexippus* (Linnaeus), originally described from "America septentrionali" as a *Papilio*, is the common cosmopolitan milkweed or "Monarch" butterfly, of which three subspecies occur in Puerto Rico. It was listed by Drs. Stahl and Dewitz as *Danaüs archippus* Fabr., and as *Danaus erippus* Cramer by Herr Möscher and by Dr. Gundlach, the latter noting "la oruga se cría en la *Asclepias curassavica*." As an *Anosia* it is listed by Mr. R. H. Van Zwaluwenburg (2002), and by Dr. Stuart T. Danforth (1926-23) noted as one of the less common species in "the clouds of butterflies which arise as one walks through the fields as one approaches (Cartagena) Lagoon." Ordinarily it is not especially abundant, but Mr. Francisco Sefin describes "Una Invasión de Mariposas" (Rev. Agr. P. R., 22 (10): 169-70. San Juan, 1929) in the metropolitan area, flying against the northeast trade winds, about a month after the hurricane of San Felipe (September 13, 1928). Presumably the connection between this migration of butterflies and the hurricane is quite fortuitous, merely serving to date it. The path of migration is at right angles to that of the hurricane, and the area in which the butterflies originated, the southwestern corner of the Island, Mona Island and southeastern Santo Domingo, was practically unaffected by the hurricane.

*Danaus plexippus plexippus* (Linnaeus) is listed by Prof. J. A. Ramos (1947-52) from Mona Island, and it doubtless finds greater opportunity to develop in large numbers there than in intensively cultivated Puerto Rico. Indeed, Mr. Austin H. Clark in his "Notes on some North and Middle American Danaid Butterflies" (Proc. U. S. National Museum, 90 (3118): 531-542, pl. 4. Washington, D. C., 1941) excludes Puerto Rico from the range of this most widely distributed and cosmopolitan subspecies, but Mr. Wm. P. Comstock (1944-431) states that "it definitely occurs in its typical

form in Puerto Rico." It has "two spots beyond end of cell on forewing and two larger spots between these and apex, light dull orange, contrasting with small white spots on costal border," as shown by a specimen in the Río Piedras collection from Guánica Lagoon. The naked caterpillar, narrowly striped with black, yellow and greenish white, apparently has no muscular control over the paired fleshy black filaments on its prothorax and on the tenth segment, which are neither retractile nor extendible, and exude no odor. The copious exudation of milky juice from the leaves of host, even from the giant milkweed (*Calotropis procera*) of xerophytic regions, seems to bother these caterpillars not at all, altho they often pupate elsewhere than on the host plant. Indeed, it is possible that the larvae of this subspecies develop on the leaves of the giant milkweed, those of the others being restricted to the more slender and less milky *Asclepias curassavica*.

*Danaus plexippus megalippe* (Hübner), the neotropical subspecies, occurs in Santo Domingo and many of the Lesser Antilles, according to Mr. Austin H. Clark (1941-536), the record for Puerto Rico being a specimen collected by Mr. August Busck at Mayagüez in January 1899, which "lacks the two white spots beyond the end of the cell in the forewing" supposedly typical of this subspecies. In the Río Piedras collection is a specimen reared by Mr. Thos. H. Jones from *Asclepias curassavica* which possesses such white spots.

*Danaus plexippus portoricensis* was described by Mr. Austin H. Clark (1941-539) as being "smaller; the forewing less than 45 mm. long; pair of white spots just beyond the end of the cell in the forewing absent," known only from Puerto Rico, the type having been intercepted by Messrs. A. S. Mills and C. G. Anderson at Ciales, December 5, 1933. This is Interception Number 4888, which was identified by Dr. Wm. Schaus as a local race of *Danaus cleophila* Godart, and was thus recorded in "Insectae Borin-quenses" (1936-397). This is the typical monarch butterfly of the mountains and the more humid regions of Puerto Rico, Mr. Wm. P. Comstock (1944-433) listing it from over a dozen such localities. The Río Piedras collection has one specimen from Mona Island, found dead in a spider web.

*Danaus gilippus cleothera* (Latreille), originally described from Hispaniola, has been collected at Lajas by Prof. J. A. Ramos. "The pattern of the upperside is like that of *plexippus*, but the smaller size of the butterfly immediately distinguishes it," according to Mr. Wm. P. Comstock (1944-435).

† *Lycorea ceres cleobaea* (Latreille), listed from Puerto Rico as *Lycorea cleobaea* Godart by Drs. Dewitz, Stahl and Gundlach, is noted by Herr Möschler (1980-94) as "sehr selten, nur auf einigen Gebirge vorkommen." Mr. Wm. P. Comstock (1944-437) records collections at Adjuntas and

Aibonito; the Río Piedras collection contains one adult from Caguas, taken by Mr. Cesario Pérez in August 1941. This is a fine, large black butterfly, its wings spotted and banded with bright yellow and dull orange, as described in detail by Mr. Comstock, of which the larvae may be expected to be found feeding on the leaves of *Ficus*.

### Nymphalidae

*Heliconius charithonius charithonius* (Linnaeus), originally described as a *Papilio* from America, is one of the most characteristic butterflies of clearings in the woods of the neotropics, the zebra butterfly. Even now, when so much of Puerto Rico is open canefield, one still finds the zebras in the coffee groves and along roads or streams in the virgin forest reserves, as well as at Peñón del Collao between Cayey and Salinas, in Guajataca gorge, and on the Isle of the Caves and the Seboruco woods bordering Laguna San José. Even a minor hurricane like San Ciprián, however, can bring these shy forest denizens to the Plaza of Río Piedras. Dr. Gundlach says of the zebra "es notable por la costumbre que tienen todas las de una localidad de reunirse por la tarde y dormir una al lado de otra. La oruga se cría en especies del género *Passiflora*." Mr. Wm. P. Comstock summarizes the life-history detailed by William Henry Edwards (1884), and the extraordinary appearance of larva and pupa. He has "no doubt that the type specimen of *charithonius* came from one of the Virgin Islands," but we have no record from Culebra and Vieques, altho zebras are common in the shade of the cliffs on Mona Island.

*Heliconius charithonius punctatus* Hall, a subspecies which is the "constant form in St. Kitts," differs in "having an additional yellow streak in vein Cu<sub>1</sub> of the forewing" and is represented by about a quarter of the specimens from Puerto Rico, according to Mr. Wm. P. Comstock (1944-439).

*Eueides cleobaea cleobaea* Geyer has not been found in Puerto Rico since listed by Dr. Gundlach as *Eueides cleobaea* Hübner: "La oruga se cría en especies del género *Passiflora*" and by Herr Möschler (1880-95) "selten, Raupe auf *Asclepiadisarten*."

*Dryas iulia juncta* was described by Mr. Wm. P. Comstock (1944-441) as a distinct Puerto Rican subspecies of what was first listed from Puerto Rico as *Colaenis delila* Fabricius by Drs. Dewitz, Stahl and Gundlach, the latter noting "la oruga se cría en las *Passifloras*," and called *Colaenis julia* Fabricius in Van Zwaluwenburg's list (P. R. 1419) after specimens collected for the American Museum of Natural History at Aibonito and Mayagüez. Dr. Wm. Schaus identified as *Colaenis cillene* Cramer one of these butterflies intercepted at Cidra but Mr. Comstock refers them all to his local subspecies. Of their "ground color; the upperside is dull fulvous in the males and grayish fulvous in the females": a hardly noticeable dif-

ference unless the two are found together. Altho these large dull-colored butterflies have been found in the metropolitan area they normally frequent more elevated localities, as Indiera and El Yunque, or such comparatively unfrequented regions as Guajataca gorge and the more retired coffee groves.

*Dione vanillae insularis* (Maynard), originally described as an *Agraulis* from the Bahamas, Cuba and Jamaica, was recorded from Puerto Rico as *Agraulis vanillae* Linnaeus by Drs. Stahl, Dewitz and Gundlach, and by Herr Möscher, both of the latter noting that its larvae feed on *Passiflora*. Considering how comparatively scarce passion vines are anywhere in the tropics it seems most surprising that the caterpillars of so many kinds of tropical butterflies should feed on its leaves. Most of these are comparatively rare, but not *Dione*, which is possibly one of the most abundant butterflies at least in Puerto Rico, and is equally at home in forest reserves and in the metropolitan area; on the beaches, in citrus groves and taking nectar from flowers at the margins of cane fields. It is common on Mona Island, and presumably occurs also on Desecheo, Vieques and Culebra Islands, as in all the Lesser Antilles and westward in the Greater Antilles. One can not fail to recognize it, with bright silvery spots on the underside of both fore and hind wings; the upper surfaces, brownish-orange with black spots, being decidedly less attractive. Prof. J. A. Ramos (1947-52) not only collected adults on Mona, but also larvae on *Corchorus hirsutus*, which were reared to adults. Presumably they had consumed all of the passion vines on which the eggs were laid, and were forced to complete their growth feeding on whatever second choice was available.

*Euptoieta hegesia* (Cramer), of which Mr. Wm. P. Comstock (1944-444) describes the Puerto Rican subspecies as *watsoni*, was listed by Drs. Dewitz, Stahl and Gundlach, the latter noting "la oruga se cría en la planta *Turnera ulmifolia*." Mr. F. E. Watson, for whom the local subspecies was named, reared larvae from this host near San Juan in the summer of 1914, and collections have been made at Pt. Cangrejos. "The larva is blood-red with short black spines, and forms a pupa about 20 mm. long which has two rows of dorsal tubercles." Mr. E. G. Smyth collected this butterfly at Camuy, Prof. J. A. Ramos at Mayagüez and Lajas, and Dr. Stuart T. Danforth (1926-23) notes it as one of members of the clouds of butterflies in the fields around Cartagena Lagóon.

*Phyciodes pelops pelops* (Drury), a little brownish butterfly barred with dull orange, was listed from Puerto Rico as a *Melitaea* by Drs. Dewitz, Stahl and Gundlach and by Herr Möscher; Dr. Harrison G. Dyar identified as *Phyciodes anocaona* H. S. the specimen collected by Mr. Thos H. Jones on El Duque, and Dr. Wm. Schaus as *Phyciodes aegon*. F. one inter-

cepted in the metropolitan area. It occurs in all parts of Puerto Rico, Mr. F. E. Watson having found it at Manatí, Arecibo, Quebradillas, Mayagüez and Aibonito, and Dr. Luis F. Martorell at Caguas and Cayey.

*Phyciodes frisia frisia* (Poey) is listed from Puerto Rico by Mr. Arthur Hall in "A Revision of the Genus *Phyciodes* Hubn." (Suppl. Bull. Hill Museum, p. 83, Witley, Surrey, 1929).

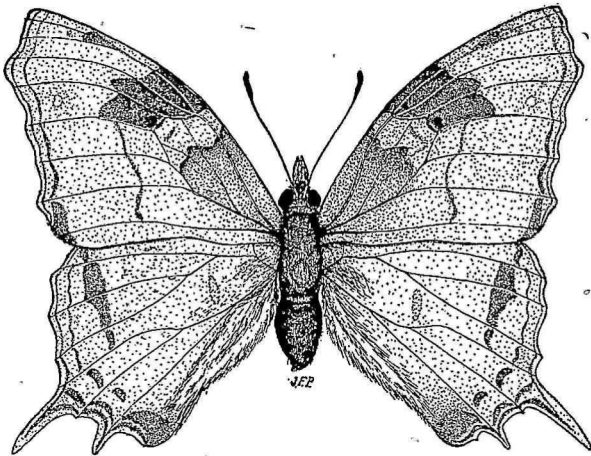
*Chlosyne perezi tulita* was described by Dr. Herman Dewitz (1877-238) from specimens collected in Puerto Rico by Dr. Gundlach, and using Dr. Gundlach's MS name of *Synchlloe tulita*. Dr. Gundlach himself, Dr. Stahl and Herr Möschler all use the generic name of *Coatlantona*, the latter noting (1880-96) "Haufig in dem Gebirgen von Quebredelle von Oktober bis Januar," echoing Dr. Gundlach's observation that it occurs near the coast, possibly because of the host plant of the larva, which Dr. Gundlach did not discover. Mr. F. E. Watson found it at Tallaboa, but Quebradillas is definitely the place where it is most abundant, Dr. Luis F. Martorell having made recent collections in Guajataca gorge. The butterflies are of medium size; "the ground color of the upperside is brownish black with deep orange markings."

*Vanessa virginiensis* (Drury), the common everlasting butterfly of continental America, is resident in Puerto Rico, one adult having been intercepted at Cayey by Messrs. Richard Faxon, A. S. Mills and C. G. Anderson, as identified by Dr. Wm. Schaus, another at Orocovis collected by Mr. F. E. Watson, and one at Indiera by Prof. J. A. Ramos. Typical nests of the spiny caterpillar on everlasting have been noted in the hills south of Fajardo, but nothing was left to identify the insect but the empty chrysalis skin.

*Vanessa cardui* (Linnaeus), the common nettle butterfly or "Painted Lady" of continental North America, is a rare visitor to Puerto Rico, listed as a *Pyrameis* by Drs. Dewitz, Stahl and Gundlach, and by Herr Möschler, and since noted but once at Cayey. The anticipated occurrence of the Red Admiral butterfly, *Vanessa atalanta* (Linnaeus), the spiny caterpillars of which also feed on nettle, predicted by Mr. Wm. P. Comstock (1944-451) as "possible" in Puerto Rico because of its presence in Hispaniola, is actually most unlikely, for the mountains of Hispaniola are much higher and have an introduced continental and European flora quite different from the tropical hurricane forests of Puerto Rico.

*Hypanartia paullus* (Fabricius), originally described as a *Papilio* from Jamaica, was listed from Puerto Rico by Dr. Dewitz as *Euroma tecmesia* Hübner, but Dr. Gundlach and Herr Möschler use the presently accepted name. The adult is a medium-sized yellowish-brown butterfly with darker brown markings, a conspicuous white spot on the forewings, the hindwing tailed at  $M_3$  and  $Cu_2$ . The spiny caterpillars hide during the

day in folded-over leaves of "guacimilla" (*Trema micrantha*), as described in detail in "Insectae Portoricensis" (1923-140). The chrysalis is formed in a similar, but uneaten leaf. The caterpillars are really quite common, several often being present on a single small tree, which is typical of cut-over second-growth forest at the higher elevations, or in cuts along new roads in the mountains.



Adult of the Guacimilla Caterpillar, *Hypanartia paullus* (Fabricius), twice natural size. (Drawn by José F. Pietri.)

*Junonia evarete* (Cramer), the Buckeye butterfly, of which three subspecies occur in Puerto Rico, was first listed as *Junonia lavinia* Cramer by Drs. Dewitz, Stahl and Gundlach, the latter noting "esta especie varía mucho; pero no es igual a la *J. coenia*," and Dr. Stahl also uses the name *Junonia genoveva* Cramer for one of these varieties.

*Junonia evarete coenia* (Hübner) is presumed to occur in Puerto Rico based on the record of identification of specimens from Mayagüez in the list by Mr. R. H. Van Zwaluwenburg (P. R. 138); material collected by Mr. Thos. H. Jones at Río Piedras in 1912; and an interception in the metropolitan area of San Juan, but the identity of these specimens can not now be determined.

*Junonia evarete zonalis* (C. and R. Felder) is the common subspecies of the Buckeye in Puerto Rico, to which may be referred the earlier records under the name of *Junonia genoveva* Cramer. It occurs in abundance in all parts of the Island, Dr. Stuart T. Danforth noting it as one of the common butterflies in the fields around Cartagena Lagoon, and Prof. J. A. Ramos lists it from Mona Island. In the summer of 1916, Mr. E. G. Smyth reared it from larvae feeding on "bretónica" (*Valerianodes jamaicensis*). In March 1920, enormous numbers of its spiny black caterpillars had been observed feeding on another of the Verbenaceae: fog-fruit (*Lippia nodiflora*) on the beach at Pt. Cangrejos. The shiny head of these caterpillars is deeply divided into two lobes, each with short spine; neck light chestnut in color, body velvety black, spines purplish at base, the more ventral row short, yellow, black-tipped. The spiny, elongate chrysalids may be either light or dark grey in color. The adults, with big eye-spots on their wings, come to many flowers for nectar, being especially noted on "botoncillo" (*Borreria verticillata*).

*Junonia evarete genoveva* (Cramer) adults have obviously smaller eye-spots on the hind wings, and are much less abundant in Puerto Rico, but occur flying with the more common *zonalis* at the same time and in the same localities, according to Mr. Wm. P. Comstock (1944-456). Prof. J. A. Ramos (1947-52) collected several specimens on the plateau of Mona Island.

*Anartia jatrophae* (Johansson) *semifusca* Munroe was listed from Puerto Rico in all the early records as *Anartia jatrophae* Linnaeus. Even Dr. Gundlach, altho listing numerous other countries in which it occurs, does not mention the host of the larvae. At the same time that the spiny black caterpillars of the Buckeye were defoliating the plants of fog-fruit at Pt. Cangrejos, superficially similar black spiny caterpillars were eating the leaves of water hysop, *Bacopa monniera*, and mingling with them in seeking a suitable place for pupation. Their shiny black heads had two branched spines; the body with silvery spots more abundant dorsally, warts on first segment, large branching spines on others. The chrysalids were more obviously different; short and plump, light green in color, or opaque purplish-black, with bloom, and from them emerged the characteristic greyish-brown butterflies, barred with dull orange and white, with a conspicuous eye-spot on the forewings and two smaller ones on the hindwings. They occur in all coastal areas of Puerto Rico but were not noted on Mona Island. Dr. Stuart T. Danforth (1926-23) estimated that they constituted nine percent of the clouds of butterflies which arise as one walks thru the fields approaching Cartagena Lagoon. One may doubt, however, if he had not confused their caterpillars with the very similar ones of the Buckeye, feeding on



*Lippia reptans*, which on September 23, 1924 "were so excessively abundant as to nearly conceal the plants."

*Metamorpha stelenes stelenes* (Linnaeus), described originally as a *Papilio* from Jamaica, is one of the largest of Puerto Rican butterflies, dark brown with numerous and extensive greenish white spots above, mostly silvery white and light orange beneath, often to be seen along the margins of coffee groves in the mountains, but also present in citrus and coconut groves along the coast. As a *Victorina* it was listed by the earlier workers, Herr Möschler (1880-98) noting "raupe auf *Blechnum* (Gdl.) und *Plantago* (Poey)" and Dr. Wm. Schaus identifying one intercepted at Adjuntas as *V. lavinia* F. *Blechnum brownnei* is an inconspicuous, low-growing plant of forest margins, locally called "yerba de papagayo," while *Ruellia coccinea*, on which Mr. F. E. Watson found the caterpillars feeding, is "yerba maravilla," both Acanthaceae. The fully-grown caterpillar is about 40 mm. long, 7 mm. wide; head glistening black, roughened with long black hairs, and two long black, knobbed and spined horns, 6 mm. long: body velvety black, purplish or dark red at sutures, with four blackened spiny warts on first segment; four branched spines, orange-red or pink, on second and third segments; seven spines on each of the next seven segments, the more ventral ones shorter and all black, the next sometimes pink at base, the three dorsal rows always pink at base and arising from round orange spots, which are coalescent on the first three abdominal segments, but black-tipped, sometimes one-half or two-thirds black; eight spines on the eleventh segment and four arranged in a square on the final segment; true legs black and shiny, prolegs pinkish. The chrysalis is 28 mm. x 10 mm., light green in color, covered with whitish bloom, head and wings transparent; suspended from a pinkish cushion of silk by black cremaster 3.5 mm. long, black, divided at base. Two cephalic horns and one dorsal green horn, with slenderer black interior horns. Five pairs of pink spines on abdomen opposite the end of the wing-pads, besides twelve brighter pink spots anteriorly, and numerous smaller pink and black spots posteriorly. The pupal stage last nine or ten days; the larval stage about twenty days.

*Biblis hyperia hyperia* (Cramer), originally described by Fabricius as *Papilio biblis* from "America," and in 1779 by Cramer from St. Thomas as a *hyperia*, is listed by Dr. Stahl as *Didonis hyperia* and *Biblis thadana*, and by Herr Möschler and Dr. Gundlach as *Didonis biblis* Fabricius: the name on the label of specimens collected by Mr. F. E. Watson at Tallaboa, and generally used since. This is a medium-sized dark brown butterfly, the forewings with a diffused and faded-out marginal band, the hindwings with a comparable band of bright red. Dr. Stuart T. Danforth (1926-28) lists it as one of the more common butterflies around the margin of the Carta-

gena Lagoon, and indeed, it may at times occur in swarms towards Faro de Cabo Rojo, but less abundantly to the east along the south coast, or to the north, individuals having been collected at Arecibo, Manatí and Mameyes. Its presence presumably depends on the readiness with which the nettling "pringamoza" (*Tragia volubilis*) grows, this vine having been discovered by Mr. Cesario Pérez when he was at Quebradillas to be the specific host plant.

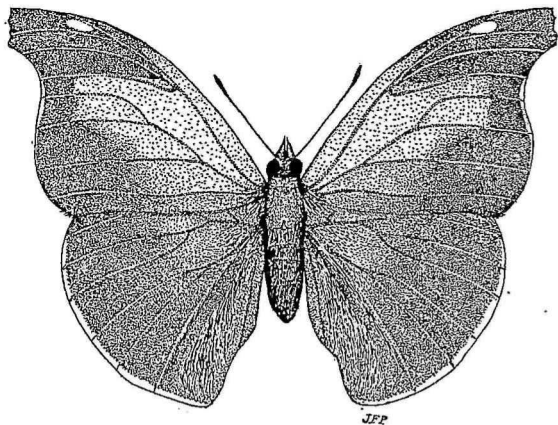
*Marpesia petreus thetyis* (Fabricius) is the name adopted by Mr. Wm. P. Comstock (1944-461) for this rare Puerto Rican butterfly, for which he thinks "it seems proper to resurrect the name *thetyis* (Fabricius) for that phase of *petreus* (Cramer of Surinam) which appears north of Panama and extends into Mexico." The latter is the name used by Dr. Stahl and Dr. Dewitz, but Dr. Gundlach adopts the Möschler name of *Megalura peleus* Sulzer. Mr. E. G. Smyth caught a pair of these butterflies at Guánica in July 1915, one dull and pale yellowish brown, the other larger and orange-brown, with three diagonal darker bands extending across both wings, and long, conspicuous tails on the hindwings. The caterpillar feeds on the leaves of fig.

*Marpesia chiron* (Fabricius) has not been found in Puerto Rico since the records by Drs. Dewitz and Stahl as a *Timetes*, and by Herr Möschler and Dr. Gundlach as a *Megalura*. Dr. Gundlach states that "la oruga se cría en la *Maclura tinctoria* y acaso en el *Xanthoxylon*. El insecto suele posarse encima del fango para chupar." The dyewood "mora" (*Maclura tinctoria*) has been completely eliminated from Puerto Rico for many years, and the caterpillars which preferred its leaves on which to feed presumably perished with it, rather than accept those of "aceitillo" (*Zanthoxylum flavum*), which also is none too abundant despite extensive planting by the Forest Service in recent years.

*Hypolimnas misippus* (Linnaeus) is one of the most interesting butterflies of Puerto Rico. The female is dark blackish-brown, with a smaller and a larger oval white spot on the forewing and a large white spot on the hindwing. The male is of approximately the same size but mostly brownish-orange, the distal part of the forewing dark with white spots; its general appearance being quite different from that of the female. Dr. Stahl listed it under its presently accepted name, but Dr. Dewitz called it *Diadema bolina* Linnaeus, and Herr Möschler and Dr. Gundlach used this generic name. It has been seen on Mona Island, and presumably occurs in all parts of Puerto Rico, the record being: males at Cayey and along the coast from Palo Seco to Dorado, females at Boquerón, and both sexes in abundance noted by Dr. Luis F. Martorell at Colonia Jauca, Salinas in October 1939. The immature stages have not been noted in Puerto Rico. Mr. Wm. P. Comstock (1944-464) states that "the food plants are said to

be species of Malvaceae, *Ipomoea* and *Portulaca*. The larvae are gregarious. The body of the larva is black with grey bands and rows of whitish, branched spines. The head is reddish with two branched spines. The pupa is light brown with dorsal and lateral tubercles." Dr. Gundlach notes it as "una especie rarísima."

*Historis acheronta cadmus* (Cramer) has not recently been collected in Puerto Rico, Dr. Gundlach noting that "en el tiempo que hay mangos maduros, acude a ellos para chupar," giving a complicated synonymy under the



Adult of *Historis odius odius* (Fabricius), natural size. (Drawn by José F. Pietri.)

generic name of *Aganisthos*. Ripe mangoes are as popular in Puerto Rico now as in the time of Dr. Gundlach, but they signally fail to attract this butterfly when any entomologist is watching.

*Historis odius odius* (Fabricius), listed from Puerto Rico as a *Aganisthos* by Drs. Stahl and Gundlach, and as *Aganisthos orion* Fabricius by Dr. Dewitz, is a magnificent big butterfly of the hills and lower mountains, the undersurface of whose wings more or less resembles a brownish leaf. Above, the basal and median portion of the forewing is yellowish-brown, the broad margins velvety black, with a white spot near the apex; the hindwing and body dark brown. Mr. Cesario Pérez collected this butterfly at San Sebastián in December 1942, apparently by chasing after it, but it is

so fond of the juice exuding from coffee shade trees (*Inga vera*) dying of "mal de goma" that it can be captured without a net, as at Ciales in November 1936. Indeed, coffee groves with such dying shade trees seem alive with these powerful big butterflies, but one rarely sees them where such an attractant is absent. Dr. Gundlach was apparently the first to note that the caterpillar feeds on the leaves of the trumpet tree or "yagrumo hembra" (*Cecropia peltata*), and Mr. E. G. Smyth thus describes those he found at Río Piedras towards La Muda: "flattish, medium gray, with white saddle 5 x 10 mm. at middle of back; two prominent projections, with spiny protuberances, projecting upward and outward from the head, about 3 mm. long. In the fully-grown caterpillar the saddle was grayer and less conspicuous. The reddish-brown pupa had two double-curved projections, 4 to 5 mm. long, extending forward from the head and almost touching at their apex, but 2 mm. apart at base."

*Colobura dirce* (Linnaeus), of which Mr. Wm. P. Comstock described the Puerto Rican subspecies as *wolcottii* in "Nymphalidae of the Antilles (Lepidoptera; Rhopalocera)" (Jour. N. Y. Ent. Soc., 50 (3): 283-288. New York, 1942), was listed by earlier workers as a *Gynaecia*, Dr. Gundlach noting "la oruga vive debajo de la hoja de *Cecropia*, comiendo las nervaciones gruesas." It is a medium-sized, brownish-black butterfly above, with a broad diagonal yellow band across the forewing, intricately striped with white below, apparently most abundant in the Mayagüez region. Mr. Cesario Pérez captured adults at San Sebastián, and Dr. Luis F. Martorell found sixteen black caterpillars on the underside of a leaf of "yagrumo hembra" on the Mt. Britton trail of El Yunque in November 1944. They had bright yellow branched spines on all segments, and two long horns on the head, and pupated to grey-brown, roughened chrysalids, darker dorsally, with pairs of light grey curved tubercles on the first, third and fourth abdominal segments. This subspecies occurs in Hispaniola (and others in Jamaica and Cuba) and possibly on Mona Island, altho not collected there.

*Eunica monima* (Cramer), originally described as a *Papilio* from "Côte de Guinée," is a small brownish butterfly with five white spots on the forewing, listed from Puerto Rico by all the earlier writers. Swarms of these butterflies, mingled with the following species, were noted by Mr. E. G. Smyth in mid-July, 1915, along the irrigation ditch and sunken road to Tablon No. 13, Hda. Santa Rita, Guánica, but none has been seen there since. Despite their intentness on freshly-crushed stalks of sugar-cane they proved too wary to be caught in his hands on the 13th, but when he returned with a net (and accompanied by the writer) on the 17th they were much less abundant. In March 1940, Dr. Luis F. Martorell collected one specimen on Mona Island.

*Eunica tatila* Herrich-Schäffer, of which Mr. William James Kaye (1926-473) described the insular subspecies *tatilista* from Jamaica, present also in Cuba, Florida, Hispaniola and Puerto Rico, was listed by all the earlier writers, Dr. Gundlach noting the extent of its variations, "por encima varía por el mayor o menor lustre azul." In all Puerto Rican specimens seen this sheen of the forewings (and to a lesser extent, that of the hindwings) is lavender or purple, definitely not blue, and otherwise they show comparatively little variation, all having six white spots arranged in a pentagon (with one in the middle) on the forewing. In addition to the five adults collected by Mr. E. G. Smyth at the edge of Tablón No. 13 Hda. Santa Rita, the Río Piedras collection contains one other, taken by Don Julio García-Díaz in March 1940 at Río Chavón.

*Hamadryas ferox diasia* (Fruhstorfer) was not collected in Puerto Rico by Dr. Gundlach, but as *Ageronia ferentina* Godart, he and Herr Möschler relate collection by Dr. Stahl (presumably in the Bayamón region), who sent his specimen to Herr Krug, and "también fué cogido por un colector botánico, el Sr. Sentenis, en el interior de la parte oriental." The AMC collection has one unlabeled specimen, and the Río Piedras collection two, in addition to two specimens collected by Mr. Francisco Seín on trunks of *Inga vera* in coffee grove at Aibonito, January 29, 1924. This is a medium-sized grey butterfly, intricately marked above with darker wavy lines and white spots; beneath for the most part white where it is grey above. It is very common in Hispaniola, where one often finds dozens resting with outspread wings on the trunk of a preferred mango tree, not taking flight until the last minute after discovery. Their wings, tightly appressed to the bark of the tree, often match it so closely in color and mottling as to be almost indistinguishable. Mr. Wm. P. Comstock (1944-472) records collections of adults from Juana Díaz, Guánica, Cartagena Lagoon and Desengaño, and of Fruhstorfer's types from Puerto Rico as well as from Hispaniola. Prof. J. A. Ramos (1947-53) reports collection of these butterflies on Sardinera Beach, Mona Island.

*Adelpha gelania arecosa* (Hewitson), originally described as a *Heterochroa* from Mexico and the West Indies, and thus listed from Puerto Rico by the earlier writers, was a New Year's capture (1944) by Prof. J. A. Ramos at Indiera. It is not exclusively of the high mountains, however, for Mr. Wm. P. Comstock (1944-473) lists collection at San Juan and Ensenada, as well as at Maricao. It is a small, almost black butterfly, with an oblique chalky white band crossing both wings.

*Asterocampa argus idyja* (Geyer), listed from Puerto Rico by Drs. Stahl and Gundlach as *Doxocopa* or *Apatura*, is noted by the latter as occurring in Cuba and widely in the United States, the larva feeding on *Ardisia cubana*. It is a yellowish-brown butterfly, even fresh specimens having a

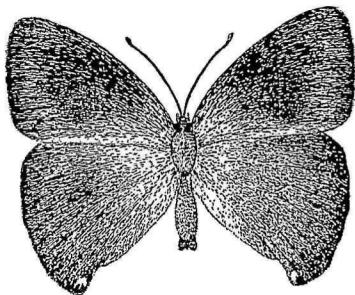
faded-out appearance, of which Mr. Wm. P. Comstock (1944-474) lists collection only at Coamo Springs in Puerto Rico. Dr. Luis F. Martorell collected one of these butterflies at Guajataca gorge, and the Río Piedras collection has another unlabeled specimen.

*Prepona antimache insulicola* Fruhstorfer is a magnificent big black butterfly with short, iridescent metallic blue-green fascia on both wings; beneath marked with lighter and darker grey. It is found only in the higher hills and mountains. Mr. F. E. Watson collected a female at Ciales, Prof. J. A. Ramos a male at Indiera, but the butterfly is not rare; merely difficult to catch. After heavy rains, one may expect to see one or more of these powerful butterflies at the waterfall of the Río Collazo on the road between Lares and San Sebastián, and Mr. Cesario Pérez captured three of them there. All the earlier writers list this butterfly, and possibly it may have been more abundant when Puerto Rico had more of virgin forest.

*Siderone nemesis* (Illiger), originally described as *Papilio nobilis nemesis* from "Insel St. Domingo" (Hispaniola), and found also in Cuba, and from Mexico to Brasil, was listed by the earlier workers as *Siderone ide* Hübner from Puerto Rico, altho Dr. Gundlach states that he prefers the older name of *nemesis*. Such a specific name seems hardly significant for such a fine butterfly, with pointed forewings and tailed hindwings that when folded more or less resemble a purplish-brown leaf beneath. Above it has a bloody red triangle at base of forewing and distally an almost equally broad diagonal fascia on a black-brown background that, in certain angles of bright sunlight, shows a purplish sheen. Mr. Wm. P. Comstock (1944-476) reports the food plant of the larva in Mexico as *Casearia abovata*, describes caterpillar and chrysalis, and notes collection in Puerto Rico by Mr. F. E. Watson at Manatí of the adult, and by Prof. J. A. Ramos at Indiera, where it was quite abundant, and by Miss Ann Wolcott at Isabela. Mr. Cesario Pérez collected an adult which shows no sheen at Río Cañas, near Caguas.

*Anaea troglodyta* (Fabricius) was listed as a *Paphia* from Puerto Rico by the earlier writers, the local subspecies, *borinquenalis*, having been described by Messrs. Frank Johnson and Wm. P. Comstock in their paper on "*Anaea* of the Antilles and their continental Relationships, with descriptions of new Species, Subspecies and Forms" (Jour. N. Y. Ent. Soc., 49 (4); 301-343, pl. 5. New York, 1941). In Van Zwaluwenburg's list two names are given: *Anaea (Pyrrhanaea) morrisoni* Edwards (P. R. 1413) and *Anaea portia* Fabricius (P. R. 1413), both referring to the same species and subspecies, which varies considerably in the extent of the brownish markings on the orange-red background on the upper side of the wings, the depth of the rose-red sheen, and beneath, the dead-leaf resemblance of the grey or brownish mottling. The caterpillar of the Goatweed butterfly

feeds on *Croton humilis*, and adults are most often noted in xerophytic areas of limestone hills where "yerba bellaca" is the most common vegetation: from Quebradillas, Isabela and Coloso around the west coast of the Island to Guánica, Guayanilla and Ponce. The butterflies themselves may not remain in such barren hills but will be found at irrigation ditches, mud-puddles in country roads, or feeding on the juice of ripe and rotting mangoes or papayas on the ground, almost invisible as long as they keep their wings folded together, but very conspicuous if their upper surfaces are displayed in bright sunlight.



Adult of the Hispaniolan Cane Butterfly, *Calisto pulchella* Lathy, twice natural size. (Drawn by Fritz Maximilien.)

#### Satyridae: the Satyrs

*Calisto nubila* was described from Puerto Rico by Mr. Percy I. Lathy in "A Monograph of the Genus *Calisto* Hübner," (Trans. Ent. Soc. London, pt. 2, pp. 221-228, pl. 1, fig. 1-13. London, 1899), the earlier records under the name *Calisto zangis* F., even as late as in Van Zwaluwenburg's list (P. R. 1419), all referring to this one little inconspicuous mountain Satyr, almost wholly black-brown above, lighter beneath with a dark eyespot in the forewing. It occurs in the hills back from the coast, but most abundantly in the high mountains; at Indiera and on El Yunque, the caterpillar presumably feeding on coarse grasses. Its habitat is quite different from the Hispaniolan cane butterfly, *Calisto pulchella* Lathy, which may swarm at times in the callejones of cane fields close to sea-level, the caterpillars often during the winter becoming injuriously abundant feeding on the older leaves of sugar-cane, as well as on the tender young leaves of the central whorl. In all the years during which enormous quantities of cane

were annually imported into the port of Guánica from La Romana, R. D., no stage of these butterflies arrived in Puerto Rico alive, due to the unceasing vigilance of the local Plant Quarantine Service, which supervised and inspected the fumigation of the cane boats and their cargoes. Other insects, both harmful, neutral and beneficial, are known to have become established in Puerto Rico due to importations from Hispaniola, but not the Hispaniolan cane butterfly against which the quarantine restrictions were formulated.

*Megisto cymela* (Cramer), as identified by Mr. Wm. P. Comstock (1944-480), was collected by Miss Ann Wolcott at Isabela in June 1938: the only record for Puerto Rico.

#### Libytheidae

*Libytheana terena* (Latreille) originally described from the Antilles (according to Mr. Wm. J. Kaye (1926-476) from Puerto Rico), was listed by Drs. Dewitz, Stahl and Gundlach as *Libythea motya* Boisduval & Leconte, but has not been collected locally in recent years.

#### Lycaenidae: the Blues

*Thecla fidena* Hewitson, according to Mr. Wm. P. Comstock (1944-485), "is the largest of the Theclinae occurring in Porto Rico, with a length of forewing of 16 mm. The single tail at  $Cu_2$  is about 4 mm. long. The upperside color is black-brown, with a sheen extending from the base of both wings, bright blue in males, and dull blue in females." Listed by Drs. Dewitz and Gundlach, Herr Möschler (1880-101) notes "raupe auf *Tetrapteris*." It was most recently collected by Mr. F. E. Watson at Isabela in 1915.

*Thecla acis mars* (Fabricius) is characterized by the diagonal white bars, margined with black, on the underside of the wings. It was listed as *Thecla acis* Drury by Drs. Dewitz and Gundlach, and by Herr Möschler, without comment. All recent specimens are from the south coast: Ensenada, Ponce and Coamo, and if this restriction to a xerophytic habitat holds, one can understand why Dr. Stahl made no collection in the Bayamón region.

*Thecla angelia* Hewitson, of which Messrs. Wm. P. Comstock and E. Irving Huntington in their "Lycaenidae of the Antilles" (Annals N. Y. Academy of Sciences, 45 (2): 49-130, pl. 1, ref. 90. New York, December 29, 1943) described the local subspecies as *boyeri*, was listed by all the earlier workers, and has been intercepted in the metropolitan area and on mango blossoms at Mayagüez. Mr. Wm. P. Comstock (1944-487) lists it from Arecibo, Aibonito, Maricao and Coamo, it being a common species in all parts of Puerto Rico as it is in Hispaniola.



*Thecla bubastus* Cramer, of which Messrs. Comstock and Huntington (1943-79) describe the local subspecies under the name of ponce, had not previously been reported from Puerto Rico, but Mr. Wm. P. Comstock lists collections from many coastal localities in Puerto Rico, as well as from the Virgin Islands and many of the Lesser Antilles.

*Thecla cardus* Hewitson listed by all the early workers from Puerto Rico, is considered by Mr. Wm. P. Comstock (1944-492) to be a possible misidentification for *Thecla christophei* Comstock and Huntington (1943-85) from Hispaniola.

*Thecla celida* Lucas, of Cuba, was listed by Drs. Dewitz and Gundlach and Herr Möschler from Puerto Rico, of which Messrs. Comstock and Huntington (1943-76) describe the local subspecies under the name aibonito, the type from Aibonito.

*Thecla columella arecibo* Comstock and Huntington (1943-81) was listed, according to the opinion of Mr. Wm. P. Comstock (1944-490), under the name of *Thecla cybira* Hewitson by Drs. Dewitz and Gundlach and Herr Möschler from Puerto Rico, and the identifications by Dr. Wm. Schaus of interceptions at Arecibo and Vega Baja as *Callicista columella* F. and *Thecla eurytilus* Hübner also refer to this subspecies. The type is from Guayanilla, others from Arecibo and Coamo.

*Thecla limenia* Hewitson, originally described from Jamaica, Cuba and Santo Domingo, was listed by all the early workers from Puerto Rico, and Mr. Wm. P. Comstock (1944-491) lists specimens from many coastal points.

*Thecla maesites maesites* Herrich-Schäffer was listed by all the earlier workers, and also, not in synonymy *Thecla telea* Hewitson: the continental subspecies, according to Mr. Wm. P. Comstock (1944-488). The latter was identified from Puerto Rico by Dr. Harrison G. Dyar as a *Eupsyche*.

*Thecla simaethis simaethis* (Drury), listed by all the earlier workers from Puerto Rico, was described from the Island of St. Kitts or "St. Christopher," and has recently been intercepted at Arecibo.

*Leptotes cassius theonus* (Lucas), was by the earlier workers listed as *Lycaena cassius* Cramer, and by Dr. Wm. Schaus identified from material reared from lima beans at Isabela as *Lycaena theonus* Lucas. "The Larvae of *Lycaena theonus* Lucas feed on the Buds and Flowers of Lima Bean and *Crotalaria incana* in Puerto Rico" (Jour. Agr. Univ. P. R., 18 (3): 435, ref. 1. Río Piedras, (October 1934) is the first local record for the greenish, slug-like caterpillars of this little grey-blue and whitish butterfly, altho Mr. S. C. Bruner had previously noted its attack on the pods of lima beans in Cuba. The wild host plant occurs widely in coastal Puerto Rico, and the butterflies are to be expected in exceptional abundance in commercial plantings of lima beans. Mr. Wm. P. Comstock noted collections on El

Yunque as well as at Ponce, Tallaboa, Guayanilla and Ensenada. He presumes that it was "a very dark phase" of this species (1944-495) which Mr. E. G. Smyth captured at Camuy which Dr. Wm. Schaus identified as *Lycaena marina* Reakirt: a continental species not known to occur in the West Indies. All of these specimens show "the greater prominence and larger size of the marginal eye-spots on the underside of the hindwings."

*Hemiargus ammon noëli* Comstock and Huntington (1943-99), the subspecies originally described from Hispaniola and named in honor of the Haitian entomological illustrator: Mr. V. Pierre-Noël, was collected by Dr. F. E. Lutz on Mona Island. Altho Dr. Lutz found but a single male, it is really quite common on Mona, Prof. J. A. Ramos (1947-53) listing the collection of numerous specimens from Uvero and Sardinera Beaches. It was this species which Mr. Carl Heinrich identified as "near *zachaeina* B. & D.," collected by Dr. Luis F. Martorell there in April 1940.

*Hemiargus ammon* (Lucas) *woodruffi*, the subspecies described by Messrs. Comstock and Huntington (1943-100) from the Island of Anegada, British Virgin Islands, is represented in the AMNH collection by four males from San Juan, Puerto Rico.

*Hemiargus hanno* (Stoll), the local subspecies which Messrs. Comstock and Huntington (1943-106) described under the name of *watsoni*, was listed by all the earlier workers and is P. R. 132 in Van Zwaluwenburg's list. It was collected by Mr. Thos. H. Jones in 1914 near Tortugero Lagoon as identified by Dr. Harrison G. Dyar, and has been repeatedly intercepted since in all parts of the Island. As *Lycaena filenus* (Poey), Prof. Wm. T. M. Forbes identified for Mr. Cesario Pérez the adults which he had reared from larvae feeding on the buds, flowers and seeds of "habichuela parada" (*Macroptilium lathyroides*). The upperside of the wings of the male are bright violet-blue, their outer margins black-brown with white fringes; those of the female are dark brown, suffused with blue at the bases.

*Hemiargus isola isola* (Reakirt) is known from Puerto Rico, according to Mr. Wm. P. Comstock (1944-498), from a single male captured by Mr. F. E. Watson at Tallaboa, July 23, 1914.

*Hemiargus bornoi* Comstock and Huntington, originally described from Haiti, is known from Puerto Rico, according to Mr. Wm. P. Comstock (1944-498) a single specimen captured by Dr. Frank E. Lutz at Ensenada, June 1915.

#### Pieridae: the Sulfurs and the Whites

*Dismorphia spio* (Latreille), listed from Puerto Rico by all the earlier writers as a *Leptalis*, is a narrow-winged butterfly of the higher mountains, its brownish-black wings banded with bright orange or bright yellow, or both yellow and orange. Mr. E. G. Smyth found it common near Ma-

meyes on the lower slopes of El Yunque during August, but altho listed from Manatí, Añasco and Mayagüez, most collections have been made high in the mountains at Indiera, or towards the top of El Yunque or El Duque. Nothing is known of the immature stages, but the caterpillar presumably feeds on some endemic plant common to the mountains of all the Antilles.

*Anteos maerula maerula* (Fabricius), listed as a *Gonepteryx* by the earlier writers, was reared by Dr. Gundlach from larvae feeding on species of *Cassia*. Dr. Luis F. Martorell found numerous larvae feeding on the foliage of "flor de San José" (*Isandrina emarginata*) on the lower slopes of the mountains north of Salinas, which transformed to plump pupae showing on the wingpads greatly enlarged spots of the distinctive black spot characteristic of the wings of the adults. The wings of the male are sulfur-yellow, those of female may be yellow or greyish-white; the spot in the center of the forewing is black; of the hindwing, orange half-circled with black. The determination of the reared adults was by Mr. W. D. Field. The only other recent record from Puerto Rico is of a specimen from Mayagüez, cited by Mr. Wm. P. Comstock (1944-503). Concerning the record of *Anteos (Gonepteryx) clorinde* Godart ascribed to Dr. Dewitz in "Insectae Portoricenses" (1923-146), Mr. Comstock states that it does not occur in the original paper.

*Phoebis (Phoebis) sennae sennae* (Linnaeus) is listed from Puerto Rico by Drs. Stahl, Dewitz and Gundlach under the older name of *Callidryas eubule* L., the latter noting "la oruga se cría principalmente en la *Cassia occidentalis*." Mr. Thos. H. Jones reared caterpillars from this host at Río Piedras, and this record was on Van Zwaluwenburg's list as P. R. 1423. Dr. Stuart T. Danforth (1926-23) notes it as one of the common butterflies around Cartagena Lagoon, and Prof. J. A. Ramos found adults on Mona Island. At Hda. Santa Rita, Guánica, the caterpillars were reared eating the flowers of "talantala" (*Herpetica alata*), and distinctly avoiding the tough leaves. The adults come to these flowers apparently in search for nectar, and retaliate for their difficulty in getting it by laying their eggs on the closely appressed flowers. The wings of the males are clear, bright sulfur-yellow above; those of the females vary from yellow to cream, their outer margins brownish and with an orange-centered brownish ring in the discal cell of the forewing, most Puerto Rican individuals being of the pale form. In "A Revision of the Genus *Phoebis* (Lepidoptera)" (American Museum Novitates No. 368, pp. 22, many ref. New York, September 5, 1929), Mr. F. Martin Brown describes this pale female as *sennalba*, the type from Cuba, the paratype from San Juan, Puerto Rico: a form of *Phoebis eubule* Linnaeus of the West Indian race of *sennae* Linnaeus. The caterpillar is parasitized by the Chalcid wasp *Spilochalcis eubule* (Cresson).

*Phoebis (Phoebis) argante* (Fabricius), of which Mr. Wm. P. Comstock

(1944-506) describes the local subspecies under the name *martini*, was listed by all the earlier writers as a *Callidryas*. Dr. Wm. Schaus identified the bright yellow adult which was reared from a green caterpillar found feeding on the leaves of *Inga vera* at Cayey as *C. rorata* Butler: a female aberration of *argante* F., considered by Mr. Wm. P. Comstock (1944-508) as "confined mainly to Hispaniola." The ground color of the wings of the males is orange-yellow, with dashes of black at the ends of some of the veins; that of the females is dull yellow, often much mottled with reddish brown, and with brownish spots at the ends of some veins and towards the apex of the forewings. While it is possible that the caterpillars may feed on the leaves of some other host than the coffee shade tree, *Inga vera*, all adults have been collected in the coffee regions: Mayagüez, Añasco, Camuy, Adjuntas, Oro-covis and Cayey.

*Phoebis* (*Phoebis*) *agarithe* (Boisduval), of which the Antillan race was described by Mr. F. Martin Brown (1929-15) under the name *antillia*, was listed as a *Callidryas* by Drs. Stahl, Dewitz and Gundlach and by Herr Möschler, Dr. Gundlach pointing out its differences from the preceding species. In Van Zwaluwenburg's list it is P. R. 1428. The AMC collection contains specimens from Yabucoa, La Plata and Mayagüez; Prof. J. A. Ramos has collected it at Lajas and at Cartagena Lagoon; and Mr. Cesario Pérez reared it from larvae on *Pithecolobium dulce* at La Muda, between Río Piedras and Caguas.

*Phoebis* (*Phoebis*) *philea* (Johansson) was listed from Puerto Rico by the earlier workers as *Callidryas thalestris* Hübner, which Mr. Wm. P. Comstock (1944-510) considers distinct. Herr Möschler (1880-94), presumably quoting Dr. Gundlach, notes "raupe auf Leguminosen: *Poinciana pulcherrima*, *Cassia fistula*, *grandis*, *occidentalis*." Mr. F. Martin Brown (1929-9) gives many names in synonymy of this, the largest of the species of *Phoebis* which occurs in Puerto Rico, but apparently it is so rare that Mr. Comstock had only a single specimen: from Aibonito.

*Phoebis* (*Rhabdodryas*) *trite* (Linnaeus), of which Mr. F. Martin Brown described the Antillean race (1929-20) under the name of *watsoni*, the type from Santo Domingo, others from Cayey and Adjuntas, Puerto Rico, was listed as a *Callidryas* by all the earlier writers. Adults have since been taken at San Juan and Mayagüez.

*Phoebis* (*Aphrissa*) *godartiana* (Swainson) is listed from Puerto Rico by Mr. F. Martin Brown on page 5 of his "A Revision of the Genus *Aphrissa*" (American Museum Novitates No. 454, pp. 14, fig. 15. New York, February 9, 1931), altho no recent collection has been made here

*Phoebis* (*Aphrissa*) *statira cubana* d'Almeida was listed from Puerto Rico by Drs. Dewitz and Stahl as *Callidryas evadne* Hübner, and by Dr. Gundlach and Herr Möschler as *Callidryas statira* Cramer, the caterpillar

feeding on Cassias, and also by all of them as *Callidryas neleis* Boisduval, not in synonymy. Mr. F. Martin Brown (1931-7) indicates the synonymy of these and others, considering "*neleis* Boisduval must be restricted to the West Indian race." Mr. Wm. P. Comstock (1944-514) states that "*neleis* is confined to Cuba," and that the adult reared from larva feeding on tender leaves of "quenepa" (*Melicocca bijuga* L.) at Río Piedras "was determined erroneously by Mr. F. E. Watson." The confusion is more than a matter of names, for quenepa is not a Leguminous tree. Mr. Francisco Sefn noted larvae on quenepa in November 1939, but from the chrysalids they formed, emerged only parasitic Chalcid wasps: *Spilochalcis eubule* (Cresson). It is apparent that the wasps are unselective as to the species of *Phoebis* attacked, and are not restricted to the species after which they are named. The adult sent to Mr. Watson was reared in July 1936, and caterpillars have been noted every year since on the same quenepa tree, feeding on the tender leaves. Adults appear every June, the females ovipositing as soon as the tender leaves appear, but no second generation of caterpillars develops on this particular quenepa. Is it possible that during the remainder of the year other generations of caterpillars feed on *Cassia*? The adults of "both sexes have a ground color of sulphur-yellow on both surfaces," the male having no color markings, the female only a few spots, mostly on the under surface.

*Kricogonia castalia* (Fabricius) is a comparatively rare butterfly in Puerto Rico at the present time, but it was listed by all the earlier writers, Dr. Dewitz using the generic name *Gonepteryx*. Dr. Gundlach gives an extensive synonymy, making no distinction between this species and *lyside*, but of *Rhodocera terissa* noting "una mancha cuadrilonga negra extendida desde el borde anterior de las alas posteriores hacia el disco." He gives the distribution as Cuba, Jamaica, Florida and Texas, and states that it "vive más bien cerca de la costa que en el interior." Whether this implies that he noted a mass migration along the coast of Puerto Rico is uncertain, but such has been recorded from Haiti (Entomological News, 38 (4): 97-100. Philadelphia, April 1927), and it might well have occurred in Puerto Rico when the host plant of the caterpillars, lignum-vitae or "guayacán" (*Guaiacum officinale*), was more abundant than at present. Guayacán grows almost exclusively in the more xerophytic areas of the south coast of Puerto Rico, the collection by Mr. F. E. Watson from Quebradillas, reported by Mr. Wm. P. Comstock (1944-517), being most exceptional, while those from Lajas and Ensenada are to be expected. Mr. Cesario Pérez collected adults, as identified by Mr. W. D. Field, in January 1942 at Salinas, a very few of these black-lined specimens being distinguished by him among swarms of cabbage butterflies.

*Kricogonia lyside* (Laterille) is distinguished by Mr. Wm. P. Comstock

(1944-517) from *castalia* on the basis of larger size, "the black bar on the hindwing is usually narrower (1 mm. wide) and tends to obsolescence and disappearance," and on the underside of the hindwings "there is a raised line of dull yellow scales about 0.5 mm. wide." He admits, however, that "the male genital armature is indistinguishable." He identifies Puerto Rican specimens from Coamo, Guayanilla and Lajas.

*Eurema* (*Eurema*) *daira ebriola* (Poey), listed under this specific name from Puerto Rico by Drs. Stahl and Dewitz, is called *Terias jucunda* (Boisduval and LeConte) by Dr. Gundlach (with *ebriola* in synonymy); "La oruga se encuentra sobre el *Desmodium*." Mr. Wm. P. Comstock (1944-520) records collections from Puerto Rico at Mameyes, El Yunque and Coamo, and wide distribution in the other Antilles.

*Eurema* (*Eurema*) *elathea* (Cramer) has been reared from a little green chrysalis found on a *Zamia* leaf at Guánica Insular Forest, May 31, 1942. Mr. Wm. P. Comstock (1944-521) records collections at Ensenada, Tallaboa, Ponce and on El Yunque, as well as in many of the other Antilles.

*Eurema* (*Eurema*) *palmira palmira* (Poey) was listed from Puerto Rico by all the earlier workers as a *Terias*, Dr. Gundlach noting "su oruga sobre el *Desmodium*." It has been intercepted at Luquillo and Vega Baja, and Prof. J. A. Ramos (1947-53) collected these little black-margined yellow butterflies on Mona Island, of which the typical form occurs in most of the Antilles.

*Eurema* (*Pyrisitia*) *dina* (Poey) is represented in Puerto Rico, according to Mr. Wm. P. Comstock (1944-525) by the subspecies *sanjuanensis*, which Mr. Frank E. Watson described as "A new *Eurema* from Puerto Rico" (American Museum Novitates No. 971, pp. 2, New York, April 25, 1938): the holotype from San Juan.

*Eurema* (*Pyrisitia*) *lisa euterpe* (Ménétriés) was identified by Dr. Harrison G. Dyar for specimens collected by Mr. Thos. H. Jones at Río Piedras in 1912, and near Tortuguero Lagoon in 1914, forming the basis for the entry as a *Terias* in Van Zwaluwenburg's list: P. R. 135. This is one of the common butterflies of Puerto Rico, having been repeatedly intercepted along the north coast from Arecibo to Luquillo, and found in great abundance at Colonia Jauca, Salinas, by Dr. Luis F. Martorell in September 1939. As *Xanthidia lisa* Boisduval and LeConte (= *Terias sulphurina* Poey), it is listed by Dr. Gundlach, who notes its extensive distribution in the West Indies, continental United States and Canada, and that according to Boisduval, "la oruga vive en la *Cassia* y *Glycine*." Prof. J. A. Ramos (1947-53) records collecting adults on the plateau of Mona Island. "The males have a bright yellow ground color on both surfaces, while the females may vary from pale yellow to white. In both sexes, the apical and outer marginal area of the forewing on the upperside is black-brown. The

hindwing of the male has a black-brown border about 0.5 mm. wide," according to Mr. Wm. P. Comstock (1944-524).

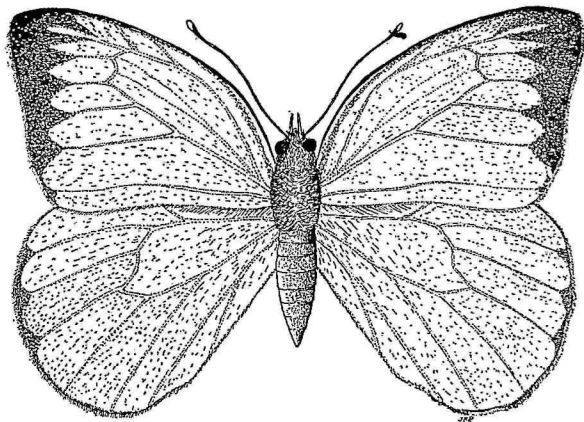
*Eurema* (*Pyrisitia*) *nicippe* (Cramer) is considerably larger than others of this genus, having deeply black bordered wings of bright orange. Mr. Wm. P. Comstock (1944-525) cites collections at Dorado and Indiera, and Prof. J. A. Ramos has additional specimens from Mayagüez.

*Eurema* (*Pyrisitia*) *portoricensis* was described by Dr. Hermann Dewitz (1877-237) as a *Terias citrina*, var. *nova* from type material presumably collected by Dr. Gundlach in the Mayagüez region of Puerto Rico. Neither Dr. Gundlach nor Herr Möschler listed it as more than a variety, but Dr. A. B. Klots in "A Revision of the Genus *Eurema* Hübner (Lepidoptera: Pieridae)" (*Ent. Americana* (n. s.) 9 (3) 99-163, pl. 4. Brooklyn, 1929) on page 132 gives it the status of a valid species, found only in Puerto Rico. Mr. Frank E. Watson in describing his *Eurema sanjuanensis* (1938-2) differentiates it from *portoricensis*, "which has the outer margin of the primary rounded, and both primary and secondary with a narrow black border." It has been collected generally in the mountains, but one individual has been intercepted at Manatí.

*Appias* (*Glutophrissa*) *drusilla* (Cramer), of which the subspecies *boydi*, described by Mr. Wm. P. Comstock in his "Notes on the Subgenus *Glutophrissa*, Genus *Appias* (Lepidoptera, Pieridae)" (*American Museum Novitates* No. 1236, pp. 6, fig. 2, ref. 25. New York, July 9, 1943) from Hispaniola, occurs widely in Puerto Rico, was listed by Dr. Stahl simply as *Pieris ilaire* Godart. Dr. Gundlach used the generic name of *Daptonoura* (= *Tachiris margarita* Hübner), and the latter name is in Van Zwaluwenburg's list: P. R. 1428. According to Mr. Wm. P. Comstock (1944-527) this whitish butterfly with basal and marginal infuscation was collected by Dr. Frank E. Lutz on Mona Island in February 1914, and Prof. J. A. Ramos (1947-53) found numerous others there thirty years later. In Puerto Rico this predominantly xerophytic butterfly is most abundant around Cartagena Lagoon and at Ensenada, but has also been collected at Quebradillas, Arecibo and even on El Yunque.

*Appias* (*Glutophrissa*) *punctifera* was described by Sr. R. Ferreira d'Almeida in his "Revisao do Género *Appias* (subgen. *Glutophrissa* Butl.)" (*Bol. Biol.*, 4 (1): 50-66, pl. 2. Rio de Janeiro, 1939) as a distinct and valid species for the four entirely white females with a prominent spot on the forewing, which Dr. Dewitz had considered hybrids or throwbacks of *Tachiris margarita* Hübner or *T. molpadia* Hübner (1877-234 and 245), and basing "his name on Dewitz' description and figures, apparently without specimens." Mr. Wm. P. Comstock (1943-5) redescribes both sexes, noting males from Orocovis and Coamo, and occurrence in St. Thomas and St. John of the U. S. Virgin Islands.

*Ascia monuste* (Linnaeus), the common white cabbage butterfly, is much better known as *Pieris*, under which generic name it was listed from Puerto Rico not only by the early systematic workers, but also by Mr. W. V. Tower (1908-35) as a pest of cabbage, radish, turnip, kale and mustard, by Mr. Thos. H. Jones (1915-6) on horse radish and *Cleome spinosa* (= *C. gynandra*), and by Dr. Richard T. Cotton (1918-281) who made fresh illustrations of egg, larva and adult from material reared on cabbage.



The Puerto Rican variety of the common Cabbage Butterfly, *Ascia* (or *Pieris*) *monusta eubotea* (Latreille), twice natural size. (The hind wings are not as large as here shown by José F. Pietri.)

Mr. Wm. P. Comstock (1944-529) notes that the typical continental subspecies, *A. m. monuste* (Linnaeus) may occur in Puerto Rico by migration, but the bulk of the insular population is *A. m. eubotea* (Latreille), mixed with and hybridized with *A. m. virginia* (Latreille), the common subspecies of the Lesser Antilles. The record of *Pieris joppe* Boisduval by the early workers refers to the subspecies *eubotea*. The hairy, greenish-yellow caterpillars feed not only on the leaves of common economic cruciferous crops, but Dr. Luis F. Martorell noted them on tender shoots of "burro" (*Caparis portoricensis* and *C. coccolobifolia*) in the mountains between Cayey and Salinas. The plant on which they were feeding at Indiera in January 1923 could not be identified, but in June 1937 they were enormously abun-



dant in all the cane fields from Guánica to Guayanilla, feeding on the weed "jazmín de río" (*Cleome gynandra*). Many pupated on cane leaves, yet but few butterflies emerged, for most of the chrysalids were brown with parasitism by *Brachymeria incerta* (Cresson). When this weed is completely devoured locally by the caterpillars, or weeded out, they complete their growth feeding on anything else available, in January 1940 on Mona Island the crop attacked being onions. Formerly the control of these caterpillars might pose a serious problem, for insecticides sprayed on cabbage did not adhere, and there was always the subsequent danger of later human consumption. One can obtain immediate results with DDT and chlordan and some of the other newer insecticides, which kill so promptly that their adhesion to the plant need be for only a few minutes to be effective.

*Ascia (Ganyra) josephina* Godart, of a variety collected from the south coast of Puerto Rico by Herr Leopoldo Krug, was described by Dr. Hermann Dewitz under the name of *Pieris josephina* var. *krugii* (1877-235). It was listed but not collected by Drs. Stahl and Gundlach, and by Herr Möschler. It is apparently confined to the more xerophytic southwestern corner of Puerto Rico, Prof. J. A. Ramos having found it at Lajas, June 13, 1942, according to Mr. Wm. P. Comstock (1944-532) who identified the specimen.

#### Papilionidae: The Swallowtails

*Papilio polydamas* Linnaeus, of which the local subspecies: *thyamus* Rothschild and Jordan, was described from St. Thomas, was listed from Puerto Rico by all the earlier workers, Dr. Gundlach, in addition to notes on continental distribution and in Cuba, states "la oruga se cría en especies de *Aristolochia*. Exhala un olor a almizcle." The local subspecies does not occur in the other Greater Antilles, but in the U. S. and British Virgin Islands, not in Lesser Antilles farther south. The adult is a fine large black, non-tailed butterfly, with a submarginal row of yellow darts and marginal crescents on the forewing, a submarginal row of greenish-yellow broad crescents and marginal crescents on the hindwings. Mr. Thos. H. Jones collected an adult near Laguna Tortuguero in July 1914; Prof. J. A. Ramos reared them at Mayagüez more recently, and Mr. Wm. P. Comstock (1944-533) records collections from San Juan, Santurce and Naguabo, with descriptions of the immature stages. Badly worn adults have repeatedly been noted on the beach at Mameyes, behind the protective margin of seagrape, visiting flowers of botoncillo and mingling with smaller butterflies.

*Papilio aristodemus aristodemus* Esper, originally described from Cuba as *Papilio Eques Achivus aristodemus* Esper, was listed from Puerto Rico by Drs. Stahl and Dewitz, and as *Papilio crespontinus* Martyn by Dr.

Gundlach, with the other name in synonymy, and by Herr Möschler. Mr. Cesario Pérez collected one somewhat faded adult in October 1940 in what he called "Rexach": the hills beside Laguna San José which the stone-crushers are reducing to level land. Black-brown in ground color, the hindwing strongly tailed, both wings above bear a transverse yellow band and a submarginal row of yellow lunules, that on the forewing being bent at right angles towards the costa. Of the Floridian subspecies the larval host plant is torchwood (*Amyris elemifera*), according to Mr. Wm. T. Comstock (1944-536) quoting Miss Florence Moore Grinshawe's "Place of Sorrow" (Nature Magazine, 33: 565. Washington, D. C., 1940).

*Papilio androgeus* Cramer; of which the local subspecies *epidaurus* Godman and Salvin was first identified from Puerto Rico by Mr. Frank E. Watson, was listed by Drs. Stahl, Dewitz and Gundlach as *Papilio polycaon* Cramer, the latter giving synonymy, and noting "su oruga se cría en especies del género *Citrus*." The caterpillar the "orange puppy" of citrus growers, is discussed as a minor pest of citrus in "An Economic Entomology of the West Indies" (1933-448), having been noted in Puerto Rico at Río Piedras, Manatí, Lares and Isabela, Mr. Wm. P. Comstock (1944-536) listing collections at Mayagüez, Maricao and Ponce. The adults are possibly the largest butterflies present in Puerto Rico, brownish-black and tailed, the males with a very broad yellow transverse band across both wings, the females with the forewings only in a limited area suffused with yellow, the hindwings extensively marked with greenish-yellow.

*Papilio pelaus imerius* Godart was listed as *Papilio pelaus* Fabricius by Drs. Stahl, Dewitz and Gundlach, the latter noting "he cogido una crisálida fijada en el tronco de un *Xanthoxylum*, y probablemente la oruga se cría en esta mata." In this supposition Dr. Gundlach was entirely correct, for larvae on "cenizo" (*Zanthoxylum martinicense*) have been noted at Martín Peña, Cayey and Barranquitas, and reared to adult. Even when fully grown the larvae are closely gregarious, crowding each other and hugging the trunk of the tree when not feeding, their purplish and greenish-brown bodies marked with extensive creamy spots and minor smoky areas, giving no indication when a lizard runs over the group, or an ant bites one. The adults are brownish-black, tailed butterflies, with a narrow transverse band across the forewings, marginal yellow crescents larger on the hindwings and submarginal orange crescents. One intercepted at Palo Seco was identified by Dr. Wm. Schaus as a new local race.

#### Hesperiidae: the Skippers

*Phocides pigmalion pyres* (Godman and Salvin), originally described from Hispaniola and Puerto Rico as *Erycides pyres* (1879-154), has not since been found outside of Hispaniola.

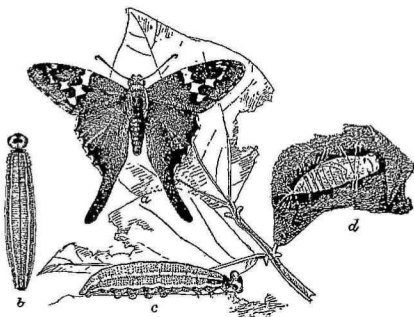
*Polygonus lividus* Hübner was originally described as *Papilio amyntas* Fabricius from America, and listed from Puerto Rico as a *Goniloba* by Drs. Dewitz and Stahl, and as *Hesperia amyntas* by Dr. Gundlach and Herr Möschler. Dr. Gundlach notes "he criado la oruga en *Lonchocarpus*," and in the Report of the Experiment Station at Mayagüez for 1937 (1938-93), the rearing of adults, determined by Mr. J. F. Gates Clarke as *Acolastus amyntas*, from larvae feeding on the leaves of semi-commercial plantings of *Derris elliptica*, is recorded. "Ventura" (*Ichthyomethia piscipula*) is the endemic host, larvae having been found at Cabeza de San Juan, in the northeastern corner of the Island, at Pt. Cangrejos, and at Boquerón, in the southwestern corner of the Island. They live in a folded-over leaf and have flat, heart-shaped heads, black in earlier instars, lemon yellow in the final instar, with a large black spot on each side of the dorsal cleft. Adults have been intercepted at Manatí and Mayagüez, and may be presumed to be present wherever the host plant grows, having been very abundant in 1923 especially at Boquerón. They are brownish-black, with three chalky white irregularly quadrangular spots on the forewings, and three smaller ones near the apex.

