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THE INSECTS OF PUERTO RICO

COLEOPTERA

By GEORGE N. WOLCOTT

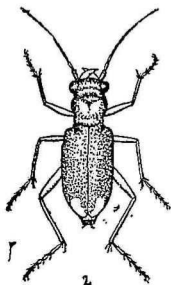
The very latest authoritative names for the beetles of Puerto Rico are included in the "Checklist of Coleopterous Insects of Mexico, Central America, the West Indies and South America", compiled by Dr. Richard E. Blackwelder. This is Bulletin No. 185 of the United States National Museum, of which two parts appeared in 1944, the third in 1945, the fourth in 1946, while the fifth and concluding part was received late in 1947. As indications of generic transfers are not given in this list, none is included in the following pages. His changes in the gender of specific names are followed in the first citation even of economic insects, but often not subsequently.

Cicindelidae: Tiger Beetles

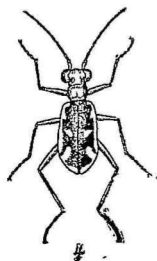
The "Descriptive Catalog of the West Indian Cicindelinae" (Bulletin Amer. Mus. Nat. Hist., 35 (36): 681-699, pl. 1, fig. 5. New York, October 17, 1916) by Dr. C. W. Leng and Mr. A. J. Mutchler, gives illustrations of the four species found in Puerto Rico, and of the alkali flat at Guánica where some of them were collected by the writers.

Megacephala sobrina Dejean, var. *infusata* Mannerheim, called by Drs. Stahl and Gundlach *Tetracha infusata* Chaudoir, is mostly an iridescent purplish green beetle, the apex of its elytra a semi-transparent yellowish brown. Its prominent mouth-parts, slender antennae and legs are opaque yellowish-brown. Mr. W. V. Tower (First Rpt. Bd. Comm. Agr. P. R., p. 20. San Juan, Jan. 1, 1912) states that it is predaceous on the changa, but we really know very little about what insects it normally feeds upon, as it is not often seen, and relatively few collections of it have been made. It is active only at night, but is neither attracted nor repelled by light. According to Leng & Mutchler it hides during the daytime under dung and debris around the higher part of the alkali flat at Guánica. It is not confined to such an environment, however, for it has been collected in all parts of the Island, in the mountains and along the coast, and in cultivated fields. Despite the speed with which this beetle runs, it is caught and eaten by the introduced toad, *Bufo marinus* (L.), as was first reported by Mrs. Raquel Dexter (1932-5), and its remains have since been found in toad excrement, the elytra being unmistakable. It is possibly for this reason that the beetle has been no more abundant in recent years.

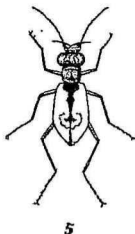
Cicindela boops Dejean has iridescent dark green legs, but is mostly lighter green, coppery, the lateral margins of the elytra whitish. In Puerto Rico it occurs only around alkali flats and near the salt ponds of the south-



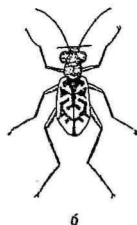
Megacephala sobrina Dejean
var. *infuscata* Mannerheim.
(After Leng & Mutchler.)



Cicindela boops Dejean.
(After Leng & Mutchler.)



Cicindela suturalis F.
(After Leng & Mutchler.)



Cicindela suturalis var.
hebraea Klug. (After Leng
& Mutchler.)

western corner of the Island: at Faro de Cabo Rojo, Parguera, Guánica and Ensenada.

Cicindela suturalis F., with elytra mostly whitish, is reported from Puerto Rico by Leng & Mutchler, but all collections at definite localities are of the variety *hebraea* Klug, which has more of the elytra green. Drs. Stahl and Gundlach noted the latter, and recent collections have been made at Añasco, Aguadilla and Camuy.

The elytra of *Cicindela trifasciata* F. are mostly dull, dark green, with a narrow pattern in white. This is the common species, reported by Drs. Gundlach and Stahl under the name *C. tortuosa* Dejean, often found in great abundance on the beaches all around the Island, but especially on the north coast, as at the ferry landing at Loíza Aldea and on Pt. Picua, Mameyes. It also occurs on the sandy banks of fresh water streams, and even in sandy cane fields, as well as on the margins of the salt lagoons of the south coast. One can but wonder what all these beetles and their larvae find to feed upon, for at times they are so much more numerous than any other insect or other small animal present on these sandy beaches. The larvae, like the adults, are entirely predaceous, and depend for their food on whatever happens to fall into their open burrows in the soil.

Carbidae: Ground Beetles

Calosoma alternans F. is the only large predaceous ground beetle that occurs in Puerto Rico. It averages an inch in total length, and in color is a dark greenish bronze, with three rows of iridescent pinkish punctures on each deeply striate elytron. Noted by the earlier entomologists under the name given by Fabricius that has persisted unchanged since 1791, it was later recorded by Mr. R. H. Van Zwaluwenburg as attacking the caterpillars of the cane looper (*Mocis repanda*) and white grubs, while Mr. Thos. H. Jones thought it probably predaceous on the southern grassworm (*Laphygma frugiperda*). The adults, being nocturnal in habits, seem not very common, but Dr. Wetmore found that they had been eaten by the ani, and Mrs. Dexter by the introduced toad. Collections have been made in all parts of the Island, usually on pavements in towns, feeding on the insects attracted to lights, but sometimes the beetle is disturbed when a field is being plowed, and runs distractedly about in search of shelter.

Scarites montana (= *S. mutchleri* Bänninger), described by Mr. A. J. Mutchler (Amer. Mus. Novitates No. 686, pp. 5. New York, January 6, 1934), the type from El Yunque, is a comparatively large (17.0 mm. long), black, elongate beetle which he thought might be the "*Scarites subterraneus* Fabricius recorded by Stahl".

At an elevation of 3,000 feet in the Maricao Forest was collected the type of *Scarites danforthi*, one of the many new species of Carabid beetles which Dr. P. J. Darlington, Jr. found in Puerto Rico, of which descriptions were published in a series of articles beginning in 1934-5 in "Psyche" and concluded in the April 1939 number of Mem. Soc. Cubana de Historia Natural. Most of the recent collections of Carabids in Puerto Rico were made or inspired by Dr. Darlington, who was always ready to identify or describe the new species collected by others.

As *Oxydrepanus coamensis*, Dr. Darlington notes the collection on El

Yunque of what Mr. Mutchler (1934-2) described as a *Dyschirius*, "length 2.0 mm., shining, reddish, prothorax globose".

The elongate, yellowish-brown *Clivina limbipennis* DuVal has been collected at Mayagüez and Cabo Rojo, and the black *Clivina addita* Darlington at Mayagüez. The small reddish-brown *Clivina insularis* DuVal has been found at many localities, at Tortuguero, Cartagena and Guánica Lagoons, and Mr. E. G. Smyth, making collections under cow dung at Guánica, thought it might be predaceous on horn-fly eggs and larvae.

The minute coppery iridescent *Ardistomus mannerheimi* Putzeys and the black *Aspidoglossa acrata* Putzeys have been collected only at Mayagüez, but the larger, shining black and reddish-brown *Aspidoglossa vulnerata* Putzeys, reported by Drs. Stahl and Gundlach under the name *A. bipustulata* F., is presumably more common, and has been collected elsewhere on the Island.

The type of the "slightly convex, piceous, shining, length 3.5 mm." *Bembidion darlingtoni* Mutchler (1934-3) was from Ensenada, and Dr. Danforth collected many specimens at the Cartagena Lagoon, but it has also been found at Ponce, Coamo and Caguas. The type of the shining *Bembidion portoricense* Darlington is from El Yunque. *Bembidion fastidiosum* LaFerte and the dull black *Bembidion sparsum* Bates are apparently mountainous species, but *Bembidion viridicole* LaFerte (= *B. chevrolati* C. & H.) was collected at Ensenada by Prof. J. A. Ramos. Dr. Wetmore found that the semipalmated sandpiper had eaten some one of these species of *Bembidion*. The "oblong, parallel, testaceous, in great part dark brown, length 2.25 mm." *Tachys ensenadae* described by Mr. A. J. Mutchler (1934-3) from a type at Ensenada and others at Arecibo, was found in abundance by Dr. M. D. Leonard on Vieques Island, and Prof. J. A. Ramos has specimens from Mona Island. Dr. Gundlach reports *Tachys macrodentra* Chevrolat and *Tachys vittiger* LeConte, and more recent collections have been made of *Tachys blandula* Schaum, *Tachys corrusca* LeConte, *Tachys carib* Darlington, *Tachys piceola* LaFerte and the light-colored *Tachys vorax* LeConte.

The holotype of *Micratopus insularis* Darlington (1934-86) is from San Juan, but it has since been taken at Humacao. It has a very small head and is less than 2.0 mm. in total length.

The little, light yellow *Perileptus dentifer* Darlington (1935-177) lives in the gravel of the river at Mayagüez, and Mr. R. G. Oakley intercepted it at Ponce.

Panagaeus quadrisignatus Chevrolat is the presently accepted name for what was recorded by Dr. Gundlach as *Panagaeus fasciatus* Say, a rather common and certainly a very distinctive black beetle with two irregular

chestnut spots on each deeply furrowed elytron, found in all parts of the Island. It is three-eighths of an inch long and almost half as broad.

Morion georgiae Palisot de Beauvois, listed by Drs. Stahl and Gundlach as *Morio monilicornis* Latreille, was reported from Vieques Island by Leng & Mutchler.

Loxandrus celeris Dejean was collected at Guánica Lagoon by Prof. J. A. Ramos.

On Mona Island, Prof. J. A. Ramos found numerous specimens, identified as a species of *Tetragonoderus* by Mr. J. M. Valentine, none of this genus being known from Puerto Rico.

Colpodes estriata was described by Dr. P. J. Darlington (1939-96) from specimens taken on El Yunque.

Lachnophorus leucopterus Chevrolat, with small head and thorax, grey elytra with three deep punctures on each, has been collected at Mayagüez, and in river gravel at Maricao.

In 1899 at Bayamón, Mr. August Busck collected the type, and another at Fajardo, from which Dr. P. J. Darlington (1934-99) described *Perigona microps*, since found also on dead wood at Villalba.

Chlaenius perplexus Dejean, a large dull brown beetle, has been collected at Mayagüez, Arecibo and Luquillo.

(Dr. Stahl lists *Oodes femoralis* Chaudoir.)

Stenocrepis metallica Dejean has been collected at the Cartagena Lagoon and at Ponce. The much more common *Stenocrepis tibialis* Chevrolat, listed by Drs. Stahl and Gundlach as a *Stenous*, dark green and bronze in color, is also from the southwestern corner of the Island. Dr. Stuart T. Danforth, in his study of the food habits of the birds of Cartagena Lagoon, found that this beetle was eaten by three kinds of sandpipers, the killdeer, the lesser yellow-legs and the northern water thrush.

Gynandropus guadeloupensis Fletiaux & Sallé, a dark iridescent greenish-black Carabid, has been collected at Humacao and Mayagüez.

Twelve species of *Selenophorus* are known to occur in Puerto Rico, of which the types or paratypes of four were collected on the Island. *Selenophorus alternans* Dejean, with the elytra deeply punctate and only faintly striate, is a very common species, noted by Dr. Gundlach, and since collected in all parts of the Island, usually at light. It has also been found on Mona Island by Prof. J. A. Ramos, "under stones near the cliff" and under dead leaves. *Selenophorus beauvoisi* Dejean has been collected at Ensenada. *Selenophorus chalybaeus* Dejean, a large black species with deeply striate elytra, the largest of the genus in Puerto Rico, has been taken at Guánica and at Coamo. Dr. Gundlach collected *Selenophorus discopunctatus* Dejean, and it has since been found under lights

on, Vieques Island and at Aibonito and at Bayamón. Concerning *Selenophorus flavilabris* Dejean, nothing more definite than Puerto Rico is known as to place of collection. Dr. P. J. Darlington described *Selenophorus lator* (1934-109) from the type collected (GNW) at Haina, Dominican Republic, with paratype collected (GNW) from one square foot of pasture at Pt. Cangrejos, Puerto Rico. It occurs in dead seaweed on the beach there, and has subsequently been found on the ground at Jayuya. *Selenophorus puertoricensis* was described by Mr. A. J. Mutchler (1934-5) as "aeneous, greenish to coppery on pronotum, coppery on the elytra, length 10.0 mm." from Desengaño, others from Mt. Mandios. Drs. Stahl and Gundlach list *Selenophorus pyritosus* Dejean. The little shining black *Selenophorus sinuatus* Gyllenhal has been found at Jayuya, Caguas and Cayey, the peons calling it "cucaracha" and claiming that it attacks tobacco leaves. Prof. J. A. Ramos found it at Cartagena Lagoon, and "under stones near the cliff at Sardinera Beach" on Mona Island. The holotype of *Selenophorus parvus* Darlington (1934-105) is from Coamo Springs, and "resembles a small *S. sinuatus*". The type of *Selenophorus ramosi* Darlington (1939-97) was from Guánica Lagoon, and it has also been collected at light in the Guánica region. *Selenophorus striatopunctatus* Putzeys has been found in the mountains and along the coast of western Puerto Rico.

The paratypes of *Bradycellus* (*Stenocellus*) *velatus* Darlington (1934-111) were collected at Río Piedras.

Acupalpus ochropezus Say, also listed as a *Stenolophus*, has been collected in all parts of the Island.

The type of *Masoreus* (*Aephnidius*) *ciliatus* Mutchler (*in* Darlington 1934-130) was collected on a cactus-covered hill at Ensenada.

The bright iridescent blue-green of *Lebia viridis* Say (which Dr. Darlington re-identifies as *Lebia marginicollis* Dejean) is very conspicuous among the dark or dull-colored Carabids. The duller *Lebia bitaeniata* Chevrolat has two yellow bands across dull blue elytra. Both species have been collected mostly at Río Piedras, Dr. R. T. Cotton noting of the former, found on cucumber vines, that "it was probably feeding on aphids".

The type of *Phloeoxema portoricensis* Darlington (1939-99) is from El Yunque, and others have been collected in the Maricao Forest. It has striate, dull blue-black elytra, and is mostly yellowish elsewhere.

The margins of the elytra of the dull brown *Apenes marginalis* Dejean are yellow, a large and rather common Carabid, found in all parts of the Island. M. Chevrolat himself identified Dr. Gundlach's specimens, placing them in the genus *Cymindis*.

The dull reddish brown *Apenes parallela* Dejean, listed by Dr. Gundlach under the name *Cymindis variegata* Dejean, has since been collected by

Dr. Danforth at Coamo. The dull *Apenes pallipes* F. has been collected by Prof. J. A. Ramos at Mayagüez, Ensenada and Guánica Lagoon. *Apenes portoricensis* was described by Dr. P. J. Darlington (1939-100) from types collected at Guánica Lagoon.

Dr. P. J. Darlington described (1934-121) *Pentagonica divisa*, an exclusively endemic Carabid previously reported by Dr. Gundlach as *Rhomoboderia atrorufa* Reiche, and more recently, because of yellow head and thorax and dark elytra, listed as *Pentagonica bicolor* LeConte. *Pentagonica flavipes* LeConte, which is entirely brown in color, and its variety *picipes* Darlington (1935-212) the type from Jamaica, but also in Puerto Rico, has been collected at Mayagüez and Luquillo.

Colliuris (*Odacanthella*) *portoricensis* Leibke (Mitt. Zool. Mus. Berlin, 15: 658. 1930) was described from Puerto Rico. Both Dr. Stahl and Dr. Gundlach list as *Casonia insignis* Chaudoir the local variety of *Colliuris rufipes* Dejean.

The holotype of *Galerita microcostata* Darlington (1934-124), a large, dull, dark purplish-brown beetle, five-eighths of an inch long, was collected at Mayagüez, but it has since been found at Quebradillas and Río Piedras.

The type of *Pseudaptinus insularis* Mutchler (1934-4), a much smaller (length 4.5 mm.), yellow brown Carabid, is also from Mayagüez, but it has since been taken at light at San Juan, Ponce and Tortuguero.

Dr. Gundlach lists *Zuphium americanum* Dejean, and there are many unlabeled specimens, handwriting of the person making the determination not recognizable, of these little black Carabids in the Río Piedras Station collection.

The brown *Brachinus brunneus* Castelnau, listed by Drs. Stahl and Gundlach as *Brachinus gilvipes* Mannerheim, has since been collected at Mayagüez, Cartagena Lagoon, Guánica and Ponce, usually at light.

Haliplidae

Dr. E. A. Schwarz identified as *Haliplus* sp., a small, oval, shining, dark brown beetle found in abundance at light, June 8, 1922, under light at Manatí.

Dytiscidae: Predaceous Water Beetles

Aquatic insects were first intensively studied in Puerto Rico by Dr. Stuart T. Danforth when making his ornithological studies at the Cartagena Lagoon. Dr. Julio García-Díaz, in his survey of fresh water insects, collected at Cartagena, Guánica and Tortuguero Lagoons, in the smaller, more inaccessible and less well known lagoons at Cabezas de San Juan: the most northeastern cape of the Island; at La Mina, or the Recreation Area on El Yunque, and in the Río Yúñez at Florida. Most recently,

the mosquito specialists of the U. S. Public Health Service, usually stationed at U. S. Army camps, and those of the local Department of Health, while collecting mosquitoes, have incidentally collected other aquatic insects.

Hydrocanthus iricolor Say is a common continental Dytiscid, 4.0 to 5.0 mm. long, which, to quote Blatchley, is "ovate, convex, attenuate behind; head, thorax and under parts reddish-yellow; elytra dark reddish-brown, polished, iridescent". Dr. Danforth found it at Cartagena, and Dr. Julio García-Díaz lists it in the "Appendix A" to his "Ecological Survey of the Fresh Water Insects of Puerto Rico" (Jour. Agr. Univ. P. R., 22 (1): 94-96. Río Piedras, April 15, 1938), collections having been made at Tortuguero.

Laccophilus proximus Say is locally a much more common species, listed by Drs. Stahl and Gundlach, collected by Dr. Danforth at Cabo Rojo and Luquillo, and by Don Julio at Cartagena and Las Cabezas de San Juan. Shortly after electric lights had been installed in the Forest Service camps on El Yunque, Dr. Luis F. Martorell in June 1935 found it attracted to these lights.

The black or very dark brown, 4.0 mm. long, *Pachydrus brevis* Sharp, *Pachydrus globosus* Aubé and *Pachydrus obniger* Chevrolat, as identified by Mr. J. A. Mutchler, were all collected and are listed by Don Julio, altho his reserve collection contains no specimens to indicate specific localities. Judging by the abundance of collections by Dr. Danforth at Mayagüez, Lajas, Cartagena Lagoon and at Humacao, *P. globosus* is the more abundant. Dr. Gundlach lists the latter under the genus *Hyphydrus*. Dr. Stahl gives *Hydroporus exilis*, which may be a MS name for one of these.

A species of *Celina*, as determined by Mr. L. L. Buchanan, has been collected at light at Mayagüez.

Copelatus angustatus Chevrolat and *Copelatus posticatus* F., small Dytiscids of which the males have discs on the fore and middle tarsi, have been found in great abundance at many localities by Dr. Stuart T. Danforth. In December 1942, Dr. A. E. Pritchard collected them at Losey Field, on the south coast near Santa Isabel. Dr. Wetmore found that they had been eaten by the wood pewee and the cliff swallow. Possibly the former species is the more abundant, as it is listed by Dr. Gundlach and also by Don Julio. It was collected on Mona Island by Prof. J. A. Ramos "from a small pool near the airfield".

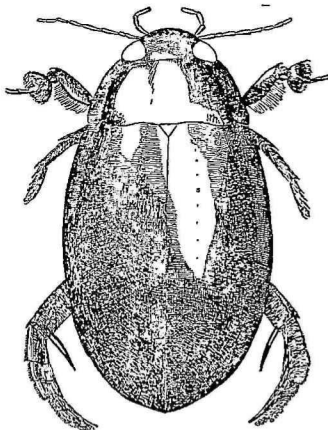
Don Julio lists *Rhantus calidus* F., as determined by Mr. A. J. Mutchler, a new record for Puerto Rico, but since found by Prof. J. A. Ramos (1947-32) on Mona Island.

† *Eretes stictica* L., as determined by Mr. L. L. Buchanan, is an Old World species which occurs in the salt lagoons at Ensenada,¹ Cabo Rojo and Boquerón, where it is presumably predaceous on the maggots of the

Ephydrid fly, *Ephydra gracilis* Packard, or the cosmopolitan crustacean, *Artemia salina*.

Dytiscid beetles identified by Mr. L. L. Buchanan as a species of *Pronoterus* have been collected at light at Mayagüez.

Thermonetus (*Thermonectus* or *Thermonectes* in the earlier records) *basilaris* Harris, *T. circumscripta* Latreille and *T. margineguttata* Aubé average 10.0 mm. in length and half as much in width, black marked with dull yellow, found in all parts of the Island. Dr. Gundlach lists the two



The Giant Predaceous Water Beetle, *Megadytes gigantea* Castelnau, twice natural size. (Drawn by G. N. Wolcott.)

latter under the genus *Acilius*, Dr. Wetmore notes that one had been eaten by the green heron, while all three were collected in fresh water streams by Don Julio, as well as in Cartagena, Tortuguero and the lagoons at Las Cabezas de San Juan. Prof. J. A. Ramos found *Thermonetus circumscripta* on Mona Island.

Megadytes fraterna Sharp, listed by Drs. Stahl and Gundlach under the name *Cybister laevigatus* F., is 20.0 mm. long, almost entirely black except for the lateral margins of the thorax.

Megadytes gigantea Castelnau, listed by Drs. Stahl and Gundlach as *Cybister Pherminieri* Guérin-Méneville, is almost twice as large, making it by far the largest of all the water beetles. Mostly a smooth but not

shining black, its prothorax and elytra are laterally margined with dull orange-yellow, and the hairs of its powerful hind legs are purplish. Previously not too common, the introduction of the giant Surinam toad, *Bufo marinus* L., by providing such an abundant food supply of pollywogs, in recent years has greatly increased its numbers. One sometimes notes a lily pond or other pool well stocked with the eggs of this toad, and a few days later great numbers of tadpoles, but their number very rapidly decreases until one soon finds only the ferocious larvae of this water beetle now devouring each other, and finally only a few fully-grown ones are left. Fortunately for the agriculture of the Island, enough pollywogs have survived until recently to maintain the toad population at a maximum that can be sustained by the May beetles, vaquitas and millipedes available for its sustenance, but certainly not in any pool where the larvae of this beetle are present. It is quite possible that the rarity of the native toads, *Bufo lemur* (Cope) (= *Peltaphryne guttuerosus* Peters), was due to the difficulty of surviving where *Megadytes gigantea* is present. The minimum length of time for "The Development of the Giant Surinam Toad, *Bufo marinus* L." (Jour. Agr. Univ. P. R., 21 (1): 77-78, fig. 3. Río Piedras, January 1937), as observed by Mr. Francisco Seín, in the tadpole stage from egg to very small adult is two months, during all of which time it is subject to attack by a great number of enemies, including dragon fly larvae as well as those of predaceous aquatic beetles. In large bodies of water, one may hope that many will elude *Megadytes* larvae, but in small pools in which one of these beetles has laid her eggs, observation indicates that all perish. Of the fifty bullfrogs, *Rana catesbeiana* Shaw, of which Mr. Mario Pérez made stomach examinations, one large bullfrog had eaten one of these beetles, thus in part avenging the numerous pollywogs which it had doubtless consumed in its larval stage.

Gyrinidae: Whirligig Beetles

Whirligig beetles are by no means as often seen in pools and the quiet reaches of streams in Puerto Rico as in North America, but at least four species are present. From the mountains, a local subspecies, *portoricensis*, has been described by Mr. G. Ochs (Amer. Museum Novitates No. 125, pp. 8. New York, July 24, 1924) of the shining black *Dineutus longimanus* Olivier of Cuba.

The common coastal form, shining metallic, not black, *Dineutus metallicus* Aubé, was noted by Drs. Stahl and Gundlach, and has often been collected since, Don Julio having specimens from Cabezas de San Juan, Florida and Isabela.

Dineutus americanus Aubé, as identified by Mr. L. L. Buchanan, was collected in a pool near what is now Punta Borinquen Air Base by Dr. Luis

F. Martorell. The apex of its elytra is rounded, that of *D. longimanus* sharply angled.

Gyrinus rugifer Régimbart, originally described from Guadaloupe and later found in Dominica, has since been collected at Aibonito in Puerto Rico and at other places in the mountains, as well as by Don Julio at Bayamón, Florida and at Tortuguero Lagoon. It is the smallest of the whirligig beetles in Puerto Rico, only a fifth of an inch long, black with bluish and metallic reflections.

Catopidae

Dissochaetus portoricensis was described as a *Choleva* by Mr. M. H. Hatch in "Studies on the Leptodiridae (Catopidae), with description of a new species" (Jour. N. Y. Ent. Soc., 41 (1-2): 187-239, pl. 1. New York, 1933) from the type collected on El Yunque.

Limnebiidae

Uncounted millions of minute little yellowish beetles, determined by Dr. E. A. Schwarz as a species of *Ochthebius*, were flying about in the early morning of February 14th, 1913 at Santa Isabel, and Dr. Stuart T. Danforth in November 1930 made comparable collections at Cabo Rojo.

Ptiliidae

Despite the minute size of Ptiliid beetles, the intensive intercepting of Mr. R. G. Oakley at Ponce adds the record of *Acratrichis haldemanni* LeConte, as determined by Mr. H. S. Barber, on *Inga vera*, and this or other species on dung and in rotten cacao pods at Mayagüez to the Leng & Mutchler record of *Acratrichis atomaria* DeGeer.

Scydmaenidae

From both St. Thomas and Puerto Rico are recorded the very small, shining, oval, convex Scydmaenid beetles: *Euconnus amoenus* Reitter, *Euconnus coralinus* Reitter, *Euconnus tantillus* Reitter and *Euconnus testaceus* Schaum. Mr. R. G. Oakley intercepted one of these at Villalba.

Pselaphidae

Herr Edm. Reitter in "Beitrag zur Kenntniss der Clavigeriden, Pselaphiden und Scydmaeniden von Westindien" (Deutsche Ent. Zeitschr., 27 (1): 33-46. Berlin, 1883) describes as *Trimiopsis*: *Melba eggersi*, *Melba parmata* and *Melba ventricosa*, of which the types were collected in Puerto Rico.

M. Ch. Aubé in his "Revision de la Famille des Pselaphiens" (Ann. Soc.

Ent. France, 2 Serie, 2: 120. Paris, 1844) describes *Reichenbachia eucera* from the type collected in Puerto Rico.

Scaphidiidae

Mr. H. G. Barber determined a small beetle intercepted by Mr. R. G. Oakley in decaying wood at Añasco as a species of *Scaphosoma*.

Staphylinidae

Dr. Richard E. Blackwelder in his "Monograph of the West Indian Beetles of the Family Staphylinidae" (Bulletin No. 182, U. S. National Museum, pp. 658, fig. 3, maps 19, bibliography. Washington, D. C., 1943) records 103 Staphylinids from Puerto Rico, 3 from Vieques, one from Culebra and one from Mona. Prof. J. A. Ramos found a *Xantholinus* on fresh cow dung on Mona, and also "numerous small undetermined Staphylinids on fungi at Sardinera Beach". The Puerto Rican species are:

1. *Piestus penicillatus* (Dalman)
(as *erythropus* Erichson) Stahl IP & IB
Blackwelder 43-46: at Utuado and on El Yunque.
2. *Phloeonomus pedicularius* Erichson (as *Omalium*) 40-887: TYPE from Puerto Rico
(as *Omalium*) Leng & Mutchler IP & IB
Blackwelder 43-52: no new records from P.R.
(as sp.—det W. S. Fisher) larvae and adults on gummy exudate from aceitillo, *Zanthoxylum flavum*, at Guánica (148-40, 79-40).
3. *Carpelimus fulvipes* Erichson (as *Trogophloeus*) 40-804: TYPE from Puerto Rico
(as *Trogophloeus aequalis* J. Duval) Gundlach 93-100
(as *Trogophloeus*) Leng & Mutchler IP & IB
Blackwelder 43-62: from Isabela (WAH), Jayuya (Oakley), Bayamón (Mills), Maricao, Guanica and Cartagena Lagoon.
4. *Carpelimus correctus* Blackwelder 43-64: at Maricao.
5. *Carpelimus borinquensis* Blackwelder 43-70: TYPE from Maricao Insular Forest, others from El Yunque, P. R. (Darlington).
6. *Carpelimus danforthi* Blackwelder 43-71: TYPE from under rubbish on muddy bank of Guánica Lagoon, others at Ensenada, P. R.
7. *Carpelimus imitator* (Bierig)
Blackwelder 43-72: at Utuado (Busck), Jayuya (Oakley), Guánica (Darlington), Maricao and Mayagüez.
8. *Carpelimus aridus* (DuVal)
(as *Trogophloeus*) Gundlach IP & IB
Blackwelder 43-73: at Guánica.
9. *Carpelimus petomus* Blackwelder 43-76: at Guánica, P. R., and from Vieques Id. (Leonard).
10. *Carpelimus flavipes* (Erichson)
Blackwelder 43-77: at Guánica and Mayagüez, P. R.

11. *Carpelimus scrobiger* (Cameron)
Blackwelder 43-76: from Vieques Id. (Busck), and at Aguadilla and Utuado, P. R. (Busck).
12. *Oxytelus insignitus* Gravenhorst
Blackwelder 43-92: at Aguadilla (Busck), Ponce (Dozier), Matrullas, Maricao, Villalba, Mayagüez and San Juan, P. R.
13. *Oxytelus incisus* Motschulsky
Blackwelder 43-96: at sixteen Puerto Rican localities.
14. *Oxytelus eremus* Blackwelder 43-98: TYPE from Guanajibo (Mayaguez), Puerto Rico (Dozier).
15. *Oxytelus scorpio* Fauvel
Blackwelder 43-99: at Maricao.
16. *Thinobius nitidulus* Bernhauer
Blackwelder 43-109: on El Yunque (Darlington).
17. *Platystethus spiculus* Erichson
Blackwelder 43-110: at Ponce (Dozier), Hormigueros, Humacao and San Juan, P. R.
18. *Bledius beattyi* Blackwelder 43-117: from Vieques Id. (Leonard).
19. *Pseudolispinodes danforthi* Blackwelder 43-125: TYPE from under bark of rotting logs at Mayagüez, P. R.
20. *Pseudolispinodes tenellus* Erichson (as *Lispinus*) 40-830: TYPE from St. John and Puerto Rico.
Blackwelder 43-126: on El Yunque.
21. *Lispinus laticollis* Erichson
Fauvel 63-442. Leng & Mutchler IP & IB
Blackwelder 43-131: no new P. R. records.
22. *Lispinus attenuatus* Erichson 40-828: TYPE from Puerto Rico.
Leng & Mutchler IP & IB
Blackwelder 43-134: on El Yunque (Darlington) and at Mayagüez.
23. *Lispinus insularis* Fauvel
Blackwelder 43-136: at Fajardo (Busck).
24. *Espeson moratum* Schaufuss
Blackwelder 43-146: on El Yunque (Darlington).
25. *Thoracophorus simplex* Wendeler
Blackwelder 43-149: at Adjuntas and Mayagüez.
26. *Thoracophorus brevicristatus* (Horn)
Blackwelder 43-150: at Mayaguez.
27. *Thoracophorus guadalupensis* Cameron
Blackwelder 43-151: at Mayaguez.
28. *Thoracophorus denticollis* Erichson (as *Glyptoma*) 40-910: TYPE from Puerto Rico.
Leng & Mutchler IP & IB
Blackwelder 43-154: no new records from Puerto Rico.
29. *Paralispinus exiguus* Erichson (as *Lispinus*) 40-830: TYPE from Puerto Rico.
(as *Ancaeus*) Leng & Mutchler IP & IB
Blackwelder 43-158: at Mayaguez.
30. *Paralispinus crepusculus* Blackwelder 43-160: at Fajardo (Busck).
31. *Paralispinus punctatus* Blackwelder 43-161: TYPE from El Yunque, Puerto Rico (Darlington).

32. *Neotrochus cylindrus* Erichson (as *Holotrochus*) 40-758: TYPE from Puerto Rico.
(as *Holotrochus*) Leng & Mutchler, IP & IB
Blackwelder 43-167: no new records from Puerto Rico.
33. *Holotrochus volutus* Erichson 40-753: TYPE from Puerto Rico.
Blackwelder 43-171: from El Yunque (Darlington), and at Ponce and Adjuntas (Oakley). in dung
(as sp.) in rotten wood at Mayagüez (I. No 6361), at Añasco (I No 6238).
34. *Mimogonus fumator* (Fauvel)
Blackwelder 43-172: at Lajas (Dozier) and at Juana Díaz (Oakley), also intercepted at New York in soil from Puerto Rico.
35. *Osorius laeviceps* Notman, Howard, "A synoptic Review of the Beetles of the Tribe Osoriini from the Western Hemisphere." Proc. U. S. Nat. Museum, 67 (11): 1-26. Washington, D. C., 1925: TYPE from San Juan, Puerto Rico.
Blackwelder 43-195: from El Yunque (Darlington), and at Adjuntas, Maricao and Mayagüez.
36. *Osorius eggersi* Bernhauer
Blackwelder 43-196: one record from Puerto Rico.
37. *Lithocharis sororcula* Kraatz
Blackwelder 43-241: at Lajas and Boquerón (Dozier), San Juan and Salinas
38. *Lithocharis ochracea* (Gravenhorst)
Gundlach IP & IB
Blackwelder 43-242: at Lajas, Guánica and Ponce (Dozier), at San Juan and Salinas.
39. *Lithocharis secunda* Blackwelder 43-244: at Salinas.
40. *Lithocharis volans* Blackwelder 43-245: at Salinas.
41. *Lithocharis limbata* Erichson
Blackwelder 43-246: at Villalba, Mayagüez and San Juan.
42. *Lithocharis dorsalis* Erichson 40-616: TYPE from Puerto Rico.
Leng & Mutchler. IP & IB
Blackwelder 43-247: at San Germán (Dozier), at Villalba, Maricao and Adjuntas.
43. *Lithocharis posticata* Erichson 40-619: TYPE from Puerto Rico.
Leng & Mutchler. IP & IB Blackwelder 43-249: no new record.
44. *Aderocharis suturalis* Blackwelder 43-254: TYPE from horse manure and flying at dusk near Villalba, Puerto Rico, others from Ensenada (Dozier) and Adjuntas.
45. *Stilomedon audanti* Blackwelder 43-258: At Ponce, P. R. (Dozier).
46. *Sunius oakleyi* Blackwelder 43-261: TYPE from rotten stump at Adjuntas, Puerto Rico, others from Maricao Insular Forest and on El Yunque (Darlington).
47. *Scopaeus fasciatellus* Erichson 40-609: TYPE from Puerto Rico.
Leng & Mutchler IP & IB Blackwelder 43-283: at Ciales.
48. *Scopaeus antennalis* Cameron
Blackwelder 43-284: at Jayuya (Oakley).
49. *Scopaeus pygmaeus* Erichson 40-608: TYPE from Puerto Rico.
Leng & Mutchler IP & IB
Blackwelder 43-287: at Jayuya (Oakley) and at Guánica.

50. *Rugilus chthonus* Blackwelder 43-304: TYPE from dead leaves at Villalba, Puerto Rico.
51. *Lathrobium subterraneum* Blackwelder 43-311: TYPE from ground cover at El Yunque, Puerto Rico (Darlington).
52. *Lobrathium borinquense* Blackwelder 43-319: TYPE in ground cover at El Yunque, Puerto Rico (Darlington).
53. *Homoeotarsus albipes* (Erichson) 40-566 (as *Cryptobium*): TYPE from Puerto Rico.
(as *Cryptobium*) Leng & Mutchler IP & IB
Blackwelder 43-328: at Bayamón (Lesesnes).
54. *Bicrypta fulvipes* (Erichson) 40-566 (as *Cryptobium*): TYPE from Puerto Rico.
(as *Cryptobium*) Leng & Mutchler IP & IB
Blackwelder 43-337: on El Yunque and in Maricao Insular Forest (Darlington), and at Villalba, from damp leaves.
55. *Stilosaurus lineatus* Blackwelder 43-349: TYPE from El Yunque, Puerto Rico (Darlington).
56. *Stannoderus labeo* (Erichson)
Blackwelder 43-352: on El Yunque (Darlington) and at Villalba.
57. *Stiliphacis exigua* (Erichson) (as *Sunius exiguus*) 40-647: TYPE from Puerto Rico.
(as *Stilicopsis*) Leng & Mutchler IP & IB: on cucumbers at Jayuya, (I No 3785 det. as "sp." E. A. Chapin).
Blackwelder 43-356: no new record from Puerto Rico.
58. *Pinophilus danforthi* Blackwelder 43-378: TYPE from Humacao, Puerto Rico (Miguel A. Díaz).
59. *Pinophilus bierigi* Blackwelder 43-382: TYPE from Mayagüez, Puerto Rico (A. Suro).
60. *Pinophilus flavipes* Erichson 40-674: TYPE from Puerto Rico.
Leng & Mutchler. IP & IB Danforth: at Humacao xi-30 det. Mutchler.
Blackwelder 43-383: no new records from Puerto Rico.
Pinophilus latipes Gravenhorst/Gundlach Stahl IP & IB
61. *Palaminus bifidus* Notman 29-14: TYPE from El Yunque, others from Aibonito and Adjuntas, P. R. IB Blackwelder 43-389: no new record.
62. *Palaminus grandicollis* Notman 29-16: TYPE from Aibonito, other from Adjuntas, P. R.
IB Blackwelder 43-390: no new record.
63. *Palaminus insularis* Cameron
Notman 29-17: at Aibonito. IB Blackwelder 43-390: no new record.
64. *Palaminus lengi* Notman, Howard, "New Species of *Palaminus* from the West Indies, together with a Synoptic Review of the Genus." Amer. Museum Novitates No. 386, pp. 17. New York, November 27, 1929: TYPE from Adjuntas, P. R.
Blackwelder 43-391: at Mayagüez (Dozier) and Adjuntas (Oakley).
65. *Palaminus parvipennis* Notman 29-14: TYPE from El Yunque, P. R., others from Loíza.
Blackwelder 43-391: from Mayagüez (Dozier) and Villalba.
66. *Palaminus procerus* Notman 29-16: TYPE from Aibonito, P. R.
IB Blackwelder 43-392: from Maricao (Morrison).

67. *Palaminus pusillus* Notman 29-15: TYPE from El Yunque, P. R.
IB Blackwelder 43-392: "only the unique type."
68. *Palaminus scitulus* Notman 29-15: TYPE from Aibonito, P. R.
IB Blackwelder 43-392: "only the two types."
69. *Palaminus variabilis* Erichson 40-633: TYPE from Colombia, Puerto Rico and St. Thomas.
Blackwelder 43-393: no new records from Puerto Rico.
70. *Paederomimus lustralis* (Erichson) (as *Philonthus*) 40-489: TYPE from Puerto Rico.
Leng & Mutchler IP & IB Blackwelder 43-398: no new records.
71. *Philonthus hepaticus* Erichson
Blackwelder 43-401: at Guánica (Smyth), at Lajas and Hormigueros (Dozier), and at Maricao, Adjuntas and San Juan.
common in and under both stale and fresh cow droppings, at Guánica (545-13).
72. *Philonthus thermanum* Aubé
Blackwelder 43-403: at Lajas, Guánica, Sabana Grande and Boquerón (Dozier), and at Maricao.
73. *Philonthus ventralis* (Gravenhorst)
Blackwelder 43-404: at Lajas, Ensenada and Juana Díaz (Dozier), from Culebra Id. (Busck), and at Guánica, Cartagena Lagoon, Adjuntas, Humacao, Mameyes and San Juan in Puerto Rico.
74. *Philonthus discoideus* (Gravenhorst)
Blackwelder 43-407: at San Juan.
75. *Philonthus figulus* Erichson
Blackwelder 43-409: at Maricao.
76. *Philonthus longicornis* Stephens
Blackwelder 43-410: at Lajas (Dozier).
77. *Philonthus havaniensis* (Laporte)
(as *P. trepidus*) Erichson 40-489: TYPE from Puerto Rico and St. John.
Leng & Mutchler IP & IB
Blackwelder 43-418: at Guánica, Maricao and Mayagüez.
- Philonthus alumnus* Erichson
Leng & Mutchler IP & IB IB Sup-85: (as "Sp.") in cacao pods at Mayaguez (I No. 6370), and in guavas (I No. 6381); at light at Palo Saco (I No. 6564).
78. *Belonuchus oakleyi* Blackwelder 43-422: TYPE "in a mass of rotting fruit" at the base of an imported palmlike tree at Mayagüez, Puerto Rico.
79. *Belonuchus gagates* Erichson 40-424: TYPE from Puerto Rico.
Leng & Mutchler IP & IB: on orange fruit at Ponce (I No. 2659).
Blackwelder 43-424: at Bayamón (Busck), Juana Díaz, Ensenada and Mayaguez (Dozier), and at Maricao, Mayagüez, San Juan and on El Yunque.
80. *Belonuchus danforthi* Blackwelder 43-429: TYPE from rotting guava fruit at Maricao, Puerto Rico.
81. *Cafius subtilis* Cameron
Blackwelder 43-436: at San Juan under seaweed and drift on sandy beaches.

82. *Cafius caribeanus* Bierig
Blackwelder 43-437: at San Juan and Humacao under seaweed.
83. *Cafius bistriatus* (Erichson)
Blackwelder 43-438: at San Juan under seaweed, and from Mona Id. (Hoffman).
84. *Erichsonius humilis* Erichson 40-512 (as *Philonthus*): TYPE from Puerto Rico.
Leng & Mutchler IP & IB
Blackwelder 43-441: at Jayuya (Oakley).
85. *Diochus nanus* Erichson
Blackwelder 43-455: at Maricao.
86. *Holius debilis* Erichson
Blackwelder 43-461: on El Yunque.
87. *Holius guildingii* Erichson
Blackwelder 43-462: at Mayagüez and on El Yunque.
88. *Atanygnathus laticollis* (Erichson)
Blackwelder 43-472: at Mayaguez.
89. *Xantholinus oakleyi* Blackwelder 43-476: TYPE in dung and manure, 13 miles east of Maricao, other from Villalba.
90. *Xantholinus attenuatus* Erichson 39-330: TYPE from St. Thomas and Puerto Rico.
Leng & Mutchler Merrill 15-54: in fresh cow dung.
(as sp.) Wolcott 24-17, 29: eaten by *Anolis pulchellus* and *A. cristatellus*.
Blackwelder 43-478: twenty-three records from Puerto Rico.
at Guánica (545-13 det. E. A. Schwarz, confirmed R. E. Blackwelder).
91. *Xantholinus humeralis* Erichson
Blackwelder 43-479: at San Germán (Dozier) and Maricao.
92. *Xantholinus illucens* Erichson
Blackwelder 43-488: at thirteen Puerto Rican localities.
93. *Leptacinus parumpunctatus* (Gyllenhal)
Blackwelder 43-494: at Lajas and Yauco (Dozier).
94. *Leucoparyphus silphoides* (Linnaeus)
Blackwelder 43-510: at Salinas.
95. *Coproporus apicalis* (Erichson) 39-250 (as *Tachinus*): TYPE from Puerto Rico.
(as *Erchomus apicalis*) Leng & Mutchler IP & IB
Blackwelder 43-514: no new records from Puerto Rico.
96. *Coproporus hepaticus* (Erichson)
(as *Cilea*) Leng & Mutchler IP & IB
Blackwelder 43-514: at Cayey (Cotton), Bayamon (Lesesne), and San Juan.
under bark of decaying bucare trees at Cayey (307-17 det. R. E. Blackwelder).
97. *Coproporus flavicollis* Scriba
(as *Tachinus nitidulus*) Erichson 39-247: TYPE from Puerto Rico.
(as *Erchomus nitidulus*) Leng & Mutchler IP & IB
Blackwelder 43-518: no new record from Puerto Rico.

98. *Coproporus ebonus* Blackwelder
(as *Tachinus piceus*) Erichson 39-246, 250: TYPE from Puerto Rico.
(as *Erchomus piceus*) Leng & Mutchler IP & IB
Blackwelder 43-519: at Adjuntas.
99. *Coproporus pulchellus* (Erichson) 39-247 (as *Tachinus*): TYPE from Puerto Rico.
(as *Cilea*) Leng & Mutchler IP & IB
Blackwelder 43-520: no new Puerto Rican record.
in guavas at Mayaguez (I No. 6383 det. E. A. Chapin).
100. *Coproporus rutilus* (Erichson) 39-522 (as *Tachinus*): TYPE from Puerto Rico.
(as *Cilea*) and (as *Coproporus terminalis* Erichson), not in synonymy
Leng & Mutchler IP & IB
Blackwelder 43-522: at Ponce (Oakley).
101. *Conosomus interruptus* (Erichson)
Blackwelder 43-525: on El Yunque (Darlington).
102. *Bryoporus obscurus* (Erichson) 39-272 (as *Bolitobius*): TYPE from Puerto Rico.
(as *Bolitobius*) Leng & Mutchler IP & IB
Blackwelder 43-529: no new record from Puerto Rico.
Gyrophæna sp.—det. E. A. Schwarz
IP & IB: common on a fungus, *Daedalea amanitoides* (1221-13).
at Mayagüez (I No. 6371); in cacao pods at Mayagüez (I No. 6378).
103. *Atheta decipula* (Erichson) 39-119 (as *Homalota*): TYPE from Puerto Rico.
Blackwelder 43-551: no new record.
104. *Atheta melanura* Erichson 39-117 (as *Homalota*): TYPE from Puerto Rico.
Blackwelder 43-553: no new record.
105. *Hoplandria terminata* Erichson 39-130 (as *Homalota*): TYPE from Puerto Rico.
Leng & Mutchler IP & IB
Blackwelder 43-557: no new record.
106. *Phloeopora religata* (Erichson) 39-79: TYPE from Puerto Rico.
Blackwelder 43-558: no new record.
Aleochara sp. nov.—det. E. A. Schwarz
in cow dung at Guanica (GBM).

Hydrophilidae: Water Scavenger Beetles

Hydrochus pallipes Chevrolat, listed by Dr. Gundlach and found by Dr. Wetmore to have been eaten by the tody, has not since been collected.

The dark brown *Berosus interstitialis* Knisch (= *B. tessellatus* F. & S.) and the light brown, spotted, 5.0 mm. long *Berosus guadeloupensis* Fletiaux & Sallé, Dr. Wetmore found eaten not only by the tody, but also by the cliff swallow, the blue heron and sandpipers. The former is presumably somewhat more abundant, as Dr. Danforth has specimens from Cartagena Lagoon, Cabo Rojo, Añasco, Coamo and Tortuguero; Dr. A. E. Pritchard from the swamps near Santa Isabel, and Prof. J. A. Ramos from Mona Island. Don Julio reports both species of the latter, as identified by Mr.

A. J. Mutchler, of which large numbers were found in the pools at Isabela, Dr. Danforth had specimens from Mayaguez and Rio Piedras.

The smooth, shining, oval, black *Tropisternus lateralis* F. (= *T. nimbatus* Say), 8.5 mm. long, its thorax and elytra narrowly margined with yellow, was listed by Drs. Gundlach and Stahl, and found by Dr. Wetmore to form part of the food of the little blue heron. Many collections were made by Dr. Danforth; Dr. Pritchard found it in the swamps around Santa Isabel, and it is listed by Don Julio, whose collection contains hundreds of specimens: from chacras at Isabela, from Guánica and Cartagena Lagoons and those at Las Cabezas de San Juan. It occurs not only on Culebra and Mona Islands, but also in the most of the other Antilles, and continentally from New York to the Argentine.

Tropisternus chalybeus Castelnau, as identified by Mr. W. S. Fisher, is represented by a single specimen collected at light at San Juan.

Tropisternus collaris F., with striped elytra, was listed by Drs. Gundlach and Stahl. Dr. H. L. Van Volkenberg, while working as Parasitologist at the Mayagüez Station in 1930 and 1931, discovered that this beetle was the host of a tapeworm cysticercoid, and of the thorny-headed worm, *Macracanthorhynchus hirudinaceus*, of swine. It is a common aquatic beetle in Puerto Rico, collected at many points by Dr. Danforth and Don Julio, but present also in the other Antilles and continentally from Mexico to the Argentine.

Neohydrophilus medius Brullé (= *N. tenebrioides* DuVal) and *Neohydrophilus phallicus* d'Orchymont are similar, smooth, shining black beetles, averaging five-eighths of an inch in length. Drs. Gundlach and Stahl reported the former as a *Hydrous*, and Dr. Wetmore found them eaten by the little blue heron. Individuals fly to lights, but most collections have been made in lagoons, pools or streams. One species, presumably the former, has two punctures on the prothorax; that of the other is impunctate.

Largest of all the Hydrophilidae is *Hydrophilus insularis* Castelnau, almost an inch and a half in length, equaling in length *Megadytes gigantea* Castelnau, but considerably slimmer, and with even more highly polished black elytra. Not especially abundant, it was listed by Drs. Gundlach and Stahl, and is found on Mona as well as in most of the Antilles and continentally from Texas to the Argentine.

Much more abundant and decidedly smaller, but otherwise similar in appearance, is *Hydrophilus ater* Olivier, a continental form, of which the subspecies *intermedius* DuVal only is found in the Antilles. Dr. Wetmore notes that it had been eaten by the little blue heron, and Mrs. Raquel Dexter, by the introduced toad. Leng & Mutchler report it from Culebra

Island as a *Stethorus*, and it has also been identified as a *Hydrous*, but Drs. Stahl and Gundlach list it under the at present preferred name.

Mr. Hugh B. Leech identifies as *Helochares rufobrunneus* Balfour-Browne "a plain dark brown beetle, like a large *Enochrus*; 7.0 mm. long; no elytral striae and virtually impunctate", of which numerous adults came to light at Río Piedras on May 20th, 1943. It has not been previously reported from Puerto Rico.

As *Philhydrus melanocephalus* F., Dr. Gundlach reports what is presumably the little brown, 3.0 mm. long *Enochrus ochraceus* Melsheimer, of which Don Julio's collection contains specimens from the streams on El Yunque and hundreds from Cartagena Lagoon. Or, it may refer to the much more common *Enochrus nebulosus* Say, of which Dr. Danforth has specimens from all parts of the Island, and Prof. J. A. Ramos (1947-32) many from Mona. Dr. Wetmore reports these beetles as being eaten by the killdeer.

Phaenonotum estriatum Say is a very convex, small, shining, dark reddish-brown beetle, 3.0 mm. long, sometimes coming to light, and in the field found in abundance in cane trash, and also in decaying fig fruits. As it was noted as an item in the food of the crested and the small yellow grass lizards, presumably it is in reality much more abundant than the scarcity of collection records would indicate.

Dactylosternum flavicorne Mulsant is listed by Drs. Stahl and Gundlach as a *Cyclonotum*. Leng & Mutchler list *Dactylosternum advectum* Horn, and Mr. A. J. Mutchler identified for Dr. Danforth numerous specimens of *Dactylosternum picicorne* Mulsant from Yabucoa, Ponce, Luquillo, Río Piedras and Mayagüez.

Dactylosternum abdominale F. is apparently the common species in Puerto Rico: 4.0 mm. long, and almost as broad, a reddish-brown to almost black beetle with very marked elytral striae. It is an item in the food of the lizards in the mountains, where it occurs under the bark of trees, in decaying figs, in decaying cacao pods and in the trash of banana plants.

In the course of his fresh water insect survey, Don Julio García-Díaz collected *Phaenotypus palmarum* Schwarz, and also *Paracymus subcupreus* Say, both identified by Mr. A. J. Mutchler, the latter with some doubt, all specimens being retained by him. Both are new records for Puerto Rico.

Dr. Wetmore reports a species of *Cercyon* eaten by a cliff swallow, and Prof. J. A. Ramos found one at light on Mona Island. Recent interceptions made in dung at Adjuntas and in rotten cacao pods at Mayagüez have been re-identified as species of *Pelosoma* not *Oösternum costatum* Sharp, as previously reported.

Monoedidae

Mr. W. S. Fisher identified as a species of *Monoedus* a small beetle intercepted by Mr. R. G. Oakley on chinaberry tree at Adjuntas.

Histeridae: Hister Beetles

The small, hard, black shining Hister beetles, usually tending to be round and flattened, are supposed to have derived their name from the Latin word *histrion*, meaning clown or mimic. The best known member in Puerto Rico is an introduced East Indian species, *Plaesius javanus* Erichson, which is predaceous on the immature stages of the banana corm weevil, *Cosmopolites sordida* Germar. In captivity in Puerto Rico, the adult Histerids fed on both larvae and pupae of the introduced pest of bananas, but no trace has since been found to indicate that any survived of those released in a banana grove at Adjuntas.

Including its prominent projecting jaws, *Hololepta 4-dentatum* F. is 11.0 mm. long, making it possibly the largest local Histerid in Puerto Rico. Hardly half the abdomen is covered by the transversely truncate elytra, which have basally two lateral striae. Dr. Richard T. Cotton found it abundant under the bark of dead bucare trees at Cayey, and it has since been collected at Mayagüez. As *Lioderma ruptistriata* Marseul, Dr. Gundlach listed *Hololepta interruptum* Marseul, a somewhat smaller but brightly polished species, which Dr. Cotton collected under the bark of bucare trees, and also in grapefruit groves.

Of *Acritus analis* Leconte, Dr. Gundlach writes, "muy pequeña (no pasa de 1.0 mm. en longitud)". It has since been identified by Dr. E. A. Schwarz from specimens found in cow dung at Guánica.

Carcinops dominicana Marseul is a small metallic green beetle, collected by Dr. R. T. Cotton under bark of bucare trees at Cayey. *Carcinops troglodytes* Paykull, listed by Dr. Gundlach, has not since been found locally.

Prof. J. A. Ramos (1947-32) reports collecting on dead birds on Sardinera Beach, Mona Island, "numerous small, black, shining undetermined histerids", which have since been identified by Mr. H. S. Barber as species of *Saprinus*.

Types of *Epierus antillarum*, collected in Puerto Rico, Hispaniola and Cuba were described by S. A. de Marseul in his "Essai Monographique sur la Famille des Histerides" (Ann. Soc. Ent. France, Series 3, 2: 671-707. Paris, 1854), in which is listed his *Epierus waterhousei* from Puerto Rico.

From material sent him by Dr. Gundlach, M. de Marseul named after Herr Leopoldo Krug what most unfortunately was mis-spelled *Omalodes klugi*: a large, almost circular Histerid, repeatedly collected since in the mountains back of Mayagüez by Dr. Danforth and his students, dozens being found in decaying bananas at Maricao. Prof. J. A. Ramos has a single specimen from Mona Island. Other specimens of what may be the same species, some of which were identified by Dr. E. A. Schwarz as *Omalodes ruficlavus* Marseul have been found under bark of decaying

bucare trees at Cayey, in coffee groves at Villalba and at El Verde (Río Grande), in grapefruit grove at Manatí, and in flight or at light at Guánica and Salinas. They vary in size from 6.0 to 8.0 mm. long, usually so highly polished that they look as tho they might be sticky to touch.

The elytra of beetles belonging to the genus *Hister* normally have nine striae. Mr. H. S. Barber has identified as *Hister confinis* Erichson, 3.0 mm. long, and as *Hister coenosus* Erichson, 5.0 mm. long, the less shiny beetles collected in dung in numerous localities of Puerto Rico.

Lucanidae: Stag Beetles

Paxillus pentaphyllus Palisot de Beauvois, an inch long, and quarter of an inch wide, is a flattened, reddish-brown to black beetle, with stout antennae, the outer segments of which are "leaf-like, but not capable of being opposed or folded together into a compact club,—therefore pectinate, or comb-toothed, rather than lamellate" according to Blatchley. It occurs most often in the mountains, the larvae living in rotten wood, all sizes being found, together with adults, in logs that have reached just the right stage of decay. This was one of the insects first noted in Puerto Rico, by the Botanist Ledru in 1780.

Ledru also listed as *Passalus dentatus* Fabricius what is now called *Paxillus puncticollis* Serville, another member of the family later collected by Dr. Gundlach in the western end of the Island.

Paxillus crenatus MacLeay is smaller and more convex, with similar habits and habitat, but present also in the Luquillo Mountains.

Scarabaeidae: Lamellicorn Beetles

Despite several attempts to introduce and establish coprophagid or dung-rolling beetles, to dispose promptly of fresh cow dung so that it would not serve as host for horn-fly larvae, no representative of any of the introduced species has been found here since release. Shortly after the establishment of the Sugar Producers' Experiment Station at Río Piedras, Mr. J. D. Mitchell of Victoria, Texas, sent 275 adult beetles, of which 146 arrived in Porto Rico alive, of three species: *Canthon ebenus* Say, *Canthon laevis* Drury and (what is now known as) *Ateuchus lecontei* (Harold) (originally identified as a *Choeridium* by Dr. W. Dwight Pierce). About a hundred beetles of *Canthon violaceus* Olivier were brought from Santo Domingo by G. B. Merrill, and 8 adults of *Copris carolina* Linn. were sent by the writer from Randolph, Illinois. These beetles were kept in large outdoor screen cages at Guánica, supplied with fresh cow dung daily and they multiplied rapidly in confinement. When the cages became crowded, a liberation of 100 adults at a time would be made. Although the condi-

tions seemed favorable for these beetles, especially those from south Texas and southern Santo Domingo, yet none was noticed in the field after their release, and it is doubtful if any became permanently established in Puerto Rico" ("Insect Parasite Introduction in Porto Rico", Jour. Dept. Agr. P. R., 6 (1): 5-20, fig. 7. San Juan, October 1922). Many years later, additional attempts at establishing dung-beetles from Santo Domingo were made by Dr. H. L. Dozier at Mayagüez, with the same lack of success.

Despite failure of coprophagid beetles from a similar xerophytic environment to become established in southwestern Puerto Rico, native species do occur on the Island, but apparently only in the mountains. Mr. R. G. Oakley, a very keen collector of hitherto unknown insects, when stationed at Ponce as representative of the Federal Horticultural Board, found five new species of such beetles, one of which Dr. Chapin named after him. Ragged by other Plant Quarantine Inspectors stationed at that time in Puerto Rico about having a dung-beetle bearing his name, he requested Dr. Chapin to name the next one he found after one of his tormentors. Unfortunately, the scheme somewhat misfired, as Oakley referred to C. G. Anderson only by his nickname: "Andy", therefore the beetle is *Canthochilum andyi*.

Canthonella parva, described by Dr. E. A. Chapin as the sole known representative of "*Canthonella*, a new Genus of Scarabaeidae (Coleoptera)" (American Museum Novitates No. 409, pp. 2. New York, March 18, 1930), with the type from Coamo Springs, others from Adjuntas, is characterized as being "almost blue-black, the pale spot on the elytron . . . humeral, and the pronotum . . . strongly, densely and moderately coarsely punctate. Length 3.0 mm." Prof. J. A. Ramos has found it under dead leaves in the Maricao Forest.

The type of *Canthochilum oakleyi*, described by Dr. E. A. Chapin as representing "A New Genus and Species of Dung-Inhabiting Scarabaeidae from Puerto Rico, with Notes on the Coprinae in the Greater Antilles (Coleoptera)" (Proc. Biological Soc. Washington, 47: 99-101. Washington, D. C., June 13, 1934), was found under dung at Adjuntas, others at Aibonito and in the mountains north of Yauco.

The type of *Canthochilum andyi* Chapin ("New Species of Scarabaeidae (Coleoptera) from Puerto Rico and the Virgin Islands" Jour. Agr. Univ. P. R., 19 (2): 67-71. San Juan, October 15, 1935), from Matrullas Dam, near Orocovis, was found under dung, and that of *Canthochilum hispidum* Chapin (1935-67) was from Villalba. The former is piceous to deep black, 5.55 mm. long, the latter with a vestiture of capitate hair and "almost completely covered with a layer of dirt most difficult to remove." Specimens of *Canthochilum histeroideis* Harold were intercepted by Mr. R. G.

Oakley at the Pietri finca, Adjuntas, and at Werscheling finca, Ponce, all in or under dung. It is doubtful if any of these is large enough, or occurs in sufficient numbers to be of any appreciable economic importance.

Saprosites *blackwelderi*, described by Dr. E. A. Chapin (1940-11), the type from rotten wood at Mayagüez, others from Añasco, is 3.0 mm. long, "moderately convex-cylindrical, pronotum slightly wider than elytra at base; castaneous with margins of pronotum and elytra darker."

In xerophytic Puerto Rico, the beetles which are very abundant and notably active in tunneling thru and aerating fresh cow-dung are the oval, shining, yellowish-brown *Aphodius lividus* Olivier, characterized by prothorax and elytra laterally margined by lighter yellowish-brown. This cosmopolitan beetle occurs in all parts of the Island, even the most humid, and in the absence of fresh cow dung may be found living under filter-press cake or "cachaza" from the sugar Centrals. Not recorded by Dr. Gundlach, it may be presumed to have been introduced rather recently thru the agency of commerce in importing live domestic animals from the United States. Dr. Chapin states that "to judge from the fact that *Aphodius lividus* (Olivier) is now generally established from the northern United States to the South Sea Islands, and completely around the world in the tropics and subtropics, climate will play a minor role among the distributional factors." Even at the time that Dr. Wetmore was making his studies on the food of birds in Puerto Rico, it presumably was not common here, for he reports finding it only amid the stomach contents of the ani.

Less abundant in Puerto Rico, smaller and entirely light brown is *Aphodius cuniculus* Chevrolat (= *A. guadeloupensis* F. & S.), specifically recorded from Vieques and the larger Virgin Islands, and noted as "common at light" on Mona Island by Prof. J. A. Ramos, it occurs widely from Mexico to Central America. Some species of *Aphodius* was indicated by Mr. J. A. Stevenson (1915-20) as being attacked by the Green Muscardine fungus, *Metarrhizium anisopliae*. The record of *Aphodius granarius* Linn. from Puerto Rico, recorded by Mr. G. B. Merrill (1915-54) as found in cow manure, is in error, as is also that of this species being eaten by the little grass lizard, *Anolis pulchellus*, altho other species are eaten by these lizards.

In any extensive collection of the beetles found tunneling thru fresh cow dung in Puerto Rico, usually about half are the light yellowish-brown *Aphodius lividus* Olivier, but most of the remainder are a large black species of *Ataenius*, 4.7 to 5.5 mm. long, previously called *Ataenius cognatus* LeConte. Subsequently re-described as *Ataenius darlingtoni* Hinton (1937) from Puerto Rico and St. Croix, it is now considered the "equal of *salvator* Fall (1930), described from Florida. This synonymy was published by Cartwright in Bulletin of the Brooklyn Entomological Society

40: 47 (1945)," according to Dr. E. A. Chapin. Prof. J. A. Ramos found a single specimen of *Ataenius salutator* Fall at light on Mona Island.

Equally large, or larger, and also black is *Ataenius stercorator* F., under which name are recorded the finding by Dr. Wetmore of this and or other species of *Ataenius* beetles eaten by the killdeer, the ani, the owl, the mockingbird and the vireo. Mrs. Raquel Dexter found these beetles eaten by the imported toad, and they have also been found in the stomach of the crested lizard, *Anolis cristatellus*. The animal Parasitologist at the Mayagüez Station, Dr. H. L. Van Volkenberg, found this beetle to be the host of a tapeworm cysticeroid, as was reported more at length by Mr. M. F. Jones & J. E. Alicate in the "Development and Morphology of the Cestode, *Hymenolepis cantianiana*, in Coleopterous and Avian Hosts" (Jour. Washington Academy of Sciences, 25 (5): 237-247. Washington, D. C., May 15, 1935). Dr. Gundlach lists this and the Cuban *rhyticephalus* Chevrolat, as species of *Auperia*, from Puerto Rico.

Dr. E. A. Chapin in "A Revision of the West Indian Beetles of the Scarabaeid Subfamily Aphodiinae" (Proc. U. S. National Museum, 89 (3092): 1-41. Washington, D. C., May 23, 1940) describes *Ataenius beattyi*, 3.5 to 4.0 mm. long, as "sooty black, anterior margins of head and prothorax and legs castaneous," from the Virgin Islands and Barbados. Prof. J. A. Ramos (1947-41) found it on Mona Island.

Dr. E. A. Chapin having examined 1,714 specimens, describes his *Ataenius luteomargo* (1940-36) as "piceous, margins of head and pronotum indefinitely paler, outer two intervals and apices of elytra yellowish to brownish yellow" from Dominica and others of the Lesser Antilles, and present in Puerto Rico, Hispaniola and Jamaica. Previous mis-identifications as *Ataenius terminalis* Chevrolat, which occurs only in Cuba and Jamaica, presumably refer to *luteomargo* in Puerto Rico and the Lesser Antilles.

Under the name *Ataenius gracilis* Melsheimer, Dr. Wetmore records the consumption of Aphodiinid beetles by the green heron and the tody. This slender black species has since been collected from all parts of Puerto Rico as well as from Vieques, having first been listed by Drs. Stahl and Gundlach as *Psammodyus gracilis* Jacq. Duval, the latter noting "viene por las noches a las velas de las casas."

The other species of *Ataenius* at present listed as found in Puerto Rico are:

- edwardsi Chapin, from Puerto Rico and St. Croix,
- frater Arrow, from Puerto Rico and the Virgin Islands,
- haroldi Steinheil,
- imbricatus Melsheimer, from Puerto Rico and St. Croix,
- liogaster Bates ?,

miamii Cartwright, from Mona Island (Ramos 1947-41), strigicauda Bates, from Puerto Rico and Virgin Islands, tenebrosus Arrow, from Puerto Rico and Vieques, versicolor Schmidt, and vincentiae Arrow.

Psammodius bidens Horn is rare, only one recent collection having been made on the beach at Humacao by Dr. R. E. Blackwelder.

The dull, dirty, yellowish-brown *Trox suberosa* Fabricius is a scant half inch long, a tropicosmopolitan species, noted by Drs. Stahl and Gundlach under the name of *Trox crenatus* Olivier. Mr. C. T. Murphy, of Guánica Centrale, was presumably in error in thinking that it was responsible for damage to sugar-cane that he noted, as it is normally a scavenger, and has been found at Río Piedras under a dead rat. Despite its filthy habits, it is eaten by the none too particular *Bufo marinus*, which it almost exactly matches in color and texture of integument. Possibly most of the beetles collected have been picked up under light. Prof. J. A. Ramos found one on Mona Island, at light.

The introduction of the giant Surinam toad, *Bufo marinus* (L.), has made a greater change in the bulk and composition by bulk of the insect population of Puerto Rico than any other single factor since the clearing of the native forest from the more level portions of the Island in the immediately post-Colombian period. In the cane fields which ever increasingly came to occupy the greater part of the more fertile vegas of Puerto Rico, especially and with increasing rapidity after the occupation by troops of the U. S. Army in the Spanish-American war, a population of native species of white grubs feeding on the roots of sugar-cane and other crops was gradually built up, and finally reached such a peak of abundance as to become the decisive factor in determining whether the growth of sugar-cane or any other crop was possible. In the irrigated land of the south coast which the development of reservoirs in the mountains and the sinking of wells made otherwise suitable for cane growing, white grubs became most abundant, but they were present in destructive abundance everywhere on the Island that agriculture was practised. *White grubs were the major insect pest of every crop grown.* It was to discover some means for the control of white grubs that the Sugar Producers' Association started the Experiment Station at Río Piedras. Numerous other small insects, such as common springtails, aphids or ants might possibly have been numerically more abundant, but certainly in bulk, the white grubs of Puerto Rico greatly overbalanced all the other insects of the Island, not only individually, but all other insects combined. Nowhere else in the world did such an ideal environment await the introduction of *Bufo*, which in its native Guiana must be content to feed on ants and miscellaneous insects.

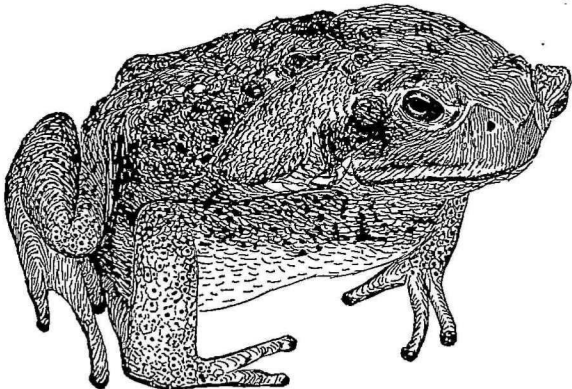
The only parallel is the enormous abundance, reported by R. S. Tohler and A. G. Cooling of individuals of the same "Toads in the Marianas" (Science, 101 (2635): 678. Lancaster, June 29, 1945) following introduction from Hawaii, via Guam, undoubtedly due to a comparable temporarily enormous food supply.

The habits of the May beetles, which are the adults of white grubs, dovetail perfectly with the food requirements of *Bufo*, for they are comparatively slow-moving, terrestrial for two periods each night: when they emerge from the ground to fly to the branches of trees for feeding, and again when they return to burrow in the ground at the base of trees, besides being both large and abundant.

Possibly the greatest damage to sugar-cane caused by white grubs was in the years just before World War I, at Guánica Centrale and its colonos, where Otaheite or White Transparent (Caña Blanca) cane was still being grown. This old variety does wonderfully well in new land, but it does not have a strong root system, and when white grubs completely destroy both rootlets and root-stock, it rots quickly, even before it can be harvested. It was customary for the mill to begin grinding by the middle of December, in an attempt to rescue something from the fields most heavily infested, but this was no solution of the problem. In an attempt to use varieties with more vigorous root systems, those recently developed in Barbados were tested, and Mr. H. Bourne, who had helped the Hon. John R. Bovell in rearing them, was brought to Guánica (Elda. Santa Rita) to breed new varieties on the spot. All Bourne's work went for naught, however, when mosaic disease infected every stool of every one of these promising new seedlings. To escape mosaic disease, the spindly Uba cane was planted, its only recommendation being that it was immune to mosaic and it could grow on unirrigated land. Uba was only a stop-gap, however, until a really superior cane could be found, but the introduction and spread of BH(10)12 a few years later was possible only because the white grub problem was solved (unfortunately, only temporarily, as we now know) by that time.

Mr. D. W. May, Director of the Agricultural Experiment Station at Mayagüez, obtained a few toads from Barbados in 1920, and Mr. R. Menéndez Ramos, Director of the Insular Experiment Station at Río Piedras, brought some in person from Jamaica in the winter of 1923-24. From these two introductions have descended all the toads that had eliminated white grubs from cane fields by a few years later. The shallow lagoons near Guánica, and the smaller irrigation reservoirs and ditches along the remainder of the south coast provided a suitable environment for the development of the immature stages of *Bufo marinus*, and the enormous number of May beetles for months each spring and fall was an apparently

inexhaustible supply of suitable food for the adults, until it was gone. Some of the men at Aguirre claimed that the use of subsoiling Fowler gyro-tiller killed the grubs in the soil that it plowed up, but its extensive use merely happened to coincide with the enormous increase in toad population which was the real cause of the disappearance of the white grubs. By 1932, when the Fourth Congress of the International Society of Sugar-Cane Technologists was held in Puerto Rico, the results of the presence of the toad were too obvious to be ignored. "The Food Habits of the Introduced Toad, *Bufo marinus*, in the Sugar-Cane Sections of Porto



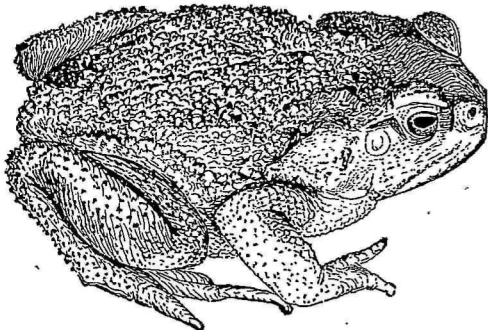
Female of the introduced Giant Surinam Toad, *Bufo marinus* (L.), less than natural size. (Drawn by G. N. Wolcott.)

Rico" (Bulletin No. 74, San Juan, March 1932) which had been investigated by Mrs. Raquel Dexter, detailed both the beneficial and the injurious aspects, the former so greatly preponderating that the entomological delegate from Hawaii, Mr. C. E. Pemberton, promptly made a shipment of them to Hawaii, and took more with him in person.

No such apparently inexhaustible food supply awaited *Bufo* in Hawaii as it had found in Puerto Rico, but otherwise the environment was suitable, and the benefits of its introduction in practically eliminating many kinds of insect pests were so apparent that introductions were made from there to Queensland, Australia, and to many of the smaller islands of the Pacific.

The story of the giant Surinam toad is incomplete without mention of the

experiences of Mr. Walter F. Jepson, whose "Report on the Search for Parasites of *Phytalus smithi* Arr., Field Investigations on Parasites of White Grubs in the United States and Puerto Rico, and their Shipment to Mauritius" (pp. 66, Port-Louis, Mauritius, 1936) gives an exceptionally good picture of the white grub situation in Puerto Rico at the time he was here. He struggled manfully to carry out his instructions to ship insect parasites of white grubs to Mauritius, but it was so obvious that effective control was primarily due to the toads, and not to insects, that in addition he took with him sixty live toads. The authorities in Mauritius, totally



Male of the introduced Giant Surinam Toad, *Bufo marinus* (L.), less than natural size. (Drawn by G. N. Wolcott.)

unprepared for such an importation, ordered the toads destroyed and years later, when finally convinced, had fresh shipments made from Puerto Rico.

Following the peak of abundance of *Bufo marinus* in Puerto Rico, when every possible source of food was devoured, and the toads spread into the less suitable environments of all but the highest mountains, the result was to reduce the common white grub population to a minimum, and apparently to exterminate at least one of the less common species. The investigations of Mr. E. Greywood Smyth on "The White-Grubs Injuring Sugar Cane in Porto Rico" (Jour. Dept. Agr. P. R. 1 (2 & 3): 47-92 & 141-169, illus. San Juan, 1917), confined to the coastal regions, indicated only four endemic species in Puerto Rico, of which the medium-sized one which he named and described as *Phyllophaga guanicana* occurred only in the Guánica region. His type material proves the former existence of this insect, but not a single individual has been collected since, altho Dr. Stuart T. Dan-

forth, the College of Agriculture at Mayagüez, always urged his students from the Yauco and Guánica regions to look for it, when they entered his classes in entomology.