*Proteides mercurius pedro* was described by Dr. Hermann Dewitz (1877-242) from Puerto Rican material presumably collected by Dr. Gundlach as *Goniloba idas* Cramer, var. *pedro*. Herr Möschler and Dr. Gundlach use the name *Eudamus idas*, with *Papilio mercurius* Fabricius in synonymy. This butterfly also was reared by Mr. H. K. Plank at the Mayagüez Station, the caterpillar feeding on the leaves of *Derris elliptica*, and it has been intercepted in a grapefruit grove at Vega Alta and at Peñuelas, the latter being determined by Dr. Wm. Schaus as *Proteides jamaicensis* Skinner. It has four pale whitish spots in a row on the black-brown forewing, and three other smaller ones, with extensive basal orange cilia.

*Proteides zestos* Geyer was listed from Puerto Rico by Drs. Dewitz and Stahl as a *Goniloba*, and by Herr Möschler and Dr. Gundlach as *Aethilla anaphus* Cramer. According to Mr. Wm. P. Comstock (1944-544) the hyaline spots on the forewing are placed as with *P. m. pedro*, but are amber-colored. He lists numerous records from Puerto Rico, in addition to the interceptions at Cidra and Ponce, and notes distribution from Florida to Barbados.

*Urbanus proteus* (Linnaeus), listed by the earlier workers in Puerto Rico as a *Goniurus*, and in Van Zwaluwenburg's list (901), by Dr. C. W. Hooker (1913-14), Mr. Thos. H. Jones (1915-7) and Dr. Richard T. Cotton (1918-277) as an *Eudamus*, is a common but not especially abundant or economically important pest of beans and cowpeas. The caterpillars may also feed on the leaves of beggar weed (*Meibomia purpurea*), and an adult reared from the leaves of "bejuco de San Pedro" (*Stigmatophyl-*

*lum lingulatum*) at Loíza in 1923 is quite typical and indistinguishable from those of which the caterpillars fed on the normal hosts. It occurs in all parts of the Island, but despite its distribution "from the southern United States to Argentina and throughout the West Indies," according to Mr. Wm. P. Comstock (1944-545), it has not been found on Mona Island, the specimens collected there by Dr. Luis F. Martorell proving to be the following species. This long-tailed Hesperiid is characterized by the whitish hyaline spots on the forewings and by the extensive basal yellowish-blue-green iridescent sheen above.



The Bean Hesperiid, *Urbanus proteus* (Linnaeus): *a*, adult, *b* & *c*, larvae, *d*, pupa, all natural size. (After Chittenden, U. S. D. A.)

*Urbanus dorantes* Stoll, of which Mr. Wm. P. Comstock (1944-546) describes the local subspecies of the Virgin Islands, Puerto Rico, Mona Island and Hispaniola as *cramptoni*, was listed from Puerto Rico by the earlier writers as an *Eudamus*, and an intercepted adult from lime flowers at Dorado was identified by Dr. Wm. Schaus as *Eudamus santiago* Lucas. The amber hyaline spots of the forewings are "distinctly reduced in size," and none of blue-green iridescent sheen of *proteus* appears. Despite the abundance of adults nothing is known of the immature stages. Prof. J. A. Ramos (1947-54) found these butterflies abundant on Mona Island, and those collected there by Dr. Luis F. Martorell in earlier years in abundance on the flowers of "corcho" (*Pisonia albida*) and of "ángela" (*Moringa oleifera*), in most cases have had their tails broken off, but were identified by Mr. Comstock as being typical of his subspecies. Dr. Martorell notes that they were "the most common insect coming to feed on the nectar of fresh blossoms" of these plants.

*Astraptes anaphus* Cramer, of which the Antillean subspecies was described from St. Vincent and Grenada as *Telegonus anausis* Godman and Salvin, was listed from Puerto Rico by Drs. Dewitz and Stahl as a *Goniloba*, and by Dr. Gundlach and Herr Möschler as an *Aethilla*. The only recent collections are one by Mr. Miguel A. Díaz at Santurce, and one intercepted in a grapefruit grove at Vega Alta.

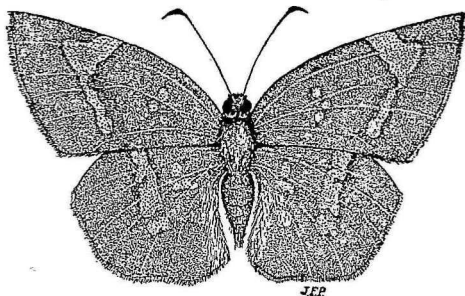
*Astraptes talus* (Cramer) is listed from Puerto Rico by Dr. Dewitz as a *Goniloba*, and by Herr Möschler and Dr. Gundlach as an *Eudamus*, the latter noting "la oruga se cría en *Guarea trichilioides*." This is "guaragua": an important cabinet-wood tree. Mr. Wm. P. Comstock (1944-550) records the recent capture of two small males at Mayagüez, but it is unquestionably so rare that its caterpillars have never been noted by the foresters.

*Pyrgus syrictus* (Fabricius) is listed from Puerto Rico under this name by the earlier workers, Dr. Gundlach noting "la oruga se cría en Malvaceas, v.g. *Sida*." Dr. Dewitz in addition gives the name *Pyrgus orcus* Cramer, of which the distribution, according to Mr. Wm. P. Comstock (1944-551) "is from Dominica southward—with an extensive South American range to Argentina." In appearance this Hesperiid is very different from most others, being dark grey with numerous white spots. Mr. Thos. H. Jones collected it on El Duque and at Laguna Tortuguero, and presumably its distribution is in all parts of the Island, altho there are no records from the south coast. Dr. Luis F. Martorell collected adults on Mona Island. Mr. E. G. Smyth photographed and reared larvae which he had found at Río Piedras feeding on "escoba" (*Sida carpinifolia* or *S. antillensis*). "The head of the mature larva is black, the collar dark brown, with three light spots, and the body yellowish green, thinly pilose. The pupa, about 15 mm. long, is bright reddish-brown, greenish on the anal segments and wing-cases, and thickly pilose." The "form montivagus Reakirt is as common as *syrictus* in Porto Rico," according to Mr. Wm. P. Comstock (1944-551).

*Pyrgus crisia crisia* Herrich-Schäffer is listed from Puerto Rico by the earlier workers, but has not been collected recently.

*Achlyodes papinianus* Poey, of which the local subspecies is described by Mr. Wm. P. Comstock (1944-552) from Dominica, Guadeloupe, the Virgin Islands and Puerto Rico under the name of *minor*, was listed as *A. thraso* Hübner by the earlier writers, although Dr. Gundlach is sure the species "no son ambos iguales." More recently it is called *Eantis*, and as *Eantis thraso* is in Van Zwaluwenburg's list (22) on orange, noted by Dr. Richard T. Cotton (1917-21) as "fairly common in some (citrus) groves," and in "Insectae Portoricensis" (1923-149) the larva and chrysalis are described, with record of the larvae found feeding on the leaves of "espino

rubial" (*Zanthoxylum monophyllum*) at Boquerón. It occurs in all parts of Puerto Rico, Prof. J. A. Ramos having specimens from Cartagena Lagoon, and larvae having been noted on wild orange at Indiera, Lares and Aibonito; on grapefruit at Isabela, Vega Alta, Pt. Salinas (Palo Seco) and Río Piedras. It is hardly an economic pest in mature grapefruit trees, but may become abundant in nurseries warranting a single application of arsenate of lead, as recommended in "An Economic Entomology of the West Indies" (1933-449). "Its head is large, prominent and heart-shaped, being attached to the body by such narrow segments as to appear as though carried on a neck. The light, yellowish-green body tapers to either end,



Adult of the Citrus Hesperiid, *Achylodes papinianus minor* Comstock, twice natural size. (Drawn by José F. Pietri.)

striped with dark green along the middle of the back and more broadly with bright yellow along the sides. Even when very small, it invariably bends over a bit of leaf to form a shelter, lined with silk, in which to live and feed. As the caterpillar grows larger, it forms an ever larger temporary shelter, eventually using an entire leaf. Within this structure, it transforms to a chrysalis, cloudy green in color and densely covered with whitish bloom. The adult butterfly is most disappointingly dull and prosaic in coloration: brown, mottled with somewhat lighter-colored lines and spots."

*Ephyriades arcas* (Drury), originally described from the Island of St. Kitts as a *Papilio*, was listed from Puerto Rico by Drs. Dewitz and Stahl as *Antigonus flyas* Cramer, and in addition Dr. Stahl lists *Nisoniades brunnea* Herrich-Schäffer, which Mr. Wm. P. Comstock states (1944-556) is confined to Cuba, and the nomen nudum *A. ptreus* Cramer. Dr. Gundlach gives a long synonymy, noting "la oruga se cría en especies de la familia de

las apocíneas, v. g. del género *Echites*." Apparently the female, so different in appearance that she has been named *Melanthes zepodea* Hübnér, is not a discriminating botanist in the selection of a host on which to oviposit, for larvae have been reared feeding on the leaves of "bejuco de San Pedro" (*Stigmatophyllum lingulatum*) at Pt. Cangrejos, Loíza and at Boquerón; on "olaga" (*Malpighia fulcata*) at Maunabo; and on leaves of "ceiba" (*Ceiba pentandra*) at Salinas. In "Insectae Portoricensis" (1923-149), as a *Brachycorene*, the immature stages are described, and the record of so many adults reared that the identity of the velvety, dark brown male and the lighter brown female, with silvery spots on the forewings, is again proved beyond possibility of dispute.

*Erynnis zarucco* (Lucas), originally described from Cuba as a *Thanaos*, is listed from Puerto Rico by Dr. Stahl as *Nisoniades jaruco* Lefebvre (in Lucas) with *N. juvenalis* H. S. in synonymy.

*Hylephila phyleus* (Drury), originally described from St. Kitts and others of the Lesser Antilles, was listed from Puerto Rico by Dr. Dewitz as a *Pamphila*, by Herr Möschler and Dr. Gundlach as a *Hesperia*. It is in Van Zwaluwenburg's list as P. R. 130, and has been repeatedly intercepted since in all parts of humid Puerto Rico—a common little skipper of yellowish-orange and dark brown. Mr. E. Stuart Paton in "The Life-History of some Jamaican Hesperiidæ" (Jour. Institute Jamaica, 2 (5): 435-441, pl. 1. Kingston, 1897) describes the habits of the greenish-brown larva, which burrows in the earth by day and comes out at night to feed on the grasses *Paspalum conjugatum* and *Panicum sanguinale*.

*Polites dictynna* (Godman and Salvin), identified as a *Thymelicus* by Dr. Wm. Schaus from a specimen intercepted in an orange grove at Pueblo Viejo. This may be what Dr. Stahl listed as *Goniloba cosinia* H. S., mistakenly in synonymy with *Thymelicus breittus* Boisduval.

*Atalopedes mesogramma* (Latreille), of which Mr. Wm. P. Comstock (1944-559) described the local subspecies under the name *apa*, was listed as a *Pamphila* by Drs. Dewitz and Stahl. Dr. Gundlach, following Herr Möschler, gives *Hesperia cunaxa* Hewitson in synonymy with *alameda* Lefebvre, this name also being given by Dr. Wm. Schaus to one of these little brown butterflies with extensive orange areas, collected by Mr. Thos. H. Jones in 1912, and to another intercepted at Villalba. - The subspecies is quite common in the more humid areas of Puerto Rico and Hispaniola.

*Wallengrenia otho* (Smith & Abbot), of which Mr. Frank E. Watson in "New Hesperiidæ from the Antilles (Lepidoptera: Rhopalocera)" (American Museum Novitates No. 906, pp. 10. New York, January 16, 1937) describes the new subspecies *mutchleri* from Puerto Rico, Mona and Desecheo Islands, St. Thomas and St. Croix of the Virgin Islands, and Hispaniola, was first listed from Puerto Rico by Dr. Dewitz as *Pamphilia*

*druryi* Latreille, and by Herr Möschler and Dr. Gundlach as *Hesperia druryi*. Indeed, the specimens collected here by staff members of the American Museum of Natural History and returned to Puerto Rico for record were labeled *Catia druryi* Latreille, but in "Insectae Portoricensis" (1923-151), the name *Catia otho* Smith and Abbot was used, the synonymy by Dr. Wm. Schaus. This little golden-brown skipper with orange spots was collected by Mr. Thos. H. Jones on El Duque, at Río Piedras and near Tortuguero Lagoon, and has since been intercepted in all parts of the Island, including Ponce, and on Mona Island by Dr. Luis F. Martorell on Sardinera Beach on March 30, 1940. In Puerto Rico the larva has not been noted, but in Santo Domingo it is "the smallest and most common Hesperiid caterpillar feeding on cane leaves, and also common on rice and other coarse-leaved grasses. The larvae are green with purplish-brown head, variably marked with silvery or greenish-yellow," as observed at Haina in 1921, and recorded under the name of *miseria*: the Cuban subspecies.

*Choranthus vittelius* (Fabricius), first listed from Puerto Rico by Dr. Dewitz as a *Pamphila*, and by Dr. Gundlach and Herr Möschler as *Hesperia hübnéri* Plotz, was identified as an *Atrytone* for Mr. Thos. H. Jones by Dr. Harrison G. Dyar, and this name has since been used for all records of the caterpillar as a minor pest of sugar-cane, Mr. E. G. Smyth (1919-143) mentioning also Sudan grass and other wild grasses as host plants. Mr. Jones noted that the larvae had twice been quite common on cane leaves at Río Piedras during the three years that he was in Puerto Rico, and apparently it was comparably abundant at the time that Mr. E. G. Smyth was conducting his tests on the transmission of mosaic disease. It has not been at all common since, not having been noted at all during the five year survey of eggs of sugar-cane moth-borer (1936-41). As observed by Mr. Jones, the caterpillar is 35 mm. long when fully-grown, with dull yellow, granular head banded with black, and robin's egg blue body, of nocturnal feeding habits, "resting by day in shelters of partly-eaten, folded-over leaves, held together with numerous strands of silk, in which, after filling in the ends with more silken strands, the opalescent, creamy yellow chrysalis is formed." "The adult is a small butterfly with brilliant, shining; chrome-yellow wings, margined with black, having an expanse of about 27 mm." This account was from his notes, published as "The Caterpillars which eat the Leaves of Sugar-Cane in Porto Rico" (Jour. Dept. Agr. P. R., 4 (1): 38-50, fig. 10. San Juan, January 1922). Adults have since been collected at Barceloneta and Cayey, and intercepted at Bayamón, Aibonito and Mayagüez, and others identified as *Atrytone portensis* Mabille by Dr. Wm. Schaus, intercepted at Bayamón and Arecibo.

Another Hesperiid larva reared on leaves of sugar-cane at Pt. Cangrejos



in 1920, about an inch long when fully-grown, its head "yellow with brown markings, its body opalescent grey-green, with two noticeable yellow spots on the twelfth segment dorsal and very short black hairs on the thirteenth segment," as reported in "The Minor Sugar-Cane Insects of Porto Rico" (Jour. Dept. Agr. P. R., 5 (2): 5-47, fig. 19. San Juan, April 1921), was identified by Mr. Carl Heinrich as possibly *Choranthus ammonia* Plotz, and later by Dr. Wm. Schaus as *Choranthus haitensis* Skinner.

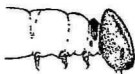
*Choranthus borinconus* was described by Mr. Frank E. Watson as a *Godmania* (1937-9), the type from Aibonito, others from San Juan and Dorado, being the butterfly listed by Drs. Dewitz and Stahl as *Pamphila silius* Latreille, and by Herr Möschler and Dr. Gundlach as a *Hesperia*. Numerous interceptions of this butterfly have been made: at Ponce identified by Dr. Wm. Schaus as *Choranthus hesperia* Plotz, and at San Juan and Mayagüez as *Choranthus hübnerei* Plotz, but as Mr. Watson had not described the female, it was not until Mr. Francisco Seín reared adults of both sexes from larvae feeding on the pinnae of areca palm that identification by Mr. J. F. Gates Clarke made possible the description of the male by Mr. Wm. P. Comstock (1944-563). They are quite different in appearance, the female having a ground color of "dark brown with ferruginous scaling" and yellowish subhyaline spots on the forewing, while the male is a shade of deep orange bordered with brown. The caterpillar differs from that of *C. vitellius* in that the four curving bands on the front of the head are dark brown ventrally, fading to dull orange above, only the thoracic half-collar black. As this is almost the only insect attacking the betel palm, *Areca catechu* L., it would be of considerable importance if at all abundant on such a popular ornamental.

*Lerodea tripuncta* (Herrich-Schäffer) is a little brown butterfly with three small white spots on the forewing, listed from Puerto Rico by Drs. Dewitz and Stahl as a *Cobalus*, and by Herr Möschler and Dr. Gundlach as a *Hesperia*. It has been intercepted on El Yunque, at Río Piedras, Quebradillas, Mayagüez and Ponce, apparently occurring in all parts of Puerto Rico, and collected on Mona Island by Dr. Luis F. Martorell, and by Prof. J. A. Ramos. According to Mr. Wm. P. Comstock (1944-566), "the larvae feed on Guinea grass and probably other grasses, pupation occurring in a cocoon formed of a rolled grass blade spun together with silk."

*Calpodes ethlius* (Cramer) was first noted in Puerto Rico by Dr. Gundlach. "La oruga se alimenta de las hojas de maranta y canna, y difiere por su forma, transparencia de la piel, y por la forma de la crisálida de las otras especies antillanas." It is number 1645 on Van Zwaluwenburg's list, and its abundance at Isabela was noted by Dr. M. D. Leonard (1932-127). Mr. John D. More vainly attempted control on the hedge of cannas

at the Union Club of Santurce during the summer of 1922. Control by DDT is now much simpler than when one was forced to use arsenate of lead, of poor adhesion to waxy canna leaves. For observing caterpillar internal anatomy these larvae are most useful, not only because of their almost perfect transparency but also because of their large size. The black-brown adults are possibly the largest Hesperiid in Puerto Rico, and may at once be distinguished by the whitish hyaline spots in the hindwing, three in number (two single and one double), as well as the much larger hyaline spots in the forewing.

*Panoquina nyctelia* (Latreille), identified for Mr. Thos. H. Jones as *Prenes ares* Felder by Dr. Harrison G. Dyar, is thus called in all the economic literature from the account in Jones and Wolcott (1922-41), illus-



Head and thorax of larva of *Panoquina nyctelia* (Latreille), twice natural size. (Drawn by Thos. H. Jones.)



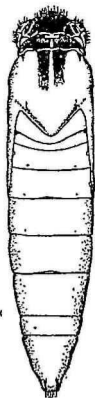
Front view of head of larva of *Panoquina nyctelia* (Latreille), twice natural size. (Drawn by Thos. H. Jones.)

trated by drawings of the front and side view of the head and chrysalis, almost to date. It is one of the more common Hesperiid caterpillars feeding on the leaves of sugar-cane in Puerto Rico. The adult may be most easily recognized by the largest of the white hyaline spots on the forewing being almost quadrangular, and the larva by the black collar on the dorsum of the neck.

*Panoquina nero* (Fabricius), of which Mr. Frank E. Watson described the local subspecies (1937-4) under the name of *belli*, was listed by Dr. Dewitz as a *Goniloba*, and by Herr Möschler and Dr. Gundlach as a *Hesperia*. Most unfortunately, the identification under this name by Dr. Harrison G. Dyar for the material collected by Messrs. D. L. Van Dine and Thos. H. Jones, referred to the next species, and all the economic notes under *nero*, including the drawings of larva, pupa and adult by Mr. Jones, are of *sylvicola*, a smaller but similarly marked species. The largest white hyaline spot on the forewing of *sylvicola* is shaped like a lop-sided arrow-head; that of *nero* has a very blunt point, but *nero* may most easily be recognized by the broad white transverse band on the underside of the hindwings, barely perceptible above. The Río Piedras collection contains one specimen collected by Mr. Thos. H. Jones on El Duque on March 9, 1914, which Dr. Wm. Schaus in 1923 had tentatively identified as "near *corrupta* H. S. of Cuba, appears peculiar to P. R. and is probably undescribed," and two others from Río Piedras, but Mr. Wm. P. Comstock

(1944-569) lists many other localities, including Adjuntas, Mayagüez and Ensenada, indicating island-wide distribution.

*Panoquina sylvicola* (Herrich-Schäffer), of which Mr. Frank E. Watson described the local subspecies (1937-6) under the name of woodruffl, was listed from Puerto Rico by Drs. Dewitz and Stahl as a *Goniloba*, and by Herr Möschler and Dr. Gundlach as a *Hesperia*. The larva is the most common Hesperiid caterpillar to be found attacking cane leaves, but in "The Seasonal Cycle of Insect Abundance in Puerto Rican Cane Fields"

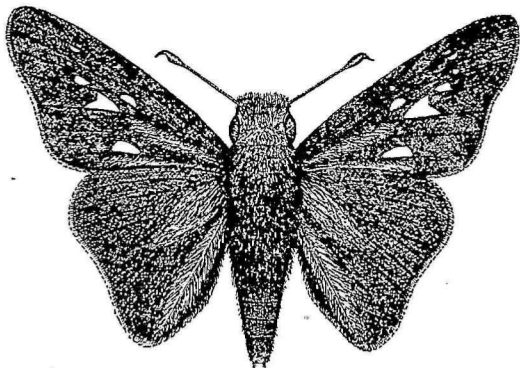


Pupa of *Panoquina nyctelia* (Latreille), twice natural size. (Drawn by Thos. H. Jones.)

(Jour. Agr. Univ. P. R., 27 (2): 95-104, fig. 12, ref. 16. Río Piedras, June 1944) its complete absence from April to September is recorded, due to total parasitism by *Oöencyrtus prenidis* Gahan of the eggs. As *Prenes nero* Fabricius (due to original misidentification by Dr. Harrison G. Dyar) it is number 319 in Van Zwaluwenburg's list, and is repeatedly mentioned by Messrs. D. L. Van Dine, Thos. H. Jones and E. G. Smyth as a pest of sugar-cane, the most complete account appearing from the notes of and with the original illustrations by Mr. Jones (1922-39). From the larvae he reared the parasites which Mr. C. F. W. Muesbeck described as *Apanteles prenidis*, and also *Ardalus antillarum* Gahan, and noted direct attack by the

paper-nest wasp, *Polistes crinitus* Felton. Only *Trichogramma minutum* Riley was reared from the eggs by Mr. Jones during the years 1912 to 1914, altho recently the only egg-parasite was *Oöencyrtus*.

*Panoquina ocola* (Edwards) was reared in 1912-13 by Mr. Thos. H. Jones from larvae eating the leaves of sugar-cane and *Hymenachne amplexicaulis*, but he left no description of them. Apparently they were so similar to those of *P. sylvicola* as to be unrecognized as distinct until the adults appeared. Indeed, the adults also are quite similar, being somewhat smaller,



Adult of the common Sugar-Cane Hesperiid, *Panoquina sylvicola woodruffi* Watson, twice natural size. (Drawn by Thos. H. Jones.)

with smaller spots. They have repeatedly been intercepted from various points along the north coast, but there are no records of occurrence in xerophytic Puerto Rico.

*Panoquina panoquinoides panoquinoides* (Skinner) is the smallest of the genus in Puerto Rico, according to Mr. Wm. P. Comstock (1944-571), of which "the small, yellow hyaline spots of the forewing correspond in position with those of *ocola*, but they are frequently obsolete and sometimes absent."

*Perichares phocion phocion* (Fabricius), listed from Puerto Rico by Drs. Stahl and Dewitz as *Goniloba corydon* Fabricius, and by Herr Möschler and Dr. Gundlach as *Hesperia corydon*, the latter noting "la oruga se cría en varias gramíneas de hoja no pequeñas, pues se esconde entre ellas reunidas

con su seda como todas las orugas de esta familia," is a minor pest of sugar-cane, being number 308 on sugar-cane in Van Zwaluwenburg's list. "Conspicuous because of its size and hairiness, being entirely green with broad greenish-yellow dorsal stripe and long white hairs, caterpillars or pupae were found only from September to April, and only on the north coast: Coloso to Mameyes. One fully grown caterpillar, possibly attempting to pupate, was found being eaten by crazy ants, *Prenolepis longicornis* Latreille," during the five years 1936-1941 in which young cane was examined for egg-clusters of *Diatraea saccharalis*. In January 1922 caterpillars were noted on cane at Guánica, Arecibo and Toa Alta, possibly marking a period of exceptional abundance. Distribution is island-wide, Mr. R. G. Oakley having intercepted adults at Ponce. Typical adults have two larger amber hyaline spots in the forewing, and two small ones, which, in the males are inside the points of a crescent of grey scales.



Larva of the common Sugar-Cane Hesperiid, *Panoquina sylvicola-woodruffi* Watson, twice natural size. (Drawn by Thos. H. Jones.)

#### HETEROCERA: Moths

Prof. Wm. T. M. Forbes of Cornell University has most recently treated the "Heterocera or Moths (excepting the Noctuidae, Geometridae and Pyralidae) Insects of Porto Rico and the Virgin Islands" (Scientific Survey of Porto Rico and the Virgin Islands, N. Y. Academy of Sciences, 12 (1): 1-171, pl. 2, ref. 52. New York, 1930). To this he added a "Supplementary Report on the Heterocera or Moths of Porto Rico" (Jour. Dept. Agr. P. R., 15 (4): 339-394, pl. 6. San Juan, November 1931) that is also reprinted as a supplementary part of Volume 12 of the Scientific Survey. His nomenclature and order of listing are followed in this account. To him the writer is most greatly indebted for a final reading of the MS as it was being printed. He rechecked all the locality records and added innumerable notes on nomenclatorial and other changes.

#### Euchromiidae (Syntomidae, Amatidae)

*Phoenicoprocta parthenii* (Fabricius), a clear-wing moth with red tegulae, was first listed from Puerto Rico by Dr. Dewitz as *Glaucopsis multicolorata* Walker, as a *Poecilosoma* by Herr Möschler and Dr. Gundlach. It was identified as a *Mallodeta* by Dr. Wm. Schaus: a specimen collected in 1912 at Río Piedras by Mr. Thos. H. Jones, and also by Dr. Harrison G. Dyar:

a specimen collected by Mr. E. G. Smyth at Hda. Santa Rita, Guánica. Prof. Forbes (1930-20 and 1931-341) lists collections at Aguadilla, Isabela and Coamo, and it has been intercepted at Bayamón.

*Phoenicoprocta capistrana* (Fabricius) has "tegulae solidly colored: yellow, or black and blue, not red." It was listed by all the earlier entomologists as *Glaucopis selecta* H. S., and in "Insectae Portoricensis" (1923 156) as a *Bombiliodes*, but the only recent collection is a specimen in the AMC collection: from Coamo.

*Eunomia columbina* (Fabricius), listed by the earlier entomologists as *Glaucopis insularis* Grote, was reared by Dr. Gundlach, who notes "la oruga en las convolvulaceas." Prof. Forbes (1930-22) lists a specimen from Maricao, which "leans a little toward *rubripunctata*," and it is as *Eunomia rubripunctata* Butler that Mr. J. F. Gates Clarke identified the specimen which Dr. Luis F. Martorell collected at light on Mona Island.

*Nyridela chalciope* (Hübner), described as an *Isanthrene* from Habana, Cuba, was thus listed from Puerto Rico by Herr Möschler and Dr. Gundlach, the latter noting "la oruga se cría en la *Cupania americana*." Drs. Stahl and Dewitz use the generic name *Glaucopis*. Prof. Forbes (1931-341) lists specimens collected by Mr. Francisco Seín at Lares.

*Cosmosoma auge* (Linnaeus), originally described as a *Sphinx*, is the largest and most abundant of the clear-wing moths of Puerto Rico, brilliant with "abdomen blue dorsally, orange on sides," to quote from Prof. Forbes (1930-23). Drs. Dewitz and Stahl list it as *Glaucopis omphale* Hübner, and Herr Möschler and Dr. Gundlach use this specific name, the latter noting "la oruga se cría en la *Mikania*." It has been reared from a cocoon on a leaf of "cedro" (*Cedrela mexicana*) at Cayey, and adults have been collected at light from numerous points in the more humid parts of the Island, from the coast to El Yunque.

*Cosmosoma achemon* (Fabricius), var. *tyrrhene* Hübner, listed by Drs. Dewitz and Stahl as a *Glaucopsis*, according to Prof. Forbes has the "abdomen orange dorsally; blue on sides." Adults have been collected from numerous points in the more humid parts of the Island.

*Lymire flavicollis* (Dewitz), described (1877-94) as an *Echeta* from Puerto Rico, is a small greyish moth with plumose antennae, a yellowish collar, its wings entirely covered with scales. Drs. Dewitz and Stahl also list from Puerto Rico the Cuban *Echeta albipennis* H. S., and Dr. Wm. Schaus determined one unlabeled specimen from Puerto Rico as the Jamaican *Lymire melanocephala* Walker, listed in "Insectae Portoricensis" (1923-157). Prof. Wm. T. M. Forbes, in his "Notes on West Indian Syntomidae and Arctiidae (Lepidoptera)" (Bull. American Museum Nat. Hist., 37 (14): 339-345. New York, 1917), on page 345 redescribes the local species under the name of *Lymire senescens*, the type from Naguabo,

but later (1930-24) indicates its synonymy and the characters by which the other West Indian species may be recognized. Several adults have been collected at light on El Yunque, but others are from Mayagüez and Coamo, and one was reared from a cocoon intercepted on a cucumber leaf at Caguas.

*Horama panthalón* (Fabricius), originally described as a *Zygaena*, was listed from Puerto Rico by all the earlier entomologists, and at times may be exceedingly abundant. On January 9th, 1923, Mr. Francisco Seín collected in his hand eight adults at Boquerón, resting on leaves of "malvavisco" (*Waltheria americana*). They are narrow winged, brownish moths, with compactly plumose antennae, the abdomen banded with yellow, their prominent yellow-scaled hindlegs with distal third of tibia black. Altho Dr. Stuart T. Danforth had specimens from Tortuguero Lagoon, all other collections are from southwestern Puerto Rico: Añasco, Mayagüez, San Germán, Boquerón, Guayanilla, and Ponce to Aguirre and Guayama.

*Horama pretus* (Cramer), originally described as a *Sphinx*, was listed by all the earlier entomologists and is P. R. 151 in Van Zwaluwenburg's list. It has a wingspread of an inch and a half, its wings opaque with chocolate brown scales, its antennae with a black club and terminal yellow hook, yellow collar and metathorax, first segment of the abdomen mostly grey, the second laterally yellow, others above velvety brown. This strikingly beautiful moth has an equally brightly-colored larva, described in "Insectae Portoricensis" (1923-157) as "bright reddish-orange, reddest on thorax and head, shining, 15 mm. long, 7 mm. wide when fully grown; body with numerous spreading tufts of grey and white hairs, curved towards their tips; on the seven anterior abdominal segments dorsally are four compressed tufts of black hair in pairs, bending towards each other, the anterior pair of each segment closer together and touching at apex." They live in silken nests, webbing together leaves of "cocorrón" (*Elaeodendron xylocarpum*) and spinning cocoons of thin grey silk with longer hairs of the larva entangled in it, the pupa itself being a bright reddish brown in color. Larvae have been noted at Pt. Cangrejos, Manatí, Arecibo and Boquerón, and adults, altho sometimes attracted to lights at night, as at Río Piedras and Guánica, are more often noted on flowers in the daytime, as at Pt. Salinas, Boquerón and on Vieques Island.

*Empyreuma pugione* (Linnaeus), originally described as a *Sphinx* from St. Thomas, more nearly resembles a tarantula-hawk (*Pepsis rubra*) in color and general appearance, if not in habits and character. Listed from Puerto Rico by all the early entomologists, Dr. Gundlach notes "oruga en *Nerium*" and indeed oleander appears to be the only host of the larva. Listed as *E. lichas* Cramer by Mr. R. H. Van Zwaluwenburg under number

1634, he described (1916-45) the eggs as "round, yellow, brown before hatching, slightly iridescent, sculptured with dull sheen, regularly spaced in groups on under side of leaf. Larvae dull orange, hairy, with silvery lateral stripes. Larval stage 26 days, pupal stage 13 days. Adult has crimson wings and dark blue body." Locally, the hairy caterpillars may become a serious pest on individual oleander bushes, occurring in all the more humid parts of the Island. It has been definitely recorded from Mayagüez, Aguadilla, Isabela, Arecibo and Bayamón, with many records in the San Juan metropolitan area.

*Correbidia terminalis* (Walker), originally described as *Euchromia* (*Pionia*), was listed from Puerto Rico as *Charidea cimicoides* H. S. by all the earlier entomologists, Dr. Gundlach noting "la oruga vive en la cara inferior de las hojas de *Cecropia*, formando luego un capullo poco primoroso." This black and red banded moth is an inhabitant of the hurricane forest and the coffee groves, Prof. Forbes reporting recent collections on El Yunque and at Lares, and additional specimens have been taken at light on El Yunque and at El Verde subsequently.

*Correbidia bicolor* (Herrich-Schäffer), listed from Puerto Rico by Herr Möschler and Dr. Gundlach as a *Charidea*, is considered by Prof. Forbes (1930-27) as "possibly an extreme light form of the preceeding, from which it appears to differ only in color," being mostly orange.

#### Nolidae

*Celama sorghiella* (Riley), originally described as a *Nola*, was re-described from Puerto Rico by Herr H. B. Möschler (1889-118) as *Nola portoricensis*. It is a minute whitish moth with some pale brown and blackish scaling, occurring, according to Prof. Forbes (1930-28), in the southern United States to northern South America, Argentine, rare or absent in tropical South America. As the caterpillars feed on the arrows of sugar-cane, this peculiar distribution, paralleling that of the culture of sugar-cane, is quite obvious. The small hairy, yellowish caterpillars, with pink lateral stripes and dark yellow heads are at times enormously abundant in sugar-cane arrows, and may even eat the pupae of those developing most rapidly. Dr. Wm. Schaus identified the reared adults, as well as numerous others intercepted at light at Bayamón.

*Nola bistriga*, described by Herr H. B. Möschler (1890-119) as a *Stenola* from Puerto Rico, is re-described by Prof. Forbes (1930-29) from a female from El Yunque as having a wingspread of 20 mm., "white, lightly sprinkled with black, with two nearly straight and parallel black lines across the wing." Mr. Francisco Sefn found an additional female at Lares.

*Nola sinuata* is described by Prof. Wm. T. M. Forbes (1930-29), the types



all females from Coamo, "expanse 16 mm., forewing dull white, lightly dusted with fuscous and some blackish scales."

#### Arctiidae: Woolly Bears

*Lycomorphodes strigosa* (Butler), originally described as a *Trichromia*, was re-described from Puerto Rican material by Herr Möschler (1890-114) under the name of *Lycomorpha fumata*. It has not since been found in Puerto Rico.

*Progona pallida* was described as a *Delphyre* from Puerto Rican material by Herr H. B. Möschler (1890-118): a grey moth with black costal margin. It is quite common according to Prof. Forbes (1931-342), who lists collections at San Germán, Lares, Dorado, Cayey and on El Yunque. Numerous specimens were intercepted at light at Bayamón, Dr. W. A. Hoffman found it as El Semil, and Don Julio García-Díaz (1938-96) lists it, presumably collected on El Yunque.

*Agylla sericea* (Druce) was re-described by Herr Möschler (1890-117) from a single Puerto Rican specimen under the name of *Gnophria limpida*. It has not since been found locally.

*Paramulona albulata* (Herrich-Schäffer), originally described as a *Mieza*, and thus listed from Puerto Rico by Drs. Stahl and Dewitz, has not since been found locally.

*Mulona nigripuncta* Hampson, is "whitish with some fifteen black dots and an orange dot near end of cell," according to Prof. Forbes (1930-33), the type having been from Colombia. Herr Möschler and Dr. Gundlach presumably had specimens, listed as *Cincia conspersa* Walker. Prof. Forbes (1931-342) notes collections at San Germán, Palmas Abajo and Lares. Repeated interceptions have been made at light at Bayamón, and at San Juan.

*Afrida charientisma* Dyar, listed by Herr Möschler, Dr. Gundlach and in "Insectae Portoricensis" (1923-158) as *Afrida tortriciformis* Möschler, is reported from El Yunque by Prof. Forbes (1930-34). It has been repeatedly intercepted at light at Bayamón, and was collected by Dr. W. A. Hoffman at El Semil, and by Mr. Francisco Sefín at Lares.

*Eupseudosoma floridum* Grote was listed from Puerto Rico by all the early entomologists as *E. nivea* H. S., Dr. Gundlach noting "la oruga en *Psidium*." Several of the beautiful brown hairy caterpillars with yellow heads were found feeding on leaves of guava at Río Piedras in April 1921, and reared to the satiny white adults, their abdomens, and in the males the inner margin of the hind wings, being suffused with pink. Dr. Richard T. Cotton had found larvae on guava at Caguas and reared adults in 1916, and Prof. Forbes (1930-34) also lists *Eugenia* as a host plant for the larva and records collections at Lares and Mayagüez.

*Ammalo insulata* (Walker), originally described as a *Halesidota*, was listed from Puerto Rico by all the early entomologists as *Pareuchaetes cadaverosa* Cramer and *P. affinis* Grote, not in synonymy, Dr. Gundlach noting "la oruga vive en *Vernonia*, *Eupatorium*." It is an entirely pale yellowish moth, except for a line of black spots on the dorsum of the abdomen, found in all parts of the Island from Guánica to Aibonito, Bayamón and Pt. Cangrejos, and collected by Dr. Luis F. Martorell at light on Mona Island. Prof. Forbes now calls it *Tanada insulata* (Walker).

*Phegoptera bimaculata* was described by Dr. Hermann Dewitz (1877-95) as a *Halesidota* from a single specimen from Puerto Rico, of which no subsequent specimen has been found locally.

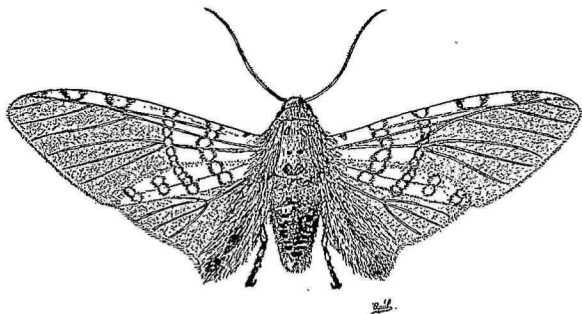
*Microdota hemiceras* was described by Prof. Wm. T. M. Forbes (1931-343), the type from San Germán, another from Coamo: a clay-colored moth, translucent, dusted with fuscous, with a wing expanse of 16 mm.

*Halysidota cinctipes* Grote was first recorded from Puerto Rico by Dr. Dewitz, and as *Halysidota tessellaris* Hübner listed by Herr Möschler, Dr. Gundlach noting "la oruga vive probablemente en *Hibiscus*." Prof. Forbes (1930-36) after describing the black and red-brown caterpillar, "clothed with gray-brown general hair and largely white pencils," states that "it eats *Coccoloba*." An adult was collected by Mr. Francisco Seín at Lares in December 1930, and another in July 1931.

*Calidota strigosa* (Walker), originally described as a *Sychesia*, was listed from Puerto Rico as a *Halysidota* by all the earlier entomologists. It is a large moth, thorax and forewings whitish striped with brownish-black, its abdomen light pink above, laterally spotted with black, not common in Puerto Rico, but found in abundance on Mona Island. According to Prof. Forbes (1930-37) its range includes the Greater Antilles and southern United States; "caterpillar on *Guettarda elliptica*; red-brown with shining black head."

*Epantheria icasia icasia* (Cramer), originally described as a *Bombyx*, was listed from Puerto Rico by all the earlier entomologists, who also gave the name *E. eridane* Cramer, not in synonymy. In Van Zwaluwenburg's list this was *E. eridanus* Cramer, number 1630, reared from *Erythrina micropteryx*, *Ipomea* sp, orange and banana, with the note "synonym of *E. icasia*: reared from the same egg-cluster and mated." In his "Notes on the Life History of *Epantheria eridanus* Cramer" (*Insecutor Inscitiae* Menstruus, 4 (1-3): 12-17. Washington, D. C., January-March 1916), Mr. R. H. Van Zwaluwenburg gave an extended account of this common woolly bear caterpillar which he found attacking also vanilla and *Cissus sicyoides*, describing all stages and noting *Eremotylus angulatus* Hooker as a parasite of the larva. In subsequent reports of the Mayagüez Station (1938-93, 1940-25 and 1943-29), it has repeatedly been noted as a pest on

vanilla. Dr. Richard T. Cotton (1918-285) records the attack of the caterpillars on stalks of celery, but actually they are almost omnivorous feeders in the garden, having been noted on beans, lima beans, tomato and eggplant, as well as on *Solanum torvum* and other weeds. The red-headed, black caterpillar, covered with stiff black hair, may be eaten with impunity by the crested lizard, *Anolis cristatellus*, and apparently relished, for three have been found devoured by the same lizard. Egg-clusters have been noted on *Psidium guajava* and *Cederela mexicana*, from one of which hatched 2,450 caterpillars. The adult is a large whitish moth with diagonal rows of brownish rings on the forewings, of which collections have been made in all parts of the Island, from El Yunque and Jácome Alto to Guánica and Isabela.



Adult of the Woolly Bear Caterpillar, *Epantheria icasia icasia* (Cramer), twice natural size. (Drawn by Raúl Maldonado.)

*Utetheisa ornatix ornatix* (Linnaeus) and *U. o. stretchii* (Butler) represent in Puerto Rico merely two color phases of the same species, of which the typical form has pale pink forewings with but a few scarlet dots only, while *stretchii* has forewings mostly cochineal pink, with prominent black spots. Listed from Puerto Rico by Dr. Dewitz as a *Deiopeia*, by Dr. Stahl as a *Callimorpha*, Dr. Gundlach gives all these names and *Utetheisa bella* Linn., noting "el colorido varía muchísimo, y por esto existen dos nombres. Muy común en los campos, la oruga se cria en *Crotalaria*." The scantily hairy, black and yellow banded caterpillars feed primarily inside the ripening pods of *Crotalaria*, and but rarely on the foliage, preferring the smooth pods of *retusa* to the hairy ones of *incana*. They void their excrement

outside the pods, and normally eat all the green seeds in a pod, leaving it clean and empty, with only the round hole for entrance and exit. They are often sufficiently abundant to cause appreciable losses when *Crotalaria* is being grown for seed production, but are of negligible importance when it is only for a cover crop or for green manure, and there is no record of an attempt being made at chemical control. The beautiful but rather weak-flying and helpless moths have been found in all parts of the Island and have an extensive neotropical distribution, a discussion of their races and variations being given by Prof. Forbes (1930-39 and 1931-343).

#### Pericopidae (Hypsidae in part)

*Composia sybaris* (Cramer), originally described as a *Phalaena*, was listed from Puerto Rico by all the earlier entomologists, Dr. Gundlach noting occurrence also in Jamaica, Santo Domingo and St. Croix. The record of *Composia fidelissima* H. S., as determined by Dr. Wm. Schaus, in "Insectae Portoricensis" (1923-179), refers to this species: a specimen captured by Mr. D. L. Van Dine at light in Arecibo. Altho the adults may come to light, they are day-flying moths, several having been noted flying in the bright sunlight in a coconut grove at Mameyes in November 1922, and feeding at flowers of "cariquillo" (*Lantana camara*). Prof. J. A. Ramos reports (1947-44) them on "the flowers of *Pisonia albida* at Uvero Beach, April 4-7, 1944" on Mona Island, Dr. Luis F. Martorell having previously collected them at light on Sardinera Beach. Indeed they normally have the habits and appearance of a butterfly; black winged with white spots, a few bright red ones near the anal margin, the black abdomen also being spotted with white. Dr. Harrison G. Dyar has described the pale yellow caterpillars as having blue-black transverse stripes on abdominal segments 1-7, red stripes on thorax and eighth and ninth segments of abdomen; head red, as are also legs and anal plate; black hair, with four long white hairs on mesothorax and eighth segment of abdomen.

*Ctenuchidia virgo* Herrich-Schäffer, of which Prof. Wm. T. M. Forbes described the local race under the name of *virginalis* (1930-42), the type from Maricao, others from Indiera, is a black moth with plumose antennae, marked with orange on abdomen and at base of forewings, spotted with white; the hindwings extensively suffused with blue or blue-green iridescence. This was identified by Dr. Harrison G. Dyar as *Composia subcyanea* Walker, as listed in "Insectae Portoricensis" (1923-179): an adult found resting on grass and weeds in an abandoned coffee grove at Indiera, in the mountains north of Yauco. Mr. Jorge Serralés in May 1941 collected one on El Yunque at light, indicating island-wide distribution in the higher mountains.

*Hyalurga* (or *Lauron*) *vinosa* (Drury) was listed from Puerto Rico by

all the early entomologists, Dr. Gundlach noting "la oruga en *Tournefortia* y *Heliotropium*." In "Some Notes on the Habits and Life History of *Lauron vinosa* Drury" (*Insecutor Inscitiae Menstruus*, 2 (7): 108-11. Washington, D. C., 1914) Mr. Thos. H. Jones described all stages, reared by him at Río Piedras, and his record is in Van Zwaluwenburg's list as P. R. 123: on *Heliotropium indicum*. The caterpillars have also been intercepted at Bayamón on "cotorillo" (*Schobera angiosperma*), and indeed the dark fluttery adults may be expected wherever any Borriginaceous host plant grows. Most of the hind wing is semi-transparent, as is the base of the forewing, which is surrounded by a triangle of dull orange, with a prominent transverse white band across the apex. Prof. Forbes (1930-42) records collection by Mr. Aug. Busck on Culebra Island, and adults have been intercepted by Mr. R. G. Oakley at Ponce.

#### Agaristidae (Phalaenoididae)

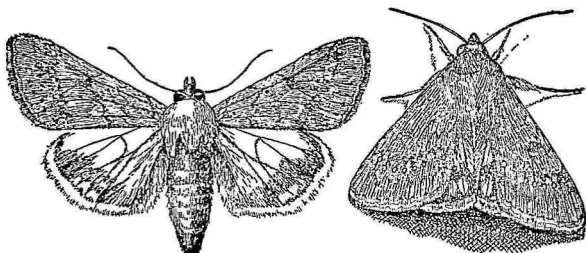
*Tuerta sabulosa* (Boisduval) was re-described from Puerto Rican material by Herr H. B. Möschler (1890-112) under the name of *Agarista noctuiformis*, and as a *Tuerta*, determined by Dr. Wm. Schaus, was listed in "Insectae Portoricensis" (1923-160). Prof. Forbes (1930-43 and 1931-344) records collections at Guánica, San Germán and Coamo of this moth which also occurs from New Mexico to Central America. Adults collected at light in the Guánica Insular Forest in August 1941 by Mr. Norberto Lugo were identified by Mr. Hahn W. Capps as *Misa sabulosa* (Boisduval), and presumably this is the preferred name at present. The light-colored fore wings are speckled and barred with scales of brown; the base of the hind wing is light yellow, the broad, sharply defined margin, dark brown; total wingspread 36 mm.

#### Noctuidae: Millers, Cutworms or Armyworms

Dr. William Schaus in writing the "Moths of the Family Noctuidae" (*Scientific Survey of Porto Rico and the Virgin Islands*, 12 (2): 175-290. New York, June 7, 1940) has provided a most modern systematic outline which will be followed in presenting the biologic notes on the members of this family, many of which are of major economic importance.

The American *Heliothis obsoleta* (Fabricius): the corn earworm, the tomato fruitworm and the cotton bollworm of the United States, in the latest list of "Common Names of Insects Approved by the American Association of Economic Entomologists" (November 14, 1946) is called *Heliothis armigera* (Hübner), of which it is an original homonym. It was thus listed from Puerto Rico by the early entomologists, Dr. Gundlach noting "en las mazorcas del maíz y en las cápsulas del algodón." Using one name or the other it has been noted or discussed at length by every

subsequent economic entomologist as a serious pest of corn, and a minor pest of beans, peppers, tomatoes, tobacco buds and seed pods, eggplant, peas, pigeon peas, and most recently attacking sunflower heads. Noted by Mr. L. Courtney Fife (1939-6) as not attacking cotton locally, caterpillars were abundant feeding within bolls at Isabela in 1950: the first record on this host since that of Dr. Gundlach. Even as a pest of the ears of corn its occurrence can by no means always be anticipated. But in the growing of sweet corn at the Mayagüez Station it proved to be a major pest, in the control of which Mr. B. A. App in "A Report on some Investigations of Corn Insects in Puerto Rico" (Jour. Agr. Univ. P. R., 25 (4): 21-31. Río Piedras, April 7, 1942) used hog rings, paper caps, string and wires. In



Adult of the Corn Earworm, *Heliiothis obsoleta* (Fabricius), twice natural size. (After Quaintance, U. S. D. A.)

the next few years, however, the use of pyrethrum extract in mineral oil proved to be such an outstanding success in the United States as entirely to displace such make-shift remedies. Against attack by these viciously-biting caterpillars on other vegetables no such obvious remedy is available. Most of the larvae noted in Puerto Rico are bright yellow, marked with dark brown and black, the adults showing little variation from the standard pattern of light yellowish-brown forewings, the hindwing deeply margined with dark brown. Of its economic status, Dr. Schaus (1940-180) merely notes: "larva on corn, tobacco buds, tomatoes, etc."

*Heliiothis* (or *Chloridea*) *virescens* (Fabricius) is not listed by Drs. Stahl and Dewitz from Puerto Rico, but Dr. Gundlach states "la oruga es muy dañina, principalmente al tabaco, pues vive en el cogollo y luego también en las cápsulas. Lo mismo en las cápsulas de *Hibiscus*, *Sesamum* y otras plantas. Una oruga que llevaba en la mano me mordía puesta con otras orugas se las comía." There is no record of attack on tobacco since

that of Dr. Gundlach, but Mr. John D. More did rear this greenish moth from cotton at Sabana Llana in 1922, and Mr. L. Courtney Fife (1939-6) records finding the larvae abundant on *Abutilon hirtum* at Guánica, Lajas and Boquerón in November 1935. It is mainly a pest on pigeon peas, however, being in Van Zwaluwenburg's list as number 1627: on *Caján cajan*, and thus noted or discussed by Messrs. Richard Faxon & C. P. Trotter (1932-446), by Dr. Mortimer D. Leonard (with A. S. Mills 1931-473, 1932-136 and 1933-122) and finally by the latter (1931-119) as eating cowpea pods. Up to 1935, thirty interception records of finding these caterpillars in pigeon peas had been made: at Isabela, Aguadilla, San Sebastián, Las Marías, San Germán, Ensenada, Peñuelas, Ponce, Juana Díaz and Aguas Buenas.

*Agrotis malefida* (Guenée), listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Argotis submucosa* H. S., is listed by Dr. Schaus (1940-180) as having been collected on Vieques Island, and at Ensenada and San Germán, the "larva a general feeder."

*Agrotis subterranea* (Fabricius) was listed from Puerto Rico by the early entomologists as *Argotis annexa* Treitschke, Dr. Gundlach noting "La oruga vive durante el día al pie de plantas tiernas, y sale al oscurecer para comer el tronco tierno. Causa daño en las huertas." This dirty brown cutworm, commonly known as "cachazudo" in Cuba, and "cuerudo" in Puerto Rico, is a serious pest of tobacco, and of it an extensive account is given in "Los gusanos de la Hoja del Tabaco" (Circular No. 53, Est. Expt. Insular, Río Piedras, pp. 1-15, fig. 8, pl. 1. San Juan, October 1922), and in "An Economic Entomology of the West Indies," pages 554 to 557, under the name of *Feltia annexa*.

In large part because of its ready availability, this cutworm was used in experiments "On the Amount of Food Eaten by Insects" (Jour. Dept. Agr. P. R., 9 (1): 47-58, ref. 6. San Juan, 1925), which indicated that tobacco leaves are 60% digestible by the larva, and that one eats "3.746 gr. of fresh tobacco leaves (or .5244 gr. dry), or 8.2 times as much as the weight of the adult." Altho normally a pest of tobacco in Puerto Rico, the caterpillars may attack other crops, as alfalfa at Fajardo in 1913, of which the adult was determined by Dr. Harrison G. Dyar, and cucumbers at Río Piedras in 1937. The year 1937 also marked an epidemic outbreak of these caterpillars at Boquerón where they destroyed three successive plantings of cotton, as related by Mr. L. Courtney Fife (1939-6). Moths have been collected at light at many points of Puerto Rico, not only in the tobacco regions of the mountains but also at Ponce and Guánica, and by Dr. Luis F. Martorell and Prof. J. A. Ramos (1947-45) on Mona Island. They are but little more attractive in appearance than the cater-

pillars, the forewings being a faded purplish-brown, with a lighter sub-marginal band and along the basal two-thirds of the costa.

*Agrotis apicalis* Herrich-Schäffer was listed from Puerto Rico by Herr Möschler and Dr. Gundlach, but has not since been collected locally.

*Agrotis repleta* Walker, as determined by Dr. Harrison G. Dyar, was reared by Mr. Thos. H. Jones in February 1912 from a "larva found under clod of dirt in section where *Laphygma* and *Remigia* were abundant" feeding on young cane leaves at Río Piedras.

*Anicla infecta* (Ochsenheimer) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Agrotis incivis* Guenée, and appears on Van Zwaluwenburg's list as number 1509: on millet, grass, seed cane. Mr. E. G. Smyth collected a dozen adults at light at Hda. Santa Rita in 1913, as determined by Dr. Harrison G. Dyar, and they have been repeatedly intercepted at light at Bayamón. They are light purplish-grey above, speckled with black scales, with a fat c-shaped mark towards the center of the forewing. The small caterpillars found attacking very young cane leaves in the greenhouse at Río Piedras were green except for a broad chalky white stripe along the side of the body just above the legs, but older ones tended to be brownish or yellowish; the chalky white stripe becoming light orange in color, margined with light yellow. In the brown caterpillars this continuous stripe from head to anus, just below the spiracles, is entirely yellow or yellow brown, with sometimes two or more small black marks just beneath most of the spiracles. The fully-grown larvae pupated on the surface of the soil, making little attempt at forming a cocoon. Dr. Schaus (1940-182) notes the occurrence of this species "throughout tropical America."

*Tiracola plagiata* (Walker) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Agrotis grandirena* H. S., but has not since been found locally.

*Lacinipolia parvula* (Herrich-Schäffer) was listed as a *Mamestra* from Puerto Rico by the early entomologists, Herr Moschler (1880-135) noting "Raupe an *Solanum torvum*." During the summer of 1916, Mr. Eugene G. Smyth repeatedly reared this from larvae on *Solanum torvum*, and collected adults at light at Río Piedras and Isabela. Dr. Schaus (1940-183) lists collections from Mameyes and Coamo. The moth is rather small for a Noctuid, the forewings gray-brown transversely banded with dark brown.

*Eriopyga adjuntas* was described by Dr. Wm. Schaus (1940-184) from a single male from Adjuntas, with a wing expanse of 24 mm., its forewings mostly "buffy brown."

*Xanthopastis timais* (Cramer), form *antillium* Dyar, was listed from Puerto Rico by all the early entomologists, Dr. Gundlach "la oruga se alimenta de las hojas y cebollas de amarillideas." It is number 1684 in



Van Zwaluwenburg's list: on *Hibiscus rosa-sinensis* and *Xanthosoma*. The caterpillars are often a serious pest on the leaves of the white spider amaryllis or "lirio" (*Hymenocallis declinata*) of the beaches of the north coast, on the red amaryllis or "amapola" (*Hippeastrum puniceum*) of the fields, in gardens attacking duendes and other cultivated kinds of amaryllis, as well as tuberoseas at times, being gregarious and often entirely destroying all aerial portions of the plants. The adults, often attracted to light, have hairy, dark brown thorax, wings mostly lavender in color, with brown areas and spots, and smaller spots or points of yellow. The larvae have bright yellow heads, dark purplish bodies with yellow spots, soft and watery. They are rapidly and very effectively controlled with DDT dust, applied directly to the caterpillars themselves.

*Leucania chejela* (Schaus), originally described from Guatemala, is listed by Dr. Schaus (1940-185) from Cuba, Jamaica and Puerto Rico.

*Leucania hamptoni* is the new name proposed by Dr. Wm. Schaus (1940-185) for what Herr Möschler and Dr. Gundlach listed from Puerto Rico as *Leucania clarescens* Hampson: a Cuban species not found locally. Specimens in the American Museum of Natural History were collected at Coamo Springs. For this and the other species of *Leucania* Dr. Schaus uses the generic name *Cirphis*, and this is the name most often used in the economic literature, especially for the sugar-cane feeding species: *latiuscula*.

*Leucania humidicola* (Guenée) was listed by Dr. Wm. Schaus (1940-186) from Coamo, and identified by Mr. J. F. Gates Clarke for Dr. W. A. Hoffman: specimens collected at light at El Semil, Villalba.

*Leucania jaliscana* (Schaus), originally described from Mexico, Central and northern South America, is listed by Dr. Schaus (1940-185) from Cuba, and from San Juan, Cataño, Toa Baja, and Guánica in Puerto Rico.

*Leucania latiuscula* (Herrich-Schäffer), listed from Puerto Rico by the early entomologists as a *Leucania*, and in addition re-described by Herr Möschler (1890-141) from local material as *Leucania punctifera* and *Leucania senescens*, is a minor pest, in Van Zwaluwenburg's list number 2010, on sugar-cane and grasses. It is listed or discussed by Mr. D. L. Van Dine (1913-257, 1913-33), by Mr. Thos. H. Jones (1914-462), and by Mr. E. G. Smyth (1819-144), but the most extensive account as a pest of sugar-cane is in Jones and Wolcott (1922-43). It is parasitized by a Tachinid, *Comp-silura oppugnator* Walton, the Braconid, *Apanteles marginiventris* Cresson and a species of *Euplectrus*. Mr. R. A. Vickery in his "Observations on *Cirphis latiuscula* H. Sch. in the Gulf Coast Region of Texas" (Jour. Agr. Research, 32 (12): 1099-1119, fig. 3, ref. 14. Washington, D. C., June 15, 1936), under "Economic History" on page 1100, gives a summary of the Puerto Rican records up to that time. It would appear that the larvae were much more abundant on sugar-cane in 1911 to 1913 than at any later period, for they were collected in large numbers in all the coastal, sugar-

cane growing regions of the Island during those years, and many adults noted at light, at Río Piedras, and at Guánica. In recent years adults have twice been intercepted at light at Bayamón, but were not noted in a five year (1936-41) survey of the cane fields of the Island, Dr. Schaus (1940-186) citing only collection by Prof. Forbes in 1939 from Vieques Island. The caterpillars vary considerably in ground color from pinkish and yellowish to light grey-brown; and are surprisingly similar in color, granulation and texture of skin to dying or dead cane leaves, altho they live and feed on normal, healthy green leaves. The adults are yellowish, creamy moths, their forewings finely and lightly striped with darker scales and a submarginal row of small darker spots.

*Leucania inconspicua* (Herrich-Schäffer) was listed from Puerto Rico by the earlier entomologists and as a *Cirphis* Dr. Schaus (1940-187) lists more recent collections from Cataño, Toa Baja, Coamo and Adjuntas.

*Leucania microsticha* Hampson, listed by Drs. Stahl and Gundlach as *Leucania secta* H. S., and by Herr Möschler (1880-141) as *Leucania comoides* Guenée: "Raupe auf gräsern," was listed by Dr. Schaus (1940-186) from Toa Baja, and has been intercepted at light at Bayamón, as identified by him.

*Leucania phragmitidicola* (Guenée), listed from Puerto Rico by Herr Möschler and Dr. Gundlach, is identified by Dr. Schaus (1940-187) from Coamo and Guayama, as a *Cirphis*.

*Leucania unipuncta* (Haworth), the common armyworm of temperate zones, was listed from Puerto Rico by the early entomologists as *Leucania extranea* Guenée. Mr. Thos. H. Jones reared it to adult from larva on grass in the winter of 1912, and the following summer Mr. E. G. Smyth collected six adults at light at Hda. Santa Rita, Guánica, all identifications by Dr. Harrison G. Dyar, but it has not since been found locally.

*Meliana rosea* (Möschler) is identified by Dr. Wm. Schaus (1940-187) from Ensenada and Coamo.

*Magusa orbifera* (Walker), listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Laphygma angustipennis* Möschler, is identified by Dr. Schaus (1940-188) from Cataño, and at Ensenada "both normal form and ab. *divida*."

*Speocropia scriptura* (Walker), re-described from Puerto Rico by Herr H. B. Möschler (1890-131) under the name of *Polyphaenis nona*, has not since been found locally according to Dr. Schaus (1940-188).

*Cropia infusa* (Walker), listed from Puerto Rico as *Decalea infusa* Walker by Herr Möschler and Dr. Gundlach, has not since been found locally, according to Dr. Schaus (1940-189).

*Perigea albiger* Guenée, listed from Puerto Rico by Herr Möschler and Dr. Gundlach, has recently been collected at Coamo, Aibonito and Ensenada, according to Dr. Schaus (1940-190).

*Perigea apameoides* Guenée, listed from Puerto Rico by the early entomologists as *Perigea subaurea* Guenée, was collected at light at Hda. Santa Rita, Guánica, by Mr. E. G. Smyth, and repeatedly intercepted at light at Bayamón. Dr. Schaus (1940-190) lists collections at seven Puerto Rican localities, and on St. Thomas, and occurrence from the United States to Argentina. The adult has a white spot in the middle of the variegated bronzy-brown forewing.

*Perigea concisa* (Walker), as identified by Mr. Frank E. Watson for moths collected by Mr. E. G. Smyth at light at Hda. Santa Rita, Guánica, has since been repeatedly intercepted at light at Bayamón, and Dr. Schaus (1940-191) records the attack of caterpillars on cotton at Mayagüez, as well as collection of adults at Coamo and Arecibo.

*Perigea circuita* Guenée was listed by the early entomologists from Puerto Rico, and unlabeled specimens have since been determined from there.

*Perigea cupentia* (Cramer) was listed from Puerto Rico by Dr. Stahl as *P. infelix* Guenée, and by Dr. Gundlach and Herr Möschler as a *Craniophora*. Mr. E. G. Smyth reared the caterpillars, "green mottled with cinnamon brown," from "salvia" (*Pluchea purpurascens*) in the summer of 1916 at Río Piedras, as did also Mr. Francisco Seín in 1923, and Mr. A. S. Mills at Pt. Cangrejos. The adults have dark hindwings, and forewings of "cinamon brown" mottled with mauve, and have been taken at light at Río Piedras and intercepted at Bayamón. Dr. Schaus (1940-189) lists collections at Lares and Aibonito. An exceptionally light-colored specimen found dead on the window ledge of the laboratory at Río Piedras in March 1945, identified by Mr. Carl Heinrich as *Condica cupentia* (Cramer), is quite different. Prof. Forbes notes that Mr. J. G. Franclemont considers that two species are combined under this name. He labels *cupentia* the bluish one with strongly mottled wings: material from St. Thomas; he calls the Puerto Rican species with a large area of nearly smooth cream or clay color *epopea* Cramer.

*Perigea selenosa* Guenée, listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *P. stelligera* Guenée, is identified by Dr. Schaus (1940-191) from San Germán, noting that it "has the white discal spot large."

*Perigea sutor* Guenée, as identified by Mr. Frank E. Watson for Mr. E. G. Smyth: moths which he had reared during the summer of 1916 from green caterpillars feeding on "salvia" (*Pluchea purpurascens*) at Río Piedras, was subsequently intercepted at light at San Juan and Bayamón, and Dr. Schaus (1940-191) lists collections at Naguabo, Coamo and Ensenada. These moths have almost no markings on their plain brown forewings.

*Perigea punctirena* (Walker), listed as a *Hadena* from Puerto Rico by Herr Möschler and Dr. Gundlach, has not since been found locally.

*Cobaliodes tripunctus* Hübner was listed by Dr. Dewitz (1877-243) from Puerto Rico.

*Eriopus floridensis* Guenée, as determined by Dr. Schaus, was reared in the summer of 1922 from a fern at Río Piedras; a light green caterpillar when small, striped with lighter green, but in the last instar dark brown, with stripes of light yellow on either side of the back. It was first listed from Puerto Rico as *Eriopus elegantulus* H. S. by Herr Möschler, Dr. Gundlach noting "criado en *Aspidium*." Adults have since been intercepted at light at Bayamón. Dr. Schaus (1940-192) notes that it occurs in Florida and tropical America, and (in correspondence) that it "sometimes attacks ferns in greenhouses." Prof. Forbes adds that it actually straggles as far north as Binghamton, New York.

*Eriopus jamaicensis* Möschler, listed from Puerto Rico by Herr Möschler and Dr. Gundlach, is identified by Dr. Schaus (1940-192) from Lares.

*Agripodes jucundella*, as one of "New American Moths and Notes," was described by Dr. Harrison G. Dyar, the type from Indiera, Puerto Rico (Insecutor Inscitiae Menstruus, 10 (10): 8-18. Washington, D. C., 1922), reared by Mr. Francisco Seín from a grey-green and dark brown caterpillar feeding on lichens of trees in the hurricane rain forest. It formed a thin, tough cocoon in the lichen, and the emerging moth has forewings light green, marked with black and white, the hind wings grey. Dr. Schaus (1940-193) lists collection of adults at Aibonito.

*Cephalospargeta elongata* was described by Herr H. B. Möschler (1890-120) from Puerto Rican material collected by Dr. Gundlach and listed by him. Dr. Schaus (1940-193) records one recent collection from Guánica.

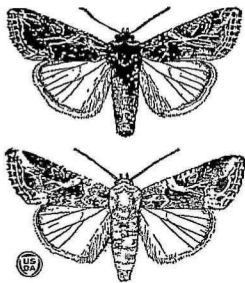
*Metaponpneumata rogenhoferi* was described by Herr Heinrich B. Möschler (1890-159), the type from Puerto Rico. Some small gray-brown moths collected by Mr. E. G. Smyth at Hacienda Santa Rita, Guánica in the summer of 1913, identified by Dr. Harrison G. Dyar as *Prorachia (Eumestleta) daria* Druce, are this species. Dr. Schaus (1940-194) lists collections from Coamo and Guayama, and Prof. Forbes from Aguirre.

*Catabena esula* (Druce) is identified by Dr. Wm. Schaus (1940-194) from Coamo, Guánica and San Germán. Mr. J. F. Gates Clarke identified for Dr. Luis F. Martorell these practically unmarked grey moths, their clear hindwings margined with brown, which he found in abundance at light on Mona Island, at the lighthouse and at Sardinera Beach. Prof. J. A. Ramos (1947-45) also found them abundant on Mona.

*Catabena vitrina* (Walker), listed as *Callierges divisa* H. S. from Puerto Rico by Herr Möschler and Dr. Gundlach, has recently been collected at both Guánica and Aguirre according to Dr. Schaus (1940-194). Extending straight across its grey fore wings from base to the middle of the margin is a narrow black stripe, paralleled near the margin by short stripes.

*Prodenia androgea* (Cramer) was listed from Puerto Rico by the early entomologists, Dr. Gundlach noting "la oruga vive durante el día al pie de una planta tierna y de noche sale de la tierra a comer. Hace mucho daño en las huertas y otras tierras cultivadas, pues troncha los renuevos. Come de muy diferentes plantas." Dr. Schaus (1940-196) questions the correctness of this identification, altho "in the U. S. National Museum (is) a female from an old Porto Rican collection . . . , also a specimen from Cuba."

*Prodenia dolichos* (Fabricius), listed from Puerto Rico as *P. commelina* Smith and Abbot by Herr Möschler and Dr. Gundlach, is identified by Dr. Schaus (1940-195) from Coamo and Ensenada, and Prof. Forbes collected it on Vieques.

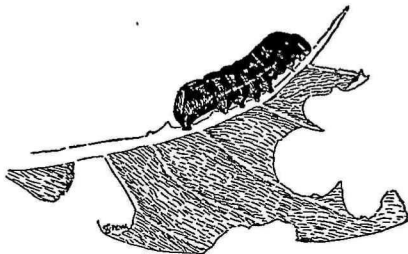


Dark and light forms of the adult of *Prodenia ornithogalli* Guenée, twice natural size. (After Chittenden.)

*Prodenia latifascia* Walker, listed as *P. testaceoides* Guenée by the earlier entomologists, is in Van Zwaluwenburg's list as number 912 on tomato. A cutworm attacking tobacco at Caguas in May 1921 was reared to adult, determined as this species by Dr. Wm. Schaus, and based on this instance are the records of it as a pest of tobacco. Another individual, which ate nearly twice as great a weight of tobacco leaves (6.697 gr.) as the common "cuerudo" (*Feltia subterranea*) in attaining full size, died in pupating. The adults have pinkish-purple, semitransparent hind wings, and a complicated pattern in the male of yellowish-brown on the forewings, with a large oval lighter area near the center towards the costal margin. Prof. Forbes points out that "the female is dull brown mixed with whitish, with very little yellow at inner margin, or none."

*Prodenia ornithogalli* Guenée, listed as *P. eudiopta* Guenée from Puerto Rico by Herr Möschler and Dr. Gundlach, was noted by Mr. Thos. H.

Jones (1915-8) as having been reared by him "from larvae found feeding on a weed of the family Convolvulaceae." Mr. E. G. Smyth collected eight adults at light, as identified by Mr. Frank E. Watson, during the summer of 1913, finding them "rather rare at light but a common species in the garden." This black cutworm, marked with golden triangles and a lateral band of yellow, preferably feeds on tobacco leaves, usually from the lower side, but has been noted on the upper side in full sunshine. Cuban tobacco growers call it "matequilla," but locally in Puerto Rico it is "casimir." It has also been noted feeding on the fruits of eggplant, tomato and pepper, and in 1942 and 1944 was observed on cowpeas at Loiza. Mr. E. G. Smyth records the caterpillars feeding on roses, and at the Mayagüez Station (1938-59) they "seriously damaged garden peas on Las Mesas." The adults show considerable variation in the depth of coloration on the forewings, but the curved transverse band across the forewing is quite constant.



Larva of *Prodenia ornithogalli* Guenée on tobacco leaf. Natural size. (Drawn by G. N. Wolcott.)

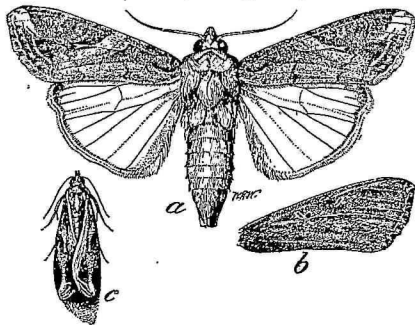
Prof. Forbes questions the occurrence of *ornithogalli* in the West Indies, tho it is common as far south as Florida. "*P. latifascia* is very like it, except the longer wings, and is sexually dimorphic in the same way: the female with more diagonal pattern, the male with a good deal of straw yellow about the middle of the wing. Aside from the longer or shorter wings, the best way to tell them apart is probably the brown terminal area which is markedly widened opposite the cell between  $M_1$  and  $M_2$ , veins 5 and 6, in *ornithogalli*, but not widened in *latifascia*."

*Prodenia pulchella* Herrich-Schäffer, listed from Puerto Rico by the earlier entomologists, has been collected at Río Piedras, Naguabo and Coamo according to Dr. Schaus (1940-195), and intercepted at light at Bayamón.

*Prodenia rubrifusa* Hampson was identified by Dr. Wm. Schaus from

material intercepted at light at Bayamón, and collections at Coamo, Río Piedras and Lares are noted by him (1940-195).

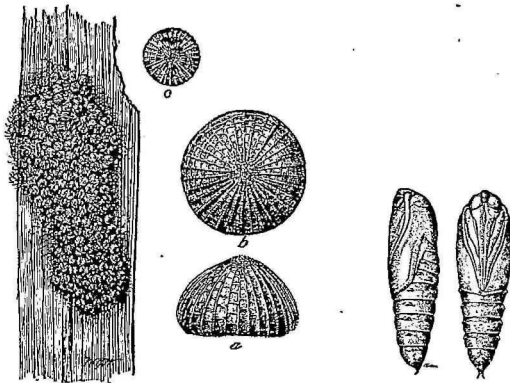
*Laphygma frugiperda* (Smith and Abbot) was listed from Puerto Rico by the early entomologists, Dr. Gundlach noting "la oruga daña a veces las siembras de maíz, caña y otras," and in Van Zwaluwenburg's list is number 912 on sugar cane in seed beds, on *Panicum* sp. Listed and discussed as a pest of sugar-cane by Mr. D. L. Van Dine (1913-13 and 1913-257) and Mr. E. G. Smyth (1919-143), the most extensive account of this grassworm is that by Mr. Thos. H. Jones in "Some Notes on *Laphygma frugiperda* S. & A. in Porto Rico" (Jour. Ec. Ent., 6 (12): 230-6, Concord, April 1913), and as a pest of corn and onions (1915-7), listing three Tachinid parasites,



*Laphygma frugiperda* (Smith & Abbot). Adult with folded wings (c) is natural size. (Drawn by W. R. Walton, U. S. D. A.)

one wasp, three predators and two fungi. The record of attack by *Spicaria* (*Botrytis*) *rileyi* and *Empusa sphaerosperma* given by Mr. J. R. Johnston in "The Entomogenous Fungi of Porto Rico" (Bulletin No. 10, Board Commissioners of Agr. P. R., pp. 1-33, pl. 9, fig. 1. San Juan, 1915) is quoted by Mr. J. A. Stevenson (1918-207) and by Miss Vera K. Charles (1941-729). The caterpillars are also eaten by the lizards *Ameiva exsul* and *Anolis pulchellus*, and at the Mayagüez Station (1938-102), Mr. W. K. Bailey noted that they were attacked by three species of paper-nest wasps. Despite all these factors of natural control the fall armyworm or southern grass worm continues to be the major cutworm pest of young sugar-cane, corn, fruit of tomatoes, green pods of beans, eggplant, pepper, onions, alfalfa and many grasses. It has been found burrowing into gladiolus bulbs, and also attacking small eucalyptus seedlings. It has been noted burrow-

ing into the ground to eat the sprouting eyes of sugar-cane seed-pieces. The eggs are laid in clusters covered with hair from the body of the female, sometimes on the leaves of the plant to be eaten, but quite as often on vegetation, such as the pinnae of the areca palm which can not be eaten by the small caterpillars, or on inert objects, such as posts or stones or clods of earth, from which the just hatched caterpillars must migrate before they have anything but their own empty egg-shells to eat. "It is doubtful if a single field of corn ever reaches maturity in the West Indies without



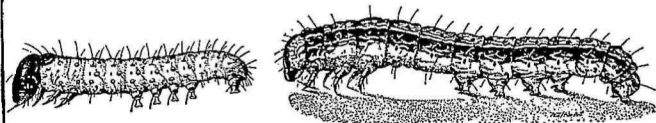
Egg-mass of *Laphygma frugiperda* (Smith & Abbot), twice natural size, and *a*, single egg from the side, *b*, from above, greatly magnified, and *c*, just about to hatch. (Drawn by W. R. Walton, U. S. D. A.)

Pupae of *Laphygma frugiperda* (Smith & Abbot), from side and from below, twice natural size. (Drawn by W. R. Walton, U. S. D. A.)

being attacked by *Laphygma*, and most corn suffers constant reinfestation." Attack on some vegetable crops can not similarly be predicted with certainty, and damage, as in the case of eggplant fruit, lima beans, and tomatoes, may not be observed until the caterpillars have attained large size, when the injury is irreparable. In fields of young cane where toads are abundant, and nothing much else exists for them to eat, they may devour large numbers of these caterpillars, excrement pellets having been found containing dozens of the characteristic skulls of the larvae marked with an inverted "Y". Up to the time that DDT became commercially



available, arsenate of lead was the standard, but not particularly effective remedy for the control of *Laphygma*, often ineffective because applied when the caterpillars were fully-grown, or so large that they could eat some of the poison with comparative immunity. Dusting young corn or cane plants with DDT gives prompt control, so immediate and so effective that this means of control is being increasingly used by many growers. The adult of *Laphygma frugiperda* has silvery white hind wings, and grey-brown forewings which may be almost devoid of any pattern, or in other individuals with conspicuous markings of light and dark. In the experience of Prof. Forbes the difference in pattern is purely sexual: all the males having the showy pattern and all the females being plain, as in *Prodenia latifascia*. The caterpillars show little variation and are easily recognized by the inverted "Y" on the head and four black spots arranged in a trapezoid on most segments dorsally, most conspicuous on the smaller green caterpillars but still apparent on the plump, purplish-grey fully-grown larvae.



Just-hatched caterpillar, greatly enlarged, and fully-grown caterpillar, twice natural size, of *Laphygma frugiperda* (Smith & Abbot). (Drawn by W. R. Walton, U. S. D. A.)

*Xylomiges eridania* (Cramer) was listed from Puerto Rico as a *Calliarges* by the early entomologists, Herr Möschler (1880-138) noting "Raupe auf *Amaranthus*, *Solanum torvum*, *Phytolacca decandra*." In addition to such weed hosts, the cutworms may also attack tomatoes, potatoes, peppers and tobacco, and are recorded from Swiss chard and mulberry, occurring in all parts of the Island. The light grey adults are common at light; repeatedly intercepted at Bayamón, Mr. E. G. Smyth having collected sixty at Hda. Santa Rita, Guánica during the summer and autumn of 1913.

*Xylomiges recondita*, described from Puerto Rico as a *Calliarges* by Herr Heinrich B. Möschler (1890-140), has not since been found.

*Xylomiges sunia* Guenée was listed from Puerto Rico by Herr Möschler, Dr. Gundlach noting "la oruga se cria en *Gossypium*." It is P.R. 1443 on Van Zwaluwenburg's list, and Dr. Richard T. Cotton (1918-287) notes it as "extremely destructive to a great many vegetable crops, being particularly abundant on chard. The small, green, dome-shaped eggs are laid in clusters of two or three hundred on the leaves, and are covered with a light white fuzz. They hatch in about four days into caterpillars that

when full grown are about an inch and a quarter long. They are dark grey in color, striped on the sides with a broad yellow band, and marked on the back with several velvety black patches." Mr. Ignacio Torres, in discussing "El Cultivo de Papas en Puerto Rico" (Rev. Agr. P. R., 24 (6): 239-242. San Juan, 1929), notes their attack on Irish potatoes. They have also been found eating celery, asparagus, green peas, alfalfa and tobacco. The adults are practically indistinguishable from *X. eridania*, their most apparent difference being a black spot or pair of black spots near the middle of the forewing towards the costal margin.

*Galgula partita* Guenée is listed from Puerto Rico by Herr Möschler and Dr. Gundlach.

*Micrathetis triplex* (Walker) is identified from San Juan, Coamo and Ensenada by Dr. Schaus (1940-199). Prof. J. A. Ramos (1947-45) collected it, as determined by Prof. Forbes, at light on Mona Island.

*Hadena* ? *ligata* was described from Puerto Rican material by Herr Heinrich B. Möschler (1880-130), and was at one time thought by Dr. Schaus to be a *Monodes*, but no specimen has been collected since the type by Dr. Gundlach.

*Elaphria agrotina* (Guenée) has been repeatedly intercepted at light in the metropolitan area of San Juan, and at Bayamón; Dr. Schaus (1940-200) lists collections at Aibonito, Coamo, Lares and Guánica, and Mr. J. F. Gates Clarke thus identified specimens taken by Dr. W. A. Hoffman at El Semil. The three specimens of what Mr. E. G. Smyth called a "rare brown-and-buff Noctuid" which he collected during the summer of 1913, were first determined by Dr. Schaus as the *Monodes* which Herr Möschler described (1890-127) from Puerto Rican material as *Hadena arna*.

*Elaphria andersoni* is described by Dr. Wm. Schaus (1940-201) from material intercepted at light at Bayamón by Mr. C. G. Anderson as having a wingspread of 13 mm., its "forewing mostly aeneous sayal brown."

*Elaphria arnoides* (Herrich-Schäffer) is listed by Dr. Schaus (1940-200): "a specimen from an old Porto Rico collection, with written label identification."

*Elaphria deltoides*, described as a *Erastria* by Herr Heinrich B. Möschler (1880-399), was identified by Dr. Wm. Schaus as a specimen intercepted at light at Bayamón, but later (1940-200) he states "no specimens have been received from Porto Rico."

*Elaphria nucicolora* (Guenée), listed from Puerto Rico by Herr Möschler and Dr. Gundlach as a *Monodes*, has been intercepted at light in the San Juan metropolitan area, and Mr. Frank E. Watson thus identified the dozen "Brownsville Noctuids" which Mr. E. G. Smyth collected at light during the summer of 1913 at Hda. Santa Rita, Guánica. Prof. Forbes lists additional collections at Cataño, Toa Baja, Lares, Coamo and Aguirre.

*Elaphria phalega* is described by Dr. Wm. Schaus (1940-201), the type from Coamo, as having a "forewing aeneous olive brown, the markings very faint," allied to "*E. nucicolora* Guenée, form *clara* Harv."

*Elaphria promiscua* was described as a *Caradrina* by Herr Henrich B. Möschler (1880-144) from material collected by Dr. Gundlach in Puerto Rico.

*Elaphria subobliqua* (Walker), listed from Puerto Rico as *Hadena chalcodonia* Hübner by Herr Möschler and Dr. Gundlach, was collected at light at Utuado by Dr. W. A. Hoffman, and Dr. Schaus (1940-201) lists it from San Juan.

*Bryolymnia huastea* was described by Dr. Wm. Schaus (1940-203) from a single female from Bayamón, mostly white in color, the "forewing white with black markings."

*Bagisara repanda* (Fabricius), listed as *Atethmia inusta* Guenée by the early entomologists, was identified for Mr. E. G. Smyth, who collected twenty-five specimens at light at Hda. Santa Rita, Guánica during the summer of 1913, as *Bagisara inusta* Guenée by Mr. Frank E. Watson. "So often was this moth seen at night on the foliage of "salcilla" (*Morongia leptoclada* = *Leptoglottis portoricensis*), that it is believed the larva must feed on that tree." The adults, identified by Dr. Schaus as *Bagisara subusta* Hübner, have three wavy lines across their light yellowish-brown forewings, the outer margin being considerably darker. Dr. Schaus lists (1940-204) additional collections at San Germán, Adjuntas and Coamo, and Prof. Forbes found it on Vieques Island as well as on El Yunque and at Lares and Isabela.

*Bagisara buxea* (Grote) is listed by Dr. Schaus (1940-204) from Coamo and Guayama.

*Sesamia vuteria* (Stoll) is listed from Puerto Rico by Dr. Schaus (1940-205): "bred from green chick pea."

*Caularis undulans* Walker, listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Eudryas bartholomaei* Boisduval, a large white and yellow Noctuid, was collected at light at Hda. Santa Rita, Guánica by Mr. E. G. Smyth three times during the summer of 1913. Dr. Schaus (1940-205) lists additional collections from Guayama. The anal angle of the yellowish hind wing has a conspicuous brownish lunule; the pinkish-white forewing is broadly margined with light brown, its inner edge dark brown.

*Cydosia nobilitella* (Cramer), listed under this name by all the early entomologists from Puerto Rico, is P. R. 1439 in Van Zwaluwenburg's list. It is a very striking moth, the forewings having six, or nine or more large white spots surrounded with purplish-brown, the ground color purplish-red; the hindwings white margined with black in the males, entirely black for the females. Mr. E. G. Smyth collected fifteen of this or the following species at light at Hda. Santa Rita, Guánica, in the summer of 1913, of

which he thought the larvae fed on *Solanum*. It is by no means a xerophytic Noctuid, however, as adults have been found at Mameyes and Río Piedras, and Dr. Schaus (1940-206) records additional collections at San Germán, Mayagüez, Coamo and Santurce.

*Cydosia submutata* (Walker) is identified by Dr. Schaus (1940-206) from Santa Rita, presumably the material collected by Mr. E. G. Smyth.

*Eublemma cinnamomea* (Herrich-Schäffer), listed from Puerto Rico as a *Thalpochares* by Herr Möschler and Dr. Gundlach, has been intercepted at light at Bayamón, as identified by Dr. Schaus. Prof. Forbes found it common on El Yunque, and has specimens from Cataño and San Germán.

*Eublemma minima* (Guenée) is identified by Dr. Schaus (1940-208) from Coamo and Cataño. Prof. Forbes collected it on Vieques Island.

*Eublemma obliqualis* (Fabricius), listed as a *Thalpochares* from Puerto Rico by Herr Möschler and Dr. Gundlach, is identified by Dr. Schaus (1940-207) from San Juan and San Germán. Prof. Forbes found it on Vieques Island, and the Cornell University collection contains specimens from seven Puerto Rican localities.

*Eublemma sydolia* is described by Dr. Wm. Schaus (1940-207) from a single male from Río Piedras with a wing expanse of 13 mm., the "forewing whitish irrorated with shell pink," collected by Mr. Tho. H. Jones, August 9, 1914. Other specimens were collected by Dr. M. D. Leonard at Cataño and Aguirre.

*Cobubatha albipectus* described by Herr Heinrich B. Möschler (1890-167) as a *Thalpochares* from material collected in Puerto Rico by Dr. Gundlach, is recognized by Dr. Schaus (1940-209) from Vieques Island: fresh material collected by Prof. Wm. T. M. Forbes.

*Cobubatha coamona* is described by Dr. Wm. Schaus (1940-208) from numerous specimens from Coamo and Aguirre showing considerable variation, with a wing expanse of 10 mm., "forewing with basal half rosy olivaceous, only base itself fuscous."

*Cobubatha luxuriosa* (Smith) is recognized by Dr. Schaus (1940-209) from Coamo.

*Cobubatha putnami*, described as a *Thalpochares* by Herr Heinrich B. Möschler (1890-168) from material collected by Dr. Gundlach in Puerto Rico, has not since been found locally.

*Cobubatha quadrifera* (Zeller), re-described from Puerto Rico as *Thalpochares grapholithoides* by Herr Möschler (1890-167), and thus listed by Dr. Gundlach, is identified by Dr. Schaus (1940-209) from Ensenada, San Germán, Aibonito and Coamo; Dr. W. A. Hoffman collected it at El Semil, as identified by Mr. J. F. Gates Clarke, and Prof. Forbes found it on Vieques Island and has specimens from five Puerto Rican localities.

*Erastria minima* Herrich-Schäffer is listed from Puerto Rico by Herr Möschler (1890-152) and Dr. Gundlach.

*Ozarba cinda* is described by Dr. Wm. Schaus (1940-210) from a single male from Coamo with wing expanse of 6 mm., a complicated wing pattern in sienna and buff.

*Ommatochila mundula* (Zeller), listed from Puerto Rico as a *Thalpochares* by Herr Möschler and Dr. Gundlach, has been intercepted at Mayagüez, and Dr. Schaus (1940-210) lists collections at San Germán and Coamo. It is a little brown moth the darker basal two thirds of the forewing sharply cut off from the lighter marginal area.

*Amyna bullula* (Grote), re-described by Herr Heinrich B. Möschler (1890-163) under the name of *Mesostrotia imprimata* from material collected in Puerto Rico by Dr. Gundlach, has not since been found locally.

*Amyna octo* (Guenée), listed from Puerto Rico as *Mesostrotia stigmatula* Snell by Herr Möschler and Dr. Gundlach, was collected at light at Hda. Santa Rita, Guánica by Mr. E. G. Smyth. He found seven individuals of this small chocolate-brown Noctuid, as identified by Dr. Schaus, of which some were presented to Mr. Frank E. Watson, but Dr. Schaus (1940-211) reports "no specimens from Porto Rico." Of the specimen which he identified, now in Río Piedras collection, the hindwings are almost if not quite as dark brown as the forewings, which bear a faint pattern and are very narrowly margined with darker brown.

*Anateinoma affabilis* was described by Herr Heinrich B. Möschler (1890-170) from Puerto Rican material collected by Dr. Gundlach, but no individuals have since been found.

*Lithacodia apicosa* (Haworth) was listed from Puerto Rico by Dr. Stahl as *Erastria nigrifutula* Guenée, and by Herr Möschler and Dr. Gundlach as an *Erastria*. It has not since been found locally.

*Chobata discalis* Walker is identified by Dr. Schaus (1940-213) from Vieques Island, and from Coamo in Puerto Rico.

*Xanthoptera aurifera* Walker, re-described by Herr Heinrich B. Möschler (1890-158) as *X. tripuncta* from Puerto Rican material collected by Dr. Gundlach, is identified by Dr. Schaus (1940-214) from Lares, Mayagüez, Aibonito, Manatí and Coamo. Mr. E. G. Smyth took thirty of these moths at light at Hda. Santa Rita, Guánica during the summer of 1913. They have golden yellow forewings, darker on the margins, and silvery white hindwings, gradually darkening at the outer edges.

*Xanthoptera botyoides* Guenée, listed from Puerto Rico by Drs. Stahl and Gundlach and Herr Möschler, has been repeatedly intercepted at Río Piedras and at Dorado.

*Xanthoptera nigrofimbria* Guenée was the identification by Dr. Wm. Schaus of moths intercepted at light at Bayamón.

*Xanthoptera operta*, as a *Krugia*, was described by Herr Heinrich B. Möscher (1890-164) from Puerto Rican material collected by Dr. Gundlach. Dr. Schaus lists a subsequent collection (1940-214) at San Juan.

*Xanthoptera portoricensis* was described by Herr Heinrich B. Möscher (1890-158) from material collected by Dr. Gundlach, and Dr. Schaus (1940-214) identifies as this species moths collected at Aguirre.

*Heliocontia margana* (Fabricius), re-described from Puerto Rican material by Herr Heinrich B. Möscher (1890-156) under the name of *Emmelia variegata*, and the variety *ochracea*, has been intercepted at Bayamón and at Mayagüez. Dr. Schaus (1940-215) notes additional collections at Ponce, Tallaboa, Ensenada, San Germán, Coamo and Aibonito. It is a little brownish moth with large, irregular whitish areas along the costal margin of the forewings. Prof. Forbes found it on Vieques Island.

*Heliocontia pantherula* (Herrich-Schäffer), listed by the earlier entomologists as *Emmelia uncinula* H. S., is identified by Dr. Schaus (1940-214): a little grey moth with irregular lighter areas on the forewings.

*Heliocontia perstructana* (Walker), listed by the earlier entomologists as *Emmelia felina* H. S. and *E. trigidula* H. S., has been intercepted at Bayamón, as identified by Dr. Schaus, and listed by him (1940-215) from Coamo.

*Spragueia dama* (Guenée), listed by Herr Möscher and Dr. Gundlach as an *Emmelia*, has been intercepted at light at Bayamón. Mr. E. G. Smyth collected thirty-four adults at light at Hda. Santa Rita, Guánica during the summer of 1913. Dr. Schaus determined as this species a little moth found resting on cane at Rincón, December 11, 1919, and he lists (1940-216) additional collections at Coamo and Aibonito. A large median area of light yellow, and smaller ones towards base and apex, are on the costal margin of the reddish-brown forewings of this little moth.

*Graeperia costalis* (Walker) has the head, collar, shoulder lappets and costal margin of forewings creamy yellow; the remainder of forewings and body golden brown. Dr. Schaus (1940-216) has identified specimens from Ensenada, Coamo and El Yunque, and Prof. Forbes has them from Aguirre and Vieques Island.

*Graeperia indubitans* (Walker) is listed by Dr. Schaus (1940-216) from Coamo and Ensenada.

*Tarachidia flavibasis* Hampson "is common in Porto Rico" according to Dr. Schaus, who lists collections from Arecibo, Aibonito, Coamo, San Germán and Ensenada. Mr. Francisco Seín found it at Lares. Prof. Forbes notes that only the male has the yellow base; the female is entirely shades of dull brown.

*Tarachidia mixta*, described by Herr Heinrich B. Möscher (1890-154)

as an *Acontia* from Puerto Rican material collected by Dr. Gundlach, and thus listed by him, is identified by Dr. Schaus (1940-217) from Ensenada and Coamo.

*Haplostola aphelioides* was described by Herr Heinrich B. Möschler (1890-163) from specimens collected in Puerto Rico by Dr. Gundlach, and was thus listed by him. It has not since been found.

*Eutelia ablatrix* (Guenée), listed as a *Penicillaria* from Puerto Rico by Herr Möschler and Dr. Gundlach, is identified by Dr. Schaus (1940-218) from San Germán and Coamo.

*Eutelia blandula* (Herrich-Schäffer), listed as a *Eurhipia* from Puerto Rico by Herr Möschler and Dr. Gundlach, is identified by Dr. Schaus (1940-218) from Coamo.

*Eutelia piratica* is described by Dr. Wm. Schaus (1940-218): a single male from San Germán with a wing expanse of 15 mm., mostly pinkish cinnamon, pinkish buff, vinaceous buff or vinaceous fawn, with complicated pattern in white. An adult, as identified by Prof. Wm. T. M. Forbes, was taken at light on Mona Island by Prof. J. A. Ramos (1940-45).

*Eutelia pyrastis* Hampson is identified by Dr. Schaus (1940-218) from Coamo and Aguirre.

*Paectes arcigera* (Guenée), listed from Puerto Rico by the early entomologists as an *Ingura*, has been intercepted at light at Bayamón and at San Juan.

*Paectes devincta* (Walker), re-described from Puerto Rico by Herr Heinrich B. Möschler under the name *Ingura vittata*, and thus noted by Dr. Gundlach to be "solamente conocida de Puerto Rico," has been intercepted at light at Bayamón.

*Paectes lunodes* (Guenée) is identified by Dr. Schaus (1940-220) from Coamo and Ensenada.

*Paectes obrotunda* (Guenée) was re-described from Puerto Rico by Herr Heinrich B. Möschler (1890-170) under the name *Ingura elegans*, and it is thus listed by Dr. Gundlach. The dozen specimens which Mr. E. G. Smyth collected at light at Hda. Santa Rita, Guánica during the summer of 1913, identified by Dr. Schaus, have a wingspread of 22 mm.; the veins of the hindwings outlined in brown; the dark grey forewings, with two major, darker, curved stripes and other less well defined markings, but hardly anything to merit the name *elegans*. Dr. Schaus (1940-221) notes collections in Vieques Island and on St. Thomas, as well as at Coamo and San Germán.

*Stictoptera vitrea* Guenée, listed by the early entomologists from Puerto Rico under this name, has been intercepted at light at Bayamón, as identified by Dr. Wm. Schaus.

*Characoma nilotica* (Rogenhofer), re-described by Herr Heinrich B.

Möschler from Puerto Rico (1890-212) under the name of *Paraxia chamaeleon* and thus listed by Dr. Gundlach, has been reared from semi-transparent, greenish-white larvae feeding on the buds and webbing together the small leaves of "sauce" or Humboldt's willow (*Salix chilensis*) at Aguadilla in January 1922. Mr. E. G. Smyth collected thirty of these small grey Noctuid moths at light at Hda. Santa Rita, Guánica during the summer of 1913, and it has also been intercepted at light at Bayamón.

Prof. Forbes doubts if this is the old world *C. nilotica*, of which the larva is supposed to feed on tamarisk. The Cornell University collection contains specimens from Cataño, Jájome Alto, Guayama, Aguirre, Coamo and San Germán.

*Casandria abseuzalis* (Walker) was re-described by Herr Heinrich B. Möschler (1890-147) under the name of *Pleurasympieza smithii* from Puerto Rican material, and it is thus listed by Dr. Gundlach. Mr. E. G. Smyth collected a dozen of these light brown Noctuids, as determined by Dr. Harrison G. Dyar, at light at Hda. Santa Rita, Guánica during the summer and autumn of 1913. Dr. Schaus (1940-223) records additional collections at Palmas Abajo (between Guayama and Jájome Alto) by Dr. W. A. Hoffman, and at Coamo and Manatí. On light grey forewings are zig-zag narrow bands of dark brown; the semi-transparent silvery hindwings are narrowly margined with brown. Prof. Forbes found it on Vieques Island, and has specimens from Dorado and Santurce.

*Casandria ferrocana* (Walker) was re-described as *Leianophora transfossa* by Herr Heinrich B. Möschler (1890-136, fig. 16) from Puerto Rican material, and under that name it is listed by Dr. Gundlach. Dr. Schaus (1940-222) notes recent collections at Guánica.

*Casandria filifera* (Walker) was re-described from Puerto Rican material by Herr Heinrich B. Möschler (1890-145, fig. 17) under the name of *Collomena elota*, and under that name it is listed by Dr. Gundlach. Dr. Schaus (1940-223) records a recent collection from El Yunque.

*Iscadia aperta* Walker was re-described as *Eucalypta schildei* from Puerto Rican material by Herr Heinrich B. Möschler (1890-148, fig. 23), and thus listed by Dr. Gundlach. Dr. Schaus (1940-224) lists collections from Coamo and Río Piedras.

*Achaea ablunaris* (Guenée), of which Herr Möschler (1890-202) as an *Ophisma* described the local Puerto Rican variety under the name of *hilaris*, was listed by Drs. Stahl and Gundlach. No recent collection has been made locally.

*Ophisma tropicalis* Guenée, listed from Puerto Rico by all the early entomologists, of which Dr. Gundlach notes "oruga en *Cupania*," has not been collected subsequently.



*Mocis antillesia* Hampson, listed in "Insectae Borinquenses" (1923-168) as *Mocis marcida* Guenée, as determined by Dr. Wm. Schaus, was first collected in Puerto Rico by Mr. D. L. Van Dine in December 1911, at light at Río Piedras. Several collections have since been made at light at the same locality. The larva when fully-grown is a large grey caterpillar with concealed black and white spots at the dorsal sutures, exposed on looping of the body, which feeds on the leaves of cowpeas. The adult is a large purplish-brown moth, both fore and hind wings banded; the forewings with a black spot nearly 1 mm. in diameter on inner margin near base; the males with heavily plumed hind legs.

*Mocis disseverans* (Walker), as identified by Dr. Wm. Schaus, has been repeatedly intercepted at light at Bayamón and in the metropolitan area of San Juan, and additional collections are noted by him (1940-226) at Coamo and Aibonito.

*Mocis megas* (Guenée), listed as a *Remigia* by all the earlier entomologists, has been collected at light at Bayamón, Río Piedras, Mameyes and Guánica; quite similar in general appearance to *antillesia*, but with the black spot near the base of the forewing very small or absent. The caterpillar has been found feeding on the leaves of velvet beans at Río Piedras. Dr. Schaus (1940-226) lists collections of adults at Fajardo, Arecibo, Coamo and San Germán. Prof. J. A. Ramos (1947-45) found them common at light, Sardinera Beach, Mona Island.

*Mocis munda* (Walker), as identified by Prof. Wm. T. M. Forbes, was collected by Mr. Harry Beatty on Mona Island, August 1944. Prof. Forbes notes that this is the smallest and most yellow species of *Mocis*, and suspects that it is "the true *repanda* of Fabricius," but is not sufficiently sure to use the name. He has additional specimens from Cuba, Haiti, St. Croix and Martinique, but not from Puerto Rico.

*Mocis repanda* (Fabricius), originally described as a *Noctua*, was listed from Puerto Rico by Dr. Stahl as *Remigia latipes* Guenée, and under this name and as *Remigia repanda* Fabricius, not in synonymy, by Herr Möschler and Dr. Gundlach. Indeed, the latter name was used by all the economic entomologists: thus listed by Mr. R. H. Van Zwaluwenburg, number 1507: on millet and grasses, and by Mr. D. L. Van Dine (1913-257 and 1913-31), Mr. Thos. H. Jones (1913-230 to 236, 1914-463) and Mr. E. G. Smyth (1919-144), who note the larva as a pest of sugar-cane, feeding on the leaves. The most complete account (Jones and Wolcott 1922-49) describes all stages and lists the parasites reared: *Phorocera claripalpis* Macq., *Linnaemyia fulvicauda* Walton, *Helicobia helcis* T.T. from the larvae, and *Sarcophaga sterno-dontis* T.T. from the pupa, and in addition to these flies, the wasps *Chalcis robustella* Wolcott and a species of *Rogas*.

Larvae have also been noted at Morovis (Wolcott 1921-38) parasitized by a species of *Euplectrus*. The caterpillars are eaten by the lizards *Anolis pulchellus*, *A. krugii*, *A. stratulus* and *A. cristatellus*, when abundant in cane fields, and presumably would also be eaten by the introduced toad, but Dr. Wetmore reports neither larva nor adult consumed by any bird. Periods of unusual abundance of the striped looper caterpillars on fields of young cane are normally followed by several years when none are to be found, which is hardly surprising considering the number of parasites and other natural enemies which converge on an outbreak. The caterpillars are partial to the leaves of young cane, but often attack weed grasses in the cane fields, as well as meadows of malojillo or guinea grass, and young stands of elephant grass. "They follow the same pattern of seasonal abundance: our (Wolcott and Martorell 1943-92) records of injury being for October, November and December; pupae and old injury in January; one record of small caterpillars in February at Manatí and another in July at La Vega, Arecibo" for the years 1936-1941. The moths are smaller than others of the genus, lavender or purplish brown, the outer third of the wings darker, and are often attracted to light during winter months in the coastal cane areas.

As *Mocis latipes* Guenée identified by Prof. Wm. T. M. Forbes, it was recorded by Prof. J. A. Ramos (1940-45), collected at light on Mona Island.

*Phurys immunis* Guenée, listed from Puerto Rico by the early entomologists, is recorded by Dr. Schaus (1940-227) from Aibonito and Coamo, and from Vieques Island. It is a light grey moth, the outer third of its wings darker, with basal third of the forewings cut off by a narrow dark band.

*Nymbis helvina* (Guenée) is listed from Puerto Rico by Drs. Stahl and Gundlach under the name *Phurys helveola* H. S.

*Nymbis garnoti* (Guenée) as a *Phurys* is listed by the earlier entomologists from Puerto Rico.

*Safia acharia* (Cramer) is listed as *Yrias* from Puerto Rico by Dr. Gundlach, but Dr. Schaus (1940-228) is of the opinion that Herr Möschler's record is a mis-identification.

*Zale erilda* is described by Dr. Wm. Schaus (1940-230) from a single male intercepted at Bayamón with a wing expanse of 48 mm., the forewings mostly "light ochraceous buff" with black markings. As *Homoptera lunata* Drury he presumes this species was reported from Puerto Rico by Herr Möschler and Dr. Gundlach.

*Zale exhausta* (Guenée) is listed from Puerto Rico by Herr Möschler and Dr. Gundlach as an *Homoptera*.

*Zale fictilis* (Guenée), listed from Puerto Rico as an *Homoptera* by Herr Möschler and Dr. Gundlach, was identified for Mr. E. G. Smyth as

*Homoptera terrosa* Guenée by Dr. Schaus: adults at light at Río Piedras. These are large grey moths with numerous wavy dark brown bands, a double one on the hindwings being most conspicuous.

*Zale setipes* (Guenée) is listed as a *Xylis* from Puerto Rico by the early entomologists, and Dr. Schaus (1940-229) records a more recent collection at Coamo.

*Autoplusia egena* (Guenée) was identified by Dr. Wm. Schaus from a shining golden-brown adult reared from a green looper caterpillar collected on shade tobacco at Cayey in January 1923. A year later other adults were reared from looper caterpillars on tobacco at Corozal. It was noted that the caterpillars were most abundant on the tobacco growing on the hills sloping to the north; those sloping to the south and west showed little injury by any kind of caterpillar.

*Autoplusia illustrata* (Guenée) was intercepted at light at San Juan and determined as a *Phytometra* by Dr. Schaus.

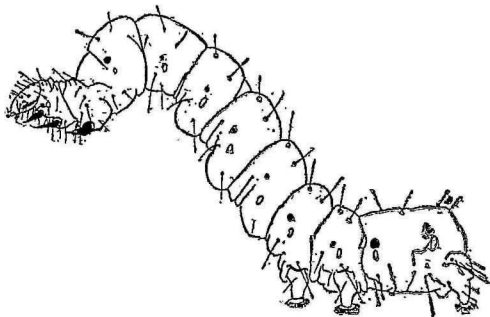
*Argyrogramma admonens* (Walker), as determined by Dr. Wm. Schaus, was intercepted at light at Bayamón.

*Argyrogramma calceolaris* (Walker), listed as a *Plusia* by Herr Möschler from Puerto Rico, is cited by Dr. Gundlach "la oruga en *Commelina*." Dr. Schaus (1940-232) notes a recent collection at Lares by Mr. Francisco Seín.

*Trichoplusia ni* (Hübner), as determined by Dr. Wm. Schaus, was collected at light at Hda. Santa Rita, Guánica by Mr. E. G. Smyth: five specimens during the summer and fall of 1913. These moths are rather small, light brown in color, with a very elongate silvery area on the forewings. They are the adults of the injurious "cabbage looper" of continental United States.

*Pseudoplusia oo* (Cramer) was listed from Puerto Rico by Dr. Stahl as *Plusia binotula* H. S., and by him and the other earlier entomologists as *Plusia rogationis* Guenée. Dr. Richard T. Cotton (1918-311) studied it as a pest on tomato, but it is possibly more seriously injurious on tobacco, being called by the growers "el agrimensor verde." Injury does not cease when the leaves are cut, for the large caterpillars continue their development eating the wilted and curing leaves in the drying shed. They may feed on other vegetables as well, having been reared to adult eating nothing but beans, cabbage, sweet potatoes or lettuce. The adults are a rich dark golden-brown, with two conspicuous silvery spots on the forewings; the smaller one almost circular, the larger one oval, less well defined at side, and outlining a question mark. They have been taken at light at Guánica as well as generally in the mountains and along the north coast, and on Mona Island by Prof. J. A. Ramos (1947-45).

*Phytometra verruca* (Fabricius), originally described as a *Noctua*, and by Herr Möschler and Dr. Gundlach listed from Puerto Rico as a *Plusia*, was reared by Mr. Thos. H. Jones from larvae on purslane, and subsequently by Mr. E. G. Smyth at Río Piedras on "bleró" (*Hyptis capitata*). Adults have repeatedly been intercepted at light at Bayamón and San Juan, and Dr. Schaus (1940-232) records collections at San Germán and from Vieques Island. They are rather small, richly golden brown moths, the two oval silvery spots of the forewings being of very unequal size.



Larva of *Pseudoplusia oo* (Cramer), five times natural size. (Drawn by G. N. Wolcott.)

*Toxonprucha diffundens* (Walker), re-described from Puerto Rico as *T. amoena* by Herr Heinrich B. Möschler (1890-198), and thus listed by Dr. Gundlach, is identified by Dr. Wm. Schaus (1940-233) from Coamo, Guánica and San Germán.

*Pseudyrias watsoni* is described by Dr. Wm. Schaus (1940-234) from a single female from Ensenada collected by Mr. Frank E. Watson, with a wing expanse of 29 mm. mostly black, brown or similarly dull colored.

*Meridyrias progenies* (Guenée), listed as a *Yrias* from Puerto Rico by the early entomologists, and also in Van Zwaluwenburg's list (P. R. 1408), was collected at light at Hda. Santa Rita, Guánica by Mr. E. G. Smyth. He found these sooty little Noctuid moths, with numerous

wavy lines on both fore and hind wings, most abundant during July and August. Dr. Schaus (1940-235) notes additional collections at Coamo and Ponce.

*Lyncestis acontioides* (Guenée) was listed as *Stictoptera penicillum* H. S. from Puerto Rico by the early entomologists, Dr. Gundlach noting "la oruga vive en *Parkinsonia aculeata* y en *Poeppigia procera*." Dr. Schaus (1940-236) identifies moths from Mameyes, Coamo and Guánica. Those from Guánica were identified by Mr. Frank E. Watson for Mr. E. G. Smyth as *Melipotis acontioides* Guenée (= *M. sinualis* Harvey), and under this name his collections at light were listed in "Insectae Borinquenses" (1936-436), eighteen having been taken from October to December 1913. Had Smyth happened to collect after an outbreak of these caterpillars on "flamboyán" (*Poinciana regia*), such as occurred in 1937 and 1941 at Guánica, he would have found them overwhelmingly numerous. An outbreak on the flamboyán trees in Hato Rey and the Condado became so serious that it was reported in an article in "El Mundo," August 10, 1933. The landlord of a house surrounded by infested flamboyán trees lamented that one tenant had just moved out because of the annoyance of the hungry caterpillars, and others who came to look at the house would not even enter the gate. Another outbreak at Manatí defoliated trees along the road to Ciales for a long distance. Such defoliations are not serious from the point of view of the trees themselves, for flamboyán leaves grow out with surprising rapidity and a few weeks later there is no trace of injury. The caterpillars have also been reared from "palo verde" (*Parkinsonia aculeata*) at Faro de Cabo Rojo, confirming Dr. Gundlach's observation. Indeed, considering that the flamboyán was already a common tree in Puerto Rico at the time he was here, it is surprising that he failed to note it as host for these caterpillars. *Poeppigia procera* is a name not found in any modern botany, and possibly it does indeed refer to the flamboyán. The caterpillars are slender, striped with dark greenish-brown, and prefer to rest during the daytime under loose bark, crowding by the dozens into any suitable hiding-place, and later filling it with their cocoons. The adults have silvery white hindwings, deeply margined with dark brown or black, the forewings obscurely patterned in grey.

*Melipotis contorta* (Guenée), listed as a *Bolina*, or as *Bolina striolaris* H. S. by Dr. Gundlach and Herr Möschler, has since been found on Mona Island by Prof. J. A. Ramos (1947-45).

*Melipotis famelica* (Guenée), listed from Puerto Rico by the early entomologists as *Bolina leucomelana* H. S., is identified by Dr. Schaus (1940-237) from Coamo, Ponce and Guánica. More than half of the hind wings of these moths are black, but the black "does not reach the anal angle."

The forewings are mostly dark brown, with lighter area and transverse band narrowly outlined with a most convoluted black margin. Mr. E. G. Smyth took eighteen of these moths at light during October and November of 1913 at Hda. Santa Rita, Guánica, and Mr. Norberto Lugo collected many at light at Guánica Insular Forest in August 1941. Mr. Francisco Seán collected caterpillars on "salcilla" or "zarcilla" (*Leucaena glauca*) at Yauco in November 1923, which he reared to adult, but of which one larva was parasitized by a Tachinid fly recently identified by Mr. C. W. Sabrosky as *Euphorocera tachinomoides* T.T. The species is not confined to the south coast, as one adult was collected at Isabela in December 1918, and the Cornell University collection has specimens from Dorado. Prof. Forbes noted them on Vieques Island, and Prof. J. A. Ramos found them on Mona Island in considerable abundance (1947-48).

*Melipotis fasciolaris* (Hübner), listed as a *Bolina* from Puerto Rico by Herr Möschler and Dr. Gundlach, is recognized by Dr. Schaus (1940-239) only from Aibonito. For Mr. E. G. Smyth he had previously identified as this species moths collected at light, Hda. Santa Rita, Guánica, with the most sharply defined pattern on their wings: the base of the forewings dark brown, with a straight-edged transverse light yellowish band, which may be what he subsequently described (1940-238) as *Melipotis guanicana*. Other adults, identified by Mr. Hahn W. Capps as *Melipotis fasciolaris*, have the base of the forewings dull greenish-brown, with no broad yellowish transverse band separating the basal area from the darker apical two-thirds. Many of these were collected at light in Guánica Insular Forest in August 1941 by Mr. Norberto Lugo, and others have been reared from dull, striped, blue-grey caterpillars found crowding under the bark scales of "guayacán" (*Guaiacum officinale*) at the same locality, May 1942, and farther west at the salt pools, March 1946. Prof. J. A. Ramos (1947-46) found one at light on Mona Island.

*Melipotis guanicana* was described by Dr. Wm. Schaus (1940-238) from a single female from Guánica, date of collection and collector not mentioned, with a wing expanse of 42 mm., the base of its fore wing "deep olive buff: a broad white medial fascia faintly outbent edged by fine black lines."

*Melipotis indomita* Walker is listed from Puerto Rico by Herr Möschler and by Dr. Gundlach, as *Bolina nigrescens* Grote and Robinson, var. *ochreipennis* Harvey. Prof. Forbes identifies as this species specimens labeled "Desengaño" collected by Dr. Stuart T. Danforth. Desengaño is the flag stop on the American Railroad and the Hacienda at Cartagena Lagoon, where Dr. Danforth made his most intensive observations on birds.

*Melipotis januaris* (Guenée) was listed as a *Bolina* by Herr Möschler,

Dr. Gundlach noting "esta especie varía mucho, v. gr. var. *limitata*, var. *bimaculata*, var. *confusa*, Möschler." Mr. R. H. Van Zwaluwenburg (1918-34) records thousands of larvae on "guamá" (*Inga laurina*) at Mayagüez in June 1917, which pupated in the ground. Adults have been intercepted at light in the metropolitan area of San Juan and at Bayamón, and Dr. Schaus (1940-237) notes additional collections at Ensenada, Aibonito and Coamo, and on Vieques Island, while Prof. J. A. Ramos found them at light, Sardinera Beach, Mona Island (1947-45).

*Melipotis ochrodes* (Guenée), which Dr. Schaus considers Herr Möschler listed from Puerto Rico as the varieties *bimaculata* and *confusa* of the preceding species, was identified by Dr. Harrison G. Dyar as *Melipotis manipularis* Guenée for Mr. E. G. Smyth, who collected nearly sixty specimens at light at Hda. Santa Rita, Guánica, during the summer and autumn of 1913. This is the name in Van Zwaluwenburg's list: P. R. 1435. The next year Mr. Smyth repeatedly collected larvae under the bark of the trees called locally "algarrobo de Hawaii," "bayahonda," or "mesquite" (*Prosopis juliflora*), or under trash at the base of these trees, which he reared to adult. They were found under the bark of these trees at Central Mercedita, Ponce, in 1922, and extensive collections of adults were made at light in the Guánica Insular Forest in August 1941 by Mr. Norberto Lugo. The transverse, lighter-colored band on the forewings occupies half of the basal area; the lighter area towards the apex is often irregularly margined with black.

*Melipotis perpendicularis* (Guenée) is listed by Dr. Schaus (1940-239) from Puerto Rico, "without precise locality."

*Pararcte schneideriana* (Cramer), originally described as a *Noctua*, Dr. Schaus identified as a *Cocytodes*: a single specimen collected at light at Río Piedras by Dr. Richard T. Cotton on May 1, 1916. It is a large, brownish, thick-bodied moth, with a wingspread of 76 mm., its patterned forewings narrow; the dark brown hindwings with lunules on the outer margin.

*Mimophisma forbesi* was described by Dr. Wm. Schaus (1940-240) from a single male from Coamo with a wing expanse of 35 mm., mostly drab in color; "forewing drab crossed by rather faint light cinnamon drab vertical lines and with a few scattered black scales."

*Blosyris mycerina* (Fabricius), originally described as a *Noctua*, was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Letis atricolor* Guenée. It was later identified by Dr. Schaus as *Letis mycerina*, the name given in "Insectae Borinquenses" (1936-434), being "widely distributed in tropical America." The caterpillars have been found feeding on coffee leaves at Lares, altho possibly originally they ate those of some endemic plant or tree of the virgin tropical rain forest. The fresh adults are almost black in color, but while still alive may fade to a dull brown,

showing the wavy pattern on the wings, the largest ones having a wingspread of close to 80 mm. They begin flying soon after sundown; in November 1921, a dozen or more were noted above Ciales sporting in a road opening. Occasionally two would snap their wings together with a sound like that made by dragonflies, and fall to the ground, scuffling in copulation. They sometimes are attracted to lights, having been intercepted at Bayamón, and are quite common in coffee fincas at the higher elevations.

*Otosema odorata* (Linnaeus) was listed from Puerto Rico by all the early entomologists as an *Erebus*, Dr. Gundlach noting "la oruga se alimenta de varias especies de *Cassia*, de *Pithecolobium*, etc., ocultándose durante el día entre las grietas de la corteza." It was number 1418 in Van Zwaluwenburg's list, having been reared by him on *Cassia fistula*, *Pithecolobium saman* and *Ficus* sp., but without record of anything more concerning the caterpillars. The adults have possibly the largest wing area of any moth found in Puerto Rico, mostly dull brown with innumerable lighter or darker wavy lines; a small eye-spot on the forewing and a double one on the hind wing. They are sometimes found hiding in the dark corners of a house early in the morning, and by the more superstitious thought to be an omen of death. Some houses, poorly illuminated at night, with dark interior walls and densely shaded by surrounding trees, may prove especially attractive to these big, black, fluttery moths, one or more of them haunting it nearly every twilight both night and morning.

*Peosina numeria* (Drury) was listed from Puerto Rico by all the early entomologists, but has not since been collected locally.

*Hemeroblemma rengus* (Poey), listed as a *Brujas* from Puerto Rico by Herr Möscher and Dr. Gundlach, has not since been collected locally.

*Latebraria amphipyroides* Guenée, listed from Puerto Rico by Herr Möscher, and by Dr. Gundlach noted with the "oruga en especies de *Cassia*," has not since been collected locally.

*Hemicephalis characteria* (Stoll), listed from Puerto Rico by Herr Möscher and Dr. Gundlach, is recognized by Dr. Schaus (1940-244): a single specimen from Mameyes.

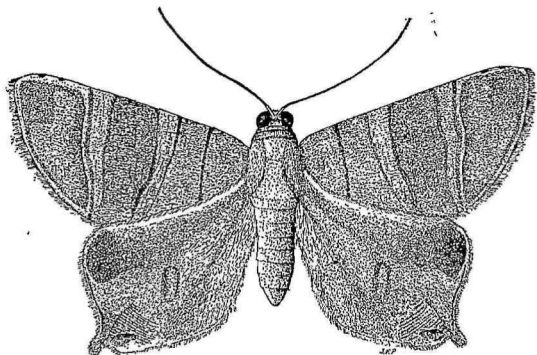
*Pseudochemiceras krugii* was described by Herr Heinrich B. Möscher (1890-176) from Puerto Rico, and listed by Dr. Gundlach. Mr. E. G. Smyth collected two adults of this brick-red Noctuid at light at Hda. Santa Rita, Guánica in the summer of 1913, and later he reared adults from larvae boring in twigs of "roble" (*Tabebuia pallida*), at Río Piedras. As observed by Drs. Donald de León and Luis F. Martorell, other species suffer similar injury: *Tabebuia rigida* at Guavate, Cayey; *T. heterophylla* at Ponce and Guánica; and Dr. Martorell noted the latter species and *T. lucida* attacked on Mona Island. The burrow opening of a caterpillar is at a crotch of a small branch, clogged with excrement and uneaten bits of



leaves, for the larva not only feeds on the pith of the twig, but at night sallies forth to drag to the entrance of its tunnel entire leaves, to be devoured in safety with its body inside the burrow.

*Concana mundissima* Walker, listed from Puerto Rico as his *Thelidora splendens* by Herr Möschler, and by Dr. Gundlach, is recognized by Dr. Schaus (1940-245) from Ensenada and Coamo, and from Vieques Island.

*Adiopa disgrega*, described by Herr Heinrich B. Möschler as a *Hadena* from Puerto Rico (1890-128), and thus listed by Dr. Gundlach, was found very abundant at light by Mr. E. G. Smyth at Hda. Santa Rita, Guánica, during the latter half of 1913, fifty-six specimens in all being taken, some



Adult of *Eulepidotis addens* (Walker), four times natural size. (Drawn by José F. Pietri.)

of these being identified by Dr. Schaus as being in the genus *Tarachidia*. These are medium-sized light grey moths with a black inverted question mark and other less pronounced black markings on the costal margin of the forewings; the silvery hindwings margined with grey.

*Dyomyx juno* was described by Herr Heinrich B. Möschler (1890-197) from Puerto Rico, and it is thus listed by Dr. Gundlach. It is known only from Puerto Rico, and no additional specimen has been collected since the type was found.

*Eulepidotis addens* (Walker), originally described as a *Palindia*, and as *Palindia variabilis*, var. *obscura* re-described from Puerto Rican material by Herr Heinrich B. Möschler (1890-195), was thus listed by Dr. Gundlach. It is a sleek little brownish moth, a darker basal cross-bar and two

double ones on the forewings; a washed-out eyespot on the tailed hindwings. Its small, green leaf-folding caterpillars have twice been found at Cayey feeding on the tender leaves of "guaba" (*Inga vera*) during the winter, and after forming slight cocoons, emerging as adults identified originally by Dr. Harrison G. Dyar and subsequently by Mr. J. F. Gates Clarke. It has been taken at light at Río Piedras, and intercepted at light at Bayamón and at Mayagüez. Dr. Schaus (1940-247) also reports collection at Lares.

*Eulepidotis hebe* was described as a *Palindia* by Herr Heinrich B. Möschler (1890-195) from Puerto Rican material, and it is thus listed by Dr. Gundlach. It has been intercepted at light at Bayamón, and Dr. Schaus (1940-248) recognizes as this species adults from Coamo.

*Eulepidotis mabis* (Guenée) was listed from Puerto Rico as a *Palindia* by Herr Möschler and Dr. Gundlach, but has not since been found locally.

*Eulepidotis modestula* (Herrich-Schäffer) was listed by Herr Möschler and by Dr. Gundlach from Puerto Rico as a *Palindia*, and under this name is in Van Zwaluwenburg's list (P. R. 1406). Mr. E. G. Smyth collected twenty-six of these "medium buff" moths at light at Hda. Santa Rita, Guánica, during the latter half of 1913, and it has been intercepted at light at Bayamón. Dr. Schaus lists additional collections (1940-248) at Coamo and San Germán, as well as in Cuba and Haiti. Dr. R. C. Smith and Mr. André Audant found its larvae defoliating trees of "ceiba" (*Ceiba pentandra*) in Haiti, and it may be presumed that this is its normal host in Puerto Rico also. The creamy yellow forewings have a darker margin, and submarginal darker cross-bars; the hindwings but the faintest trace of a tail, and a poorly-formed eye-spot.

*Eulepidotis superior* (Guenée) was re-described from Puerto Rican material by Herr Heinrich B. Möschler (1890-196) under the name of *Palindia dewitsii*, and is thus listed by Dr. Gundlach. It has not since been collected locally. Dr. Stahl also lists from Puerto Rico *Palindia inferior* H. S.

*Noropsis hieroglyphica* (Cramer) was listed from Puerto Rico by Dr. Stahl as *Euglyphia fastuosa* Guenée, and as *Noropsis fastuosa* Guenée by Dr. Gundlach and Herr Möschler, the latter noting "Raupe auf *Corchorus siliquosus*." It is P. R. 1421 in Van Zwaluwenburg's list, and he gives an extended account of it (1918-33), the caterpillars feeding on *Waltheria americana* and *Morongia leptoclada*. "The larvae are more or less gregarious, and drop to the ground when disturbed. The full grown larva is about 25 mm. long and about 4 mm. across the head. The ground color of the body is bluish or greenish white, with a black stripe running around the body on each segment. The segments are divided from one another by a narrow black line. The anal plate and head are reddish-brown, the collar shiny black. The oval pupa case, about 22 x 10 mm., is formed of parchment-like material on the stem of the food plant, and is covered with grass

and bits of leaves." The cocoons were very abundant on fence posts in cane fields at Yauco in September 1921, and two years later the caterpillars caused considerable damage to young trees of beefwood (*Casuarina equisetifolia*) at Hda. María Antonia, Guánica, boring into their tender trunks, apparently seeking a place to pupate. The adults have plain, unmarked abdomens and hindwings, but the collar and sides of thorax are light yellow, the shoulder lappets brownish with purplish iridescence; the forewings mostly yellowish with strongly contrasting hieroglyphic marks of dark brown, surrounding elongated areas of iridescent lavender. While normally most abundant in the more xerophytic areas of the Island, adults have been taken at light at Río Piedras, and Dr. Schaus (1940-248) lists additional collections at Ponce, Coamo, Mayagüez, Lares and Cataño.

*Litoprosopus hatuey* (Poey), originally described from Cuba as a *Noctua*, is recognized by Dr. Schaus (1940-249) from a specimen collected by Mr. Aug. Busck in Puerto Rico, and one by Dr. Wm. T. M. Forbes on Vieques Island.

*Baniana relapsa* (Walker), listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Baniana significans* Walker, and thus identified by Dr. Schaus for Mr. E. G. Smyth: adults collected at light at Hda. Santa Rita, Guánica in 1913, is a fawn-colored moth; the forewings with a conspicuous dark brown triangle near the base, the marginal third equally dark on strongly-curved basal side, but fading towards the margin; the marginal third of the hindwings also somewhat darker. Prof. Forbes notes that "only the male has black on the wings; the female has only top of head and collar black." He has specimens from Guayama and Coamo, and from Lares collected by Mr. Francisco Sefn.

*Rivula pusilla* was described by Herr Heinrich B. Möschler (1890-234) from Puerto Rican material collected by Dr. Gundlach. It is recognized by Dr. Schaus (1940-250): a single specimen from Lares.

*Selenis suero* (Cramer) was listed from Puerto Rico by the early entomologists. Dr. Schaus (1940-250) recognizes from Naguabo and Coamo this species "widely distributed in tropical America."

*Selenis sueroides* Guenée is listed by Dr. Stahl from Puerto Rico, and Dr. Schaus (1940-251) identifies it from Coamo, noting that it is "evidently rare in Porto Rico, but common in Cuba." Prof. Forbes has specimens from Coamo, Aguirre and Toa Baja.

*Selenis portoricensis* was described by Herr Heinrich B. Möschler (1890-214), the type from Puerto Rico, collected by Dr. Gundlach. It is an inconspicuous brownish moth, the costal margin of the forewings very broadly and somewhat irregularly light grey. Mr. Thos. H. Jones reared this moth, as determined by Dr. Schaus, from "yerba de ciénaga" (*Aeschynomene sensitiva*) at Río Piedras in July 1914, and adults have subsequently been

collected at Río Piedras, and in the Guánica Insular Forest at light by Mr. Norberto Lugo.

*Aluaca eubolialis* Walker was identified by Dr. Schaus (1940-251) from Yauco and Aguirre, and Prof. J. A. Ramos (1947-46) found a single adult as identified by Prof. Wm. T. M. Forbes at light, March 4, 1944, at Sardinera Beach, Mona Island.

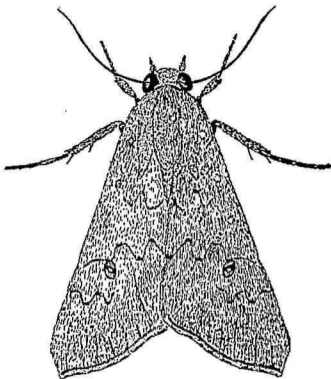
*Glympis concors* Hübner was re-described as *Diastema flavicapilla* by Herr Heinrich B. Möschler (1890-162) from Puerto Rican material collected by Dr. Gundlach. Mr. Thos. H. Jones found small green caterpillars stretched out along the leaflets or leaf stems of "gallito" (*Agati grandiflora*) in March 1912, which were reared to little dark-brown moths, spotted with darker brown, identified by Dr. Harrison G. Dyar as *Aluaca agilaria* Druce. Adults have also been intercepted at light at Bayamón, and in March 1949 were again found in large numbers at Río Piedras.

*Trissophaes serpentifera* (Walker), as identified by Mr. J. F. Gates Clarke, is a large moth with wingspread of over 100 mm., its forewings light brown with unremarkable pattern, but bright yellow hindwings, margined with brown, with an enormous black serpent entering from the anal margin. One adult was found on the mosquito bar in the morning at Guajataca, April 23, 1940, and another at Camp Doña Juana, Villalba. This is the nearest to a *Catocala* that Puerto Rico can show.

*Graphigona regina* (Guenée), listed from Puerto Rico as *Ophideres gubernatrix* Guenée by Herr Möschler and Dr. Gundlach, has not since been collected locally.

*Alabama argillacea* (Hübner), originally described as an *Aletia*, was listed from Puerto Rico by all the early entomologists and is number 1401: on cotton, in Van Zwaluwenburg's list. It is not a permanent resident of Puerto Rico, but outbreaks have been noted since that in 1905 at Aguadilla, reported by Mr. O. W. Barrett (1906-23) and Mr. D. W. May (1906-11); at Hatillo in July 1919 reported by Mr. E. G. Smyth (1920-122); another at Hatillo in the summer of 1922 (Wolcott 1924-6), in the winter of 1922 at Cabo Rojo, reported by Mr. W. V. Tower (1924-13), continued the next year at Boquerón (Wolcott 1924-97); in all the cotton regions in 1930-31, as reported by Dr. M. D. Leonard (1931-114 and 119, 1932-130) but not on Vieques Island during these years, as noted by Mr. Arturo Riollano (1931-104); and again in the Cabo Rojo-Lajas region in the months of October and November of 1935 and 1938, extending to the north coast at Quebradillas in December, and returning again to Lajas in November 1939. In recent years, no important commercial outbreak has occurred, as is indicated by the untouched stocks of arsenate of lead held by the Co-operativa, but in 1942, a few caterpillars were noted on cotton at Río Piedras, and somewhat later at Coamo. "The Mystery of *Alabama argillacea*" (Amer.

Naturalist, 63 (684): 82-87. New York, Jan.-Feb. 1929) consists not only in its sudden appearances in such enormous numbers, and equally sudden disappearances, but in the stimuli in the tropics which can start such migrations from equatorial regions where it presumably is present at all times of year. The continued spread of outbreaks in the southern states of the United States from the Río Grande region in south Texas, and from the West Indies into south Florida, advancing thru the entire cotton region, finally ends in migratory flights of moths across the Great Lakes and the



Adult of the Cotton Caterpillar, *Alabama argillacea* Hübner, three times natural size. (Drawn by Fritz Maximilien.)

St. Lawrence into southern Canada. All of these adults perish without oviposition, and fresh infestations in the following or succeeding years originate in the West Indies or Mexico, or further south; never a return from the north. Mr. André Audant is convinced that the species is present at all times in Haiti, with caterpillars feeding on the leaves of cotton around Cap-Haitien during the winter, when the plants in the Cul-de-Sac and Presque Isle are maturing their bolls and have dropped all their yellowed leaves. Migration of the moths is not only necessary to ensure a fresh supply of food for their progeny, but during an outbreak of the larvae, so many are parasitized by the wasps *Apanteles aletiae* Riley and species of *Brachymeria*, and so many pupae are destroyed by *Sarcophaga sternodontis* T.T., that a fresh generation can only escape mass attack when developing

in a location far removed from that in which the previous generation attained maturity. The moths are sleek in appearance, well fitted for making long flights, grey in color, with but the most indistinct of markings on the forewings. The eggs are laid individually, usually on the underside of cotton leaves, but several or many moths may oviposit on the same leaf. The caterpillars feed only on cotton leaves, and altho not gregarious, usually occur in such numbers as to completely defoliate all or most of the plants in large fields. Those which attain full size most rapidly spin loose cocoons in folded-over leaves, which later may be eaten by other caterpillars, leaving the purplish red chrysalis dangling, suspended by a few scattered threads. The mortality among such pupae is often total, being aided by the presence of Sarcophagid flies, alert to oviposit in any dead, dying or injured insect. On perennial cotton, as in southern Haiti, which with abundant rains may develop vegetatively to a height which makes the harvesting of bolls difficult, repeated defoliation by these caterpillars is definitely beneficial, but on Sea Island cotton, as in Puerto Rico, their prompt control is invariably desirable. Arsenate of lead is the standard remedy, and it continues to be used, despite the lower price of calcium arsenate, because of its superior adhesiveness to cotton leaves. In recent years the superior effectiveness of DDT and others of the newer insecticides in killing caterpillars has been demonstrated elsewhere, but not in Puerto Rico, due to non-occurrence of outbreaks on which to make the tests.

In the spring of 1949, after seven years when this pest had not been noted in Puerto Rico, it appeared in considerable abundance at Isabela. Not only were DDT and the gamma isomer of benzene hexachloride effective in control, but, as observed by Dr. Luis F. Martorell, a strip of cotton sprayed with chlordan before infestation had begun to appear continued to remain free from caterpillars despite heavy infestation in unsprayed fields near-by. Such repellent action of chlordan for the moths, preventing their laying eggs on sprayed cotton, has not previously been noted anywhere. All of the new insecticides are so much more promptly effective than was arsenate of lead that the growers who kept a stock on hand to be prepared for expected outbreaks can but regret their caution.

*Anomis erosa* Hübner is a bright golden yellow moth, the distal half of the forewings somewhat darker, the pattern outlined with narrow curving brown lines; a sharp angle on the outer margin. In January 1922, Mr. John D. More reared a caterpillar collected on cotton at Sabana Grande which Dr. Schaus identified as *Cosmophila erosa*. Under this name it had been listed from Puerto Rico by the early entomologists, Dr. Gundlach noting "la oruga se cría en *Plumbago*, también en las *Althaea*." It was thus identified by Mr. Frank E. Watson for Mr. E. G. Smyth, who had taken forty of these moths at light at Hda. Santa Rita, Guánica during the latter half of 1913. It has been intercepted at Bayamón, and additional records

of collection at San Germán, Coamo and on El Yunque are given by Dr. Schaus (1940-253). Mr. Francisco Seín found it at Lares.