Nor is this the *Lachnosterna monana* of Herr J. Moser (Stettiner Ent. Zeitung, 82: 181. Stettin, 1921), a similar medium-sized species from the similar xerophytic environment of Mona Island, where toads do not occur, and these May beetles are correspondingly numerous even to the present time.

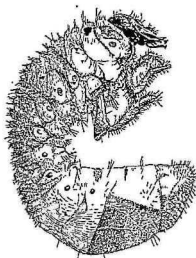
Somewhat larger than Smyth's *guanicana* is his *Phyllophaga citri*, abundant in all the humid coastal regions of the Island, the adults often collected feeding on the leaves of citrus trees, and, to that extent, economic pests. Judging by size alone, this may be presumed to be Moser's *Lachnosterna insulicola* ("Neue Arten der Gattungen *Lachnosterna* Hope und *Phytalus* Er. (Col.)," Stettiner Ent. Zeitung, 79: 19-76. Stettin, 1918), but the letter and package containing all the common Puerto Rican May beetles sent to him some years ago for comparison with his types, were returned by the German post-office marked "Gestorben," and it is doubtful if even his types are in existence today.

The only other of the less common coastal species is the large and extremely hairy *crintissima*, which Mr. J. D. More described in "Insectae Portoricensis" (1924-105) from a holotype male collected at light at Pt. Cangrejos, of which many adults were later collected by Dr. W. A. Hoffman in Muñoz Rivera Park, Puerta de Tierra. Johnny More noted as one of its characteristics "tooth of tarsal claw wanting," which Mr. Lawrence W. Saylor in his "Notes on Beetles related to *Phyllophaga* Harris, with the Descriptions of New Genera and Subgenera" (Proc. U. S. National Museum, 92 (3145): 157-161, pl. 1. Washington, D. C., 1942) used as the basis for making the new monobasic subgenus: *Abcrana*.

Intensive collecting in the higher mountains of Puerto Rico has indicated, to date, the presence at these altitudes of at least four additional species of May beetles. Presumably these mountainous species are as abundant now as when Smyth made his intensive studies of the coastal species, for the introduced toad finds these elevations too cold for its comfort, but the beetles are definitely not common. Dr. E. A. Chapin (1935-70) described *Phyllophaga yunqueana* from a holotype male collected by Dr. Leonard Stejneger in 1900, and *Phyllophaga discalis* from a holotype male intercepted by Mr. R. G. Oakley at Indiera, in the mountains above Yauco, and others in the mountains between Mayagüez and Añasco, collected by J. A. Zalduondo when he was in college.

Mr. Lawrence W. Saylor, describing "Ten New West Indian Scarab Beetles of the Genus *Phyllophaga*, with two new Names" (Washington Academy of Sciences, 30 (7): 305-314. Washington, D. C., July 15, 1940),

includes two from Puerto Rico: *Phyllophaga* (*Phyllophaga*) *adjuntas*, which "externally resembles *P. citri* Smyth, but differs from that species in the nonpruinose dorsal surface, the much longer male antennal club, and the quite different male sixth abdominal segment," and *Phyllophaga* (*Phyllophaga*) *wolcottii* from El Yunque, and others from Indiera in the mountains north of Yauco intercepted by Mr. R. G. Oakley, "most closely related to *P. yunqueana* Chapin, but besides the quite different male genitalia, it may be separated by the darker color, less densely punctate head, nontumid clypeus, and shorter antennal club." This completes the non-economic species of May beetles, all of which are now listed in Saylor's new genus of *Cnemarachis* (1942-159) which "includes nearly all of the described

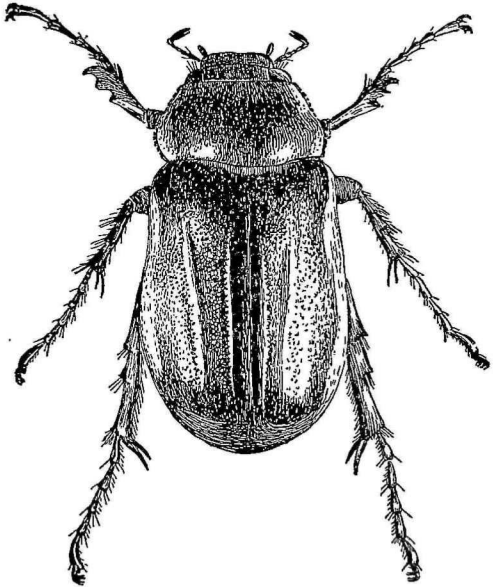


Puerto Rican White Grub, *Phyllophaga* (or *Cnemarachis*) *portoricensis* Smyth, less than twice natural size. (Drawn by G. N. Wolcott.)

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West Indian species formerly placed in *Phyllophaga*," and is characterized by "either middle or hind tibiae or usually both, of both sexes, with an incomplete carina; lateral margins of the middle and hind tibiae usually with obviously serrate edges or with one to several moderately large spines; only rarely do the tibiae lack such carinae or spines or teeth."

The most serious insect pest in Puerto Rico, an endemic May beetle which Mr. E. G. Smyth eventually named *Phyllophaga vandinei* (after Mr. D. L. Van Dine, Entomologist of the Sugar Producers' Station), the type specimens being from Hda. Santa Rita, Guánica, has its distribution limited to the western end of the Island, "its farthest east recorded occurrence being at Manatí on the north coast and Peñuelas on the south." Its eastern analogue, the almost indistinguishable *Phyllophaga portoricensis*, occurs in the remainder of coastal Puerto Rico, and in Vieques. These are big beetles, *Cnemarachis vandinei* adults being 17.0 to 22.0 mm. long, and *Cnemarachis portoricensis* averaging 1.0 to 2.0 mm. larger.

(Judging by the size given by Herr Moser, his *Lachnosterna portoricensis* (1918-62) (= *Phyllophaga borinquensis* Blackwelder), length 21.0 mm., may be either one, as the type locality is merely "Portorico"). The morphological differences noted by Smyth are that in the male genitalia of



The Puerto Rican May Beetle or "Caculo," *Phyllophaga* (or *Cnemerachis*) *portoricensis* Smyth, about three times natural size. (Drawn by G. N. Wolcott.)

vandinei "armatures of theca (are) bicuspidate; spicula sharply deflexed," while in his *portoricensis* the "armatures (are) spatulate at tip; spicula roundly deflexed," but for practical purposes, one identifies them by their geographic distribution. Since this cuts squarely across any natural division of the Island by rainfall or soils, it appears essentially irrational. Economically they are a single species. The adults of both feed indiscriminately on the leaves of sugar-cane, and of many trees. After the first

instar, the grubs eat only live roots of plants. Destruction of the weeds in a field by cultivation forced them to feed on the roots of sugar-cane or of some other crop, and often they were so abundant as to kill the plants the roots of which they attack. Growth of the grubs is rapid, and they may attain full size inside of five months. The entire life-cycle requires but one year, as compared with two years for May beetles of southern United States, three years for many of those of the northern United States, and four years for most of those of Canada. Adults appear in greatest numbers at the time of, or before the spring rains of April, and in somewhat lesser numbers again in late August, with now and then one coming to light at any time from September to March.

Certain especially favored banana plants may be entirely stripped of their leaves by the feeding of one or the other of these species of May beetles, when they are most numerous, but on other trees, the effects of their feeding are not so noticeable. The leaves of introduced trees, like the Australian beefwood (*Casuarina equisetifolia*) and the silver oak (*Grevillea robusta*), often appear to be preferred to what, thru long establishment here, are considered native trees, or those which are really endemic. One may wonder whether the introduction of these foreign trees, plus the extensive growing of sugar-cane, which furnishes preferred food for both adults and grubs, was the lever or factor which so greatly favored these endemic beetles that they could become so abundant, before *Bufo marinus* was introduced, to readjust the balance.

By comparison with what one finds in grub-infested fields in the United States being plowed, those of Puerto Rico would appear to have none of the Scoliid cocoons of the numerous species of *Tiphia* and *Elis* or *Campsomeris*, representing possibly the major factor in the natural control of white grubs in the States. To be sure, representative species of all these Scoliids do occur in Puerto Rico, and a few, attacking other than the economic species of white grubs, are quite abundant, but they are heavily parasitized by numerous Bombyliid flies, thus the influence of the Scoliids attacking the economic species of May beetles is negligible. In all the millions of hand-picked grubs collected at Guánica while Smyth was working on the white grub problem there, not one was noted that was parasitized, nor was a cocoon ever found in the fields being plowed, even when special search was made for them after the releases of Illinois species of *Tiphia* and *Campsomeris*. Very definitely, something must have happened, of which we have no knowledge, since Dr. Gundlach reported *Tiphia argentipes* Cresson as abundant, for no entomologist has ever found it abundant since.

In studying "Porto Rican Cane-Grubs and their Natural Enemies" (Jour. Dept. Agr. P. R., 9 (4): 291-356, fig. 21, ref. 15. San Juan, October 1925), Mr. Harold E. Box was "able to demonstrate that the third instar

grubs are host of the Scoliid wasp, *Dielis (Campsomeris) trifasciata* F., and are also liable to attack by *D. dorsata* F. and *D. pyrura* Roh. The second instar grubs have been found to serve as host for another Scoliid, *Elis xanthonotus* Roh., and it is not improbable that *Lachnosterna portoricensis* is the host of *Elis ephippium* F." These last two are now considered synonymous, but Mr. Walter F. Jepson, rearing them at Cidra, found that the females also attack third instar grubs. He was able to confirm most of Mr. Box' records, and also noted that second instar grubs, in his mountain laboratory, were attacked by *Elis haemorrhoidalis* F. His rearings were made in the mountains, at Cidra, while those of Box were made at Aguirre on the south coast, two entirely different environments; altho only a few miles apart on the map. It is doubtful, however, if the attack of the very common *Campsomeris dorsata* F. and *Elis haemorrhoidalis* F. on the economic species of *Lachnosterna* is normal in the field, which leaves the much less abundant *Elis ephippium* F. (= *Elis xanthonotus* Rohwer), *Campsomeris trifasciata* F. and the rare *Campsomeris tricincta* F. (= *Dielis pyrura* Rohwer) as their only specific parasites. An abundance of hosts normally implies an abundance of parasites, but despite an enormous abundance of hosts, these Scoliid parasites have always been comparatively rare.

That white grubs never generally became as serious a pest in the more humid parts of the Island as they were on the xerophytic south coast is presumably due, in part at least, to specific parasites which were confined to the humid regions. One of these is an endemic Tachinid fly, *Cryptomeigenia aurifacies* described by Mr. W. R. Walton (Proc. Ent. Soc. Washington, 14 (4): 198-200, illus. Washington, D. C., January 10, 1912) from Añasco, and generally present in the more humid areas in Puerto Rico. The adults attack May beetles when they raise their wings in flight, and oviposit in the soft upper side of the abdomen thus exposed. The grubs develop rapidly within the body of the beetle, and, to quote Smyth, "the number of pupae found within one dead adult host varies from two to nine, usually four to six. Infested beetles that have died are always found in their burrows in the ground."

A much less common species, with similar habits, is *Eutrixoides jonesi* Walton. Repeated attempts were made to bring puparia of these flies from Guánica's old Central Pagán property at Añasco to their Hda. Santa Rita, but the flies could not survive such an abrupt change in environment.

Of possibly even greater importance in the natural control of white grubs in the more humid and elevated parts of Puerto Rico is the endemic "cucubano," an eyed Elaterid beetle, *Pyrophorus luminosus* Illiger, the luminous subterranean larvae of which feed on white grubs. A single

larva, reared in the laboratory from egg to pupa, ate 68 white grubs, and would have killed more had they been available. The habits of the charming and innocent fruit-eating adults are in most striking contrast to the unbridled ferocity of their voracious larvae, which, after they have temporarily satisfied their appetite for food, appear to kill additional white grubs merely for the sport of killing. The number of luminous cucubanos which one might see after twilight in a dewy meadow was a very obvious visual demonstration of the number of white grubs that they must have destroyed.

Altho one would never guess from the title of Dr. Alexander Wetmore's "Birds of Porto Rico" (Bulletin No. 15, Board Comm. Agr. P. R., and Professional Paper, Bulletin No. 326, U. S. Dept. Agr., pp. 140, pl. 10. Washington, D. C., March 24, 1916) that it was primarily a study of the economic food habits of the native and migratory birds, with especial emphasis on white grubs or May beetles, it is in fact just one facet of the attempt to control these pests by natural means. From the standpoint of the cane growers, its conclusions were rather disappointing, for they already knew from personal observation that the boat-tailed grackle or "mozambique" (*Holoquiscalus niger brachypterus*) fed on white grubs, fearlessly following the bull-teams plowing, and picking up the grubs in the furrows just as soon as they were uncovered by the plow. Even today they follow the snorting tractors, the gyrotillers and the Fowler drag-plows, but until recently found little to reward their courage. That the bare-legged owl feeds upon May beetles or "caculos" means little to cane fields in the vegas, for the owls live mostly in the forested mountains, and possibly if someone had examined their stomach contents obtained by Dr. Wetmore and extracted the male beetle genitalia, these rarer mountainous species of *Lachmosterna* could have been described first. The little blue heron also feeds on caculos, and possibly in the more retired fields of "poyal" lands might be a minor factor in control. This completes the list of local birds having any appreciable effect on the May beetles of Puerto Rico, and Dr. Wetmore hesitated to recommend the introduction of any bird from abroad that might feed on them if it became established here.

The later study by Dr. Stuart T. Danforth of the "Birds of Cartagena Lagoon" (Jour. Dept. Agr. P. R., 10 (1): 1-136, fig. 45, ref. 41. San Juan, January 1926) showed that the least grebe and the killdeer ate beetles, and that grubs were eaten by the local thrush. Dr. Wetmore had emphasized that the cane field environment is most unfavorable for bird life, and the observations of Dr. Danforth offered little additional encouragement, even if they did enlarge the list of birds which, in their own favored environment, might slightly affect the white grub problem.

The investigation by the writer on "The Food of Porto Rican Lizards"

(Jour. Dept. Agr. P. R., 7 (4): 5-37, ref. 8. San Juan, August 1924) indicated that "the common large brown or black tree lizard, *Anolis cristatellus*, is large enough to eat such large, apparently unpalatable and hard to digest beetles as even the May beetles or "caculos." The iguana, *Ameiva exsul*, is amply large enough to eat such beetles, and does in fact eat the white grubs. The iguana is, (however,) exclusively diurnal and the large tree lizard is so largely so that neither of them has any real opportunity to catch May beetles, which are just as exclusively nocturnal."

The iguana is subterranean during most of its existence, usually appearing above ground for only a few hours in the hottest part of the day. It burrows rapidly and easily thru the ground, and eats not only the larval stages but also the eggs of May beetles. Its most serious enemy appears to be the mongoose, *Herpestes birmanicus*, introduced into Puerto Rico first in 1877 and repeatedly in later years. Dr. J. G. Myers in "A Preliminary Report on an Investigation into the Biological Control of West Indian Insect Pests" (Empire Marketing Board 42, pp. 172. London, July 1931) notes that "wherever the mongoose has become established, it tends to extirpate these lizards everywhere, save in the immediate vicinity of towns. This both Dr. Thomas Barbour, recording "Some Faunistic Changes in the Lesser Antilles" (Proc. New England Zoological Club, 11: 73-85. Cambridge, January 10, 1930), and myself have observed in a number of the islands." No other explanation of the enormous increase in the number of May beetles in Puerto Rico by the beginning of the twentieth century seems more logical than that it resulted from the wide-spread destruction by the mongoose of what formerly had been its most important natural enemy, the ground-lizard or "iguana," *Ameiva exsul* (Cope).

The prospect for control by native wild vertebrates being so discouraging, the possibility of using hogs for eating white grubs was explored. For years, Guánica Centrale had herds of hogs to compete with the grackles in picking up grubs after the plows, but when no plowing was being done, the pigs had to be fed purchased corn, which was an annoyance to cane growers, and decidedly uneconomical. Women and boys could be hired more cheaply, and millions of grubs and beetles were collected by hand each year for many years, concerning which one may consult the account by Mr. E. H. Barrow giving definite figures (Jour. Dept. Agr. P. R., 8 (2): 22-26. San Juan, April 1924), in every Hacienda on the south coast. Dynamite exploded in a grub-infested field from which the cane has just been cut makes an impressive crater, and sends earth and grubs high in the air, but when they come back to earth, the grubs seem uninjured, and unless promptly captured, soon burrow in among the clods and disappear from sight. This is only the most spectacular of the valueless attempted methods of artificial control, as recounted by Dr. Richard T. Cotton on

"Experimental Work on the Control of White Grubs in Puerto Rico" (Jour. Dept. Agr. P. R., 2 (1): 1-18. San Juan, January 1918). In later years, the use of carbon bisulfide emulsion and of ortho- and paradichlorobenzene was found successful in killing grubs, without injury to the cane plants, but the expense of the chemicals plus that of application made the cost prohibitive, and none of these methods of chemical control has ever been used on a field scale.

Within a few years after *Bufo marinus* became at all abundant, all means of chemical control became obsolete, and practical growers filled gunny sacks full of toads from localities such as lagoons, reservoirs and pools where they could be easily collected in large numbers, and released them in grub-infested cane fields, where they would be of most immediate practical benefit. A few years later, distribution of *Bufo marinus* thru its own efforts had become so uniform and universal that cane growers calmly accepted its beneficial presence as part of the normal processes of nature, tending to forget, after the disappearance of the white grub menace, how serious a threat it had once been to the agriculture of the Island.

The solution of the white grub problem by the introduction of the toad was indeed a major triumph for biological control, at least during the years when it was most effective. Its fundamental weakness was in its very effectiveness however, for despite the supposed omnivorous food habits of the toad, the major elements in Puerto Rico are May beetles and other Scarabaeids, "vaquita" leaf beetles and millipedes. When these are gone, and we have close to total control of white grubs in cane fields, there is little else for the toads to eat. Vast numbers of them must have perished of starvation. As was explained in detail in "What has happened to the giant Surinam Toad, *Bufo marinus* L., in Puerto Rico" (Revista de Agricultura y Comercio de P. R., 38 (1): 25-29, fig. 7. San Juan, January-April 1947), "scarcity of food is only one factor which increasingly tends to limit the abundance of the Surinam toad. In the West Indies at least, the weakest point in its life-history is the tadpole or pollywog stage, which must be passed in fresh water. In addition to all the large and fierce dragon fly nymphs which attack the helpless tadpoles, the even larger and more voracious larvae of the endemic Dytiscid beetle, *Megadytes gigantea* Castelnau, appear to be the deciding factor in whether any tadpoles will survive to become adults. A single one of these large beetles may lay dozens of eggs in a pool, from which emerge small worm-like larvae with enormous jaws. At first they feed on insects and very small animals, but before they are more than half-grown, they attack tadpoles almost ready to leave the water, and often are forced to complete their growth by cannibalistically feeding on each other when every tadpole in the pool has been destroyed."

Reproduction also became more difficult because after three exceptionally

dry years, Cartagena and Guánica Lagoons completely dried up, and thus disappeared the most favorable environments for the development of the tadpoles on the south coast. Rapidly the balance for the toad began to swing in the opposite direction. Cane growers of a new generation, inexperienced in the plagues of white grubs that had infested the fields of their fathers, again began to complain about the abundance of white grubs. When advised to bring toads to infested fields, the problem was where to find the toads.

The rapid increase in abundance in recent years of the common bullfrog of the southeastern United States, *Rana catesbeiana* Shaw, introduced in 1935 into Puerto Rico, at the same time that the toad was becoming so scarce, was thought to indicate a possible incompatibility between the two introduced amphibians. Their pollywogs inhabit the same pools, altho the adults occupy entirely different ecological niches. In a study of the food habits of the frog, Mr. Mario Pérez found that altho the frog may be cannibalistic in devouring its own smaller adults and larvae, it did not eat either the pollywogs or the small adults of *Bufo marinus*. The tadpoles of both feed primarily on aquatic algae, of which an amount ample to feed them rapidly grows on the stones and vegetation of every pool. There is thus no serious competition between frog and toad, either as larva or adult, for the frog adult feeds extensively on aquatic insects and other items, and but rarely on the Maybeetles that are the mainstay of the toad.

"The Rise and Fall of the White Grub in Puerto Rico" (American Naturalist, 84 (816): 181-191, ref. 19. Lancaster, Penn., May-June 1950) shows how essentially temporary was this all too effective control by a single natural factor, and re-emphasized the importance of finding a chemical means of attaining the same end which would be entirely under the control of the grower. It has been found that both aldrin (Hyman 118) and the gamma isomer of benzene hexachloride (BHC) are very toxic to even the largest grubs, as little as 2 pounds per acre of either chemical giving commercial control. In the year and a half that these chemicals have been tested, no appreciable diminution in effectiveness is noticeable, and it is possible that they will render soils to which they have been applied permanently sterile to white grubs.

Much smaller than any of the May beetles just noted, only 8.0 or 9.0 mm. long, is what Smyth described as *Phytalus insularis*, but was later identified as *Phytalus apicalis* Blanchard, and is now listed under Saylor's new generic name of *Clemora*. This little beetle occurs not only everywhere in coastal Puerto Rico from Faro de Cabo Rojo to Luquillo, but even in the mountains, at Aibonito, and also on St. Thomas. At Guánica, Mr. E. G. Smyth collected large numbers feeding on *Amaranthus* and Pará grass, and at Garrochales on *Lantana involucrata*, but at Pt. Cangrejos it at times almost defoliates Snow-on-the-Mountain (*Phyllanthus niveus roseopictus*).

In a sandy field being plowed near the bridge between Palo Seco and Pt. Salinas, numerous skulls of third instar grubs on this beetle were found entangled in the outer threads of Scoliid cocoons from which adults of *Elis haemorrhoidalis* F. usually emerged, altho from some cocoons, the hyperparasite, *Anthrax gorgon* F., came out. This was the first discovery anywhere in Puerto Rico of fresh Scoliid cocoons associated with empty white grub skulls that could be identified. Subsequently, however, Mr. Harold E. Box (1925-334), finding females of this wasp very abundant in restricted localities, collected and transported them to other places where unparasitized grubs were numerous in Aguirre's cane fields. The grubs are so small that they must occur in large numbers to cause any serious damage, and are hardly of economic importance, but it was an interesting experiment, and most successful, for parasitism increased rapidly where the females had been released.

Cane growers in the British West Indies are accustomed to differentiate between the two kinds of May beetles as "brown hard-backs" for the *Lachnosterna*, and "black hard-backs" for those generally black instead of brown. The shiniest and most nearly impunctate of the black hard-backs in what Drs. Stahl and Gundlach listed under the genus *Chalepus*, and, after various changes to *Dyscinetus* and *Parachalepus*, is now called *Chalepides barbata* F. Presumably it was named *barbata*, not after Barbados, where it does not occur, but from the beard of long grey hairs at the rear end of the body projecting from under the elytra. Before the introduction of *Bufo marinus* into Puerto Rico, it was very abundant, especially in the more humid regions, and adults attracted to lights at night might often be a terrific nuisance. At a dance in the open-air pavilion of the Bayamón Saddle & Motor Club, they accumulated in such numbers on the dance floor as to stop the dance, for no sooner was the floor swept clean than additional beetles flew in to impede the progress of the dancers. The beetles are essentially harmless, and their grubs feed only on decaying vegetation in the soil, never, even accidentally, eating live roots. The first flights of adults to light in the spring usually came in mid-April, and by early in May they constituted the vast majority of all the insects coming to light. They proved to be as welcome to *Bufo marinus* for food as were the brown hard-backs, and toad excrement pellets have been noted which contained the remains of as many as 17 of these beetles. Naturally, they became scarce when the introduced toad became most abundant, and even with the present decreased numbers of toads, made but a single one-night appearance at Río Piedras in 1947, most of which was absorbed by the toads, reappearing as excrement pellets by the next morning.

On the night of September 23, 1948, when a hurricane was passing over Matanzas, Cuba, Key West, Florida and the Everglades, but when there was no rain at Río Piedras, and when there had been none in several days,

many of these beetles emerged from the ground, and were swept up from the hallways of the Experiment Station building next morning, or appeared in pellets of toad excrement. No other instance of response to barometric pressure is on record, and this may have been merely a coincidence.

Dyscinetus picipes, originally described as a *Chalepus* by Hermann C. C. Burmeister in his "Handbuch der Entomologie" (5: 79. Berlin, 1847) from material from Puerto Rico, is similar in general appearance to *barbata*, but is not bearded, and the elytra are distinctly striate and punctate. Not especially common, the adults have been noted feeding on the roots of sugar-cane at Carolina, of malojoillo at Mayagüez, and on the corms and roots of yautia at Cayey, and would possibly be a major pest were they more numerous.

Dyscinetus morator F., repeatedly recorded from Puerto Rico as *Dyscinetus trachypygus* Burmeister, separately or in synonymy with *picipes* may be nothing more than a name, as all specimens in the collection of the Experiment Station at Río Piedras were identified by Dr. Chapin in 1932 as being *picipes*.

With stronger spines on its legs, with elytra deeply striate and punctate, not larger than the other black hard-backs, but thicker, heavier and more heavily chitinized, and with roughened areas on the abdomen by means of which it audibly makes known its objection to being held between the fingers, is what always up to now has been called *Ligyryus tumulosus* Burmeister. Or almost always, for Chevrolat's determination of Dr. Gundlach's specimens was *Ligyryus fossulatus* Latreille. The only species listed by Dr. Blackwelder (1944-254) from Puerto Rico are *Ligyryus cuniculus* F. and *Ligyryus fossor* Latreille, altho all specimens in the Station collection at Río Piedras were identified in 1932 by Dr. Chapin as *Ligyryus tumulosus* Burmeister, a species which Dr. Blackwelder restricts to continental United States, Mexico and Cuba. At the time that Mr. Eugene Graywood Smyth was commencing his white grub investigations at Hda. Santa Rita, Guánica, the larvae of *Ligyryus* were temporarily very abundant in cane fields, but it was only after extensive rearing that the essentially harmless character of their feeding was decisively proved. They eat only decaying vegetation in sandy soil: typically the dead cane stool which the larger *Lachnosterna* grubs have killed. The *Lachnosterna* grubs feeding on live cane roots have yellow heads, while those of all feeding on decaying vegetation are brown, or at least a much browner yellow. *Ligyryus* grubs also do not have the permanent quirk in their body characteristic of *Lachnosterna*, and when the sandy land in which they live has been saturated by rainfall, have been observed crawling about on its surface, their body dragging out straight behind, until the top soil has dried out sufficiently to

permit life for white grubs beneath its topmost layer. Eventually, Smyth published life-history summaries for all of these grubs, showing that *Ligyris* can complete its entire life-cycle in less than three months. Harmless as *Ligyris* may be in its immature stages, however, the adults sometimes bore into the base of live cane stalks, but this injury amounts to only one percent of some 50,000 stalks examined in all parts of the Island in 1921.

Before the advent of the imported toad in Puerto Rico, *Ligyris* was often very common in most favorable environments, and they still are on Mona Island. This abundance was despite heavy parasitism of the grubs, first noted by Mr. H. Bourne at Hda. Santa Rita, Guánica on June 20, 1913. He wrote as follows:

"While I was getting these grubs, I found 28 cocoons of a wasp, very probably the black one with two reddish bands across the abdomen, *Campsomermis dorsata* F., because while digging, two flew out. This wasp is commonly seen in callejones and cane fields. I also found one grub with a medium sized larva attached to it, and one with the egg of the wasp freshly laid on its body."

Subsequently, Mr. Harold E. Box noted that this wasp "succeeds in periodically reducing the numbers of *Ligyris* grubs in each locality almost to the zero point."

In the size of the head and in other gross characters, the fully-grown third instar grubs of *Ligyris* are practically indistinguishable from those of the second instar of the sugar-cane rhinoceros beetle of Puerto Rico and the Virgin Islands. This is now known as *Strategus barbigerus*, described by Dr. E. A. Chapin (Jour. Washington Academy of Sciences, 22 (15): 449-456, fig. 10. Washington, D. C., September 19, 1932), but from the first record by Ledru until recently, it has been recorded under the name of *Strataegus titanus* F. *Strataegus* grubs primarily feed on rotten wood, especially the roots and stumps of trees in the soil, but when these have been consumed in recently cleared land, readily attack old cane stalks and decaying cane seed, and may eventually attack live cane root-stalks and rootlets when other more acceptable sources of organic matter are lacking. When no more new land was being brought under cultivation, reports of their injuries ceased, and the beetles are comparatively rare now as they are just small enough to be swallowed by the largest females of *Bufo marinus*. They are too large for the male toads, but the females form a ring around a beetle, and seem to dare each other swallow the hard, horny, spiny creature. After several attempts by the bravest toads to keep down such a furiously resisting mouthfull of live food, one toad accidentally swallows the beetle so that its struggles force it down into her stomach, and with her hand over her mouth, she keeps it down until all movement ceases. Only on Mona Island is the beetle at all common now, and only on Mona is

its specific Scoliid parasite, *Campsomeris atrata* F., still to be found in any abundance. From a dead beetle on Mona, the fly *Sarcophaga rapax* Walker has been reared, but it is doubtful if this is more than a scavenger.

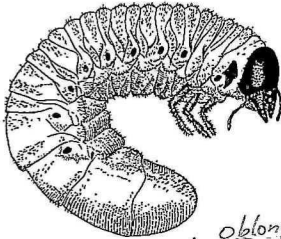
The extremely tough and heavily chitinized prothorax of the males rises in two lateral tubercles and a median anterior horn, always forked at the tip, or at least tending to be forked even when least developed. "By means of these horns the powerful male beetles can tear their way easily into mature sugarcane, and even into the solid wood of the coconut palm. The males use the horns also in fighting, and engage often in long battles. The size of the beetles, as well as of the horns, seems to be determined largely by the amount of food that was available for the larva during its period of feeding," according to Mr. E. G. Smyth, in discussing "The Rhinoceros Beetles" (Jour. Dept. Agr. P. R., 4 (2): 3-29, illus. San Juan, April 1920). The female beetles have no horns, and indeed their prothorax is only slightly roughened anteriorly. They lay their pearly white, opaque, oblong-oval eggs singly in hardened spherical cells of earth, in which the eggs swell before hatching to be over 5.0 mm. in diameter. The beetles are often infested by mites, supposedly only catching a ride, but Smyth noted that some of these mites leave the female when she oviposits, and attain an enormously distended abdomen feeding on her eggs. The grubs, at least when reared in captivity, seem especially susceptible to the Green Muscardine fungus, *Metarrhizium anisopliae*, and also suffer from hard black spots, supposedly bacterial in origin, which gradually enlarge and may eventually cause death. The life-cycle is completed in a year.

Despite their much greater size, rhinoceros grubs seem as susceptible to the newer insecticides, such as the gamma isomer of benzene hexachloride, chlordan and Hyman 118, as are the considerably smaller ordinary white grubs. With the practical disappearance of the toad in 1948-9 in the more xerophytic parts of the Island, rhinoceros grubs began to appear in cane fields, possibly every thirtieth or fiftieth grub collected at Isabela or Aguirre being a *Strataegus*. When placed in the laboratory tests with the other grubs, and supplied with rotten wood to eat, they died at concentrations of the chemicals no greater than those killing the *Phyllophaga* grubs, but because of insufficient numbers, these data are not as extensive or conclusive as for the smaller grubs. Nevertheless, it may be presumed that few rhinoceros grubs will develop to large size in fields treated with even the minimum amount of insecticide to kill white grubs.

Apparently the toad is a much more important enemy of the rhinoceros beetle than was supposed, for not only did these beetles practically disappear when the toads were numerous, and again appear in numbers when toads were scarce, but they have continued abundant in St. Croix during all these years. St. Croix has no permanent streams or fresh water ponds,

and *Bufo marinus* can with the greatest difficulty maintain itself there, for despite its specific name, its tadpole or pollywog stage can be passed only in fresh water.

Strategus oblongus Palisot de Beauvois is at present considered the correct scientific name by Dr. Blackwelder for the coconut rhinoceros beetle of Puerto Rico, altho in all economic literature it is given as the synonymous *Strataegus quadriveatus* Palisot de Beauvois. Drs. Stahl and Gundlach listed it under what the latter thought "acaso nombre manuscrito": *Strataegus laevipennis* Chevrolat. It is one of the largest and certainly the heaviest beetle in Puerto Rico, with shining black, polished elytra, the male often having very well developed horns, of which the median anterior one is never forked. By means of these horns, it is able to burrow into the base of mature coconut palms, but its principal economic

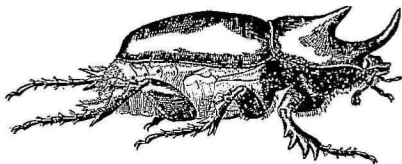


Grub of the Coconut Rhinoceros Beetle, *Stratægus quadriveatus* (Palisot de Beauvois), natural size. (Drawn by Fritz Maximilien.)

injury is to young palms which have not yet developed a stem. Burrowing into the sand close beside such young palms, it rasps and chews into the base of the fronds, often killing the young seedling. Such injuries become abundant after hurricanes, when many such young palms are being set out in established palm groves to take the place of those which have been destroyed, and at this time also the beetles are most numerous. The eggs are laid in the rotting trunks of dead palms, on the interior of which the grubs feed, quickly causing them to collapse. The attempted use, even very temporarily, of the dead palms, for fenceposts or anything else, is not only impossible, but such dead palms are a menace in the grove, and they must be burned as soon as possible to prevent the adults from developing from the grubs feeding on their interiors. Unfortunately, few growers can be convinced of such necessity, and thus a few years after a destructive hurricane the beetles become injuriously abundant. The cost of hand-

collection of grubs and beetles, when financed by government agencies, may easily run into thousands of dollars, and becomes big business for small boys doing the collecting.

The coconut rhinoceros beetle occurs in all parts of Puerto Rico, in the mountains as well as along the coast, and the adult may attack other kinds of palm besides the coconut, and it sometimes burrows into a stool of sugar cane. The grubs are able to feed on the roots of deciduous trees, and in moist decaying tree stumps, and even in undisturbed piles of cachaza. The most exceptional host record is of a pineapple fruit at Palo Seco being tunneled into by an adult. With a stout thread tied securely around its middle, the adult beetle may serve as an exciting and somewhat dangerous pet for children, for when held suspended, it unweariedly circles like a miniature airplane, until the erosion of its bonds permits escape.



Male of the Coconut Rhinoceros Beetle, *Strataegus quadrisoveatus* Palisot de Beauvois, natural size. (Drawn by Fritz Maximilien.)

Mr. Harold K. Plank has most recently published on the "Life-History, Habits and Control of the Coconut Rhinoceros Beetle in Puerto Rico" (Bulletin No. 45, Federal Experiment Station, Mayagüez, pp. 35, fig. 12, ref. 24, Washington, D. C., November 1948), detailing the results of his investigations since 1935: a most detailed and beautifully illustrated work.

The horns of the male rhinoceros beetle are on its prothorax: those of *Homophileurus quadrituberculatus* Palisot de Beauvois are on its head, with only comparatively low tubercles on its prothorax. Dr. Gundlach first noted "la larva vivió en el nido o bulto de *Termes morio*," and all more recent collections of adults have been made in nigger-head nests of termites, one at Ciales included also "berraco" ants inhabiting part of the nest with the beetles and the termites. These are large and powerful beetles, over an inch long, and half an inch wide, with elytra deeply striate and punctate, previous identification by Dr. E. A. Schwarz as *Phileurus didymus* L. being referred to this species.

The somewhat smaller *Phileurus valgus* L. has been collected at light in Ponce, and in rotten wood at Adjuntas, Lares and Barranquitas.

Epiphileurus puertoricensis, described by Dr. E. A. Chapin (1935-69) from adults in decaying palm at Villalba, has also been found at Baranquitas.

Cyphonidae (Helodidae)

Prionoscirtes dilaticornis Champion, as identified by Mr. H. S. Barber, was intercepted on oranges trees in the mountains back of Ponce, and at Villalba, by Mr. R. G. Oakley. This is a small black beetle, originally described from St. Vincent. Numerous others of these obscure little beetles, collected on a variety of hosts and on flowers at various localities by Mr. Oakley, were identified only to a species of *Scirtes*, which is the determination given by Sir Guy A. K. Marshall to others found in the squares of cotton in a field near the beach at Laguna Tortuguero. No specific injury to the cotton could be observed at the time, and no collection has since been made on this host.

Ptilodactylidae

Ptilodactyla "perhaps *emarginata* Chevrolat" is the determination given by Mr. H. S. Barber to beetles intercepted by Mr. R. G. Oakley in the mountains of southern Puerto Rico.

Heteroceridae

Heterocerus spp., as determined by Mr. H. S. Barber, have been collected in the mud of Guánica Lagoon by Prof. J. A. Ramos.

Byrrhidae

Lioon sp., as doubtfully determined by Mr. H. S. Barber, was intercepted by Mr. R. G. Oakley on betel palm at Adjuntas.