*Anomis flava fimbriago* (Stephens) is listed from Puerto Rico by Dr. Wm. Schaus (1940-253). Prof. Forbes notes that it looks almost exactly like *A. erosa*, but the male antennae are thicker in his specimens from Haiti.

*Anomis gundlachi* is the new name which Dr. Wm. Schaus (1940-254) applies to what the early entomologist in Puerto Rico listed as *Anomis fulvida* Guenée. "The *A. fulvida* of Gundlach represents accurately the male specimen from Cuba to which I apply his name. This specimen has a tuft of hairs at the base of the costa underneath, and was collected near Havana."

*Anomis illita* Guenée was listed from Puerto Rico by the early entomologists, and has since been taken at light in the San Juan area, at Bayamón and at Mayagüez. Dr. Schaus (1940-254) lists it from Coamo.

*Anomis impasta* Guenée is easily confused with *Alabama argillacea*, the caterpillars of both feeding on cotton leaves, but the larva of the *Anomis* is essentially solitary, never having been known to occur in such abundance as to constitute an outbreak. The moths are also similar, but the forewings of *Anomis* are darker, with a more distinct pattern and more golden than the dull clay of *Alabama argillacea*, and they have a distinct angle on the outer margin. Mr. E. G. Smyth, writing of the "Cotton Insects of Porto Rico" (Ent. News, 21 (5): 121-125. Lancaster, May 1920) confused the two, and recommends the destruction of "cadillo" (*Urena lobata*) and "malva de caballo" (*Malachra alceifolia* or *rotundifolia*), on which he had reared this *Anomis*, as a measure of control for *Alabama*. Dr. Harrison G. Dyar first identified this species from Puerto Rico as his *Anomis doctorum*, in error in "Insectae Borinquenses" (1936-440) as *doctorium*. No adult has been collected at light, but adults have been reared from larvae feeding on cotton at Humacao, Guayama, Villalba, Guánica, Camuy, Garrochales, Manatí and Vega Baja, and Dr. Schaus (1940-254) notes it as "widely distributed in tropical America."

*Gonitis editrix* Guenée is a light brownish moth, its forewings sharply angled on the outer margin and unevenly quartered by transverse lines. It was listed from Puerto Rico by all the early entomologists, Dr. Gundlach noting "la oruga se cría en *Triumfetta*." Mr. E. G. Smyth in the summer of 1916 at Río Piedras, reared several of these moths, as identified by Mr. Frank E. Watson, from "cadillo" (*Triumfetta* spp.), noting them as "a duller, darker brown than *Anomis erosa*." Dr. Schaus (1940-255) notes additional collections at Coamo and Ensenda.

*Gonitis praeurupta*, described as an *Anomis* by Herr Heinrich B. Möscher (1890-173), is noted by Dr. Gundlach as "no está indicada de otras tierras." This is unquestionably true because the host of the larva is the endemic

"maga" (*Montezuma speciosissima*), a tree which does not occur elsewhere. The smaller caterpillars are entirely green, exactly matching the color of maga leaves, but in the last instar become tinged with pink, which becomes more intense as the larva approaches maturity. The chocolate-brown adults, with somewhat clearer hind wings, as identified by Mr. J. F. Gates Clarke, have been reared at Isabela and Toa Baja. Dr. Schaus (1940-254) writes "I have seen no material from Porto Rico, but I consider *G. hedys* Dyar the same species (type from Cuba in U. S. National Museum)," in which opinion he can hardly be correct, for the larvae of the Cuban species must feed on the leaves of a different host.

*Plusiodonta thomae* Guenée, listed from Puerto Rico by Herr Möschler and Dr. Gundlach, was collected at El Semil by Dr. Wm. A. Hoffman, as identified by Mr. J. F. Gates Clarke.

*Duriga nealcesalis* (Walker) is recognized from Coamo by Dr. Schaus (1940-256) as being in his new genus.

*Cecharismena cara* was described by Herr Heinrich B. Möschler (1890-166) from specimens collected by Dr. Gundlach in Puerto Rico. Dr. Schaus (1940-256) recognizes it from Coamo, and from Palmas Abajo, a locality not to be found on most maps, but located north of Guayama to the west of the road to Cayey, where collections were made by Dr. Wm. A. Hoffman.

*Cecharismena nectarea* was described by Herr Heinrich B. Möschler (1890-165) from Puerto Rican material collected by Dr. Gundlach, and listed by him. As *Zagorista debora* Druce, Dr. Wm. Schaus identified these "handsome brown and grey moths" for Mr. E. G. Smyth, who had reared them from "sacatrapos" (*Caperonia palustris*) at Río Piedras during the summer of 1916. The basal third of the forewing of this little moth is sharply cut off by a broad, transverse lighter band, which is irregularly and less sharply defined apically. Prof. Forbes has specimens from Coamo and Toa Alta.

*Parachabora abydas* (Herrich-Schäffer), re-described by Herr Heinrich B. Möschler (1890-197) under the name of *Penicillaria cuprea* from Puerto Rican material collected by Dr. Gundlach, was thus listed by him. Dr. Wm. Schaus considered Möschler's species as being a *Eutelia*, and it is thus listed in "Insectae Portoricensis" (1923-167), and with present synonymy in "Insectae Borinquenses" (1936-429) under Möschler's specific name. Mr. E. G. Smyth collected only five of these moths at light at Hda. Santa Rita, Guánica during the latter half of 1913, but elsewhere it is quite common. Dr. Schaus (1940-257) listing collections from Lares, Isabela, San Germán and Guayama, as well as from Vieques Island. The forewings of the adult are rich purplish-brown, as are also the outer margins of the silvery hindwings.

*Gonodonta clotilda* (Stoll) was listed from Puerto Rico as *G. maria*



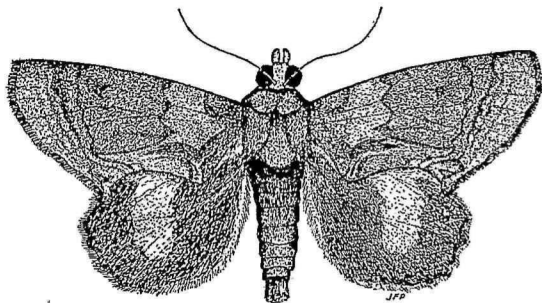
Guenée by Herr Möschler, Dr. Gundlach noting "oruga en *Anona glabra* y *palustris*, *Bocagea virgata*, *Nectandra*."

*Gonodonta bidens* (Hübner) was identified by Dr. Wm. Schaus as an *Athysania*: adults intercepted at light at Bayamón.

*Gonodonta hesione* (Drury) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach. Adults intercepted at light at Bayamón have been identified by Dr. Schaus as this species.

*Gonodonta incurva* (Sepp), listed by all the early entomologists as *G. teretimacula* Guenée from Puerto Rico, Dr. Gundlach noting "la oruga come *Artanthe*," is recognized by Dr. Schaus (1940-258) from Lares.

*Gonodonta marmorata* Schaus is recognized from Lares by Dr. Schaus (1940-258). He thinks this is presumably what Dr. Stahl listed as *Gono-*



Adult of the velvety black Higuillo Caterpillar, *Gonodonta nitidimacula* Guenée, a little more than twice natural size. (Drawn by José F. Pietri).

*donta uxoria* Cramer, and all the early entomologists listed as *Gonodonta soror* Cramer. An adult determined by Mr. Hahn W. Capps, collected by Dr. Luis F. Martorell at Villalba, May 19, 1940, has the distal half of the inner margin of the forewing cut out, and a complicated pattern of rich brown, orchid and lavender; the hindwings with a large bright yellow spot in the middle, margin very dark brown. The head, thorax and abdomen are dark brown.

*Gonodonta nitidimacula* Guenée, as identified by Dr. Harrison G. Dyar, is what Herr Möschler listed from Puerto Rico as *G. latimacula* Guenée of which Dr. Gundlach noted "la oruga en *Artanthe* y *Pothomorphe*." Both of these are of the Piperaceas, and the distinctive larvae have repeatedly been noted since on them as well as on "higuillo" (*Piper amalago* or *medium*) at Río Piedras, Cayey, and generally in the lower coffee regions where

these plants are most abundant. As described in "Insectae Portoricensis" (1923-176), the caterpillar is "entirely black except for yellow clypeus, two bright yellow semi-circular spots on the sides of the first segment, two narrow reddish-orange spots on the fourth segment and two small yellow spots dorsally; two small reddish-orange spots on the sides of the seventh segment, four larger on the eighth, two large ones on the ninth and tenth and two small ones on the eleventh, all lateral, and two large crescents on the hump of the twelfth, dorsally. When fully-grown, it forms a cocoon on a branch by fastening together many bits of cut-up leaves with their edges sticking out." The adults have creamy white heads; the size of the bright yellow spots on the hindwings varies considerably, as does also in details the pattern of purplish-brown and lavender of the forewings.

*Calpe aequalis* (Walker) is listed as an *Oraesia* from Puerto Rico by Herr Möschler and Dr. Gundlach.

*Calpe excitans* (Walker), listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Oraesia metallescens* Guenée, an oriental species not found in the Americas, is recognized by Dr. Schaus (1940-259) from specimens intercepted at light at Bayamón.

*Sudariophora fastigiata* (Herrich-Schäffer), listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Pseudocaple tristriga* H. S., was doubtfully identified by Dr. Schaus in 1923, specimens reared from undetermined host at Boquerón, as *Phiprosopus albiguttata* Herrich-Schäffer. The moths exhibit considerable variation in appearance, the hindwings and abdomen of some being dull yellow; the head, thorax and forewings light brown, with a diagonal, lighter-colored, stripe extending from the apex to about the middle of the inner margin of the forewing. Others are considerably darker, the diagonal stripe being merely the margin of the darker-colored marginal area. Some have a small white orbicular, others a darker one, and Dr. Schaus (1940-260) notes that Dr. Gundlach "thought that Herrich-Schäffer's three species, *albiguttata*, *fastigiata* and *tristriga* represented one species." The larvae, as noted in "Insectae Portoricensis" (1923-177), are looper caterpillars, about 30 mm. long, grey in general appearance due to irregular, waved, longitudinal, narrow stripes of yellow, or orange edged with yellow, alternating with broader stripes of greyish lavender margined with darker lavender. Two pairs of prominent yellow warts on the most elevated abdominal segments are covered with short fine brown hairs. Setae and their bases black. Head creamy and opalescent, with rows of aggregations of orange-yellow dots and dark brown ocelli, mouth-parts creamy and opalescent. They spin cocoons of light yellow silk, thick and roughly quadrangular, 6 x 20 mm. Adults have been collected at light at Coamo.

*Antiblemma andersoni* was described by Dr. Wm. Schaus (1940-261) from a drab-colored moth with a wing expanse of 19 mm. intercepted by

Mr. C. G. Anderson at light at Bayamon. Prof. Forbes has specimens from Cayey and Lares, the latter collected by Mr. Francisco Sefn.

*Antiblemma astyla* was described from Puerto Rico as a *Capnodes* by Herr Heinrich B. Möschler (1890-215) from material collected by Dr. Gundlach. It has not been found since and Dr. Schaus (1940-261) is of the opinion that it "is the male of *A. sterope* (Cramer) or *A. rufinans* Guenée. Both species are common in Cuba."

*Antiblemma anhypha* (Guenée) is listed as a *Capnodes* from Puerto Rico by Herr Möschler and Dr. Gundlach.

*Antiblemma concinnula* (Walker) was re-described as *Capnodes priscilla* by Herr Heinrich B. Möschler (1890-216) from Puerto Rican material collected by Dr. Gundlach. Dr. Schaus (1940-260) recognizes it from fresh specimens from Lares.

*Antiblemma marita*, originally described by Dr. Schaus as a *Capnodes* from Cuba, is identified by him (1940-261), specimens from Coamo.

*Antiblemma prisca*, described by Herr Heinrich B. Möschler (1890-216), from material collected in Puerto Rico by Dr. Gundlach, as a *Capnodes*, is recognized by Dr. Schaus (1940-261): specimens from Coamo.

*Antiblemma sterope* (Cramer), listed from Puerto Rico by Herr Möschler and Dr. Gundlach as a *Capnodes*, has not recently been collected locally.

*Massala obvertens* (Walker), of which Herr Heinrich B. Möschler (1890-215) described the variety *insularis* of *Capnodes turtur* Felder and Rogenhofer from material collected in Puerto Rico by Dr. Gundlach, has since been found at Ensenda and Coamo, according to Dr. Schaus (1940-262), and collected at light at Dorado by Dr. Wm. A. Hoffman.

*Euthermesia absumens* (Walker) was re-described by Herr Heinrich B. Möschler (1890-263) under the name *Metallata variabilis*, and thus listed by Dr. Gundlach. It has not been found since locally.

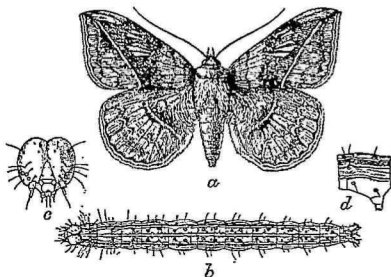
*Bendis bayamona* was described by Dr. Wm. Schaus (1940-264), "the male, with a wing expanse of 31 mm., very closely allied to *Bendis formularis* Hübner, distinguished by the underside of the forewing—hair brown, the inner margin narrowly whitish; the female nearer *Bendis irregularis* Hübner." Prof. Forbes considers this the Puerto Rican and Virgin Island race of the mainland *Bendis formularis*.

*Bendis formularis* Hübner was listed under this name by Herr Möschler and Dr. Gundlach, but Dr. Stahl had the name *Bendis impar* Guenée. Mr. E. G. Smyth took nine specimens of this "chocolate-brown barred Noctuid" at light at Hda. Santa Rita, Guánica, during October, November and December 1913, and two at Río Piedras in January 1917. It has been intercepted at light at Bayamón, and Dr. Schaus (1940-264) lists collections at Santurce, Coamo, Aibonito, Lares and Arecibo. Dr. Gundlach noted the larvae on *Cassia obtusifolia*, and they have been found at Río Piedras on "moriviví" or "sensitiva" (*Mimosa pudica*).

*Bendis gurdá* Guenée, originally described from St. Thomas, was collected at light by Prof. J. A. Ramos (1947-46) at Sardinera Beach, Mona Island, as determined by Prof. Wm. T. M. Forbes. It has not been found in Puerto Rico.

*Bendis magdalia* Guenée, originally described from French Guiana, was listed from Puerto Rico by Herr Möschler and Dr. Gundlach.

*Anticarsia gemmatilis* Hübner, the velvet bean or cowpea caterpillar, was listed from Puerto Rico by all the early entomologists as a *Thermesia*. According to Dr. Schaus (1940-206), it occurs from the United States to Paraguay, and in the Galapagos Islands. Outbreaks may occur at any point in Puerto Rico, the caterpillars having been found on alfalfa, peanuts and the foliage of the "gallito" tree (*Agati grandiflora*). Mr. H. K. Plank



The Velvetbean Caterpillar, *Anticarsia gemmatilis* Hübner: *a*, adult, *b*, larva from above, *c*, head of larva, *d*, one segment of larva, from the side. (After Chittenden, U. S. D. A.)

(1945-27) notes an outbreak on soybeans at Mayagüez, controlled by the fungus *Spicaria prasina* (Maubl.) Saw., but the identification by Miss Vera K. Charles of that eliminating outbreaks on this host at Isabela and at Loíza Aldea was *Spicaria rileyi* (Farl.) Charles, as recorded in "Epidemics of Fungus Disease Control Insect Pests in Puerto Rico" (Jour. Ec. Ent., 33 (1):201-2. Menasha, February 1940). Under optimum weather conditions of high humidity and temperature for the development of this fungus, extensive outbreaks may be controlled with total efficiency. The diseased caterpillars crawl to outermost leaves or branches, and there immobilized, are soon covered with a greenish-white film of spores. On the contrary, during dry weather no fungus appears, and entire fields of cowpeas or velvet beans may be defoliated unless artificial means are taken. The appearance of these caterpillars is often so sudden that farmers have the

greatest difficulty in protecting their crops, but the present availability of DDT now makes artificial control comparatively simple. The caterpillars vary considerably in the amount of green, black and intermediate coloration they show, but rearing will indicate that they are all the same species. The adults also show considerable variation in both pattern and depth of coloration.

*Anticarsia elegantula* (Herrich-Schäffer), listed from Puerto Rico by Herr Möschler and Dr. Gundlach, is by the latter thought "es probable que ésta y la especie precedente sean iguales." Prof. Forbes has a female collected by Mr. Francisco Seín at Lares which "fits this species or form, being pale, greenish, and lacking the white submarginal dots on under side."

*Sylectra congemmalis* Hübner, re-described as *Sylectra fictilina* by Herr Heinrich B. Möschler (1880-440), and listed from Puerto Rico by him and Dr. Gundlach, has not since been found locally.

*Sylectra erycata* (Cramer), listed from Puerto Rico by Herr Möschler and Dr. Gundlach, has been identified by Dr. Harrison G. Dyar (unlabeled specimen); by Mr. J. F. Gates Clarke, (a specimen collected at Río Piedras in August 1939) and intercepted at light at Bayamón. It has flattened antennae, combed on one side, ending in a curved whip; blood-orange wings, three transverse bands on the forewings, one more prominent on the hindwings. Dr. M. D. Leonard collected it on Vieques Island.

*Sylectra lucifer* as a *Sylectra* was described by Herr Heinrich B. Möschler (1890-267), and thus listed by Dr. Gundlach.

*Ephyrodes cacata* Guenée, listed from Puerto Rico by Herr Möschler and Dr. Gundlach, has been recognized by Dr. Schaus (1940-267) from Coamo.

*Azeta repugnalis* (Hübner), listed by Herr Möschler and Dr. Gundlach from Puerto Rico, is recognized by Dr. Schaus (1940-268) from Aguirre, and has been collected at light, as identified by Prof. Wm. T. M. Forbes, by Prof. J. A. Ramos (1947-45) at Sardinera Beach, Mona Island.

*Orthogramma coppyri* Guenée, as *Thermesia icterodes* Felder and Rogenhofer, is listed by Dr. Gundlach from Puerto Rico, remarking "no observada por Krug ni por mí. Möschler no dice quién la cogió." It has not been found since.

*Epidromia pannosa* Guenée, listed from Puerto Rico by Herr Möschler and Dr. Gundlach, is recognized by Dr. Schaus (1940-269) from Catano and Coamo. It has also been intercepted at light at Bayamón.

*Epidromia pyraliformis*, as identified by Prof. Wm. T. M. Forbes, possibly a Walker species described from Santo Domingo, was collected at light by Prof. J. A. Ramos (1947-46) at Sardinera Beach, Mona Island.

*Epidromia rotundata* Herrich-Schäffer was listed from Puerto Rico by Dr. Stahl.

*Focilla angularis* was described from Jamaica by Herr Heinrich B. Möschler and identified by him from Puerto Rico, specimens collected by Dr. Gundlach, and listed by him.

*Epitomisptera orneodalis* (Guenée) was identified by Dr. Schaus as a *Tortricodes*: an inconspicuous little brownish moth of which Mr. E. G. Smyth had taken two at light at Hda. Santa Rita, Guánica in 1913, and of which Dr. Richard T. Cotton had reared a male from a larva on tomato, at Río Piedras. Dr. Schaus (1940-271) states "no males have been received from Porto Rico," having forgotten about the one he returned, and lists collections at Adjuntas and on El Yunque. A larva feeding on a papaya leaf, intercepted at Isabela, when reared to adult, proved to be this species, and in the Report of the Mayagüez Station for 1938 (1939-118) is the record of the larva of this little moth feeding on bamboo. To these varied host plants, Dr. Schaus adds lima beans.

*Epitomisptera alucitalis* (Guenée) is listed by Dr. Schaus (1940-271) from Lares.

*Lophoditta tuberculalis* (Herrich-Schäffer), re-described by Herr Heinrich B. Möschler (1890-230) as *L. perspicillaris*, and thus listed by Dr. Gundlach, is recognized by Dr. Schaus (1940-271): specimens from Lares.

*Kyneria utuadae* was described by Dr. Wm. Schaus (1940-272) from a type collected by Dr. Wm. A. Hoffman at Utuado: an olive colored moth with a wing expanse of 22 mm., "forewing below light mouse gray." It is presumed that this is what he had previously determined as *Epitomisptera pterophalis* Guenée, as listed in "Insectae Borinquenses" (1936-442).

*Mastigophorus demissalis* was described by Herr Heinrich B. Möschler (1890-233) from Puerto Rican material collected by Dr. Gundlach, and is thus listed by him. It has been intercepted at light at Bayamón, and collected at El Semil by Dr. W. A. Hoffman, as identified by Mr. J. F. Gates Clarke.

*Mastigophorus jamaicalis* Schaus is recognized by its describer (1940-272) from specimens taken at Lares and Adjuntas.

*Hypenula complectalis* Grote, as identified by Prof. Wm. T. M. Forbes, was found by Prof. J. A. Ramos (1947-46) "common at light, Sardinera Beach, April 4-7, June 29, July 20, 1944" on Mona Island. It is not reported from Puerto Rico.

*Phlyctainia irrigualis* was described by Herr Heinrich B. Möschler (1890-229) from Puerto Rican material collected by Dr. Gundlach. Dr. Schaus (1940-273) recognizes as this species specimens from Coamo.

*Tetanolita mutatalis* was described as a *Scelescepon* by Herr Heinrich B. Möschler (1890-230) from Puerto Rico, under which name it was listed by Dr. Gundlach. It has been repeatedly intercepted at light at Bayamón and Dr. Schaus (1940-273) lists additional collections at Río Piedras,

Dorado, Adjuntas, Aibonito, Coamo, Lares and San Germán. It is a small brownish moth, the female with darker brown triangles along the outer margin of the forewing, and one larger crescentric mark towards the center, the male having a complicated pattern of brown and grey.

*Lophophora clanymoides* was described by Herr Heinrich B. Möschler (1890-228) from Puerto Rican material collected by Dr. Gundlach. Dr. Schaus (1940-274) notes recent collections at Lares, Coamo and by Dr. W. A. Hoffman at Palmas Abajo, which is between Guayama and Jájome Alto. This moth has been repeatedly intercepted at Bayamón, and Prof. Forbes found it on Vieques Island.

*Physula peckii* was described by Herr Heinrich B. Möschler (1890-232) from Puerto Rican material collected by Dr. Gundlach. It has not since been found.

*Carteris oculatalis* was described as a *Zanclognatha* by Herr Heinrich B. Möschler (1890-225) from Puerto Rico, and it is thus listed by Dr. Gundlach. Altho with an extensive neotropical distribution, it has not since been found locally.

*Bleptina acastusalis* Walker, re-described from Puerto Rican material by Herr Heinrich B. Möschler (1890-219) as *Anagoa placidalis*, and thus listed by Dr. Gundlach, has not since been found here. It was originally described from Santo Domingo, and Prof. J. A. Ramos (1947-46) records the collection at light, of two specimens, as determined by Prof. Wm. T. M. Forbes, from Sardinera Beach, Mona Island.

*Bleptina atymnusalis* (Walker), a common species in Cuba, is recorded by Dr. Schaus (1940-275) from Ensenada, and by Prof. J. A. Ramos (1947-46) from Mona Island.

*Bleptina araealis* (Hampson) is identified by Dr. Schaus (1940-276) from Coamo.

*Bleptina limatalis* was described as an *Anagoa* by Herr Heinrich B. Möschler (1890-218) from Puerto Rico, and it is thus listed by Dr. Gundlach. Dr. Schaus had previously advised that it was a synonym of *B. menalcasalis* Walker, and it is thus listed in "Insectae Borinquenses" (1934-443). He has since identified females from Ensenada.

*Bleptina nigromaculatalis* was described by Herr Heinrich B. Möschler (1890-218) as an *Anagoa* from Puerto Rican material collected by Dr. Gundlach, and it is thus listed by him.

*Bleptina priassalis* Walker was re-described from Puerto Rican material by Herr Heinrich B. Möschler (1890-226) under the name of *Bleptina subjecta*, and it is thus listed by Dr. Gundlach. It has not since been found locally.

*Aglaonice hirtipalpis* (Walker), re-described from Puerto Rican material by Herr Heinrich B. Möschler (1890-227) under the name *Aglaonice*

*snelleni*, and thus listed by Dr. Gundlach, has not since been collected locally.

*Mursa subrufa* (Warren), re-described from Puerto Rican material by Herr Heinrich B. Möscher (1890-222) under the name *Sisputa gracilis*, and thus listed by Dr. Gundlach, is recognized by Dr. Schaus (1940-276) from specimens from Coamo, and those collected by Dr. Wm. A. Hoffman at Palmas Abajo, between Guayama and Jájome Alto. It was repeatedly intercepted at light at Bayamón, and identified under Möscher's name, as indicated in "Insectae Borinquenses" (1936-443).

*Hormoschista latipalpis* (Walker), re-described from Puerto Rico by Herr Heinrich B. Möscher (1890-221) as *H. pagenstecheri*, has not since been found locally.

*Bomolochá conditalis*, described by Herr Heinrich B. Möscher (1890-222) from Puerto Rico as a *Hypena*, and thus listed by Dr. Gundlach, is identified by Dr. Schaus (1940-277): a specimen from Coamo.

*Bomolocha exoletalis* (Guenée), listed as a *Hypena* by Herr Möscher and Dr. Gundlach from Puerto Rico, has not since been found locally.

*Bomolocha umbralis* Smith, re-described from Puerto Rican material by Herr Heinrich B. Möscher (1890-223) under the name of *Hypena cervinalis*, and thus listed by Dr. Gundlach, has been intercepted at light at Bayamón.

*Ophiuche degesalis* (Walker), re-described by Herr Heinrich B. Möscher (1890-224) from Puerto Rican material collected by Dr. Gundlach, under the name of *Hypena vincularis*, has not since been found locally.

*Ophiuche lividalis* (Hübner), listed from Puerto Rico by Herr Möscher and Dr. Gundlach as a *Hypena*, is recognized by Dr. Schaus (1940-279): a specimen from Lares. Prof. Forbes states that "this specimen is really *consilialis* Walker. I have *lividalis* only from Africa."

*Ophiuche minualis* (Guenée) was identified by Dr. Schaus in 1923 as an *Anepischetos*: two little brown moths reared by Mr. E. G. Smyth at Río Piedras during the summer of 1916 from "escoba" (*Sida carpinifolia* and *S. antillensis*). Prof. Forbes notes additional collections by Dr. Stuart T. Danforth at Cartagena Lagoon by Mr. Francisco Sefn at Lares, and by himself with Dr. M. D. Leonard at Aguirre and Coamo.

*Ophiuche porrectalis* (Fabricius), originally described as a *Phalaena*, and re-described from Puerto Rican material by Herr Heinrich B. Möscher (1890-225) as *Hypena incertalis*, has been identified by Dr. Schaus (1940-279) from specimens collected at Aibonito, Coamo and Lares.

#### Notodontidae

*Nystalea ebalea* (Cramer) is listed from Puerto Rico by the early entomologists, Dr. Gundlach noting "la oruga vive en *Comocladia* y en



*Spondias*." Prof. Wm. T. M. Forbes (1930-45) notes a recent collection at Coamo. Mr. Francisco Seín found an adult, as identified by Dr. Wm. Schaus, resting on the branch of a tree at Río Piedras, and another was intercepted at San Juan. This is a large brown moth with a wing expanse of over two inches, the apex of the forewing bluntly rounded "with a contrasting pale spot," the veins and margin of the hindwing also brown.

Purplish-red caterpillars, found resting on leaves of "tapón blanco" *Calyptranthes pallescens*, in Guajataca Gorge October 9, 1945, doubled up so that they resembled bird excrement, were possibly one of the following Notodontids, but were so small when found that they were not reared to adult. They had extremely large heads; elongate, narrow necks with an oval brownish mark dorsally; four sharply-pointed but fleshy humps on dorsum of body, and an even larger hump on the next to the terminal segment; much lengthened hind legs. Dorsally they are more or less spotted with whitish flecks.

*Nystalea nyseus* (Cramer) is listed from Puerto Rico by all the early entomologists, Dr. Stahl calling it a *Cyrrhesta*. It has not since been found locally.

*Proelymniotis aequipars* (Walker) was listed as *Nystales divisa* Möschler by Dr. Gundlach and Herr Möschler from Puerto Rico.

*Rifargia distinguenda* (Walker), a shining pale gray moth, was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Symmerista dubia* Möschler.

*Hippia insularis* (Grote), listed as an *Edema* from Puerto Rico by Herr Möschler and Dr. Gundlach, is by the latter noted as "la oruga se crió en *Cupania*." Prof. Wm. T. M. Forbes (1930-47) describes the moth as being "mottled, dull grey with a triangular whitish costo-apical shade; the apical area below is shaded with darker grey; 35 mm."

### Sphingidae: Sphinx Moths

*Herse cingulata* (Fabricius) was listed from Puerto Rico by Dr. Stahl as a *Macrosila*, and by the other early entomologists as a *Sphinx*, Herr Möschler (1890-111) noting "Raupe auf Convolvulaceen: *Ipomaea batatas*, *trilobata*, *bona nox*, u. s. w." As *Phlegethontius convolvuli* Linn. it is mentioned by Mr. Thos. H. Jones (1915-7) as a pest of sweet potato of minor importance. In Van Zwaluwenburg's list it is number 918: on sweet potato. Adults quite often come to light, having been collected at Río Piedras, intercepted at Bayamón, while Prof. Wm. T. M. Forbes (1930-50) records it at Mayagüez and (1931-344) from Vieques Island, being "easily distinguished by the pink on the body" and on the hindwings. Mr. E. G. Smyth noted all all-devouring outbreak during December 1918 along the northwestern coast from Arecibo to Aguadilla, the caterpillars after having

eaten all the sweet potato leaves, and of such wild hosts as goat's food morning glory, attacked any other green vegetation available. "Farmers at Hatillo say that about December 10th the larvae were seen by millions, and that after devouring all sweet potato vines in one field, they migrated to another in hordes, crawling over one another "como un río de hormigas." Many were parasitized by Tachinid flies, *Belvosia bifasciata* F., but the caterpillars themselves are so large as to be avoided by all except such large birds as blackbirds and grackles. The farmers were helpless before such an invasion. No tests have since been made with DDT or other of the newer insecticides to determine if control might be possible if noted when the caterpillars were small, and before they had done much damage.

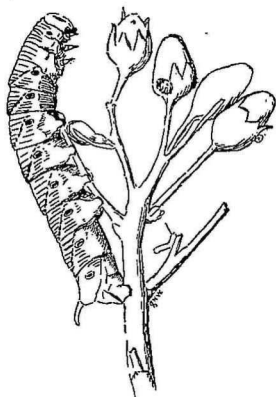
*Cocytius antaeus antaeus* (Drury), listed from Puerto Rico by all the early entomologists as an *Amphonyx*, is noted by Dr. Gunlach with "la oruga se cría en *Anona muricata*." Mr. E. G. Smyth found a partly grown larva on this host, "guanábana," at Río Piedras, heavily parasitized by *Apanteles* maggots, and had earlier found an adult in his room at the Casa Grande of Hda. Santa Rita, Guánica. Numerous adults have been taken at light at Río Piedras, and intercepted at Bayamón. They are by far the largest sphinx moths to be found in Puerto Rico, with wing expanse of seven and a half inches. Three segments of the abdomen have large lateral yellowish spots, and the base of the hindwing is yellowish; its outer half is dark brown, as are also the veins in the transparent inner portion; the forewings are grey, patterned in dark brown or black. Prof. Forbes (1930-52) notes that "the caterpillar has only the stripe leading to the horn, distinct."

*Cocytius cluentius* (Cramer) as an *Amphonyx* was listed from Puerto Rico by all the early entomologists, and one unlabeled specimen is in the Río Piedras collection. The Rev. A. Miles Moss, of Belém do Pará, Brasil, (Nov. Zool., 28: pl. 2. 1920) records the larva feeding on *Annona*, rarely on *Piper*.

*Cocytius duponchel* Poey, originally described from Cuba, "will certainly be taken in Porto Rico," according to Prof. Wm. T. M. Forbes (1930-51), but in fact has not been collected locally to date.

*Phlegethontius* (or *Protoparce*) *sextus* Johansson var. *jamaicensis* Butler, the tobacco or tomato hornworm, was listed from Puerto Rico by all the early entomologists; Drs. Stahl and Devitz as *Macrosila carolina* L., and Herr Möschler and Dr. Gundlach as *Sphinx carolina* L., the latter noting "muy dañina al cultivo del tabaco, y en las huertas al tomate (*Lycopersicum*)." Mr. W. V. Tower (1908-36) found the eggs parasitized by *Telenomus monilicornis* Ashmead, but this seems to be its only recorded parasite. Mr. Arthur H. Rosenfeld, commenting on "The Food of Porto Rican Lizards" (Jour. Ec. Ent., 18 (2): 422-3. Geneva, April 1925),

describes the fight between an adult moth and the lizard *Anolis cristatellus*, which the lizard finally won. The caterpillars are eaten by the boat-tailed grackle or "mozambique," but not in such numbers as to be a serious limitation on their abundance. The eggs weigh 0.001 gr., and the just hatched larva 0.0004 gr., while the fully-grown larva weighs from 5.0 to over 6.0 gr., having eaten over 25.0 gr. of fresh tobacco leaves in attaining its growth. Two-thirds of the weight of the food has been voided as excrement. The adults weigh only a tenth as much as the food which the caterpillars consumed, as was shown in experiments conducted "On the



Egg, just-hatched caterpillar and fully-grown caterpillar of the Tobacco Hornworm, *Phlegonthius sextus jamaicensis* Butler, less than natural size. (Drawn by G. N. Wolcott.)



Pupa of the Tobacco Hornworm, less than twice natural size. (Drawn by F. Seín.)

Amount of Food Eaten by Insects" (Jour. Dept. Agr. P. R., 9 (1): 47-57, ref. 4. San Juan, January 1925). Despite the relatively enormous amount of food which one caterpillar destroys, the hornworm is normally not a serious pest in Puerto Rico. Most of the caterpillars are killed when still small by the constant application of insecticides for the control of fleabeetles and other pests, and laborers almost automatically destroy the hornworms in the course of their other work. On old tobacco left for seed, or on volunteer plants, or in abandoned fields, the caterpillars may strip the plants,

but strictly speaking, this is not commercial injury. In the same way, control is almost perfect in commercial tomato plantings, because insecticides must be applied for the control of other insect pests, and but rarely do hornworms even get started. The caterpillar may eat the leaves of *Solanum torvum*, as was first noted by Herr C. Moritz (1836-382) long ago, but this is quite exceptional, and such wild alternate hosts are of little importance. Moths have been taken at light in all parts of the Island, and Dr. Luis F. Martorell noted them at the lighthouse on Mona Island. These and other sphinx moths were so abundant, indeed, that Coast Guardsmen stationed there slept under mosquito-bars, not for protection

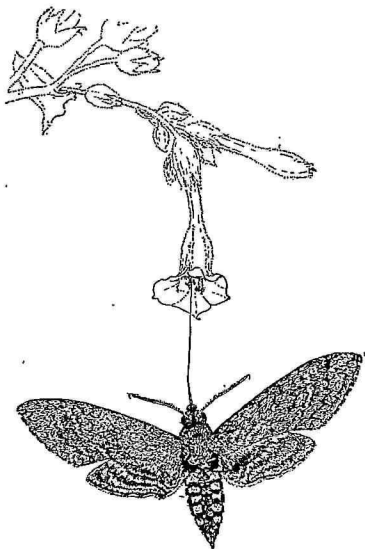


The "Mozambique": a natural enemy of the Tobacco Hornworm. (Drawn by F. Sefn.)

against mosquitoes, but to prevent their sudden awakening by having these big moths descend upon them.

*Phlegethontius rusticus rusticus* (Fabricius) was listed from Puerto Rico by Dr. Stahl as a *Macrosila*, and by the other early entomologists as a *Sphinx*, Dr. Gundlach noting "la oruga vive en *Sesamum* y en *Tecoma stans*." It was listed from Mayagüez by Mr. R. H. Van Zwaluwenburg (P. R. 1431), and has been collected at light at Río Piedras by Mr. E. G. Smyth, as determined by him. It is somewhat larger than *P. jamaicensis*, its plump abdomen is less conspicuously marked with yellow spots, its forewings are extensively barred with white.

*Phlegenthontius brontes* (Drury), of which Mr. B. Preston Clark as a *Protoparce* (New England Zoological Club, 4: 100. Boston, March 21, 1919) described the variety *smythi* from Puerto Rico, the type from Río Piedras, September 1, 1916, collected by Mr. E. G. Smyth, was listed as *Sphinx brontes* Drury by all the early entomologists. It has since been



Adult of the Tobacco Hornworm, *Phlegenthontius sextus jamaicensis* Butler, less than natural size. (Drawn by F. Seán.)

intercepted at Bayamon, and Prof. Forbes notes additional collections from San Germán and Coamo Springs. He writes: "After handling three specimens I think it more like a species than merely a race of *brontes*. The wings are much wider than of any other *Phlegenthontius* that I know, and it looks quite different." The adult has light grey forewings with an inconspicuous darker pattern; the hindwings are dark brown except for the anal angle. The specimen taken by Dr. Luis F. Martorell at Villalba has shorter wings

and a more sharply defined pattern on the forewings. The larva of the type form of this species, described from Jamaica, is similar to that of *P. jamaicensis*, but has orange spiracles, and according to Dr. Gundlach, feeds on *Tecoma*.

*Protambulyx strigilis* (Linnaeus) was listed from Puerto Rico by all the early entomologists, Dr. Gundlach noting "la oruga vive en *Comocladia* y también en *Erythroxylon*." "The larva is rough with high triangular head, as is usual in the Ambulicinae, with several pale oblique stripes, and a longitudinal subdorsal one on the thorax," according to Prof. Forbes (1930-55). "The last oblique is stronger than the others which sometimes are absent." The adult has narrow, yellowish-brown forewings, deeply cleft on the inner margin, and more intense yellow hindwings, with three irregularly transverse darker bands and a darker inner margin. The local race was described as *portoricensis* by Mr. B. Preston Clark (Proc. New England Zool. Club, 12: 79. Boston, 1931), having a broad border, the antemedial spot near inner margin very large.

*Pseudosphinx tetrio* (Linnaeus) was listed from Puerto Rico by all the early entomologists, Dr. Gundlach noting "oruga en *Plumiera*." Prof. Forbes (1930-55) describes the caterpillar as "black, transversely striped with cream, with red head and tail. It is very conspicuous and feeds on frangipanni," making no distinction between the red-flowered "alhelí" (*Plumiera rubra*), the white-flowered "alhelí cimarrón" (*Plumiera alba*), the common species in Puerto Rico, and the white-flowered *Plumiera obtusa* of Mona Island. Altho present on these specific hosts wherever they occur, as at Mameyes, Loíza Aldea, Pt. Cangrejos, Río Piedras, and Dorado, the caterpillars often assume outbreak proportions in the xerophytic regions, one at Ballena in the Guánica Forest having been noted during the summer of 1915. On the plateau of Mona Island in the spring of 1940 all the trees on the western half of the Island were completely defoliated, and many half-grown caterpillars were migrating to those nearer the lighthouse, which still had some uneaten leaves. The female moths are exceptionally large by comparison with the males, and dozens of their dead bodies were to be seen at the base of the lighthouse. At night, mingled with tobacco hornworm moths, they were a veritable pest, smashing into the panes of glass around the light, and disturbing the Coast Guardsmen sleeping in the rooms below. The moths are mostly light grey in color, marked with black, the male with "a conspicuous dark patch resting on the middle of the costa; the female is paler, much larger and without the patch."†

*Isognathus rimosa* Grote, of which Mr. B. Preston Clark (Proc. New England Zoological Club, 8: 8. Boston, January 1922) described the local variety as *walcotti*, was listed from Puerto Rico by Dr. Dewitz as an *Anceryx*, and by Herr Möschler and Dr. Gundlach as a *Dilophonota*,

both noting that the larvae fed on the leaves of *Plumiera*. No specimens have been collected since that of the type of the variety, and that was an unlabeled specimen of which the locality of collection was unknown. "The caterpillar is striped irregularly in two shades of gray," according to Prof. Forbes (1930-56), "with irregular white lateral spots, and a filiform horn," the type form having first been described from Cuba.

*Erinnyis alope* (Drury) was first listed from Puerto Rico by Dr. Dewitz as an *Anceryx*, and by the other early entomologists as a *Dilophonota*, Dr. Gundlach noting "la oruga se cría en *Carica papaya*." According to Prof. Forbes (1930-57), the "caterpillar with black thoracic patch, including a red ring, and with a black lateral line," may also feed on cassava or "yuca" (*Manihot utilissima*). The caterpillars are by no means conspicuous, and even when the injury and their excrement on the ground underneath is obvious, one may experience considerable difficulty in detecting them. The parasitic wasp *Apanteles americanus* (Lepelletier) apparently has no such trouble, and the shining white cylinder of the combined cocoons of the hundreds of maggots which may develop in a single caterpillar is often found in plantings of papayas. Its value in control of the papaya sphinx is considerably limited, however, by the numerous hyperparasites which emerge from the cocoons of the parasite, and have often been confused with it. The sphinx moths has brown forewings, the inner margin often lighter in color; the hindwings are yellow with broad brownish margin.

*Erinnyis crameri* Schaus, first determined by Mr. E. G. Smyth comparing the specimen which he had taken at light at Río Piedras in 1916 with the illustration in Holland's "Moth Book," has since been intercepted at light at Bayamón, and Prof. Forbes (1930-59) notes collection at Ponce. Its body and forewings are quite dark, the inner margin much lighter; the hindwings are mostly a dark red (the color of raw meat), narrowly margined with brown. "Caterpillar with two red bars on thorax, the posterior bar with a black spot on it. Found on *Tabernaemontana*" *oppositifolia* or "pegoge."

*Erinnyis ello* (Linnaeus) is considered by Dr. W. J. Holland ("The Moth Book," p. 58) "quite the commonest of all the hawkmoths of the American tropics." It was listed from Puerto Rico as an *Anceryx* by Dr. Dewitz, and by all the other early entomologists as a *Dilophonota*, Dr. Gundlach noting "la oruga se cría en *Jatropha manihot*." He continues: "muchas orugas mueren, porque un himenóptero pequeño pone centenares de huevos en una sola oruga. Las larvas de estos himenópteros, que son *Microgaster flaviventris* Cresson, salen del cuerpo, cada una forma un capullito blanco uno al lado del otro y estos todos juntos parecen una mota de algodón, pegada en el peciolo u hoja de la planta." It is presumed that *Micro-*

*gaster flaviventris* is in synonymy with *Apanteles americanus* (Lepelletier), as this parasite has repeatedly been more recently identified. The caterpillars vary greatly in general appearance; those of the same size found at the same time may be green, brown or grey, with lateral stripes from head to horn and dark dorsal patch on thorax. The adults have hindwings of an ugly red, margined with black; the forewings are light grey, with inconspicuous pattern for the female, but with a dark, interrupted stripe from base to apex for the male. They have repeatedly been collected at light at Río Piedras, intercepted at Bayamón, and Prof. Forbes (1931-344) notes collection on Vieques Island, while Prof. J. A. Ramos (1947-47) found one at light on Sardinera Beach, Mona Island. Mr. Thos. H. Jones reared adults from larvae feeding on *Chamaesyce hyssopifolia* (or *Euphorbia hypericifolia*), and caterpillars are sometimes found also on papaya.

*Erinnyis domingonis* (Butler), as identified by Mr. B. Preston Clark, was collected at street light in the plaza of Río Piedras by Dr. Richard T. Cotton, May 21, 1917. By comparison with other moths of the genus, it is very small, with grey forewings and reddish hindwings, without appreciable pattern.

*Erinnyis lassauxi* (Boisduval) form *merianae* Grote was listed by the early entomologists from Puerto Rico, Dr. Gundlach noting "la oruga se cría en *Carica papaya*." It has not since been found locally.

*Erinnyis obscura obscura* (Fabricius) was listed from Puerto Rico by the early entomologists as *Dilophonota stheno* Hübner. Prof. Forbes (1930-59) records collection at Ponce and (1931-344) on Vieques Island, the larva feeding on *Gonolobus*.

*Erinnyis oenotrus* (Stoll) was listed from Puerto Rico by Dr. Dewitz as an *Anceryx*, and by the other early entomologists as a *Dilophonota*, but has not since been collected locally.

*Pachylia ficus* (Linnaeus) was listed from Puerto Rico under this name by the early entomologists, Dr. Gundlach noting "la oruga se cría en especies del género *Ficus*." At Río Piedras, the caterpillar has been noted on the leaves of the rubber tree, *Castilla elastica*, and also feeding on the leaves of the vine "yedra" (*Ficus pumila* or *Ficus repens*). It is somewhat more orange-yellow than the underside of the leaves of the latter host: a light green, almost entirely covered, except at sutures, with small yellow-orange spots, giving a roughened appearance. Two yellow lateral stripes start at the spinnerets and end at the short horn, and there are eight diagonal stripes on each side. The head is large and joined closely to the body, which is largest over the median prolegs. The younger caterpillars have six dark green dorsal spots. Adults have repeatedly been noted at light at Río Piedras, and are common everywhere on the Island, Prof. Forbes (1931-344) noting collections on Vieques Island and Prof. J. A.



Ramos (1947-47) on Mona Island. The anal angle of the dark brown and yellow hindwings is tipped with cream; the velvety brown forewing has a conspicuous elliptical light area at apex.

*Madoryx oiclus* (Cramer), a medium-sized Sphinx with lighter and darker grey forewings, deeply cleft on outer margin and with two silvery spots, was reared from a larva pupating under a rosebush at Río Grande.

*Epistor lugubris* (Linnaeus) is a dark grey sphinx with deeply cleft forewings and a small O-mark, repeatedly collected at light at Río Piedras. As an *Enyo* it was listed by all the early entomologists, Dr. Gundlach noting "la oruga vive en varias especies de *Cissus* o *Vitis*." The Rev. A. Miles Moss, of Belém do Pará, Brasil, (Nov. Zool., 27: 397. 1920) figures the caterpillar, which has eight or nine oblique side-stripes and a complete subsdorsal one.

*Cautethia noctuiformis* (Walker) was listed from Puerto Rico by Dr. Dewitz as an *Oenosanda*, and by Herr Möschler and Dr. Gundlach as *O. grotei* Henry Edwards. It is the smallest of the West Indian Sphingidae, with barred brown and grey forewings, the basal half of the hindwings yellow, the margin dark brown. It has been found at light on Mona Island by Dr. Luis F. Martorell, and in the Guánica Forest by Mr. Norberto Lugo. "Bejueo de berac" (*Chiococca alba*), a common xerophytic vine, present on Mona Island and extensively distributed in Puerto Rico, is the host for these caterpillars, as noted by Dr. Harrison G. Dyar.

*Perigonia lusca* (Fabricius), of which Prof. Forbes (1930-63) believes that the local form is *interrupta* Walker, was listed from Puerto Rico by the early entomologists, Dr. Gundlach noting "la oruga vive de *Genipa*, *Rondeletia*, *Gonzalea*, y otras rubiaceas." Indeed Prof. Forbes gives coffee as host for the green larvae "with seven side-stripes and a subsdorsal stripe," and Mr. Cesario Pérez reared it on "palo pelado" (*Duggena hirsuta*) at Martín Peña. The costal margin and anal angle of hindwings of these moths is yellow, the broad outer margin a darker brown than on the body or the forewings. They have been taken at light at Río Piedras and Mayagüez.

*Aëlopos blaini* Herrich-Schäffer is listed from Puerto Rico by the early entomologists under the name *Macroglossa aedon* Boisduval, but has not since been found locally.

*Aëlopos fadus* (Cramer) was identified by Prof. Forbes (1930-64) from adults reared by Mr. Francisco Sefn at Bayamón, from caterpillars on "jagua" (*Genipa americana*), of which half were parasitized by a species of *Apanteles*. The largest dark brown adult has a wingspread of two and half inches; its fourth abdominal segment is covered with white scales; of the two series of transparent spots on the forewing, those in the outer series number from four to seven, the inner series is in a double row.

*Aëlopos titan* (Cramer) was identified by Prof. Forbes (1930-64) from the same lot of reared material of which the others were called *A. fadus* by him, and considered "doubtless a straggler," quite ignoring the fact that all were reared from a single collection of eight caterpillars on a single host.

*Aëlopos tantalus* (Linnaeus) var. *zonata* (Drury) was listed from Puerto Rico by all the early entomologists, Dr. Gundlach noting "se cría en plantas de la familia de las rubiaceas, v. g. *Genipa*, *Randia*, *Alibertia*." Prof. Forbes (1930-65) records collections at five Puerto Rican localities, and notes that "the transparent spots on the fore wing" are in a single line and number but "three, the upper one largest, the middle normally smallest." These are day-flying moths, of which Dr. Luis F. Martorell noted one on flowers of *Moringa oleifera* on Mona Island in the spring of 1940.

*Pholus fasciatus* (Sulzer) was listed by all the early entomologists from Puerto Rico as a *Philampelus*, Dr. Gundlach noting "la oruga se cría en *Jussiaea*." It is P. R. 1426 in Van Zwaluwenburg's list. It has been repeatedly found on *Jussiaea*, at Río Piedras and at Martín Peña, Prof. Forbes (1930-66) noting the caterpillars as being "green, or red, black and white, or yellow, with eight slender oblique stripes." They did not happen to occur in the years when Prof. James G. Needham was making intensive observations on the primrose willow, and indeed have not been noted in the metropolitan area since 1923, but adults were collected at Mayagüez in 1927 and 1929, all three records being for the month of April. Adults have a broad, cream-colored "Y" extending from apex to base of the forewing; the anal and outer margins of the hindwing are bright pink.

*Pholus labruscae* (Linnaeus) is listed from Puerto Rico by all the early entomologists as a *Philampelus*, Dr. Gundlach noting "la oruga se cría en especies del género *Vitis*," and Van Zwaluwenburg giving it P. R. number 1425 in his list. It has been reared from larvae on the wild grape vine, *Cissus sicyoides*, at Isabela, and the beautifully shaded green and greenish-brown and greenish-pink adults have been repeatedly noted at light in the metropolitan area, intercepted at Bayamón, and reported by Prof. Forbes (1930-67) at Mayagüez and Ponce. While the curiously marked larvae doubtless would feed on the leaves of cultivated grape, they have not been found on it. Sometimes the adults by flight reach southern Canada and Patagonia. The caterpillars have "side patches very broad when young, (later) fusing into a broad vague pale shade, with only a little oblique mottling," according to Prof. Forbes.

*Pholus vitis vitis* (Linnaeus) is listed from Puerto Rico by all the early entomologists, Dr. Gundlach noting "la oruga se cría en *Cissus* (*Vitis*) *sicyoides*." Its larvae have not been found since locally, but adults, with pink only on the anal angle of the hindwing, have been noted at light at

Río Piedras and Mayagüez, and intercepted at Bayamón, and doubtless occur in all the more humid parts of the Island.

*Xylophanes chiron* (Drury) var. *nechus* (Cramer) was listed from Puerto Rico by Drs. Stahl and Dewitz as *Choerocampa nechus* Cramer, and by Herr Möschler and Dr. Gundlach as *Chaerocampa chiron* (Drury). The only recent collection, as identified by Mr. B. Preston Clark, was at light at Río Piedras, February 15, 1916, by Mr. E. G. Smyth, who described it as a "handsome green sphinx moth; primaries olive green with brown markings; secondaries rich brown with row of six pale yellow spots; body green with three brown spots on thorax and yellow-brown sides of abdomen." Prof. Forbes (1930-68) notes that the caterpillar has "red subdorsal ocelli on first two segments of abdomen and a yellow one on third; feeding on several Rubiaceae."

*Xylophanes pluto* (Fabricius) was listed from Puerto Rico by Dr. Dewitz as *Pergesa thorales* Hübner and by Herr Möschler and Dr. Gundlach as *Pergesa pluto*, the latter noting "la oruga se cría en *Erythroxylon*." To this, Prof. Forbes (1930-69) adds that the caterpillar has "the usual eyespot on the first abdominal segment"; the adult with "green fore wings and yellow-centered hind wings." The most recent record of collection is by Mr. G. Navarrete, November 1, 1912, at light at Río Piedras.

*Xylophanes tersa* (Linnaeus) was listed from Puerto Rico by all the early entomologists as a *Chaerocampa*, and is in Van Zwaluwenburg's list as P. R. 1415, Dr. Gundlach noting "la oruga se cría en *Spermacoce*." Later called *Mitracarpus portoricensis*, this plant is now known as *Borreria verticillata*, the "botoncillo" of which the nectar of the flowers is so attractive to the wasps of the changa parasite, *Larra americana*, as well as to honey bees. It is a common plant, and the sphinx caterpillars which feed on its leaves, and the sleek and slender adults which develop from them are similarly common. A similar common plant, *Diodia sarmentosa*, as identified by Mr. J. A. Stevenson, was found by him being eaten by these caterpillars at Mameyes in January 1915. They are green above, laterally barred with yellow, which becomes confluent dorsally into continuous stripes ending posteriorly in a pointed hump; each yellow stripe ornamented with seven eye-spots decreasing in size posteriorly, the anterior ones largest, most brightly colored and most elaborate. The dark brown hindwings of the adults have a series of bright yellow submarginal spots; the forewings are a light greenish-brown with somewhat darker stripes approaching the apex; the very tapering abdomen dorsally of the same color is laterally light yellow. Adults have been taken at light in all parts of the Island, Prof. Forbes (1930-68) listing Ponce and Naguabo, and (1931-345) Vieques Island.

*Celerio lineata lineata* (Fabricius) was listed from Puerto Rico by Drs. Stahl and Dewitz as a *Deilephila*, and by Herr Möschler and Dr. Gundlach as *D. daucus* Fabricius, the latter noting "he cogido las orugas en *Oenothera* de los jardines, en *Claytonia perfoliata* y en *Boerhaavea*." This is P. R. 1424 in Van Zwaluwenburg's list. Altho sometimes found at light along the north coast, this is primarily a xerophytic or semi-xerophytic species, with many records from the south coast and from Mona Island. Prof. Forbes (1930-70) describes the caterpillars as "highly variable, green with red- or yellow-centered ocelli, or checkered with black and green, or largely black, with yellow dots in patches; head yellow, without black stripe across the mouth." No natural enemies have been noted in Puerto Rico, but in Hispaniola, the crows devour enormous numbers of these caterpillars, when they appear as outbreaks feeding on the weeds of *Boerhaavea* in cultivated fields. The wings of adults are often found in caves in Haiti frequented by insectivorous bats, but none of these or any other sphinx moth has been noted in bat caves in Puerto Rico. The forewings are brownish, with a broad light stripe extending from base to apex; the hindwings at base and marginally are dark brown, but the median area is bright pink.

#### Geometridae: Loopers or Measuring Worms

Dr. Wm. Schaus in his paper on the "Moths of the Families Geometridae and Pyralididae (Scientific Survey of Porto Rico and the Virgin Islands, 12 (3): 291-417. New York Academy of Sciences, New York, July 15, 1940) has provided a most modern systematic basis for the arrangement of biological data on these two families of moths. In the case of the Geometridae, this is rather insignificant in amount, for comparatively few rearings have been made, and indeed not much collecting of adults has been made in recent years. Dr. Schaus is continually in doubt as to the identity of many of these moths identified or described from Puerto Rico by Herr Möschler for this very reason; a condition which was finally resolved when the collections of the American Museum of Natural History in New York, and those of Cornell University made by Prof. Wm. T. M. Forbes, were available for his studies.

*Ametris nitocris* (Cramer) was listed from Puerto Rico as a *Mecoceras* by Herr Möschler and Dr. Gündlach. The MAC collection at Mayagüez contains specimens of local origin thus identified.

*Almodes terraria* Guenée, originally described from Haiti, and quite common in Cuba, is considered by Dr. Schaus (1940-292) to be what Dr. Gundlach collected in Puerto Rico, rather than the *Boarmia squamigera* Felder, a South America species, which was the identification given by Herr Möschler. Prof. J. A. Ramos (1947-47) found these moths, as identi-

fied by Prof. Wm. T. M. Forbes, abundant at light at Sardinera Beach, Mona Island in the summer of 1944.

*Semaepus caecaria* Hübner was listed as *Zonosoma occipitraria* H. S. from Puerto Rico by the early entomologists, and Dr. Schaus (1940-293) notes recent collection from the Island of Vieques.

*Semaepus malefidaria* was described as a *Cnemodes* by Herr Heinrich B. Möschler (1890-241) from material collected in Puerto Rico by Dr. Gundlach. It has since been found at San Germán, and on the Island of Vieques, as noted by Dr. Schaus (1940-293).

*Semaepus perletaria* was described as a *Cnemodes* by Herr Heinrich B. Möschler (1890-240) from Puerto Rican material collected by Dr. Gundlach. It has not since been found anywhere.

*Asellodes fenestraria* Guenée is a very beautiful pinkish-white moth with irregular transparent golden areas on both fore and hind wings, identified by Dr. Harrison G. Dyar as a *Hydratoscia*, and thus listed by Mr. R. H. Van Zwaluwenburg (1601): on *Genipa americana*. Its distinctive caterpillars, found eating the leaves of this host locally called "jagua," at Río Piedras in the summer of 1921, and in the summer of 1942 at El Verde, Río Grande, have a dark purplish-brown head and five large irregularly rectangular spots of this color on the anterior abdominal segments, alternating with areas of the ground color of dull green; small purplish spots on the second and third segments, and smaller purplish spots on the other segments. They are very active when disturbed, jumping up and down very rapidly. Dr. Gundlach did not find this moth in Puerto Rico, and it may be a rather recent immigrant. Its caterpillars have been noted on the same host at Belém do Pará, Brasil, and its known distribution includes Mexico and Cuba.

*Pleuroprucha pyrularia* was described as an *Apallacta* by Herr Heinrich B. Möschler (1890-242) from Puerto Rican material collected by Dr. Gundlach, but has not since been found anywhere.

*Pleuroprucha yunkearia* was described by Dr. Wm. Schaus (1940-295) from a single female from El Yunque, with a wing expanse of 11 mm., its wings "pale yellow with roseate suffusions."

*Pleuroprucha asthenaria* (Walker), previously identified by Dr. Schaus from a single little yellowish moth reared from a two-horned pupa on a cane leaf at Yauco as *Hemiptilota insulsaria* Guenée and thus listed in "Insectae Borinquenses" (1936-454), has since been recognized by him (1940-295) from Aguirre, Coamo and San Germán. Prof. Forbes notes of this moth that "when fresh it is a very delicate pale green with some white."

*Pleuroprucha molitaria* was described by Herr Heinrich B. Möschler (1890-238) from Puerto Rican material collected by Dr. Gundlach. It

has been intercepted at light at Bayamón, and Dr. Schaus (1940-295) lists collections at Coamo, Aibonito, Lares and San Germán. The specimens which Dr. Schaus returned to the Cornell University collection were labeled *rudimentaria* Guenée, with *molitaria* indicated as a synonym.

*Acratodes intamiataria* was described by Herr Heinrich B. Möschler (1890-241) as a *Syllexis* from Puerto Rican material collected by Dr. Gundlach. It has not since been found anywhere.

*Acratodes oslinaria* was described by Dr. Wm. Schaus (1940-296) from numerous specimens "allied to *intamiataria* (Möschler)" from Cataño, Aibonito, San Germán and Ensenada, showing slight variation, with a wing expanse of 12 mm., "body and wings white with a few scattered irrorations; the wings crossed by two very fine brownish lines."

*Acratodes oblinataria* was described by Herr Heinrich B. Möschler (1890-239) as a *Leptostales*, and was thus listed from Puerto Rico by Dr. Gundlach.

*Acratodes praepeditaria* was described as a *Leptostales* by Herr Heinrich B. Möschler (1890-239) from Puerto Rican material collected by Dr. Gundlach. Dr. Schaus (1940-296) recognizes as this species specimens from Aguirre.

*Acratodes virgota* (Schaus) is recognized by its describer (1940-296) from Coamo and Ensenada.

*Scelolophia delectabilaria* was described as a *Zonosoma* by Herr Heinrich B. Möschler (1890-236) from Puerto Rican material collected by Dr. Gundlach. More recent collections have been made at Cataño, Coamo, Aibonito and Mayagüez, according to Dr. Schaus (1940-297).

*Scelolophia phorcaria* (Guenée), listed as an *Acidalia* by Herr Möschler and Dr. Gundlach from Puerto Rico, is recognized by Dr. Schaus (1940-298) from Coamo and Aguirre, and from Vieques Island.

*Scelolophia randaria* was described by Dr. Wm. Schaus (1940-298) from a single male with a wing expanse of 14 mm., from Coamo, with "head, metathorax and abdomen above, purplish red; wings pale pinkish yellow, the markings light russet vinaceous."

*Scelolophia terminata* (Guenée) was re-described under the name of *Leptostales devolutaria* by Herr Heinrich B. Möschler (1890-239), and as *Leptostales insularia* (1890-240) from Puerto Rican material collected by Dr. Gundlach. It has since been intercepted at light at Bayamón and at Río Piedras, and Dr. Schaus (1940-298) cites additional collections at Aibonito, Coamo, San Germán, and on Vieques Island.

*Scopula canularia* (Herrich-Schäffer), as identified by Dr. Schaus (1940-300), has been collected at Coamo.

*Scopula eburneata* (Guenée), listed as an *Acidalia* by Herr Möschler and

Dr. Gundlach from Puerto Rico, is considered by Dr. Schaus (1940-299) as "undoubtedly one of the unfortunate mislabelings in the Staudinger Collection."

*Scopula fernaria* was described by Dr. Wm. Schaus (1940-200) from a single female intercepted at Bayamón, others from Coamo, with a wing expanse of 16 mm., which has the "head, thorax and abdomen pale smoke grey; wings white, finely irrorated with dark scales; a black discal point on both wings." Mr. Francisco Sefn subsequently collected this moth at Lares, and Prof. Forbes at San Germán.

*Scopula innominata* was described by Dr. Wm. Schaus (1940-299) as differing, "according to Möschler, from *chioneata* Herrich-Schäffer by the absence of terminal black points on wings; the costa of the fore wing below, blackish gray," the type from San Germán, others from Ensenada, Ponce, Aguirre, Cataño and La Sardinera. "This is the whitest of the very small local geometers, and probably is the one formerly reported as *eburneata*," according to Prof. Forbes.

*Scopula laresaria* was described by Dr. Wm. Schaus (1940-300) from a single male from Lares, others from Coamo and Vieques Island, with a wing expanse of 12 mm., "thorax and abdomen white, the latter with grayish suffusions; wings white with black discal points."

*Scopula subquadrata* (Guenée) was described as *Acidalia tortuosaria* by Herr Heinrich B. Möschler (1890-237) from Puerto Rican material collected by Dr. Gundlach. It has not since been found locally.

*Scopula umbilicata* (Fabricius) is recognized by Dr. Schaus (1940-299) from Coamo, Guayanilla and Isabela. Prof. Forbes collected it on Vieques Island and at Aguirre.

*Tricentrogyna floridora* was described by Dr. Wm. Schaus (1940-301) from a single male from El Yunque, with a wing expanse of 13 mm., with a "fore wing long and narrow, the apex curved; ground color yellowish white rather thickly irrorated with vinaceous cinnamon scales."

*Tricentrogyna vinacea* (Butler), originally described as a *Hyria* from Jamaica, was re-described under the name of *Acidalia opentularia* by Herr Heinrich B. Möschler (1890-237) from Puerto Rican material collected by Dr. Gundlach. It was found at Utuado by Dr. Wm. A. Hoffman, intercepted at San Juan and Bayamón, and Dr. Schaus (1940-301) lists additional collections at Lares and on El Yunque. Prof. Forbes notes that the male is "rose with yellow border, the female looks totally different, being yellow with rose spots and patches."

*Lobocleta dativaria* was described by Dr. Wm. Schaus (1940-303) from a female from Coamo, others from Haiti, with a wing expanse of 15 mm., "wings silvery white with scattered fine irrorations."

*Lobocleta maricaria* was described by Dr. Wm. Schaus (1940-303) from a male from Coamo with a wing expanse of 16 mm., "wings silvery white, underneath the basal half of the fore wing suffused with gray."

*Lobocleta monogrammata* (Guenée) was recognized by Dr. Schaus (1940-303) from a single specimen from Coamo.

*Lobocleta mutuataria* was described as a *Leptostales* by Herr Heinrich B. Möscher (1890-239) from Puerto Rican material collected by Dr. Gundlach, but it has not since been found locally.

*Lobocleta perditaria* (Walker) was re-described under the name of *Acidalia offendata* by Herr Heinrich B. Möscher (1890-238) from material collected in Puerto Rico by Dr. Gundlach. It is recognized by Dr. Schaus (1940-302): a specimen from Coamo.

*Sterrrha curvicauda* was described by Dr. Wm. Schaus (1940-304) from a male from Coamo, others from San Germán and Lares, and from Haiti, with a wing expanse of 13 mm., "fore wing silvery gray suffused somewhat with lilacine."

*Ptychopoda monata* was described by Prof. Wm. T. M. Forbes (*in* Ramos 1947-47) from an abundance of badly rubbed material collected on Mona Island by Dr. Luis F. Martorell, Prof. J. A. Ramos and Mr. J. A. Ferrer, 1939 to 1944, with a wing expanse of 11-12 mm., "luteous," "distinguished by the contrasting ordinary lines." This is the same genus as *Sterrrha* used by Dr. Schaus.

*Sterrrha placitaria* was described by Dr. Wm. Schaus (1940-304) from a female from Coamo with a wing expanse of 12 mm., "head, thorax and abdomen pale olive gray, partly irrorated with dull brown, the abdomen with transverse dark lines; wings grayish white with minute brownish irrorations."

*Racheospila cupedinaria* Grote is recognized by Dr. Schaus (1940-306) from collections made on Vieques Island, and in Puerto Rico at Lares and San Germán. Prof. J. A. Ramos (1947-49) found a single specimen, as determined by Prof. Wm. T. M. Forbes, at light, Sardinera Beach, Mona Island.

*Racheospila gerularia* (Hübner) was listed as *Geometra ocellata* Stoll from Puerto Rico by Herr Möscher and Dr. Gundlach, but has not since been found locally.

*Racheospila herbaria* (Fabricius), re-described from Puerto Rico by Herr Möscher under the name of *Geometra attendaria* (1890-243), has not since been found locally.

*Racheospila isolata* Warren was described (Nov. Zool. 7: 138. 1900) from Grenada and Puerto Rico.

*Racheospila merlinaria* was described by Dr. Wm. Schaus (1940-306) from a male from Vieques Island, others from Aibonito, Coamo, Manatí,



Río Piedras and Palmas Abajo (between Guayama and Jájome Alto, collected by Dr. Wm. A. Hoffman) and from San Germán, which has a wing expanse of 12 mm., wings, thorax and abdomen green, "shaft of antennae white."