Elmidae

The Elmids live in swiftly running water, where they cling to flat stones or aquatic vegetation. Dr. Stuart T. Danforth, making the first collections of these beetles in Puerto Rico, had *Cyloepus danforthi* named for him by Mr. P. N. Musgrave, describing "Two New Elmidae from Puerto Rico, with Description of New Genus (Coleoptera)" (Proc. Ent. Soc. Washington, 37 (2): 32-35, fig. 1. Washington, D. C., February 1935), characterized as "elongate, subparallel; dull black with dark burnt sienna tinges," the males being 1.6 mm. long and the females 1.8 mm. Later, Don Julio García-Díaz, in conducting his survey of the aquatic insects of Puerto Rico, collected not only this species, and *Neoelmis gracilis* Musgrave, which is "elongate, parallel, opaque, dark reddish-brown, length 1.4 mm.," but also *Phanocerus hubbardi* Schaeffer, originally described from Jamaica;

all three being abundant in the steam at La Mina on El Yunque, and in the Río Yúñez at Florida. *Elmis filiformis* Darlington, as doubtfully identified by Mr. H. S. Barber, was collected by Dr. W. A. Hoffman, possibly at El Semil.

Limnichidae

Eulimnichus sp., as determined by Mr. H. S. Barber, is a small aquatic beetle collected at light at Mayagüez. *Limnichoderus* sp. "near *navicularis* Casey" was intercepted by Mr. R. G. Oakley at Ponce in water.

Melasidae (Eucnemidae)

Arrhipis lanieri Guérin-Méneville, originally described from Cuba, but listed by Fletiaux from Puerto Rico, is the only previously undescribed representative of this family not included by Mr. W. S. Fisher in his "New Eucnemid Beetles from Puerto Rico" (Jour. Agr. Univ. P. R., 19 (2): 65-66. Río Piedras, October 15, 1935). All four of these were collected by Mr. R. G. Oakley, a keen "interceptor" of previously unknown beetles, with an unerring ability to find the new and unique.

Dirhagus puertoricensis is characterized by Mr. Fisher as 2.75 mm. long, "nearly black, and in having the antennae pectinate and the elytra ornamented with two transverse, whitish pubescent fasciae," the type having been found on coffee in the mountains above Ponce.

Dirhagus oakleyi is 2.6 mm. long, has bicolored elytra, "with golden yellow pubescent fascia at apical third, the antennae flabellate," the type from pomarrosa (*Eugenia jambos*) at Aibonito.

Adelothyreus insularis is from the same host and type locality, 3.0 to 3.25 mm. long, with the "body narrow, subcylindrical, black, with an elongate, brownish yellow spot covering the exterior three-fourths of each elytron, . . . pubescence sparse, uniform, whitish."

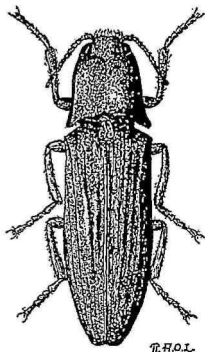
Nematodes puertoricensis is 5.0 mm. long, has a "body very narrow, subcylindrical, dark reddish-brown, . . . the elytra not distinctly striate," and was found on weeds at Matrullas Dam, near Orocovis.

Elateridae: Click Beetles

Adelocera rubida, described by Otto Schwarz ("Neue Elateriden," Stettin. Ent. Zeit., 63: 195. Stettin, 1902) from specimens collected on Mona Island, has not been found since, so far as known.

The larvae of most Elaterid beetles are phytophagous, but those of one species endemic to Puerto Rico have long been known to be predaceous. In "The Accidental Introduction of a Beneficial Insect into Puerto Rico" (Caribbean Forester, 3 (2): 58-9, pl. 1. Río Piedras, January 1942), similar larval habits of *Chalcolepidius silbermanni* Chevrolat are first

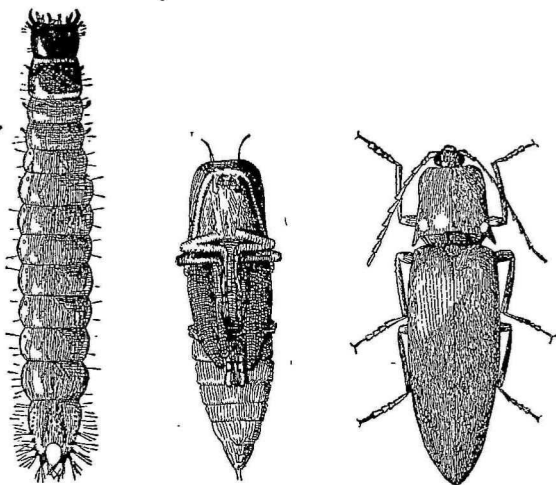
noted. This is possibly the largest and certainly the broadest of any of the click beetles to be found here, dull velvety brown or grey in color, with deeply furrowed elytra. It occurs in Mexico, Central and northern South America, Jamaica and even in St. Vincent, but had not been collected in Puerto Rico previous to 1933. It "is comparatively common in Hispaniola, where one often sees the adults sunning themselves in a sun-lit spot on the bark of a tree in a woodland glade. Some years ago, students of the late Dr. Stuart T. Danforth, at Mayagüez, began bringing in specimens collected in Puerto Rico: from Salinas, December 1933 (Hipólito Monserrate), and from Mayagüez, November 1934, December 1936 and September 1937. Dr.



Chalcolepidius silbermanni Chevrolat, twice natural size. (Drawn by Raúl Maldonado.)

Luis F. Martorell found one specimen in April 1939 at what is now Punta Borinquen Air Base, and subsequently reared one from a log of *Albizia lebeck* at Ponce infested with larvae of *Elaphidion irroratum* L. and *E. spinicorne* Drury." A log of "almácigo" (*Bursera simaruba*) from Camuy, infested with larvae and pupae of *Lagochirus araeniformis* L., was found to also contain several of these large Elaterid larvae. "Hispaniola is to the windward of Puerto Rico, both for the prevailing trade winds and for hurricanes. Unquestionably *Chalcolepidius silbermanni* was brought to Puerto Rico by commerce, for lumber, both as mahogany planks and unbarked railroad ties, has formed an important item of importations from the Dominican Republic to Puerto Rico for many years past. The un-

peeled ties are often heavily infested with Cerambycid larvae, fortunately all species already occurring in Puerto Rico, and in some of these the predaceous Elaterid larvae were also present; the predator accompanying the host insect. This appears to be one of the few instances of the accidental and quite unanticipated introduction of a beneficial insect." At no stage of its existence is any part of the body of *Chalcolepidius silbermanni* luminous.



The Cucubano, *Pyrophorus luminosus* Illiger, larva, pupa and adult, twice natural size. (Drawn by G. N. Wolcott.)

Luminosity is concentrated in two spots on the rear corners of the prothorax of the adults of the endemic "cucubano," *Pyrophorus luminosus*, described by J. C. W. Illiger ("Monogr. d. Elateren (Pyrophorus)," Mag. Gesellschaft Nat., Fr. I: 149. Berlin, 1807), and these luminous spots are sharply defined even in its pupa. The larva, however, is luminous generally in the prothorax, and slightly so on the rear edge of the following segments, but shows this luminosity only when disturbed. The cucubano larva is a subterranean wireworm, which when fully grown is nearly two

inches long, quite plump, and the color of old ivory. It feeds on other subterranean insects, more especially white grubs and "vaquita" larvae because they are normally most abundant, but has been found inside an over-ripe melon, presumably in pursuit of a melonworm, the caterpillar of *Margaronia hyalinata* L., and in a *Diatraea* tunnel at the base of a stalk of sugar-cane. Mr. Francisco Sefn, Jr., reared larvae from egg to pupa in captivity, and by actual count found that a single cucubano wireworm ate sixty-eight white grubs in attaining full size, as is related in "El Cucubano, *Pyrophorus luminosus* Illiger" (Circ. No. 80, Estación Experimental Insular, pp. 5-8 fig. 3. Río Piedras, October 1923). This number does not include those killed for sport, as when it had eaten all that it could hold, it would continue to kill additional grubs merely for the joy of killing. Unquestionably the cucubano was an important factor in the control of white grubs in the more humid sections of the Island, but it rarely occurs on the xerophytic south coast where injury by white grubs was greatest.

In an effort to control the Barbadian white grub, *Phytalus smithi* Arrow, some thousands of living cucubano larvae were collected at Cidra and sent by airplane express to Barbados in 1933, and a few years later others were sent to Mauritius, where the same Barbadian white grub is an even more serious pest. Cucubano adults have been noted in the regions where these larvae were released in Barbados, and possibly the species has become established there. On the basis of what it costs to hand-pick white grubs in Barbados, as compared with how many grubs each cucubano larva destroys, it was estimated that these imported cucubano larvae were worth all they cost, even if they had all died in the first generation.

The introduction of the giant Surinam toad, *Bufo marinus* (L.), into Puerto Rico affected the cucubano in two ways: by reducing the number of white grubs available for food for the larval cucubano, and also because the luminous adult cucubano proved to be quite as acceptable to the toad for food as were the caculo adults. At the lower elevations along the north coast, *Pyrophorus luminosus* practically ceased to exist when *Bufo marinus* had reached its peak of abundance, but in the mountains where it was too cold for comfort for the toads, the cucubano remained as abundant as ever. By 1940, a few adult cucubanos might again be seen on the north coast, marking the passing of the crisis caused by the introduction of the toad.

The visiting Botanist Ledru noted the presence of the cucubano in 1780, using the name *Elater phosphoreus*, but the insect had been named before Dr. Gundlach issued his list, and was correctly noted by him. Mr. R.-H. Van Zwaluwenburg was the first to record the feeding of the adults on the fruit of decaying fallen mangoes, and of the larvae on white grubs. Under normal conditions, the life-cycle of the cucubano is completed in a year,

the adults appearing in the spring, from April to June, and the first pupa by the following January.

In contrast to the activities beneficial to man of the predaceous larvae of the larger Elaterids in Puerto Rico, the phytophagous larvae of the smaller species are definitely injurious to cultivated crops, especially to young tobacco transplants. In fallow land or pastures, these slender little wireworms feed on the roots of grass or weeds, causing no appreciable injury so far as the farmer is concerned, but when a field is plowed and cleared for planting tobacco, the wireworms are deprived of their normal food for a time, until the young tobacco plants are set out. The wireworms burrow into their roots and underground stems, often killing the plants, which have not yet recovered from the shock of being transplanted. In Cuba the damage is much more severe than in Puerto Rico, altho the species concerned are the same in both islands. Field control has been obtained in Puerto Rico by burying "considerable numbers of small potatoes in the ground where damage is anticipated. The potatoes are preferred by the wireworms to tobacco plants, which thus escape injury. To be completely effective in ridding the field of wireworms, however, it is most desirable to dig up the potatoes after they have been in the tobacco field for a week or two, and destroy them together with the wireworms which they contain. This is easily accomplished if each potato is impaled on a wire which extends above the surface of the ground, and to the other end of which a bit of cloth is tied, to indicate the position of the potato" (Wolcott 1935-545).

Conoderus bifoveatus Palisot de Beauvois, in the economic literature usually called *Monocrepidius* (or mis-spelled *Monocrepidus*), is the larger of these pests, of which the adults are found in the most varied of environments. In cotton fields, they hide during the daytime in cotton squares, or in the empty cocoons of *Alabama argillacea*. One sometimes finds them under the loose bark of trees, or hiding in opaque spider-webs, behind loose sugar-cane leaf-sheaths, and very rarely attracted to light. They fall a ready prey to *Bufo marinus*, to the local iguana and lizards, and Dr. Wetmore found that they had been eaten by Latimer's vireo, the wood pewee, the yellow warbler, the yellow-shouldered blackbird, the mozambique and the ani. Presumably *Conoderus bifoveatus* is the more common species, as most individuals in collections bear this identification label, but *Conoderus lividus* DeGeer, *C. memorabilis* Candeze and *C. pinguis* Candeze have also been recorded from Puerto Rico, all superficially indistinguishable except to the specialist. *Conoderus figuralis* Candeze and *C. sericatus* Candeze, as determined by Dr. M. C. Lane, occur on Mona Island, as noted by Prof. J. A. Ramos (1937-34), but we have no records of any from Vieques or Culebra, or any of the Virgin Islands.

Mr. R. H. Van Zwaluwenburg identified as *Heteroderes amplicollis*

Gyllenhal a beetle which Mr. D. L. Van Dine sifted from earth in 1912. Mrs. Raquel Dexter found in the stomach of a toad what was identified as *Heteroderes laurenti* Guérin-Ménéville; Mr. Van Zwaluwenburg also identified as *Aeolus binotatus* Candeze a beetle which Mr. Van Dine found under cane trash at Arecibo in 1911. No more recent collections have been made of any of these three.

Dr. E. A. Schwarz identified as an *Aeolus* the beetle which was described in "Insectae Portoricensis" (1923-87), and in "Insectae Borinquenses" (1936-213) named *litoris*, from a pile of coconut husks at Arecibo. It has since been found in spider-webs on beach vegetation at Pt. Cangrejos, and intercepted by Mr. R. G. Oakley on mangrove and flowers of *Randia mitis* at Ponce. It is only 3.0 mm. long.

Drasterius elegans F., in local economic literature called an *Aeolus*, is 7.0 or 8.0 mm. long, and altho a much smaller species than *Conoderus bifoveatus*, is the much more serious pest of transplant tobacco in the mountains of Puerto Rico, where its larva is called "tijerilla." It is found in all parts of Puerto Rico, on Vieques and on Mona, the adults characteristically hiding in spider-webs, in cotton squares, in plant galls (as on the leaves of "ucar," *Bucida buceras*), and even burrowing in the excrement of *Laphygma frugiperda* in young corn. Remains of the adults were found by Dr. Wetmore in the stomach of the green heron, and Mrs. Raquel Dexter found that it is eaten by *Bufo marinus*.

Dicrepidius ramicornis Palisot de Beauvois, as tentatively identified by Mr. W. S. Fisher for Dr. Luis F. Martorell, who found it on Mona Island, is almost as large as a cucubano adult, but posteriorly it is acutely tapering. Specimens have been found at Mayagüez and at Maricao. Much smaller is *Ischiodontus* sp. "probably anceps Candeze," as determined by Dr. P. C. Ting, collected at Villalba.

Esthesopus paedicus Candeze, as identified by R. J. M. Valentine, was collected on Mona Island (Ramos 1947-34) and at Guánica, Ponce and Mayagüez. It is only an eighth of an inch long.

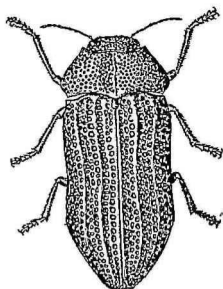
Trixagidae (Throscidae)

Drapetes chalybea was described from Puerto Rico by Carl E. A. Gerstaecker in "Die Arten der Gattung *Lissomus* Dalm." (Linn. Ent. Bol., 14: 169. 1860), and Mr. R. G. Oakley found a beetle of this genus on *Mayepea* at Guánica.

Buprestidae: Flat-Headed Borers, or Metallic Wood Boring Beetles

Polycesta porcata F., the Haitian "bete d'argent," is one of the unfortunate accidental importations that have accompanied the unrestricted traffic in lumber from Hispaniola to Puerto Rico. How this could occur

is only too plainly shown by the discovery of a live larva of this Buprestid beetle burrowing out of a piece of mahogany furniture made from imported lumber. Presumably the insect is established in Puerto Rico, for adults have been collected at Salinas and Santa Isabel, in flight and resting on sugar-cane. It is the more serious pest because the larvae definitely attack trees of West Indian Mahogany (*Swietenia mahagoni*), as well as others of lesser value, feeding on the cambium when they are small, but penetrating to the heartwood as they approach full size. The adults are hardly silvery, as one might suppose from the Haitian common name, but darker and metallic greenish, or "aeneo-nigris, with a strong greenish and purplish tinge," according to Mr. W. S. Fisher in his "Revision of the West Indian



The Haitian "Bête d'Argent," *Polycesta porcata* Fabricius, twice natural size. (Drawn by Fritz Maximilien.)

Coleoptera of the Family Buprestidae" (Proc. U. S. National Museum 65 (2522): Art. 9, 1-207. Washington, D. C., 1925), who also notes: "This is one of the broadest species of the genus, averaging two and one-fifth times as long as wide." Even the smallest specimens found in Puerto Rico are three-quarters of an inch long, the largest measure all of an inch in length.

Polycesta thomae Chevrolat, black with metallic luster, was described from St. Thomas, subsequently collected by Dr. Stuart T. Danforth on Vieques, and more recently in considerable numbers on Mona Island, where Prof. J. A. Ramos found all stages in the dead branches of a beefwood (*Casuarina equisetifolia*). It does not occur in Puerto Rico. In addition to the difference in color as compared with *Polycesta porcata*, it may be distinguished, according to Mr. Fisher, because the "four costae on disc are distinctly elevated and the scutellar costae are entirely absent."

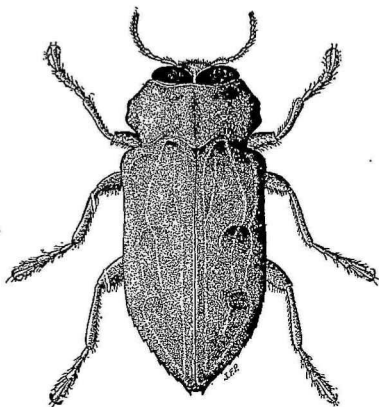
Polycesta depressa L., of which a single specimen has been collected at Ponce, according to Mr. Fisher is "more slender, more brightly colored, more acuminate posteriorly, and the costae on the elytra are more strongly elevated than in *Polycesta porcata*."

Long before Mr. W. S. Fisher (1925-45) had described *Acmaeodera gundlachi* as being "broadly elongate, . . . aeneous, with a strong purplish or greenish tinge on the pronotum and elytra, the former with an oblong yellow spot on each side; each elytron ornated with small irregular yellow spots," the types from many coastal and mountainous localities in Puerto Rico, Dr. Alexander Wetmore had noted it as forming part of the food of the local kingbird, petchary, Latimer's vireo and the grossbeak. "This species is quite variable in size, form and elytral markings"; the type being 8.5 mm. long, 3.5 mm. wide. These little Buprestid beetles hide during the day between leaves of low weeds, or in the flowers of mangrove, ucar or sedges. A single specimen was collected by Dr. Luis F. Martorell on Mona Island, resting between the leaves of a weed locally called "té," and subsequently Prof. J. A. Ramos collected several on flowers and weeds there.

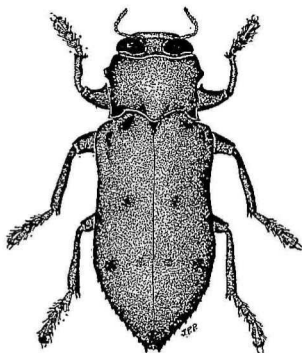
Buprestis decora Olivier, listed as an *Ancylochira* by Dr. Gundlach, has not since been collected in Puerto Rico.

Buprestis lineata F., listed by Drs. Stahl and Gundlach, is represented by one recently-collected specimen, found at Mayagüez in May 1933.

The Australian pine or beefwood tree (*Casuarina equisetifolia*) is attacked by comparatively few insects native to Puerto Rico, the endemic May beetles feeding on the foliage being almost the only serious pest. Dr. T. E. Snyder found "Injury to Casuarina Trees in southern Florida by the Mangrove Borer" (Jour. Agr. Research, 16 (6): 155-164, pl. 4, fig. 2. Washington, D. C., February 10, 1919), as he calls *Chrysobothris tranquebarica* Gmelin, to be serious. He found that the female beetle lays eggs in cracks or under the loose bark of small trees less than five years old, the larvae developing in, feeding on and burrowing into the cambium layer of the bark in all directions, and often killing the young sapling before reaching full size and ready to pupate. The normal life-cycle is completed in one year. Only a single such instance, at Vega Baja in 1930, has been noted in Puerto Rico of injury to beefwood, altho these trees and all kinds of mangrove are common everywhere in the coastal regions of the Island. This beetle is not known to occur in Cuba, altho a pest in Florida, and present in the Bahamas, Hispaniola and some of the Lesser Antilles. The adults are the largest of the genus in Puerto Rico, cupreous or aeneous in color, with deeply foveate elytra, and have been reported under a variety of names: *Chrysobothris impresa* F. by Drs. Stahl and Gundlach, *C. fraterna* described by Mannerheim, the type from Puerto Rico, and as *C. denticulata* Castelnau & Gory by Dr. Wetmore, who found it eaten by the petchary.



The Mangrove Borer, *Chrysobothris tranquebarica* Gmelin, five times natural size.
(Drawn by José F. Pietri.)



The Aceitillo Borer, *Chrysobothris meqacephala* Castelnau & Gory, six times natural size. (Drawn by José F. Pietri.)

Adults are found resting on dead logs or stumps of trees, in the mountains as well as on the coast, altho presumably only small living saplings serve as food for the immature stages.

Chrysobothris megacephala Castelnau & Gory has a head which seems not exceptionally large, but certainly it is much broader between the eyes than in *C. tranquebarica*, and the smaller beetle has no such deeply sculptured foveae, thus making more prominent the "four round, deep impressions" on each elytron. It was collected on Mona Island by Prof. J. A. Ramos, and occurs in Hispaniola as well as in Puerto Rico, the observed hosts of the larvae being "gallito" (*Agati grandiflora*), reared by Mr. E. G. Smyth, and the valuable cabinet wood "aceitillo" (*Zanthoxylum flavum*), reared by Dr. Luis F. Martorell, both records from Guánica.

Chrysobothris dentipes Germar, as identified for Dr. Stuart T. Danforth (Mayagüez vi-32), may be presumed to be in error, for Mr. W. S. Fisher in his "Revision of the North American Species of the Buprestid Beetles belonging to the Tribe Chrysobothrini" (Misc. Pub. No. 470, U. S. Dept. Agr., pp. 275, fig. 126, ref. 11. Washington, D. C., September 1942) says of this species that it is "restricted to coniferous trees," of which none occurs in Puerto Rico.

Chrysobothris thoracica described by Fabricius as a *Buprestis* from St. Thomas, has subsequently been collected at Ponce and Guánica in Puerto Rico. The beetle is scarcely a fifth of an inch long, short, robust, "head bright green, with the reliefs on front cupreous; pronotum reddish-cupreous with anterior margin aureous; scutellum dark green, elytra brownish-aneous, with Nile-green markings."

Chrysobothris wolcottii, described by Mr. W. S. Fisher (1925-119 to 121), the type from Mayagüez, others from Añasco and Río Piedras, was found by Dr. Stuart T. Danforth to form part of the food of the grackle and the flycatcher, and it is doubtless eaten by other birds as well. It is slightly larger than *C. thoracica*, has a similar bright green head, but each elytron is ornated with bright green markings. Dr. Gundlach referred to it as *C. lepida* C. & G., a Cuban species. Adults have been collected in all parts of Puerto Rico, and Dr. Luis F. Martorell found the larvae with characteristic flattened and enlarged thorax abundant in the trunks of the ornamental crape myrtle, *Lagerstroemia indica*.

Neotrachys hoffmani, one of the "New West Indian Buprestidae (Coleoptera)" (Proc. Ent. Soc. Washington, 32 (7): 125-129. Washington, D. C., October 1930) described by Mr. W. S. Fisher, is only 3.0 mm. long, the type from Puerto Rico, "allied to *guadeloupensis*, but differs in being subopaque, uniformly dark bronzy green above, broadly elongate and not so strongly narrowed posteriorly." Mr. R. G. Oakley subsequently found another on areca palm at Adjuntas.

Peronaemis cupricollis was described by Mr. W. S. Fisher as one of some "New Buprestid Beetles from Mexico, Central and South America, and the West Indies" (Proc. U. S. National Museum, 99 (3240): 327-351. Washington, D. C., 1949). The type was collected by Prof. J. A. Ramos at Indiera Alta, Maricao, being 11 mm. long, 3.5 mm. wide, "broadly agriliform, broadly rounded in front, strongly narrowed posteriorly, glabrous and rather strongly shining; head green, pronotum reddish cupreous, elytra olivaceous-green, body beneath uniformly bronzy green, with a distinct purplish tinge."

A single Buprestid collected at Indiera, in the mountains between Yauco and Maricao, is considered by Mr. W. S. Fisher to be possibly a new species of *Peronaemis*.

Taphocerus elegans was described by Mr. W. R. Fisher (1925-187) from a single specimen collected by Dr. Richard T. Cotton on El Yunque. Later, Mr. R. G. Oakley found another on chinaberry at Adjuntas.

Micrasta oakleyi, named after its collector by Mr. W. S. Fisher as one of "Two New Buprestid Beetles from Puerto Rico" (Proc. Ent. Soc. Washington, 37 (2): 30-32. Washington, D. C., February 1935), is from Ponce, "smaller (than *cubensis*), glabrous, and uniformly brownish cupreous, the marginal carina on each side of the pronotum entire," found on *Trophis racemosa*. What Dr. Luis F. Martorell found under castor bean leaf on Mona Island is considered by Mr. Fisher to be near this, or a new species.

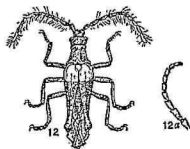
Micrasta ornata Fisher (1935-31), the type from Guánica, has "elytra ornamented with violaceous black spots, the marginal carina on each side of the pronotum obliterated anteriorly, and the elytra depressed deeply along the base." No collection has been made since that of the type by Mr. R. G. Oakley.

Micrasta puertoricensis was described by Mr. W. S. Fisher (Psyche 46 (4): 163-4. Cambridge, December 1939) from a single specimen collected by Dr. P. J. Darlington in the Maricao Forest at an elevation of 3,000 feet. Like others of the genus, it is very small, only 1.25 mm. long and 0.6 mm. wide, and "resembles *Micrasta oakleyi*, but differs in being uniformly black, with indistinct bronzy-green tinge."

Lycidae: Net-Winged Beetles

"The Lycidae, Lampyridae and Cantharidae (Telephoridae) of the West Indies" are comparatively well known because of this publication (Bulletin American Museum of Natural History, 46 (8): 413-499, fig. 65. New York, August 24, 1922) by Dr. Charles W. Leng and Mr. Andrew J. Mutchler, and their subsequent papers. They established the tribe Leptolycini and the included genus for the little black beetle, only 3.0 mm. long, with basal fifth of elytra yellow, named *Leptolycus heterocornis*,

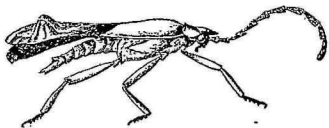
from Aibonito and Cayey. It has since been found at Villalba and Prof. J. A. Ramos has specimens from Maricao, Consumo and the mountains back of Mayagüez, all localities in the mountainous interior of Puerto Rico. Of the holotypic female with the color of the thorax and scutellum yellow, from Aibonito, to which Leng & Mutchler gave the varietal name *flavicollis*, Prof. Ramos also has specimens from the type locality.



Leptolycus heterocornis Leng & Mutchler, male, eight times natural size. 12a antenna of female. (After Leng & Mutchler.)

Lycids of the genus *Thonalmus* "are all elongate, glabrous insects, with long, feebly serrate antennae and subparallel elytra, usually bearing three more or less elevated ridges or costae. The elytra are of a brilliant orange or red color, with the posterior portion metallic green or violet." Of the two red and blue species present in Hispaniola, *Thonalmus dominicensis* Chevrolat has prominent elevated elytral crests, which are lacking in *Thonalmus chevrolati* Bourgeois. The latter was noted by Leng & Mutchler (1922-422) as present "in Porto Rico by commercial introduction only—at Guanica, April in boat-load of cane from Higuera (R. H. Van Zwaluwenburg)," but when questioned many years later, he could not remember whether his specimens were collected near the pier at Guánica where the cane boats from Santo Domingo landed, or dead in the hold of the boat after its load of cane fumigated with sulfur had been transferred to the empty waiting cane cars. Dr. Gundlach has no record of this strikingly obvious insect from Puerto Rico altho Dr. Stahl, possibly in error, records it as *Calopteron suave* J. Duval. The first authentic collections of live beetles in Puerto Rico were made by Mr. Felipe Mora at Hormigueros, August 1, 1932, reported but incorrectly identified by Dr. Stuart T. Danforth as *Thonalmus dominicensis*. In September 1936, adults were found in abundance in one field of young plant cane at Hda. María Antonia at Guánica, and in succeeding years others were found in cane fields as far east as Ponce by 1941. "In March 1940, a single beetle was collected at Hda. Victoria, between Coloso and Aguadilla, and several were noted in the same or adjacent fields in April and July," as reported in "The Seasonal Cycle of Insect Abundance in Puerto Rican Cane Fields"

(Jour. Agr. Univ. P. R., 27 (2): 85-104, fig. 12, ref. 16. Río Piedras, June 1944). In December 1939, a single specimen was found at Isabela, and in December 1943 one was collected in the mountains at Lares. Establishment in Puerto Rico had unquestionably occurred long before, presumably before 1930. If the beetle had come in on boat-loads of cane from Santo Domingo, as is most probable, it must have arrived before 1930, for it was in this year that the importation of cane ceased, due to federal quarantine restrictions. "That we have not found this beetle on Mona Island may be due to the xerophytic character of the Island, or it may furnish additional evidence of the probability of the introduction of *Thonalmus chevrolati* into Puerto Rico by commerce, for there is little or none from Hispaniola to Mona Island." Nothing is known as to the immature stages of the insect, and altho it is often noted in cane fields at La Romana and Higuera, Dominican Republic, we do not know if it in any way depends on sugar-cane. In captivity, the adults do not eat the eggs of *Diatraea saccharalis* F., and Mr. H. S. Barber is of the opinion that neither larva nor adult is predaceous.



The Lycid Beetle, *Thonalmus dominicensis* Chevrolat, four times natural size. (Drawn by Fritz Maximilien.)

Lampyridae: Firefly Beetles

Nearly a dozen fireflies are recorded from Puerto Rico, of which half are quite common, especially in citrus and coffee groves, and in virgin forest at the higher elevations, but some occur abundantly in even the most xerophytic coastal regions.

Lucidota marginipennis, described by Leng & Mutchler (1922-438) from Aibonito, has not since been collected.

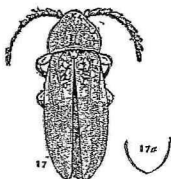
The elongate *Callopisma borencona* Leng & Mutchler (1922-440), "yellow, with apical two-thirds of elytra, tibiae and antennae black," is comparatively common. It has been repeatedly collected in grapefruit groves along the north coast, in coffee groves in the mountains and on the tree ferns of El Yunque and found to be an item in the food of lizards of these environments.

The broadly oval *Callopisma emarginata* Leng & Mutchler (1922-443), described from specimens collected at Mayagüez and in the mountains of

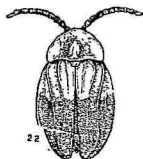
the western part of the Island, "reddish yellow, apical half of elytra, antennae and tibiae black," has since been found as far east as Rio Piedras.

Callopisma miniatocollis Chevrolat is listed from Puerto Rico by Dr. R. E. Blackwelder (1945-355), as is also *Callopisma rufa* Olivier, in synonymy with the *Lychnuris dimidiatipennis* J. Duval. The latter name was listed by Dr. Stahl, and as a *Callopisma* by E. Olivier in his "Contribution a la Faune Entomologique des Antilles Lampyrides" (Rev. Sci. du Bourbonnais et du centre de la France, 25: 19. 1912).

Leconteia galeata, described from St. Thomas and Puerto Rico by E. Olivier (Bul. Soc. Zool. France, 24: 91. Paris, 1899), was reported from Vieques by Leng & Mutchler (1922-453), and is found in all parts of Puerto Rico, even the driest, as well as in the mountains. It is possibly the largest firefly in Puerto Rico, dark grey to black above, prothorax broadly and elytra narrowly margined with yellow. Mr. August Busck collected



Callopisma boreconca L. & M. (After Leng & Mutchler.)



Callopisma emarginata L. & M. (After Leng & Mutchler.)

it at Fajardo, Arroyo and Aguadilla, and he is responsible for the collection on Vieques Island.

What Motschulsky described from Puerto Rico (1853-42) under the name of *Rabopus roseicollis*, "thorax red at middle; yellowish at margin, without spots; head, base of antennae, and the palpi, legs and the whole border of the elytra yellowish white," re-described by Leng & Mutchler (1922-436) as *Lucidota decorus* (Gemminger & Harold), being thus placed because the antennae are strongly serrate, is now listed as *Photinus decorus* Motschulsky. Mr. August Busck collected this at Bayamón, and it has since been found in grapefruit groves at Vega Alta and Río Piedras, but it is more typically a mountain species: from El Duque at Naguabo, and Jácome Alto, and in the higher coffee groves, being so abundant as to form an appreciable item in the food of *Anolis evermanni* and *Anolis cristatellus*.

Photinus dubiosus, described by Leng & Mutchler (1922-461) as known only from Puerto Rico, is considerably larger, 9.0 to 10.0 mm. long, "oblong,

greenish, becoming pale testaceous in drying," resembling *Photinus glaucus* of Cuba and Hispaniola, but "much darker in color beneath." Indeed, it was under the name of *Photinus glaucus* that Dr. Alex. Wetmore recorded finding this firefly eaten by the yellow warbler, the yellow-shouldered blackbird and the oriole. It is also eaten by the lizards *Anolis evermanni* and *Anolis krugii*. It has been found in the most xerophytic parts of Puerto Rico: on cotton plants at Boquerón and at light at Hda. Santa Rita, Guánica, as well as in coffee and orange groves and virgin forest in the mountains.

Photinus heterodoxus, described by Leng & Mutchler (1922-457) from females from Farjardo and Adjuntas as "elongate, 12.0 mm. long, parallel; yellowish above and beneath, the eyes only black," has not since been found.



Photinus triangularis E. Olivier. (After Leng & Mutchler.)

The type of *Photinus triangularis* E. Olivier (Ann. Soc. Ent. Belgique, 56: 25. Bruxells, 1912) is from El Yunque, and other specimens of this large, dull yellowish or golden-brown firefly, 13.0 mm. long, have been collected there. Mr. H. S. Barber, in a note accompanying the identification of the latest collection (November 30, 1944) states that "this does not belong to the genus *Photinus*, but in the genus *Diphotus* as now understood." Mr. August Busck collected this beetle on Culebra Island, altho the highest elevation there, Mt. Resaca, is only 650 feet high, and in recent years it has been covered with sugar-cane almost to the top.

Photinus vittatus G. A. Olivier is possibly the most abundant of all the fireflies in Puerto Rico, only 7.0 mm. long, "narrow, subparallel in form; pronotum yellow with carmine disc, elytra brown with narrow subsutural vitta often joining the broader outer testaceous margin." Certainly it is more common at the lower elevations, coming to light at all times of the year at Río Piedras and Guánica. Dr. Wetmore found it eaten by the cliff swallow, the patchary, the vireo and several warblers, while the crested

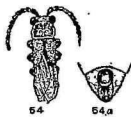
lizard, *Anolis cristatellus*, also succeeds in finding it, despite its normally nocturnal habits.

Cantharidae (Telephoridae): Leather-Winged Beetles

Tylocerus barberi, dedicated by Leng & Mutchler (1922-497) "to our friends and colleagues, Herbert S. Barber of Washington and Harry G. Barber of New York," is an elongate, yellowish-brown beetle, 7.5 to 9.5 mm. long, the pronotum yellow and subquadrate, the elytra blackish-brown, margined with yellow, and with two narrow yellow stripes. The type is from Manatí, but it is common everywhere in coastal Puerto Rico, and in the mountains as at Cayey, Aibonito and Villalba, being most often attracted to light. Prof. J. A. Ramos collected one specimen at light on Mona Island. The greatest number of these beetles observed was on watershoots of an unidentified tree at Barceloneta, June 8, 1916, many being in coitu.



Tyththonyx cavicornis L.
& M. (After Leng &
Mutchler.)



Tyththonyx discolor L.
& M. (After Leng &
Mutchler.)

Tylocerus bilineatus was described by Maurice Pic in his "Neue Malacodermen" (Zool. Anz., 76 (3/6): 95-98. Hamburg, 1928) from Puerto Rico.

Tyththonyx discolor, described by Leng & Mutchler (1922-490), the type from Aibonito, others from Desecheo Island collected by Dr. Frank E. Lutz, is a little elongate black beetle with elytra only partly covering the abdomen. The type is 3.25 mm. long, but those from Desecheo are smaller, 2.5 to 2.75 mm. in length, and paler thruout, being "dark brown rather than black." Subsequent collections have been made from Lares and Camuy.

Tyththonyx cavicornis, described by Leng & Mutchler (1922-489) from an elongate brownish holotype from Mona Island, 3.0 mm. long, has since been collected there in April and June by Prof. J. A. Ramos (1947-33), "swept from shrubs on the plateau."

Mr. Howard E. Hinton described "A New Species of West Indian *Tyththonyx* (Col. Cantharidae)" (Pan-Pacific Ent., 10 (1): 30-32. San

Francisco, 1934) from Puerto Rico under the name *bicolor*, and included a key for the separation of the five known West Indian species. Three additional species, "mostly red or yellowish red in color, with the black underwings protruding from beneath the short elytra," have since been found in Cuba (American Museum Novitates No. 924, pp. 5, fig. 5. New York, May 4, 1937).

Dasytidae (Melyridae): Soft-Winged Flower Beetles

Mr. G. E. Bryant determined two small flea-beetle-like insects collected at Pt. Cangrejos on cotton bolls to be a species of *Alymeris*, now called *Melyrodes*. Prof. J. A. Ramos (1947-33) reports collecting one such, as determined by Mr. H. S. Barber, on the beach of Mona Island, at Sardinera.