*Racheospila sanctae-crucis* Prout is listed by Dr. Schaus (1940-305) from four Puerto Rican localities, and Prof. J. A. Ramos (1947-48) found it common on Mona Island.

*Oöspila confundaria* was described as a *Racheospila* by Herr Heinrich B. Möschler (1890-242) from material collected by Dr. Gundlach in Puerto Rico, but has not subsequently been found anywhere.

*Phrudocentra centrifugaria* (Herrich-Schäffer) was re-described from Puerto Rico by Herr Heinrich B. Möschler (1890-243) under the name of *Racheospila anomalaria*. Dr. Schaus identified as this species an unlabeled, faded green moth, beautifully mounted, and lists (1940-307) another from Lares.

*Synchlora albicostaria* (Herrich-Schäffer) as an *Eucrostis* is listed from Puerto Rico by all the early entomologists.

*Synchlora frondaria* Guenée is identified by Dr. Schaus (1940-308) from five Puerto Rican localities and from Vieques Island. It has been reared from larvae intercepted on "Tártago emético," at San Juan.

*Chloropteryx paularia* Möschler, originally described from Cuba and Jamaica, is identified by Dr. Schaus (1940-308) from Aguirre, Palmas Abajo (between Guayama and Jájome Alto), Jájome Alto, La Sardinera (Dorado), Coamo, San Germán and Ensenada, three of these collections having been made by Dr. Wm. A. Hoffman.

*Phrygionis moeschleri* Prout, listed by the early entomologists as *Eulepidotus cultraria* Hübner or *E. paradoxata* Guenée, is represented in recent collections by one specimen, which may be this species, or *P. polita* (Cramer) or *P. argentata* (Drury), all three of which names are listed by Herr Möschler and Dr. Gundlach as species of *Eulepidotus*.

*Leuciris mysteriötis* Prout is considered by Dr. Schaus (1940-310) what Herr Möschler and Dr. Gundlach report from Puerto Rico under the name of *Chrysocestis fimbriaria* Cramer.

*Macaria adrasata* (Snellen), originally described as a *Semiothisa* from Jamaica, is recognized by Dr. Schaus (1940-311) from Puerto Rico: one specimen from Coamo.

*Macaria cellulata* Herrich-Schäffer was listed as a *Semiothisa* from Puerto Rico by Herr Möschler and Dr. Gundlach. Dr. Schaus (1940-311) identifies as this species a specimen from San Germán.

*Macaria diffusata* Guenée is a "medium buff Geometrid" of which Mr. E. G. Smyth collected thirty specimens at light at Hda. Santa Rita, Guánica, during the summer and fall of 1913, identified by Dr. Harrison G. Dyar

as a *Semiothisa*. During the winter of 1915 he noted their larvae completely defoliating trees of "flamboyán" (*Delonix regia*) at Guánica, and in the summer of 1916 reared others to adult at Río Piedras. At that time, the latter specimens were returned by Dr. Schaus with the notation "*Semiothisa* sp., in Coll. unnamed," but he later (1940-312) identified specimens from Coamo and Ensenada. These are moths with a wing expanse of 22 mm., pale buff or slightly greenish yellow, the marginal areas of whose wings are slightly darker than the basal two-thirds.

*Macaria everiata* Guenée is identified by Dr. Schaus (1940-311): specimens from Coamo.

*Macaria increta* Walker was re-described as *M. bisignata* by Herr Heinrich B. Möschler (1890-248) from Puerto Rican material collected by Dr. Gundlach. It has not since been noted locally.

*Macaria paelolata* Guenée was re-described from Puerto Rico by Herr Heinrich B. Möschler (1890-248) under the name of *Semiothisa infimata*, and it is thus listed by Dr. Gundlach. Dr. Schaus has thus identified recently collected specimens from Coamo and Aguirre. Prof. Forbes found it on Vieques Island.

*Macaria regulata* (Fabricius) was re-described from Puerto Rican material collected by Dr. Gundlach under the name of *Semiothisa enotata* given by Herr Heinrich B. Möschler (1890-246). Dr. Schaus (1940-311) thus identifies subsequent collections at Coamo, Ponce and Ensenada. An unlabeled specimen, to which he had given Möschler's name, is creamy white, speckled with brown; hind wing strongly angled, forewing with antepical brown band and spot. Another, which appears to be the same, was collected by Dr. Luis F. Martorell at Villalba.

*Macaria trientata* Herrich-Schäffer is identified by Dr. Schaus (1940-311) from Yauco.

*Syrhodia decrepitaria* Hübner was listed as an *Acroleuca* from Puerto Rico by all the early entomologists, and Dr. Schaus (1940-312) identified a specimen from Coamo.

*Numia terebintharia* Guenée, listed from Puerto Rico by Herr Möschler and Dr. Gundlach, is identified by Dr. Schaus (1940-313): specimens from Ensenada and Coamo. Prof. J. A. Ramos (1947-49) collected several adults, as identified by Prof. Wm. T. M. Forbes, at light on Mona Island.

*Cyclomia mopsaria* Guenée, re-described from Puerto Rico by Herr Heinrich B. Möschler as *Cerasympiasta marsitata* (1890-261) and *C. sanata* (1890-262), is "an extremely variable species" according to Dr. Schaus (1940-314), who lists recent collections from Coamo and from Vieques Island.

*Drepanodes infensata* Guenée, altho listed by Herr Möschler and Dr. Gundlach from Puerto Rico, does not occur in any of the West Indies,

according to Dr. Schaus (1940-314) "and Möschler has probably misidentified the species." Prof. J. A. Ramos (1947-49) collected specimens at light, thus identified by Prof. Wm. T. M. Forbes, on Mona Island, which were *Halesa ephyrata* (Guenée), as redetermined by Prof. Forbes.

*Möschleria hulstii* Saalmüller (in Möschler 1890-235), the type from Puerto Rico, is listed by Dr. Gundlach, but no subsequent collection has been made.

*Nepheloleuca complicata* (Guenée), listed from Puerto Rico as a *Urapteryx* by Herr Möschler and Dr. Gundlach, has "a black point on angle of hind wing" according to Dr. Schaus (1940-135), who lists a recent specimen from Coamo.

*Nepheloleuca politia* (Cramer), listed from Puerto Rico as an *Urapteryx* by the early entomologists, is recognized by Dr. Schaus (1940-315): a pair from Coamo. This is a fine large sulfur yellow Geometrid, with a wing expanse of 48 mm., with minute dark spots and narrow cross-bars; poorly developed pinkish eye-spots on anal angles of both wings; similar semi-circular pinkish area near apex of forewings and transverse submarginal band across hindwings.

*Nepheloleuca illiturata* (Guenée) is listed by Dr. Schaus (1940-315) from Puerto Rico: a Cuban species originally described as a *Urapteryx*.

*Microgonia vesulia* (Cramer), has a most misleading generic name, being possibly the largest Geometrid in Puerto Rico, some adults having a wing spread just short of three inches. Dr. Stahl lists it as *Oxydia quadriagliata* Guenée, and Herr Möschler and Dr. Gundlach used this generic name, the latter adding "estas especies varían muchísimo: Möschler describe diez variedades." In Van Zwaluwenburg's list it is P. R. 1450. Mr. E. G. Smyth collected six adults at light at Hda. Santa Rita, Guánica during the summer and fall of 1913, and they have repeatedly been intercepted at light at Bayamón. They are light yellowish-brown in color, with a darker stripe extending from the pointed and curved apex of the forewing to the middle of the inner margin of the hind wing. The caterpillar is a large grey looper, which, when at rest resembles a bare twig, being stiff and immobile, resting only on the anal prolegs. Mr. E. G. Smyth found one feeding on the ornamental *Acalypha wilkesiana* at Río Piedras, but apparently the caterpillars are not very particular as to host, for one has since been found feeding on the leaves of wild orange at Cayey, and one on cultivated rose at Aibonito, all of these having been reared to adult.

*Sabulodes caberata* Guenée, listed from Puerto Rico as *Microgonia dositheata* Guenée by Herr Möschler and Dr. Gundlach, is recognized by Dr. Schaus (1940-317): a specimen from Coamo.

*Sabulodes exhonorata* Guenée is listed by Dr. Schaus (1940-316) from Puerto Rico.

*Pero rectisectaria* Herrich-Schäffer was listed from Puerto Rico by all the early entomologists, Dr. Stahl using the name *Pero curvistrigaria* H. S.

*Pero vetustaria* (Walker) was identified by Dr. Schaus as an *Azelina*, as noted in "Insectae Borinquenses" (1936-452), and he notes (1940-317) another specimen from Coamo.

*Apicia alteraria* Guenée, listed as *Apicia distycharia* Guenée from Puerto Rico by Herr Möschler and Dr. Gundlach, does not occur in the West Indies, according to Dr. Schaus (1940-318), who believes "it is another case of wrong locality in the Staudinger Collection."

*Gonorthus vestalis* (Hulst), listed from Puerto Rico as *Sericoptera area* Cramer by Herr Möschler and Dr. Gundlach, has not since been found locally.

*Halesa epionata* (Guenée) is identified by Dr. Schaus (1940-319) from Puerto Rico: a specimen from Coamo.

*Halesa ephyrata* (Guenée), listed from Puerto Rico as a *Drepanodes* by Herr Möschler and Dr. Gundlach, is apparently quite common, Dr. Schaus (1940-319) noting collections at Ensenada, San Germán, Coamo, Aguirre and Palmas Abajo. It was this moth which Prof. J. A. Ramos (1947-49) collected at light on Mona Island, misidentified as *Drepanodes infensata* Guenée.

*Sphacelodes vulneraria* (Hübner) is listed as a *Brothis* from Puerto Rico by Herr Möschler and Dr. Gundlach, but has not since been found locally.

*Thysanopyga apicitruncaria* Herrich-Schäffer is listed from Puerto Rico by Herr Möschler and Dr. Gundlach, and Dr. Schaus (1940-320) records collection at Coamo.

*Thysanopyga nicetaria* (Guenée), originally described as a *Psamatodes* from Haiti, is identified by Dr. Schaus (1940-320) from Puerto Rico; a specimen from Coamo. He considers *T. subpusaria* (H. S.), listed from Puerto Rico by Herr Möschler and Dr. Gundlach under the generic name of *Stegania*, to be a probable synonym. Prof. Forbes, examining his specimens from Coamo Springs, is of the opinion "that they are more probably *cyclata* (Walker 1862-1669), originally described from Santo Domingo as *Fidonia*."

*Leucula simplicaria* (Guenée), listed from Puerto Rico as a *Bombycodes* by Herr Möschler and Dr. Gundlach, has not since been found locally.

*Bronchelia detexta* Walker was listed from Puerto Rico as *Boarmia pudicaria* Guenée by the early entomologists, and Herr Möschler identified another "female with underside of hind wing ocher yellow" as *Boarmia scolopacea* Drury. Dr. Schaus (1940-322) is of the opinion that "these determinations are all wrong."

*Iridopsis delicata* (Butler) was listed from Puerto Rico as a *Boarmia*

by Herr Möscher and Dr. Gundlach, but no specimen has since been found locally.

*Iridopsis momaria* (Guenée), listed as a *Boarmia* from Puerto Rico by Herr Möscher and Dr. Gundlach, as which Dr. Schaus identified a specimen as an *Alcis*, reported in "Insectae Borinquenses" (1936-452), "does not agree with Guenée's excellent figure" according to Dr. Schaus (1940-323).

*Iridopsis hilararia* was described by Herr Heinrich B. Möscher (1890-266) from Puerto Rican material collected by Dr. Gundlach, and thus listed by him, but has not since been found anywhere.

*Iridopsis idonearia* (Walker) was listed from Puerto Rico as *Boarmia objectaria* H. S. by Herr Möscher and Dr. Gundlach, and Dr. Schaus (1940-323) lists subsequent collections at Ensenada, Coamo and Aguirre.

*Thyrintina arnobia* (Cramer), listed from Puerto Rico as *T. quadricostaria* H. S. by Herr Möscher and Dr. Gundlach, has not since been found locally.

*Scordylia quadruplicaria* (Hübner), listed from Puerto Rico by Herr Möscher and Dr. Gundlach, does not occur in the West Indies, according to Dr. Schaus (1940-324).

*Melanchroia cephise* (Stoll) was not listed from Puerto Rico by any of the early entomologists, the first record being in Van Zwaluwenburg's list as number 1663: on *Phyllanthus lathyroides*, and in his account, Mayagüez Station Report for 1914 (1916-31) of "a local outbreak at Camuy, where the larvae practically stripped the grosella trees, *Phyllanthus distichus*." At the same time, Mr. Thos. H. Jones noted an outbreak at Río Piedras, and two years later, in the summer of 1916, Mr. E. G. Smyth a comparable one on "grocilla" or "cereza amarilla" (*Cicca disticha*). The dark adults, their rounded wings apically margined with cream, plumed antennae and chestnut collar, were first noted on weeds in cane fields at Río Piedras in January 1912, and have since been seen repeatedly on flowers of "botoncillo" (*Borreria verticillata*), most recently at Yabucoa in 1939. The moths rarely come to light, but have been intercepted at Bayamón and at Peñuelas, and are presumably present in all parts of the Island, despite the scarcity of records in recent years.

*Hammaptera chloronotata* was described by Herr Heinrich B. Möscher (1890-273) from Puerto Rican material collected by Dr. Gundlach. Dr. Schaus (1940-325) lists a recent collection from Utuado.

*Hammaptera moeraria* (Guenée) is listed by Dr. Schaus (1940-325) from Puerto Rico.

*Hammaptera vinacea* was described as a *Cidaria* by Herr Heinrich B. Möscher (1890-273) from Puerto Rican material collected by Dr. Gundlach, but has not since been found anywhere.

*Pterocypha praecurraria* was described as a *Spargania* by Herr Heinrich B. Möschler (1890-269) from Puerto Rico, and thus listed by Dr. Gundlach. Dr. Schaus (1940-326) recognizes as this species a specimen from Adjuntas.

*Pterocypha defensata* Walker, as determined by Dr. Schaus, was collected by Mr. E. G. Smyth at light, Hda. Santa Rita, Guánica, on October 2nd., November 19th. and 26th., 1913. Dr. Schaus (1940-326) notes an additional collection at San Germán. This is a greyish moth, its rounded wings with darker wavy lines, a dark spot at base and apex of forewings, a wing expanse of 30 mm.

*Camptolina stellata* (Guenée) was listed as *Cidaria balteolata* H. S. from Puerto Rico by Herr Möschler and Dr. Gundlach, and as a *Larentia* by Dr. Stahl. Recent collections identified by Dr. Schaus (1940-327) have been made at Coamo and Aguirre, and on Vieques Island.

*Rhopalodes castniata* Guenée, altho listed from Puerto Rico by Herr Möschler and Dr. Gundlach, is a Brazilian species, according to Dr. Schaus (1940-327), to which the wrong locality label was attached in the Staudinger Collection.

*Graphidius aureocapitaria* was described as a *Terenodes* by Herr Heinrich B. Möschler (1890-274) from Puerto Rican material collected by Dr. Gundlach, but it has not since been found anywhere. Dr. Stahl has the name *Terenodes mirandilis*.

*Cambogia snellenaria* was described as an *Asthena* by Herr Möschler, are listed by him and Dr. Gundlach from Puerto Rico, but has not since been found locally.

#### Epiplemidæ

*Nedusia excavata* was described by Herr Heinrich B. Möschler (1890-244) from Puerto Rican material collected by Dr. Gundlach, and thus listed by him. The adult is "ash gray, with dark brown markings, the median line of the hind wing whitish, edged with dark brown, and bent at a right angle" according to Prof. Forbes (1930-71), who records a recent collection at Coamo, and (1931-345) at Jácome Alto.

*Syngria ramosaria* and *Syngria reticularia* were described by Herr Heinrich B. Möschler (1890-256) from Puerto Rican material collected by Dr. Gundlach, and listed by him, but neither has since been found anywhere.

*Epiplema ecludaria* and *Epiplema obvallataria* were described as belonging in genus *Erosia* by Herr Heinrich B. Möschler (1890-262 and 263) from Puerto Rican material collected by Dr. Gundlach, and thus listed by him. Neither has since been found locally.

*Epiplema ineptaria* was described by Herr Heinrich B. Möschler (1890-262) as an *Erosia* from Puerto Rico, and it is thus listed by Dr. Gundlach.

Prof. Forbes identifies (1930-72) as this species specimens collected at Coamo and San Germán.

*Letchena myreusalis* Walker, as identified by Dr. Wm. Schaus, was intercepted at light at Bayamón.

#### Pyralidae or Pyralididae: Snout Moths, Webworms, Leaf-Folders and Leaf-Tiers

Practically all of the new rearing and host records in this section are due to Dr. Luis F. Martorell, many of these being first reported by him in "Some Notes on Forest Entomology" (Caribbean Forester, 1 (2): 25-26, 1 (2): 31-32, 1 (3): 23-24, 2 (2): 80-82. New Orleans, October 1939, January and April 1940, and January 1941). These observations, and others made by him in succeeding years, formed the field work for his doctorate thesis, "A Survey of the Forest Insects of Puerto Rico" (Jour. Agr. Univ. P. R., 29 (3 and 4, July and October 1945): 69-608, fig. 18, pl. 21. Río Piedras, September 30, 1948), interminably delayed in publication and unfortunately not available for consultation until after this section had been written. It may be presumed, therefore, that all records of leaf-folders and leaf-tiers attacking forest trees, here reported as having been made by Dr. Martorell, were previously recorded in this thesis.

#### Subfamily Glaphyriinae

*Glaphyria badierana* (Fabricius) is listed as a *Homophysa* by Dr. Schaus (1940-329) from Coamo in Puerto Rico, and from Vieques Island. The Cornell University collection contains specimens, as identified by Prof. Forbes, collected by Dr. M. D. Leonard at Aguirre, by Dr. W. A. Hoffman in Santurce and by Mr. Francisco Seín at Lares.

*Glaphyria dolatalis* was described by Herr Heinrich B. Möscher (1890-321) from Puerto Rican material collected by Dr. Gundlach, and listed by him. Adults have repeatedly been intercepted at light at Bayamón, and Dr. W. A. Hoffman found it at Utuado and at El Semil. Dr. Schaus (1940-330) notes that "this species is much more abundant than *H. badierana* (Fabricius)," and lists additional collections from Aguirre, Coamo, San Germán, Lares and El Yunque, as well as from the Islands of Vieques and Culebra.

*Symphysa amoenalis* (Walker) is identified by Dr. Schaus (1940-331) from Puerto Rico: two specimens from Coamo.

*Lipocosma hebescalis* was described by Herr Heinrich B. Möscher (1890-316) from Puerto Rican material collected by Dr. Gundlach, and listed by him. Adults have been intercepted at light at Bayamón, and Dr. Schaus (1940-331) lists additional collection on El Yunque.

*Lipocosma metalophota* (Hampson) is recognized by Dr. Schaus (1940-331) from Puerto Rico: adults collected by Dr. W. A. Hoffman at La Sardinera, Dorado.

*Lipocosma savoralis* Schaus, originally described from Cuba, also occurs in Puerto Rico according to the describer (1940-331), recognizing an adult from Lares.

*Dicymolomia pegasalis* (Walker); as identified by Mr. Carl Heinrich, was intercepted on "roble" (*Tabebuia pallida*) at San Juan.

*Chalcoëla discedalis* was described by Herr Heinrich B. Möschler (1890-320) from two males and a female collected in Puerto Rico by Dr. Gundlach, and listed by him. Dr. Schaus (1940-402) lists later collections at Manatí and Lares, and from Vieques Island. Prof. Forbes suggests a generic transfer to *Dicymolomia*.

#### Subfamily Pyraustinae

*Hymenia recurvalis* (Fabricius) was listed as a *Zinckenia* from Puerto Rico by all the early entomologists, Dr. Gundlach noting "la oruga se cría en *Amaranthus* y *Celosia*." As *Zinckenia fascialis* (Cramer) it is in Van Zwaluwenburg's list; Mr. Thos. H. Jones (1915-8) notes its larvae feeding on *Amaranthus*, and Dr. Richard T. Cotton (1918-8) as "webbing and skeletonizing the leaves of beets." Dr. M. D. Leonard (1932-115) under the generic name of *Hymenia*, records collecting adults at light at Aguirre, and finding larvae on beets and Swiss chard at Palo Seco, and on *Gomphrena dispersa*. During the summer, fall and early winter of 1913, Mr. E. G. Smyth collected eighty-six of these "spotted brown Pyraustids" at light, Hda. Santa Rita, Guánica, they being possibly more abundant than any other moth found at that time. It has also been taken at light at Río Piedras, and repeatedly intercepted at Bayamón, being, as Dr. Schaus (1940-332) notes, "almost universally distributed," with collections from seven additional localities in Puerto Rico as well as in Vieques Island. The collar and posterior margin of the abdominal segments are white, as is also a broad band halving both golden-brown wings, and a shorter band on the forewings half-way towards the apex.

*Hymenia perspectalis* (Hübner) has much narrower, wavy white bands on its brown wings. It was listed from Puerto Rico by Dr. Gundlach, without any note as to the host plants of the larvae, but Herr Möschler states "Raupe nach Guenée am *Lilium canadense*, Burg vermutet sie an *Cestrum* parque und an *Saplichroa rhomboida*." Dr. E. G. Smyth reared larvae at Río Piedras on *Synedrella nodiflora*, *Eleutheranthera ruderalis*, *Wedelia trilobata*, *Verbesina alba* and *Melanthera canescens*, having previously collected seventy-five adults, as determined by Dr. Harrison G. Dyar, at light at Hda. Santa Rita, Guánica, during the latter half of 1913.



*Pycnarmon receptalis* (Walker) is listed from Puerto Rico by Herr Möschler and Dr. Gundlach under the name *Spilomela personalis* H. S., but has not since found locally.

*Desmia naclialis* Snellen, listed from Puerto Rico by Herr Möschler and Dr. Gundlach, has been collected by Dr. W. A. Hoffman at El Semil, determined as "probably" by Mr. Carl Heinrich.

*Desmia recurvalis* was described by Dr. Schaus (1940-334), the type specimen from Cuba, a battered one from Puerto Rico, with a wing expanse of 27 mm., mostly "sepia" in color, with white markings.

*Desmia stenizonalis* Hampson is listed by Dr. Schaus (1940-334) from Puerto Rico.

*Desmia tages* (Cramer) is listed from Puerto Rico under this name by Dr. Stahl, and as *Desmia sertorialis* H. S. by Herr Möschler and Dr. Gundlach. It is identified by Dr. Schaus from five Puerto Rican localities.

*Desmia ufeus* (Cramer) was listed from Puerto Rico as *Desmia orbalis* Guenée and re-described by Herr Heinrich B. Möschler (1890-311) under the name of *Desmia viduatalis*; and under both these names, not in synonymy, listed by Dr. Gundlach. The irregular, iridescent white bands on its wings are so extensive as sometimes to cover more than half of their area. Mr. J. D. More reared to adult some larvae feeding on the leaves of the wild grape, "bejuco de caro" (*Cissus sicyoides*) at Río Piedras, finding some of them parasitized by *Apanteles ruficollis* (Cameron), as identified by Mr. C. F. W. Muesebeck. Mr. Carl Heinrich identified adults collected at El Semil by Dr. W. A. Hoffman, and Dr. Schaus (1940-332) lists collections at Aguas Claras (Fajardo), Manatí, Cayey, Aibonito and San Germán. Prof. Forbes found it on Vieques Island.

*Synclera traducalis* (Zeller) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach. Twenty-four adults of this "white and brown Pyraustid," as identified by Dr. Harrison G. Dyar, were collected by Mr. E. G. Smyth at light at Hda. Santa Rita, Guánica, during the latter half of 1913. It has been intercepted at Bayamón, and Dr. Schaus (1940-335) lists additional collections at San Germán, Coamo, Manatí, Lares, and Guayama. The adult is more white than brown, its wings having oval or irregular-shaped white areas bounded by narrow brown lines.

*Ercta vittata* (Fabricius) was re-described by Herr Heinrich B. Möschler (1890-302) from Puerto Rican material collected by Dr. Gundlach under the name of *Euclasta torquillalis*. Mr. E. G. Smyth collected eight adults of this "small buff-brown Pyralid" at light at Hda. Santa Rita, Guánica, during the latter half of 1913, and Dr. Schaus (1940-336) lists additional collections at San Germán and Guayama, and on Vieques Island. It has been intercepted once at San Juan. The legs and the posterior half of the

forewings are cream in color, the anterior half is dark brown, with small black spots along the margin.

*Marasmia cochrusalis* (Walker) was re-described by Herr Heinrich B. Möschler (1890-293) from Puerto Rican material collected by Dr. Gundlach under the name of *Cnaphalocrocis perpersalis*. Mr. Francisco Seín reared adults from corn leaves; the delicate whitish moths have been intercepted at light at Coamo and on Vieques Island. The eyes of this moth are black; the fore margin of the fore wing is light brown, as are also narrow submarginal and marginal bands, and three bands on the hind wings, but otherwise it is whitish.

*Marasmia similis* (von Hedemann), originally described as a *Cnaphalocrocis* from St. Croix of the Virgin Islands, was first noted economically as "A Pyralid-Pyraustinid larva attacking the Leaves of Sugar-Cane in Hispaniola" (Jour. Ec. Ent., 18 (2): 422. Geneva, April 1925). "*Marasmia trapezalis* Guenée on Sugar-Cane only in Hispaniola and Perú of the Western Hemisphere" (Jour. Ec. Ent., 22 (1): 268-9. Geneva, February 1929) records a further extension of its range. In "The Seasonal Cycle of Insect Abundance in Puerto Rican Cane Fields" (Jour. Agr. Univ. P. R., 27 (2, April 1943): 85-104, fig. 12, ref. 16. Río Piedras, June 1944), it is noted as a leaf-tier which feeds on the tips of the leaves of young cane, "ruining the appearance of young fields, but at present of no economic importance in Puerto Rico because of its scarcity. The first record of this insect in Puerto Rico was at Barrio Camaseyes, Aguadilla, in July 1931, a single caterpillar only in a large cane field. Reared to adult, it was determined by the late Dr. William Schaus as *M. similis* von Hedemann. The type of *M. similis* is from St. Croix, but in economic literature it has not been recorded from there as a pest of sugar cane. Mr. Carl Heinrich states that the specimen identified by Dr. Schaus 'agrees in all details with typical *trapezalis*,' altho it is considerably darker and richer in color. "Our records in Puerto Rico would appear to indicate its recent arrival from Hispaniola: very abundant in Barrio Aguacate, Aguadilla in October 1936, as well as in another field near Camuy; also very abundant in two fields at Guánica in November 1939, and in a field at Yauco in December 1936, and in one at Sabana Grande in the same months in 1937. The only other record of its presence is in July 1937 at Guayanilla. All of these localities are on or near the west coast of Puerto Rico, closest to Hispaniola."

*Marasmia trapezalis* (Guenée) is noted by Dr. Schaus (1940-337) as being "widely distributed," definitely recorded from Vieques and from Cuba. If present in Cuba, it has not been noted as occurring on sugar-cane. Adults intercepted at light at Bayamón have been identified by Dr. Schaus as this species. The most recent record is of a very light colored adult, reared from leaves of sugar-cane at Río Piedras, growing in the Station

greenhouse, found in May 1944. All specimens are similar in the brownish costal and outer margins of the fore wing, and the pattern of one entire and two interrupted darker brown bands, but vary considerably in depth of coloration. On the assumption that Mr. Carl Heinrich is correct in his synonymy, all of the records under *M. similis* (von Hedemann) described in 1894 are to be assigned to *M. trapezalis* (Guenée) described in 1854.

*Syngamia cassidalis* (Guenée) was re-described by Herr Heinrich B. Möschler (1890-291) from Puerto Rican material collected by Dr. Gundlach under the name of *Salbia praeformatalis*. It has been intercepted at light at Bayamón, and Dr. Schaus (1940-337) records collection at Coamo.

*Syngamia cognatalis* (Snellen) was listed as a *Salbia* from Puerto Rico by Herr Möschler and Dr. Gundlach. The Cornell University collection contains a series of specimens labeled "*Marasmia conflictalis* Sehs." including one labeled "cotype" from Lares collected by Mr. Francisco Sefín, others from Maricao, Coamo, Cayey and El Yunque. Prof. Forbes thinks these were not described by Dr. Schaus, but probably represent what Herr Möschler and Dr. Gundlach report under the name of *cognatalis*.

*Syngamia florella* (Cramer) was listed from Puerto Rico by all the early entomologists. It is a very distinctive little brownish moth, with three large golden yellow spots on the fore wing, two on the hind wing, and an orange-yellow abdomen. It has an extensive distribution in tropical America, according to Dr. Schaus (1940-338), who lists it from nine Puerto Rican localities in the more humid and mountainous parts of the Island from El Yunque to Mayagüez. An adult was intercepted on flame at Isabela, which may indicate the host plant of the caterpillar.

*Syngamia haemorrhoidalis* (Guenée) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach, and Dr. Schaus (1940-338) notes subsequent collection at San Germán, Lares, Aibonito and Coamo.

*Syngamia varanalis* was described by Dr. Wm. Schaus (1940-338), the type from Coamo, with a wing expanse of 19 mm., the head, front of collar, patagia and base of abdomen white; fore wing white, the lines black.

*Hileithia ductalis* was described by Herr Heinrich B. Möschler (1890-292) from Puerto Rican material collected by Dr. Gundlach. It has been repeatedly intercepted at light at Bayamón. Dr. W. A. Hoffman collected adults at Utuado, and Dr. Schaus (1940-339) records additional collections from El Yunque, Río Piedras, Coamo and Mayagüez.

*Samea caretalis* was described by Dr. Wm. Schaus (1940-340), the type from Jamaica, others from San Germán, Maricao, Lares, Aibonito, Jájome Alto and El Yunque in Puerto Rico, both sexes having a wing expanse of 18 mm. The sexes of this mountainous species differ considerably, only the fore wings being similar in markings.

*Samea ecclesialis* Guenée was listed from Puerto Rico by all the early

entomologists, thus or as *Samea castellalis* Guenée. It has repeatedly been intercepted at light at Bayamón, and Dr. Schaus (1940-339) lists nine other localities of collection in the more humid parts of the Island. Broad and narrow brown bands alternate with iridescent clear areas on the fore wings.

*Samea mictalis* Hampson is identified by Dr. Schaus (1940-339) from Coamo and Arecibo.

*Samea multiplicalis* Guenée, as identified by Prof. Wm. T. M. Forbes, was found by Prof. J. A. Ramos (1947-49) abundant at light in April 1944 on Sardinera Beach, Mona Island.

*Trithyris quadrifenestralis* (Herrich-Schäffer) was listed from Puerto Rico as a *Coenostola* by Herr Möschler and Dr. Gundlach, but has not since been found locally.

*Bocchoris differentialis* Dyar, as identified by Mr. Carl Heinrich, was collected at light at El Semil, Villalba by Dr. W. A. Hoffman.

*Pilocrocis delimitalis* (Guenée), re-described from Puerto Rico as *Cera-toclasia metatalis* by Herr Heinrich B. Möschler (1890-307) from two males in the Krug collection, and a female in that of Dr. Staudinger, and thus listed by Dr. Gundlach, is recognized by Dr. Schaus (1940-342): a series from Coamo, collected by Prof. Forbes.

*Pilocrocis dryalis* (Walker), as determined by Mr. Carl Heinrich, was collected by Dr. W. A. Hoffman at El Semil, Villalba, on May 10th, 1941.

*Pilocrocis hesperialis* (Herrich-Schäffer), originally described from Cuba and quite common there, is recognized by Dr. Schaus (1940-342) from Puerto Rico: a specimen from Aguirre.

*Pilocrocis infuscalis* (Guenée) was listed from Puerto Rico as *Botys pruinialis* Lederer by Herr Möschler and Dr. Gundlach. Dr. Schaus (1940-343) notes a more recent collection, from Coamo.

*Pilocrocis* "presumably *inguinalis* (Guenée) but somewhat abnormal" as identified by Mr. Carl Heinrich, is called the "higüerillo leaf-webber" by Dr. Luis F. Martorell, who found the larvae causing heavy defoliation of *Vitex divaricata* at Cayey in January 1941. It is a pale yellowish moth, with three narrow wavy and somewhat interrupted bands on the fore wing, and two on the hind wing.

*Pilocrocis lauralis* (Walker) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Spilomela pervialis* H. S. It has been intercepted at light at Bayamón, and Dr. Schaus (1940-342) notes collection at Coamo. It is quite common on Mona Island, having been collected at light at Camp Kofresí by Dr. Luis F. Martorell in August 1939, with identification by Mr. Carl Heinrich, and at the same locality by Prof. J. A. Ramos, (1947-49) in March 1944. The brown bands on both fore and hind wings are arranged as somewhat distorted Ws.

*Pilocrocis pertentalis* was described by Herr Heinrich B. Möschler (1890-284) as a *Botys*, and thus listed by Dr. Gundlach, who had several specimens of both sexes from Puerto Rico. Dr. Schaus (1940-343) notes subsequent collection at Ensenada and on Vieques Island.

*Pilocrocis ramentalis* Lederer is recognized by Dr. Schaus (1940-343) from Puerto Rico: a specimen from Coamo.

*Pilocrocis secernalis* was described from Puerto Rico as a *Botys* by Herr Heinrich B. Möschler, and is thus listed by Dr. Gundlach. Dr. Schaus (1940-343) records collection from San Juan and San Germán.



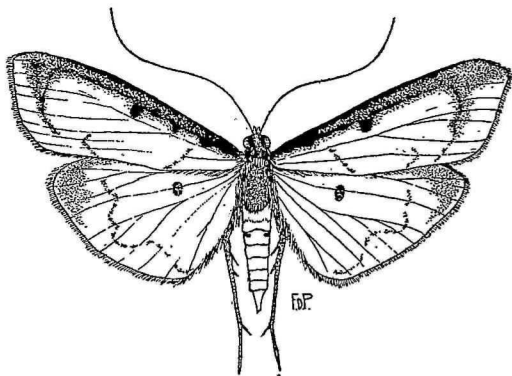
Adult of the Capá Blanco Leaf-Webber, *Pilocrocis secernalis* (Möschler), four times natural size. (Drawn by José F. Pietri.)

It is an inconspicuous little brownish moth with three darker bands on the fore wing, of which Dr. Luis F. Martorell reared numerous adults, as identified by Mr. Carl Heinrich, from caterpillars defoliating trees of "capá blanco" (*Petitia domingensis*) in November and December 1940 at Aguas Buenas and San Sebastián.

*Pilocrocis tripunctata* (Fabricius) was listed from Puerto Rico by all the early entomologists as *Acrospila campalis* Guenée. Mr. Thos. H. Jones (1915-9) found "sweet potato leaves webbed together and injured by the larva" and illustrated the adult. Mr. E. G. Smyth found larvae on what was at that time identified as *Ipomoea bonanox*: "bejuco de vaca" (*Calonyction aculeatum*). Adults have been repeatedly taken at light at Bayamón, and Dr. Schaus (1940-343) records collections at Coamo and Guayama. The adult is a yellowish moth with a wing expanse of 25 mm., a prominent brown spot near the costal margin of the hind wing, another less well

marked at the apex. The forewing has several brown spots along the costal margin, of varying size and intensity.

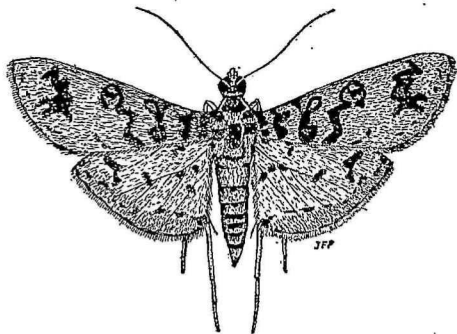
*Mesocondyla concordalis* (Hübner), most recently re-placed in the genus *Eulepte*, in which it was originally described, was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as an *Acrospila*, and as *Acrospila gastralis* Guenée, with no note as to the host plant of the larva. The injury to the foliage of the calabash tree, or "higüero" (*Crescentia cujete*) is often conspicuous, but the caterpillars may also attack that of the "roble"



Adult of the Roble Leaf-Webber, *Eulepte concordalis* Hübner, three times natural size. (Drawn by Francisco D. Palacios Comelin.)

(*Tecoma pentaphylla* or *Tabebuia pallida*), the "roble de sierra" (*Tabebuia rigida* and *T. argentea*), the "higüerillo" (*Enallagma latifolia*), as well as of one tree not present in Puerto Rico at the time of Gundlach's visits: the imported African tulip tree or "tulipán" (*Spathodea campanulata*). All of these trees belong to the family of the Bignoniaceas, the caterpillars by their choice of food plants, or the female moths by their selection of trees on which to oviposit, confirming the opinion of the botanists as to their essential similarity. Mr. E. G. Smyth collected at light at Hda. Santa Rita, Guánica, during the latter half of 1913, eighteen of these "fancy yellow Pyralids," and they are often quite common at light in the mountains or in the more humid parts of the Island. Dr. Schaus (1940-344) notes collection at Lares and on El Yunque, as well as on Vieques Island.

Prof. J. A. Ramos (1947-49) collected "numerous adults of the pale variety (det. W. T. M. Forbes), Sardinera Beach" on Mona Island, confirming the observation of Dr. Luis F. Martorell, who had noted the larvae attacking the leaves of *Tabebuia heterophylla* and *T. lucida* on the plateau of Mona. The costal margin of the fore wing of these pale iridescent yellow moths is brown, broadening towards the apex and extending down on the outer margin; the hind wing has prominent (or sometimes only traces of) two brown spots. The caterpillars are attacked by the Tachinid fly, *Sturmia albincisa* (Wiedemann), by the Chalcid wasp, *Bracymeria incerta* (Cresson). Dr. Luis F. Martorell, in his "Notes on the Biology of *Mesocondyla concordalis* Hübner, and its Parasites" (Caribbean Forester, 2 (1): 18-19,



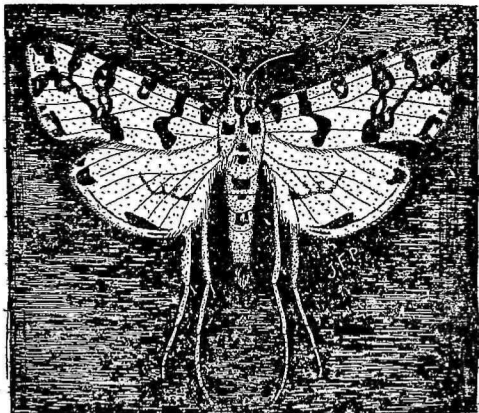
Adult of the Colubrina Leaf-Roller, *Spilomela fimbriauralis* (Guenée), about twice natural size. (Drawn by José F. Pietri.)

fig. 1. New Orleans, October 1940), records rearing another Braconid wasp, *Microbracon cushmani* Muesebeck, from larvae collected several times on the southeastern coast of Puerto Rico (at Naguabo and Mau-nabo), and on Mona Island. Prof. Forbes has separated males, larger and with squarer looking wings, from Lares, Cayey and El Yunque under the name *gastralis* Guenée, but wonders if there is any biological basis for such division.

*Spilomela fimbriauralis* (Guenée) is recorded from Puerto Rico by Dr. Schaus (1940-344): a specimen from Aibonito. Dr. Luis F. Martorell found numerous larvae rolling the leaves of "abeyuelo" (*Colubrina ferruginosa*) at Guajataca Gorge, Quebradillas, in November 1940, and at San Sebastián in December of the same year, being most abundant on trees

in the shade, those in the open not being attacked. The beautiful yellow adults with brown and golden spots were determined as this species by Mr. Carl Heinrich.

*Conchylodes diphteralis* (Geyer) is listed from Puerto Rico as a *Ledereria* by all the early entomologists, Dr. Gundlach noting "la oruga en especies de *Cordia*, y la crisálida en su capullo, hace saltar este a distancia de algunas pulgadas." This is a conspicuous silvery white moth, its fore wings with circles or bars of black, of which Dr. Luis F. Martorell reared several from gregarious caterpillars webbing together leaves of "capá prieto"



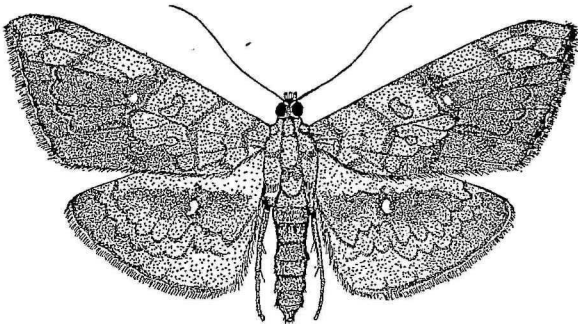
Adult of the Capá Prieto Leaf-Webber, *Conchylodes diphteralis* (Geyer), three times natural size. (Drawn by José F. Pietri.)

(*Cerdana alliadora*) at Cayey in October 1940. They were identified by Mr. Carl Heinrich. Dr. Schaus (1940-345) records collection of adults at Lares, and gives as the distribution of this species, Cuba, Jamaica and Haiti. Dr. Harrison G. Dyar identified as *Conchylodes hebraealis* Guenée specimens from Haina, Dominican Republic.

*Pantographa limata* Grote & Robinson, as identified by Mr. Carl Heinrich, was reared by Dr. Luis F. Martorell from larvae cutting and rolling the leaves of "guano" (*Ochroma pyramidale*) on El Yunque in September 1940. It has been noted repeatedly there, and less often elsewhere, subsequently, but we have no way of determining if it was present in Puerto



Rico previous to that date. Some of the larvae were parasitized by *Chelonus insularis* Cresson. Dr. W. J. Holland in "The Moth Book," on page 393, claims that "the insect occurs from Maine to Patagonia." The U. S. National Museum has no specimens from farther south than Rio de Janeiro, Brasil, and none of the South American material was reared. Prof. John Henry Comstock, in discussing the basswood leaf roller, says that "our bass-wood trees often present a strange appearance from the fact that nearly every leaf is cut more than half way across the middle, and the end rolled into a tube. Within this tube there lives a bright green larva, with the head and thoracic shield black. The moth expands about one and one half inches; it is straw-colored, with many



Adult of the Guano and Basswood Leaf-Roller, *Pantographa limata* Grote & Robinson, three times natural size. (Drawn by José F. Pietri.)

elaborate markings of olive with purplish iridescence." The attack on balsa leaves in Puerto Rico is identical with that on basswood in the States, altho the two hosts are not botanically but only superficially similar in having very large leaves.

*Dichogama amabilis*, described by Herr Heinrich B. Möschler (1890-296) from a pair in the Krug collection from Puerto Rico, was listed by Dr. Gundlach. It has not since been found in Puerto Rico, but Dr. Luis F. Martorell collected numerous specimens at Camp Kofresi, Mona Island in 1939, and Prof. J. A. Ramos (1947-49) made additional collections at the same locality. The silvery white moth has a wing expanse of 35 mm., the fore wing creamy with a small orange spot and black dot at the apex.

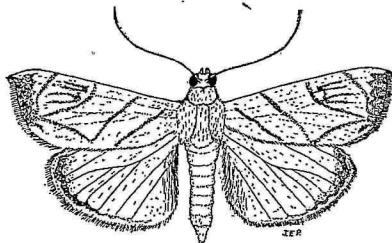
*Dichogama bergii* was described by Herr Heinrich B. Möschler (1890-

297) from a single female collected by Dr. Gundlach in Puerto Rico. It has not since been found locally.

*Dichogama colotha* Dyar, originally described from Mexico, is recognized by Dr. Schaus (1940-345): males from Coamo.

*Dichogama fernaldi* was described by Herr Heinrich B. Möschler (1890-279) from Puerto Rico, and is listed by Dr. Gundlach. Dr. Schaus (1940-346) identifies this species from Vieques Island, and Prof. J. A. Ramos (1947-49) collected a single adult, identified by Prof. Wm. T. M. Forbes, on Mona Island. Adults doubtfully identified as this species by Mr. Carl Heinrich were reared by Dr. Luis F. Martorell from larvae on leaves of "palinguán" (*Capparis flexuosa*) at Salinas in the summer of 1940.

*Dichogama gudmanni* von Hedemann is recognized by Dr. Schaus (1940-347) from Puerto Rico: specimens from Coamo and Ensenada.



Adult of the *Capparis* Pod-Borer, *Dichogama gudmanni* Hedemann, twice natural size. (Drawn by José F. Pietri.)

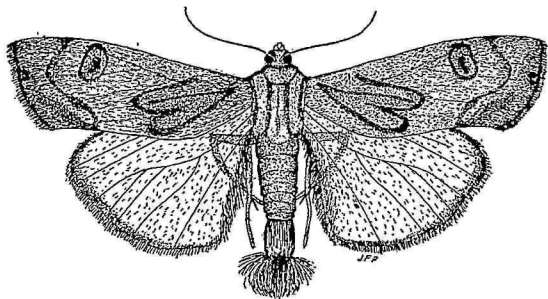
Dr. Luis F. Martorell reared these silvery white adults, as determined by Mr. Carl Heinrich, from larvae folding leaves and burrowing in pods of "burro prieto" (*Capparis cynophallophora*) at Salinas in the summer of 1940. Their fore wings are margined in yellow, and bear a more, or usually less, apparent pattern of fine dark lines.

*Dichogama innocua* (Fabricius) was re-described and illustrated by Herr Heinrich B. Möschler (1890-296) as *D. krugii* from Puerto Rican material of which Dr. Gundlach had five specimens of both sexes. Dr. Schaus (1940-346) recognizes as this species specimens from Coamo. Judging by Möschler's illustration, it is only a more distinctly patterned *gudmanni*.

*Dichogama jessicales* is described by Dr. Wm. Schaus (1940-346) from a male with a wing expanse of 25 mm., from Coamo, mostly white, its fore wings "finely irrorated with pale smoke grey and suffused with light drab."

*Dichogama redtenbacheri* Lederer was listed from Puerto Rico by Herr

Möschler, and Dr. Gundlach notes "también en Cuba, Santo Tomás, Santa Cruz." Dr. Schaus (1940-346) lists it from Coamo and the Island of Vieques, and numerous adults have been taken at light on Mona Island, as noted by Prof. J. A. Ramos (1947-49). Mr. E. G. Smyth collected three adults at light at Hda. Santa Rita, Guánica, during the latter half of 1913, identified by Dr. Harrison G. Dyar. Dr. Luis F. Martorell noted heavy infestations of caterpillars feeding on the foliage of "palinguán" or "palo de burro" (*Capparis flexuosa*) at Salinas, Santa Isabel, Yauco, Guánica and Arecibo during the summer of 1940, and reared adults which were identified by Mr. Carl Heinrich. Some are a satiny and semitransparent brownish yellow, with but the faintest indication of a pattern on the



Adult of the Capparis Leaf-Webber, *Dichogamma redtenbacheri* Lederer, three times natural size. (Drawn by José F. Pietri.)

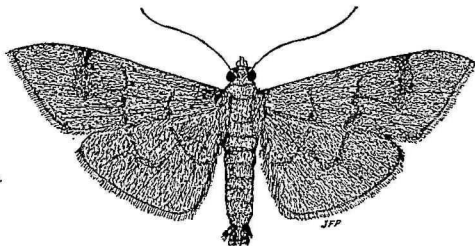
fore wing; others have very conspicuous markings in dark brown, or but slightly darker oval or irregular areas with dark brown margins.

*Phostria humeralis* (Guenée), listed from Puerto Rico as an *Omoides* by Herr Möschler and Dr. Gundlach, was recently collected at light at Utuado by Dr. W. A. Hoffman, and Dr. Schaus (1940-347) lists collection at Lares. From green caterpillars feeding on the foliage of "guaba" (*Inga vera*) at Cayey in December 1940, Dr. Luis F. Martorell reared adults which were determined as being this species by Mr. Carl Heinrich. With a wing spread of 32 mm., these almost plain, dull, dark brown moths have shoulder lappets or patagia extending as far back as the anal angle of the hind wings.

*Phostria insolotalis* was described by Herr Heinrich B. Möschler (1890-301), but Dr. Gundlach states that he "no indica si hay seguridad de su existencia en Puerto Rico," and no collection has since been made locally.

*Phostria martyralis* (Lederer) was listed from Puerto Rico as a *Coenos-*

*tola* by Herr Möschler and Dr. Gundlach, the latter noting its abundance in Cuba. During the winter of 1940-41, Dr. Luis F. Martorell found greenish caterpillars webbing together leaves of "genogeno" (*Lonchocarpus domingensis*) at Guayanilla and of "palo hediondo" (*Lonchocarpus latifolius*) at Maunabo, which he reared to adult. These were identified by Mr. Carl Heinrich: orange-brown moths with three narrow darker bands on the fore wings and two on the hind wings.



Adult of the Lonchocarpus Leaf-Webber, *Phostria martyralis* (Lederer), three times natural size. (Drawn by José F. Pietri.)

*Phostria originalis* Lederer, as identified by Dr. Wm. Schaus, was reared by Dr. Luis F. Martorell in the summer of 1936 and again in 1940 from greenish caterpillars living congregated in a dense web and feeding on the foliage of "moca" (*Andira jamaicensis*) at Barranquitas, Aibonito and Cayey. The adult is a light yellowish-brown moth with the standard three narrow wavy darker bands on the fore wings and two on the hind wings. Mr. Hahn W. Capps states that the name *martyralis*, for an East Indian species, is incorrect for the Puerto Rican insect.

*Phostria prolongalis* (Guenée), listed from Puerto Rico as a *Microthyris* by Herr Möschler and Dr. Gundlach, is confirmed by a subsequent collection at Aibonito recorded by Dr. Schaus (1940-347).

*Phostria simialis* (Guenée), listed from Puerto Rico as *Coenostola erup-talis* Lederer by Herr Möschler and Dr. Gundlach, has been intercepted at light at Bayamón.

*Blepharomastix acutangulalis* (Snellen) is identified as a *Bocchoris* by Dr. Schaus (1940-342): specimens from Coame and San Germán.

*Blepharomastix ebulealis* (Guenée) is identified by Dr. Schaus (1940-350), specimens from Lares and El Yunque. Dr. Luis F. Martorell found larvae of this species acting as leaf-folders on a "camasey" (*Heterotrichum cymosum*), some of which were parasitized by the Tachinid fly *Leskiopalpus*

*flavipennis* (Wiedemann). Those reared to adults, as determined by Mr. Carl Heinrich, had a wing spread of 15 mm., were golden yellow in color, their wings with transverse brown lines.

*Blepharomastix stenialis* (Guenée), as determined by Mr. Carl Heinrich, was collected by Dr. W. A. Hoffman at El Semil, Villalba, May 10, 1940. Prof. Forbes notes an additional collection at Cayey by Mr. Huntoon of this moth which occurs thruout the neotropics from Argentina to Massachusetts. By other workers it is called a *Lamprosema* or a *Nacoleia*.

*Lamprosema inabsconsalis* was described as a *Diasemia* by Herr Heinrich B. Möscher (1890-306) from both sexes collected in Puerto Rico by Dr. Gundlach, and listed by him. More recent collections listed by Dr. Schaus (1940-350) are from Lares, Coamo and Aguirre, and from Vieques Island. Prof. J. A. Ramos (1947-50) found a single specimen at light on Mona Island.

*Lamprosema iarchisalis* (Walker) is identified by Dr. Schaus (1940-349) from Puerto Rico: specimens from Lares, Coamo, Aguirre and Palmas Abajo (between Guayama and Jájome Alto).

*Lamprosema memorialis* was described by Dr. Wm. Schaus (1940-348), the type from Coamo, wing expanse 14 mm., "head and thorax brownish drab"; "wings grayish drab." It was this species which was cited by Herr Möscher and Dr. Gundlach as *Lamprosema lunulalis* Hübner from Surinam, from which it differs in size and markings.

The Cornell University collection contains a single specimen labeled "*Lamprosema santialis* Schaus", very close to the continental *pelealis* Walker, according to Prof. Forbes, which was collected at Coamo Springs. Apparently Dr. Schaus did not publish a description, and this is a MS name.

*Lamprosema subulalis* (Guenée) was re-described and illustrated from Puerto Rico by Herr Möscher and listed by Dr. Gundlach under the name of *Sisyrcera preciosalis*, also from Surinam. Dr. Schaus (1940-348) records occurrence in Guatemala, and in Puerto Rico.

*Lamprosema xanthialis* (Guenée) was listed from Puerto Rico as *Botys incalis* Snellen, of which Herr Heinrich B. Möscher (1890-285) described the variety *rosealis*, "not separable," according to Dr. Schaus (1940-350). Adults of this moth, which is common in Hispaniola and Cuba, have repeatedly been intercepted at Bayamón.

*Lamprosema zolusalis* (Walker) was re-described from Jamaica by Herr Heinrich B. Möscher and listed by him and Dr. Gundlach from Puerto Rico under the name *Botys hilaralis*. It has been intercepted at light at Bayamón and Mayaguez, and Dr. Hoffman collected it at Utuado. Dr. Schaus (1940-349) lists additional collections at Lares, Aibonito, Coamo, Manatí and San Germán.

*Hedylepta indicata* (Fabricius) was listed from Puerto Rico by all the early entomologists as *Hedylepta vulgaris* (Guenée) and according to Dr. Schaus (1940-349) also re-described by Herr Möschler (1890-288) as *Botys fortificalis*. Dr. Gundlach gives both names, noting of the former "la oruga se cría entre las hojas reunidas de plantas de la familia de las papilionáceas." Mr. H. K. Plank uses the generic name *Hedyleptz* (1945-26) in discussing these caterpillars as a pest of soybeans, from which he reared three parasites, but Mr. Thos. H. Jones (1915-9) uses *Nacoleia* in noting their attack on the leaves of beans and cowpeas, as does Dr. Richard T. Cotton (1918-278), giving as a common name the "bean leaf-webber." He continues: "The small, dirty-green colored larva webs the leaves (of bean) together, living between them and skeletonizing them with its feeding." The little dull golden-brown moths are common at light in all the more humid parts of the Island, as well as on Vieques. The adult reared by Mr. E. G. Smyth from a larva on *Lantana camara* is not this species, being much more yellow, the transverse brown lines on the forewings being narrow and regular, not broad and broken. Those he reared from caterpillars on "zarabacoa" (*Meibomia purpurea*) in the summer of 1916, are typical however, and since the introduction of derris into Puerto Rico, its leaves have repeatedly been observed attacked, first at Río Piedras and subsequently at Mayagüez. In the Mayagüez Station Report for 1938 (1939-108) their parasitism by *Chrysocharis* sp. and *Apanteles* sp. is noted. The common parasite, attacking other Pyralid leaf-webbers as well, is the Tachinid fly, *Sturmia* (or *Argyrophylax*) *albincisa* (Wiedemann). Despite heavy parasitism the caterpillars are often of sufficient abundance on garden beans and lima beans to require control by means of insecticides, calcium arsenate being the standard remedy until DDT and others of the newer chemicals were commercially available.

*Sylepta ceresalis* (Walker) was re-described from Puerto Rico by Herr Heinrich B. Möschler (1890-314) as *Diaphantania conspicalis* from three females which Dr. Gundlach had collected. Dr. Schaus (1940-352) lists a more recent collection from Coamo, and Prof. Forbes found it on Vieques Island.

*Sylepta denticulinea* was described by Dr. Wm. Schaus (1940-351) from a single badly rubbed female, intercepted at light at Bayamón, which has a wing expanse of 25 mm., mostly light buff in color, "but easily recognized by the outer line."

*Sylepta elevata* (Fabricius) was listed as a *Botys* from Puerto Rico by Herr Möschler and Dr. Gundlach. Mr. E. G. Smyth collected only six of these "speckled yellow Pyralids" at light at Hda. Santa Rita, Guánica during the latter half of 1913, as determined by Dr. Harrison G. Dyar, and only one at Río Piedras. It has been intercepted at light at Bayamón,

and Dr. Schaus (1940-353) notes additional collections at Mayagüez and San Germán. Mr. E. Molinary Salés found larvae in the tubers of sweet potatoes, in stems, and even eating into wooden stakes at the surface of the ground of experimental plots, late in 1947, from which many adults were reared. The moths have black eyes, but otherwise are a dull, light yellow, with dark pink spots on body, abdomen and wings; the fore wing sometimes having as many as thirty spots on it, quite evenly distributed from base to outer margin. This is the first recorded instance of this insect being a pest in Puerto Rico, and indeed, up to the time of Mr. Molinary's collection nothing was known locally as to the host plant of the larva. Dr. Gundlach gives the distribution of the insect as Belém do Pará, the Guianas and Cuba, and in the "Catálogo de los Insectos que Atacan a las Plantas Económicas de Cuba" (Boletín No. 63, Estación Experimental Agronómica, pp. 246, pl. 12. Santiago de las Vegas, September 1945) Messrs. S. C. Bruner, L. C. Scaramuzza and A. R. Otero record its interception in sweet potatoes at Santiago de las Vegas in abundance in August 1930. "Las larvas, aparentemente, se alimentan de los tejidos exteriores. No se ha observado en boniatos en otra ocasión, y su *status* como plaga es dudoso."

*Sylepta gordialis* (Guenée) was listed from Puerto Rico by all the early entomologists as an *Asciodes*, and Dr. Gundlach and Herr Möschler also give the name *Asciodes scopulalis* Guenée in doubtful synonymy. The caterpillars web together the leaves of the Bougainvillea vine, and have been reared to adult, as determined by Dr. Harrison G. Dyar, at Río Piedras, at Pt. Cangrejos and at Isabela. They have also been intercepted eating the leaves of four o'clock at San Juan, and adults have been repeatedly intercepted at light at Bayamón. Dr. Schaus (1940-351) lists additional collections at Coamo, Lares and San Germán, as well as on Vieques, and presumably the insect occurs wherever its host is planted. The moth is singularly uninteresting; dull grey in color, forewings barred and the hind wings margined with darker grey. If handpicking does not control the caterpillars, one might try, with caution, spraying with a water-suspension of DDT.

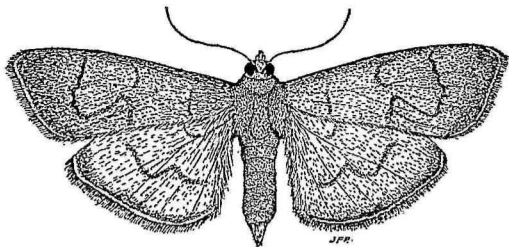
*Sylepta helcitalis* (Walker) was re-described by Herr Heinrich B. Möschler (1890-308) from three males collected by Dr. Gundlach in Puerto Rico under the name of *Crossophora miscellalis*. Dr. Schaus (1940-351) records collection of adults at Lares and on El Yunque. Under this name, Mr. Charles E. Wilson, writing of the "Truck-Crop Insect Pests in the Virgin Islands and Methods of Combating Them" (Bulletin No. 4, Virgin Islands Agr. Expt. Station, pp. 35, fig. 24. Washington, D. C., 1923), describes a sweet potato leaf-folder, apparently of considerable importance, parasitized by a Tachinid fly (*Exorista pyste*). This name is not listed by

Mr. Harry A. Beatty in his "Fauna of St. Croix" (Jour. Agr. Univ. P. R., 28 (3-4):103-185). Río Piedras, July-October 1944), altho he had access to all the insect determinations of the Experiment Station.

*Sylepta internitalis* (Guenée) was listed from Puerto Rico by all the early entomologists as *Sathria stercoralis* Lederer. Dr. Schaus (1940-352) notes a more recent collection at Coamo.

*Sylepta onophasalis* (Walker) is listed from Puerto Rico by Dr. Schaus (1940-252): collections from Coamo, Aibonito and from Vieques Island.

*Sylepta patagialis* (Zeller) is listed from Puerto Rico by Herr Möschler and Dr. Gundlach under the name of *Herpetogramma servalis* Lederer. Dr. Gundlach had three females, but Dr. Schaus (1940-351) is of the opinion that "there is a misidentification." Dr. W. A. Hoffman collected females at El Semil, Villalba, May 10, 1941, concerning which Mr. Carl Heinrich noted "must have males for exact determination."



Adult of the Yagrumo and Ortiga Leaf-Roller, *Sylepta silicalis* (Guenée), three times natural size. (Drawn by José F. Pietri.)

*Sylepta silicalis* (Guenée), as determined by Dr. Harrison G. Dyar, is a rich, cream-colored moth, with very faint pinkish transverse lines on its wings, of which larvae have been found feeding on the leaves of "yagrumo" (*Cecropia peltata*) at Lares and on El Yunque, especially singling out the more tender leaves and the bud for consumption. Dr. Luis F. Martorell found similar larvae feeding on the leaves of *Urera chlorocarpa* at Jayuya, from which a single adult reared appeared to be this species. Mr. H. W. Capps identified a single adult reared from a large number of larvae which had half defoliated a clump of the nettle "ortiga" (*Urera baccifera*) at La Romana, Dominican Republic, as being this species, confirming the selection for consumption by these larvae of plants which seem most unlike, but botanically are in adjoining families.

*Lygropia imparalis* (Walker) is identified as *L. flavofuscalis* (Snellen)



by Dr. Schaus (1940-353) specimens from Cataño, Aguas Claras (between Fajardo and Naguabo), Aguirre and from the Island of Vieques.

*Lygropia joelalis* was described by Dr. Wm. Schaus (1940-354) from a female collected on Vieques Island by Prof. Wm. T. M. Forbes, "allied to *L. flavofuscalis* (Snellen)," which has a wing expanse of 12 mm., "palpi isabella color," "head, collar and thorax very light brownish olive;" "wings above very light brownish drab." Prof. Forbes thinks it merely a variety of *flavofuscalis* which has lost all the yellow marks except the basal one, for he caught several normal *flavofuscalis* with the type.

*Lygropia joasharia* was described by Dr. Wm. Schaus (1940-353) from a female, collected on Vieques Island by Prof. Wm. T. M. Forbes, which has a wing expanse of 17 mm., "head, collar and thorax pinkish cinnamon; fore wing pale yellow orange," "easily recognized by the distinct line on discocellular."

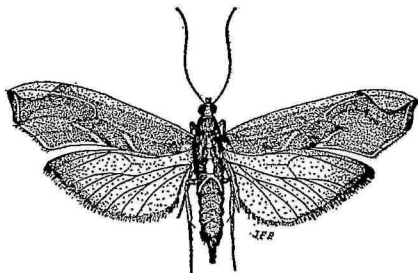
*Lygropia lelex* (Cramer) was re-described by Herr Heinrich B. Möschler (1890-309) and listed by Dr. Gundlach from Puerto Rico under the name of *Cyclocena gestatalis*. In November 1921, Mr. J. D. More collected a leaf-tier on the leaves of sweet potato which he reared to an adult that was determined as this species by Dr. Schaus. It is an inconspicuous little light brown moth with very wavy lines on the wings, which has not been found to date elsewhere than at Río Piedras since the collection of the two males noted by Dr. Gundlach.

*Lygropia placentalis* was described as a *Botys* by Herr Heinrich B. Möschler (1890-285) and thus listed by Dr. Gundlach from a single female which he had collected in Puerto Rico. It has not since been found locally.

*Lygropia principaloides* was described as a *Botys* by Herr Heinrich B. Möschler (1890-295), and thus listed by Dr. Gundlach from a single male which he had collected in Puerto Rico. It has not since been found locally.

*Agathodes designalis* Guenée was listed from Puerto Rico as a *Stenurges* by Herr Möschler and Dr. Gundlach, the former noting "Raupe nach Berg auf *Erythrina cristigalli*; nach Guenée an *Asclepias incarnata*, nach Le Conte an *Salix*." According to observations in Puerto Rico, various species of *Erythrina* are most often selected for hosts, the caterpillars not only rolling leaves, but also boring in tender watershoots, and sometimes even in the bark of large trees, noted at Río Piedras, Cayey, Aibonito, Villalba and Arecibo. Indeed, this might well be called the *Erythrina* or bucare stem borer, altho Dr. Richard T. Cotton in January 1917 found numerous yellow larvae spotted with black on a tree near Río Piedras identified by Mr. J. A. Stevenson as *Citharexylum fruticosum*, the common "péndula." Adults have been collected at light at Villalba, Mayagüez, and Añasco, and presumably the insect occurs in all the mountainous and humid sections of the Island. The moth in colors is a symphony in gold

and lavender, but rests in a most ungainly position with the end of its abdomen straight up. Its narrow, angled and cleft forewings are dull gold, with a median parallelogram of lavender laterally bordered with iridescent silver, the same colors appearing on its body. The moths are sometimes common at light, reflecting a comparable abundance of the caterpillars, especially in nurseries of young trees. Earwigs, several kinds of ants, and numerous other insects may subsequently occupy their tunnels after the emergence of the adults.



Adult of the Bucare Stem-Borer, *Agathodes designalis* Guenée, two and a half times natural size. (Drawn by José F. Pietri.)

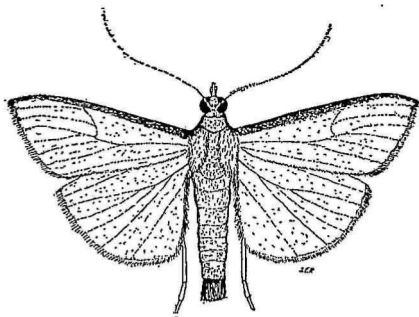
*Diaphania ausonia* (Cramer) was listed as a *Hoterodes* by all the early entomologists from Puerto Rico, but it has not since been found locally.

*Diaphania* (or *Margaronia*) *costata* (Fabricius) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach under the name of *Pachyarches aurocostalis* Guenée: a singularly appropriate name for an all silvery white moth except for the costal margin of the forewings, which is golden. Mr. E. G. Smyth took ten of these "bluish-white Pyralids" at light at Hda. Santa Rita, Guánica during the latter half of 1913, and Dr. Schaus (1940-356) lists collections at Coamó, San Germán and from Vieques Island. Prof. J. A. Ramos (1947-50) collected adults at light on Mona Island, and noted the larvae on their host plant, "palo de muñeca" (*Rauwolfia nitida*). Each larva makes a very neat bag of one or two leaves, within which it lives and eventually within which it pupates, such characteristic bags having first been noted at Camuy, and subsequently at Guajataca and Guayama. Mr. Francisco Seín found several larvae rolling the leaves of a climbing bean at Boquerón in January 1923, which, when reared to adult, proved to be this species.

*Diaphania flegia* (Cramer) is a considerably larger moth than *D.*

*costalis*, and the costal margin of its forewings is brown, not golden. Mr. J. A. Stevenson brought in larvae from Isabela Grove, Plantaje, Pt. Salinas, in July 1916, which he found eating the leaves and webbing together the foliage of the "cabalonga" or "cabalón," the lucky nut tree (*Cerbera* or *Thevetia thevetia*), and in April 1937, Dr. Mel. T. Cook found them on the same host at La Fortaleza, San Juan. Twice collected by Plant Pathologists, the third record on the same host at Isabela was by Mr. Francisco Seán, in July 1933, and later at Lares.

*Diaphania elegans* was described as a *Phacellura* by Herr Heinrich B. Möschler (1890-299) and thus listed by Dr. Gundlach from several specimens from Puerto Rico. It has been intercepted on medicinal herbs at



Adult of the Rauwolfia Leaf-Folder, *Diaphania* (or *Margaronia*) *costata* (F.), three times natural size. (Drawn by José F. Pietri.)

San Juan, as identified by Mr. Carl Heinrich, and Dr. Schaus (1940-356) records collections from El Yunque, and from St. Croix and St. John of the Virgin Islands, under the name *Margaronia*, as of all others of the genus.

*Diaphania fuscicaudalis* (Möschler), originally described from Jamaica and Surinam, is listed from Puerto Rico by Herr Möschler and Dr. Gundlach, but it has not since been found in the West Indies, according to Dr. Schaus (1940-357).

*Diaphania hyalinata* (Linnaeus) is listed from Puerto Rico by Dr. Stahl as *Phacellura immaculalis* Guenée; and by Herr Möschler and Dr. Gundlach with the latter name as a variety, the latter quoting the former that "la oruga se cría en curcubitaceas y también en *Ipomoea*." Both are quite correct as to the cucurbitaceous hosts, for caterpillars have repeatedly been found on cucumber, cantaloupe, watermelon, cassava melon, pump-

kin, squash and cocozelle squash, and even on yautía, but not on sweet potatoes or any wild species of *Ipomoea*. This is the "melonworm" of the United States, listed as a *Diaphania* by Mr. O. W. Barrett (1903-448), Mr. Thos. H. Jones (1916-8), Dr. R. T. Cotton (1918-294) and in Van Zwaluwenburg's list (920): on Cucurbitaceae. The longitudinally-striped caterpillars feed on the more tender leaves, on the flowers, and even on the developing young fruits of many of these plants. By adding arsenate of lead to the Bordeaux mixture that must be used to obtain a commercial crop, control of the melonworm has been obtained in the past. Because DDT prevents fruiting of cucumbers, it can not be used for the control of this caterpillar, and the use of others of newer insecticides is indicated, although none has been sufficiently tested in the tropics for specific recommendation. The head and thorax of the moth is brown, as are also the broad outer margins of all wings and the costal margin of the fore wing. The triangular inner area of the wings is semi-transparent silvery white, and the abdomen is also white, tipped with a relatively enormous brush of golden and brown scales, which in life the moth opens and contracts and waves about when others of the opposite sex are present.

The manufacturers of lindane, the new technically pure gamma isomer of benzene hexachloride, state that at 1% this is safe to use on cucumbers for control of the melonworm, and that large amounts are being used by growers in Florida at the present time.

*Diaphania immaculalis* (Guenée), listed as a variety of *hyalinata* (L.) by Herr Möschler and Dr. Gundlach, is considered a distinct species by Dr. Schaus (1940-357), who lists collections from Coamo and Arecibo, and from the Island of Vieques.

*Diaphania imitalis* (Guenée) is listed by Dr. Schaus (1940-357) from Puerto Rico: specimens from Coamo, for he considers it "a distinct species, and not a synonym of *M. aurocostalis* (Guenée) as stated by Hampson."

*Diaphania infernalis*, as a *Phacellura* is described by Herr Heinrich B. Möschler (1890-300) as "am nächsten bei *Nitidalis* stehend," and is listed by Dr. Gundlach from Puerto Rico. Adults determined by Mr. Carl Heinrich were collected by Dr. W. A. Hoffman at El Semil, Villalba on May 10, 1941, and Mr. Francisco Seín found it at Lares.

*Diaphania infimalis* (Guenée) is listed by Dr. Schaus (1940-356) from Puerto Rico: a specimen from Mayagüez.

*Diaphania isoscelalis* (Guenée) is listed from Puerto Rico by Herr Möschler and Dr. Gundlach, but has not since been found locally.

*Diaphania lucidalis* (Hübner) is listed from Puerto Rico by all the early entomologists as a *Phacellura*, and Dr. Schaus (1940-357) lists a subsequent collection at Santurce.

*Diaphania nitidalis* (Cramer) is listed by Dr. Stahl as *Phacellura hyalin-asalis*, and by Herr Möschler and Dr. Gundlach as a *Phacellura*. Mr. Francisco Sefn, writing on "The Pickle Worm in Chayote in Porto Rico" (Jour. Ec. Ent., 24(3): 762. Geneva, June 1921), reports finding 20 per cent of the "chayote" (*Sechium edule*) fruits infested with these caterpillars at Lares and five to ten per cent at Río Piedras. It also infests the fruit of cucumbers, interceptions having been made at Loíza Aldea, Vega Baja, Manatí and Isabela, and is not subject to insecticidal control for it burrows within the fruit. The adult is a golden brown moth, the base of the hind wings and a smaller irregular-shaped area in the forewings being semi-transparent golden yellow. It is rarely taken at light, altho Dr. W. A. Hoffman made collections at El Semil, Villalba. Apparently the insect is more common in the mountains than at lower elevations, and is not found at all in xerophytic regions.

*Diaphania sibilalis* (Walker) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as a *Glyphodes*. It is a beautiful golden brown and white moth, its fore wings having three larger irregular white areas partly iridescent golden, separated by dark brown margined light brown areas, and a narrow, irregular, submarginal white band that continues on the hind wings. The moths which Mr. Francisco Sefn reared from caterpillars which he found during the winter of 1922 feeding on the leaves of mulberry (*Morus alba*, var. *tartarica*) are somewhat different, however, having in addition on the hind wings an irregular brown band surrounding the central iridescent golden area, and submarginally more brown. Adults have repeatedly been intercepted at light at Bayamón, and Dr. Schaus (1940-358) reports additional collections at San Juan, Aguirre, Coamo, and Guánica, as well as on Vieques Island.

*Palpita quadristigmalis* (Guenée) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as a *Margarodes*, and it has since been collected at light at Guánica and intercepted at Bayamón. Dr. Schaus (1940-358) notes additional collections on El Yunque and on Vieques Island. It has semi-transparent, whitish wings, the costal margin brown, with four small black spots or points as indicated by the name; and in addition two near the apex and one in the middle of the hind wing.

*Cliniodes euprosinalis* Möschler, originally described from Jamaica, was listed from Puerto Rico by Herr Möschler and Dr. Gundlach: a single well preserved specimen in the Krug collection. It has not since been found locally. *Cliniodes* sp. "near *nomadalis* Dyar" was the determination by Mr. Carl Heinrich of a large moth with semi-transparent silvery wings, narrow lines of black on the outer margin of the hind wing, brownish at base of forewing and scatteringly elsewhere, which Dr. W. A. Hoffman had taken at light at El Semil, Villalba on May 10, 1940.

*Cliniodes semilunalis* was described by Herr Heinrich B. Möschler from several females in the Staudinger collection from Puerto Rico (1890-297), and is listed by Dr. Gundlach. It has not since been found locally.

*Syllepsis marialis* Poey, originally described from Cuba, was recognized by Herr Möschler in the Krug collection from Puerto Rico, and is listed by Dr. Gundlach. Dr. Schaus (1940-359) notes collections from Aibonito and Coamo. Dr. Luis F. Martorell found numerous small green larvae rolling the leaves of "quebracho" (*Thyana portoricensis*) at Guayanilla, especially in the most shady locations, in January 1941, from which he reared adults which were determined as being this species by Mr. Hahn W. Capps. The body of this slender moth is purplish brown, as are also broadly the apical angles of both wings and the base and hind angle of the forewing; elsewhere the wings are semi-transparent golden.

*Leucinodes elegantalis* Guenée, the name under which Dr. Gundlach listed the two specimens he had collected in Puerto Rico, as identified by Herr Möschler, and Dr. Schaus (1940-360) lists subsequent collections at nine Puerto Rican localities, should be *Neoleucinodes elegantalis* (Guenée) according to Mr. Hahn W. Capps, who has studied the "Status of the Pyraustid Moths of the Genus *Leucinodes* in the New World, with Descriptions of New Genera and Species" (Proc. U. S. Nat. Museum, 98(3223): 69-83, pl. 6. Washington, D. C., 1948). It "has recently attracted considerable attention as a pest of tomatoes in South America, where severe damage to crops has been reported. The damage to crops where *elegantalis* occurs, ranges from unnoted in such places as Cuba and Puerto Rico, negligible in Mexico, to as high as 30 to 80 per cent in Paraná and Minas Gerais, Brazil. The larvae are strictly borers, feeding only in the fruits. Soon after hatching, the young larva bores into the young fruit, and as the fruit develops, the entrance hole is closed. Thus, a fruit that looks perfectly normal, even under a hand lens, may contain one or several larvae. The number of larvae per fruit is usually one, two, or three, but as many as 18 have been found in a single fruit.' The slender little brownish moth has been repeatedly collected at light at Río Piedras, and intercepted at Bayamón. Its hyaline white wings are marked with cinnamon brown areas at base and apex of the fore wings, and less conspicuous bands or areas elsewhere.

*Neoleucinodes prophetica* (Dyar) is listed by Mr. Hahn W. Capps (1948-76) from Adjuntas, Puerto Rico.

*Neoleucinodes torvis* was described by Mr. Hahn W. Capps (1948-77), the type from Santiago de las Vegas, Cuba, reared from *Solanum torvum*; others from Río Piedras, Bayamón, Coamo, Utuado, Lares and San Germán, of which "well-marked specimens resemble small examples of *ele-*

*gantalis*, *dissolvens* and *prophetica*, but are easily separated from them by the very short pubescent-like cilia of antenna."

*Ommatospila narcaeusalis* (Walker) was identified as *O. nummulalis* Lederer by Herr Möschler for the single female which Dr. Gundlach had collected in Puerto Rico. Dr. Schaus (1940-361) lists additional collections at Coamo and San Germán, and has identified numerous unlabeled specimens. It is a strikingly beautiful little moth, with a complicated pattern of oval and elongated spots outlined in dark brown, and narrow transverse brown lines on the distal margin of areas becoming increasingly darker from a semitransparent, iridescent whitish base.

*Hellula phidilealis* (Walker) was listed from Puerto Rico as *H. undalis* Hübner by Herr Möschler and Dr. Gundlach, and Dr. Schaus (1940-361) records collections from Ensenada, San Germán, Aibonito and Coamo, and from the Island of Vieques. He identified several unlabeled specimens: small moths with irregular dull yellowish-green stripes and areas on the forewings.

*Epipagis cambogialis* (Guenée) was re-described as *Botys citrinalis* by Herr Heinrich B. Möschler (1890-282) from a single male collected by Dr. Gundlach in Puerto Rico, and also listed as *Botys cambogialis* Guenée. Dr. Schaus (1940-362) "can find no reason to separate *E. citrinalis*," listing collections at Aguirre, Coamo, Ponce and Guánica. He identified specimens collected at Utuado and at Palmas Abajo by Dr. W. A. Hoffman as this species.

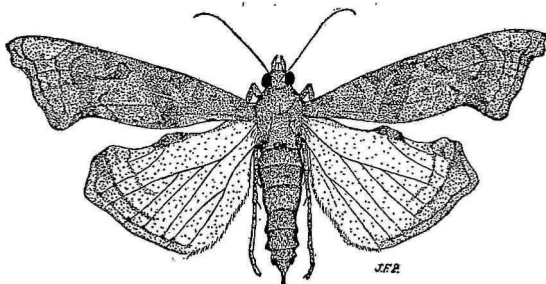
*Epipagis conjunctalis* was described as a *Samea* by Herr Heinrich B. Möschler (1890-290) from a single female in the Staudinger collection and it is thus listed by Dr. Gundlach. It has not since been found anywhere.

*Epipagis mopsalis* (Walker) was described as *Botys villicalis* by Herr Heinrich B. Möschler from Jamaica, and listed by him and Dr. Gundlach from Puerto Rico, the latter having three specimens. Dr. Schaus (1940-362) notes collections from Guánica, Coamo, Aibonito, Lares and Cataño, and from the Island of Vieques.

*Epipagis togalis* (Lederer) was listed as a *Botys* from Puerto Rico by all the early entomologists, but has not since been found locally.

*Terastia meticulosalis* Guenée was first determined by Dr. Harrison G. Dyar from Puerto Rico: adults from Río Piedras reared from larvae boring in a planting of trees of *Erythrina glauca*, 90 percent of which were infested in September 1921. It has since been found in similar seedlings of *Erythrina berterooana* at Villalba, in the pods of *Erythrina glauca* at Río Piedras, and most destructively in the pods of the cardinal-flowered *Erythrina horrida* at Río Piedras. Adults have been intercepted at light at Bayamón and at Mayagüez, and were collected by Dr. W. A. Hoffman at Utuado and

El Semil, Villalba. In size and shape of the wings it somewhat resembles the other *Erythrina* shoot-borer, *Agathodes designalis*, but both the costal margin of the hind wing and the inner margin of the fore wing are deeply cleft; its colors are various shades of brown in places speckled with black; and the semi-transparent areas are silvery, not golden.



Adult of the Bucare Seedling and Pod Borer, *Terastia meticulosalis* Guenée, two and a half times natural size. (Drawn by José F. Pietri.)

*Azochis euvexalis* was described as a *Catacteniza* by Herr Heinrich B. Möschler (1890-314) from four females collected by Dr. Gundlach in Puerto Rico and listed by him under this name. Mr. E. G. Smyth collected sixty-four of these "handsome white Pyralids with brown markings" at light at Hda. Santa Rita, Guánica, during the latter half of 1913, and subsequently a single specimen at light at Río Piedras, August 20, 1916. These were identified by Dr. Schaus, who (1940-363) lists additional collections at Arecibo, Coamo, Dorado and from Vieques Island. The iridescence on the clear white areas of the fore wings of this moth is light blue; that of the hind wings is less obviously lavender.

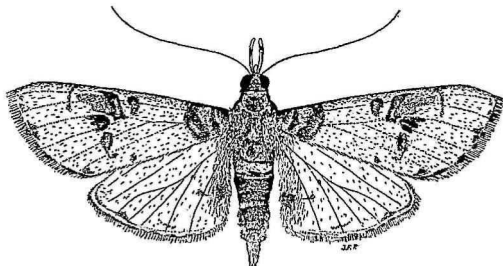
*Azochis* "probably *rufidiscalis* Hampson" is the identification by Mr. Carl Heinrich of a moth which Dr. Luis F. Martorell reared in the autumn of 1940 from a larva boring in the twigs of "jagüey" (*Ficus stahlii*) at Camuy.

*Crocidophora algarroboalis* was described by Dr. Wm. Schaus (1940-364), the type collected by Mr. Thos. H. Jones at Algarrobo (near Tortuguero Lagoon) on July 26, 1914: a male with a wing expanse of 20 mm., others from San Juan, Cataño, Dorado, Isabela and Lares, and from Vieques Island. This is what Herr Möschler and Dr. Gundlach list from Puerto Rico under the name *Stenophyes serinalis* Walker, what Dr. Harrison G. Dyar had identified as *Crocidophora zinghalis* Walker, and, as reported in



"Insectae Borinquenses" (1936-464), what Dr. Schaus had identified as *Crocidophora huronalis* Guenée. Its fore wings are mostly light brown with white spots; the hind wings white with deep brown margin and two transverse stripes.

*Crocidophora palindialis* (Guenée) was described as *Orobena implicitalis* by Herr Heinrich B. Möschler (1890-292) from a male and two females collected by Dr. Gundlach in Puerto Rico, and listed by him. It has since been intercepted at Vega Alta, and listed by Dr. Schaus as a *Crocidolomia*.



Adult of the Jagüey Twig-Borer, *Azochis rufidiscalis* Hampson, twice natural size. (Drawn by José F. Pietri.)

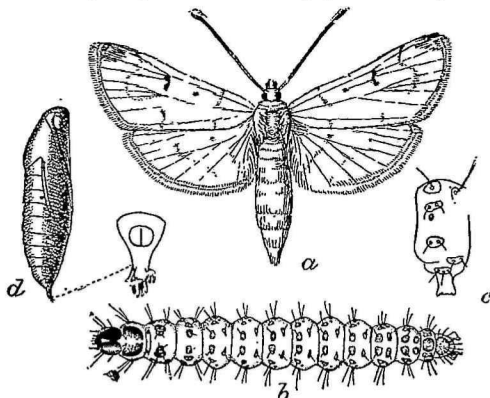
*Maruca testulalis* (Geyer), as identified by Dr. Harrison G. Dyar, was listed from Puerto Rico as a *Crochiphora* not only by Herr Möschler and Dr. Gundlach, but also by Dr. Schaus. According to Mr. H. W. Capps, "*Crochiphora* is not available for use in the Pyraustidae," and the correct name is *Maruca*, which, fortunately, is the name used in the economic publications on bean pod-borers. Its presence in Puerto Rico was in considerable part responsible for the establishment of the quarantine and inspection regulations governing the importation of vegetables into continental United States. The action taken as a result of a "Report of Hearing Held by the Federal Horticultural Board to Consider the Advisability of Restricting or Prohibiting the Entry from Porto Rico of Fruits and Vegetables into the United States" (Jour. Dept. Agr. P. R., 8 (1): 5-46, pl. 1. San Juan, August 1945) was the "Fruit and Vegetable Quarantine of Puerto Rico Notice of Quarantine of Porto Rico Notice of Quarantine No. 58" (Fed. Hort. Board, U.S.D.A., Washington, D. C., May 27, 1925), enforced by federal inspectors with headquarters at San Juan. These men did not confine their activities to merely inspecting the fruit and vegetables after they were packed for shipment, but visited fruit groves and vegetable farms in all parts of the Island, making "interceptions" of the

insects found there, and thus greatly contributing to the records of hosts and abundance of the insects of Puerto Rico. Dr. Mortimer D. Leonard, at that time working at the Río Piedras Station, and Mr. A. S. Mills, of the F. H. B., published "A Preliminary Report on the Lima Bean Pod-Borer and Other Legume Pod-Borers in Porto Rico" (Jour. Ec. Ent., 24(22): 466-473. Geneva, April 1931), and on "The Eggs of the Lima Bean Pod Borer in Porto Rico" (Jour. Ec. Ent., 24 (3): 663. Geneva, June 1931), describing the eggs on the leaves and blossom-buds.

Altho not nearly as abundant as two other "Lima Bean Pod-Borer Caterpillars of Porto Rico" (Jour. Dept. Agr. P. R. 17 (3): 241-255, fig. 6. San Juan, July 1933), "from the standpoint of extensive distribution and of quarantine restrictions at present in force," it "is of the greatest importance. It is present in Japan and many other regions of the old world, but only in Cuba and Puerto Rico of the new world, and specifically not in the United States. For that reason, since July 1, 1925, no beans in the pod can be exported from the West Indies to the United States, except during the winter, and only under special permit and inspection, thus to a considerable extent limiting production in the West Indies. Incidentally, these restrictions have been responsible for an intensive study of the insect in Cuba, where it is the most common pod-boring caterpillar. In Puerto Rico, *Maruca* is of only minor importance, not because it is less abundant than in Cuba, but because two other species are so much more abundant and cause much heavier losses. The caterpillars, after burrowing into the pod, have the habit of keeping an exit open to the outside, through which to void their excrement. (This habit is of value to the bean grower, for he is thus able to make sure of all infested pods, and eliminate them as culls when green beans are being prepared for shipment to distant markets.) They are generally of a creamy white and can most readily be distinguished by their spotted appearance, for they generally have four large black or dark grey spots on the back of nearly every segment. Sometimes the spots are not very dark, but usually they are quite distinct, and coupled with the presence of a frass-disposal hole to the outside of the pod, one can usually identify the caterpillar without difficulty." "Methyl Bromide Fumigation for Destruction of Pod Borer Larvae" (Jour. Ec. Ent., 33 (1): 176-9. Menasha, February 1940) conducted on the pier at San Juan by Mr. Randall Latta showed that it caused complete mortality at 0.5 pound per 1,000 cu. ft., at atmospheric pressure in a tightly closed container after two hours exposure at 70° F. temperature. The caterpillars have been found in the wild lima bean (*Vicia faba*), in pigeon peas (*Cajanus indicus*), and in sword beans (*Canavali maritima*), and these are possible alternative hosts for normal infestation in lima beans and string beans. Twenty-six interceptions had been made in lima beans up to 1936; at

Loiza, Río Piedras, Caguas, Cidra, Cayey, Bayamón, Vega Baja, Barceloneta, Arecibo and Isabela, and thirteen in string beans: at Río Piedras, Carolina, Caguas and Manatí. At the Mayagüez Station (1937-43) they were considered "a limiting factor in dry bean production," (1938-60) constituting "approximately 85 per cent of the entire borer population."

"The moth is very active, and when not flying about, stands with wings outspread and all ready to go. The forewings are chocolate brown, with a large white triangular spot on the front margin; the hind wings are silvery

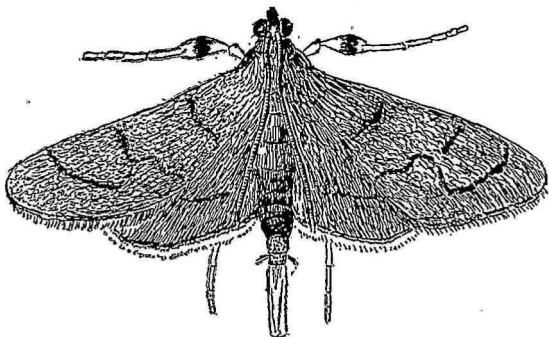


The Southern Beet Webworm, *Psara* (or *Pachyzancla*) *bipunctalis* (Fabricius): *a*, adult; *b*, caterpillar, both about three times natural size; *c*, lateral view of first proleg and abdominal segment of larva (incorrectly showing 2 setae on the pinnacula bearing setae iii and vi: there should be only one each, according to Mr. H. W. Capps); *d*, pupa, three times natural size, and cremaster at right showing location of hooks. (Bureau of Entomology, U. S. Dept. Agr.)

white with a spot" on the apical margin. Of them, Mr. E. G. Smyth collected thirty-four at light at Hda. Santa Rita, Guánica during the latter half of 1913, and they have also been taken at Bayamón and Río Piedras, Dr. Wm. Schaus (1940-365) noting additional collections at Lares, Aibonito and Coamo. Prof. Forbes notes its presence in Haiti, and widely in South America, confirming Herr Möschler's records from French and Dutch Guiana and Colombia to the Argentine. Apparently these records were overlooked in the economic account of distribution.

*Psara bipunctalis* (Fabricius) is by Dr. Schaus (1940-366) identified

with what Herr Heinrich B. Möscher had re-described from Surinam and Jamaica under the same *Botys terricolalis*, and this is the name used by Dr. Gundlach for his single female from Puerto Rico. Dr. Schaus had previously considered that *Botys detritalis* Guenée, as listed by them, was also in synonymy, and this is indicated in "Insectae Borinquenses" (1936-465). The caterpillar is a common webber of the leaves of "beets, chard and *Amaranthus*," and as a *Pachyzancla* is noted by Mr. Thos. H. Jones (1915-8), Dr. Richard T. Cotton (1918-280), and in Van Zwaluwenburg's list, P. R. 1438. Most surprisingly, "*Psara* has priority over *Pachyzancla*:" one instance of a short, simple name taking precedence over a longer and more complicated one. Of these light brown moths, with a few darker



Adult of the "Pega-Pega del Tabaco," *Psara periusalis* (Walker), six times natural size. (Drawn by G. N. Wolcott.)

spots and wavy lines on the wings, Mr. E. G. Smyth collected over fifty at light at Hda. Santa Rita, Guánica, during the latter half of 1913, and they have repeatedly been taken at light at Río Piedras and intercepted at Bayamón. When viewed at an angle the wings have a lavender iridescence. Adults were reared by Mr. E. G. Smyth at Río Piedras from larvae on "rabo de gato" (*Achyranthes indica*), and, altho this seems unlikely, on "botoncillo" (*Borreria ocimoides*), as well as on such economic hosts as eggplant and pepper.

*Psara periusalis* (Walker), a smaller and darker brown moth, was identified by Dr. Harrison G. Dyar as a *Pachyzancla* for Mr. Thos. H. Jones, who (1915-9) noted that "the young larvae live at first as miners in the leaves (of eggplant and *Solanum torvum*), but later web the leaves together."

Dr. Richard T. Cotton in his "Report of the Assistant Entomologist" (in Ann. Rpt. Insular Expt. Station, 1916-17. San Juan 1917), calling it the "Tobacco Leaf-Folder," gives an extended account, with descriptions of all stages, life-history and control, on which is based his subsequent account (1918-299) as a leaf-folder on eggplant. Mr. J. M. Langston found that "The Tobacco Leaf-Folder of Porto Rico attacks Tomatoes in Mississippi" (Quarterly Bull. State Plant Board Miss., 2(4): 7-9. A. & M. College, Mississippi, 1923). Locally it is called "el Pega-pega del Tabaco," being possibly the most abundant insect on shade-grown tobacco, but much less abundant on sunny hills and on tobacco grown in the open. To some extent, the caterpillars may feed on the leaves of the tomato, and on those of *Solanum torvum* and *Solanum nigrum*. The adults have been intercepted at light at Bayamón, and Mr. E. G. Smyth found them very abundant at Guánica, where he collected over a hundred of these "small dusky Pyralids" during the latter half of 1913. Dr. Schaus (1940-367) lists collections at Coamo, Lares and San Germán, but the insect is present in all parts of the Island, being possibly most abundant in the tobacco regions of the interior.

*Psara phaeopteralis* (Guenée), considered by Dr. Schaus (1940-286) to be what Herr Heinrich B. Möscher (1890-286) described as *Botys intricatalis*, and which Dr. Gundlach thus listed, is specifically and almost exclusively a pest of St. Augustine grass or "grama" (*Stenotaphrum secundatum*). Caterpillars have been noted defoliating this grass at Río Piedras, Santurce, Hatillo, Isabela and Aguirre, but Dr. Mortimer D. Leonard (1932-133) notes that "adults and larvae were also abundant during June in large patches of a weed, "siempreviva" (*Gomphrena globosa*) at El Morro in San Juan:" the only record on any other host than grama. The little brown moths, intermediate in depth of coloration between the other two local species of *Psara*, have been taken at light at Río Piedras, intercepted at Bayamón repeatedly, and at Dorado and Manatí, while Dr. W. A. Hoffman found them at El Semil, Villalba, and Prof. J. A. Ramos (1947-50) on Mona Island. Presumably the insect occurs wherever its host is present, Dr. Schaus (1940-366) noting ten localities at which it has been collected including Aguirre and Ensenada. Most outbreaks on lawns or pastures start in the shade of trees, but before the outbreak has run its course spreads to areas in full sunshine, shaded by trees at no time of day. No parasite of the caterpillars has been reared, but when they have defoliated a section of grass the naked grass stems offer them little protection from grackles and blackbirds, or any other birds that will descend to the ground to eat caterpillars, and both toads and lizards have been observed feeding on them at Isabela.

Prof. Forbes notes the fringe of the hind wing of *phaeopteralis* is all dark, while that of the adult of *periusalis* is tipped with white.

*Loxostege bifidalis* (Fabricius) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach under the name *Eurycreon evanadalis* Berg, and as a *Phlyctaenodes* was identified by Dr. Harrison G. Dyar for inclusion in Van Zwaluwenburg's list: P. R. 1407, and in "Insectae Borinquenses" (1936-466). Mr. E. G. Smyth found this "common buff Pyralid" very abundant at light at Hda. Santa Rita, Guánica, for during the latter half of 1913 he collected 167 individuals, but he did not discover the host of the larvae. It is primarily an inhabitant of the xerophytic regions of the Island, Dr. Schaus (1940-368) listing additional collections at Aguirre, Coamo, Arecibo and San Juan, and on Vieques Island, but it has not been intercepted at light at Bayamón or found at Río Piedras. It is a small, dull cream-colored moth, with broad darker bands on the forewings.

*Loxostege nudalis* (Hübner), listed by Herr Möschler and Dr. Gundlach as introduced from Spain into Puerto Rico, has not since been found locally.

*Loxostege stolidalis* was described by Dr. Wm. Schaus (1940-368) from a male from Ensenada, others from Coamo, with a wingspread of 20 mm., mostly buff in color; "markings extremely faint" on the forewings.

*Loxostege similalis* (Guenée) is considered by Dr. Schaus (1940-367) to be what Herr Heinrich B. Möschler (1890-290) described from a single male, collected in Puerto Rico by Dr. Gundlach, under the name of *Eurycreon collucidalis*. Mr. E. G. Smyth collected 26 adults of this "buff barred Pyralid," identified by Dr. Harrison G. Dyar as a *Phlyctaenodes*, at light at Hda. Santa Rita, Guánica, during the latter half of 1913, and Dr. Schaus records additional collections at San Germán, Guayanilla, Coamo and from Vieques Island. Prof. J. A. Ramos (1947-50) found many specimens, as determined by Prof. Wm. T. M. Forbes, at light on July 20, 1944, Sardinera Beach, Mona Island.

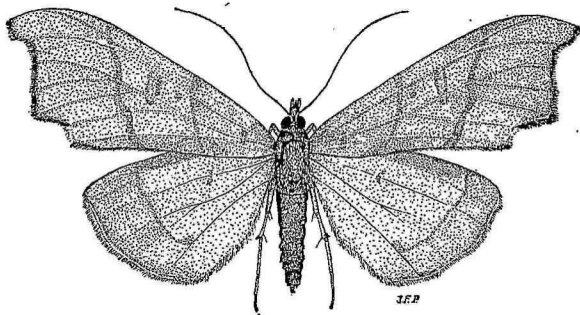
*Diasemia ramburialis* (Duponchel), of which Herr Heinrich B. Möschler described from two specimens collected in Puerto Rico by Dr. Gundlach the variety *minimalis* (1890-306), is "universally distributed" according to Dr. Schaus (1940-369), and "in the U. S. National Museum there are specimens from Florida, Panama, French Guiana, South Brazil, Argentina and Jamaica all representing the var. *minimalis* Möschler." Adults have been intercepted at light at Bayamón, and collections made at Cataño, Coamo and on El Yunque.

*Sparangmia gigantalis* Guenée was listed by Herr Möschler and Dr. Gundlach from Puerto Rico, and it has twice since been collected at Lares, and once intercepted at light at San Juan. The caterpillar feeds on "yagrumo" (*Cecropia peltata*) and spins an extensive cocoon of brownish silk. The adult is a large, dark orange moth, its forewings twice deeply cleft on the

outer margin and with two darker transverse narrow bands; a fainter one on the hind wing; a pinkish iridescence at certain angles on areas of both wings.

*Tholera reversalis* (Guenée) was re-described as the variety *hilaralis* of *Botys* (*Mecyna*) *polygonalis* Hübner by Herr Heinrich B. Möschler (1890-283). It is not represented in recent collections from Puerto Rico.

*Cybalomia evincalis* was described as a *Botys* by Herr Heinrich B. Möschler (1890-287) from a single male collected in Puerto Rico by Dr. Gundlach, and listed by him. It has since been found in Cuba but not in Puerto Rico.



Adult of the Yagrumo Leaf-Webber, *Sparangmia gigantalis* Guenée, three times natural size. (Drawn by José F. Pietri.)

*Udea rubigalis* (Guenée) as identified by Mr. Carl Heinrich, the celery leaf tier or the greenhouse leaf tier of continental United States, was intercepted as larvae eating the leaves of string beans at San Juan in 1931.

*Condylorrhiza vestigialis* (Guenée), as identified by Mr. Hahn W. Capps, was collected at light at Villalba, May 19, 1940, by Dr. Luis F. Martorell. This is continental species of which the larva feeds on willow. The adult is an intensely yellow moth, with a faintly darker pattern on the wings.

*Hapalia albipunctalis* (Dognin) as identified by Mr. Carl Heinrich was collected by Dr. W. A. Hoffman at light at El Semil, Villalba, May 10, 1940.

*Hapalia* ? *concinna* was described by Herr Heinrich B. Möschler (1890-287) from two females collected in Puerto Rico by Dr. Gundlach and a pair in the Staudinger collection as a *Botys*, and it is thus listed by Dr. Gundlach. Dr. Schaus (1940-371) admits that "I have not been able to identify it in any material that I have seen."

*Hapalia eupalusalis* (Walker) is listed by Dr. Schaus (1940-371) from Coamo, Lares, Utuado and El Yunque.

*Hapalia vinotinctalis* (Hampson) is listed by Dr. Schaus (1940-371) from Coamo and Bayamón. Prof. Forbes notes additional collections at Cayey, and at Lares by Mr. Francisco Seín.

*Botys* ? *flammeolalis* is described by Herr Heinrich B. Möschler (1890-289) from a single female collected by Dr. Gundlach in Puerto Rico as "ein eigentümliches Tier," with wingspread of 6.3 mm. Despite the valiant effort made by Dr. Schaus to place in their proper genus all the Pyralids described by Herr Möschler in the catch-all genus of *Botys*, of doing so for this one he confesses his failure: "My notes made in Berlin placed this species doubtfully as belonging in the Nymphulinae."

*Pyrausta albifrontalis*, described as a *Botys* by Herr Heinrich B. Möschler (1890-284) from a single male collected in Puerto Rico by Dr. Gundlach, and thus listed by him, is recognized by Dr. Schaus (1940-374): a female from Guánica.

*Pyrausta cardinalis* (Guenée) was listed as a *Botys* by Herr Möschler and Dr. Gundlach from Puerto Rico. Dr. Schaus (1940-376) lists subsequent collections from Lares, Aibonito, Arecibo, Coamo, Río Piedras and El Yunque. It is a cardinal red except for black antennae, eyes, the broad outer margin of the hind wings, a narrow outer margin of the forewings and a single oval spot towards the apex. Mr. S. S. Crossman found it at Aibonito, and Dr. Luis F. Martorell at Villalba. The Cornell University collection has specimens from Cayey, Toa Alta and Mayagüez.

*Pyrausta cerata* (Fabricius) was listed from Puerto Rico as *Botys oedipodalis* Guenée by Herr Möschler and Dr. Gundlach, and is in Van Zwaluwenburg's list (P.R. 1411) as *Pyrausta mellinalis* Hübner, identified by Dr. Harrison G. Dyar for Mr. E. G. Smyth, who collected a hundred adults at light at Hda. Santa Rita, Guánica, during the latter half of 1913. In "Insectae Portoricensis" (1923-193), using the name *Epicorsia mellinalis* Hübner, the caterpillar, abundant on "higüerillo" (*Vitex divaricata*) and "péndula" (*Citharexylum fruticosum*), is described, and the three-layered cocoon which it forms in a folded-over leaf of the host tree. The caterpillars are so abundant during some years that one can hardly find anywhere on the Island, a single uninfested tree and most of them are so heavily attacked as to be conspicuous as one drives along the road. Possibly the most widespread outbreak was that of the autumn of 1937, but that noted at only Aibonito and Río Piedras in February 1923 may have been quite as extensive. That of the autumn of 1940, noted in "Trees for Roadside Planting in Puerto Rico" (Caribbean Forester, 6 (3): 115-129, fig. 3. Río Piedras, April 1945) was checked for all parts of the Island: from Cabo Rojo to Isabela, from Patillas to Fajardo, and at numerous intermediate



points. At San Sebastián, Dr. Luis F. Martorell found the eggs, very light green in color, oval, flattened and overlapping, laid on a péndula leaf. The adults are large creamy yellow moths, with a wing expanse of 40 mm., the costal margin of the fore wings brown, and the outer margins of both and sometimes on the abdomen a dorsal stripe in brown.

*Pyrausta eupalusalis* (Walker), as identified by Mr. Carl Heinrich, is a little iridescent yellowish moth, with darker outer margins on its wings and a faint darker pattern, collected by Dr. W. A. Hoffman at light at El Semil, Villalba, May 10, 1941.

*Pyrausta episcopalis* (Herrich-Schäffer) was listed as a *Botys* from Puerto Rico by Herr Möschler and Dr. Gundlach, and Dr. Schaus records more recent collections at Lares, Adjuntas, Aibonito and on El Yunque.

*Pyrausta gentillalis* was described by Dr. Wm. Schaus (1940-373) from a single male from San Juan, with a wing expanse of 13 mm., the "fore wing purplish vinaceous, the costa very narrowly, the termen and inner margins more broadly golden yellow."

*Pyrausta glirialis* (Herrich-Schäffer), originally described from Cuba, is reported as a *Botys* from Puerto Rico by Herr Möschler and Dr. Gundlach. Dr. Schaus (1940-375) notes an additional collection at Coamo.

*Pyrausta gracilalis* (Herrich-Schäffer), originally described from Cuba, is listed as a *Botys* from Puerto Rico by Herr Möschler and Dr. Gundlach. It has since been found at Arecibo and Coamo, according to Dr. Schaus (1940-376).

*Pyrausta illutalis* (Möschler) mis-identified, according to Dr. Schaus, by Herr Möschler (1890-295) from Puerto Rico under the name of *Condylorrhiza illutalis* Guenée of Brasil, was listed under this name by Dr. Gundlach. Dr. Schaus (1940-374) notes a specimen from Puerto Rico in the U. S. National Museum which he considers "possibly the same as *P. illutalis* (Möschler)."

*Pyrausta insignitalis* (Guenée) is listed from Puerto Rico as a *Botys* by Herr Möschler: a single specimen collected by Dr. Gundlach. Dr. Schaus (1940-376) notes another from Arecibo.

*Pyrausta laresalis* was described by Dr. Wm. Schaus (1940-374) from a single female from Lares with a wing expanse of 22 mm., "fore wing olive buff with dark suffusions and irrorationes not well defined."

*Pyrausta oculatalis* was described as a *Botys* by Herr Heinrich B. Möschler (1890-282) from a male and three females collected by Dr. Gundlach in Puerto Rico and listed by him. Dr. Schaus (1940-373) lists "a male in the U. S. National Museum from an old Puerto Rican collection."

*Pyrausta phoenicealis* (Hübner) was listed as a *Botys* from Puerto Rico by Herr Möschler and Dr. Gundlach. Mr. E. G. Smyth reared larvae at Río Piedras from "marubio botón" (*Hyptis capitata*), several of which were

parasitized by either a black or a yellow Braconid, and others transformed to adults which were identified by Dr. Schaus. This little orange-yellow moth, with somewhat darker broad markings, has been repeatedly intercepted at light at Bayamón, and Dr. Schaus (1940-375) considers it "universally distributed," listing collections at nine Puerto Rican localities.

*Pyrausta phyllidalis* was described by Dr. Wm. Schaus (1940-373) from a female from Cuba, another from Coamo, with a wing expanse of 28 mm., the thorax, abdomen and legs white, elsewhere orange cinnamon; "fore wing white; costal margin deep chrome at base; markings pale ecru drab." Prof. Forbes collected caterpillars at Coamo in the folded-over leaf of milkweed, *Asclepias curassavica*, which were reared to adult.

*Pyrausta tyralis* (Guenée) was identified by Herr Möschler and listed by Dr. Gundlach as *Botys diffusa* Grt. & Rbs.: a single female in the Krug collection from Puerto Rico. It has not since been found locally.

*Pyrausta viscendalis* was described as a *Botys* by Herr Heinrich B. Möschler (1890-285) from a single female collected in Puerto Rico by Dr. Gundlach and listed by him. It has not since been found anywhere.

*Pyrausta votanalis* was described by Dr. Wm. Schaus (1940-374) from a single female from Pueblo Viejo, with a wing expanse of 10 mm., "palpi, head and thorax ecru drab; abdomen cinnamon buff; fore wing chiefly reddish purple," reared from caterpillars feeding on "molinillo" (*Leonotis nepetaefolia*).

*Microtheoris ophionalis* (Walker) is listed from Puerto Rico by Dr. Wm. Schaus (1940-377): specimens from Santurce and Aguirre.

*Noctuella thalialis* (Walker), as identified by Mr. E. G. Smyth by comparison with illustration in Holland's "Moth Book" (later confirmed by Dr. Schaus), is a "tiny barred Pyralid" of which he collected 160 individuals at light at Hda. Santa Rita, Guánica, during the latter half of 1913. Dr. Schaus (1940-377) lists collections at Aguirre, Aibonito, Coamo, Tallaboa, San Germán and Isabela. The distal third of both wings is brown, as is the base of the forewings, and an intermediate costal area of varying intensity that may reach the inner margin. This is P. R. 1412 in Van Zwaluwenburg's list. Considering how abundant the moths are in the more xerophytic regions of the Island it is rather surprising, as Dr. Schaus remarks, that he "can find nothing in Möschler to agree with this species," and possibly indicates, according to Prof. Forbes, that Herr Möschler mistook it for a Noctuid. Adults have been collected at Palmas Abajo by Dr. W. A. Hoffman, and on Vieques Island by Prof. Forbes.

Mr. H. W. Capps notes this a synonym for *Noctuella rufofascialis* (Stephens).

*Stenoptycha metagrammalis* was described as a *Lineodes* by Herr Heinrich B. Möschler (1890-305) from a pair collected in Puerto Rico by Dr.

Gundlach and listed by him. Dr. Schaus (1940-378) lists subsequent collections from the Island of Vieques, and from Río Piedras, Aibonito, Coamo and Adjuntas.

*Stenoptycha serpentifera* Hampson, originally described from the Bahamas and Cuba, is identified by Dr. Schaus (1940-378) from Puerto Rico: specimens from Coamo.

*Lineodes gracilalis* Herrich-Schäffer is listed from Puerto Rico by Herr Möschler and Dr. Gundlach, but no specimen has been found locally since the male collected by Dr. Gundlach which Herr Möschler re-describes at length.

*Lineodes triangulalis* was described by Herr Heinrich B. Möschler (1890-305) from three specimens collected in Puerto Rico by Dr. Gundlach and listed by him. It has not since been found locally.

#### Subfamily Nymphulinae

*Argyractis doriscalis* is described by Dr. Wm. Schaus (1940-379) from a female intercepted at light at Bayamón with a wing expanse of 15 mm., mostly "citric drab" in color, patterned on both wings.

*Argyractis plusialis* (Herrich-Schäffer) was listed from Puerto Rico by Herr Möschler, identifying several specimens collected by Dr. Gundlach as *Cataclysta angulatalis* Lederer. A more recent collection has been made at Coamo, according to Dr. Schaus (1940-380), who neglects to mention his identification of this little grey-brown, sharply patterned Pyralid for Mr. E. G. Smyth, who took 25 of them at light at Hda. Santa Rita, Guánica, during the latter half of 1913, and thought them "rather common." Prof. Forbes found adults common at Coamo, and collected a few on Vieques Island. The larvae of continental species of this genus live in cases attached to stones in swift water.

*Nymphula fluctuosalis* Zeller, as identified by Prof. Wm. T. M. Forbes, is mentioned by Don Julio García-Díaz (1938-54) as being attacked by the dragonfly *Lepthemis vesiculosa* (F.), at Tortuguero Lagoon during February and March, when "these small white swamp moths were very abundant. These moths flew very low over the water surface, among the emerging aquatic, and so were in part protected from *Lepthemis*."

*Nymphula hermeasalis* (Walker) is listed by Dr. Schaus (1940-381) from Lares and Coamo, and Dr. W. A. Hoffman collected it at light at El Semil, Villalba.

*Nymphula infirmalis* (Möschler), described originally as a *Paraponyx* from Jamaica, was identified by its describer for Dr. Gundlach as the two males which he had collected in Puerto Rico. It has not since been found anywhere.

*Nymphula rugosalis* was described as a *Paraponyx* by Herr Heinrich B.

Möschler (1890-318) from a pair collected in Puerto Rico by Dr. Gundlach and thus listed by him. Prof. Wm. T. M. Forbes identified this species from Laguna Tortuguero for Don Julio García-Díaz (1938-96), and notes collections from Toa Alta and Aguirre. Dr. Schaus (1940-381) lists collections at Coamo and Río Piedras, noting that it is "closely allied to *N. fluctuosalis* Zeller."

*Cataclysta bromachalis* is described by Dr. Wm. Schaus (1940-382) from a male taken at San Juan which has a wing expanse of 15 mm., "head light pinkish cinnamon; thorax brown, the patagia creamy white; abdomen drab grey with fuscous segmental lines; fore wing silvery, costal margin grayish."

*Cataclysta miralis* was described by Herr Heinrich B. Möschler (1890-319) from two males and a female collected in Puerto Rico by Dr. Gundlach, and listed by him. Subsequent collections have been made at Lares, Adjuntas, Aibonito, Jájome Alto and on El Yunque, according to Dr. Schaus (1940-381), and Dr. W. A. Hoffman collected some of these striking little moths at El Semil, Villalba and at Utuado. They do not exclusively live in the mountains, however, for they have been intercepted at light at Bayamón and found resting on vegetation in the daytime at San Juan and at Trujillo Alto. The outer margin of their hind wings is a series of small black spots with iridescent golden centers; their fore wings have each four large oval white areas margined in dark brown on a lighter brown background. Prof. Forbes found them especially abundant on El Yunque.

*Cataclysta minimalis* H. S. is listed by Dr. Stahl.

*Cataclysta moniligeralis* Lederer was identified as an *Argyractis* by Dr. Schaus (1940-380) from material intercepted at light at Bayamón.

*Cataclysta sumptuosalis* was described by Herr Heinrich B. Möschler (1890-319) from several specimens collected in Puerto Rico by Dr. Gundlach. Dr. Schaus as an *Argyractis* (1940-380) lists collections at Lares, Maricao, Adjuntas, Coamo, Aibonito, Manatí and Jájome Alto, and Don Julio García-Díaz (1938-96) lists it as a fresh water insect.

*Cataclysta opulentalis* Lederer was listed from Puerto Rico by Herr Möschler and Dr. Gundlach, but has not since been found locally.

*Cataclysta vestigialis* Snellen, listed from Puerto Rico by Herr Möschler and Dr. Gundlach, is considered by Dr. Schaus (1940-382) to be a mis-identification.

*Ambia mineolalis* was described by Dr. Wm. Schaus from specimens collected on El Yunque, the male having a wing expanse of 14 mm., the female 16 mm., "palpi, head and body white; a small orange spot on tegula, and transverse line on third segment of abdomen; fore wing white; costa narrowly maize yellow (with) dark points."

*Bradina hemmingalis* Schaus, originally described from Jamaica, is recognized by its describer (1940-384) from El Yunque.

*Diathrausta yunquealis* was described by Dr. Wm. Schaus (1940-384) from adults of both sexes collected by Dr. Wm. T. M. Forbes on El Yunque. The wing expanse of the male is 14 mm., that of the female 17 mm.; brown moths, marked with white, often edged with black.

*Stenia aguirrealis* was described by Dr. Wm. Schaus (1940-385) from a male at Aguirre with a wing expanse of 10 mm.; "head and collar white with grayish irrorations; wings with pale ochreous irrorations." The Cornell University collection contains the type, of which Prof. Forbes can note no difference from *Bocchoris acutangulalis*.

*Stenia declivalis indianalis* (Dyar) is listed by Dr. Schaus (1940-385) from Culebra Island, and from San Germán, Ensenada, Coamo and Palmas Abajo (between Guayama and Jájome Alto) in Puerto Rico.

*Stenia pellucidalis* was described as *Somatania* by Herr Heinrich B. Möschler (1890-301) from four specimens collected by Dr. Gundlach in Puerto Rico, and listed by him. This moth has not since been found locally, but Dr. Schaus (1940-385) records it from Cuba.

*Piletocera bufalis* (Guenée), re-described under the name *Penestola praeficalis* by Herr Heinrich B. Möschler (1890-316) from several specimens collected in Puerto Rico by Dr. Gundlach, is listed by Dr. Schaus (1940-386) from both Culebra and Vieques Islands, and from Cataño, Dorado and Ensenada in Puerto Rico.

*Odilla noralis* was described by Dr. Wm. Schaus (1940-387) from a male from Adjuntas with a wing expanse of 16 mm., "head and thorax vinaceous buff; fore wing apricot buff; hind wing whitish."

#### Subfamily Scopariinae

*Elusia enalis* was described by Dr. Wm. Schaus (1940-388) from a number of small moths (wing expanse 8 mm.) from El Yunque, Jájome Alto and Lares, with "head and thorax gray mottled with fuscous; fore wing whitish with dark patches," the markings varying "considerably in the different specimens."

#### Subfamily Chrysauginae

*Salobrena recurvata* was described as a *Ballonicha* from Jamaica by Herr Möschler, and listed by him and Dr. Gundlach from Puerto Rico, but has not since been found here.

*Carcha hersifialis* Walker, according to Dr. Schaus (1940-389), was re-described by Herr Heinrich B. Möschler under the name of *Thalpochares basalis* for the female (1890-169) and as *Coeloma tortricalis* for the male (1890-277), both names being listed by Dr. Gundlach. These little moths have been repeatedly intercepted at Bayamón at light, and were found by Dr. W. A. Hoffman at El Semil, Villalba, May 10, 1941, while Dr. Schaus

notes additional collections at Palmas Abajo, Coamo and Lares. The basal third of the fore wing is dark brown, the median third whitish, the distal third light brown, as is also the hind wing.

*Caphys bilinea* Walker was re-described from Puerto Rico: two females in the Krug collection, by Herr Heinrich B. Möscher (1890-275) under the name of *Callasopia rosealis*, and it is thus listed by Dr. Gundlach. Dr. Schaus (1940-389) notes a recent collection on El Yunque.

*Bonchis munitalis* (Lederer) is listed from Puerto Rico as an *Ethnistis* by Herr Möscher and Dr. Gundlach. The queer little brown moths with expanded legs, the tips of the fore wings turned in, have been reared twice at Río Piedras from the seed pods of "roble" (*Tabebuia pallida* or *Tecoma pentaphylla*) and again at San Sebastián in October 1939 from the same host, when all the pods appeared to be infested with the caterpillars. Dr. Schaus (1940-390) lists an additional collection at Aguirre, and presumably the insect will occur wherever its specific host grows. Over half of the fore wing is a black-centered but poorly-developed eye-spot; the base is dark brown, as is also the hind wing and the body of the moth.

*Pachymorphus subductellus* was described by Herr Heinrich B. Möscher (1890-278) from a single male collected in Puerto Rico by Dr. Gundlach, and listed by him. Mr. Thos. H. Jones found the larvae boring in twigs of "roble" (*Tabebuia pallida* or *Tecoma pentaphylla*) at Río Piedras in the spring of 1912, and reared the large-snouted, dull purplish-pink adults, as determined by Dr. Schaus. Subsequent rearings from this host at Río Piedras were made in March 1923, and adults found at light in September 1922, intercepted at Bayamón, and reported by Dr. Schaus (1940-390) at Cataño, Aibonito, Coamo and San Germán. This and the preceding species are as different in size and general appearance as can well be imagined, and it is merely by the accident of systematic listing that two moths, the larvae of which happen to feed on the same host, should be placed together.

*Epitamyrta albomaculalis* was described as a *Tamyrta* by Herr Heinrich B. Möscher (1890-278) from a single female collected in Puerto Rico by Dr. Gundlach, and listed by him. It has since been found in Cuba but not in Puerto Rico.

*Streptopalpia minusculalis* was described as a *Tamyrta* by Herr Heinrich B. Möscher (1890-278) from three females collected in Puerto Rico by Dr. Gundlach, and listed by him. Dr. Schaus (1940-391) lists a subsequent collection at San Germán. The Cornell University collection has specimens from Cataño, Río Piedras and Aguirre, in addition to those collected by Prof. Forbes on Vieques Island.

## Subfamily Endotrichinae

*Perforadix sacchari* was described by Mr. Francisco Seín as "The Sugar-Cane Root Caterpillar and other new Root Pests in Puerto Rico" (Jour. Dept. Agr. P. R., 14 (3): 167-191, pl. 10. San Juan, August 1930), having been previously reported as *Sulfetula grumalis* Schaus, as identified by Dr. Harrison G. Dyar. Mr. Seín found larvae boring in the root-tips of sugar-cane at Río Piedras and elsewhere in Puerto Rico, and in Santo Domingo, specific locality records being at Adjuntas, and of adults intercepted at light at Bayamón, and recorded by Dr. Schaus (1940-392) at Coamo and Isabela, and on Vieques Island. Mr. Harry A. Beatty found it on St. Croix, and it will doubtless be found in others of the Lesser Antilles where sugar-cane is grown. Mr. Seín's observations were summarized by Dr. M. D. Leonard (1931-112 and 1931-144), and in "An Economic Entomology of the West Indies," pages 156 to 158.

*Micromastra isoldalis* was described by Dr. Wm. Schaus (1940-393) from specimens collected on El Yunque, at Jácome Alto and San Germán, the males with a wing expanse of 8 mm., the females 9 mm., thorax and base of abdomen mostly white; wings white with fine grey irrorations, head and markings light drab.

## Subfamily Pyralinae

*Pyralis manihotalis* Guenée, originally described from Java, was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Asopia gerontesalis* Walker, but without indication of its economic role. Dr. Richard T. Cotton reared it from larvae feeding on corn meal and on rice, for it is a pest of stored products altho not of great importance. The dirty brown moths have two wavy lines on both wings.

*Herculia dissimilalis* was described as *Parasopia* by Herr Heinrich B. Möschler (1890-276) from three specimens collected in Puerto Rico by Dr. Gundlach, and listed by him. Dr. Schaus (1940-394) notes subsequent collections at Lares and San Germán. Mr. Carl Heinrich identified as *Herculia psammioxantha* Dyar the adults which Dr. W. A. Hoffman found at light at El Semil, Villalba, on May 10, 1941: inconspicuous greenish-yellow moths with two narrow, curved, transverse lines across the wings. In the late autumn of 1938, the baled alfalfa hay at the Isabela Substation, in which Mr. L. A. Serrano took such pride, was greatly disfigured by the numerous white, thin but dense cocoons of caterpillars which had spun webs over it, in which their excrement was entangled. The injury was really not serious, as comparatively little of the hay was actually eaten, but its appearance was ruined, and Mr. Serrano began to doubt its palatability

for cattle. To the reared adults Mr. Heinrich applied the Dyar name, although considering it in probable synonymy with what Möschler had described from Puerto Rico. It may be presumed that the insect is endemic, although it is doubtful if the larvae of the adults which Dr. Gundlach collected had fed on alfalfa hay.

#### Subfamily Galleriinae

*Galleria mellonella* (Linnaeus), the wax moth of bee hives, or "traza" as it is called locally, was listed from Puerto Rico by Herr Möschler and Dr. Gundlach, but without comment. Adults have been intercepted at light at Bayamón, and Mr. Francisco Seín records an infestation at Lares which had destroyed several colonies, but we have no data on abundance on whether it is a really serious pest of wide distribution.

*Achroia grisella* (Fabricius), as identified by Mr. Aug. Busck, is a small brown moth which Mr. Francisco Seín found very abundant at Río Piedras in June 1925, tunneling thru the comb of which the honey had been centrifuged out, forming dark-colored silk tubes. The comb had been out in the open for some time, near the hive, resting on the ground. This is the "lesser wax moth" of apiaries, and altho present in Puerto Rico is apparently not abundant.

*Corcyra cephalonia* (Stainton) was first reported from Puerto Rico by Dr. F. H. Chittenden, writing of "The Rice Moth" (Bulletin No. 783, pp. 1-15. U. S. D. A., Washington, D. C., July 14, 1919), of which the eggs were laid in sacks of cereals, the larvae abundant in rice, and also reared from chocolate. Dr. Richard T. Cotton found larvae attacking dry garbanzos or chick peas at Río Piedras, and Mr. Miguel A. Diaz noted them in sesame, with the seeds webbed together to form tunnels and cocoons. Dr. Luis F. Martorell reared adults from larvae in pods of "bayahonda" (*Prosopis juliflora*) at Guánica in January 1914, and they had previously been intercepted in tamarind pods at Guánica, and in bean pods and cotton seed cake at San Juan. The brownish, oval-winged adults have been intercepted at light at Bayamón.

#### Subfamily Macrothecinae

*Pogrima palmasalis* was described by Dr. Wm. Schaus (1940-396) from a male collected by Dr. W. A. Hoffman at Palmas Abajo, between Guayama and Jácome Alto. It has a wing expanse of 12 mm., the wings silvery white with pattern in black, the abdomen white; "thorax wood brown; palpi, collar and tegulae vinaceous buff; head pale drab gray."

*Genopaschia protomis* Dyar, as determined by Mr. Carl Heinrich, was reared by Mr. Mario E. Pérez at Río Piedras from the base of a pineapple fruit. "This is strictly a pineapple insect" writes Mr. C. F. W. Muesebeck



under date of September 10, 1948, "but it is a predator that sometimes feeds on mealybugs occurring on pineapple."

*Pseudotracha irenealis* was described by Dr. Wm. Schaus (1940-397) from a male from Coamo, mostly brown in color with a wing expanse of 10 mm. Prof. Forbes has additional specimens from Isabela.

#### Subfamily Crambinae

*Crambus biguttellus* Forbes, originally described from Louisiana, is listed by Dr. Schaus (1940-398) from Maricao, Jácome Alto and El Yunque.

*Crambus discludellus* was described by Herr Heinrich B. Möschler (1890-323) from a single male collected in Puerto Rico by Dr. Gundlach, and listed by him. Dr. Schaus (1940-398) lists additional collections at Lares, Aibonito, Cayey, Jácome Alto and El Yunque.

*Crambus domingellus* Schaus, was doubtfully identified by Herr Möschler as *Crambus ? ligonellus* Zeller from a single male collected by Dr. Gundlach in Puerto Rico. Originally described from Santo Domingo, its describer (1940-398) identifies it from Puerto Rico: specimens from Lares.

*Crambus fissiradiellus* Walker was re-described by Herr Heinrich B. Möschler under the name *Crambus gestatellus*, from two males and a female collected in Puerto Rico by Dr. Gundlach. Dr. Schaus (1940-399) lists collections at Lares, Arecibo, Manatí, Coamo, Aguirre and San Germán, as well as from the Island of Vieques. Prof. J. A. Ramos (1947-50) collected two specimens at light on Mona Island.

*Crambus ligonellus* Zeller was re-described by Herr Heinrich B. Möschler (1890-322) as *Crambus delomatellus* from six males collected in Puerto Rico by Dr. Gundlach, and listed by him. Dr. Schaus (1940-398) lists collections at seven Puerto Rican localities and from Vieques Island. Mr. H. K. Plank found its larvae causing minor "Grassworm Injury to Lawns in Puerto Rico" (*Tropical Agriculture* 24 (1-3): 7-8, ref. 2. Port-of-Spain, Trinidad, January 1947) on Manila grass, *Zoysia matrella* (L.) Merr. More recently its dark, spotted caterpillars have completely defoliated entire lawns of this grass at Río Piedras, apparently indicating that this newly-introduced grass is a much more acceptable host than any native or naturalized grass previously present on the Island. When fully-grown, the caterpillars construct tough, spindle-shaped cocoons of dark silk, in the outer threads of which are entangled many short bits of grass and excrement. The moths are silvery grey in color, the forewings lavender with the venation outlined in dull orange or yellow; a narrow, doubly-curved darker band across the middle and another paralleling the outer margin inside a line of three conspicuous black spots towards humeral angle, and four others much smaller and less noticeable.

*Crambus moeschleralis* was named by Dr. Wm. Schaus (1940-398) from

numerous specimens from Cuba, Hispaniola and Puerto Rico of which Mr. Carl Heinrich described the genitalia of both sexes. This species was listed from Puerto Rico by Herr Möscher and Dr. Gundlach as *Crambus quinquareatus* Zeller, and identified by Dr. Harrison G. Dyar as *Crambus hastiferellus* Zeller, as recorded in "Insectae Borinquenses" (1936-471), adults resting on sugar-cane at Manatí.

*Crambus profanellus* Walker is identified by Dr. Wm. Schaus (1940-399) from the Island of Vieques, and from Manatí, Arecibo, Lares, San Germán, Coamo and Aguirre in Puerto Rico.

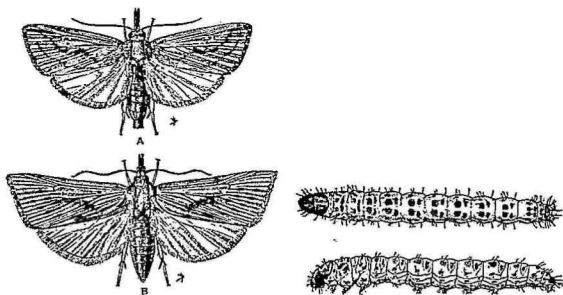
*Crambus santiagellus* Schaus, originally described from Cuba, is identified by the describer (1940-398) from Coamo and Aguirre, and from Vieques Island. Prof. J. A. Ramos (1947-50) collected one specimen at light on Mona Island.

*Argyria diplomachalis* Dyar, originally described from Panama and Cuba, is quite common in Puerto Rico, Dr. Schaus (1940-401) listing it from nine localities and from the Island of Vieques. He considers that "this is the *A. nivalis* (Drury) of Möscher, (of which Dr. Gundlach had one male). *Argyria nivalis* (Drury) may occur in Puerto Rico, as it is found in Cuba and Jamaica." It is a little silvery white moth with a brown triangle on costa of the fore wing, approaching the apex, and the outer margin brown.

*Argyria lacteella* (Fabricius) is listed from Puerto Rico by Herr Möscher under the name *Argyria lusella* Zeller, of which Dr. Gundlach had "ein Parr, welches Snellen nach von Zeller selbst bestimmt Stücken mir bestimmte." Dr. Schaus (1940-400) lists it from San Germán, Mayagüez, Aibonito and El Yunque, and from Vieques Island. Presumably his record from Naguabo is what was intercepted at Juncos and identified by him as *A. opposita* Zeller. Apparently it is quite common, for the Cornell University collection has specimens from Cataño, Río Piedras, Santurce, Jájome Alto and Lares. Prof. Forbes notes that it is but half the size of *Argyria nivalis*.

*Diatraea saccharalis* (Fabricius) was listed from Puerto Rico by Herr Möscher and Dr. Gundlach under the name *Diatraea obliteratedella* Zeller, the latter noting "había varios ejemplares en la colección de Krug," without any indication of the host of the larva or its economic importance. It is the lesser sugar-cane moth stalk-borer of the Americas, commonly known as "sugar-cane borer" according to its designation in the "Common Names of Insects Approved by the American Association of Economic Entomologists" (Jour. Ec. Ent., 39 (4): 427-448. Menasha, August 1946). At the time that Dr. Gundlach visited Puerto Rico the value of the coffee exported equalled and often exceeded that of the sugar produced, yet sugar-cane was grown at Hormigueros, Mayagüez and Afiasco, and it seems surprising that he should not have collected the moth in person. To be sure,

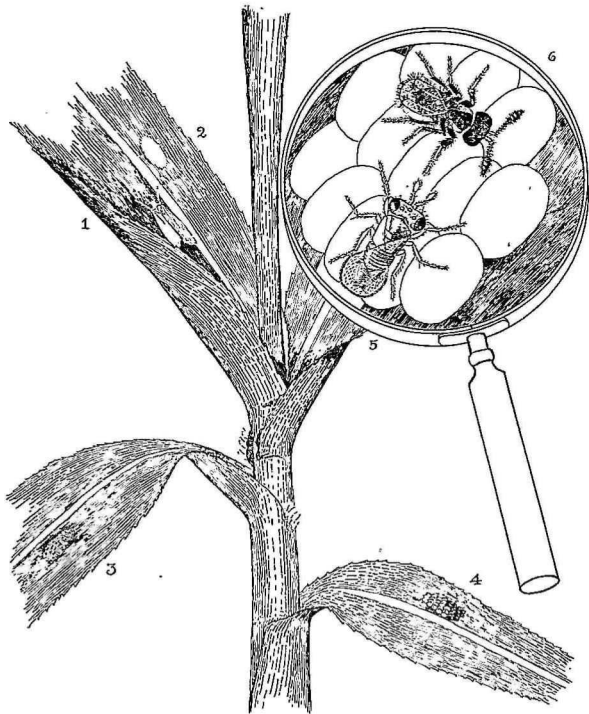
it is most retiring in the cane field during the daytime, but often comes to light at night, not only in cane regions but up in the mountains, as at El Semil, Villalba, and at Treasure Island, Cidra, and even on Mona Island, where no cane is grown. Mr. August Busck (1900-89) noted the larvae boring in stalks of sugar cane. "The annual cutting and crushing the cane with all living larvae and pupae naturally keeps the pest in check, but the remaining roots and single canes always contain enough individuals to infest the next year's growth." One of the earliest recommendations for control, and one that is still effective, so far as it goes, was made by Mr. D. W. May, Director of the Mayagüez Station, (1906-10) that "seed-cane



Left. Male adult of the Lesser Sugar-Cane Moth Borer, *Diatraea saccharalis* (Fabricius), above, female below, natural size. (Drawn by Harry Bradford. After Holloway, Haley & Loftin, Bureau of Entomology, U. S. D. A.)

Right. Caterpillars of the Lesser Sugar-Cane Moth Borer, *Diatraea saccharalis* (Fabricius), viewed from above and from the side, natural size. (Drawn by Harry Bradford. After Holloway, Haley & Loftin, Bureau of Entomology, U. S. D. A.)

be soaked twenty-four hours before planting to destroy (the larvae)." Because the injury is so insidious its extent was not known until Mr. D. L. Van Dine demonstrated the "Damage to Sugar Cane Juice by the Moth Stalk-Borer (*Diatraea saccharalis* Fabr.)" in the very first circular to be issued by the Experiment Station of the Porto Rico Sugar Producers' Association (pp. 11, Río Piedras, 1912). Indeed, Mr. Van Dine gave first place to this pest in his lists of the insects of sugar-cane (1913-28) and (1913-251), even tho white grubs actually caused more serious and certainly more obvious injuries at that time, before the introduction of the giant toad. Mr. Thos. H. Jones prepared the first extended account (Bulletin No. 12, Experiment Station, Board of Commissioners of Agri-



Shoot of sugar-cane on which is resting (1) an adult female of *Diatraea saccharalis* (F.), which has laid a cluster of eggs (2). The egg-cluster (3) has been eaten by ants, (4) is partly parasitized: black, and partly hatched: white. Under the lens, greatly enlarged, is a fresh egg-cluster of the moth-borer being parasitized by *Trichogramma minutum* Riley (5), and by *Prophanurus alecto* Crawford (6). (Drawn by G. N. Wolcott.)

culture, pp. 1-30, fig. 8. Río Piedras, March 16, 1915), and Dr. John R. Johnston (1915-24) the first record of the larva being attacked by the entomogenous fungus, *Cordyceps barberi*, or *Isaria (Cordyceps) barberi*

Giard, as it was later listed by Mr. J. A. Stevenson (1918-218) and by Miss Vera K. Charles (1941-734). A more intensive study showed the "Influence of Rainfall and Burning the Trash on the Abundance of *Diatraea saccharalis*" (Circular No. 7, Insular Experiment Station, pp. 1-5, map. Río Piedras, 1915) and "The Influence of the Variety of Sugar Cane on its Infestation by *Diatraea saccharalis* Fabr., and the Other Factors Affecting the Abundance of the Moth Borer" (Jour. Dept. Agr. P. R., 6 (1):21-31, fig. 2. San Juan, October 1922), both stressing the importance of the egg-parasite, *Trichogramma minutum* Riley, and the minor role played by the other egg-parasite, *Prophanurus alecto* Crawford. It was found, also, that the lizards *Anolis pulchellus*, *Anolis krugii*, *Anolis stratulus* and *Anolis cristatellus* eat a surprisingly large number of the caterpillars. The effect of "Weather and the Non-burning of Trash in Borer Control in Porto Rico" was presented at the Fourth International Congress of Entomology at Ithaca, New York, August 1928 (2: 62-64, ref. 1), in an attempt to summarize what was known at that time of the ecology of this insect.