Mr. H. S. Barber gives the names of *Attalus* spp., or *Anthocomus* spp., to similar small beetles intercepted by Mr. R. G. Oakley on banana leaves in the mountains back of Ponce, and on the flowers of *Inga laurina* at Indiera in the mountains back of Yauco.

Cleridae: Checkered Beetles

Callotillus crusoe was the name given by Mr. A. B. Wolcott to one of "Two New species of West Indian Cleridae" (American Museum Novitates No. 59, pp. 3, fig. 1. New York, February 14, 1923), a slender black beetle, the apical half of its elytra pale yellow, collected on the ground at Camuy. The specific name was chosen, not because Robinson Crusoe had anything to do with Puerto Rico, but as this was the only Clerid at that time known here, and that but a single specimen, it seemed as lonesome as Crusoe on his tropical island. Dr. Gundlach, however, had reported *Opilo unifasciatus* as determined by Chevrolat. More recently Mr. R. G. Oakley has collected what Dr. E. A. Chapin identified as species of *Epiphloeus* on flowers at Ponce, and of *Phyllobaenus* at Guánica. Under the bark of a dead flamboyán (*Delonix regia*), another Clerid with a transverse yellow stripe across the dark brown elytra has been found at Río Piedras.

Indeed, more intensive collecting would doubtless produce more than a month of Fridays, even if not including the abundant *Necrobia rufipes* DeGeer. This is a not-so-slender but typically hairy, bright, iridescent blue beetle, collected at Mayagüez in December 1939 by Mr. H. Ayguabibas on dried meat. Even earlier than this it had been found resting on cucumbers at Loíza, and Prof. J. A. Ramos (1947-33) on Mona Island collected "numerous specimens on decaying fish at Sardinera Beach, March 6, 1944, and others on a dead goat on the plateau, April 7, 1944."

The cosmopolitan *Necrobia ruficollis* F., greenish-blue with basal fourth

of elytra and legs red, has been found at Mayagüez in abundance by Prof. J. A. Ramos on old cheese imported from Argentina.

Temnochilidae (Ostomidae, Trogositidae, Ostomatidae)

Temnochila portoricensis, described by A. Leveille (Ann. Ent. Soc. France, 76: 401. Paris, 1907), and *Temnochila aenea* Olivier are sufficiently abundant in forests, even if not in collections, to furnish food for the woodpecker, as reported by Dr. Alex. Wetmore.

Mr. W. S. Fisher determined as a species of *Airora* the Ostomid beetles which Mr. R. G. Oakley found under the bark of a dead tree at Guánica.

Tenebroides transversicollis J. DuVal, listed by Dr. Gundlach as a *Trogosita*, has since been collected under bark of *Inga vera* at Cayey, and with no host records, at Barranquitas, Hatillo, Mayagüez and San Germán.

Tenebroides punctulata Chevrolat, listed from Puerto Rico by Herr Edmond Reitter in his "Die Sud- und Mittel-Amerikanischen Arten der Gattung *Tenebroides* Piller & Mitterpacher" (Verh. Nat. Ver. Brünn für 1874, 13: 74. 1875), is in confirmation of its listing as a *Trogosita* by Dr. Stahl. It was of this or the preceding species of which Dr. Donald De Leon found larvae and pupae under the bark of various trees at various localities, and the remains of adults of which Dr. Alex. Wetmore had reported eaten by the woodpecker and the tody.

Quite different in habits is the "cadelle," *Tenebroides mauritanica* L., a cosmopolitan pest of stored products, observed in Puerto Rico with the larvae feeding on rice and sunflower seeds. Adults have been collected at light on Mona Island, at Camp Kofresi, but it remains to be seen if the species can continue to exist there when Mona is no longer inhabited by man. It is possibly the largest beetle which feeds on stored products, being three-eighths of an inch long, shining, dark brown and quite flattened.

Dermestidae: Larder Beetles

Only by the most unremitting care are collections of insects and natural history specimens preserved from the attack of Dermestid beetles, especially in the tropics. Thus it is but natural that Drs. Stahl and Gundlach should list *Dermestes carnivora* F., and *Dermestes vulpinus* F., now called *Dermestes maculata* DeGeer, altho neither has since been found in any great abundance: the former at Lareñ, the latter on the docks at San Juan. *Dermestes ater* DeGeer, originally identified from Puerto Rico as *Dermestes cadaverinus* F. by Dr. E. A. Schwarz, appears to be much more common recently, with many records from all parts of the Island, those from Mayagüez being on sausage and preserved meat.

Dermestes canina Germar, as determined by Mr. H. S. Barber, was

found on Mona Island by Dr. Luis F. Martorell: larvae, pupae and adults being present in abundance on goat skins being dried and also feeding on the fragments of flesh inside turtle shells on the beach. Prof. J. A. Ramos (1947-35) found them on dead fish at Sardinera Beach.

Attagenus piceus Olivier, the cosmopolitan "black carpet beetle," elsewhere known as a common museum and household pest, in Puerto Rico was first found on cotton plants at Quebradillas, as determined by Dr. E. A. Schwarz, and Prof. J. A. Ramos has since collected these small black beetles at Isabela and Mayagüez. Numerous interceptions of undetermined species of this genus were made at San Juan.

Attagenus gloriosae F., as identified by Mr. H. S. Barber, has been collected by Prof. J. A. Ramos at Río Piedras, Ponce and Mayagüez.

Globicornis fulvipes Guérin-Méneville, listed by Drs. Stahl and Gundlach as a *Trogoderma*, has been repeatedly collected since, most recently feeding on dead butterflies. They also list *Trogoderma insularis* Chevrolat, which has since been collected in the field, at Loiza and at Bayamón.

Eucnocerus anthrenoides Sharp, as identified by Mr. H. S. Barber, has recently attacked the insect collection of the College of Agriculture at Mayagüez.

One or more species of *Cryptorhopalum* were found by Dr. Alex. Wetmore to have been eaten by warblers, and numerous subsequent collections, identified only to "sp." or "sp. nov." have since been made from the flowers of various trees: guácima, capá prieto and guamá, as well as from jasmin and sedges.

Bostrychidae: Powder-Post Beetles

"*Rhizopertha dominica* F. as a Library Pest" by Dr. W. A. Hoffman (Jour. Ec. Ent., 26 (1): 293-4. Geneva, February 1933) appears to be the first record of these little yellowish-brown powder-post beetles attacking the inner portion of the back of books, altho they have since been intercepted in chicory beans and in dry chick peas at San Juan. Under the name of *Rhizopertha pusilla* F., Leng & Mutchler record the same insect as a "cosmopolitan species, or introduced from the United States in timber." It is by no means the only beetle or other insect pest which attacks books in the tropics, but the effectiveness of fumigating with cyanide at the rate of 10 pounds of Cyanogas to 10,000 cubic feet, recommended by Dr. Hoffman for the library of the School of Tropical Medicine, will doubtless be equally successful if used elsewhere against this or any other of the insects attacking books.

Dinoderus minutus F., a short little cylindrical, yellowish Bostrychid beetle, has been found in great abundance in flour, and feeding on sweet

corn seed, as well as in the trunks of upright dead trees and in the stems of dead gaudul bushes. These are comparatively incidental and accidental deviations, however, from its normal habit of attacking bamboo when dry, and most injuriously when the bamboo has been made up into furniture or novelties for tourists. As such it has received the almost undivided attention of Mr. H. K. Plank for a considerable number of years, the results of his investigations being summarized in the annual reports of the Mayagüez Station from 1936 to date. The common *Bambusa vulgaris* is much more susceptible to attack than some other relatively resistant or nearly immune species, as is shown in "The Relation between Curing and Durability of *Bambusa tuldoides*" (Caribbean Forester, 7 (3): 253-273. Río Piedras, July 1946), by David G. White, Milton Cobin and Pedro Seguinot Robles. Indeed it has not been possible for Mr. Plank to secure complete immunity of *vulgaris* until he tried "DDT for Powder-Post Beetle Control in Bamboo" (Science, 106 (2753): 317. Baltimore, October 3, 1947), of which "one thorough brushing with a kerosene solution at the 5 percent residual strength resulted in 94 percent control." His studies on the "Biology of the Bamboo Powder-Post Beetle in Puerto Rico" (Bulletin No. 44, Federal Expt. Station, Mayagüez, pp. 29, fig. 19, ref. 13. Washington, D. C., May 1948) showed that "development from deposition of the egg to emergence of the adult averaged 51 days."

Heterarthron gonagrum F., a much larger, darker and more elongate Bostrychid beetle, three-eighths of an inch long, is present in all the Greater Antilles and in most of the Lesser Antilles as far south as St. Vincent. All the local records are from the more xerophytic part of the Island: Mr. E. G. Smyth having reared it from mesquite or "bayahonda" (*Neltuma* or *Prosopis juliflora*) at Guánica, Dr. Luis F. Martorell from "burro" (*Capparis flexuosa*) at Santa Isabel, and Prof. J. A. Ramos (1947-40) on Mona Island "boring in casuarinas."

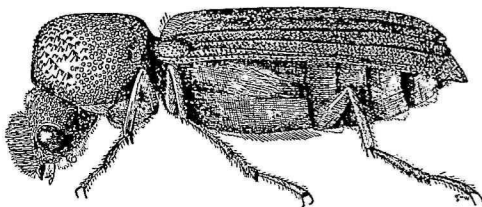
Xylomeira torquata F., quarter of an inch long, has a similar distribution, Dr. Luis F. Martorell having collected many specimens at light on Mona. Dr. Stuart T. Danforth reared it from a dead tamarind tree near Ponce, and it has been found infesting the dead branch of an unidentified leguminous tree at Coamo.

Tetrapriocera longicornis Olivier (= *T. tridens* F.), listed by Dr. Gundlach as a *Xylopertha*, with continental as well as West Indian distribution, but restricted to a xerophytic environment, was noted in great abundance at light at Guánica by Mr. E. G. Smyth in October 1913, and Prof. J. A. Ramos found a single specimen attracted to light on Mona Island in April 1944. The crested lizard, *Anolis cristatellus*, at Boquerón was found to have eaten these beetles.

Xylobiops floridanum Horn, as determined by Mr. W. S. Fisher, was reared by Dr. Luis F. Martorell from a dead branch of "burro" (*Capparis flexuosa*) at Santa Isabel.

Xylobiops parilis Lesne, previously known from Mexico, has been collected at Tallaboa, Puerto Rico, according to Prof. J. A. Ramos.

From their lateral appearance of perpetually bowed head, suggesting the devotion of priests, Fabricius gave the names of religious orders to what he considered the various species of *Apate*, but his *francisca* and *carmelita* are now thought to be only synonyms of *Apate monacha*, present in Africa as well as in the West Indies. These are large beetles, five-eighths of an inch long and three-sixteenths wide, cylindrical, dark brown and heavily chitinized, rarely coming to light, but most often found in the dead or dying trunk of a small tree in which each beetle has made a separate tunnel.



The Bostrychid Beetle, *Apate monacha* Fabricius, five times natural size. (Drawn by G. N. Woleott.)

It "starts obliquely from a node in the tree where the small branches come out, but curves upward when the center of the slender tree is reached, and is discontinued just before joining the next tunnel. Alternate tunnel entrances are on opposite sides of the sapling, indicating that the beetles are possibly less social in their habits than might at first appear." "The female beetle lays her eggs in the tunnel of the tree which she and her companions have killed, as the larvae require the wood of freshly killed trees for their nourishment." Infestations most often develop in coffee groves, or plantations of mahogany, where the brush and small trees, cut down where the more valuable trees are to be planted, has been left lying about to furnish food for the initial generation of *Apate*. The beetles developing from this valueless brush, which should have been burned if no other use could have been found for it, then attack the economic trees and may cause serious losses before the death of the smaller trees indicates what is happen-

ing. If the infested trees already dead are of no particular value, the simplest method of killing the beetles is to cut down the trees and burn them. If the trees are alive and valuable, the beetles may be killed in their tunnels by means of a No. 6 or No. 8 soldering wire. These wires are strong enough to pierce the beetles, yet sufficiently flexible to bend according to the curve of the tunnels. Their use is entirely practical, as has been proved by extensive use.

Under the name *Apate carmelita* F., both Dr. Stahl and Dr. Gundlach recorded the presence of this pest, the latter adding, "Es dañino a los árboles, perforando la larva, los troncos y ramas." Mr. R. H. Van Zwaluwenburg thought the insect exceptionally injurious around Mayagüez in the year 1915, and it is true that most records of injury are from the Mayagüez region or the western part of the Island, the farthest east being at Bayamón in 1923 and at Río Piedras in 1912. He recorded it as attacking mahogany, coffee, grapefruit, citron, pomelo, gandul, flamboyán, willow and hueso (which may have been *Linociera* (or *Mayepea*) *domingensis*, or *Picramnia pentandra*). Additional recorded hosts are tamarind, quenepa, guava, aguacate, pomarrosa, achiote, mangle, ucar, beefwood and cultivated grape vines. Mr. H. Bourne, of Guánica Centrale, found a cane stalk at Limón infested with thirty beetles, but attack on sugar-cane is very exceptional. Even such short-lived plants as Sea Island cotton may be attacked, and sometimes the diameter of the infested sapling tree is so small that most of its woody interior is eaten away to make a tunnel large enough to contain the beetle. Rarely can such plants recover, but if the beetles have been killed, larger trees eventually outgrow the injury.

Lyctidae: Powder-Post Beetles

The Lyctid powder-post beetles are small, elongate and slender, somewhat flattened as compared with the cylindrical Bostrichids, larger and more impressive, but they are possibly even more destructive, and convert an even larger part of their host to powder.

Lyctus aequalis Wollaston, as identified by Mr. W. S. Fisher, has been intercepted at light in San Juan.

Lyctus caribeanus Lesne has been reported as attacking stored bamboo at Mayagüez, and as infesting almacigo logs at Guayama.

Lyctoxylon japonum Reitter is an oriental species, identified in 1921 by Dr. E. A. Schwarz from Puerto Rico, where large numbers were attracted to light at Río Piedras, having come from native baskets that were eventually so completely destroyed that nothing remained of them but a mere shell, and a large heap of fine yellow powder. They were parasitized by Pteromalid wasps, identified by Mr. S. A. Rohwer as a species of *Neo-*

catolaccus, and possibly for this reason the beetle has not been noted generally as a serious pest since. Indeed, the only other local record is of occurrence in the branch of a leguminous tree at Coamo, two years later.

Trogoxylon curtulum Casey, as identified by Mr. W. S. Fisher, also attacks native baskets, and has been reared from almacigo logs, but is of greatest importance as a pest of the sapwood of mahogany, *Swietenia mahagoni*. When an attempt is made to cover up the deception of incorporating sapwood in furniture supposed to be all heartwood, by heavy staining with potassium bichromate, the emerging beetles come out through both stain and varnish, leaving telltale holes and little piles of very fine powder. Very definitely, they do not breed in mahogany heartwood, and if the furniture is guaranteed to be entirely and exclusively of heartwood, their emergence will prove the substitution of sapwood.

Ptinidae: Spider Beetles

Dr. Alexander Wetmore reported the remains of a species of *Ptinus* as eaten by the northern parula warbler, but this is the only record of a representative of this family from Puerto Rico.

Anobiidae: Drug Store Beetles

Stegobium panicea L., the tropicosmopolitan "drug store beetle," has been collected at light at Mayagüez. This is the only familiar Anobiid which Mr. W. S. Fisher identified from Puerto Rico out of the abundance of material collected here by Mr. R. G. Oakley, which was found to consist of eight new species. His descriptions of these eight new species were published in "Insectae Borinquenses" (1936-238 to 242).

Trichodesma oakeyi Fisher (1936-238) is a "very robust, brownish black, moderately shining Anobiid, "the whitish pubescence on each elytron forming a more or less distinct spot at middle and a smaller spot along sutural margin near apex." It is 5.5 mm. long, 3.0 mm. wide, the type from Aibonito. Dr. Donald De Leon, while conducting his two months survey of the forest insects of Puerto Rico, found this or other species of *Trichodesma* under the bark of mahogany and ucar at Guánica.

Lasioderma serricornis F., "la Carcoma del Tabaco," a cosmopolitan pest of stored tobacco, was first definitely identified locally by Mr. D. L. Van Dine in 1921, when found attacking the binding of books. It seems to be especially attracted to the kind of stiff cardboard used for the binding of books, or for luggage in imitation of leather, and has also been collected in Puerto Rico in packaged chocolate, in ginger, and in pepper. Stored garden seeds are often found infested, possibly the most interesting example of attack on seeds being on camándula beads, the hard grey seeds of *Coix lachryma-jobi*. Not only did the adults and developing larvae eat the

interior of these seeds, but when strung on a thread to form a portiere, the thread was so often severed as to greatly discourage the person industriously engaged in re-stringing them. Cotton seed and cotton seed meal are notoriously subject to attack, as is also tobacco seed, but the principal economic host is stored tobacco.

In the older economic literature, *Lasioderma serricorne* is called the "cigarette beetle," altho as a matter of fact one rarely finds cigarettes attacked, the injury to cigars being much more common, and "tobacco beetle" seems a more suitable name. The beetles themselves cause comparatively little damage, for they rarely eat enough to be noticeable, but it is the tunnels and the dusty powder resulting from the activities of the larvae that are chiefly objectionable. In made-up cigars, such holes render the product unsaleable. Dr. W. D. Hunter once said of gift cigars from Havana that heavy infestation indicated the quality of the cigars, but this was cold comfort to the unfortunate giver. Injured cigars do not draw well, burn unevenly, and dust is drawn into the mouth of the smoker. Infestation may occur at any time: from the time the green tobacco is hung up in the drying shed until the finished product is in the hands of the consumer. The dust-filled cracks and crevices of old tobacco factories, and piles of discarded refuse are almost invariably infested with all stages of this small beetle, and in one case in Puerto Rico, an exceptionally heavy infestation developed in tobacco hung in a drying shed in which was stored infested cotton seed meal, intended to be used for fertilizer.

Mr. Joseph N. Tenhet, inspecting tobacco storage warehouses in Puerto Rico in August 1949, found practically no live adults. On compiling the records of injury on file at the Río Piedras Station, it was found that practically all were during the winter and early spring, with none for the summer and autumn months. Apparently summer temperatures prevent injury, while winter temperatures, especially in the mountains, are much more favorable for the development of this pest. This suggests that as a practical measure of control, storage at temperatures varying considerably from those of winter in Puerto Rico might be reasonably effective.

Neither Dr. Stahl nor Dr. Gundlach note the presence in Puerto Rico of *Lasioderma serricorne*, and it seems hardly possible that it could have been present and they did not have its damage brought to their attention. In 1910, however, Mr. W. V. Tower, at the Mayagüez Station, reported "a beetle borer in tobacco warehouses" and started his experiments in fumigation with cyanide which eventually resulted in his taking over the commercial fumigation for the Porto Rico-American Tobacco Co. At the present time, the beetle may be presumed to be in all parts of the Island. The adult is from 2.2 to 3.0 mm. long, elongate-oval, moderately convex, uniform dull reddish-yellow or brownish-red, with a fine uniform recumbent

pubescence on the entire body. The segments of the antennae are triangular, all except the first of approximately of the same size, and not as in *Stegobium panicea*, with the terminal three much larger than the others. The whitish larva is almost as hairy as a Persian kitten, and when fully-grown and about to pupate, compacts its excremental dust into a definite pupation chamber. Possibly the best technical and economic account is "The Tobacco Beetle: an Important Pest in Tobacco Products" (Professional Paper) Bulletin No. 737, U. S. Dept. Agr., pp. 77, fig. 16, pl. 3, ref. 90. Washington, D. C., March 17, 1919) by Mr. George A. Runner.

Petalium puertoricensis Fisher (1936-239) is only 1.22 to 1.75 mm. long, 0.5 to 0.75 mm. wide, "moderately elongate, subopaque, uniformly reddish brown," the type from dead wood or live "ucar" or "moca" trees in the mountains north of Ponce, intercepted by Mr. R. G. Oakley.

Calymmaderus bibliothecarum Poey, listed by Dr. Gundlach as a *Dorcatoma*, was characterized by him as "sumamente dañino, porque la larva perfora libros y destruye colecciones de historia natural, tanto zoológicas como botánicas," but this particular pest of books and natural history collections has not been reported from Puerto Rico since.

Catorama herbarium Gorham has been repeatedly identified by Mr. W. S. Fisher as a pest of the bindings of books in the San Juan region: a considerably larger beetle than *Lasioderma serricorne*, and sometimes accompanying it in destroying book bindings.

Catorama neitumae was recently described by Mr. W. S. Fisher as one of several "New Coleoptera from Puerto Rico" (Jour. Agr. Univ. P. R., 25 (4): 37-39. Río Piedras, April 7, 1942) from an abundance of material reared by Dr. Luis F. Martorell from the seed pods of mesquite or "baya-honda" (*Neltuma* or *Prosopis juliflora*), at Guánica. "This species is related to *Catorama herbarium* Gorham, but differs from that species in being uniformly black on the dorsal surface of the body, in having the pubescence on the pronotum and elytra finer and more silky, the punctures on the elytra irregularly distributed and not arranged in rows, the lateral striae extending only to the middle of the elytron, and the anterior tibia with only one longitudinal sulcus." It is 3.5 mm. long and 2.0 mm. wide.

Catorama insulicola Fisher (1936-240) is only 2.0 mm. long and half as wide, described from specimens intercepted on ucar (*Bucida buceras*) on the beach west of Ponce by Mr. R. G. Oakley.

The other non-economic species of Anobiid beetles intercepted by Mr. R. G. Oakley in the Ponce region which Mr. W. S. Fisher named and described (for three of which Dr. Blackwelder (1945-405 and 406) changes the gender of the specific name to the feminine, ending in -a) are:

Cryptorama densipunctatum Fisher (1936-240)

Protheca flavitarsis Fisher (1936-241)

Caenocara insulanum Fisher (1936-242)

Caenocara maculatum Fisher (1936-242)

Caenocara oakleyi Fisher (1936-241).

Aderidae (Euglenidae)

Mr. R. G. Oakley was even more industrious in collecting new species of Euglenids in the coffee groves, on orange trees and on various other hosts in the mountains north of Ponce. Of them, however, Mr. H. S. Barber, of the U. S. National Museum, to whom this material was assigned, has prepared no descriptions, but merely given subgeneric names such as *Ganascus*, *Pseudariotus*, *Sandytes*, *Hylophilus*, *Xylophilus* and *Zonantes*, the only specific determination being *Aderus guttatus* Champion, originally described from St. Vincent and Grenada. This beetle Mr. Oakley repeatedly collected on coffee in the Ponce region, on "moca" (*Andira jamaicensis*), on "roble de pantano" (*Quercus thompsonii*) and on "mato de playa" (*Guilandina crista*); and at Juana Díaz on guava (*Psidium guajava*) and orange.

Lymexylonidae: Ship-Timber Beetles

Attractocerus brasiliensis Laporte & Serville was first noted in Puerto Rico by Dr. Gundlach. "Solamente la he cogido cuando voló a la vela encendida en la casa de campo. Su vuelo es ruidoso o acompañado de un zumbido." It is a slender, elongate beetle, nearly an inch in length, with very small non-functional elytra standing erect on its back, and membranous hind wings reaching a little more than halfway to the apex of the abdomen. When the beetle is at rest, its hind wings are held upright like those of a butterfly. The characteristic noise which it makes in flight is doubtless due to the inadequacy of such short wings, but nevertheless, the insect persists in western Puerto Rico, and repeated collections have been made in the mountains by students of Dr. Danforth. The most recent collections were: at light at Lares in the fall of 1938 by Felipe Mora; at Las Bocas, Utuado in 1941, and at light in Ponce, 1946. Dr. Gundlach did not find it in Cuba, and it is not recorded from any other of the West Indies, but its range is from Mexico thru Central America and tropical South America to Argentina and Chile. Nothing is known of its life-history.

Nitidulidae: Sap-Feeding Beetles

With nothing comparable in the tropics to the abundant flow of sap of maple and other trees in the spring of the temperate zone, Nitidulid beetles occur mostly under the leaf-sheaths of sugar-cane, in rotten cane stalks, or those eaten by rats, as well as in decaying fruit of all kinds lying on the ground. They are small, flattened beetles, having wide, thin side-margins

of the thorax, and elytra often truncate long before the apex, leaving the end of the abdomen exposed.

Colopterus truncatus Randall, synonymous with the *Colastus infimus* which G. F. Erichson described from Puerto Rico (in E. F. Germar's "Versuch einer Systematischen Eintheilung der Nitidularien" (Zeit. für die Ent., 14: 245. Berlin, 1843) has not since been collected here, but Mr. A. J. Mutchler identified specimens in the collection of Dr. Stuart T. Danforth as *Colopterus amputatus* Erichson.

Of *Conotelus fuscipennis* Erichson, now considered as only a variety of *Conotelus conicus* F., which is also separately listed by Dr. Blackwelder (1945-411) from Puerto Rico, Dr. Gundlach notes, "se le encuentra a menudo en el cáliz de las flores." Repeated collections have been made since in the more humid parts of the Island, on many kinds of flowers, such as rose, gardenia, kumquat, "roble" (*Tecoma pallida*) and "emajagua" (*Pariti tiliaceum*), of this exceptionally elongate, dark reddish-brown, spindle-shaped beetle, which has less than half the length of its tapering abdomen covered by its elytra.

Carpophilus dimidiatus F. has been found in abundance in flour and corn meal in Puerto Rico, in stored mahogany seed at Cayey, and Prof. J. A. Ramos reports it from Mona Island. The cosmopolitan variety *mutilatus* Erichson is listed from Vieques Island by Leng & Mutchler.

Carpophilus hemipterus L., as identified by Dr. E. A. Schwarz, was found in decaying cane seed at Río Piedras, only a single record, but actually this is a common insect in the rotten seed or rat-eaten cane, which nobody since Mr. Thos. H. Jones has bothered to collect. It is black, with prominent large subtriangular yellow spots at the apex of the elytra.

Carpophilus (Urophorus) humeralis F., as identified by Dr. E. A. Chapin, was found on the ground at Arecibo under rotten fruits of "almendra" (*Terminalia catappa*) and of "jobo de la India" (*Spondias dulcis*).

Carpophilus tempestivus Erichson, as determined by Mr. W. S. Fisher, was found by Mr. R. G. Oakley on rotten oranges at Ponce. Undetermined species have been found in rotten maga pods at Vega Baja, and Dr. Wetmore reports finding these beetles eaten by the martin.

The yellow elytra of *Haptoncus luteolus* Erichson almost cover its short abdomen. Judging by the number of times it has been collected, it is by far the most abundant of Puerto Rican Nitidulids: under leaf-sheaths of sugar-cane, in cane chewed by rats, on tassels of corn, in rotten oranges, in rotten grapefruit, in rotten fruit of "jobo" (*Spondias mombin*), in rotten fruit of "jobo de la India" (*Spondias dulcis*), in rotten fruit of "níspero" (*Sapota achras*), in rotten fruits of "caimito" (*Chrysophyllum cainito*), in rotten fruits of "limón de Jerusalén" (*Triphasia trifolia*), and in rotten

Pods of *Inga laurina*. Dr. Gundlach lists it as an *Epurma*, and Dr. Wetmore notes that it was eaten by a flycatcher. It has been repeatedly collected at light on Mona Island.

A small beetle identified as a species of *Epuraea* by Dr. A. E. Chapin has been collected at Mayagüez.

The cosmopolitan *Stelidota geminata* Say and the West Indian *Stelidota ruderata* Erichson are listed by Dr. Gundlach, and Dr. Wetmore found these beetles to have been eaten by the swift and the cliff swallow. Dr. Stuart T. Danforth collected them in large numbers from decaying citrus fruits in the Mayagüez region and in the mountains, at Las Marías and Maricao. Their distribution is general wherever citrus fruits are grown in Puerto Rico, altho the most eastern record is at Bayamón.

The very small dark brown *Stelidota strigosa* Gyllenhal, as determined by Dr. E. A. Chapin, was collected by Prof. J. A. Ramos on Mona Island.

Lobiopa insularis Castelnau, listed by Drs. Stahl and Gundlach as *Lobiopa decumana* Erichson, and thus identified for Dr. Danforth by Mr. A. J. Mutchler, is 6.0 mm. long, with the apex of its elytra rounded, lateral margins of prothorax and elytra thin and semitransparent yellowish. Mr. E. G. Smyth noted adults and larvae under rotten fruits of guava (*Psidium guajava*) on the ground at Río Piedras, and it has also been found under rotten fruit of "jobo" (*Spondias mombin*). Most records are from citrus fruits lying rotting on the ground, Dr. Stuart T. Danforth and students having made repeated collections in the Mayagüez region, at Las Marías and Maricao, and Mr. R. G. Oakley having intercepted it in the mountains back of Yauco, at Indiera. Adults may hide under the bark of trees, and have been attracted to light at Bayamón.

Dr. A. G. Böving identified as a species of *Glischrochilus* the beetles which Mr. R. G. Oakley found in rotten orange fruit at Ponce.

Cucujidae: Flat Bark Beetles

The early records of *Laemophloeus adustus* Leconte, listed by Dr. Gundlach, and of *L. bituberculatus* Reitter and *L. unicornis* Reitter, have not been confirmed by later collections, but unidentified species of this genus: minute, flattened, oblong reddish-brown beetles, were found under the bark of trees and in decaying wood by Dr. Donald De Leon when making his survey of forest insects of Puerto Rico in 1940.

The cosmopolitan flat grain beetle, *Laemophloeus minutus* Olivier, has been repeatedly found in wheat flour, in macaroni and in soup pastes, as well as in garden seeds and chocolate.

Silvanus bidentatus F., as identified by Mr. W. S. Fisher, was collected by Prof. J. A. Ramos at Mayagüez, Ponce and Humacao.

Herr Ferd. Nevermann of Costa Rica identified for Dr. Stuart T. Danforth some beetles collected at Mayagüez as *Silvanoprus scuticollis* Walker.

The foreign grain beetle, *Ahasverus advena* Waltl, was listed from Puerto Rico by Dr. Gundlach as a *Silvanus*, and by Riley & Howard (*in* *Insect Life*, 6: 218. Washington, D. C., February 1894) as a *Cathartus*. It has since been intercepted in green lima beans and in dry pigeon peas at Bayamón, in the dry pods of *Inga laurina* at Juana Díaz, and most recently under the bark of a dead tree on Mona Island.

Ahasverus rectus Leconte, as identified by Mr. W. S. Fisher, was found in abundance on Mona Island by Prof. J. A. Ramos (1947-35), having previously been noted in pigeon peas at Bayamón.

The cosmopolitan *Cathartus quadricollis* Guérin-Ménéville (= *C. cassiae* Reiche, under which name it was originally reported) was also collected in pigeon peas at Bayamón, and Prof. A. J. Ramos found them in abundance in tamarind pods at Faro de Cabo Rojo.

The saw-toothed grain beetle, *Oryzaephilus surinamensis* L., is a common pest of stored food products in Puerto Rico, having been found in corn, rice, dry dates, chocolate candy, raisins, walnuts, almonds, and most recently in babassú nuts, *Orbiginia speciosa*.

Monamus concinnulus Walker, as determined by Mr. W. S. Fisher, has been collected on bananas, grapefruit and pomarrosa (*Eugenia jambos*).

Nausibius clavicornis Kugelann, listed by Drs. Stahl and Gundlach as *N. dentatum* Marsham, has repeatedly been found since in brown sugar.

The German consul in Mayagüez, Herr Leopold Krug, who was instrumental in inducing Dr. Gundlach to visit Puerto Rico, was himself much interested in entomology, and in 1871 brought to Germany specimens of beetles which he had collected from the Mayagüez region. It was not until 1932, however, that Herr Ferd. Nevermann, of San José, Costa Rica, a specialist in the Cucujidae, described in his "Beitrag zur Kenntnis der Telephanus (Col. Cucujidae)" (*Stettiner Ent. Zeitung*, 93 (1): 1-35, pl. 2, Stettin, 1932) these specimens, collected sixty-one or more years previously, and untangled the nomenclature of the West Indian species. Later, he identified the light yellow, unmarked species common in Puerto Rico which hides during the daytime under the leaf-sheaths of sugar-cane. This is *Telephanus pallidus* Reitter, which he considered, if anything, to be a beneficial insect, as at night both larvae and adults feed on fungus spores. *Platamus* ? (*Telephanus*) *pallidulus* Chevrolat with which it has been confused, is quite a different species, most often found on withered banana leaves, but also present in grapefruit groves and on *Inga laurina*, or forest vegetation, and found in Cuba as well as in Puerto Rico.

Telephanus cubanus Nevermann (1932-28) was described from 41 speci-

mens in the Krug collection from Cuba and two from Puerto Rico, having five spots on the elytra forming an elongated pentagon.

Telephanus megacephalus Nevermann (1932-12) was described from three Puerto Rican specimens in the Krug collection, their most obvious character being a broad dark median band across the elytra.

Europs apicalis Reitter (in the older classification placed in the family Monotomidae), first determined from Puerto Rican material by Dr. E. A. Schwarz, was in pods of *Inga laurina* at Lares, but has since been found in the flowers of this coffee shade tree at Mayagüez and Adjuntas. It has been reared by Messrs. Richard Faxon and A. S. Mills from the seed pods of "maga" (*Montezuma speciosissima*) at Vega Alta.



The Cucujid Beetle, *Telephanus pallidus* Reitter, twelve times natural size. (Drawn by G. N. Wolcott.)

Europs maculata Grouvelle has been found in rotten papaya fruit at Arecibo, and under bark of almacigo at Guayama. Prof. J. A. Ramos found an undetermined species of *Europs* on Mona Island.

Smicrips palmicola LeConte, identified by Mr. W. S. Fisher as *S. hypocoproides* Reitter, was first found in Puerto Rico in rotten papaya fruit at Arecibo, but later collections have been made from the seed pods of mesquite or "bayahonda" (*Neltuma* or *Prosopis juliflora*).

Cryptophagidae: Silken Fungus Beetles

Hapalips filum Reitter are small beetles collected at Río Piedras and Ponce, identified by Mr. W. S. Fisher, which are now in the Mayagüez College of Agriculture collection.

The little beetles of the genus *Loberus*, superficially resembling some of the flea-beetles of the family Chrysomelidae, are represented in Puerto Rico by three or more species. *Loberus mutatus* Grouvelle, as identified by Mr. W. S. Fisher, has been intercepted in betel palm at Adjuntas, where also another species has been found on orange by Mr. R. G. Oakley.

The beetles found by Dr. Luis F. Martorell on watermelon vines on Mona Island, were identified by Mr. W. S. Fisher as a species of *Loberus* "not *mutatus* or *testaceus*," and later collections by Prof. J. A. Ramos (1947-36) sweeping vegetation on Sardinera and Uvero Beaches indicate that they are quite abundant on Mona.

Loberus testaceus Reitter is presumably the more common species, listed by Leng & Mutchler (1917-202) and identified for Dr. Stuart T. Danforth by Mr. A. J. Mutchler, the specimens from Boquerón. Without being specific, Dr. Wetmore notes these beetles eaten by the tody and the flycatcher, and they also form an item of food for the lizards *Anolis stratulus* and *Anolis cristatellus*. They have been found in the most diverse environments: in pink bollworm-injured cotton bolls at Pt. Cangrejos, in buds of "emajagua" (*Pariti tiliaceum*) at Arecibo, in pods of *Acacia farnesiana* at Boquerón, in dry pods of *Crotalaria incana* on the Mayagüez Playa, on leaves of *Inga laurina* and on tamarind flowers at Juana Díaz, and on the ground at Ponce, but it is quite possible that these do not all refer to the same species.

Phalacridae: Shining Flower Beetles

Phalacrus acutangulatus Chevrolat, previously known only from Peru, is the identification by Mr. A. J. Mutchler of some little oval shining black beetles found in cotton bolls at Pt. Cangrejos. Others, less highly polished but twice as large, at times abundant at light at San Juan and Río Piedras, have not been identified as to species. Those attracted to light on Mona Island have been identified as a species of *Acylomus* by Mr. W. S. Fisher.

Anthicidae: Ant-Like Flower Beetles

Of all the ant-like flower beetles, *Notoxus bipunctatus*, described from Puerto Rico by L. A. Auguste Chevrolat (Ann. Soc. Ent. France, (5), VII: ix. Paris, 1877) is immediately recognized by "the thoracic horn which extends in a sort of hood over the head," and the not so prominent posterior spot on each elytron. It was re-described by G. Quedenfeldt, the type from Puerto Rico, as *Notoxus krugii*, but Dr. Gundlach lists only *Notoxus dentipennis*, described by Chevrolat from Puerto Rico on the same page. The latter has not since been collected here, but the former has been taken at light at Pt. Cangrejos, Mayagüez and Ponce, and Mr. R. G. Oakley found it resting on ucar (*Bucida buceras*) at Ponce.

The beetles which Mr. R. G. Oakley found on the flowers of *Randia mitis* and other trees near Ponce were identified by Mr. H. S. Barber as a species of *Amblyderus*.

Anthicus floralis L., listed by Drs. Gundlach and Stahl, and by G. Quedenfeldt and Leng & Mutchler, was found by Dr. Wetmore to be an item in the food of the yellow-shouldered blackbird. These slender little reddish-brown beetles were found once in abundance in the central whorl of young shoots of sugar-cane at Arecibo, but we have no lead as to their role in a normal environment, for all other collections were at light: by Mr. R. G. Oakley at Ponce and by Prof. J. A. Ramos on Mona Island.