Mr. Harold E. Box, an English entomologist coming to Puerto Rico from British Guiana, first intensively studied the larval parasites, as his "Report upon a Trip to Porto Rico April-July 1924" (pp. 22. S. Davison & Co., Ltd., Berbice, B. G., November 1924), later expanded to "Observations on *Lixophaga diatraeae* Townsend, a Tachinid Parasite of *Diatraea saccharalis* Fabr., in Porto Rico" (Bull. Ent. Research, 19 (1): 1-6, ref. 11, fig. 1. London, August 1928), and "The Introduction of Braconid Parasites of *Diatraea saccharalis* Fabr., into Certain of the West Indian Islands" (Bull. Ent. Research, 18 (4): 365-370, fig. 2, pl. 1. London, May 1928), shows. He discussed the systematic position of the local economic species in "The Crambine Genera *Diatraea* and *Xanthopherene* (Lep., Pyral.)" (Bull. Ent. Research, 22 (1): 1-50, fig. 5, pl. 5. London, March 1931), and in "The Food Plants of the American *Diatraea* Species" (pp. 11, Port-of-Spain, Trinidad, 1935) listed *Hymenachne amplexicaulis*, *Oryza sativa*, *Panicum barbinode*, *Panicum maximum*, *Pennisetum purpureum*, *Saccharum officinarum* and *Zea mays*. Altho no longer directly connected with Puerto Rico, Mr. Box has continued his investigations on the borer in some of the Lesser Antilles, and most recently in Venezuela.

The book by Mr. F. S. Earle, "Sugar Cane and its Culture" (pp. 355, fig. 24. John Wiley & Sons, New York, 1928) contains a chapter (pp. 162-188, ref. 22) on the "Insect and other Pests of Sugar Cane" giving a practical account of the borer, with recommendations for control that can be adopted by field men. Mr. D. W. May, Director of the Mayagüez Station, in his directions for "Germinating Sugar-Cane" (Agr. Notes No. 38, pp. 2. San Juan, April 1927), notes that soaking in lime water for one day, water alone, or with lime and magnesium, stimulated germination and killed the borer caterpillars. At the Fourth Congress of the International

Society of Sugar Cane Technologists, held at San Juan, March 1 to 16, 1932, some of the field men anticipated that the presence of so many entomologists would result in definite, specific and practical methods of control being formulated. No entomologist was that sanguine, and the discussion of the comparative merits of egg-parasites vs. larval parasites was inconclusive. Dr. M. D. Leonard and Mr. Francisco Seín presented their "Observations on Some Factors which may Affect the Abundance of *Diatraea saccharalis*" (Bull. No. 92, pp. 2), while the paper "On Methods of Determining Borer Abundance in Cane Fields" (Bull. No. 88, pp. 2) was ignored. Eventually, however, "The Introduction of Parasites of the Sugar-Cane Borer into Puerto Rico" (Jour. Agr. Univ. P. R., 21 (2): 237-241. Rio Piedras, July 1937) became the major activity of Mr. S. M. Dohanian in Demerara and Perú. Later reports from the Mayagüez Station (1938-96) indicated that none of the parasites he collected became established, while a native parasite of the larva, *Lixophaga diatraeae* TT reached a high of 31.9% at Hormigueros, and *Bassus stigmaterus* Cresson a high of 4.8% at the same locality in 1936. Dr. K. A. Bartlett renewed the attempts at introducing the "Amazon Fly" (*Metagonistylum minense* TT) into Puerto Rico, making collections from regions in southern Brasil with climatic conditions more nearly similar to those the flies would find here, as is told by him in the "Biological Control of the Sugar-Cane Moth Borer in Puerto Rico" (P. R. Sugar Manual, pp. 7-9. New Orleans, 1938) and "The Collection of Parasites of the Sugar-Cane Borer, *Diatraea saccharalis*, in São Paulo, Brazil" (Sixth Pacific Science Congress, July 1939).

"The Extent to which the Practice of Not Burning Cane Trash has been adopted in Puerto Rico" (Jour. Dept. Agr. P. R., 17 (3): 197-8. San Juan, July 1933) was 84.7% of all fields observed in a trip around the Island made April 3 to 5, 1933. The trend towards decreased infestation due to the non-burning of trash is balanced in recent years by increased infestation due to planting of superior varieties with low fiber content, making them more susceptible to attack. The importance of having exact data on the extent of "Natural Parasitism by *Trichogramma minutum* of the Eggs of the Sugar-Cane Moth Borer, *Diatraea saccharalis*, in the Cane Fields of Puerto Rico" (Jour. Agr. Univ., P. R., 27 (2): 39-83, fig. 1, pl. 6, ref. 14. Río Piedras, June 1944) was fundamental in undertaking experiments in "Control of the Sugar-Cane Borer in Puerto Rico by Laboratory-Reared Parasites" (Jour. Ec. Ent., 36 (3): 460-464. Menasha, June 1943). This was a five year project, taking practically all of the time of Dr. Luis F. Martorell for his part of the field work during that period. As summarized in "Criteria for *Trichogramma*" (Tropical Agriculture, 20 (11): 221-2, ref. 3. St. Augustine, Trinidad, November 1943), conditions

are optimum in Puerto Rico for maximum parasitism during June, July and August, but beginning in September or October and reaching a peak in mid-winter, some fields of gran cultura cane show a deficiency and often a complete absence of *Trichogramma*: a condition which may be promptly changed by the release of laboratory-reared wasps. It is hardly to be expected that this will be surely and decisively reflected a year later, when the cane is harvested, in an obvious reduction in borer injury to the mature stalks, for the tendency of *Trichogramma* is for dispersion, invading check fields as well as high cane, and making impossible an exact statistical proof of the benefits of releases.

Nevertheless, such releases seem to promise more continuing benefits that ground or airplane dusting or spraying with cryolite and various other insecticides tested on a field scale elsewhere, but merely being considered in Puerto Rico. The most promising method of control, a purely incidental benefit among the engineering considerations, is that which may result from overhead irrigation. If the artificial application of water in this way proves to be the equivalent of rainfall, it may partially solve the problem of borer control in areas where it is economically and mechanically possible. To give some indication of the possible value of the newer insecticides, a dozen of them have been applied by overhead irrigation at two week intervals, September–November 1950, in circular areas of two and a half acres at Hda. Santi, Central Cortada.

*Diatraea saccharalis* is not only a major pest of sugar-cane, but, as shown by Dr. Richard T. Cotton (1918-290), the caterpillars may cause considerable damage to corn. It is not severe, however, because corn is harvested within a few months, and also the caterpillars are more subject to attack by parasites. Elephant grass and other large forage grasses are also sometimes infested, but the most obvious injury is to rice. The stems of rice are so small that the fully-grown caterpillar finds them a tight fit even when it has hollowed them out completely, and just as the crop is approaching maturity many of the weakened stems may droop or fall over, effectually preventing the harvesting of the crop. This is of little importance when rice is merely an experimental crop, but might prevent it from being widely grown commercially in Puerto Rico.

#### Subfamily Schoenobiinae

*Rupela longicornis* was described as a *Scirpophaga* by Herr Heinrich B. Möschler (1890-321) from a pair collected in Puerto Rico by Dr. Gundlach, and listed by him. These are large, silvery white moths, with conspicuous tufts of radiating scales on collar and patagia of male; "abdomen long, in female expanding at extremity and with very large anal tuft" of golden scales, of which Mr. E. G. Smyth collected eighty-seven at light at Hda.

Santa Rita, Guánica: seven in July and eighty in October of 1913. In August 1939, Dr. Luis F. Martorell found them on Mona Island, and they have been intercepted at light at Mayagüez and Bayamón. Dr. Schaus (1940-403) records collections at Arecibo, Dorado, Cataño and Río Piedras. The Cornell University collection has specimens from Desengaño (Cartagena Lagoon) and Toa Baja. Both Dr. Gundlach and Herr Möschler also give the name *Scirpophaga leucatea* Zeller, and Dr. Harrison G. Dyar's determination of the Guánica specimens was *Rupela albinella* Cramer, entered in Van Zwaluwenburg's list as P. R. 1410.

#### Subfamily Epipaschiinae

*Pococera atramentalis* (Lederer) is listed from Puerto Rico by Herr Möschler and Dr. Gundlach under the name *Phidotricha erigens* Ragonot. It is 1226 on mango and 1626 on *Clerodendron squamatum* in Van Zwaluwenburg's list, and has repeatedly been intercepted at light at Bayamón. Mr. A. S. Mills reared it from the buds of "flamboyán" (*Delonix regia*) and from "almendro" (*Terminalia catappa*). Dr. Schaus (1940-403) records collections from San Germán, Cataño and El Yunque, and from Vieques Island.

*Pococera insularella* (Ragonot) was listed by Dr. Gundlach and Herr Möschler as a *Tetralopha* from Puerto Rico: a single female collected by the former. Dr. Schaus (1940-404) records collection at San Germán, the larvae from others of the West Indies and in Central America observed feeding on "bulbs of Henequen and Sisal."

*Tetralopha scabridella* Ragonot was listed from Puerto Rico by Herr Möschler and Dr. Gundlach. In "Insectae Portoricensis" (1923-195) the habits are recorded of the "brown larvae, with lighter-colored medio-dorsal stripe bordered with black, (which) web together several terminal leaves of *Inga vera*, making "nidos de mariposa," at Lares, as determined by Dr. Wm. Schaus, at Cayey, and generally common on host thruout the coffee districts." Dr. Schaus (1940-404) records collection at Villa Margarita, by Prof. Forbes, and Dr. Luis F. Martorell's observation on El Yunque refers to occurrence on the coffee shade trees remaining at Hda. Santa Catalina, where the old road ended and the trail began.

*Jocara majuscula* (Herrich-Schäffer) was re-described by Herr Heinrich B. Möschler (1890-279) under the name *Deuterollyta infectalis*, and it is thus listed by Dr. Gundlach who collected the type material in Puerto Rico. Dr. Schaus (1930-404) records collection at Adjuntas.

*Jocara ragonoti* was described by Herr Heinrich B. Möschler (1890-280) as a *Deuterollyta* from a pair collected by Dr. Gundlach in Puerto Rico, and listed by him. Dr. Schaus (1940-405) reports "no specimens," but this should be the common leaf-webber of "mangle de botón" (*Conocarpus*



*erecta*), repeatedly observed on this host at many points along the coast around the Island, and also noted on Mona Island, identified by Mr. Carl Heinrich as "sp., not in the Museum collection." It is a common, but hardly a serious pest.

*Stericta alnotha* was described by Dr. Wm. Schaus (Proc. Ent. Soc., Washington, 24(9): 239. Washington, D. C., December 1922), the type from Puerto Rico.

#### Subfamily Phycitinae

As the subfamily Phycitinae was omitted from treatment by Dr. Schaus in his "Moths of the Families Geometridae and Pyralididae" (Scientific Survey of Porto Rico and the Virgin Islands, 12 (3): 291-417, see page 329), no systematic arrangement was available for the species present in Puerto Rico, some of which are of considerable economic importance. Of these, the "Mahogany Moth" of the foresters of Trinidad, or the "cedro shoot-borer" as it might more properly be called, *Hypsipyla grandella* (Zeller), is largely responsible for the failure of Spanish cedar or "cedro" (*Cedrela odorata* or *Cedrela mexicana*) in Puerto Rico. The mass attack of its specific leafhopper, causing defoliation long before the leaves would normally fall, might be survived, but the caterpillar of *Hypsipyla* attacks the main shoot of young seedlings in the nurseries, or shortly after they have been transplanted to their permanent location, burrowing into it and causing it to wither and eventually to die. The volunteer new shoots sent out are in turn attacked so that the resulting tree is so gnarled and crooked as to be of little or no economic value, even if it does succeed in attaining marketable maturity. And, as noted by Mr. José Marrero in "Forest Planting in the Caribbean National Forest" (Caribbean Forester, 9 (2): 85-213, fig. 7, ref. 14. Río Piedras, April 1948), "its attacks became more evident in unthrifty stands," so that "large-scale plantings of cedar have been discontinued pending results of investigations." The first record for Puerto Rico is of determination of adults by Mr. Carl Heinrich for Dr. M. D. Leonard (1932-128), whose attention was called by Mr. Wm. R. Barbour to the abundance of the caterpillars "having done considerable damage to about 4,000 young trees at Jayuya and to about 1,000 young trees recently planted at Adjuntas in June 1931; a number of young trees were moderately infested at Lares," but unfortunately he gives an incorrect scientific name for the host and misspells the name of the moth. The adult looks somewhat like a Noctuid, with its dull brown color extending even to the costal margin of the hind wings. The caterpillars are parasitized by an Ichneumonid wasp, identified by Mr. R. A. Cushman as a species of *Calliephialtes*, but these have been reared but once, by Dr. Luis F. Martorell at Cayey in May 1940. That the insect was not known previously may

indicate that it is not endemic, but was accidentally introduced in planting material, or, as it attacks only young shoots on which individual eggs are laid, that although present in small numbers previously, it had no opportunity to become noticeable on the few old native cedros remaining in Puerto Rico.

*Hypsipyla muriscus* Dyar, as re-determined by Mr. Carl Heinrich, was reared from larvae intercepted at Mayagüez completely destroying the seed of "mamey" (*Mammea americana*).

*Acrobasis crassisquamella* Hampson, as identified by Mr. Carl Heinrich, has been repeatedly intercepted at light at Bayamón. Dr. J. A. Bonnet found the leaves of an ornamental tree (*Acassia nodosa*) with pink flowers being eaten by these caterpillars at Río Piedras in February 1944. The moths are small and inconspicuous, grey-brown in color.

*Homalopalia damera* Dyar, as identified by Mr. Carl Heinrich, has been repeatedly intercepted at light at Bayamón.

*Myelois ceratoniae* Zeller, as identified by Mr. Hahn W. Capps, was intercepted as larvae in the pods of tamarind (*Tamarindus indica*) at San Juan and at Arecibo.

*Myelois decolor* Zeller, as identified by Mr. Carl Heinrich was intercepted as larvae in pods of "algarrobo" (*Hymenaea courbaril*) at Arecibo.

*Myelois furvidorsella* Ragonot was re-described by Herr Heinrich B. Möschler (1890-326) from two females which Dr. Gundlach had collected in Puerto Rico, and listed (1891-370), without indication of the host of the larva.

*Ephestia cautella* (Walker), as identified by Mr. Carl Heinrich, was intercepted as larvae at Bayamón feeding on fruits of "icaco" (*Chrysobalanus icaco*), and at Dorado feeding on fruits of "almendra" (*Terminalia catappa*). Mr. L. Courtney Fife (1939-6) found it attacking injured cotton seed.

*Crocidomera fissuralis* (Walker), originally described from Santo Domingo, is re-described by Herr Heinrich B. Möschler (1890-327) from a single male which Dr. Gundlach collected in Puerto Rico.

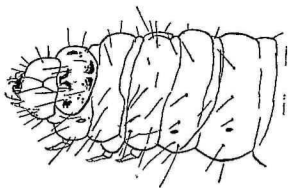
*Crocidomera turbidella* Zeller is listed from Puerto Rico by Herr Möschler and Dr. Gundlach, and was subsequently identified from unlabeled specimens by Dr. Schaus.

*Plodia interpunctella* (Hübner), the Indian meal moth, has been found only once in Puerto Rico: by Mr. J. D. More at Río Piedras in April 1921, the larvae feeding on dry dates, and present in great abundance. His identification was confirmed by Dr. Richard T. Cotton, who, in his "Insect Pests of stored grain and grain products," on page 28, writes: "It is handsomely marked and can be distinguished from other grain infesting moths by the characteristic markings of its fore wings. These are reddish brown with a coppery luster on the outer two-thirds, but whitish gray on the

inner or body end." It is doubtful if this pest is a permanent resident in Puerto Rico, but new records may be anticipated if brought in with infested food products.

*Cuba furculella* Dyar, as identified by Dr. Wm. Schaus, was collected at light by Dr. W. A. Hoffman at El Semil, Villalba, and had previously been determined by Dr. Schaus from unlabeled specimens from Puerto Rico.

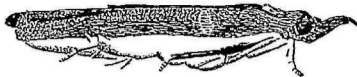
*Etiella zinckenella* (Treitschke), the lima-bean pod borer, was listed from Puerto Rico by Herr Möschler and Dr. Gundlach, the latter having a single female. Dr. M. D. Leonard and Mr. A. S. Mills prepared "A Preliminary Report on the Lima Bean Pod-Borer and other Legume Pod-Borers in Porto Rico" (Jour. Ec. Ent., 24 (2): 466-473). Geneva, April 1931) in which they note the presence of larvae in lima beans, pigeon peas, crotalaria and cowpeas; that cocoons are formed in the ground, the pupal



Forepart of larva of *Etiella zinckenella* (Treitschke), ten times natural size. (Drawn by G. N. Wolcott.)

period being less than two weeks and that the caterpillars are parasitized by *Heterospilus etiellae* Rohwer and an *Eurytoma* near *insularis* Ashmead. Messrs. Richard Faxon and C. P. Trotter (1932-445) record the abundance of these caterpillars in bean pods, and Dr. Leonard (1932-122, 1932-131 and 1933-102 and 122) gives specific locality records in various hosts and on Vieques Island. Indeed, up to 1936, the larvae had been intercepted twenty-seven times in pigeon peas: at Río Piedras, Cataño, Isabela, Aguadilla, Mayagüez, Utuado, San Antonio, Ponce, Peñuelas, Ensenada, Lajas and Arroyo, and repeatedly intercepted in lima bean pods at Bayamón, Isabela and Yauco, and found in pods of *Crotalaria incana* at Isabela and at Mameyes. The first season's continuous observations showed them to be common in lima bean pods at Isabela during the summer, but practically disappearing in the winter when commercial shipments would normally be made to the continental market. Later observations showed little seasonal variation in abundance in the original wild host, *Crotalaria incana* L., and in "Lima Bean Pod-Borer Caterpillars of Puerto Rico on their Wild Hosts" (Jour. Agr. P. R., 18 (3): 429-434, ref. 2. San

Juan, October 1934), they were noted as much more abundant in hairy crotalaria pods of plants growing on sandy beaches than in those growing on heavy clay soil. The eggs are laid between the hairs on the pods, sometimes as many as eight eggs being found on a pod, but one never finds more than one caterpillar inside the pod subsequently. The egg may be, but is not often parasitized by *Trichogramma minutum* Riley. The caterpillar has a yellowish or brownish head, and its body, normally green, may become purplish at maturity. It is readily distinguishable, however, by the thoracic shield, which "is invariably opalescent greenish-yellow, marked with a very definite pattern in black." The fore wings of the adult costally are broadly margined "with silvery white, these margins blending with the white of the legs and abdomen when the moth is at rest. Its large palpi stick out like a beak in front." As noted in the reports of the Mayagüez Station, Mr. H. K. Plank (1937-74) found these caterpillars feeding in the pods of *Tephrosia toxicaria*, with the heaviest infestation (1938-71) during the summer, and (1939-108) parasitized by *Heterospilus etiellae* Rohwer and *Agrophylax* sp. nov. at Isabela. One additional host record is of interception of larvae in pods of *Martiusia laurifolia* at Dorado.



Adult of the Lima Bean Pod Borer, *Etiella zinckenella* (Treitschke), five times natural size. (Drawn by G. N. Wolcott.)

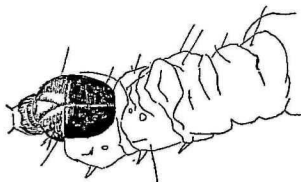
*Fundella pellucens* Zeller, the Caribbean pod borer, was listed by Herr Möschler from Puerto Rico, where Dr. Gundlach had collected a pair. The material collected by Mr. Thos. H. Jones (1915-8) was most unfortunately mis-identified, so that the name *Pachyzancla bipunctalis* F. was used by him in recording the attack of its larvae on garden beans and the pods of sword beans, *Canavalli ensiformis*. Dr. Richard T. Cotton (1918-292 listed it as *Ballovioa cistipennis* Dyar: the stalk and pod borer of cowpeas, originally described from Barbados, and since found in St. Vincent, St. Croix and at Port-au-Prince, Haiti. By Dr. M. D. Leonard and Mr. A. S. Mills (1931-471) and subsequent economic workers it was called *Fundella cistipennis* Dyar, and only recently has its synonymy been shown with what Dr. Gundlach collected here. Mr. Arturo Riollano (1931-113) noted its presence on Vieques Island, and Dr. Leonard (1931-119 and 1932-122, 131 and 135) in cowpeas, pigeon peas, black-eyed peas, lima beans and sword beans from various localities in Puerto Rico. Its real economic importance is as a pest of lima beans during the winter shipping season. Spraying



Injury to pods of Sword Bean, *Canavali ensiformis*, caused by caterpillars of the Caribbean Pod Borer, *Fundella pellucens* Zeller. (Drawn by G. N. Wolcott.)

with Bordeaux, arsenicals, rotenone and pyrethrum is ineffective in preventing oviposition or hatching of the eggs, or in killing the small caterpillars before they burrow into the pods, and indeed seems to cause them to seek safety inside the pods earlier than if they were unsprayed. Even

the fully-grown caterpillar makes no exit-hole until it is ready to leave for pupation in the ground, but sorters soon learn to spot and eliminate the infested pods in packing for shipment. Control is the more difficult because "its original wild hosts are the beach bean, *Canavali maritima*, and "hedionda" (*Ditremexa* or *Cassia occidentalis*)," the latter being a common weed of field margins. The record in "Insectae Borinquenses" (1936-478) of "larvae boring in shoots of Uba cane at Villalba" is a printer's error: it should have been under *Elasmopalpus lignosellus* Zeller, on the same page, while that of larvae boring in stalks and stems of cowpeas (under *Elasmo-*



Forepart of larva of *Fundella pellucens* Zeller, ten times natural size. (Drawn by G. N. Wolcott.)



Adult of the Caribbean Pod Borer, *Fundella pellucens* Zeller, five times natural size. (Drawn by G. N. Wolcott.)

*palpus rubedinellus* Zeller) was the observation of Dr. Richard T. Cotton on *Fundella pellucens*. "The thoracic shield of *Fundella* (larvae) is of the same color as the head, or possibly a little darker, unmarked, or with the markings scarcely visible because of the dark color of the entire shield, or with the markings distinct but vaguely outlined and of a variable pattern. The moth is of a characterless, inconspicuous greyish-brown, with no marked or well-defined pattern on the wings, but with the interesting habit of often keeping the ends of its antennae underneath its folded wings."

Mr. L. B. Scott found that all three of "The Bean Pod Borers in Puerto Rico" (*Jour. Agr. Univ. P. R.*, 24 (2): 35-47, fig. 2, ref. 3. Río Piedras, August 1940) could be controlled with cryolite, and that the small-seeded lima bean, variety Carolina, is highly resistant to their attack.

*Elasmopalpus lignosellus* (Zeller) was listed by Herr Möscher and Dr. Gundlach from Puerto Rico, the latter having collected several specimens there. This is the lesser cornstalk borer of the southern United States, first noted attacking shoots of Uba cane at Villalba during the summer of 1924 by Mr. Francisco Seín, as reported by Dr. H. L. Dozier (1926-117), but since repeatedly found in fields of young ratoons in which the trash had been burned. The tunnels are smaller than those made by *Diatraea* caterpillars, and cleaner, for the *Elasmopalpus* leave no excrement in their tunnels but live outside in a crack or under debris in a silken tunnel rendered more opaque and less obvious by the drying excrement entangled in its strands. Control in fields of sugar-cane is obtained by not burning trash; for the injury has never been found in fields where the trash remained from the previous crop. At the Mayagüez Station (1937-43), these caterpillars were found attacking dry-bean variety tests on Las Mesas; (1938-57) killing 90 per cent of lima bean plants, also peas and cowpeas, and subsequently (1940-49) attacking teosinte. Their most spectacular attack, however; was at Cerro Gordo on a planting, several acres in extent, of seedlings of "guanábana" (*Annona muricata*) during the late summer of 1945. Of the comparatively few seedlings which survived damping-off, changas and other difficulties, the stem was entered an inch or less below the surface of the ground; the caterpillar boring up and down and leaving little more than a shell of the plump stem of the seedling. The seeds of guanábana had been planted in unshaded, naked beds of sandy soil, with no protecting mulch or trash, and presented a most desirable target for attack by these caterpillars. Living as they do outside of their tunnels, they are mostly dark in color, with a very dark spot dorsally on each segment. The adult is a little grey moth, the central and basal portion of the fore wings being a lighter grey; the hind wings very light and semi-transparent.

*Elasmopalpus rubedinellus* (Zeller) was listed from Puerto Rico by Herr Möscher and Dr. Gundlach, the latter having collected three specimens. This is a somewhat reddish-brown little moth, of which Mr. Thos. H. Jones found thousands flying over just-plowed land at Maunabo in June 1912, the adults being determined by Dr. Schaus.

According to Mr. Carl Heinrich, neither *Piesmopoda columnella*, nor *P. rubicundella*, described by Zeller from Colombia, but listed by Herr Möscher and Dr. Gundlach, actually occur in Puerto Rico.

*Piesmopoda rufulella* Ragonot was re-described by Herr Möscher (1890-328) from a pair which Dr. Gundlach had collected and listed from Puerto Rico. It is an insignificant little moth, repeatedly intercepted at light at Bayamón and Comerio, and taken by Dr. W. A. Hoffman at light at El Semil, Villalba in May 1940.

*Oligochroa pellucidella* Ragonot was re-described by Herr Möscher

(1890-329) from two specimens which Dr. Gundlach had collected in Puerto Rico, and listed from there. It has not since been found locally.

*Oncolabis anticella* Zeller was identified by Herr Möschler from a pair which Dr. Gundlach had collected in Puerto Rico.

*Nonja exiguella* Ragonot is re-described as an *Homoeosoma* by Herr Möschler (1890-330) from a pair which Dr. Gundlach had collected in Puerto Rico.

*Homoeosoma maturella* Zeller was listed from Puerto Rico by Herr Möschler: a single male collected by Dr. Gundlach and listed by him.

*Salebria famula* (Zeller) was identified by Herr Möschler from a single female which Dr. Gundlach had collected in Puerto Rico. Mr. Heinrich doubts the correctness of this and the preceding identification.

*Laetilia portoricensis* was described by Dr. Harrison G. Dyar, the type from Puerto Rico (Insector Inscitiae Menstruus, 3: 62. Washington, D. C., 1915) collected by Mr. Thos. H. Jones, the larvae feeding on scale insects on pigeon peas at Mameyes, November 1913. Presumably this is their normal habit, as they have since been intercepted feeding on *Saissetia oleae* on African tulip tree or "tulipán" (*Spathodea campanulata*), but Mr. E. G. Smyth reared two of these "small drab moths," as identified by Dr. Wm. Schaus, from withering stems of "Santa María" (*Eupatorium* or *Osmia odorata*), in the summer of 1916. Adults have been intercepted at light at Bayamón. They are little brownish moths, the costal margin of the fore wing a light grey.

#### Hyblaeidae

*Hyblaea puera* (Cramer) was listed from Puerto Rico by all the early entomologists, Herr Möschler (1890-183) noting "Raupe auf Crescentia, Tecoma pentaphylla," and in Van Zwaluwenburg's list it is P. R. 124. This is an East Indian and Oriental insect, a serious pest of teak (*Tectona grandis*) there and also attacking *Bignonia* and *Millingtonia*, yet in Puerto Rico it has been observed on none of these hosts. Locally it has been noted repeatedly with the larvae feeding on the leaves of "roble" (*Tabebuia pallida* or *Tecoma pentaphylla*), and on the leaves of the African tulip tree or "tulipán" (*Spathodea campanulata*). Dr. Luis F. Martorell (1939-25) records an extensive outbreak in nurseries at Cayey of "capá blanco" (*Petitia domingensis*) so serious that it was controlled only by spraying with arsenate of lead. The caterpillars feed only at night, during the daytime remaining hidden in the shelter of a folded-over leaf, or, as they become larger, of several leaves held together. Pupation may occur in this shelter, or in leaves on the ground, or in the soil. The adult is a stout-bodied moth showing considerable variation in its markings. The fore wings may be entirely velvety brown, or barred, or with a distinct pattern



of light grey or darker brown; the hind wings with three orange-red or yellow spots on brown, and margined with the orange-red or yellow; the same color being repeated in a narrow transverse band on each abdominal segment.

### Thyrididae

*Rhodoneura myrsusalis* (Walker) was listed from Puerto Rico by Herr Möschler as *Striglina scallula* Guenée, of which he describes a variety *immaculata* (1890-123) "lacking the transparent patch on the fore wing," and both of these were listed by Dr. Gundlach. Prof. Forbes (1930-74) notes this moth as being "general in tropics of both hemispheres," but no recent collection has been made locally, except for a very small specimen from Lares, taken by Mr. Francisco Sefín.

### Pterophoridae

*Pterophorus basalis* was described as an *Oedematophorus* by Herr Heinrich B. Möschler (1890-345) and listed by Dr. Gundlach: a single specimen in the Berlin Museum. Prof. Forbes (1931-345) doubtfully identified from Lares "a very poor specimen, but much too large for any other species known to the region."

*Pterophorus inquinatus* (Zeller), a "mottled gray (moth), with an oblique series of darker shades across middle of (fore) wing; larva on *Ambrosia*"; is listed by Prof. Forbes (1931-345) from Coamo.

*Pterophorus paleaceus* (Zeller) is listed from Puerto Rico by Herr Möschler and Dr. Gundlach: a single specimen in the Berlin Museum. It has not since been found locally, but Prof. Forbes (1930-77) records from material from the eastern United States "larva varying from greenish white to dull salmon, the shorter hairs sticky, on *Vernonia*."

From leaves of sweet potato, Mr. E. G. Smyth during the summer of 1916 at Río Piedras reared some small brownish moths which Mr. Aug. Busck determined as a species of *Pterophorus*.

*Adaina bipunctata* was described as *Pterophorus* by Herr Heinrich B. Möschler (1890-346) as "sehr klein," from a single specimen collected in Puerto Rico by Dr. Gundlach and listed by him. Mr. A. S. Mills intercepted larvae on "salvia" (*Pluchea purpurascens*) and adults have been intercepted at light at Bayamón, and collected by Dr. W. A. Hoffman at El Semil, Villalba, at Dorado and in Santurce. Prof. Forbes (1931-345) records additional collections from El Yunque, Aguirre and Coamo, and from Vieques Island.

*Adaina praeusta* was described as a *Pterophorus* by Herr Heinrich B. Möschler (1890-346) from a single specimen collected in Puerto Rico by Dr. Gundlach, and listed by him. It has been intercepted at light at San

Juan and Bayamón. Prof. Forbes (1930-75) is of the opinion that it "may be a form of the preceding, rubbed specimens of which tend to lose the costo-apical spot."

*Adaina participata* was described as a *Pterophorus* by Herr Heinrich B. Möschler (1890-346) from a single specimen collected in Puerto Rico by Dr. Gundlach, and listed by him. Prof. Forbes (1931-345) records more recent collections at Lares, Coamo and from Vieques Island.

*Marasmarcha pumilio* (Zeller), a "light brown (moth) with two or three black spots; 15 mm.," has been collected at Naranjito, according to Prof. Forbes (1930-78). He also collected it on Vieques Island, and has specimens from Cataño, Coamo and San Germán.

*Trichoptilus defectalis* (Walker), as identified by Prof. Forbes (1930-78), has been collected at Coamo, Guayanilla, and Ensenada, and Prof. J. A. Ramos (1947-51) found it on Mona Island. The moth is "light ochreous brown, with faint paler transverse bars; tufts of black scales and some white ones in the fringes; hind wings dark brown, a single larger tuft in the third feather; 14 mm. Larva with large clubbed primary hair and a few secondaries; yellow, with reddish stripes; on *Boerhaavea* and *Amaranthus*."

Subsequent collections have been made on Vieques Island, and at Palmas Abajo, Aguirre and Coamo.

*Sphenarches caffer* (Zeller), the Lab-Lab Plume moth, was first reported from Puerto Rico by Prof. Forbes (1930-79), identifying adults intercepted as larvae by Messrs. C. P. Trotter and Herschell Fox on pigeon peas at San Juan, and others previously identified by Mr. Aug. Busck as a species of *Oxyptilus* for Mr. Thos. H. Jones, who had reared them from larvae and pupae on *Caperonia regalis* at Río Piedras in August 1912. From one pupa Mr. Jones thought a parasite had emerged, and another showed indication of attack by a fungus, which was not identified. Prof. Forbes describes this plume moth as being "light ochre, first feather of fore wing dark with pale bars. Fringes with numerous scattered black spatulate scales, which are most numerous in the dorsal fringes, where they tend to gather into tufts. Larva with both clubbed and long simple hairs; pupa spinose, exposed."

*Platyptilia crenulata* Barnes & McDunnough, originally described from the southern United States, was identified by Prof. Forbes (1931-346) from Puerto Rico: a rubbed specimen from Coamo, "reddish brown, with white subterminal line across both lobes of fore wing, a triangular blackish shade before subterminal line in the first lobe, and another before the notch."

*Platyptilia pusillidactyla* (Walker) was reared by Mr. E. G. Smyth during the summer of 1916 at Río Piedras on "sacatrapos" (*Caperonia palustris*), the adults being determined by Mr. Aug. Busck. They are described by Prof. Forbes (1930-80) as being "smoky with a pale and dark

band across each feather of the fore wing near its apex. Caterpillar pale yellow, without obvious structures or markings," and (1931-346) collected at Coamo.

*Ochyrotica fasciata* Walsingham, as identified by Mr. Aug. Busck, has been intercepted on guava leaf at Barceloneta.

### Orneodidae

*Orneodes eudactyla* (Felder) was listed as an *Alucita* from Puerto Rico by Herr Möscher and Dr. Gundlach, and Prof. Forbes (1930-80) records his collection of this species at Coamo.

### Tortricidae

*Apinoglossa comburana* was described by Herr Heinrich B. Möscher (1890-331) from a pair collected in Puerto Rico by Dr. Gundlach and listed by him. It has not since been found anywhere. Prof. Forbes (1930-83) condenses Möscher's description to "fore wing with costal fold in male. Tawny, shaded with yellow-brown, especially on inner margin and before outer margin. Hind wing with inner half shaded with gray. 12 mm."

*Paratorna rotundipennis* (Walsingham), as determined by Prof. Wm. T. M. Forbes, was reared from numerous larvae, tying together the leaves and almost defoliating a small tree of Hawaiian algarroba or "bayahonda" (*Prosopis juliflora*) at Boquerón during the autumn of 1923. He describes (1930-83) the adults as being "tawny reddish, with waterlines and faint darker shades."

*Coelostathma paralelana* Walsingham is identified by Prof. Forbes (1931-346) from Lares and El Yunque, and (1930-84) Naguabo, described as "cream-colored, with two transverse fawn bands. 12 mm." It has also been intercepted at Bayamón and San Juan.

*Drachmobola insignitana* was described as a *Tortrix* by Herr Heinrich B. Möscher (1890-330) from a single female collected in Puerto Rico by Dr. Gundlach, and listed by him. Prof. Forbes (1930-84) summarized Möscher's description of the adult as being "pale yellow with darker strigulations on fore wing, and black discal dot. 10 mm.," and notes collections at Aibonito, but (1931-346) with additional material from El Yunque, and what Dr. W. A. Hoffman found at Jájome Alto, notes that "females are considerably darker than implied by Möscher's description, but fit well enough. The male is strikingly different," and gives an extended description.

*Sparganothis effoetana* was described as a *Tortrix* by Herr Heinrich B. Möscher (1890-330), from single female collected in Puerto Rico by Dr. Gundlach and listed by him. It has not since been collected anywhere.

Prof. Forbes (1930-85) re-describes the adult as having "fore wing powdery rusty brown; terminal line of hind wing also tawny. 18 mm."

*Sparganothis flavedana* (Clemens), originally described as a *Platynota*, has "palpi long and beak-like, fore wing heavily tufted. Red-brown, the basal three-fourths of the fore wing darker brown, and typically contrasting in male," according to Prof. Forbes (1930-85). He continues "female much larger than male; 10-20 mm," and records collection from Coamo. On the accession card (880-16) recording the rearing of the adult by Mr. E. G. Smyth during the summer of 1916 from a larva on "jobo" (*Spondias mombin*), Prof. Forbes wrote *Sparganothis* (group *Platynota*). Mr. Smyth considered this identical with another moth which he had reared at the same time from the hairy form of *Malachra rotundifolia*, which he had identified as a species of *Archips*. Prof. Forbes (1930-83) records these as "perhaps *A. jamaicensis* Walker"—a record which cannot stand if his determination of Smyth's material is correct. He notes that the larva of *Sparganothis flavedana* is a general feeder, and Dr. Luis F. Martorell has had adults reared from greenish larvae on "cedro" (*Cedrela odorata*) in April 1941 thus identified. Mr. J. F. Gates Clarke determined as a species of *Platynota* some that Dr. Martorell in June 1940 had reared from larvae feeding on the leaves of "guayacán" (*Guaiacum officinale*) at Salinas. This is the determination of adults reared from larvae intercepted on icaco fruits, from rose, and from "molinillo" at Pueblo Viejo. At the Mayagüez Station (1939-120) it is recorded as a minor pest of vanilla. These records may, or may not, all refer to the same insect.

Mr. Robert Lambert, a graduate student at Cornell University specializing in this group, finds only two specimens from Puerto Rico: one each from Coamo and Lares, and these he considers to be *rostrana*.

*Sparganothis saturatana* (Walker) is listed by Prof. Forbes (1931-347) from Coamo, having the "fore wing fawn, with brown reticulation and transverse lines toward outer margin. Hind wing orange. 18 mm. This species differs from *S. effoetana* by the orange hind wing, from *S. flavedana* by the smooth fore wing and much larger size."

#### Olethreutidae

*Olethreutes albimaculana* (Walsingham) has been identified by Mr. Aug. Busck from material intercepted at light at Bayamón.

*Olethreutes anthracana* was described by Prof. Wm. T. M. Forbes (1931-347) from a single male from El Yunque which has "head and thorax blackish; fore wing coal black outwardly; a contrasting yellow discal dot," as illustrated in his painting (fig. 2).

*Olethreutes canofascia* was described by Prof. Wm. T. M. Forbes (1930-86) from a great abundance of material reared by Mr. Thos. H. Jones in

October 1913 and by Mr. E. G. Smyth in July 1916 from "light olive green larvae, the contents of alimentary canal darker, head light brown" webbing together the leaflets of *Phyllanthus lathyroides* at Río Piedras. It has been intercepted at Bayamón and collected at Manatí, but not found elsewhere in Puerto Rico. It is a little brown moth, 12-14 mm. in wing expanse, with a complicated pattern on the forewing in three lighter irregular oval areas.

*Olethreutes hebesana* (Walker) is a continental North American species, of which the larva is "a stem borer in various herbs. (The adult is) mottled dull brown, the middle of the costa darker," reported by Prof. Forbes (1930-88) from Coamo and collected by him on Vieques Island. Another species of this genus, as identified by Mr. Carl Heinrich, has been reared from larvae intercepted on *Psidium guajava* at Corozal.

The adult reared from larvae intercepted on fruit of "almendra" (*Terminalia catappa*) at Arecibo has been identified by Mr. Carl Heinrich as a species of *Laspeyresia*.

*Bactra verutana* Zeller is a clay-colored moth "with some fuscous striation, especially on veins and barring toward the margins; with blackish shade-spots, often obsolete, toward base and end of cell," which Prof. Forbes (1931-350) identifies from five Puerto Rican localities and from Vieques Island.

*Episimus argutanus* (Clemens) is a continental and West Indian species which Prof. Forbes (1931-350) collected on Vieques Island. It is "brown, mottled, with purple iridescence when fresh; a few submarginal black dots towards costa; larva a rather general feeder."

Mr. Aug. Buseck identified as a species of *Episimus*, possibly his *guiana*, a moth intercepted on squash at Bayamón.

*Gymnandrosoma desotatum* Heinrich, originally described from adults reared from larvae in red mangrove seed (*Rhizophora mangle*) found in the Florida Everglades, is identified by Prof. Forbes (1931-349) from his collection of adults on Vieques Island.

*Gymnandrosoma trachycerus* was described and illustrated in fig. 1 of his colored plate by Prof. Wm. T. M. Forbes (1931-349) from a holotype male, a fuscous and blackish moth from El Yunque, with a wing expanse of 15 mm.

*Ethelgodia texanana* (Walsingham), as determined by Mr. Carl Heinrich, is a little gray moth, reared from "jumping beans," the infested seeds of "yaiti" (*Gymnanthes lucida*) collected at the Garrochales Forest Station at Arecibo, September 1944. It was "described from Texas, but is undoubtedly of tropical origin, this being the first Puerto Rican record," according to Mr. Heinrich. Mr. Muesebeck writes that "Dr. Bottimer reared this insect in 1929 from seed pods of *Stillingia sylvatica* at Lake Alfred, Florida."

An inconspicuous little brown moth, with no obvious markings, of which the larva webs together and feeds on the tender leaves of "María" (*Calophyllum antillanum*) found in the spring of 1940 near Laguna Tortuguero, as reported by Dr. Luis F. Martorell (1948-114) who reared the material, was determined by Prof. Wm. T. M. Forbes as a new species of *Episimus*.

*Anchyloptera virididorsana* was described as a *Phoxopteryx* by Herr Heinrich B. Möschler (1890-334) from two specimens collected in Puerto Rico by Dr. Gundlach, and listed by him. Prof. Forbes (1930-89) collected it at San Germán and on Vieques Island. It is an orange-ochre moth, "shaded with green, a triangular green patch on inner margin of fore wing; hind wing gray with three metallic strigules near margin; 8-10 mm."

*Thiodia autochthonos* Walsingham was collected by Prof. Forbes (1931-350) at San Germán, and he records collection by Dr. M. D. Leonard and Mr. A. S. Mills at Cataño and Aguirre. It is "mouse grey, strigulated; the most conspicuous mark being an ochreous patch near anal angle, containing two black dots, preceded by lead gray and followed by a whitish spot, a continuous black basal line in fringe; 8 mm."

*Eucosma longipalpana* was described as a *Grapholitha* by Herr Heinrich B. Möschler (1890-333) from a single male collected in Puerto Rico by Dr. Gundlach, and listed by him. It is a pale yellow moth, not since found anywhere.

*Eucosma strenuana* (Walker), originally described as a *Grapholitha* from Santo Domingo, Prof. Forbes (1930-90) collected at Coamo and Isabela in Puerto Rico and on Vieques Island. It is a smoky moth, "more or less dusted with white," of which the "larva (is) a stem-borer in *Ambrosia*."

*Crociosema plebeiana* Zeller is a common, tropicosmopolitan, mottled brown moth, collected on Culebra Island by Mr. Aug. Busck in 1899, and by Prof. Forbes (1931-350) on Vieques, and taken at light at many localities in Puerto Rico. It has been reared from larvae intercepted in seed-heads of *Sida cordifolia* at Vega Alta, by Mr. A. S. Mills.

*Strepsicrates smithianus* Walsingham, as identified by Mr. Aug. Busck, was reared by Mr. E. G. Smyth at Río Piedras during the summer of 1916 from guava (*Psidium guajava*), together with some Braconid parasites which were not identified. Prof. Forbes (1930-91) records collection at Naguabo and on El Yunque, describing the adult as "dark brown, inner margin light gray, outer part of costa mottled with light gray; hind wing translucent blue-gray, with smoky border and veins."

*Heligmocera calvifrons* Walsingham was collected by Prof. Forbes (1930-92) on El Yunque. The "base and disc (of the fore wing is) largely dull rose, outer part and inner margin olive green, shaded and mottled with blackish; 14 mm."

*Balbis excitana* was described as a *Grapholitha* by Herr Heinrich B. Möschler (1890-333) from a single female collected in Puerto Rico by Dr. Gundlach, and listed by him. Don Julio García-Díaz (1938-96) lists it, identified with some doubt by Prof. Forbes, as having been collected by him in some aquatic environment, possibly on El Yunque.

*Epinotia unica* Heinrich is listed by Prof. Forbes (1931-351) as having been collected by him at Isabela, a single undersized male.

#### Phaloniidae

*Saphenista bunteoides* was described and illustrated (fig. 3 of his colored plate) by Prof. Wm. T. M. Forbes (1931-353) from material from Coamo, having the head, thorax and basal portion of fore wing cream-colored. It has since been found by Dr. W. A. Hoffman at Utuado.

*Saphenista lepidulana* was described and illustrated (fig. 4 of his colored plate) by Prof. Wm. T. M. Forbes (1931-354) from specimens he had collected at Coamo, El Yunque and from Vieques Island, the "ground of the fore wing darker ochreous and more even."

*Saphenista multistrigata* Walsingham-Durrant is identified by Prof. Forbes (1931-354) from specimens collected by him at Coamo and on El Yunque, and by Dr. W. A. Hoffman at Jájome Alto.

*Saphenista semistrigata* was described and illustrated (fig. 5 of his colored plate) by Prof. Wm. T. M. Forbes (1931-355) from material he collected on El Yunque and from Coamo, the fore wing having "a defined olive streak." This has been reared by Mr. A. S. Mills from larvae intercepted on *Pluchea purpurascens* at Pt. Cangrejos. Other species of this genus have been collected at light on El Yunque, or intercepted at light at Bayamón.

*Phalonia distigmatana* Walsingham, originally described from St. Vincent and Grenada, was collected on January 1899 by Mr. Aug. Busck at Bayamón, and has since been taken at Isabela by Prof. Forbes (1931-355). It is a cream-colored moth with fawn-brown markings, a wing expanse of 9 mm.

*Phalonia prolectana* was described as a *Cochylis* by Herr Heinrich B. Möschler (1890-332) from a single female collected in Puerto Rico by Dr. Gundlach, and listed by him. It has not since been found anywhere.

*Phalonia subolivacea* Walsingham was collected at Bayamón in January 1899 by Mr. Aug. Busck. It is presumed that it was this "tiny brown and white moth" which Mr. E. G. Smyth during the summer of 1916 at Río Piedras reared from flower heads of *Erechtites hieracifolia*, and it was definitely identified as this species which Mr. A. S. Mills intercepted at Dorado and Guayama in flower heads of "margarita" (*Bidens pilosa*). Prof. Forbes (1930-95 and 1931-355) records collection from seven Puerto

Rican localities and from Vieques Island of this moth "creamy white with olivaceous markings."

*Phalonia tectonicana* was described as a *Cochylis* by Herr Heinrich B. Möschler from a single specimen collected in Puerto Rico by Dr. Gundlach and listed by him. It has not since been found anywhere.

*Phalonia vincinitana* was described as a *Cochylis* by Herr Heinrich B. Möschler (1890-333) from a single male collected in Puerto Rico by Dr. Gundlach, and listed by him. This pale yellow moth marked by with brown has not since been found anywhere. The little moths reared from larvae boring in the buds of dahlias at Río Piedras in the summer of 1922, causing them to wither, were identified by Mr. Aug. Busck as a species of *Commophila*.

### Cossidae

*Psychonoctua personalis* Grote was described by Dr. C. W. Hooker (1913-35) as "a lepidopterous borer, determined by Dr. H. G. Dyar as *Psychonoctua* sp., which was reported as the 'coffee stem-borer' by Mr. W. V. Tower (1908-27) as boring in orange, citron, rose-apple and sweet-al-



Larva of *Psychonoctua personalis* Grote in its tunnel in the coffee trunk. Natural size. (Drawn by F. Sefn.)

mond, has done considerable damage, where the trunks and larger branches of the coffee plants are riddled with canals." In his summary of the "Insects Affecting Coffee in Porto Rico" (Jour. Ec. Ent., 10 (6); 513-517. Concord, December 1917), Mr. R. H. Van Zwaluwenburg noted that it is "most often found in old coffee at altitudes up to 1,500 feet," and recommends pruning and burning invaded wood for control, giving Dr. Dyar's determination of *Psychonoctua jamaicensis* Schaus. It was subsequently identified by Dr. Wm. Schaus as *Xyleutes muricolor* Dyar MS, but male genitalia studies unite *P. personalis* Grote, *P. jamaicensis* Schaus and the Porto Rican race under the name of the Cuban species. Altho individuals may occur in the higher coffee groves, as at Indiera, Lares and Villalba, serious injury has been noted only at lower elevations, as at Vega Baja, Quebradillas and Aguadilla, and the most severe attack was on coffee growing in an experimental plot on the grounds of the Mayagüez Experiment Station under *Gliricidia* shade. Mr. T. B. McClelland had planted this on level land, intending to run fertilizer experiments without the complica-



tions due to uneven contour of commercial groves, but the damage by these borers was so excessive that the experiment had to be abandoned. Apparently the moths normally and by preference occur close to sea-level, and attain a much greater size in shoots of "mangle" (*Laguncularia racemosa*), as around Laguna San José in 1938, than they do in coffee. They have also been found attacking croton bushes at Río Piedras, and Prof. J. A. Ramos (47-51) found them in seagrape (*Coccoloba uvifera*) on Mona Island. In coffee trees, infestation may cause warty growths somewhat similar to that produced by heavy infestations of the "hormiguilla," but in mangrove, no indication of infestation appeared until the exit tunnel was formed. The pupal skin of the insect is left in the tunnel when the moth emerges. It is "gray with inconspicuous light brown markings," of great variation in size, some individuals having a wing expanse of two and a quarter inches, others not measuring even an inch from tip to tip.

#### Hyponomeutidae

*Urodus sordidata* was described as a *Trichostibas* by Herr P. C. Zeller (Horae Societatis Entomologica Rossicae, xiii, p. 233. 1877), the type from Puerto Rico, and apparently it has not since been found anywhere.

*Hyponomeuta triangularis* was described by Herr Heinrich B. Möschler (1890-339) from two males collected in Puerto Rico by Dr. Gundlach, and listed by him. Prof. Forbes (1930-99) calls this *Yponomeuta* one of the "Small Ermine Moths," and it is indeed silvery white, "Vorderflügel weissgrau mit 21 schwarzen Punkten" according to the count by Herr Möschler, altho some individuals have 27 or more black spots on the fore wing, if one counts the smallest ones. The larvae have been found making nests between leaves of "coscorrón" (*Flacodendron xylocarpum*) at Boquerón, Arecibo, Pt. Salinas and Loíza Aldea, and indeed may be expected wherever this shrub or tree occurs along the beaches. As noted in "Insectae Borinquenses" (1936-484), "the full-grown larva is 14 mm. long, with an orange-yellow head. Body is canary yellow; an irregular medio-dorsal black spot on each abdominal segment, laterally bordered with white, lateral of which is a much larger irregular, black, grey-bordered spot. On the second and third thoracic segments, these large later spots are broken in two by median white bands; on the first segment are two black crescents only. True legs black, spiracles black, lateral hairs with black areas at base, prolegs black and white banded."

*Euarne obligatella* was described by Herr Heinrich B. Möschler (1890-340) from a single female collected in Puerto Rico by Dr. Gundlach, and listed by him. It has not since been found anywhere.

*Plutella maculipennis* (Curtis), the cosmopolitan diamondback moth of cabbage, was identified by Herr Möschler from a single male collected in

Puerto Rico by Dr. Gundlach, which he thought "enteramente parecido a los europeos; era acaso introducido." It has become much more abundant since, and was noted by Mr. O. W. Barrett (1904-448) on cabbage, and by Mr. W. V. Tower (1908-35) on cabbage, kale, mustard and turnips. Mr. Thos. H. Jones (1915-9) gives an illustration of an injured mustard leaf, and Dr. Richard T. Cotton (1918-281) illustrations of all stages and considers it "the worst insect pest of cabbage in Porto Rico." It occurs in all parts of the Island, and has been repeatedly taken at light, even in areas where no cruciferous vegetables are grown, as in Guajataca Gorge, but Dr. Hoffman's collection at El Semil is hardly surprising, as larvae have been intercepted on brocolli at Villalba. Control in the past has been exceptionally difficult because of the unadhesiveness of most chemicals to the waxy cabbage leaf. Pyrethrum dust has given control, if used when fresh, but DDT dust is even more effective, and for the present at least can be recommended without reservation for use by cabbage growers until something more desirable is synthesized by the organic chemists. Prof. Forbes (1930-100) describes the adult as "brown, the inner margin of the fore wing in the male contrastingly paler, taking the form of a series of overlapping half-diamonds, female with the same markings but not contrasting."

#### Glyphipterygidae

*Tortyra aurofasciana* (Snellen), originally described from the Island of St. Martin in the Lesser Antilles, was listed as a *Choregia* by Herr Möschler, identifying two males from Puerto Rico collected by Dr. Gundlach, and listed by him. Prof. Forbes (1930-102) notes collection at Guánica and Guayanilla, and (1931-356) by Dr. M. D. Leonard on Vieques Island.

*Brenthia pavonacella* Clemens seems to bear a singularly appropriate specific name, altho it actually holds its dark brown wings in a manner quite the reverse of that of a strutting turkey, displaying their upper surfaces marked and spotted with white, and iridescent lavender spots on the outer margin of the fore wings. It was listed from Puerto Rico by Dr. Gundlach and Herr Möschler, and is quite common in coffee groves and even in citrus groves, resting on low vegetation. Mr. Carl Heinrich, identifying adults from Indiera, Adjuntas and Utuado, added that the larva "feeds on *Amphicarpea*," and in November 1931, Mr. Francisco Sefn found them abundant, feeding on the underside of the leaves of the coffee shade tree, *Inga vera*, at Lares. Most recently at Mayagüez, Mr. H. K. Plank (1945-27) found them a serious pest on soybeans.

#### Heliodinidae

*Heliodines quinqueguttata* Walsingham was collected on Culebra Island by Mr. Aug. Busck in February 1899, and is reported by Prof. Forbes

(1931-356) from Dorado and Aguirre. He describes the moth as being "golden-orange, fore wing with three bronzy spots on costa, alternating with two on the inner margin; apical third of fore wing edged with bronzy; 8.5 mm."

#### Cosmopterygidae

*Batrachedra albistrigella* was described by Herr Heinrich B. Möschler (1890-345) from a single specimen collected in Puerto Rico by Dr. Gundlach, and listed by him. It is "light gray-green striped with white, the hind wing mostly white," according to Prof. Forbes (1930-107), and has not subsequently been found anywhere.

Mr. Francisco Sefn, studying the insects present in ripening and mature pineapple fruits as they might be implicated with the excessive production of gum exudations from injured (or uninjured) portions of the fruit, found that the most common small caterpillar present was a species of *Batrachedra*. Prof. Forbes thought that it might be a new species, but Mr. J. F. Gates Clarke identified it as "near, if not *mathesoni* Busck," originally described from Florida, where its larvae were found on the blossoms of the coconut palm. These minute little elongate silvery-gray moths have prominent black eyes, the markings on the fore wings consisting only of a single submedian spot. Mr. Sefn found exudations of gum from areas eaten into the base of the fruit by the caterpillars, from near-by such areas, and also from portions of the fruit far distant from caterpillar injury, indicating only a facultative connection between gumming and the *Batrachedra* larvae. His preliminary report is entitled "Estudio del Daño causado por los Insectos a las Piñas" (in Informe Bienal, 1940-42, pp. 83-85. Río Piedras, 1944). Mr. Mario Pérez, continuing the studies, found decisive reduction in gumming and caterpillar injury following spraying with chlordan.

*Cosmopteryx antillia* was described by Prof. Wm. T. M. Forbes (1931-356) from Coamo, "closely similar to *C. mimetis*," which was the identification he (1930-108) had formerly given to these specimens.

*Cosmopteryx attenuatella* (Walker), as identified by Mr. Aug. Busck, was intercepted in the metropolitan area, and Prof. Forbes (1930-107) records collection at Coamo. The adult has "antenna with four segments at tip white, then five black, one white and one black."

*Cosmopteryx gemmiferella* Clemens was identified with some doubt by Herr Möschler, as Dr. Gundlach had but a single injured specimen from Puerto Rico, and Prof. Forbes "strongly suspects" that it was *C. attenuatella*.

*Cosmopteryx sancti-vincenti* Walsingham is listed by Prof. Forbes (1930-108) from Coamo and El Yunque.

*Cosmopteryx similis* Walsingham was collected by Prof. Forbes (1930-108) on Vieques Island and at Coamo.

*Triclonella rhabdophora* was described and illustrated by Prof. Wm. T. M. Forbes (1930-135) from a type collected by him on St. Thomas, others from Vieques Island. It is a small, narrow-winged, ochre yellow moth, striped with dark brown.

*Pyroderces stigmatophora* (Walsingham), extensively recorded in economic literature as *Pyroderces rileyi* (Walsingham), and thus first identified from Puerto Rico by Mr. J. D. More, has a slender pinkish larva, often found in old cotton bolls, and because of the color, often confused with the pink bollworm of cotton. In Puerto Rico, it has been most often collected in old cotton bolls because of the intensive studies made on pink bollworm, but it also attacks seed corn, and is known as the pink corn worm. Dr. M. D. Leonard (1932-131) records its interception by Mr. A. S. Mills on dry cowpea stems from Vieques Island, and it has repeatedly since been found heavily infesting the heads of only partially mature sorghum on the PRACO farm on Vieques Island. It was not found by Mr. Aug. Busck when he was in Puerto Rico in 1899, but he has repeatedly identified it from here since, and he is responsible for a most extensive critical discussion of what he calls "the scavenger bollworm" (pp. 362-366) in his technical paper on "The Pink Bollworm, *Pectinophora gossypiella*" (Jour. Agr. Research 9 (10): 343-370, fig. 7, pl. 6, ref. 48, Washington, D. C., June 4, 1917). "Aside from the color of the larva, there is only a superficial resemblance between it and the pink bollworm; and even the color is somewhat different—much deeper and more reddish. Full grown, it is much smaller than the pink bollworm, and appears more hairy because of the proportionally longer setae." The adult has very narrow wings, and is quite different in general appearance from the pink bollworm adult. Large numbers were found killed in the Isabela ginnery after its interior had been sprayed with 5% DDT in kerosene, but this is hardly a commercial method of control, even in instances where control is considered desirable. The old cotton bolls and stored corn attacked are usually valueless by the time injury is noted, but some preventive to its attack on ripening sorghum is needed if this is to be grown commercially on Vieques Island.

*Homaledra sabalella* (Chambers), as determined by Mr. Aug. Busck, is much more obvious in the injury caused by the feeding of its caterpillars on the underside of palm leaves, and the web of loose silk, in which most of its brown excrement becomes entangled, than as whitish caterpillar, or as elongate grey-brown adult. Injury to the areca palm has not been noted, nor to the royal palm, but to the coconut palm is sometimes so severe as to be of commercial importance, and such ornamental palms as the fan palms (*Coccothrinax argentea*, *Neowashingtonia robusta* and *Livistona chinensis*), are ruined from the standpoint of appearance. The imported cahoun palm, the oil palm (*Elaeis guineensis*), the sugar palm

(*Arega saccharifera*), and the native mountain palm (*Euterpe globosa*) are also attacked. This may be an endemic insect, altho its range extends to Hispaniola and Florida. The caterpillars are attacked by two species of *Spilochalcis*, but this by no means results in even commercial control. Spraying ornamental palms with nicotine sulfate will prevent re-infestation for a considerable period, but does not bring back the original appearance of injured leaves, and they should be cut off and removed even if all living caterpillars have already left them. The insect occurs in all parts of the Island, mountain-palms being attacked on El Yunque, and coconut palms at Guánica and on Vieques Island, but it is not reported from Mona. Prof. Forbes (1930-109) describes adults as being "clay color, with black dots in fold and at end of cell; 15 mm."

*Prochola fuscula* was described by Prof. Forbes (1931-357) from a type collected by him on Vieques Island, others from Coamo: a little fuscous moth, 8 mm. in wing spread.

*Perimede annulata* Busck was identified with some doubt by Prof. Forbes (1931-358); a single female from Cataño, "deep bronzy brown-black, with four raised scale-tufts on fore wing."

*Perimede purpurescens* was described by Prof. Forbes (1931-358) from a single female collected by Mr. Francisco Seña at Lares, "umber brown, the thorax and fore wing with decided iridescence, in most lights violet blue, but changing to crimson; immaculate; last ten segments of antennae white."

*Eriphia curvipunctella* (Walsingham) is listed as an *Eritarbes* from Puerto Rico by Prof. Forbes (1930-110) collected by Mr. R. H. Van Zwaluwenburg, but later he (1931-360) admits "I am not sure of my identification" of specimens from Isabela, Coamo, Santurce and Vieques Island.

*Eriphia pernigrella* was described by Prof. Wm. T. M. Forbes (1931-360) from a coal black type which he had collected on Vieques Island.

*Eriphia quinquepunctata* was described by Prof. Wm. T. M. Forbes (1931-360) from a type collected by him on Vieques Island, others from Coamo, a fuscous moth; "the scales with contrasting whitish bases and with whitish underscaling, so that the moth becomes steadily paler as it gets rubbed, and may become almost clay color." It has been collected at light at El Semil, Villalba, by Dr. W. A. Hoffman, in May 1940, and also on El Yunque.

*Stilbosis phaeoptera* was described by Prof. Wm. T. M. Forbes (1931-361), a "dark umber brown" moth, of which he collected the type from Coamo, another from El Yunque, and has a specimen from Surinam.

*Aphanosara planistes* was described by Prof. Wm. T. M. Forbes (1931-362), a whitish moth of which he collected the type from El Yunque, and painted the fore wing, see fig. 10 of his plate.

## Blastobasidae

*Blastobasis argillacea* Walsingham, as identified by Prof. Forbes (1930-112) was collected by Mr. J. D. More as a brown scavenger caterpillar in cotton bolls injured by the pink bollworm, at Fajardo and between Guayama and Salinas on February 10, 1922, and reared by him to adult. It is a mottled moth, "with red-brown shading and contrasted fuscous scaling," as described by Prof. Forbes (1931-363) from material collected by Dr. W. A. Hoffman in Santurce, and by himself at Coamo and on Vieques Island.

*Blastobasis subolivacea* Walsingham, as determined by Prof. Forbes (1931-363), has "the fore tarsus as well as tibia fuscous, pale banded" in the specimens from Coamo; "more doubtful are a pair from Vieques Island, and a very dark specimen from Aguirre." It is "olive gray, shading to brownish outwardly; 12 mm.," according to Prof. Forbes (1930-112), who suspects "that a specimen bred from sorghum belongs to this species." Mr. Carl Heinrich has identified as a species of *Blastobasis* some moths which Messrs. R. G. Oakley, A. S. Mills and F. A. Vitrano reared from larvae intercepted on heads of grain sorghum being grown on the PRACO farm on Vieques Island, May 28, 1948. A previous identification of moths obtained from sorghum heads from Vieques Island a year and a half previously was *Holococera* sp.

*Auximobasis constans* Walsingham was found by Prof. Forbes (1931-363) on Vieques Island, as was also *Auximobasis flaviciliata* Walsingham. "All my female material is *flaviciliata*, male *constans*, but Walsingham claims to have males of both."

*Auximobasis insularis* Walsingham was collected by Prof. Forbes (1931-0363) on Vieques Island.

*Auximobasis variolata* Walsingham was collected by Mr. Aug. Busck on Culebra Island in February 1899, and by Prof. Forbes (1931-363) on Vieques Island on April 1930, and at Coamo.

Prof. Forbes (1931-363) "cannot distinguish offhand from the North American *Pigritia ochrocomella*" moths collected by Dr. W. A. Hoffman at Palmas Abajo and by himself at Coamo and Lares.

## Gelechiidae

*Sitotroga cerealella* (Olivier), the Angoumois grain moth, was first found in Puerto Rico by Dr. Richard T. Cotton in August 1917 attacking corn at Río Piedras. In November 1921 injury was widespread and serious to the grains of ripening corn at Vega Alta. The conditions under which it became so abundant as to attract notice can not be determined, for the insect is comparatively rare in Puerto Rico, and has been intercepted only once, resting on weeds at Cidra. Prof. Forbes (1930-116) describes

the moth as being "straw color, with obscure darker dots and shades; hind wing dark."

*Ecia tectophila* (Staudinger), as identified by Prof. Forbes (1930-115), was originally determined by Mr. Carl Heinrich as *Ecia maculata* Walsingham for Mr. J. D. More, who in January 1923 reared a single specimen from refuse in an "old cockroach jar." This is the only record for Puerto Rico.

*Tholerostola evippella* was described by Prof. Wm. T. M. Forbes (1931-364) from an abundance of material from Isabela, Coamo and San Germán, a "fuscous and cream white" moth, with a wing expanse of 7 mm.

*Aristotelia absconditella* (Walker) was collected by Prof. Forbes (1931-367) at Coamo.

*Aristotelia diolcella* was described by Prof. Wm. T. M. Forbes (1931-366) from an abundance of material collected by him on Vieques Island, others from Coamo, San Germán and Palmas Abajo, and mentioned by him as being from Puerto Rico in "The Rubidella Group of *Aristotelia* (Lepidoptera, Gelechiidae)" (Jour. N. Y. Ent. Soc., 40 (4): 423-433, pl. 1. New York, December 1932.). He has since identified it for Prof. J. A. Ramos (1947-51), who collected "several specimens at light, March 4, 1944, Sardinera Beach," Mona Island.

*Aristotelia lignicolora* was described by Prof. Wm. T. M. Forbes (1931-368) from a male collected by him at Coamo, mostly clay-colored, "characterized by an enormous penis."

*Aristotelia penicillata* Walsingham, originally described from Hispaniola, is identified by Prof. Forbes (1931-369) from his collections at Coamo and Isabela, which show "the '*Eucatoptus*' hair-pencil very strikingly." This moth is "ochreous with mottling and complex markings of grayish fuscous, whitish and some metallic gray; apex with some rosy; 10 mm."

*Aristotelia picticornis* Walsingham was collected by Prof. Forbes (1931-368) at Coamo.

*Aristotelia vagabundella* was described by Prof. Wm. T. M. Forbes (1931-365) from an abundance of material which he collected on Vieques Island, others from Isabela, Coamo and Aguirre.

*Glaucacna iridea* was described by Prof. Wm. T. M. Forbes (1931-369) from material which he collected on El Yunque, a dull ochre moth with a wing spread of 8 mm., of which his painting of the fore wing is fig. 15 of the colored plate.

*Empedaula rhodocosma* (Meyrick) was identified by Prof. Forbes (1931-370) from material he collected at Coamo and San Germán.

Prof. Forbes collected a specimen of *Eucordylea* at San Germán "in too poor condition to describe satisfactorily."

*Epitactis annulicornis* (Walsingham) was collected by Mr. Aug. Busck

on Culebra Island in February 1899, and by Prof. Forbes (1931-371) on Vieques Island in April 1930, and at Coamo Springs.

*Epithectis eromene* (Walsingham) is identified by Prof. Forbes (1931-370) from Santurce, Aguirre and Coamo, and a pale strain from Vieques Island. "Larva on *Bromelia pinguin*."

*Epithectis kittella* (Walsingham) "I think I recognize from El Yunque" writes Prof. Forbes (1931-371).

*Schistophila fuscella* was described by Prof. Wm. T. M. Forbes (1931-371) from a single type from El Yunque, mostly luteous or fuscous, with a wing spread of 11 mm.

*Telphusa distictella* was described by Prof. Wm. T. M. Forbes (1931-372) from a specimen collected at San Germán by Dr. M. D. Leonard, mostly "light dull gray" in color, with a wing spread of 10 mm."

*Telphusa perspicua* (Walsingham) was collected by Prof. Forbes (1931-372) on Vieques Island and at Coamo. It is "blackish-brown, contrastingly marked with yellow."

*Trichotaphe (Cymotricha) pectinella* was described by Prof. Wm. T. M. Forbes (1931-372) from a type he collected at Coamo which is "deep iron gray, with faint brown iridescence."

*Trichotaphe (Onebala) elliptica* was described by Prof. Wm. T. M. Forbes (1931-373) from a type which he collected on Vieques Island which is "ash gray," marked with contrasting cream yellow. The blackish fore wing is represented in fig. 19 of the colored plate.

*Trichotaphe (Onebala) melissia* (Walsingham) is identified by Prof. Forbes (1931-373) from Río Piedras and El Yunque. According to Mr. Aug. Busck, in Barbados its larva is a pest on sweet potatoes.

*Trichotaphe manella* was described as an *Ypsolophus* by Herr Heinrich B. Möschler (1890-344) from a single female collected in Puerto Rico by Dr. Gundlach, and listed by him. According to Prof. Forbes (1930-121), this moth is "dark violet, brown, with a costal yellow stripe, triangularly widened a third way out." It has been intercepted resting on pomarrosa at Barceloneta.

Mr. Aug. Busck identified as a new species of *Trichotaphe* a small grey moth with thick orange antennae, a large black spot near base of fore wings, which emerged from a pupa taken at Río Piedras in February 1923. He wrote that the "larva is a leaf-roller on *Inga vera* and is apt to be a fine, highly-colored larva."

*Eunebristis zingarella* (Walsingham), reared from round mines in the leaves of seagrape (*Coccoloba uvifera*) at San Juan in February 1899 by Mr. Aug. Busck was listed as a *Dichomeris* in "Insectae Portoricensis" (1923-202). It has since been reared from the same host at Mameyes, the adults having been identified by Prof. Forbes. Such mines are not es-



pecially common, but may locally occur in great abundance. The adult moth is "ochreous, mottled with brick red, with steel blue streaks and fringe; 9 mm.," according to Prof. Forbes (1930-120).

*Dichomeris indignus* (Walsingham) was collected by Prof. Forbes (1931-374) at Coamo and on El Yunque, and by Dr. W. A. Hoffman at Jájome Alto. It is "pale rufocinereous, somewhat mottled and powdery."

*Dichomeris piperatus* (Walsingham) was first noted in the spring of 1930 by Mr. L. A. Serrano at the Isabela Sub-Station, feeding on the tender leaves of alfalfa and webbing together the tips of the shoots. Mr. Francisco Sefn reared some of these larvae to adult, had them identified by Prof. Forbes, who was in Puerto Rico at the time, and wrote "Insectos que atacan la Alfalfa en Puerto Rico" (Rev. Agr. P. R., 25 (2): 91. San Juan, 1930) and "*Dichomeris piperatus* Walsingham, a Pest of Alfalfa in Puerto Rico" (Jour. Ec. Ent., 23 (5): 885-6, Geneva, October, 1930). In subsequent years these caterpillars were much less abundant on alfalfa than in the first year that it was grown at Isabela, and indeed did little damage after this first attack. Presumably the caterpillars may feed on the leaves of other legumes, for Prof. Forbes (1930-121) notes collections of adults at Santurce, Cataño, and Coamo, and on Vieques Island, and they have been intercepted at light at Bayamón.

*Dichomeris rusticus* (Walsingham), as identified by Mr. Aug. Busck, has been intercepted at light at Bayamón. Dr. Stuart T. Danforth (1926-100) noted at the Cartagena Lagoon an unidentified species of *Dichomeris* eaten by the yellow-shouldered blackbird.

*Thiotricha sciurella* (Walsingham) was found by Prof. Forbes (1930-122) on Vieques Island. He describes the adult as being "silvery white; dark shades grayish; orange spot large, but not reaching dorsum; radiating orange and fuscous stripes in fringe below apex; 8 mm."

*Polyhymno luteostrigella* Chambers is "silvery white with longitudinal brown stripes, and oblique ones near the caudate apex; 9 mm.," according to Prof. Forbes (1930-123). It has been intercepted at light at Bayamón and Comerío and Prof. Forbes (1931-374) lists additional collections at Río Piedras, Cataño, Lares and Isabela, and by himself on Vieques Island.

*Brachyacma palpigera* (Walsingham) was found by Dr. M. D. Leonard and Mr. A. S. Mills, while collecting data for "A Preliminary Report on the Lima Bean Pod-Borer and other Legume Pod-Borers in Porto Rico" (Journ. Ec. Ent., 24 (2): 466-473. Geneva, April 1931), to occur in considerable abundance in dry pigeon pea pods grown along the north coast, or at Cabo Rojo. Often over half of these larvae were parasitized by *Paralitomastix* sp. nov., as determined by Mr. A. B. Gahan. They also found larvae in dry pods of *Crotalaria retusa* at Pueblo Viejo and Bayamón, and caterpillars have since been noted in old pods of *Crotalaria incana* at

Loíza Aldea, scavengers in pods previously occupied by larvae of *Etiella zinckenella*. The elongate, slender, whitish larvae are quite different in appearance from the plump greenish pod-borers which are primary in their attack on these hosts, and they transform to adults which Prof. Forbes (1930-123) describes as with "fore wing shading from pale ochreous to fawn brown, with a dark shade from middle of costa to apex, sometimes cut by two oblique white lines, and three dark dots on disc; 10-18 mm." Mr. H. K. Plank, in Reports of the Mayagüez Station (1937-74 and 1938-71), noted these caterpillars feeding on leaves of *Tephrosia candida* and *T. toxicaria*, and abundant in their pods during the summer. Adults have been taken at light at San Juan, and repeatedly at Bayamón, Prof. Forbes reporting (1931-374) collections made by him at Coamo and on Vieques Island.

*Anacamptis (Commatica) bifuscella* was described by Prof. Wm. T. M. Forbes (1931-375) from a type collected by him at Coamo, others from San Germán, Isabela and El Yunque. This is "a rather distinct little thing; ash gray, faintly yellowish and powdered lightly with fuscous scales."

*Anacamptis (Anacamptis) insularis* Walsingham was found by Prof. Forbes (1931-375) on El Yunque. The moth is "grayish fuscous, with three white costal blotches, the third nearly meeting a blotch on inner margin; a series of connected darker spots in fold, fringe whitish; 8 mm."

Two new but undescribed species of *Anacamptis (Anacamptis)* are listed by Prof. Forbes (1931-375), and Mr. Aug. Busck has thus identified adults reared from hibiscus buds intercepted at Vega Alta.

*Anacamptis (Compsolechia) mangelifora* Walsingham has a flesh-colored larva with brown head, which webs together two leaves of "mangle" (*Rhizophora mangle*). Prof. Forbes (1930-125) reports its collection on St. Thomas, and (1931-377) doubtfully reports its collection on El Yunque. No mangrove grows on El Yunque, but the adult of a caterpillar feeding on mangrove might be blown there from the mangrove swamps on the beach at Mameyes.

*Anacamptis (Compsolechia) melanophaea* was described by Prof. Wm. T. M. Forbes (1931-376, fig. 16) from a male from El Yunque (TYPE) and a duller colored female from Coamo, both collected by him.

*Anacamptis (Compsolechia) meibomiella* was described by Prof. Wm. T. M. Forbes (1931-376, fig. 17) from a light ash grey adult, reared from *Meibomia* in Cuba, and a "paler smoother looking, and more lightly marked" specimen from San Germán, Puerto Rico.

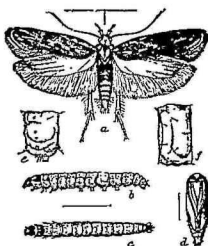
*Anacamptis (Compsolechia) plumbeolata* Walsingham is identified by Prof. Forbes (1931-377) from a non-typical specimen he collected at Coamo.

*Gnorimoschema gudmannella* (Walsingham), the pepper flower-bud moth, altho known from the Virgin Islands since before 1923, when Mr.

Charles E. Wilson reported it as one of the "Truck-Crop Insect Pests in the Virgin Islands" (Bulletin No. 4, Virgin Islands Agr. Expt. Station, pp. 35, fig. 24, Washington, D. C., 1923), was not noted in Puerto Rico until April 1940, when Mr. Francisco Seín found its larvae "abundant on buds and in flowers of cultivated pepper and 'ají' at Río Piedras," after specific inquiry by Mr. E. R. Sasser if it might not be present here. His intensive studies were reported as "Oruga de la Flor del Pimiento" (*en Informe Bienal*, 1940-2, p. 91, Río Piedras, 1944). Its larvae are heavily parasitized, Mr. A. B. Gahan identifying as new a species of *Euderus* (Entedontidae) and a new species of *Copidosoma* (Encyrtidae), two of the parasites obtained. The latter is by far the most common and widely-distributed of the parasites, present at all seasons of the year everywhere that Mr. Seín collected the infested flower buds. Mr. C. F. W. Muesebeck identified two Braconid wasps; a species of *Chelonus*, and *Apanteles dignus*, which he had described from material reared from *Gnorimoschema lycopersicella* (Busek) at Santa Ana, California. Despite this heavy parasitism, the caterpillars are very abundant, and are responsible for a heavy drop of flower buds. It is doubtful, however, if pepper plants could develop more fruit than they actually produce commercially, and this heavy pruning of buds may be beneficial. As the fruits are not infested under Puerto Rican conditions, the presence of the pepper flower-bud moth does not involve quarantine restrictions on commercial shipments to continental markets. Prof. Forbes (1930-126) describes the adults as being "powdery gray, with white-tipped scales and a few ochre spots, three of four of them centered by a few black spots; costal pencil present in male; 8—10 mm."

*Gnorimoschema operculella* (Zeller), the potato tuberworm of continental United States, but in tobacco-growing regions known as a leaf-miner, or locally called "candela" or "candelilla," was not reported from Puerto Rico by Drs. Stahl or Gundlach, and indeed may not have been present here at the time they were collecting most intensively. As *Gelechia picipella*, it was reported by Mr. O. W. Barrett (1905-396) causing "slight damage to tobacco at Aguas Buenas." Under the older and more familiar generic name of *Phihorimaea*, Dr. Richard T. Cotton (1916-299) noted damage to eggplant, but this is quite exceptional. "Nuevas Cosechas, Nuevas Plagas" (*Rev. Agr. P. R.*, 23 (2): 84-86. San Juan, 1929) is Mr. Francisco Seín's account of attack on Irish potatoes. Commercial injury in Puerto Rico is practically confined to tobacco, and this only during periods of more or less extended drought. The little greenish caterpillars feed on the interior layers of young tobacco leaves, the outer tissues becoming papery and yellowish-brown soon after the growing larva has extended its feeding to fresh areas. When fully-grown, the larva often becomes pinkish or purplish, pupating in trash or debris on the ground. The in-

conspicuous little brownish adult Prof. Forbes (1930-127) does not bother to describe. During the daytime it rests quietly on the ground or in debris, quickly seeking shelter if disturbed, but is doubtless active during the night, the females laying individual eggs on suitable hosts. Because the caterpillars feed on the inside of leaves, they are not susceptible to poisoning with arsenicals, but heavy rainfall quickly rots their burrows, exposing them to attack by predators and parasites and forcing them to eat poisoned tissue in starting a new mine. Indeed, all stages of the insect appear to be very susceptible to rainfall, and infestations drop to a minute fraction of 1% after heavy rains. Even under normal weather conditions infestations rarely become serious, but with continued scarcity of rain



The Tobacco Leaf-Miner or "Candela," *Gnorimoschema operculella* (Zeller): *a*, adult, *b* & *c*, larvae, *d*, pupa, *e*, *f*, segments of larva enlarged. (Redrawn from Riley and Howard, U. S. D. A.)

little may be left of young transplants except root, stem and midribs. If such weather were normal, tobacco growing would be possible only with overhead irrigation. The commercial tobacco regions, however, usually have ample rainfall to keep leaf-miner injury to a minimum, and it is the marginal regions, more subject to drought, where heaviest losses are most likely to occur. In the past, artificial control has been almost impossible, but the newer insecticides, especially DDT, may make control possible, even when climatic conditions are most unfavorable for the tobacco grower. This is a cosmopolitan pest, present everywhere in Puerto Rico except in the most humid regions, and Prof. Forbes (1931-377) records collection of adults at light by Dr. W. A. Hoffman at Jácome Alto, as well as by himself on Vieques Island.

*Gnorimoschema striatella* (Murtfeldt) is listed by Prof. Forbes (1930-127) as having been reared from "larva in berries of *Solanum*, pale green-

ish yellow with five irregular and interrupted crimson stripes, and shining dark brown head, true legs and cervical shield." Whether this refers to his record of collection at Fajardo, Jan. 19, 1914, is uncertain, but a subsequent record (1931-377) is of collection of adult at Cataño.

*Gelechia exclarella* was described by Herr Heinrich B. Möschler (1890-343) from a single specimen from Puerto Rico collected by Dr. Gundlach, and listed by him. It has not since been found anywhere.

*Gelechia salva* Meyrick was collected by Prof. Forbes (1931-377) at Coamo and San Germán.

*Stegasta bosquella* (Chambers) var. *costipunctella* was described as a species of *Gelechia* by Herr Heinrich B. Möschler (1890-344) from a single specimen collected in Puerto Rico by Dr. Gundlach, and listed by him. This is a widely distributed species, of which, according to Prof. Forbes (1930-128), "Porto Rico specimens are noticeably smaller than those from the United States, and the patch on the inner edge while normal in form varies from pink to a dark brown, hardly paler than the ground. Purple-gray, the patch on inner margin tawny or pinkish and connected as a rule to the antemedial costal spot. 12 mm. Larva green, with crimson thorax and chitinized parts black; on *Cassia*." Adults have been intercepted at light at Bayamón, and Prof. Forbes (1931-377) collected them at San Germán and on Vieques Island. Mr. Francisco Sefn found them at Lares.

*Stegasta capitella* (Fabricius) was described from Puerto Rico as *Gelechia rivulella* by Herr Heinrich B. Möschler (1890-344), the type a single specimen collected by Dr. Gundlach, and listed by him. It was collected on Culebra Island by Mr. Aug. Busck in February, 1899, by Prof. Forbes (1931-377) at many localities in Puerto Rico and on Vieques Island, and identified by him for Prof. J. A. Ramos (1947-51) who took specimens at light on Mona Island. It is "a common species, dark brown, spots and band on inner margin white; fringe mainly white; 8 mm. Walsingham believed that the type was taken on St. Croix," where recent collections have been made by Mr. Harry A. Beatty.

*Pectinophora* (or *Platyedra*) *gossypiella* (Saunders), the pink bollworm of cotton, was first found in Puerto Rico as an empty pupal case in an injured boll of tree cotton at Humacao, August 13, 1921, by Mr. Ignacio Torres. This was identified by Mr. J. D. More, and his identification confirmed by Mr. Carl Heinrich, but there was no question about the identity of the insect, and subsequent determinations were made by Mr. More as long as he remained in Puerto Rico. He examined all material collected on trips around the Island which showed that even in 1921, "The Distribution of the Pink Bollworm in Porto Rico" (Circular No. 85, Insular Expt. Station, pp. 7, map. San Juan, September 1923) extended from Cabo Rojo all along the south and east coasts as far as the Cabezas de San Juan, and along

the north coast from Dorado to Aguadilla. This included all the principal cotton-growing areas of the Island, and spread in 1922 was not more than ten or fifteen miles from known areas of previous infestation, mostly to plants of wild or volunteer cotton. An anonymous report on the observations of Mr. Aug. Busck (Service and Regulatory Announcements, Federal Horticultural Board, July-December 1921, No. 71, pp. 95-178. Washington, D. C., 1922) indicated that the appearance of the pink bollworm in the Lesser Antilles was due to the importation of infested seed from Egypt into the Island of St. Croix in 1911-12, whence it reached Puerto Rico ten years



Exit Hole and typical Injury to Cotton Boll caused by the Pink Bollworm, *Pectinophora gossypiella* (Saunders). (Drawn by F. Señ.)

later. Due to the earlier appearance of the pink bollworm in the British Islands, the Puerto Rican cotton industry has enjoyed exceptional prosperity, growing Sea Island cotton for the manufacture of thread in England, and the discovery of this new and insidious pest demanded a strict enforcement of control measures if cotton growing was to be continued. Within the next ten years twenty-six publications dealing wholly or in part with this pest appeared, as listed in "Insectae Borinquenses" (1936-492 to 495), with attendant publicity that induced one local satirical columnist to sign his communications "Pink Bollworm." Mr. Juan Pastor Rodríguez wrote "Nuestra Industria Algodonera se ve Amenazada por un Insecto Peligroso" (El Imparcial Dominical, pp. 29-30, fig. 1. San Juan, May 23, 1937), and Mr. L. Courtney Fife, who had been sent to Puerto Rico to make ob-

servations exclusively on this insect, recorded the "Status of the Pink Bollworm in Puerto Rico during 1935-36" (Jour. Agr. Univ. P. R., 21 (2): 233-235. San Juan, July 1937). Seeds of the endemic "maga" (*Montezuma speciosissima*), an especially important cabinet-wood tree because its wood is more resistant to dry-wood termite attack than is mahogany, are often heavily infested by pink bollworm larvae after cotton has been harvested, and "The Infestation of Young Okra Pods by Pink Bollworm in Puerto Rico" (Jour. Dept. Agr. P. R., 15 (4): 395-398. San

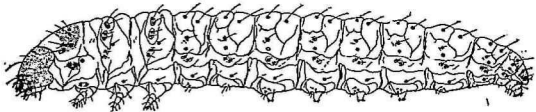


Infestation by the Pink Bollworm, *Pectinophora gossypiella* (Saunders), in the Seed Pods of Maga, *Montezuma speciosissima*. (Drawn by G. N. Wolcott.)

Juan, 1931) may indeed become total if grown near infested cotton. Mr. Fife's observations on "Alternate Host Plants of the Pink Bollworm in Puerto Rico" (Jour. Agr. Univ. P. R., 22 (4): 483-492, ref. 18. San Juan, March 23, 1939) gives additional data on this point.

"Studies of the Diapause in the Pink Bollworm in Puerto Rico" (Technical Bulletin No. 977, U. S. D. A., pp. 26, fig. 7, ref. 56. Washington, D. C., January 1949) by Mr. L. Courtney Fife showed that "under Puerto Rican conditions pink bollworms in the diapause always occur most abundantly during periods of drought, regardless of the age of the crop or

the time of the year at which the drought takes place. A few resting larvae always occur in the field regardless of the amount of rainfall—an indication of the existence of an inherited cycle which cannot be broken within several generations. A low relative humidity combined with a high temperature reduces the water content of the larvae by evaporation, thereby decreasing the rate of metabolism and causing arrested development. Dry food caused by drought conditions, i.e., lack of rainfall, high temperatures, low humidity, excessive wind movement, high evaporation, and lack of available moisture for the plants, reduces the water content of the larvae themselves. Moisture is the most important factor terminating the diapause under tropical conditions; and in the field, under conditions of heavy rainfall and high temperature, pupation and emergence of a majority of the resting larvae would be completed within two and a half to three months."

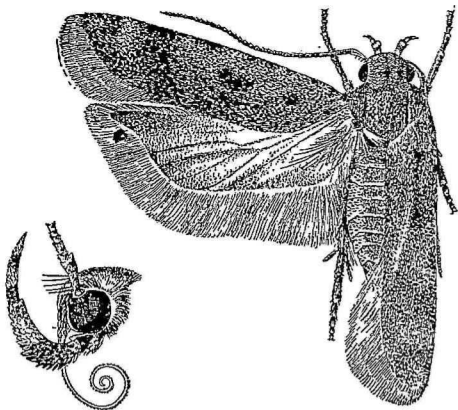


The Pink Bollworm of Cotton, *Pectinophora gossypiella* (Saunders), eight times natural size. (After Busek, U. S. D. A.)

Two native wasps, a small Bethyloid (*Perisierola* sp. nov., near *nigri-femur*) and an Ichneumonid (*Calliephialtes ferrugineus* Cushman), have been found to attack pink bollworm larvae, but neither is abundant, and they are of negligible importance in control. "Through the cooperation of the Divisions of Cotton Insect Investigations and Foreign Parasite Introduction of the Bureau of Entomology, three species of pink bollworm parasites were introduced during 1935, 1936 and 1937, namely *Exeristes roborator*, *Microbracon kirkpatricki*, and *Chelonus blackburni*. These parasites were reared by L. W. Noble and W. T. Hunt at the Presidio, Texas, station of the Division of Cotton Insect Investigations, and were received and liberated by K. A. Bartlett of the Puerto Rico Station." Tens of thousands of these parasites were released and "Dr. Bartlett reports that all species were recovered at points of liberation within a few months after they were released," according to Mr. Fife (1939-4), but none was found in succeeding years. The completeness of the failure of natural control of the pink bollworm in Puerto Rico by means of parasites is matched by the inefficiency and ineffectiveness of the recommended agricultural practices and clean-up after the harvesting of the crop. Indeed, the later ob-



servations of Dr. Luis F. Martorell were to show that neither control measures nor alternate hosts were of such vital importance as propinquity to the ginnery at Isabela, which proved to be the major source of re-infestation for the succeeding crop. As the near-by farmers became aware of this, they ceased planting cotton, making impossible a continuation of observations on comparative infestation, but incidentally furnishing most convincing proof of its menace. Spraying the interior of the ginnery with 5% DDT in kerosene might have been effective in killing all emerging moths if



Adult and side view of head of adult of the Pink Bollworm, *Pectinophora gossypiella* (Saunders), ten times natural size. (After Busck, U. S. D. A.)

doors and windows had been kept closed, but as they had to be kept open for the reception of the crop and for the comfort of the workers, it was very largely nullified by the conditions under which the ginnery operated. To be sure, many pink bollworm moths, and possibly larvae and pupae, as well as various stages of numerous other insects, were killed by the single spraying of its interior August 31, 1945, but not in sufficient numbers to justify the adoption of such a procedure under any practical method of operation. A more modern ginnery, or its removal to outside of the cotton region, seems to be the most obvious remedy. The pink bollworm has been present on Mona Island quite as long as it has been in Puerto Rico, for the

light-house keeper took infested Egyptian seed from St. Croix there when such seed was first available, and the insect has survived on wild cotton to date. An intensive and costly wild cotton clean-up on Vieques Island, initiated just before World War II that Sea Island cotton might be grown there, may have been successful in eradicating pink bollworm, but no cotton was planted when the Navy and the PRACO took over the Island.

Most recent spraying tests conducted at Isabela indicate that commercial control of the pink bollworm can be obtained by spraying with DDT at two week intervals when squares begin to form. It is yet to be shown that any other of the new insecticides is more effective.

#### Stenomidae

*Mothonica ocella* was described and illustrated by Prof. Wm. T. M. Forbes (1930-130 to 132), the type from Guatemala, others from Mexico, Panama, and Naguabo in Puerto Rico. The moth is "clay color, shading into light wood-brown; expanse 17-24 mm."

From seeds of *Inga vera* intercepted by Mr. A. G. Harley at Mayagüez, moths were reared which Mr. Carl Heinrich identified as a species of *Stenoma*.

*Schistonoea fulvidella* (Walsingham), originally described as a *Brachmia* (?) from St. Thomas, was found by Mr. Aug. Busck on Culebra Island in February 1899, by Prof. Forbes (1931-378) on Vieques Island in April 1930, and at San Germán, Isabela and Coamo, and by Dr. W. A. Hoffman at Dorado and Santurce. The moth is "pale ochreous, more or less heavily shaded with tawny and brown, and scaled with black; with fuscous terminal bars; 15 mm.," according to Prof. Forbes (1930-120), who continues, apparently quoting the observations of Mr. Gudmann, "larva dark brown, with white tubercles, (living) in a web decorated with bits of dead leaf, grass, etc., in the concave leaf-bases of *Bromelia pinguin*."

#### Ethmiidae

*Ethmia abraxasella* (Walker), first described as a *Psecadia* from Santo Domingo, was redescribed as *Psecadia aureoapicella* by Herr Heinrich B. Möschler (1890-341) from numerous specimens of both sexes collected in Puerto Rico by Dr. Gundlach, and listed by him. Mr. E. G. Smyth collected sixty-seven of these small speckled moths, as identified by Mr. Aug. Busck, at light at Hda. Santa Rita, Guánica during the latter half of 1913. In Van Zwaluwenburg's list it is PR 1403. Prof. Forbes (1930-134) notes additional collections at Coamo, and describes the moth as "white, with several black spots and brown shades on costa and a patch on inner margin; a golden dot nearly surrounded with black in middle of fold and another below apex on outer margin; hind wing translucent gray; 16 mm." Mr.

Francisco Seín took adults at light at Lares, but nothing is known as to the host plant of the larva.

*Ethmia confusella* (Walker) was re-described by Herr Heinrich B. Möschler (1890-343) as *Psecadia ingricella* from numerous specimens of both sexes collected in Puerto Rico by Dr. Gundlach, and listed by him. Mr. E. G. Smyth collected seventy-three of this "speckled gray" moth, as identified by Mr. Aug. Busck, at light at Hda. Santa Rita, Guánica, during the latter half of 1913, two-thirds of them taken in October. It is P. R. 1404 in Van Zwaluwenburg's list. It was taken by Mr. Aug. Busck on Culebra Island in February 1899; by Prof. Forbes (1931-379) on Vieques Island in April 1930, and noted by him as common at Coamo and San Germán. Altho the moth appears grey, it is really white with numerous black dots and dashes on the body and fore wings; the hind wings translucent white; expanse 20 mm.

*Ethmia joviella* Walsingham was collected at Río Piedras by Dr. M. D. Leonard, and at Isabela by Prof. Forbes (1931-379), who describes it as being "smaller than the other Puerto Rican species; white, fore wing with about eight black dots; hind wing gray with white fringe; 14 mm."

*Ethmia kirbyi* was described as a *Psecadia* by Herr Heinrich B. Möschler (1890-342) from a pair collected in Puerto Rico by Dr. Gundlach, and listed by him. Prof. Forbes (1930-133) collected several at Coamo which he described as "white with numerous gray spots, fusing into costal and dorsal marginal stripes towards apex; marginal stripe golden in male, absent in female; 16 mm."

*Ethmia notatella* (Walker), listed as *Psecadia xanthorrhoea* Zeller from Puerto Rico by Herr Möschler and Dr. Gundlach, was identified under this specific name by Mr. Aug. Busck for Mr. E. G. Smyth, who collected forty-five of this "speckled white" moth at light at Hda. Santa Rita, Guánica, during the latter half of 1913. It is *Ethmia xanthorrhoea* Zeller, P. R. 1405 in Van Zwaluwenburg's list. Prof. Forbes notes collection at Coamo (1930-133) and at Curaçao, and in Hispaniola. Dr. Luis F. Martorell collected many adults at light on Mona Island, both at the lighthouse and at Camp Kofresi, and Prof. J. A. Ramos (1947-51) also found it abundant. This striking moth has a wing expanse of 25 mm., black eyes, its white thorax and fore wings spotted with black; hind wings translucent grey, darker at apex, fringed with white; abdomen grey.

*Ethmia nivosella* (Walker) was first listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Psecadia adustella* Zeller, and this specific name was given by Mr. Aug. Busck to Mr. E. G. Smyth, who collected fifty-five of these "brown and white" moths at light at Hda. Santa Rita, Guánica, during the latter half of 1913. In Van Zwaluwenburg's list it is P. R. 1402, *Ethmia adustella* Zeller. Adults have been intercepted at

Bayamón. They have a dense tuft of erect white hair on their head; body, base of fore wing and very large dorsal patch dark brown, with traces of purplish iridescence; outlines of these spots, costal and apical margins and hind wings grey.

#### Coleophoridae

*Coleophora picticornis* Walsingham, as identified with some doubt by Mr. J. F. Gates Clarke, was collected at light by Dr. W. A. Hoffman at El Semil, Villalba, May 10, 1940.

*Coleophora pulchricornis* Walsingham was collected by Prof. Forbes (1930-138) at Coamo and on Vieques Island. He describes the adult as being "dull fawn, with a whitish costal streak and some streaks on veins outwardly; a black and white streak below costa and a small streak or two small streaks towards apex, 10 mm. Larva in a straight case ("cigar-case"), with mouth set on at an angle and with a three-keeled apex." While making observations on "The Minor Sugar-Cane Insects of Porto Rico" (Jour. Dept. Agr. P. R., 5 (2): 5-47, fig. 19. San Juan, April 1921), "a large number of case-bearer larvae and pupae (identified by Mr. Aug. Busck as a species of *Coleophora*) were noted on cane plants 12-24 inches high, May 13, 1920, in a field on a shelf of the Espinosa hill road from the Toa Valley. No indication of their feeding on cane was observed, but some plants had as many as eight on a single shoot. A few specimens had previously been found on cane, farther down the valley at Toa Baja and Dorado, from which parasites emerged determined by Mr. A. B. Gahan as a species of *Microplectrum*."

#### Gracilariidae

*Spanioptila spinosum* Walsingham was found by Prof. Forbes (1931-380) at Coamo. It is "white, with some transverse dark flecking and faint yellowish shades; a dark streak in apical fringe; 10 mm."

In the Mayagüez Station Report for 1939 (1940-115), a leaf-miner in the leaves of *Tephrosia* spp. is noted, identified by Mr. Aug. Busck as a new species of *Phyllonorycter*.

*Acrocercops albomarginata* (Walsingham) was found by Prof. Forbes (1930-142) at Coamo.

*Acrocercops cymella* is described and illustrated (his fig. 23 of the colored plate) by Prof. Wm. T. M. Forbes (1930-380) from a type he collected at Coamo. It is "a striking species; fore wing white, marked with shining fuscous gray; 13 mm."

*Acrocercops dives* (Walsingham), as identified by Prof. Forbes (1930-141), was collected at Mayagüez by Mr. R. H. Van Zwaluwenbürg. It is "brilliant metallic bronze; forewing with an orange patch on costal contain-

ing a black and bronze costal spot before middle, and one at end of cell, beyond which the wing is duller golden; base of costa black, 8 mm." Mr. Francisco Sefn reared the larvae, which are blotch-miners, from the leaves of *Inga vera* at Lares, in October 1936. Mr. Aug. Busck determined the reared adults, and Mr. C. F. W. Muesebeck identified a parasite as a new species of *Microbracon*.

*Acrocercops inconspicua* was described by Prof. Wm. T. M. Forbes (1930-142) from a type reared from larvae mining in the leaves of "péndula" (*Citharexylon fruticosum*) at Yauco in January 1923. It is a minute moth, with a wing spread of only 5 mm., "gray with black spots."

*Acrocercops pontifica* was described and illustrated (fig. 24 of his colored plate) by Prof. Wm. T. M. Forbes (1931-380), the type from El Yunque, "ochre yellow, marked with silver."

*Acrocercops rendalli* (Walsingham), originally described from Jamaica, is with some doubt identified by Prof. Forbes (1930-142) as being the moth reared by Mr. Thos. H. Jones from larvae mining in the leaves of a Malvaceous weed at Río Piedras. The adult is "buff, transversely banded with silver, antemedial and medial band very broad, postmedial narrow, and apex again white." It has recently been reared by Prof. James G. Needham at Río Piedras from larvae mining the leaves of hibiscus.

*Acrocercops sanctæcruis* (Walsingham) was originally described from St. Croix, as is indicated by the specific name, but is not noted as a pest of eggplant by Mr. Charles E. Wilson (1923-21), nor even listed by Mr. Harry A. Beatty in his "Fauna of St. Croix, V. I." (Jour. Agr. Univ. P. R., 28 (3-4, July-October, 1944): 103-185. Río Piedras, July 7, 1947). The reddish larvae, making linear mines at first in the leaves of eggplant, and later blotch mines with characteristic puckering of the uneaten leaf around the mine, were first noted in Puerto Rico by Dr. Richard T. Cotton at Río Piedras in the spring of 1916. He reared adults which were identified by Mr. Aug. Busck, but his account (1918-300) of this pest gives little indication of how serious it may at times become, for he says "the parasites of this insect are very abundant and keep it well under control at all times." Indeed, the insect is so small that one can hardly think of it as being much of a pest, yet when several caterpillars occur in the first, full-sized leaf put out by the young seedling, nearly all of its surface may be invaded. If conditions are favorable for the continued growth of the plants, no perceptible injury results, but in seed-beds not kept watered and thinned, many seedlings die, presumably in part at least because of this leaf-miner. Rarely are mines to be noted on the leaves of older plants, and injury, except in the seed-bed, is negligible. No method of artificial control has been tested, but presumably nicotine sulfate would be effective, and most certainly DDT and some of the newer insecticides. The heavy infestation

recorded was at Isabela in January 1932, but mines have also been noted in *Solanum torvum* at Río Piedras. Prof. Forbes (1931-380) lists collections of adults at Coamo and Las Cruces (Cidra), adding, "Mr. Busck tells me that *A. undifraga* Meyrick, from Haiti, bred from *Solanum torvum*, is a synonym of this species." The adult is a beautiful little moth, the wings of which are dark brown with four silvery spots, two of which are triangular, edged with black (making a cross across the back—another explanation of the specific name), and when at rest are kept tightly folded around the abdomen. The little moth seems to have disproportionately large legs and antennae, and it fearlessly stands up on its hind legs at a sharp angle quite different in manner from the clinging, crouching habits of many insects.

*Acrocercops zebrulella* was described and illustrated (figs. 21 and 22 of his colored plate) by Prof. Wm. T. M. Forbes (1931-381) from types and paratypes collected by him on El Yunque. It is "a striking little thing," its fore wing white and light buff or yellow with pattern in dull black.

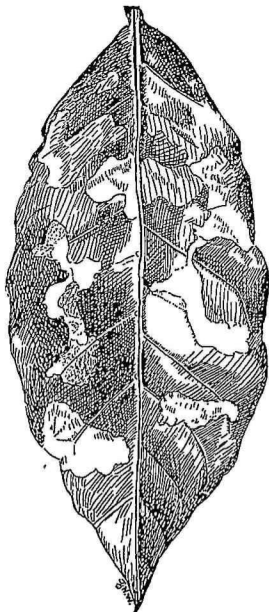
Prof. Forbes (1931-382) notes "three more species of *Acrocercops* from Porto Rico not suitable for description." He suspects another, "with grey-barred borders," reared from the smaller mines in the leaves of sea-grape (*Coccoloba uvifera*) at Mameyes in February 1936, as being new. Mr. J. F. Gates Clarke gave no specific identification to the moths of this genus which Dr. Luis F. Martorell reared in 1940 from material collected from "escambrón colorado" (*Pithecellobium unguis-cati*) on the Cayey-Salinas road, and later in the year from "capá prieto" (*Cerdana alliodora*), in the same region.

*Gracilaria aeneocapitella* Walsingham, originally described from the Island of St. Vincent, Prof. Forbes (1931-382) has identified from Lares. The adults he describes as being "tawny, the costa except at base golden yellow, with purple iridescence and dark brown flecking, especially on costa and towards apex."

#### Lyonetiidae

Mr. Aug. Busck identified as a species of *Bucculatrix* the moths which Dr. Luis F. Martorell (1948-135) reared from very numerous small caterpillars feeding on the leaves of "ceiba" (*Ceiba pentandra*) north of Aguadilla, in October, 1940, causing an incomplete but heavy defoliation. Each caterpillar was under a white silken net, feeding on the leaf surface, sometimes breaking thru and making a hole in the leaf. When fully-grown the caterpillar spun a light grey, ribbed cocoon attached to the midrib of the leaf, from which the adult emerged leaving the empty pupa case half out of the entrance.

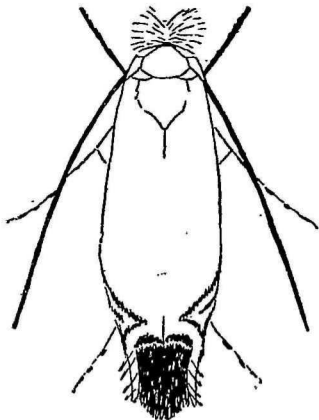
*Leucoptera coffeella* (Guérin-Méneville), the cosmopolitan coffee leaf-miner, was not noted in Puerto Rico by Drs. Gundlach or Stahl, the first record for the Island being by Mr. O. W. Barrett, in his first report as Entomologist and Botanist (*in Ann. Report P. R. Agr. Expt. Station for*



Injury to Coffee Leaf by the Miner Caterpillars of *Leucoptera coffeella* (Guérin-Méneville). (Drawn by G. N. Wolcott.)

1903, pp. 429-450. Washington, D. C., 1904). By the next year (1905-397) he had discovered that its caterpillars were parasitized by the minute wasp *Chrysocharis livida* Ashmead, and by the following year (1906-22) had reared another parasite, *Zagrammosoma multilineata* Ashmead. The

Coffee Specialist at the Mayagüez Station, Mr. J. W. Van Leenhoff, reported (1906-46) that severe attacks caused shedding of the leaves, and Dr. C. W. Hooker (1913-14) noted abundance of the caterpillars. Mr. R. H. Van Zwaluwenburg made intensive studies, as reported from year to year, summarizing the results in his paper on the "Insects Affecting Coffee in Puerto Rico" (Jour. Ec. Ent., 10 (6): 513-517. Concord, December, 1917), and listing the leaf-miner as number 602 in his list. When



Adult of the Coffee Leaf-Miner, *Leucoptera coffeella* (Guérin-Ménéville), twenty-five times natural size. (Drawn by G. N. Wolcott.)

Mr. Edmundo Colón, as Director of the Insular Experiment Station, initiated a survey of the coffee industry, Mr. Francisco Seín eagerly commenced studies which were continued almost up to the present, but of which the results were for the most part reported by others in one or two paragraphs in each annual report of the Insular Station. The preliminary Circular No. 52 (pp. 12, fig. 6. Insular Experiment Station, Río Piedras, October 1921) attempted to summarize all that was known of "El Minador de las Hojas del Café." In "An Economic Entomology of the West Indies" (1933-330 to 338) is an extensive, illustrated account. Mr. Seín went to Haiti to discover why the leaf-miner was so scarce there, and later



visiting some of the Lesser Antilles, discovered in Guadeloupe the parasite, which Mr. C. F. W. Muesebeck named *Mirax insularis*, which attacks from sixty to eighty-five per cent of all the leaf-miner caterpillars. Introduced into Puerto Rico, it managed to survive at Lares, but only in one recent exceptionally dry year has it become as abundant as the native parasites. Mr. Seín found that these native parasites are not as common in the principal coffee regions as Mr. Barrett found them at Mayagüez, and that their combined effect in natural control is negligible. The important factor is humidity: ridges exposed to the full force of the drying wind having heavy infestations, while protected humid ravines a short distance away have trees practically free from mines. Artificial control in seed-beds can be obtained by spraying with nicotine sulfate, but this is hardly practical after the trees have been set out in their permanent position in the grove. The only host of the leaf-miner is Arabian coffee, and everywhere in the Island that host trees are present, infestation by the leaf-miner will be noted. The adult is a little satiny-white moth, its forewings outwardly margined with a darker pattern, its head with a spreading tuft of white hairs. Mr. Seín made numerous paintings, but no comparable, carefully-worked out drawings that could be reproduced in black and white. The moth shows a strong "A Reaction to Light Intensity" (Ecology, 3 (1): 86. Brooklyn, January 1922) as do the caterpillars when they chose a place in which to spin their cocoons. All observed ecological relations to environment and parasites are given in "A Quintessence of Sensitivity: The Coffee Leaf-Miner" (Jour. Agr. Univ. P.R., 31 (3-July 1947): 215-219. Río Piedras, Sept. 19, 1950).

#### Oinophilidae

*Taeniodyctys sericella* was described by Prof. Wm. T. M. Forbes as one of "Two Wasp-Guests from Puerto Rico (Microlepidoptera)" (Psyche, 40 (3): 89-91. Pl. 1. Cambridge, September 1933), the type reared by Mr. Francisco Seín from nests of *Polistes crinitus* at Lares.

Mr. Aug. Busck has identified as a species of *Opogona* the moths reared from larvae which are scavengers in old leaves of coconut palm previously infested with *Homaledra sabalella* (Chambers). Prof. Forbes (1930-148) thinks that "it is closely related to *O. rhynchaema* Meyrick, of Brazil, but appears to be distinct." The Puerto Rican sugar-cane bud moth, the same or another species of *Opogona*, develops from "a small grey-brown caterpillar with a black head, which eats the eyes of cane and makes superficial tunnels in the rind of the cane stalk near the nodes, and in the inside of the leaf-sheaths, when burrowing between the stalk and the leaf-sheaths. During 1914-16, in examining a large number of fully-grown stalks of cane in all parts of the Island, it was found to have made tunnels or eaten into

the eyes of 1.2 per cent of all stalks examined. It can not be considered a pest of very great importance, as it does not burrow far enough into the rind of the cane to cause an appreciable loss of juice, and the eyes chewed into are usually far enough down on the stalk so that they go to the mill to be ground and are not on the seed-top. It is also so scarce that it would not be noted unless large numbers of stalks are inspected."

#### Tischeriidae

*Tischeria heliopsisella* Chambers is Prof. Forbes' re-determination (1930-150) of the moths which Mr. Thos. H. Jones reared from leaf-miners in *Piper?* sp., found on El Yunque in December 1912. The adult has a "fore wing with two transverse bands of fuscous dusting."

#### Psychidae

*Oiketicus kirbyi* Guilding, the West Indian bagworm, presumably originally described from Jamaica, was first listed from Puerto Rico by Herr Möschler (1890-122)—a single male in the collection of Dr. Staudinger, not seen by Dr. Gundlach—and from Cuba, "Raupe auf *Persea gratissima*, *Cupania*, *Terminalia* u.s.w." The larva of this bagworm is an omnivorous feeder, Dr. Luis F. Martorell (1948-545) listing over a dozen additional trees on which it is recorded or he found it feeding, and this does not include the introduced ash trees (*Fraxinus*, sp.) on which it was noted at Cayey and Maricao, or leafless trees that could not be identified in the Guánica Forest. Indeed, it rather appears to prefer introduced trees, for it was noted on beefwood (*Casuarina equisetifolia*) at Arecibo, Guánica and on Mona Island, and for several years was very abundant on "ciprés" (*Thuja orientalis*) around the lily pool at the Forest Station, Río Piedras. The lizards *Anolis pulchellus* and *Anolis cristatellus* swallow the larva inside its bag, and are apparently able to sever its connection with the host twig. Presumably the bag, and the bits of leaf, twig and other vegetable debris adorning its exterior, are undigestible, but it hardly seems possible that lizards would eat enough of these bagworms to eliminate an infestation, yet no other natural enemy is known. Dispersion to fresh hosts is difficult, for the female is a naked maggot "that never leaves the cocoon. The male of the Porto Rican species has an enormous extensible abdomen with which to fertilize her," according to Prof. Forbes (1930-150). He is of the opinion that dispersion occurs among the young larvae which drift with the wind immediately after hatching.

#### Tineidae

*Ereunetis aeneoalbida* Walsingham was collected at Aguirre by Dr. M. D. Leonard and at San Germán by Prof. Forbes (1931-382). He

(1930-148) describes it as having "antennae yellowish, vertex brassy; three costal brassy streaks and one dorsal on fore wing; 8 mm., snow white, with two fasciae near base, and oblique ones toward apex, and a longitudinal black line."

*Ereunetis minuscula* Walsingham, as determined by Mr. Aug. Busck, was reared by Mr. Thos. H. Jones from larvae "working under scales on papaya" at Río Piedras in November 1912; by Dr. Richard T. Cotton from larvae "feeding on purple scale in citrus grove" at Río Piedras in January 1917, and by Dr. M. D. Leonard (1932-1106) feeding on cottony cushion scale. Mr. Busck wrote to Dr. Cotton that "this species is a very general feeder, and one of the most abundant Micros in the West Indies and Florida. It has been bred from scale insects before, but I doubt that it is really predaceous on the scale; it is more likely merely a scavenger, which incidentally eats the living scale. I have bred the species in large numbers in Cuba from refuse in a coconut warehouse, and from dry "mummy" fruit of loquats in Florida." When the survey was being made of the dispersion of pink bollworm, it was repeatedly found as a scavenger in injured cotton bolls, Mr. J. D. More rearing adults, as determined by Mr. Carl Heinrich, from collections at Mameyes, Humacao and Fortuna (Ponce). Larvae have been found in old cotton lint at Vega Baja, in dry okra pod at Vega Baja, in partitions of pods of *Thespesia populnea* at Guayanilla, in old coconut palm leaves at Río Piedras, and intercepted in cowpeas on Vieques Island. Adults have been repeatedly intercepted at light at Bayamón. Prof. Forbes (1930-147) describes the moth as being "light wood color, with oblique darker bands; base of male hind wing transparent."

*Ereunetis particolor* Walsingham, as identified by Mr. Aug. Busck, was collected at Río Piedras in January 1923 by Mr. J. D. More, a single specimen resting on a pink bollworm rearing box.

*Setomorpha insectella* (Fabricius), as identified by Mr. Aug. Busck, was first noted in Puerto Rico by Mr. D. L. Van Dine, who found the larvae developing on paprika at Río Piedras in May 1912. Mr. Francisco Seín later thought them to be scavengers in the abandoned nests of paper wasps, and Prof. Forbes (1930-152) notes that "The larva is a tropical and warm-temperate pest in stored food, and is especially injurious to potatoes," altho not so recorded in Puerto Rico. The adult he describes, as "dull luteous, spotted with gray," repeatedly intercepted at light at Bayamón.

*Tiquadra aeneonivella* (Walker) was first listed from Puerto Rico by Herr Möschler (1890-338) as *Tiquadra aspera* Zeller, identifying several specimens for Dr. Gundlach. "Nach Berg, lebt die Raupe in einem langlich ovalen Sack." A large grey moth reared from a pupa found in a rotten

*Erythrina* tree at Cayey in November 1922 was identified as *Tiquadra inscitella* Walker by Mr. Aug. Busck, but is re-determined by Prof. Forbes (1930-152), who thinks "The Porto Rican species may well be new." The male he describes as "cream-colored, with numerous light grey spots; female much larger, pearl gray with larger, darker gray spots. Hind wing of male whitish with a pale brassy lustre; that of female gray. 25-35 mm."

The moth reared from a creamy white, unmarked caterpillar living in a dead and rotten underground stem of sugar-cane at Río Piedras in January 1915, was identified by Mr. Aug. Busck as a species of *Amydria*, possibly his *umbraticella* (Proc. U. S. National Museum, 47: 64. Washington, D. C., 1914).

*Myrmecozela ochraceella* Tengström, reported from Puerto Rico by Herr Möschler and Dr. Gundlach, Prof. Forbes (1930-154) considers "undoubtedly an accidental introduction from Europe." It has not since been found locally.

*Achanodes antipathetica* was described by Prof. Wm. T. M. Forbes (1931-384) from a type male collected by Dr. W. A. Hoffman at Santurce, others from San Germán, Isabela, Coamo, Dorado, San Juan and the Island of Vieques, with light and dark forms, "dull ochre to light wood brown, more or less dusted with fuscous; 9 mm." Don Julio García-Díaz (1938-96) also collected this moth when making his survey of fresh water insects.

*Antipolistes anthracella* was described by Prof. Wm. T. M. Forbes (1933-92) from type material from Lares reared by Mr. Francisco Sefn from nests of the paper wasp, *Polistes crinitus* Felton.

*Tineola walsinghami*, the plaster bagworm, was described by Mr. Aug. Busck on page 188 of his "Microlepidoptera of Cuba" (Entomologica Americana of Brooklyn Ent. Soc. 13 (4): 151-202, pl. 7. Lancaster, 1933), the type from St. Thomas, but present generally in the West Indies and southern Florida. *Tineola uterella* Walsingham, originally described from Brasil, is considered by Mr. Busck to be distinct from the West Indian species, altho most of the references are under that name, and indeed the original identification from Puerto Rico as such was by Mr. Busck. Not especially abundant in wooden houses, the flattened cases of this bagworm appear in surprisingly large numbers on the walls of freshly finished concrete buildings, with grains of sand and flecks of cement attached to the outside of the silken bag. What the caterpillar inside can find to eat is a mystery to many people, for most housekeepers feel sure that not enough dead insects, spider skins and other debris can possibly occur on new walls to support such a population of bagworms. In this they are quite correct, for woolen clothes in storage and especially woolen blankets when not in constant use are attacked, as may be noted in the Forest Service camps on

El Yunque, at El Verde, and at Camp Kofresi on Mona Island. Even cotton clothes may have holes eaten in them at times, for the bagworms hide in wicker laundry hampers, and in wardrobes which can not be closed tightly enough to exclude them, or are carelessly left open. Prof. J. R. Watson considers what he named "the plaster bagworm" a most serious pest of woolen rugs, and in Florida Press Bulletin No. 536 (pp. 2. Gainesville, 1939) recommends control by means of fresh pyrethrum powder, or soaking or spraying the rugs with a solution of pyrethrum in water-white kerosene. *Tineola biselliella* (Hummel), the webbing clothes moth, and *Tinea pellionella* (L.), the casemaking clothes moth, may be temporarily present in Puerto Rico by introduction, but neither has been identified from local collecting. *Apanteles carpatus* Say, the common parasite of the continental clothes moths, is however, present in Puerto Rico and presumably attacks the plaster bagworm. The crested lizard, *Anolis cristatellus*, when living in the house, may swallow the insect, bag and all, as it hitches its way along. Dr. Stuart T. Danforth (1926-122) reports finding this bagworm eaten by the northern water thrush, but presumably this is of rare occurrence. The rarely noted adult, as described by Prof. Forbes (1930-154), is "yellowish fawn, with some purplish fuscous dusting, and a few purplish fuscous spots; 10-15 mm."

*Tinea brevistrigata* Walsingham was collected on Culebra Island in February 1899 by Mr. Aug. Busck, in April 1930 by Prof. Forbes (1931-388) on Vieques Island, and by Dr. M. D. Leonard and Mr. A. S. Mills at Aguirre. It has the "dorsal half of wing grayer than costa; four dark brownish fuscous streaks, two in fold and two in cell; 9-12 mm."

*Tinea familiaris* Zeller was found by Prof. Forbes (1931-388) at Coamo and on Vieques Island. He had previously (1930-159) reported it from St. Thomas "taken in a house, and perhaps a clothes-moth in habits."

*Tinea minutella* (Fabricius) originally described from "Americae insulis" —"not improbably St. Thomas" according to Prof. Forbes (1930-158), has been identified by Mr. Aug. Busck from Puerto Rico for Mr. A. S. Mills who reared an adult from a pupa intercepted on grapefruit at Bayamón. Concerning it, Mr. Busck wrote that it was "a most interesting, striking species which has never been re-discovered since Fabricius' description. No specimen in the British Museum, here (U. S. National Museum), or in Cornell before this." It is a white moth, more or less dusted with gray, both antennae and palpi white; a wing expanse of 9 mm.

*Tinea pallidorsella* Zeller was found by Prof. Forbes (1931-388) on El Yunque, April 22, 1930. "The ground is wood brown, and in our fresh specimen the dark flecks show a distinct violet iridescence."

*Tinea scythropiella* Walsingham was collected by Prof. Forbes (1931-388) on Vieques Island and on El Yunque, by Dr. W. A. Hoffman at Palmas

Abajo (between Guayama and Jácome Alto), and at Cataño. It is white, "lightly dusted with brown; an antemedial oblique brown dash from costa, an angulated median band, a spot at end of cell and smaller ones outwardly; 11 mm."

*Homostinea tischeriella* (Walsingham) was collected by Prof. Forbes (1931-385) on El Yunque, a brown and ochreous species with "a purplish iridescence on the dark part of the fore wing." He identified for Don Julio García-Díaz (1938-96) others that had been collected in his survey of fresh water insects.

*Infurcitinea papella* was described by Prof. Wm. T. M. Forbes (1931-386) from material he collected on Vieques Island, others from Cataño, "dark clay color or light wood brown, dusted and marked with grayish fuscous; 8 mm."

*Infurcitinea luteella* was described by Prof. Wm. T. M. Forbes (1931-386) from moths collected by him on Vieques Island, "luteous, dusted with fuscous, 8 mm."

*Mea incudella* was described and illustrated (fig. 26 of his colored plate) by Prof. Wm. T. M. Forbes (1931-387) from specimens collected by him on El Yunque, others from Santurce taken by Dr. W. A. Hoffman, "white with black markings; 9 mm."

*Mea yunqueella* was described and illustrated (fig. 25 of his colored plate) by Prof. Wm. T. M. Forbes (1931-388) from a single type found by him "flying about the face of a cliff near the summit of El Yunque; cream color or bone white, marked with black, larger and heavier (than the preceding species), the hind wing wider with more sinuate costa; 10 mm."

Small silvery moths which Mr. Aug. Busck identified as a new species of *Mea* were reared from larvae making long tunnels of silk, in which the excrement was entangled, over bark of trees of *Inga vera* infested by *Xyleborus* beetles at Juana Díaz. The tunnels were of so solid a construction they could be lifted off whole.

*Protodarcia argyrophaea* was described and illustrated (fig. 28 of his colored plate) by Prof. Wm. T. M. Forbes (1931-390) from moths collected by him at Coamo. It is "a striking species; fore wing light gray-brown, with irregular silvery white transverse lines; 7 mm."

*Protodarcia bicolorella* was described and illustrated (fig. 27 of his colored plate) by Prof. Wm. T. M. Forbes (1931-389), the type from Coamo, others from Vieques Island, Río Piedras and San Germán. It is "a striking little thing; fore wing dark gray, mottled with black and outwardly with white; 7 mm."

*Protodarcia plumella* (Walsingham), originally described as a *Tinea* from St. Croix, was collected by Dr. M. D. Leonard at San Germán, as identified by Prof. Forbes (1931-390). Its "fore wing (is) tricolored, with black and ferruginous on white; antenna gray; 6 mm."

*Pexicnemidia mirella* was described as a new genus and new species by Herr Heinrich B. Möschler (1890-338) from two males collected in Puerto Rico by Dr. Gundlach, and listed by him. Prof. Forbes (1930-159) re-describes it as "fuscous with paler hind wing; immaculate; 14 mm." It has not since been found anywhere.

*Acrolophus* (*Pseudanaphora*) *arcanellus* (Clemens) was re-described by Prof. Forbes (1931-390) examining a small specimen intercepted by Mr. A. S. Mills at Río Piedras. It has also been collected at light at Utuado by Dr. W. A. Hoffman, as identified by Mr. Aug. Busck.

The moth collected at Aguirre by Dr. M. D. Leonard on May 22, 1930, was identified by Prof. Forbes (1931-391) as a new species of *Pseudanaphora*.

*Acrolophus* (*Caenogenes*) *ochraceus* was described as ? *Caenogenes* by Herr Heinrich B. Möschler (1890-337) from a single male collected in Puerto Rico by Dr. Gundlach, and listed by him. Prof. Forbes (1930-162) re-described specimens from Coamo as being "light ochre, dusted with red-brown, with three powdery dark brown spots; 20 mm.," and later (1931-393) notes additional collections at Río Piedras, Santurce and Cataño.

*Acrolophus* (*Anaphora*) *popeanellus* Clemens is listed from Puerto Rico by Herr Möschler and Dr. Gundlach, but Prof. Forbes (1930-162) thinks "this record should be verified."

*Acrolophus* (*Anaphora*) *triformellus* was described by Prof. Wm. T. M. Forbes (1930-163), the type from Coamo, others from Manatí, Mayagüez, and Hda. Santa Rita, Guánica. "This appears to be the commonest species of *Acrolophus* in Porto Rico. *A. walsinghami* Möschler—should be rather similar, but the latter is described by Möschler as "brick-red," and he later notes (1931-391) "a series of this species from San Germán tend strongly to a reddish ground, and may turn out to be *walsinghami* Möschler." Mr. E. G. Smyth collected only ten paratypes of this moth at Hda. Santa Rita, Guánica in 1913, eight of these being taken in August, but the following spring he reared several more from dirty brown larvae which he found spinning silken tunnels among trash on the ground. He was doubtful as to the host, but presumably this species was the one of which caterpillars were so numerous at Juncos and Gurabo in the autumn of 1923 as to absolutely eliminate all the grasses in many pastures, altho most of the weeds were untouched. The larvae have been found eaten by the lizards *Anolis pulchellus* and *Anolis cristatellus*.

The rough-looking, dirty brown or reddish-brown adults have been repeatedly intercepted at light at Bayamón, and in recent years have possibly been the most common moths noted at light at Río Piedras.

*Acrolophus* (*Anaphora*) *triatomellus* Walsingham was identified by Prof. Forbes (1931-391) as being six adults which he collected on Vieques Island, "very close to my *triformellus*."

*Acrolophus (Acrolophus) harpasen* was described by Prof. Wm. T. M. Forbes (1931-391) from type specimens collected by Mr. Francisco Seán at Lares, others from Río Piedras, and one previously reported as *mimasalis* Walker ? from San Juan.

*Acrolophus (Acrolophus) plumifrontellus* Clemens was listed from Puerto Rico by Herr Möschler and Dr. Gundlach, but Prof. Forbes (1930-165) is of the opinion that "the Porto Rican record (of this continental species) should be verified."

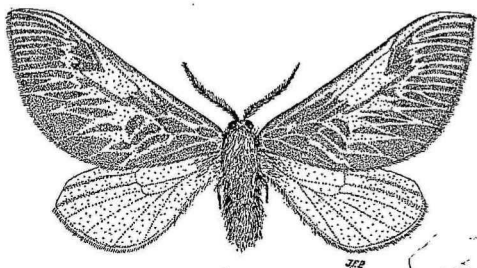
*Acrolophus (Acrolophus) vitellus* Poey was identified from Puerto Rico by Mr. Aug. Busck, as noted in "Insectae Portoricensis" (1923-206).

*Acrolophus (Acrolophus) walsinghami* was described by Herr Heinrich B. Möschler (1890-336) from a male collected in Puerto Rico by Herr Krug, and two males in the Berlin Museum, as noted by Dr. Gundlach. It is mostly "licht ziegelrot," which Prof. Forbes translates as "brick-red" when comparing with his *triformellus*, but (1930-165) describes it as "light cinnamon dusted with brown, with a dark shade through middle of fore wing from base to near outer margin, where there is a separate brown spot; 16 mm." To the non-specialist, this would seem to describe his cotypes of *triformellus* in the Río Piedras Station collection. Or possibly its interpretation depends on the color of bricks in Germany.

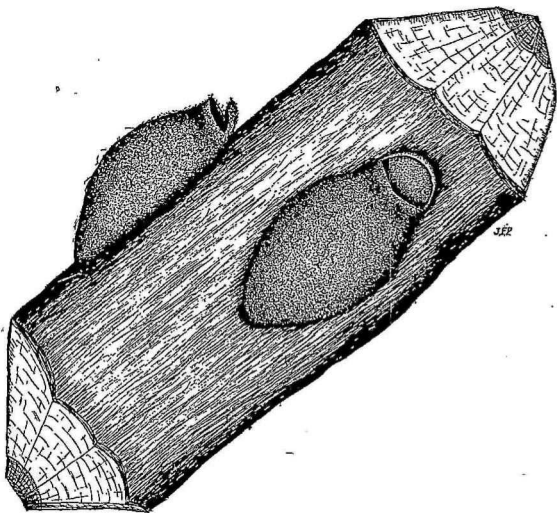
#### Megalopygidae

*Megalopyge krugii* was described as a *Lagoa* by Dr. Hermann Dewitz (1877-95) the type from Puerto Rico, presumably collected by Herr Krug of Mayagüez. As a *Megalopyga* it is listed by Herr Möschler, and Dr. Gundlach notes "parece ser propia solamente de Puerto Rico." The "plumilla" of Puerto Rico was possibly most intensively studied at Mayagüez by Mr. R. H. Van Zwaluwenburg, who lists it as number 1662; on *Inga vera*, *Terminalia catappa* and coffee, and (1915-31) gives *Inga laurina* as an additional host plant of the hairy white caterpillar. He continues (1915-34), "the larva is covered with long white hairs and is provided with brittle spines which cause a burning sensation if allowed to come in contact with the (human) skin. The pupa-case, with a 'trap-door' exit at one end, 16 by 10 mm., is formed of the hairs of the larva mixed with a substance secreted by the mature larva." Some persons are much more susceptible to poisoning by these innocent-looking little caterpillars, and suffer ugly lesions if they accidentally happen to come in contact with them. They occur in all parts of the Island, and tend to be omnivorous in their feeding habits, Dr. Luis F. Martorell (1948-546) listing eighteen other forest or roadside trees on the trunks of which their cocoons have been noted. The concrete posts guarding the edge of the causeway and bridge of the Arecibo River in 1938 were thickly covered with cocoons, altho the





Adult of the "Plumilla," *Megalopyge krugii* (Dewitz), two and a half times natural size. (Drawn by José F. Pietri.)



Cocoons of the "Plumilla," *Megalopyge krugii* (Dewitz), from which the adults have emerged, two and a half times natural size. (Drawn by José F. Pietri.)

larvae had fed on the leaves of "almendro" (*Terminalia catappa*) trees shading the road. When the moth leaves the cocoon the latter is promptly taken over as a most secure and desirable residence by small spiders and many small insects, especially small cockroach nymphs, and ants, for the plastic of which it is formed resists weathering for a long time. The flat "trap-door" is at the top, however, so it can not be as weather-proof as they might wish. If the larva has been parasitized by one of the Chalcid wasps, *Brachymeria* spp., some of the uneaten remains of the caterpillar will also be present to furnish food as well as shelter to the first insect finding its way inside the cocoon. The adult is described by Prof. Forbes (1930-166) as being "gray or light buff, with numerous white lines on and between veins, and some white transverse shading on disc; 25-30 mm."

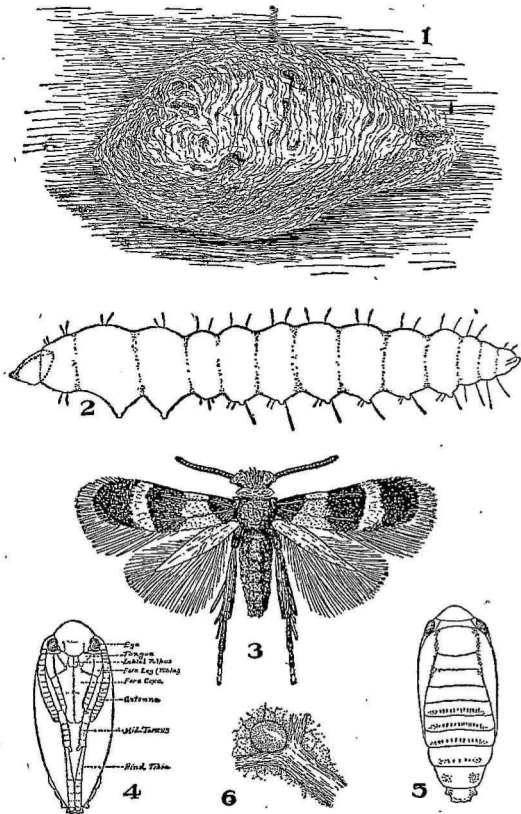
#### Limacodidae

*Monoleuca albicollis* was described by Prof. Wm. T. M. Forbes (1930-167) from a type collected at Coamo, June 5-7, 1915, mostly buff in color, with wing expanse of half an inch. Apparently without having seen the cocoon, Prof. Forbes describes it as being "substantially like that of *Megalopyge*." Drs. Donald De Leon and Luis F. Martorell in April 1940 found them on the upper surface, and sometimes on the underside, of the leaves of "maricao" (*Byrsonima spicata*) at Doña Juana Camp, Villalba, from which moths were reared that were determined by Mr. Carl Heinrich. Later in 1940, Dr. Martorell found additional cocoons on the same host at Cayey, and on "cedro" (*Cedrela mexicana*) at Cayey, on West Indian mahogany, and on "maga" (*Montezuma speciosissima*) at Isabela. It is presumed that the caterpillars fed on the leaves of these trees, but they have not been found. Dr. Martorell (1948-549) describes the cocoon as "whitish, mottled with brown, or vice versa; about 5 mm. long, 4 mm. wide and 4 mm. in height; made of a parchment-like substance, smooth and hard in consistency like a lizard's or very small bird's egg, with an operculum at one end."

The single specimen of an adult in the Cornell University collection, taken at Lares by Mr. Francisco Seín, was figured in Seitz' "Macrolepidoptera of the World," vol. 6, pl. 168, fig. g7.

#### Nepticulidae

*Nepticula gossypii* was described by Drs. Wm. T. M. Forbes and M. D. Leonard as "A New Leaf-Miner of Cotton in Porto Rico" (Jour. Dept. Agr. P. R., 14 (3): 151-7, pl. 2, San Juan, August 1930), the type from Juana Díaz. The moth is "purple black, with two transverse silvery bands; tuft on head tawny, eye-caps cream; 3 mm.; the larva a serpentine miner on the under side of cotton leaves." It is quite common on the



*Nepticula gossypii* Forbes & Leonard: 1, cocoon, 2, larva, 3, adult, 4 & 5, pupae, 6, egg. (After Forbes & Leonard.)

south coast, from Guayanilla to Yauco, in the spring, but "exceeding rare if present at all on the north coast or on Vieques Island." It was noted in the leaves of wild cotton on Mona Island, and Mr. C. F. Rainwater, reporting on "Insects and a Mite of Potential Economic Importance found on Wild Cotton in Florida" (Jour. Ec. Ent., 27 (4): 756-761, ref. 4. Geneva, August, 1934), found it on Anglefish Key, Key Largo, Cape Sable and around Ft. Myers, Florida, causing severe shedding of the foliage. Larvae have also been noted in the leaves of hollyhocks in the greenhouse at Río Piedras. Prof. Forbes (1931-393) reports an undescribed species of *Nepticula* from Coamo.

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