Dr. E. A. Schwarz tentatively identified as *Anthicus fulvipes* LaFerté two beetles which Mr. Thos. H. Jones found on the underside of aphid-infested okra leaves at Río Piedras, and this species has since been collected on flowers of flamboyán (*Delonix regia*) at Juana Díaz.

Anthicus vicinus was described by Marquis F. Thibault de la Ferté-Sénéctère on page 157 of his "Monographie de *Anthicus* et gen. voisins" (Paris, 1848) from "America borealis," but actually the type was from Puerto Rico. Herr G. Quedenfeldt (1186-122) re-described the same insect under the name of *fulvomicans*, and this was the name used by Drs. Gundlach and Stahl in their lists. It has since been found under fresh cow dung at Guánica by Mr. G. B. Merrill, as identified by Dr. E. A. Schwarz: a ferruginous shining beetle, not pubescent, legs lighter in color, elytra densely punctate, dark at apex and about the middle. Apparently it is quite common in the xerophytic part of Puerto Rico, for numerous subsequent collections have been made under dung at Guánica and Ponce.

Lathridiidae: Minute Brown Scavenger Beetles

"*Eufallia unicostata* (Belon), a Fungus Eating Beetle new to Puerto Rico" (Jour. Ec. Ent., 33 (5): 810-11. Menasha, October 1940) was found by Dr. W. A. Hoffman in great abundance on the casein-covered walls of the School of Tropical Medicine at Puerta de Tierra, feeding on their fungus-discolored surfaces during wet weather.

Mr. W. S. Fisher identified as a species of *Melanophthalma* some beetles which Mr. R. G. Oakley collected on coffee in the mountains back of Ponce. This may be what Dr. Gundlach lists as "*Lathridus fasciatus* es su nombre en la colección del Museo de Berlín."

Coccinellidae: Ladybeetles

No injurious ladybeetle is known to occur in Puerto Rico, the Mexican bean beetle or bean ladybird, *Epilachna varvestis* Mulsant (= *E. corrupta* Mulsant) being a pest of beans only in Central America northward from Panama to Mexico and the southern United States. Of *Epilachna patricia*

Mulsant, recorded from St. Croix in the Virgin Islands, we have no record of its host plant, and it is not even listed by Harry A. Beatty in his "Fauna of St. Croix, V. I." (Jour. Agr. Univ. P. R., 28 (3-4): 103-185. Río Piedras, July 7, 1947).

Psorolyma maxillosa, in the "Descriptions de Varietes, Especies et Generes nouveaux appartenant a la Famille des Coccinellides" (Ann. & Mag. Nat. Hist., 9 (9): 349-360. London, April 1922) by A. Sicard was described as "ovalis, convexa nitida, coerulea; subtus piceo-brunnea; antennis, palpis, pedibusque pallide flavis. Mandibulis exsertis, oculis prominentibus distinctissimus. Long 2.5 mm." was from a type collected at Lares. This ladybeetle is common in coffee groves everywhere on the Island, but is possibly most abundant at the higher elevations, as at Indiera. Dr. Stuart T. Danforth's collection includes specimens from El Yunque, as well as from Cartagena Lagoon. The larva is grey with black spots, and often two or three occur on a single coffee leaf, without apparent source of animal food. Rarely are they found on coffee leaves infested with the aphid *Toxoptera aurantiae*, and we do not know what either larvae or adults eat. The beetles themselves are eaten by the lizard *Anolis gundlachi*. Other native ladybeetles are often snapped up by lizards, and indeed lizards prove to be one of the greatest hazards encountered in releasing introduced ladybeetles, appearing just as the shipping cage is opened and catching and swallowing the beetles, sent from abroad with such care and expense, before they can make even the first adjustment to their new environment.

Scymnodes lividigaster Mulsant is an introduced ladybeetle. Dr. Francis X. Williams, on p. 183 of his "Handbook of the Insects and other Invertebrates of Hawaiian Sugar Cane Fields" (Experiment Station of Hawaiian Sugar Planters' Assn., pp. 400, fig. 190, pl. 41. Honolulu, 1931) under the name *Platyomus lividigaster* (Muls.), describes it as "a hairy, shining black species, about 3.0 mm. long, with a large yellow spot occupying each side of the thorax above. The abdomen seen from beneath is reddish. It is well distributed but rather uncommon in the (Hawaiian) Islands, and is an importation by Koeble from Australia in 1894." A shipment of this beetle was made from Hawaii in 1938, of which a liberation was made at Lajas. "In general, the beetles did not appear to be particularly voracious on *Sipha flava*, but some feeding was observed in the laboratory."

Rodolia cardinalis Mulsant, the internationally famous Australian ladybeetle, was introduced into Puerto Rico from Florida in 1932 for the control of the cottony cushion scale. For a considerable number of years, a colony of living beetles was maintained in the laboratories of the Experiment Sta-

tion at Río Piedras, so that some might be immediately available to control any outbreak of this scale as soon as it was reported by the worried citrus grower. Presumably this was a service much appreciated, but in many cases the entomologist, bringing a supply of beetles or larvae for release where cottony cushion scale had never before been found, would discover the Australian ladybeetles already present by natural dispersion. Thus paralleling the spread of the scale, it became dispersed along the north coast of Puerto Rico and by 1940 had appeared in the mountains back of Mayagüez. In the region around San Juan, where it had once been temporarily very abundant, it could no longer be found, because other factors in the natural control of cottony cushion scale, added to its own efforts, had eliminated this, its only source of food.

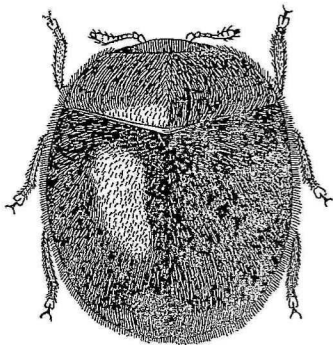
The planting of scale-infested beefwood (*Casuarina equisetifolia*) seedlings on Mona Island, brought from nurseries at Río Piedras, established the scale there, and necessitated the introduction of *Rodolia*. Some of the other factors in natural control in Puerto Rico do not exist or are less effective, thus "Introduced Ladybeetles on Mona Island" (Jour. Ec. Ent., 37 (3): 451. Menasha, June 1944) find there a continuous supply of food sufficient "to maintain a reserve of ladybeetles from which they may be obtained in sufficient numbers to supply the very rare needs of Puerto Rico." Forced by stern necessity, *Rodolia* in recent years has survived feeding on the endemic *Icerya montserratensis*, as in the plaza of Manatí, and no sooner does an outbreak of *Icerya purchasi* get well started, as at Palo Seco in 1945, and at Bayamón in 1947, before the ladybeetles appear and proceed to eliminate it. The brilliant cardinal red and shining black of the adults of *Rodolia cardinalis* should make them conspicuous, but in reality they are very hard to find, and especially to catch in large numbers in a citrus grove. On casuarina, however, the fully-grown larvae migrate from scale-infested twigs to the needles when about to pupate, and the pupae far out on the needles are readily seen and easily collected, while one judges of the former abundance of the insect by noting the empty pupal skins still attached to the casuarina needles.

Stethorus punctum Le Conte, a continental North American species, was specifically re-determined by A. Sicard, confirming the tentative identification by Dr. E. A. Schwarz as "close to *punctum* Lec." of the minute little black ladybeetles which Mr. Thos. H. Jones had found on leaves of "bucare" (*Erythrina glauca*) infested with mealybugs, and Mr. E. G. Smyth had later noted on jobo and guava leaves infested with thrips and whiteflies. It has since been found in considerable abundance on the leaves of sugar-cane at Loíza heavily infested with the green red spider, *Tetranychus sacchari* McGregor, and may be a factor of considerable im-

portance in the control of this new minor pest. These beetles identified by Dr. E. A. Chapin only to genus, were found on Mona Island by Dr. Luis F. Martorell on leaves of castor bean infested by lace bugs.

Mr. S. M. Dohanian, when engaged in "The Importation of Coccinellid Enemies of Diaspine Scales into Puerto Rico" (Jour. Agr. Univ. P. R., 21 (2): 243-7. Río Piedras, July 1937) from Trinidad, included in his shipments of beetles collected on scale-infested coconut palms the comparatively rare *Scymnus aeneipennis* Sicard. Only seventeen of these beetles were actually sent to Puerto Rico, and none has been collected here since the release in January 1936.

Dr. Stanley E. Flanders has identified as *Scymnus flavifrons* Melsheimer some beetles accompanying *Saissetia nigra* material received from Puerto Rico.

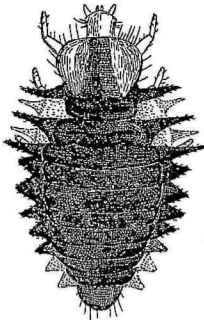


The Ladybeetle, *Scymnus roseicollis* Mulsant, thirty times natural size. (Drawn by G. N. Wolcott.)

Scymnus floralis F., listed by Dr. Gundlach from Puerto Rico, was collected by Prof. J. A. Ramos (1947-36) on Mona Island.

The little oval ladybeetle which the economic entomologist identifies by the orange prothorax and the orange apex of black elytra, earliest considered as a variety of *floralis*, but subsequently identified by Dr. E. A. Schwarz as *Scymnus roseicollis* Mulsant, is very common in Puerto Rico. Messrs. D. L. Van Dine and Thos. H. Jones were first to note its importance as a predator on the yellow aphid of sugar-cane, *Sipha flava* Forbes, and by the latter as attacking *Aphis setariae* Thos. on the same host. Mingled

with the aphids, one often notes the larvae of these ladybeetles, mostly black with retractile protuberances on the back. In reality, these almost omnipresent ladybeetles are not at all fussy about which particular kind of aphid serves as their food, and recent records are of their attacking *Aphis gossypii* Glover on cucumbers and okra, and resting on many other plants. With such characteristically marked elytra, their presence could be readily determined for Dr. Alex. Wetmore to report as items in the food of the tody, wood pewee, vireo, redstart, honey creeper and the yellow and parula warblers. Rather surprisingly, none was found in the stomachs of lizards. On Mona Island, Dr. Luis F. Martorell found them on the underside of castor bean leaves infested with lace bugs, and Prof. J. A. Ramos swept them from vegetation.



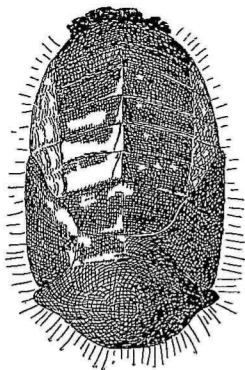
Larva of the Ladybeetle, *Scymnus roseicollis* Mulsant, forty times natural size. (Drawn by G. N. Wolcott.)

Scymnus phloeus Mulsant, formerly "frequently identified as *S. loewii* Muls., all records of *S. loewii* from the West Indies being certainly *phloeus*" according to Dr. E. A. Chapin, was listed from Puerto Rico by Dr. Gundlach. It has elytra laterally broadly margined with orange, the prothorax and median line of the elytra black. Judging by the records, it is not as common as *roseicollis*, but has almost identical habits. Dr. Wetmore found it in not a single bird stomach, nor was it found to have been eaten by lizards.

Scymnus thoracicus F., listed by Dr. Gundlach with *Scymnus ochroderus* Mulsant in synonymy, has not since been collected in Puerto Rico. "*Diomus thoracicus* Fabr., the type of the genus *Diomus*, and other species

including *D. roseicollis* Muls. of the West Indies, possess antennae of eleven segments and tarsi of four segments," according to Dr. E. A. Chapin (1933-95), *Diomus* being a subgenus of *Scymnus* as listed by Dr. R. E. Blackwelder (1945-444), and these two species distinct.

When most intensive studies were being made of the natural enemies of the cottony cushion scale, *Icerya purchasi* Maskell, after its initial occurrence and rapid spread in Puerto Rico, other ladybeetle larvae were noted, not associated with those of *Rodolia cardinalis*, on the exposed beach at Dorado where the introduced Australian ladybeetles failed to thrive.



Pupa of the Ladybeetle, *Scymnus roseicollis* Mulsant, forty times natural size. (Drawn by G. N. Wolcott.)

They pupated when much smaller than the introduced *Rodolia*, and emerged a few days later as light red beetles with two large black spots on each elytron. A technical "Description of the Larva of *Decadiomus pictus* Chapin (Scymnini, Coccinellidae)" by Dr. Adam G. Böving (Proc. Biological Soc., Washington, 46: 101-4, pl. 1. Washington, D. C., April 27, 1933) complements the naming and description of the adult of this new ladybeetle by Dr. E. A. Chapin in "A New Genus of West Indian Coccinellidae (Coleoptera)" in the immediately preceding pages (95-99, pl. 1) of the same journal. This endemic ladybeetle must have been predaceous on some other insect before the cottony cushion scale occurred in Puerto Rico, and the subsequent extreme scarcity of its adopted host is possibly one reason why it has since been found feeding on scale insects

of coconut palm at San Juan, and intercepted at Ponce and Yauco by Mr. R. G. Oakley, not associated with any host. *Decadiomus pictus* is "flesh-pink to red, ornamented with piceous to black markings,—length 1.6 mm."

Decadiomus tricuspis Chapin (1933-98) is "very pale stramineous (almost white)—length 1.0 mm.," the type collected on papaya at Río Piedras by Dr. H. L. Dozier, who characterized the larvae, feeding on whiteflies, *Metaleurodicus variabilis*, and the pupae as being "soiled white, without markings, and covered with fine hairs."

"The mealybug destroyer, *Cryptolaemus montrouzieri* Mulsant," according to Dr. E. O. Essig on p. 415 of his "Insects of Western North America," "is 3.0 to 3.5 mm. long, shining black, with the head, prothorax, tips of the elytra, and abdomen reddish. The minute oval eggs are yellow and are laid singly among the hosts. The larvae are yellow and entirely covered with long white waxy filaments. When mature they are 7.0 to 10.0 mm. long, and are often mistaken for huge mealybugs. The species was introduced from Australia into California in 1892 by Albert Koeble and has proven to be one of the most proficient enemies of the many kinds of mealybugs in California where it is firmly established." It was the first ladybeetle to be introduced and to become established in Puerto Rico. Mr. D. L. Van Dine, Entomologist of the Sugar Producers' Experiment Station at Río Piedras, had distributed it by 1911 thruout the cane districts of the Island, and had recovered it in the field. When reared in captivity, furnished mealybugs from sugar-cane for food, it accepts them without question and appears to thrive on a diet composed exclusively of this one kind of mealybug. When released, however, it finds these mealybugs protected by cane leaf-sheaths much too difficult to reach, by comparison with the numerous exposed mealybugs and soft scale insects present in Puerto Rico. Indeed, the first authentic record of finding *Cryptolaemus montrouzieri* living in a cane field was by Dr. H. L. Dozier more than a dozen years later, feeding not on the protected mealybugs, but on *Pulvinaria iceryi* Guérin-Ménéville, a soft scale insect normally occurring on sugar-cane, but in only this one case in sufficient abundance to attract these imported ladybeetles into a cane field. Another soft scale, *Pulvinaria psidii* Maskell, is often common on "palo de muñeca" (*Rauwolfia nitida*), and when its leaves are noted blackened by sooty mold from the scale, one can usually find some of these ladybeetles present. On trees of "jobo" (*Spondias mombin*), each dry autumn at Río Piedras *Pulvinaria psidii* formerly became so abundant as to cause an early shedding of the leaves, and great clusters of the scale and their waxy secretions accumulated on the underside of each leafless twig and branch. One never sees such mass infestations since the introduction of *Cryptolaemus*. The introduced scales *Icerya purchasi* Maskell and *Coccus viridis* Green are also eaten to some

extent, and the common exposed mealybugs *Pseudococcus citri* Risso, *Pseudococcus adonidum* L., and *Pseudococcus nipae* Maskell.

Scymnillus nunenmacheri Sicard (1922-355) is the only endemic scale-feeding ladybeetle normally to be found in Puerto Rican citrus groves. It is iridescent blue-black, 1.2 to 1.5 mm. long, and feeds on other diaspine scale insects, as on coconut palms and cycads, Dr. Luis F. Martorell finding it even attacking the mealybug *Pseudococcus nipae* Maskell on leaves of "anacagüitas" (*Sterculia apetala*) at Ponce. It is rarely sufficiently abundant in citrus groves or coconut groves to be much of a factor in the natural control of scale insects.

Scymnillus varipennis Sicard (1922-354), a small light brown ladybeetle, present with its bluish-grey larvae and reddish-brown puparia in great abundance on the leaves of coconut palm infested with *Aspidiotus destructor* Signoret at Río Piedras, has since been found in comparable abundance on coconut palms at Ponce. Dr. R. T. Cotton observed them feeding on mealybugs in grapefruit groves, and collected them on guava leaves infested with mealybugs and whiteflies, and on jobo leaves infested with thrips. Dr. Alex Wetmore reported species of *Scymnillus*, presumably this or the preceding, had been eaten by the tody, wood pewee, vireo and various warblers, and by the honey creeper or "reinita". None of these minute ladybeetles was found in the stomachs of the lizards examined, but it may be presumed that they are eaten by lizards when an opportunity is presented.

Of *Zilus cyanescens*, described by A. Sicard as a *Scymnillodes* from Jamaican specimens, characterized as "subrotundus, convexus, nitidus, supra cyaneous; antennis flavis, palpis rufis; subtus nigro-brunneus; pedibus rufis", he subsequently differentiated the Puerto Rican variety *violaceus* with "elytris violaceo-micantibus, prothorace angustiore". The types of this variety were collected from coconut palm infested with *Aspidiotus destructor* Signoret, but subsequently Dr. Richard T. Cotton noted them in considerable abundance feeding on *Asterolecanium bambusae* Boisduval on bamboo at Vega Baja, apparently the only record of an endemic ladybeetle attacking this scale.

Dr. E. A. Chapin, in describing "New Coccinellidae from the West Indies" (Jour. Washington Academy of Sciences, 20 (20): 488-495. Washington, D. C., December 4, 1930) presents the new name *Scymnillodes caseyi* for Casey's *Delphastus violaceus*, of which he noted two specimens collected "from Maricao, Porto Rico, July 2, 1917 by Harold Morrison".

Zilus gilvifrons, the types collected at Maricao by Dr. Harold Morrison, was described as a *Scymnillodes* by Dr. E. A. Chapin (1930-493). It has "metallic violaceous elytra", and is "easily recognizable by the brilliant

yellow pubescence on head and pronotum, length 1.5 mm." It has been repeatedly collected since in coffee groves in the mountains, and in orange groves, but without definite record as to the insects on which it was feeding.

A shipment containing 146 live *Hyperaspis billoti* Mulsant, collected in Trinidad by Dr. K. A. Bartlett, was opened in Río Piedras on February 9th, 1939, and the ladybeetles released on a small wild orange tree heavily infested with *Selenaspidus articulatus* Morgan. Most of the ladybeetles promptly took flight, and of those which remained in the scale-infested tree, several disappeared inside a crested lizard which had suddenly become interested when these little beetles began to emerge from the package. The scales shortly afterwards disappeared from the orange tree, but whether this was due to the introduced ladybeetles could not be determined by repeated observations. None of the descendants of these beetles has since been collected in Puerto Rico.

In contrast to the introduced ladybeetles from Australia that prefer unprotected and exposed mealybugs, rather than those hidden under the leaf-sheaths of sugar-cane, *Hyperaspis trilineata* Mulsant of Barbados is normally to be found only feeding on those of sugar-cane. This is quite a large ladybeetle, 4.0 mm. long, mostly dull orange in color, with the median margin and an elongate stripe on the elytra black, forming the "three lines" of the specific name. In life, both larvae and adults are usually whitened with the wax of their host, with which they are so closely associated under the cane leaf-sheaths. Repeated sendings of this beetle were made by Mr. R. W. E. Tucker in 1932 to 1935, and releases made in all parts of Puerto Rico. No recoveries have been made to date, and it seems doubtful if this ladybeetle became established in Puerto Rico.

Hyperaspis connectens Thunberg has two large dull orange spots on each black elytron connected to form a large "C", but the smaller and often more yellowish spots of *Hyperaspis festiva* Mulsant, aberation *apicalis* Weise, are joined, if at all, only narrowly on the lateral margin. Both species are listed by Dr. Gundlach. Dr. Wetmore found remains of the latter in the stomach contents of the martinique, the parula warbler, and the martin, while Dr. Danforth found that it had been eaten by the golden warbler. In every case where these ladybeetles are found associated with a host, this has invariably been aphids; most often *Sipha flava* Forbes on sugar-cane, but also *Aphis gossypii* Glover on cotton. Often they are found singly on plants not infested with aphids, but they are so constantly associated with the yellow aphid of sugar-cane, and in such numbers, that one may consider them as a major factor in its natural control.

Cryptognatha nodiceps Marshall and *Cryptognatha simillima* Sicard were found in abundance in Trinidad on coconut palms by Mr. S. M. Dohanian, who sent 646 of the former and 94 of the latter to Puerto Rico for release

in coconut groves. This was in sufficient numbers so that the former, at least, became firmly established here.

Delphastus nebulosus, described by Dr. E. A. Chapin as one of the "New Genera and Species of Ladybeetles related to *Serangium* Blackburn (Coleoptera: Coccinellidae)" (Journal Washington Academy of Sciences, 30 (16): 263-272, fig. 24, ref. 13. Washington, D. C., June 15, 1940), is characterized by being "pale yellow-brown, legs whitish, elytra each with a single basal castaneous spot of indefinite extent, length 1.0 mm., width 0.8 mm.". It was described from a type intercepted by Mr. R. G. Oakley at Villalba, but collections had been made long previously by Mr. Thos. H. Jones at Río Piedras, and at Martín Peña on bushes of guava (*Psidium guajava*) heavily infested with whiteflies. Large numbers of adults and larvae were found on a papaya tree at Isabela heavily infested with white scale in April 1939, and collections have also been made at Barceloneta and Ponce.

Pentilia insidiosa Mulsant (= *P. castanea* Mulsant) was first collected for importation into Puerto Rico by Mr. S. M. Dohanian on coconut palms in Trinidad, but later shipments were made by Dr. K. A. Bartlett, as related in his "A Search in Guianas and Trinidad for Predatory Beetles on the Bamboo Scales" (Jour. Agr. Univ. P. R., 22 (4): 493-5. Río Piedras, March 23, 1939), and were reared in the laboratory at Mayagüez, releases being made only of reared material. In succeeding years, these light to dark chestnut brown beetles were reported as being "well distributed" and "notably active" in the Mayagüez region. Dr. Bartlett at the same time sent a species of *Pentilia* that was dark brown in color, with red spots on the elytra, and another *Pentilia* which was "a solid dark brown".

Pentilia egena Mulsant, a shining hemispherical black ladybeetle of Brasil, was collected for shipment to Puerto Rico by Dr. K. A. Bartlett, and later shipments were made by Dr. Felisberto C. de Camargo from Campinas, Sao Paulo. A very similar ladybeetle, but blue-black in color, found several years before the introductions at Mayagüez, in considerable numbers in the stomachs of crested lizards from the Condado beach, was identified by Dr. E. A. Chapin as a species of *Pentilia*.

The densely pubescent black ladybeetles with a large circular spot of shining black on each elytron, tentatively identified by Mr. Harold E. Box as *Azya orbiger*a Mulsant, which he collected in Venezuela in 1926 feeding on the hemispherical scale, were sent by him to Puerto Rico as pupae. Thirty beetles emerging were released in the Condado, and an equal number placed outdoors at Río Piedras in a wire cage over a coffee tree infested with *Saissetia hemispherica*. After the second generation of beetles had begun to develop in captivity, the wire cage was removed. In 1940, Dr. K. A. Bartlett reported the introduction of this or a similar

species, collected in Brasil, of which releases were made in the environs of Mayagüez.

The elytra of *Azya trinitatis* Marshall are blue-black in color, evenly but much less densely pubescent than the prothorax. Mr. S. M. Dohanian collected this ladybeetle in Trinidad, feeding on the scales on coconut palm. Only 11 beetles were sent to Puerto Rico by him, but additional shipments were subsequently made and by 1938 the species was considered "well established" in the environs of Mayagüez. Prof. J. A. Ramos has since collected it feeding on coconut scales at Guánica and Ponce.

Ladoria desarmata Mulsant was sent from Brasil by Dr. K. A. Bartlett, but only seven beetles arrived in Puerto Rico.

Each elytron of the black *Chilocorus cacti* L. bears a large dark crimson spot, and the comparable continental *Chilocorus bivulnerus* Mulsant is called the twice-stabbed ladybeetle. Subsequent to the initial introduction of a few of these beetles from Texas, a large number was sent from Cuba, and reared at Mayagüez on white scales on papaya trees outdoors under screen cages. The large beetles are so conspicuous as to fall an easy prey to lizards, as on the naked trunk of a papaya they have no protection. It would appear, however, if even one female beetle escapes and lays her eggs, the gregarious larvae will soon clear a large area on the papaya trunk of all large live scales, and succeeding generations may largely eliminate the scale from that and adjacent trees, and may entirely clear a grove in time. These ladybeetles were originally introduced into Puerto Rico in the expectation that they would feed on the scales on bamboo, but they by no means confine their attention to one species of scale insect. They eat both the white and the grey scales on papaya, and the scales on coconut palms, besides numerous other scales on wild hosts. It has been noted in citrus groves that they appear to have cleaned some trees of all live scale, and they might have been an important factor in the natural control of scale insects of grapefruit, if their introduction had occurred earlier when the production of grapefruit was a thriving industry. Indeed, on the ornamental shrub *Acalypha wilkesiana*, where the beetles are well protected by the dense reddish foliage from being easily caught by lizards, they may be not only commercially but actually 100% successful in destroying all scale insects. While numerous releases of these beetles have been made in different parts of Puerto Rico, they appear to have widely dispersed on their own initiative, and the finding of these "Introduced Ladybeetles on Mona Island" (*Jour. Ec. Ent.*, 37 (3): 451. Menasha, August 1944) is ample proof of the vigor with which they invade new environments. In December 1947, many were noted feeding on coconut scales at La Romana, Dominican Republic. At Kenscoff, Haiti, they are apparently responsible for the entire elimination of the West Indian peach

scale from peach trees, the earliest record of this ladybeetle from Haiti being from Jérémie in 1945.

The sharply differentiated, prominent yellowish lateral lobes of the dark blue prothorax and the shining dark blue elytra will identify *Curinus coeruleus* Mulsant, introduced into Puerto Rico from Martinique, French West Indies. It became established at Mayagüez and Bayamón by 1939, and has since been collected by Prof. J. A. Ramos at Río Piedras and at San Germán.

Egius platycephalus Mulsant, with shining yellow pronotum but dull black elytra so greatly produced laterally as to make the beetle appear broader than it is long, was introduced from Cuba. It has become established in the environs of Mayagüez, whence large-scale releases have been made in scale-infested bamboo at Loíza and Maunabo.

With the co-operation of Dr. Felisberto C. de Camargo at Campinas, Sao Paulo, Dr. K. A. Bartlett sent or had sent to Puerto Rico large numbers of *Exochomus orbiculus* Weise, and later received many *Exochomus jourdani* Mulsant from Brasil. Releases of both beetles were made at Mayagüez.

Cladis nitidula F. is a large, bright yellow ladybeetle, with head, eyes, middle of pronotum and elytra bright iridescent green. The larvae are white, yellow and black, spiny; the puparia orange-yellow marked with black, occurring singly or in clusters of three or four. Introductions of this ladybeetle were made from Trinidad and Martinique, and releases made at Mayagüez, in the expectation that they would be predaceous on bamboo scales. In April 1945, Mr. Francisco Sefn found larvae and adults predaceous on *Orthezia praelonga* Douglas on bougainvillea vine at Río Piedras, and subsequently they were noted on gardenia bushes feeding on *Coccus viridis* Green and *Protospulvinaria longivalvulata* Green, eventually entirely freeing the bushes of these scales.

Dr. Francis X. Williams (1931-1982) states that "if we first consider those ladybeetles that feed principally on plant-lice or aphids, we must place *Coleophora inaequalis* (Fabr.), an introduction from Australia in 1894, well at the head of the list, both as regards efficiency and abundance. It is a rather large, polished orange-red species, usually with heavy black markings, that measures about 5 millimeters or a fifth of an inch long. In Australia, it varies more in color and intensity of markings, one form being nearly all black". Many in Puerto Rico, descended from those brought from Hawaii, are mostly orange-red above with only the posterior half of the pronotum irregularly margined with black. "It is possible to rear a brood in 2 weeks' time, but the adults do not lay eggs until several days after hatching. Both larvae and adults devour aphids in great quantity, and they feed also upon the young of the sugarcane leafhopper, particularly

when the pest is numerous, and on other small creatures. *Coleophora*, however, is by no means confined to the agricultural districts, for we often find it on forest trees in the mountains, and in city gardens feeding on aphids on hibiscus". In 1938, a shipment of this Australian ladybeetle was received from Hawaii, and released in cane fields near Mayagüez, Cabo Rojo and Villalba, in the expectation that it would feed on *Sipha flava* Forbes, the yellow aphid of sugar-cane. Laboratory rearing and field releases were continued for some time, presumably firmly establishing it in Puerto Rico.

The most abundant of all the ladybeetles at present to be found in Puerto Rico is unquestionably the hemispherical *Cycloneda sanguinea* L., a medium-sized black species with the lateral margins of the pronotum and a spot on each side white, the entire elytra shining orange-red. Presumably it is endemic, Dr. Gundlach listing it as a *Neda*, and Dr. Stahl as a *Daulis*. Dr. Alex. Wetmore found that it had been eaten by the ani, tody, petchary, wood pewee, Elainea, cliff swallow and a vireo. It was found to form part of the food of *Anolis gundlachi*, and presumably is also eaten by other lizards. It has most often been noted as predaceous on the yellow aphid of sugar-cane, *Sipha flava* Forbes, but it will eat any species of aphid on any host, anywhere in Puerto Rico. Dr. M. D. Leonard noted that it even feeds on the cottony cushion scale, and this observation has recently been confirmed by Mr. Francisco Seín. It occurs on Mona Island and in most of the West Indies, and in most South American countries, but has not been recorded from Vieques, Culebra and Desecheo. While scarcity of food in some cases may be the limiting factor in preventing it from becoming even more abundant, the Braconid wasp parasite, *Homalotylus terminalis* Say, which attacks the larva and causes the pupa to mummify, is the most obvious cause of its scarcity when food is present in abundance.

Proculia ferruginea Olivier, previously assigned at various times in the genera *Neda*, *Cycloneda* and *Daulis*, is an even larger hemispherical endemic ladybeetle, entirely chestnut brown in color, except for black eyes. It is listed by Dr. Gundlach, and all earlier records are from coffee groves. Its presence in the mountains, however, is largely incidental, for it feeds largely or entirely on Psylliids, and in coffee groves it finds a great abundance of these on the tender shoots of the coffee shade tree *Inga vera*. In the forest of logwood, *Haematoxylon campechianum*, in the Guánica Insular Forest between Hda. María Antonia and the coast at Ballena, these beetles were noted exceptionally abundant, and sure enough, enormous numbers of the logwood Psylliid, *Heteropsylla fusca* Crawford, were present on the tender shoots of the trees.

Superficially resembling *Cycloneda sanguinea* in coloration, but longer

and narrower is *Coleomegilla innotata* Mulsant, listed by Drs. Stahl and Gundlach and in all the earlier local economic literature as a *Megilla*. It is not very abundant, and really is only a minor factor in the control of aphids, less often found on those of sugar-cane than on those of honey-dew melons, okra, beans and other garden vegetables. Mr. E. G. Smyth noted this beetle so often on hosts lacking aphids that he concluded they might also feed on pollen. Prof. J. A. Ramos states that these beetles are sometimes rather abundant on the aquatic vegetation of Cartagena and Guánica Lagoons, but possibly these plants are infested with *Rhopalosiphum nymphae* L., the waterlily aphid. It has plain, shining orange-red elytra, and is recorded only from Puerto Rico. The internationally common *Coleomegilla maculata* DeGeer has more pinkish elytra, spotted with black. It is not listed from Puerto Rico, but a live individual has been collected at the airport at Arecibo during wartime, to which it may accidentally have been carried in a plane from Cuba or continental United States.

Mr. R. H. Van Zwaluwenburg lists *Hippodamia convergens* Guérin-Méneville as predaceous on aphids at Mayagüez, where it had been introduced from California by Dr. C. W. Hooker in 1912, but it has not since been collected.

Dr. Felisberto C. de Camargo, Director of the Instituto Agronomico do Norte, at Belém do Pará, Brasil, when formerly at Campinas, Sao Paulo, made a special study of the Coccinellid genus *Psyllobora*, and has in preparation a monograph on the genus, which he is now much too busy to bring to completion. He claims that these little beetles feed only on the spores of rusts, and that one should search for them on plants the leaves or stems of which have been reddened by the breaking open of rust pustules. The little hemispherical yellowish *Psyllobora nana* Mulsant, with large black spots, has been taken at many points in Puerto Rico, resting on a great variety of hosts, but no collector has noted whether any of these showed rust spots.

Psyllobora lineola F. has much smaller black spots, and is a brighter yellow. Dr. Gundlach lists it, and subsequent collections have been made at Boquerón, Ponce, Guayama and on the Isle of the Caves in Laguna San José, between Pt. Cangrejos and Río Piedras. Prof. J. A. Ramos found both species quite abundant on Mona Island, on weeds, and the former also attracted to light.

Erotyliidae: Pleasing Fungus Beetles

Under the light of the lighthouse at East Cape on Mona Island, on April 1, 1940, Dr. Luis F. Martorell collected four oval, dull black beetles, 5.0 mm. long, concerning which Mr. W. S. Fisher states that they belonged either to *Mycotretus* or *Tritoma*.

Some Erotylid beetles collected at Mayagüez by Prof. J. A. Ramos have been identified by Mr. W. S. Fisher as probably a species of *Hypodacne*.

Mycetophagidae: Hairy Fungus Beetles

Litargus balteatus LeConte, as identified by Mr. W. S. Fisher, was intercepted by Mr. R. G. Oakley on flowers of an undetermined plant near Ponce, and at Utuado what may be this species. Dr. Wetmore found a species of *Litargus* eaten by the northern parula warbler.

Typhaea semirufa Chevrolat is listed from Puerto Rico by Dr. Gundlach, but it has not since been collected here.

Typhaea stercorea L., (= *T. fumata* L.), a "narrowly oblong-oval, slightly convex, dull reddish brown beetle", 3.0 mm. long, "distributed by commerce to all parts of the world" according to Blatchley, in stored flour or grain, has been found in Puerto Rico in dry crotalaria pods at Pueblo Viejo, at light in Ponce, and Prof. J. A. Ramos reports collection on Mona Island.

Colydidae: Cylindrical Bark Beetles

Aulonium bidentatum F., listed by Dr. Gundlach, was found by Dr. Wetmore to have been eaten by a black and white warbler, which, in its habits of search for food resembles the nuthatches. He found that the black and white warbler had also eaten *Asynchita granulata* Say, listed by him as an *Endeitoma*, and later called a *Synchita*: "oblong, parallel, moderately convex; uniformly dull reddish brown, subopaque; elytra coarsely granulate, length 4.0 mm." and in life covered with a lavender bloom that is very noticeable on the insect in the field but seems to have disappeared completely from museum specimens. It is common under the bark of trees in the dryer portions of the Island, where it has been repeatedly collected, and has also been found on El Yunque, and at Aibonito in a tree fungus.

Cryptozoon civile and *Cryptozoon nitidicolle* were described from Puerto Rican type material by L. W. Schaufuss in his "Coleopteres aveugles de la Famille des Colydidae" (Ann. Soc. Ent. France, Ser. 6, 2: 46-48. Paris, 1882), but neither has since been collected here or elsewhere.

Bitoma undata Guérin-Méneville was the determination of Mr. A. J. Mutchler for Dr. Stuart T. Danforth of a beetle which he had found under the bark of decaying trees of "almácigo" (*Bursera simaruba*) at Joyuda. It has since been collected under the bark of an unspecified tree at Añasco, but no subsequent collections have been made of the *Bitoma trifasciata* Moritz listed by Leng & Mutchler as a *Ditoma*, nor of *Eulachus semifuliginosus* Chevrolat and *Neotrichus tuberculatus* Chevrolat, also listed by them.

Lobogestoria gibbicollis Reitter, as determined by Mr. W. S. Fisher, has been intercepted in rotten wood at Adjuntas, and in rotten wood in the mountains north of Ponce by Mr. R. G. Oakley.

Pycnomerus exaratus Chevrolat is recorded from Puerto Rico by G. C. Champion in his "List of the Clavicorn Coleoptera of St. Vincent, Grenada and the Grenadines" (Trans. Ent. Soc. London for 1898, p. 401).

Pycnomerus biimpessus Reitter was the identification given by Mr. W. S. Fisher of some beetles collected under a dead tree at Matrullas Dam by Mr. R. G. Oakley, and at Mayagüez by Prof. J. A. Ramos.

Penthelispa aequicollis was described by Edm. Reitter as one of the "Neue Colydidae des Berliner Museums" (Deutsche Ent. Zeitschrift, 22 (1): 123. Berlin, 1878) from material collected in Puerto Rico, and it has been repeatedly intercepted since from decaying wood and tree fern fronds, *Cyathea arborea*, in the mountains.

One or more species of *Ethelema* occur in Puerto Rico, living on leaves of pomarrosa and coffee shade trees, or on dead leaves and debris on the ground at the higher elevations.

Bothrideres dentata Chevrolat, as identified by Mr. W. S. Fisher, was found under bark of beefwood (*Casuarina equisetifolia*) at Guánica, and under bark of dead tree in Guánica Forest by Prof. J. A. Ramos.

Philothermus puberulus, described by Dr. E. A. Schwarz (1878-361) from Florida, has been collected on El Yunque, and on decaying wood at Añasco.

Euxestus erithacus Chevrolat, first recorded from Puerto Rico by Albert Fauvel in his "Notes Synonymiques" (Rev. d'Entomologie, 14: 106. Paris, 1895), considered "probably not more than a variety of *E. parki* Wollaston" by Leng & Mutchler, is indeed synonymous with *Olibrus parki*. Under this should presumably be grouped the records of species of *Olibrus* found by Dr. Alex. Wetmore to have been eaten by the northern parula warbler, and noted by Dr. M. D. Leonard as commonly found breeding in dry pods of pigeon peas at Río Piedras during July and August. These beetles were also repeatedly intercepted by Mr. R. G. Oakley: on fungus on a tree and on *Inga vera* at Aibonito; on orange leaves and on flowers of *Inga laurina* at Adjuntas; on leaves of "moca" (*Andira jamaicensis*) at Ponce, and on wild morning-glory at Juana Díaz.

Mordellidae: Tumbling Flower Beetles

The Mordellid beetles are small and wedge-shaped, characterized by Mr. W. S. Blatchley as "having the body arched, the head bent downward and the abdomen usually prolonged into a style or pointed process". "The name *Mordella*, that of the typical genus, is from the Latin *mordere*, or 'bite'." Herr G. Quedenfeldt, working on the material submitted by

Dr. Gundlach, described in "Neue und selterne Käfer von Portorico" (Berliner Entomologische Zeitschrift, 30 (1): 119-128. Berlin, 1886) four new species from Puerto Rico and identified two others. It remained for Mr. Eugene Ray, however, in his "Synopsis of the Puerto Rican Beetles of the Genus *Mordellistena*, with Descriptions of New Species" (Proc. U. S. National Museum, 84 (3020): 389-399, fig. 1, ref. 5. Washington, D. C. 1937) to describe ten additional endemic species, collected in almost equal numbers by Mr. R. G. Oakley, and by Mr. C. M. Matos, formerly one of the students of Dr. Stuart T. Danforth at Mayagüez, and now and for many years past, Agricultural Agent at Comerío.

Mordella basifulva Quedenfeldt and *Mordella leucocephala* Quedenfeldt have not been found in Puerto Rico since Dr. Gundlach collected the types here.

Mordella scutellaris F., first reported from Puerto Rico by Dr. Gundlach, has been repeatedly collected since: on milkweed flowers at Bayamón, on flowers of "margarita" (*Bidens pilosa*), "cundeamor" (*Momordica charantia*) and other plants at Arecibo; of "zarza" (*Senegalia westiana*) at Ponce. Others of this genus, not identified as to species, have been collected on coffee and "jagüey" (*Ficus laevigata*).

Mordellistena annuliventris Quedenfeldt, according to Ray (1937-390), is characterized with the "ventral surface bicolorous", and was most recently collected at Aibonito by Mr. R. G. Oakley, by Prof. J. A. Ramos at Mayagüez and Ponce, and also on Mona Island.

The type of *Mordellistena angustiformis* Ray (1937-390) was intercepted by Mr. R. G. Oakley at Indiera, in the mountains above Yauco, and Mr. C. M. Matos found others at Adjuntas.

The type of *Mordellistena barberi* Ray (1937-395) was intercepted by Mr. R. G. Oakley at Ponce on "moca" (*Andira jamaicensis*), others on coffee at Juana Díaz.

The type of *Mordellistena danforthi* Ray (1937-392) was from Villalba, collected by Mr. C. M. Matos.

The type of *Mordellistena ephippium* Ray (1937-398) was from Aibonito, other from Ponce, intercepted by Mr. R. G. Oakley on "pomarroza" (*Eugenia jambos*).

Mordellistena ferruginea F. is listed as a continental species, but the only assured records are from St. Thomas and Puerto Rico. The early record by Dr. Gundlach has been confirmed by numerous later collections: on banana leaf at Ponce, on mamey leaf at Barceloneta, on *Inga laurina* at Juana Díaz, and possibly to it also should be assigned Dr. Wetmore's records (as sp.) of being eaten by the wood pewee, the redstart and the yellow warbler.

The type of *Mordellistena humeralis* Ray (1937-393), collected by

Mr. C. M. Matos, was from Villalba; that of *Mordellistena leai* Ray (1937-396) was collected by the grapefruit grower Capt. Lesne in his grove at Bayamón, other from Maricao.

Maricao is also the type locality for *Mordellistena lucidovirga* Ray (1937-398), collected by Dr. Harold Morrison, and others have since been found by Prof. J. A. Ramos at Mayagüez.

The type of *Mordellistena lineata* Ray (1937-395) was collected at Guánica by Mr. C. M. Matos, and this species has since been found on Mona Island by Prof. J. A. Ramos.

The presence in Puerto Rico of *Mordellistena marginicollis*, described from Brasil by F. W. Mäklin as one of his "Neue Mordelliden" (*Acta. Soc. Sci. Fennicae*, 10: 561-595. 1875), is implied by inclusion in Ray's paper, where he differentiates it as having "elytra more than three times as long as broad". No recent collection has been made here.

Mordellistena signaticollis, described from Puerto Rico by Herr Quedenfeldt as a *Mordella*, is characterized, according to Ray, in possessing "basitarsus with two oblique ridges". No specimen has been collected since Dr. Gundlach's of the type.

The type of *Mordellistena varietas* Ray (1937-391) is from Adjuntas, others from Villalba and Maricao; that of *Mordellistena y-nigrum* Ray (1937-397) was intercepted by Mr. R. G. Oakley on *Inga laurina* at Juana Díaz.

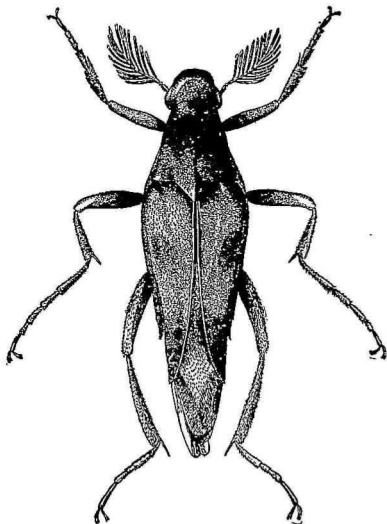
Mordellid beetles intercepted by Mr. R. G. Oakley on *Randia mitis* at Ponce were identified by Mr. H. S. Barber as a species of *Pentaria*. Mr. Eugene Ray identified some collected by Prof. J. A. Ramos at Mayagüez as being his *Pentaria multiplis*, previously known only from Cuba.

Naucles fasciata Ray (1939-312) was described from material collected at Ponce.

Rhipiphoridae

The Rhipiphorids are "wedge-shaped beetles resembling the Mordellidae closely in general appearance, but having the sides of the thorax without a sharp edge; hind body not terminating in a spinous process as in the Mordellids" according to Blatchley. Large and conspicuous Rhipiphorids are quite common on the flowers of "botoncillo" (*Borreria verticillata*) at Belém do Pará, Brasil, and when collections were being made there of the wasp *Larra americana* Saussure, in an attempt to introduce this natural enemy of the changa into Puerto Rico, some of these beetles were also collected, killed, pinned and mounted for the collection. One species, black with the anterior third of its elytra bright yellow, was identified by Mr. G. E. Bryant of the British Museum, as *Macrosiagon flavipennis* LeConte. In the list by Dr. R. E. Blackwelder (1945-480) it is given as

flavipenne LeC. 66-153, with a range from Mexico and the U. S. A., the United States records in Leng (p. 156) being "Pa. Ga. Ill. So. Cal. Conn." When intensive observations on botoncillo flowers, to note the dispersion of the introduced *Larra americana*, were commenced in Puerto Rico, what appears to be this species was found in considerable abundance in 1939 and 1940 at all points where releases of this wasp from Brasil had been



Adult of the Rhipiphorid Beetle, *Macroisiagon pectinatus* Fabricius, a parasite of continental *Tiphia*, eight times natural size. (After Davis.)

made, even including Luquillo, where it did not become established until years later. Specimens from Luquillo were sent to Dr. W. Dwight Pierce, a specialist in this group, concerning which he replied under date of September 30, 1941:

"The determination is correct. I have compared it with specimens from our central states and can find no distinguishing characters. It is a little of a puzzle as to whether this beetle has just recently come to Puerto Rico, or whether the collectors have merely failed to find it in

the past. Ordinarily these beetles are only found during the short season, and by rather specialized collecting at certain flowers and in the vicinity of the host nests. They undoubtedly lay their eggs in flowers and the young will hatch and cling to the legs or hairs on the body of host insects. If you will scrutinize your collections under the microscope, you may find some of these larvae clinging to the hairs of some of the wasps."

Search on large numbers of *Larra americana* wasps, collected in Brasil, which had died en route to Puerto Rico, failed to show any of the Rhipiphorid eggs or larvae described by Dr. Pierce. The beetle is not restricted to any particular host wasp, however, as Mr. H. S. Barber notes "*Macrosiagon flavipennis* in cocoon of *Bembex spinolae*" (Proc. Ent. Soc. Washington, 17 (4): 187-8. Washington, D. C., April 1915) at Brookland, D. C., and cites parasitism of *Tiphia* cocoons by *Macrosiagon pectinatus* F. in Illinois.

Other specimens of what was considered to be the same insect, submitted to the U. S. National Museum, were at first tentatively identified by Mr. H. S. Barber as probably *Macrosiagon spinosus* (F.), and to additional specimens this name was assigned without qualification. Of it, Mr. Barber writes, "The original source record was "Habitat in Americae meridionalis Insulis Dom. v. Rohr", and I believe von Rohr is known to have collected in the Virgin Islands. The record under the specific name *basalis* probably belongs to *spinosus*". *Rhipiphorus basalis* Gerstaecker was Quedenfeldt's identification of Dr. Gundlach's specimens from Puerto Rico, apparently not confirmed by subsequent collection. The miscellaneous insect collection assembled by Mr. Harold E. Box when he was working at Central Aguirre approximately twenty years ago, eventually sent to the U. S. National Museum, contained a single specimen of this beetle, unlabeled except for the single word: Brebner. Mr. R. B. Brebner, one of the Superintendents of Fields for Luce & Co., of the Central at the time Box was there, may be presumed to have collected the specimen and presented it to him.

If all these data are correct, we have a chain of evidence indicating (1) original collection in the Virgin Islands, (2) subsequent collection in Puerto Rico by Dr. Gundlach, and (3) later collection by Mr. Brebner for Mr. Harold E. Box. The apparent recent abundance is not real, and has no connection with the introduction of *Larra americana* from Brasil. But because of intensive observations on the insect visitors of botoncillo flowers, which these beetles haunt, many happened to be collected within a short period at many localities along the north coast of Puerto Rico. The beetles show considerable variation in both size and coloration, the largest

being half an inch long, and some have most of the elytra yellow. One individual has elytra entirely yellow, and reddish antennae.

Macrosiagon discicolle Gerstaecker is a much smaller beetle, of which three varieties: *mutilatus* Gerst., *melanoptera* Chevrolat and *quadrimaculatus* Gerst. are listed by Dr. Gundlach. The variety most common on botoncillo flowers is bright chestnut-red with black elytra. Another is entirely black, a third has only the posterior margin of the prothorax red, and the four-spotted one has been collected on seed pods of Jamaican sorrel at Bayamón.

Herr Quedenfeldt described (1886-128) as major a variety of *Rhipiphorus* (now *Macrosiagon*) *sordidum* Gerstaecker which Dr. Gundlach collected here.

Meloidae: Blister Beetles

Dr. E. A. Schwarz identified as a species of *Zonitis* the Meloid beetles which Mr. E. G. Smyth collected at light at Guánica in 1913. They are 11.0 mm. long, mostly dull yellow in color, median area of disc of prothorax and two large longitudinal bands on each elytron brown, and as they are apparently still unnamed, might appropriately be called *smythi*. Another *Zonitis*, of which a single specimen was collected at light at Guánica by Mr. E. G. Smyth on August 8, 1913, 16.0 mm. long, mostly dull yellow, but with areas of brown at base and near apex of the elytra, may be designated as *guanicana*.

Cissites maculata Swederus, identified by Dr. E. A. Schwarz as *Horia auriculata* Duges, from 15.0 to 20.0 mm. long, mostly orange-yellow, has two series of four black spots, to some extent tending to be confluent, on each elytron. It has been collected at Río Piedras, Mayagüez, Hormigueros and San Germán.

Epicauta annulicornis, described by Chevrolat (1877-ix) from specimens collected in Puerto Rico by Dr. Gundlach, has since been found only at Mayagüez, but of Chevrolat's *Epicauta obscuricornis*, described at the same time from Dr. Gundlach's material, no specimen has since been found.

Tetraonyx quadrimaculata F., found in many of the Lesser Antilles and the Virgin Islands, as well as in Cuba, Puerto Rico and the southern United States, was listed by Chevrolat, Drs. Stahl and Gundlach, and has been repeatedly collected since. It is mostly yellow, with black head and antennae, and with the legs black distad of the apex of the femora. Hardly more than the median third of each elytron is yellow, the black base and apex forming the four spots of the specific name. The beetles are possibly most often found on the flowers of leguminous plants in the more humid parts of the Island, but may occur on other kinds of flowers, as on flowers

"yerba bellaca" (*Croton humilis*) at Isabela, of *Lantana camara* at Trujillo Alto, and sometimes in such abundance as to cause appreciable injury, as on grapefruit blossoms at Bayamón, and on flowers of tecoma vine or "ricosolana" (*Pandorea ricasoliana*) at Isabela.

Stylopidae: Twisted winged Insects

Stenocranophilus quadratus, the Puerto Rican representative in a "Description of Two New Species of Strepsiptera (Halcotophagidae) Parasitic on Sugar Cane Insects" (Proc. Ent. Soc. Washington, 16 (3): 126-9. Washington, D. C., September 1914) by Dr. W. Dwight Pierce, was collected by Mr. Thos. H. Jones on October 14, 1912 at Río Piedras from the sugar-cane Fulgorid, *Delphax saccharivora* Westwood. A year later, additional material was obtained for study of the immature stages by Dr. Pierce, for this parasite is quite abundant, and is possibly one reason why its host is normally so scarce in Puerto Rican cane fields. Known only from Puerto Rico, outbreaks of its host, the sugar-cane "fly", have been of historic destructiveness in Barbados and Jamaica, presumably in part because this parasite is not present to minimize the abundance of the Fulgorid. The parasite will be noted extruding from between the abdominal segments of nymphs and adults of *Delphax*, but no attempt at working out its life-history has been made since the collection of the types by Mr. Jones.

Oedemeridae

Enormous numbers of restless, slender, iridescent blue-green or purplish Oedemerid beetles are sometimes to be found on beach vegetation, or attracted to lights in the spring, from April to June, on the north coast of Puerto Rico. Altho substantially similar in general appearance, they show considerable variation in size and color, and even in habits. Both the larger beetles with pinkish iridescence which dropped from bushes of seagrape at Pt. Salinas (the next point west of Palo Seco, fortified by the U. S. Army in World War II) when capture was attempted in June 1916, and the smaller greenish ones which flew when disturbed, were much more difficult to capture than those apparently feeding on the honey or pollen of the flowers of a *Metastelma* vine in the Condado in April of the same year, or those in May and June 1923 very abundant at Pt. Cangrejos resting on the stems, leaves and flowers of a common fleshy-leaved plant "jayajabico" (*Erithalis fruticosa*) with white, star-shaped flowers and purple berries. As these beetles are merely a nuisance when they swarm about lights of houses in the spring, no economic study of them has been made, and nothing is known of their immature stages. None of them answering to Chevrolat's

description of *Oxacis geniculata* from Puerto Rico, according to Mr. H. S. Barber, they were described in "Insectae Borinquenses" (1936-206) under the specific name of *litoris*. Prof. J. A. Ramos thinks that this description agrees perfectly with a single specimen which he collected on Mona Island in March 1944, listed by him (1947-37) under the name *Copidita* (*Asclera*) *litoris* Wolcott.

Copidita laeta Waterhouse, identified by Mr. J. M. Valentine as an *Oxacis* for Prof. J. A. Ramos of specimens collected at Guánica and Faro de Cabo Rojo, is listed by Dr. R. E. Blackwelder (1945-490) from Mustique, Grenada, Jamaica and Hispaniola.

Copidita lateralis Waterhouse, as doubtfully identified by Mr. H. S. Barber for material intercepted at San Juan and Bayamón, is the name given without qualification by Mr. J. M. Valentine to Oedemerids collected by Prof. J. A. Ramos at Mayagüez.

Copidita rubricollis, described by Charles O. Waterhouse (1878-309) from St. Thomas, and *Copidita tenella* Waterhouse, subsequently listed from St. Vincent, Jamaica and Hispaniola, should also occur on Culebra and Vieques, even if not in Puerto Rico itself.

A single Oedemerid, entirely dull violet-blue in color, collected on Sardinera beach, Mona Island, July 20, 1944, Prof. J. A. Ramos (1947-37) lists as a species of *Copidita* (*Asclera*), as determined by Mr. J. M. Valentine.

Others of this genus, as described by Mr. Valentine, are readily distinguished "with the prothorax brownish red, the eyes and antennae nearly black; the elytra with outer margins and a median longitudinal ridge whitish", first found by Dr. Stuart T. Danforth as very abundant on Desecheo Island on May 8, 1927, and determined by Mr. A. J. Mutchler as a new species of *Ditylus*. Because of this first collection, it might be well to designate these beetles as *Copidita* (*Asclera*) *desecheonis*. Prof. J. A. Ramos found one on Mona Island in June, and abundantly on weeds on the plateau in August 1944, and has in the collection many collected at Guánica in late July 1934 by Mr. C. M. Matos. The pubescent elytra of some are purplish, others are blue-green or horizon blue in color.

Oxacis geniculata, described by Chevrolat (1877-x) from Puerto Rican material collected by Dr. Gundlach, is listed by Drs. Gundlach and Stahl. As this species, Mr. J. M. Valentine identifies numerous specimens collected by Prof. J. A. Ramos on Mona Island in March and April, but the only specimen in the collection at Río Piedras corresponding to this abundant Mona Island material is a single specimen found by Mr. Francisco Seín at light in Santurce, April 10, 1922. In August 1939, Dr. Luis F. Martorell found these beetles very abundant on seagrape bushes on Mona

Island in the daytime, and swarming about lights at night. "This is the second most abundant and the largest Oedemerid on the Island. The head, except for the black eyes and infuscated basal segment of the antennae, and the entire prothorax are yellowish. The abdomen and elytra, except the outer and inner margins, are greyish-blue. The legs are light yellow, with the apical half of the femora strongly infuscated" according to Prof. Ramos (1947-38).

Sessinia vittata F., until quite recently called *Ananca*, was collected in Puerto Rico by Dr. Gundlach and listed by Chevrolat (1877-x), and by Leng & Mutchler from Vieques. Dr. Stuart T. Danforth subsequently collected it on Vieques, as well as from Humacao, Yauco, Faro de Cabo Rojo, Mayagüez and Añasco, and collections have also been made at Isabela, and at Pt. Cangrejos and Santurce on the north coast. It was especially abundant and troublesome at Aguirre in May 1916, and again in June 1923, as reported by Mr. F. S. Earle, forcing its way thru screens and around glass windows into houses at night. Mr. E. G. Smyth noted many attracted to light at Hda. Santa Rita, Guánica in July and August 1913. Superficially, it looks like a somewhat faded and browned specimen of *Oxaxis geniculata*, for in life the elytra are often blue-grey, sometimes with only a narrow median band between very broad margins, but the legs are invariably entirely yellowish. Prof. J. A. Ramos (1947-38) personally collected a single specimen on Sardinera beach on Mona Island in April 1944.

Short descriptions of three distinctly different species of *Alloxaxis*, as identified by Mr. J. M. Valentine, collected only on Mona Island, are given by Prof. J. A. Ramos (1947-38). The most abundant in the spring, "a very dull and dark blue species", was found feeding on the pollen of the flowers of "abeyuelo", *Colubrina ferruginosa*.

Scaptiidae

Cteniakantha marginata, described (1886-121) by Herr G. Quedenfeldt from Puerto Rican material collected by Dr. Gundlach and listed by him, has since been intercepted in the mountains north of Ponce and at Adjuntas by Mr. R. G. Oakley. Other interceptions in the mountains have been identified by Dr. E. A. Chapin as species of *Scaptia* and *Conomorphus*, and on mangrove at Guánica as *Canifa*.

Monommidae

Hyporrhagus marginatus F., as a *Monomma*, is reported from Puerto Rico by both Dr. Stahl and Dr. Gundlach, but of it no subsequent collection has been made.

Aspathines aenea Thomas, as identified by Dr. E. A. Chapin, has been

found on dead wood at Guayanilla and on mangrove at Ponce by Mr. R. G. Oakley.

Alleculidae (Cistelidae): Comb-Clawed Bark Beetles

Enormous numbers of elongate-oval brown beetles with golden pubescence, 5.0 to 6.0 mm. long, are sometimes to be found under dry seaweed and dead vegetation on the beach, or at night are attracted to lights in houses near the beach. They have been found hiding under the loose bark of *lignum-vitae* or "guayacán" (*Guaiacum officinale*) and of snake-bark or "abeyuelo" (*Colubrina ferruginosa*) at Guánica, and Mr. R. G. Oakley found them repeatedly at Ponce, on "ucar" (*Bucida buceras*) and other trees. Possibly their most interesting hiding place, beside the squares and bolls of cotton, is in the empty pupal skins of the cotton caterpillar, *Alabama argillacea* Hübner, observed at Hatillo. At Pt. Cangrejos, they were noted hiding in cavities in the stems of dead or injured castor bean plants, and in an investigation to determine the number of animals present in three square feet of pasture near the beach (in February 1920, before all this region had been so closely built up as to form a suburb of Santurce), seven of these beetles were found. Quantitatively, this indicates their abundance at particular times, not their entire absence at other times. They are eaten by the iguana, *Ameiva exsul*, but Dr. Wetmore noted none in the stomach contents of any of the beach-inhabiting birds that he collected. Two observations, in February and June, have been made of their exceptional abundance on "malvavisco", *Corchorus hirsutus*, at Pt. Cangrejos, and in September on Mona Island, in a few of these plants on the edge of the air-strip near the beach where two or three beetles were hiding in the folds of nearly every leaf, or in the terminal buds. They were merely resting, not feeding, and indeed little is known of their habits or immature stages, for they are definitely of no economic importance, having never been noted injuring any economic plant, or any other. In August 1939, Dr. Luis F. Martorell found them very abundant on a weed locally known on Mona Island as "té", and they have been collected at light on Mona in March, April, June, July and September. Concerning their identity, Dr. Gundlach lists *Allecula flavipes* J. Duval in synonymy with *Allecula fuscula* Schönherr, the latter name only being given by Quedenfeldt. Some of the specimens from Pt. Cangrejos were identified by Dr. E. A. Schwarz as a species of *Hymenorus*, and Mr. K. G. Blair of the British Museum tentatively gave the name *Hymenorus fuscula*. Mr. A. J. Mutchler labeled one specimen *Hymenorus fuscula*? Fab., but Dr. E. A. Chapin called the recent collections from Mona probably a new species of *Hymenorus*. If a specific name is needed for the Mona Island-Puerto Rican species, it might well be *corchorophilus*.

Tenebrionidae: Darkling Beetles

Treintoma varvasi Solier, as determined by Dr. C. W. Leng, was collected by Dr. Stuart T. Danforth at Ensenada in February 1927, and by students of his at Guánica in April 1931. On Mona Island, Prof. J. A. Ramos reports (1947-39) sweeping specimens from vegetation on Uvero beach in July and August, 1944.

Diastolinus fuscicornis, described by Chevrolat (Ann. Soc. Ent. France, (5), VII Bulletin, p. viii. Paris, 1877) from material collected by Dr. Gundlach, has not since been found.

Opatrinus pullus Sahlberg (= *anthracinus* Mulsant), first determined by Dr. E. A. Schwarz as *Hopatrinus*, from specimens collected at the base of decaying pineapple slip, is a shining black beetle 10.0 mm. long, with deeply punctate elytra and minutely and evenly punctate head and pronotum. It has since been collected by Dr. Stuart T. Danforth or his students at Ensenada, Mayagüez, Añasco, Coamo and Tortuguero, and most recently at light on Mona Island by Dr. Luis F. Martorell.

Blapstinus punctatus F., as determined by Mr. A. J. Mutchler, is a dull black beetle, 5.0 mm. long, which Dr. Stuart T. Danforth reported as doing considerable damage to tobacco seedlings and melons at Algarrobo in February 1931. This is the only record of attack on cultivated crops, however, despite periods of temporary abundance of these beetles, especially in the more xerophytic parts of Puerto Rico. In Tablón No. 9, Hda. Santa Rita, Guánica, in December 1914 they were so numerous that whenever an old stool of cane was broken up, dozens would scurry for cover. The smallest piece of trash or chunk of dirt seemed to offer them all the concealment necessary. At Boquerón they have been found in like abundance hiding under every slab of dry cow dung, where the hard unbroken crust of dry soil offered no other chance at concealment. Dr. Stuart T. Danforth and/or his students have also collected these beetles at La Plata, Faro de Cabo Rojo, Tortuguero, Humacao and Luquillo, Mr. R. G. Oakley found them at Jayuya, and Dr. Luis F. Martorell first noted them at light on Mona Island.

Blapstinus striatulus Melsheimer, as tentatively identified by Dr. E. A. Chapin, are similarly dull black beetles, reported as attacking sprouting cotton seedlings at Isabela in June 1931.

Sellio tibidens Quedenfeldt, as tentatively identified by Mr. K. G. Blair of the British Museum, is 6.0 to 7.0 mm. long, with elytra decidedly constricted just distad of the base, and broadest at the middle. They were found abundant under dry cow dung at Boquerón and at Salinas in the summer of 1923. Dr. Stuart T. Danforth had specimens from Desecheo Island. When alive they have a noticeable bluish bloom which is not apparent in the museum specimens.

Trachyscelis flavipes Melsheimer, as tentatively identified by Mr. K. G. Blair, is a small black beetle, hairy beneath, found on the beach at Pt. Cangrejos in January 1923. Other individuals, collected by Dr. Stuart T. Danforth at Río Piedras in August 1931, were considered a new species by Dr. E. A. Chapin.

Concerning *Phaleria variabilis*, described by G. Quedenfeldt (1886-128) from Dr. Gundlach's material from Puerto Rico, Gundlach says in his list: "esta especie varía mucho en su colorido que puede ser totalmente el pálido amarillo hasta casi el solo negro, o amarillo con una mancha común oscura en forma de luna sobre el disco de los elitros". Dr. E. A. Chapin identified as this species the beetles and larvae found in the claws of dead crabs on the beach at Isabela, and tentatively some adults at light on Mona Island, Mr. A. J. Mutchler adults found under seaweed on the beach at Pt. Cangrejos, and Dr. A. G. Böving those under seaweed at Cataño and Santurce. Previously, specimens showing the same variation in coloration, collected under seaweed at Pt. Cangrejos, were identified by Dr. E. A. Schwarz as *Phaleria angustata* Chevrolat, described by him in 1878, and Dr. R. E. Blackwelder thus identified the material collected by Prof. J. A. Ramos on Mona Island. It seems possible that both names apply to the same, very variable insect.

Dr. Wetmore reports finding in the stomach contents of the killdeer beetles identified as a species of *Crypticus*, and Dr. E. A. Schwarz gave this name, "possibly *obsoletus* Say" to others of these dull black beetles, 3.0 to 4.0 mm. long, collected on seaweed on the beach at Pt. Cangrejos, and to 13 such beetles found there in three square feet of pasture. They have since been found in a pasture at Camuy, and by Prof. J. A. Ramos at Hatillo and Mayagüez, and on Mona Island.

Eutomus cornutus Arrow, as determined by Dr. E. A. Chapin, has been found in a tree fungus at Mayagüez.

Eutomus micrographus Lacordaire, determined by Dr. E. A. Schwarz as a *Rhipidandrus*, is a dull black beetle, 4.0 mm. long, of which many adults and larvae were found in a polypore fungus, *Fomes australis*, at Jácome Alto and at Adjuntas.

Diaperis hydni Fabricius, now less happily called *maculata* Olivier, is the other common beetle feeding on polypore shelf fungi in Puerto Rico and on Mona Island. Adults are broad, 5.0 to 7.0 mm. long, with basal half of the elytra chestnut red in color. This species was listed by Drs. Stahl and Gundlach, and has repeatedly been collected since, the most recent identification of the fungus being of *Polyporus palmarum* on coconut palm.

Beetles found in a polypore fungus on El Yunque have been identified by Dr. E. A. Chapin as belonging in a "genus near *Pentaphyllus*".

Palembus ocularis Casey, a light yellow-brown beetle, 4.0 mm. long, and its larvae have been found feeding on tamarind seeds, intercepted at Loíza, and noted on this host by Prof. J. A. Ramos at Faro de Cabo Rojo, but the original determination by Dr. E. A. Schwarz was of an individual collected on the ground at Pt. Cangrejos. Mr. R. G. Oakley also found these beetles on sedges at Ponce and at Cabo Rojo.

Of the numerous species of *Platydemia*, Dr. Gundlach lists *apicalis* Laporte & Brullé, not since collected, and *pivicornis* Fabricius, later found by Dr. Donald DeLeon under the bark of almácigo logs at Guánica. To numerous small black oval beetles found in dead almácigo (*Bursera simaruba*) infested by the termite *Nasutitermes costalis* Holmgren at Vega Baja, Mr. G. E. Bryant gave the name *Platydemia excavata* Say, and Mr. J. A. Mutchler independently also made the same determination. Dr. Alex. Wetmore lists *Platydemia virens* Laporte & Brullé as having been eaten by the black and white warbler, and this or other species by the woodpecker, oriole and grasshopper sparrow.

Numerous small beetles intercepted by Mr. R. G. Oakley in decaying tree fern (*Cyathea arborea*) or in decaying wood at Adjuntas, Villalba and in the mountains above Yauco at Indiera, have been identified by Dr. E. A. Chapin as a species of *Dioedus*.

Gnathocerus cornutus F., as identified by Mr. H. S. Barber, has been found in a tree fungus at Aibonito.

Gnathocerus maxillosus F., as identified by Dr. R. E. Blackwelder, was found at Guánica under the bark of almácigo trees by Dr. Donald De Leon, and under the bark of leguminous trees in the patio of the School of Tropical Medicine by Dr. W. A. Hoffman.

Tribolium castaneum Herbert (= *T. ferrugineum* Dej.), a dark reddish, elongate, flattened beetle, commonly known as an economic pest of flour, bran and similar stored products, was found by Dr. W. A. Hoffman under the bark of a leguminous tree in the patio of the School of Tropical Medicine. In Puerto Rico, this beetle has been found in dry peas, dry ganduls, chicory beans, dry tamarind pods at Guánica, dry cotten seed meal in a tobacco warehouse at Cayey, and most recently in the cotton ginnery at Isabela in which baled cotton and cotton seed in guano palm sacks from Hispaniola was stored. Together with the quite similar *Tribolium confusum* DuVal, also found in Puerto Rico, attacking similar dried food products, these two cosmopolitan pests may cause very considerable injury if allowed to breed undisturbed. Flour in tough paper sacks is much less readily infested than in cloth sacks, while that brought to the Island in bulk is most subject to injury. While fumigation is possible, most wholesale grocers and bakers anticipate only small shipments of flour at any one time, and plan to get rid of any infested flour quickly before they suffer much loss. Indeed,

the simplest and cheapest and most practical method of control in the tropics is prompt consumption by human beings of the food product.

First noted in Puerto Rico by Dr. Richard T. Cotton in wheat flour, is what he describes in his "Insect Pests of Stored Grain and Grain Products" (pp. 242, illus. Minneapolis, 1941) as a "cosmopolitan insect found in damp situations breeding in grain and cereal products that are spoiled or out of condition: the lesser meal worm, *Alphitobius diaperinus* Panzer. It causes no damage to grain that is sound and dry. The adult is black, or a very dark reddish brown, and measures from three to four-sixteenths of an inch in length. The larva is yellowish brown and similar in appearance to young larvae of the true meal worm".

"The black fungus beetle, *Alphitobius piceus* Olivier, is closely related to the lesser meal worm, . . . and has similar habits. In the lesser meal worm, the surface of the thorax is finely and sparsely punctuated, whereas in the black fungus beetle the surface of the thorax is coarsely and profusely punctuated". Of it in Puerto Rico, as *Heterophaga fagi* Panzer, Dr. Gundlach writes, "encontrado en almacenes y en lugares donde existen substancias descompuestas y secas". It has most recently been found in the cotton ginnery at Isabela, and Prof. J. A. Ramos noted it in a store-room for cattle feed at Mayagüez.

Sitophagus hololeptoides Castelnau, listed by Dr. Gundlach under Chevrolat's MS name of *Adelina livida*, has been recently collected at Mayagüez, and at Añasco by Prof. J. A. Ramos.

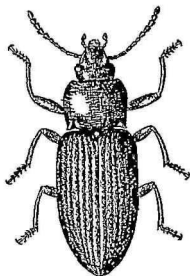
Doliema pallida Say, is a pale yellow beetle, 4.0 mm. long, so flat that it appears to have been crushed from above. Its head is concave between the eyes. The first Puerto Rican collection, from under bark of a fence post at Boquerón, was determined by Mr. K. G. Blair of the British Museum, but numerous subsequent collections have been made from similar xerophytic localities: under bark of almácigo at Guánica, and on stump at Ponce, the most recent being from Mona Island, where repeated collections from under loose bark of fence posts would indicate it as being quite common.

Corticeus rufipes F., identified as a *Hypophloeus* by Dr. E. A. Schwarz from material collected under bark of dead "bucare" (*Erythrina poeppigiana*) trees at Cayey by Dr. Richard T. Cotton, is a very elongate, cylindrical, shining brown beetle, since found under bark of dead flamboyán (*Delonix regia*) at Río Piedras, in dry branches of "burro" (*Capparis flexuosa*) at Santa Isabel, and at Mayagüez.

Zophobas morio F. is by far the largest Tenebrionid beetle occurring in Puerto Rico, adults being from three-fourths to seven-eighths of an inch long, entirely dull black or faintly bluish in color. Of it, Dr. Gundlach states, "se encuentra en las casas debajo de tablas, cajones, etc. Nunca

lo he visto en el campo". Leng & Mutchler list it from Culebra Island. *Zophobas rugipes* Kirsch is the determination by Mr. A. J. Mutchler of specimens from the Corozal cave, and from many other localities collected by Dr. Stuart T. Danforth and his students, but he was unable to note any distinguishing characteristics separating it from the other species. Records of collection are from all parts of Puerto Rico. The beetles are eaten by the introduced toad, *Bufo marinus*, and by the endemic iguana, *Ameiva exsul*. Nothing is known of the immature stages.

Dr. Richard T. Cotton may be quoted on the two species of meal worms which occur in Puerto Rico: "the yellow meal worm, *Tenebrio molitor* L., which was described by Linne in 1758 and the dark meal worm, *Tenebrio obscurus* F., which was described by Fabricius in 1792. The yellow meal



The Tenebrionid Beetle, *Zophobas morio* Fabricius, twice natural size. (Drawn by Fritz Maximilien.)

worm is so named because of its honey-yellow color. It is also known as the European meal worm because of the many reports of its occurrence in Europe. The meal worms are inclined by nature to be scavengers, and prefer to feed on decaying grain or milled cereals that are damp and in poor condition. They are usually found in dark, damp places". None was collected by Dr. Cotton while he was here, but Dr. Stuart T. Danforth and students have made innumerable collections at Mayagüez and at other localities in the western end of the Island, including, surprisingly enough, one of *T. molitor* on Desecheo Island. The adults are "elongate, narrowly oval, piceous or dark reddish-brown, opaque, 13.0 to 17.0 mm. long", and in that stage the two species are almost indistinguishable.

Mr. R. G. Oakley intercepted at Yauco some beetles identified by Dr. E. A. Chapin as a species of *Lorelopsis*. The only West Indian species of

this genus is *Lorelopsis pilosa*, described by G. C. Champion from St. Vincent.

Dr. Alex Wetmore reports the woodpecker, flycatcher, wood pewee, vireos, warblers and the oriole as eating beetles identified for him as a species of *Helops*, but no previous or subsequent collections by entomologists have been made that correlate with what he found so abundantly in these birds' stomachs.

Pyanisia tristis Laporte, reported as a *Cymatothes* by Drs. Stahl and Gundlach, has not since been found locally.

Strongylium pulvinatum was described from Puerto Rico by F. W. Mäklin (*Acta. Soc. Sci. Fennicae*, 8 (1): 265) in 1867, and Dr. Wetmore reports finding a beetle of this genus in the stomach contents of Latimer's vireo.

Talanus insularis Mäklin is doubtfully reported from Puerto Rico in the list of Dr. R. H. Blackwelder (1945-543).

Cisidae

Mr. R. G. Oakley intercepted on dead tree at Ponce, in decaying wood at Añasco and in fungus at Mayagüez what Mr. W. S. Fisher identified as species of *Cis*.

Ennearthron delicatulum J. DuVal, listed by Dr. Gundlach, is represented in a recent collection of a beetle of this genus in decaying wood at Añasco.

Prof. J. A. Ramos found abundant on fungi on Sardinera beach, Mona Island, what Mr. W. S. Fisher identified as a species of *Ceracis*.

Cerambycidae: Long-Horned Wood-Boring Beetles

Parandra cribrata Thomson and *Parandra cubaecola* Chevrolat, both reported from Puerto Rico by Leng & Mutchler, are possibly the least typical of the Cerambycidae. Only the first is represented by recent collections: at Villalba by Mr. R. G. Oakley, and on the floor of the camp at El Verde, in the Luquillo Mountains above Río Grande. These shining, parallel-sided, reddish-brown beetles, three-quarters of an inch long, have antennae inserted at the side of the head near the base of the mandibles barely reaching to base of the thorax. Dr. Alex. Wetmore reported the remains of one of these beetles in the stomach contents of an owl, and their occurrence is presumably confined to the higher forests.

With the jaws of the males three-quarters of an inch long, and total length approaching three inches, some species of *Stenodontes* (*Mallodon* or *Nothopleurus*) are among the largest beetles occurring in Puerto Rico, although they are only three-quarters of an inch wide, and not nearly so thick and solid as the rhinoceros beetles. The females have much smaller man-

dibles, but more deeply serrate and more extended lateral margins of the prothorax. All are shining light brown. They are not abundant, and the only definite host record is of an adult in an oval tunnel in a live guácima (*Guazuma ulmifolia*) at Salinas, altho others have been found on dead stumps, or resting on trunks of dead trees on the ground. Mr. W. S. Fisher identified as *Stenodontes bituberculata* Palisot de Beauvois some unlabeled specimens, presumably collected at Guánica, the Danforth collection contains others from Mayagüez and Añasco, and Dr. Luis F. Martorell found one on Mona Island, resting on an old stump of a tree at Rancho Grande.

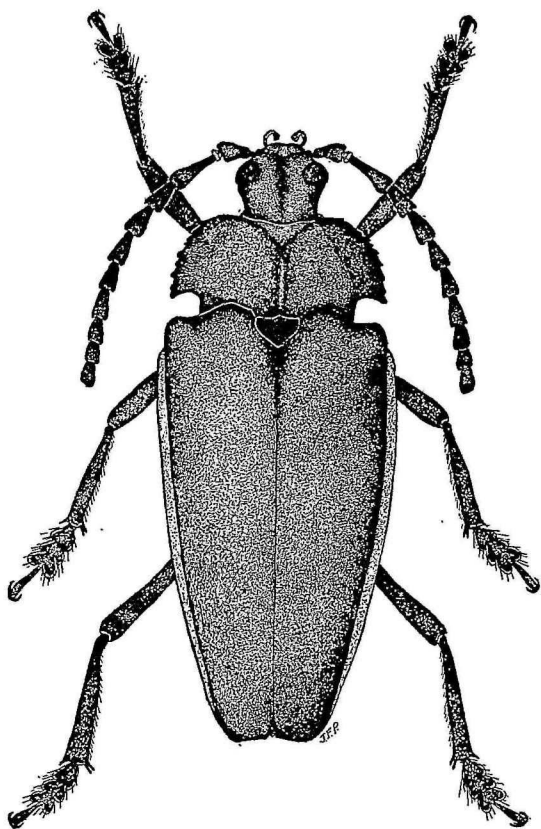
Stenodontes exserta Olivier, as identified by Mr. W. S. Fisher, is represented in the Río Piedras collection by one taken at light at Ceiba. This is what Drs. Stahl and Gundlach report as *Stenodontes mandibularis* F., known also from Mona Island.

Stenodontes maxillosus Drury, listed as a *Mallodon* by Drs. Stahl and Gundlach, is unrepresented in recent collections, and in doubt is the record of the subspecies *bajulus* Erichson of *Stenodontes dasystemus* Say, and Dr. Stahl's of *Stenodontes damicornis* Linnaeus.

Callipogon proletarium described, as a *Callomegas* by A. Lameere (Ann. Soc. Ent. Belgique, 48: 66. Brussels, 1904) from Puerto Rico, is an even larger beetle, represented in recent collections by one found on stump at Lares, September 8, 1921, as identified by Dr. E. A. Schwarz.

Callipogon sericeum Olivier, listed as an *Orthomegas* by Drs. Stahl and Gundlach, is represented in recent collections by a male with curved and deeply sculptured jaws found by Mr. R. W. Johnson at Mayagüez. The specific name is most appropriate, as the beetle has a grey, mouldy appearance, due to the uneven, scattering silvery pubescence.

Derancistrus thomae Linnaeus, listed for Puerto Rico by Dr. Stahl as *Solenoptera lateralis* Chevrolat, and by Dr. Gundlach as a *Prosternodes*, is a comparatively common elongate, reddish-brown Cerambycid, varying in length from an inch and three-eighths to only five-eighths of an inch for the smallest individuals. It has prominent antennae, extending half way down the elytra margined with yellow. Dr. Alex. Wetmore reports it eaten by the kingbird, and Dr. Stuart T. Danforth by the lizard cuckoo. It has been collected in all parts of the Island, and abundant larvae found under the bark of fence posts or rotten stumps have been repeatedly reared to adult. Presumably any kind of unbarked dead or rotting wood will serve, those identified being "cedro" (*Cedrela mexicana*) at El Verde, "achiote" (*Bixa orellana*) at Lares, and "camasey" (*Henrietta fascicularis*) at Aguas Buenas, besides many others not recognized. From the incomplete rearing records, one may approximate the larval period as two months, that of the pupa as two weeks.



The Cerambycid Beetle, *Derancistrus thomae* Linnaeus, four times natural size.
(Drawn by José F. Pietri.)

Derancistrus bilineatus Fabricius is the identification by Mr. W. S. Fisher of a single specimen collected by Dr. Stuart T. Danforth at Utuado.

Xystrocera globosa Olivier, which Mr. W. S. Fisher notes as having been "introduced from the Orient", has been collected by Prof. J. A. Ramos at Arroyo in December 1937 and by Dr. Luis F. Martorell at light at Río Piedras in June 1941. It is an elongate, yellowish-brown beetle, an inch long, with a dark stripe on the lighter yellow elytra, and extremely long antennae, the four basal segments scabrous.

Smodicum impressicolle Lacordaire was collected by Prof. J. A. Ramos at Mayagüez in May 1936.

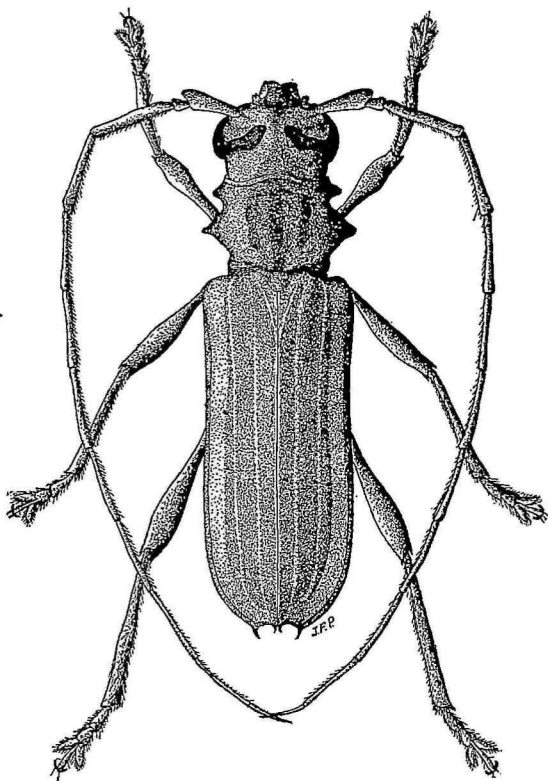
Pseudoeme poolei Fisher, originally described from l'Atalye, St. Michel, Haiti, was intercepted at light at San Juan.

Methia necydalea Fabricius, a slender little Cerambycid with antennae considerably longer than its body, was listed from Puerto Rico by Leng & Mutchler. Dr. Stuart T. Danforth had collected it at Mayagüez and at Luquillo, and Dr. Donald De Leon found it attracted to light in the Guánica Forest, and collected adults on *Eugenia* and *Amyris* trees, and what he presumed to be the larvae in their dead twigs. Dr. Luis F. Martorell found adults, identified by Mr. W. S. Fisher, common at light at Camp Kofresí in August 1939, on Mona Island, the largest being only 8.0 mm. long, and in April 1940 found others at the lighthouse at East Cape. The Cuban *Methia punctata* Leconte, listed from Puerto Rico by Drs. Gundlach and Stahl, is presumably this species.

Criodion cinereum Olivier, described from Surinam, has been doubtfully recorded from Puerto Rico.

"To Dr. N. L. Britton, eminent botanist, director for more than three decades of the New York Botanical Garden, chairman of the Porto Rico committee of the New York Academy of Sciences, to whose able and indefatigable services are due in large part the success of the natural history survey of Porto Rico" Mr. W. S. Fisher dedicated the genus *Brittonella* in "New West Indian Cerambycid Beetles" (Proc. U. S. National Museum, 80 (2922): 1-93. Washington, D. C., 1932), of which the only known species is *chardoni* Fisher, the types collected at Mayagüez by Mr. R. H. Van Zwaluwenburg. This is a uniformly reddish-brown beetle, 17.0 to 20.0 mm. long, elongate, parallel, strongly flattened above, moderately shining, the legs and antennae yellowish-brown.

Chlorida festiva Linnaeus, found in Africa, all of eastern South America and in most of the West Indies, including Puerto Rico, but not known from Vieques, Culebra, Mona or Desecheo Islands, is a large bright yellow Cerambycid, often an inch long, with elytra mostly light green in color. The apex of each elytron bears two spines, and the lateral margins of the prothorax have less pronounced spines. Above, the prothorax bears the



The Cerambyoid Beetle, *Chlorida festiva* Linnaeus, four or five times natural size.
(Drawn by José F. Pietri.)

darkened marking of a three-branched candelabra. The dark antennae are considerably longer than the body. Listed by Drs. Gundlach and Stahl, Dr. Alex. Wetmore found it eaten by the ani. Innumerable collec-

tions have since been made, usually at light, in all parts of the Island. If captured and held alive between the fingers, they make vocal their objection with a squeaking noise of undetermined source. The adults are usually heavily infested with Uropodid mite nymphs which have firmly attached themselves to the thorax. Mr. R. H. Van Zwaluwenburg recorded the larvae boring in the branches of a mango tree at Mayagüez, and subsequent collections have been made of larvae reared to adult in casuarina fence posts at Naguabo, in acacia stump at Ponce and in "cobana logs imported from Vieques."

Eburia quadrimaculata Linnaeus, of which *Eburia binodosa* Gahan, the type from Puerto Rico, is a synonym, is an elongate, yellowish-brown beetle, three-quarters of an inch long, of which each elytron bears two elongate bright yellow spots. Presumably because of these characteristic elytra, which could so easily be recognized among the insect debris present in the contents of a bird stomach, as well as because of the normal abundance of the beetle itself, Dr. Alex. Wetmore reports it as being eaten by the tody, cuckoo, flycatcher, vireos, Adelaide's warbler and the yellow-shouldered blackbird. Altho most of the earlier records are from the more humid parts of the Island, recent collections have been made at Ponce and Guánica, and Dr. Luis F. Martorell found it at light on Mona Island. It is so abundant on Mona, indeed, that one will find adults in the daytime resting on the foliage or twigs of trees. Presumably it also occurs on Vieques and Culebra, as it is recorded from St. Thomas and Guadeloupe.

Eburia portoricensis Fisher (1932-15), a very densely pubescent reddish-brown beetle, 20.0 to 25.0 mm. long, "with two pairs of small, oblong eburneous spots" ornating each elytron, is known from the type, collected at Aguirre Central, April 15, 1930, and one other at Río Piedras, November 19, 1945.

Elaphidion irroratum Linnaeus, dark reddish brown with dense whitish pubescence making characteristic patterns on thorax and elytra, is possibly the most striking of the numerous species of this genus found in Puerto Rico. One especially large individual, an inch and a quarter long, has denuded areas on the prothorax simulating eyes and an elongated nose, but smaller individuals have additional denuded areas on the lower cheeks. Drs. Gundlach and Stahl list this as *E. bidens* Olivier, the former noting, "No lo creo igual *E. irroratum* L." with which he was familiar in Cuba. It has an extensive distribution: Mexico and Nicaragua, as well as in the West Indies, Dr. Luis F. Martorell having found it abundant at light on Mona Island. He reared one adult of this species, as well as *Elaphidion spinicorne* Drury, from a dead trunk of *Albizia lebbek* lying on the side of the Ponce road, and also adults of the Elaterid, *Chalcolepidius silbermanni* Chevrolat, a recent accidental introduction from Hispaniola, the

larvae of which are predaceous on Cerambycid larvae in their tunnels in dead tree trunks.

Elaphidion spinicorne Drury, with antennae scarcely more spiny than those of *irroratum*, and similarly dark reddish-brown, has dense yellowish pubescence spotting the elytra and normally denuded mostly along the median dorsal keel of the prothorax. Listed by Drs. Gundlach and Stahl, it occurs in all parts of Puerto Rico, recent collections having been made at Lares and Humacao, but is much more abundant on the xerophytic south coast, and on Mona Island, where it has repeatedly been collected.

Elaphidion mutatum Gahan (= *E. tomentosum* Chevrolat) is somewhat smaller, the greyish pubescence of the elytra being arranged in elongated areas. In fresh specimens, as those reared from prunings of crape myrtle (*Lagerstroemia indica*) by Dr. Luis F. Martorell at Río Piedras, such denudation is less noticeable. Larvae have also been reared to adult at Río Piedras in the wood of "cupey" (*Clusea rosea*), and adults collected at Palo Seco, Cayey and Maricao. The greyish pubescence of individuals rather doubtfully identified as this species by Mr. W. S. Fisher, collected by Mr. Miguel A. Pérez from a live tree of "aceitillo" (*Zanthoxylum flavum*) at Guánica, is entirely undenuded, even the spiny antennae being densely pubescent in the least rubbed individuals.

Elaphidion insulare Newman, barely half an inch long even in the largest specimens, and with apparently more spiny antennae because of its small size, has grayish pubescence in more or less elongated areas on the elytra of denuded individuals. Collected at Ponce and Mayagüez, and by Mr. Miguel A. Pérez on Mona Island, as determined by Mr. W. S. Fisher, it also occurs in the more humid parts of Puerto Rico, adults having been reared from larvae in hormiguilla-infested dead twigs that had fallen from the twin "jagüey" (*Ficus laevigata*) tree on the side of the road between Manatí and Ciales.

Elaphidion portoricensis Fisher (1932-33), of which the type is from Coamo Springs, others from Yauco and Ponce, is a "uniformly bright reddish brown, strongly shining,—each elytron with three white pubescent spots," the entire beetle being 8.0 to 11.0 mm. long.

Elaphidion nanum Fabricius, which Dr. Gundlach listed as *E. cinereum* Olivier, is only half an inch long in the largest individuals: yellowish-brown, with the lateral ridges of the prothorax more prominent and usually more denuded than the dorsal keel, more or less elongated denuded areas on the elytra. It occurs on Vieques Island, where it was collected by Dr. Stuart T. Danforth, but not on Mona Island, despite its occurrence in Hispaniola. Numerous collection of adults, usually at light, have been made in all parts of Puerto Rico, but nothing is known of the immature stages.

Elaphidion thomae Gahan has been found at San Germán and at Bayamón.

Elaphidion glabratum Fabricius, as doubtfully determined by Mr. W. S. Fisher, was collected at Utuado by Dr. Stuart T. Danforth.

Elaphidion conspersum Newman, described from Hispaniola, was collected at light, Sardinera beach, Mona Island, by Prof. J. A. Ramos, in April 1944.

Stizocera vanzwaluwenburgi, described by Mr. W. S. Fisher (1932-46) from specimens collected at Mayagüez, and others at San Germán and Coamo Springs, is "narrowly elongate, subcylindrical; above pale yellow, beneath brownish-yellow", varying in size from 11.5 to 19.0 mm. in length. Apparently this slender beetle is confined to the western end of Puerto Rico, all subsequent collections made by Dr. Stuart T. Danforth or his students are from Mayagüez and Añasco, the farthest east being Coamo on the south and Algarrobo (Tortuguero Lagoon) on the north.

Dr. Alex. Wetmore reports in the stomach contents of the owl and the flycatcher remains considered to be that of a species of *Compsa*, but possibly assignable to the former or one of the following.

Heterachthes ebenus Newman, as determined by Mr. W. S. Fisher, was collected by Prof. J. A. Ramos (iv-37) at Mayagüez.

Heterachthes quadrimaculata Fabricius, found in the Lesser Antilles, was first identified from Puerto Rico by Dr. E. A. Schwarz. It is a very slender beetle, cylindrical, normally about half an inch long, the four light yellow spots on the somewhat darker elytra far from prominent. Since the first collection at Guánica, it has been repeatedly found at Ponce, and in the mountains at Utuado and Lares, as well as on the north coast at San Juan and Pt. Cangrejos.

Cylindera flava Fabricius, 7.0 to 10.0 mm. long, shining, flattened, entirely yellowish, occurs in the Old World, as well as in Hawaii, Mexico, British Guiana, Florida, the Bahamas and most of the West Indies. Drs. Gundlach and Stahl list it from Puerto Rico as *Lampromerus pilicornis* F., and it is so common here generally that Mrs. Raquel Dester found it eaten by the introduced toad, *Bufo marinus*. Dr. Donald De Leon noted the "saffron yellow" larvae feeding between the wood and the bark of beefwood (*Casuarina equisetifolia*) logs at Guánica in April 1940, and pupating in the bark. In July 1937, Miguel A. Pérez and Luis F. Martorell had noted logs of "ucar" (*Bucida buceras*) on the beach at Guayanilla heavily infested. It is not very common on Mona Island, Dr. Martorell finding only one at light at Camp Kofresi in August 1939, and Prof. J. A. Ramos (1947-42) one other five years later.

Merostenus attenuatus White, listed as a *Lampromerus* by Dr. Gundlach, has since been collected at Ponce by Mr. R. G. Oakley on flowers of *Scirpus*

validus, and Dr. Luis F. Martorell found a single specimen at light on Sardinero beach, Mona Island in March 1940.

Plectromerus distinctus Cameron, a Hispaniolan species, has been reported from Puerto Rico.

Acyphoderes aurulenta Kirby, described from Brasil and formerly known only in addition from Argentina, listed by Drs. Gundlach and Stahl from Puerto Rico as *Odontocera abdominalis* Olivier, was first correctly identified from Puerto Rico by Mr. G. E. Bryant, the synonymy subsequently being published (Proc. U. S. National Museum, 77 (2842) Art. 19:12. Washington, D. C., 1930) by Mr. W. S. Fisher. Densely pubescent with bright golden yellow hairs, the elytra acutely triangular, showing the hind wings beneath, the basal segments of the antennae spinose, the apical ones flattened, these unique beetles display such varied characters that, when found resting on leaves or flowers, they are easily mistaken for some unique bee. Rarely collected at light, the beetles seem to have no connection with wood or trees, having been observed resting on cane leaves, in the midst of extensive cane fields, as at Coloso and at Toa Baja; on mango blossoms, as at Mayagüez, on leaves of *Psidium guajava*, as at Cayey, and at light at Ponce. Nothing is known of the immature stages.

Euryscellis suturalis Olivier is dull reddish brown, densely covered with erect dull yellow hairs, the inner half of the narrow elytra with recumbent whitish pubescence. It has extremely long legs, the femora and tibiae being each half an inch long, of a beetle only three-quarters of an inch in total length. Noted by Mr. Francisco Sefn on October 17, 1925 at Guayama, where at 5 o'clock in the afternoon he found the adults running briskly over logs of mesquite or "bayahonda" (*Prosopis juliflora*) imported from Santo Domingo, it had previously been established in Puerto Rico, for nine years before collections had been made at light at Aguirre, and subsequently at San Juan and Bayamón, all identifications made by Mr. W. S. Fisher. Presumably this beetle is endemic in Hispaniola, but it is now known to occur in the Bahamas and southern Florida.

Neoclytus araeniformis Olivier, listed by Drs. Stahl and Gundlach, is dull purplish-brown in color, with characteristic whitish pubescent markings, 12.0 to 15.0 mm. long. The narrow elytra are spined at the apex, and the middle and posterior femora, greatly expanded and darkened, end in two spines, which are the more prominent because the beetle when alive normally rests with its tarsi and tibiae folded up beneath its body. Recorded also from Guadeloupe and Hispaniola, in Puerto Rico it has been found to date only in southwestern part of the Island: collections at Las Marías, Maricao, Añasco and Coamo Springs by Dr. Stuart T. Danforth apparently representing its extreme range. Adults have been reared from dead wood at Mayagüez and Yauco, and females have been observed

ovipositing in fresh logs of *Inga vera* at Indiera in the mountains between Yauco and Maricao, September 8, 1921. Logs of "ucar" (*Bucida buceras*), freshly-cut and being seasoned on the beach at Guayanilla, intended for use as the ribs of barges, were observed by Miguel A. Pérez and Luis F. Martorell as rendered quite unserviceable by the tunnels of the grubs of these beetles. The smaller larvae of *Cylindera flava* were boring between the bark and the wood of these logs, but those of *Neoclytus* were tunneling into the heartwood of the ucar.

Tilloclytus minutus was described by Mr. W. S. Fisher (1932-62) as "small, 4.8 mm. long, elongate, nearly glabrous and subopaque, above bluish-black, each elytron with a broad, transverse, white fascia at middle, connected posteriorly to a yellow vitta extending along the sutural margin to apex", the type from Tallaboa, collected by Mr. H. G. Barber on July 23, 1914. It has not been noted since.

Tilloclytus puertoricensis, one of the "New Cerambycid Beetles from Puerto Rico" (Jour. Agr. Univ. P. R., 19 (2): 51-63. Río Piedras, October 15, 1935) described by Mr. W. S. Fisher, is even smaller, 3.0 to 4.25 mm. long, with reddish elytra. The broad white transverse fascia on each elytron is bordered anteriorly with black, and an elongate black spot extends along the lateral margin nearly to the apex. The type and others were intercepted by Mr. R. G. Oakley in decaying wood in the Guánica Forest, October 3, 1934, but no additional collections have since been made.

Lamproclytus elegans was described by Mr. W. S. Fisher (1932-68) from a single female collected at Bayamón by Mr. R. C. Shannon, "3.8 mm. long, elongate, nearly parallel, strongly shining, black, except basal third of each elytron . . . brownish yellow, and each elytron ornamented with a transverse, eburneous fascia".

Lamproclytus oakleyi was described by Mr. W. S. Fisher (1935-52) from a single type intercepted by Mr. R. G. Oakley on *Tabebuia pallida* at Guánica, September 21, 1933. It is 3.25 mm. long, and differs from *L. elegans* in being uniformly dark reddish brown.

Rhopalophora pustulosa White, described from Venezuela, is reported from Puerto Rico.

Trachyderes nigripes Dupont, described from French Guiana, is doubtfully reported from Puerto Rico.

Neoptychodes trilineata Linnaeus, listed by Leng (1920-281) as a *Ptychodes* from Louisiana, Texas, Arizona and lower California, occurs also in Mexico, Central America, the northern part of South America, Trinidad, Puerto Rico, Jamaica and Cuba.

Monochamus titillator Fabricius, listed by Dr. Gundlach as a *Mono-
hammus*, has not since been found in Puerto Rico.

What Dr. E. A. Schwarz determined as *Proeccha spinipennis* Chevrolat

has been re-determined by Mr. W. S. Fisher as what he described (1926-3) from Cuba under the name *Ataxia alboscuteolata*. It is elongate, sub-cylindrical, three-quarters of an inch or less in length, light brown in color with evenly scattered whitish pubescence, deeply punctured on elytra and pronotum, and may be distinguished by the ivory-white scutellum (whence the specific name *alboscuteolata* given by Mr. Fisher), the segmentation of the antennae marked by whitish pubescence, and the three tubercles on the pronotum, one in front and one on each side. Puerto Rican specimens have been collected at Río Piedras, Pt. Cangrejos and Bayamón; by Dr. Stuart T. Danforth at Utuado, and by Mr. R. G. Oakley on dead wood at Guánica and on pomarrosa at Ponce. Among the "Insects and a Mite found on Cotton in Puerto Rico" (Bull. No. 39, P. R. Agr. Expt. Station, pp. 14, ref. 45. Washington, D. C., March 1939), Mr. L. Courtney Fife noted the larvae of this beetle boring in the stalks of cotton at Sabana Grande.

Ecyrus flavus was described by Mr. W. S. Fisher (1932-80) from a single female collected by Mr. R. H. Van Zwaluwenburg at Mayagüez, "elongate, 8.5 mm. long, robust, strongly convex above, uniformly pale reddish brown, rather densely clothed with short whitish and yellowish pubescence."

Ecyrus nanus was described by Mr. W. S. Fisher (1932-79) as "rather short, length 6.0 mm., robust, strongly convex above, uniformly reddish brown, densely clothed with whitish, brownish and yellowish pubescence": a single female collected by Mr. C. W. Leng at Boquerón, and another at Mayagüez by Mr. R. H. Van Zwaluwenburg. Dr. Donald De Leon found one of this genus on a rock beside a pile of old almácigo logs at Guánica. Both of these species are listed as *Callipogonius* by Mr. E. G. Linsley in his "Revision of the Pogonocherini of North America" (Ann. Ent. Soc. America, 28 (1): 73-103, pl. 1. Columbus, 1935).

Estola ignobilis Bates, a Central American Cerambycid, is listed from Puerto Rico, possibly in error for Costa Rica.

Oncideres lebasii, described by H. Dupont on p. 46 of his "Monographie des Trachydérides" (Guérin Magasin, Paris, 1936) from Puerto Rico, has not since been found.

Oncideres tessallata Thomson, of northern South America, is reported from Puerto Rico.

Cacostola leonensis Dillon & Dillon, described (Sci. Pub. No. 6, pp. 259-260, Reading Public Museum, Reading, 1946) from material collected at Coamo Springs by Dr. Stuart T. Danforth, is known only from the types.

Spalacopsis filum Klug, listed from Puerto Rico by Dr. Gundlach, and since found in a coffee grove at San Sebastián; by Dr. Stuart T. Danforth at Luquillo, and possibly this species on Malpighia flowers at Aibonito, is

an extremely slender and elongate beetle, with short, plump legs, which in life holds its antennae straight out in front of its head. By comparison with the slender antennae of Phasmids, it indicates how convergent development towards a similar end may find antennae useful, instead of an unavoidable nuisance and a detriment to perfection of protective resemblance.

Oreodera glauca Linnaeus, found in Mexico, Central and the tropical parts of South America, is reported from many of the Lesser Antilles, and all of the Greater Antilles except Cuba.

Oreodera lateralis Olivier, described from Cuba, also occurs in Puerto Rico.

Steirastoma brevis Sulzer, found in most of South America and some of the Antilles, is reported from Puerto Rico.

Steirastoma histrionica White occurs in Mexico and Central America, in Jamaica and in Puerto Rico.

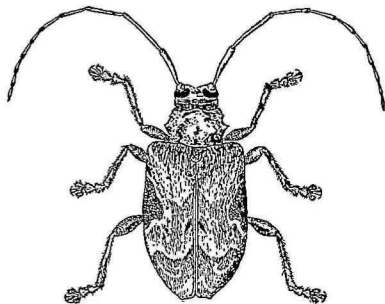
Acanthoderes circumflexa DuVal occurs in Mexico thru Central America to Venezuela, and in Cuba and Puerto Rico.

Lagochirus araeniformis Linnaeus is a somewhat flattened, robust, brownish Cerambycid, three-eighths of an inch across at the humeral angles, and approximately twice as long, its antennae much longer than the body, which is marked with intricate wavy pattern of grey and lighter brown. Listed by Drs. Gundlach and Stahl, it is common in all the less elevated parts of Puerto Rico, and elsewhere occurs thruout tropical America from Mexico to Argentina, in all the Greater Antilles and in many of the Lesser, but has not been collected on Vieques, Culebra, Mona or Desecheo.

Despite the wide distribution of the species and the abundance of its squeaking adults, apparently nothing was known of the immature stages until Dr. Willis R. Whitney, founder and for many years in charge of the research division of General Electric Co., in February 1940, "while tramping along the West Bay Road, leading from Nassau, Bahamas, to the Golf Club, found a tree which had very peculiar, large holes through its bark. They were approximately round and varied from about one and a half to two inches in diameter. Over most of these holes were still attached the bark coverings nearly quarter of an inch thick. These reminded one of refrigerator doors, owing to their well-fitted, beveled edges. Automatically, we at once spoke of these as "trap-doors". Of Dr. Whitney's most persistent search for the cause of these "trap-doors" in the bark of what in the Bahamas is locally known as "gumbo limbo" or "gum eleme," or more generally referred to as West Indian birch: the "almácigo" of Puerto Rico, *Bursera (Elaphrium) simaruba* (= *B. gummifera*), may be read in his privately printed "Isn't Research Fun" (Schenectady, N. Y., August 1941, and subsequently reprinted in the *Caribbean Forester*, 3 (2): 47-56, pl. 1.

Río Piedras, January 1942, and summarized in *Entomological News*, 53 (3): 60-62, pl. 1, ref. 5. Philadelphia, March 1942 by Dr. Raimon L. Beard as "A Note on *Lagochirus araeniformis* L.").

In part of a dead almacigo tree with similar cavities and "trap-doors" brought to the laboratory from Camuy on May 21, 1941, larvae and pupae were found, the chirping of the first adult signaling its emergence on the 26th. Altho fully-grown larvae occurred in the cavities under the bark where they had completed their growth, they retired to the interior of the log for pupation. "In the quiet of the laboratory, one can hear the larva chewing just beneath the bark, and note exactly its location. But a day or two later, the "trap-door" begins to crack loose, and nothing is present



The Cerambycid Beetle, *Lagochirus araeniformis* Linnaeus, twice natural size. (Drawn by Fritz Maximilien.)

in the deserted chamber except the hole back into the center of the log where pupation will occur. The intriguing chamber is only a feeding cavity and nothing more."

The considerably smaller but quite similar *Lagochirus obsoletus* Thomas, which does not occur in Puerto Rico, was found by Mr. Patricio Cardin to be one of the most injurious of the "Insectos y Enfermedades de la Yuca en Cuba" (Bol. No. 20, Est. Expt. Agr., pp. 28, pl. 8. Santiago de las Vegas, 1911), several larvae often developing in a single shoot. His photographs indicate a comparable feeding of the nearly fully-grown larvae in the tissue just under the bark and "cuando ha llegado á su completo crecimiento la larva hace un agujero hasta llegar casi afuera para poder salir cuando adulto, forma su cámara con serrín y virutas arriba y abajo de él, con la cabeza hacia la salida y empieza á pasar sus metamórfosis". It is

possible that the bark of the manioc also cracks around the area where the larva has been feeding, but even the largest shoots are too small to develop the "trap-doors" which Dr. Whitney describes in the bark of the gumbo limbo.

Oviposition by the females of *Lagochirus araeiformis* does not occur in the living, uninjured tree, nor in dead, decaying logs on the ground, but in freshly-cut logs or branches, and the hatching larvae may develop to adult even in those which, when used for fence posts, take root and live. From the almácigo material brought from Camuy, adults of the predaceous Elaterid, *Chalcolepidius silbermanni* Chevrolat, later emerged, their larvae having fed upon the larvae and developed in the tunnels of the Cerambycid.

Leptostylus argentatus, described by P. N. Camille Jacquelin-Duval in "Coleoptera von Cuba" (in Ramón de Sagra's Hist. Cuba, VII, p. 273. 1857), present also in southern Florida and in Hispaniola, is not listed by Dr. Gundlach, altho possibly the most abundant of the genus in Puerto Rico at the present time. Numerous collections have been made from all parts of the Island, and Dr. Luis F. Martorell reared adults from pieces of "aceitillo" (*Zanthoxylum flavum*) from the Guánica Forest in October 1938. The adults are somewhat less than half an inch long, mostly grey in color, but with a conspicuous transverse dark band on the inner margin of the elytra more than half way to the apex.

Leptostylus sagittatus, also described from Cuba by Jacquelin-Duval, was listed from Puerto Rico by Dr. Gundlach. Mr. W. S. Fisher has identified as this species those intercepted at light at Bayamón, on grapefruit at Dorado, at Adjuntas and at Villalba. It is recorded as eaten by the crested lizard, but possibly this refers to some other species of the genus.

Of the nine species of *Leptostylus* which occur in Puerto Rico, all except the two just discussed have been described by Mr. W. S. Fisher from specimens collected within little more than the last score of years, and this is by no means all that may be present. Many of the species are small to of medium size, usually robust, mottled grey or brown, with exceptionally long antennae. Dr. Alex. Wetmore found that they had been eaten by the following birds: cuckoo, woodpecker, tody, owl, flycatcher, honey creeper, redstart and several vireos and warblers.

Leptostylus longicornis, so named by Mr. W. S. Fisher (Proc. U. S. National Museum, 68 (2623) Art. 22: 1-40. Washington, D. C., 1926) because of its extremely long antennae, was described from a single male, 11.5 mm. long, 4.5 mm. wide, bearing the label "Porto Rico Exp. Sta." (which is the Station at Mayagüez, not that at Río Piedras, as inferred by Mr. Fisher). Subsequent identifications by Mr. Fisher, in addition to an undersized adult from Aibonito, are: at light at Mayagüez, on dead wood at Adjuntas, resting on bark of *Inga vera* at Lares, on firewood at Lares,

and in tunnels of a log at Naguabo. These are "uniformly reddish-brown, densely clothed with cinereous pubescence," most obviously marked with a denuded median darker area on the pronotum opposite the dark scutellum, the pubescence being considerably lighter in the specimens from Naguabo.

Leptostylus antillarum, one of the "New West Indian Cerambycidae (Coleoptera), Subfamily Lamilinae" described by Mr. W. S. Fisher (American Museum Novitates No. 174, pp. 16. New York, May 28, 1925) from types and paratypes collected by Mr. August Buseck on Culebra Island in February 1899, and one collected on cacao at Mayagüez by Dr. C. W. Hooker, is "strongly robust and moderately convex above, length 11.0-12.0 mm., width 5.0-5.2 mm., uniformly reddish brown to brownish black, rather densely clothed with pale brownish pubescence, and ornated with a few darker and paler areas." Subsequent collections of adults have been made at light at Bayamón, on *Derris elliptica* at Río Piedras, on dead wood at Yauco, all identified by Mr. Fisher, as well as adults reared from larvae under bark of stump at Dorado, and larvae and pupae in rotten fence post at Maricao.

Leptostylus albosignatus Fisher (1935-53), the type from Ponce, the paratype from Bayamón, is "allied to *antillarum* Fisher, but differs from that species in having a distinct, large, white pubescent spot on the elytra."

The type of *Leptostylus gundlachi* Fisher (1925-2), only 6.0 mm. long, 2.75 mm. wide, "reddish brown, not very densely clothed with brownish-white pubescence, with an obsolete opalescent tinge and a few dark brown areas," was from Aibonito. An adult, identified by Mr. Fisher, has been reared from a pod of *Erythrina glauca* at Río Piedras.

Leptostylus oakleyi, another small species, 4.5 mm. long, 1.8 mm. wide, described by Mr. W. S. Fisher (1935-54) from a single specimen collected at light at Bayamón, "is allied to *gundlachi* Fisher, but differs in the arrangement of the brown pubescence on the elytra, and in having a broad, dark brown, pubescent vitta on each side of the pronotum." Others had previously been taken at light at Río Piedras, as subsequently identified by Mr. Fisher.

Leptostylus nigricans, described by Mr. W. S. Fisher (1935-55) from a single type collected by Mr. R. G. Oakley at Villalba, is even smaller, 4.0 mm. long, 1.75 mm. wide, "elongate, moderately flattened above, brownish yellow, with the basal halves of elytra, disc of pronotum, tips of antennal joints, tarsi, and parts of the head, tibiae and femora, black or dark brown and rather densely pubescent".

Leptostylus puertoricensis, 4.0 mm. long, 1.75 mm. wide, described by Mr. W. S. Fisher from a single specimen collected by Mr. R. G. Oakley at Adjuntas, is "elongate, moderately flattened above, brownish black to brownish yellow, rather densely pubescent."

Trypanidius nocturnus, described by Mr. W. S. Fisher (Jour. Agr. Univ. P. R., 25 (4): 38. Río Piedras, April 7, 1942) from a single female collected by Dr. Luis F. Martorell at Villalba, May 18, 1940, is "broadly elongate, uniformly dark reddish-brown, length 15.0 mm., each elytron ornamented with a black pubescent spot along sutural margin behind scutellum and a narrow arcuate one behind middle, the apical fourth yellowish-white, tip obtusely angulated; pronotum with short acute tubercle on each side behind middle."

Lepturges guadeloupensis Fleutiaux & Sallé, in size comparable to the smallest of the *Leptostylus*, occurs in several of the Lesser Antilles, as well as in Cuba and Puerto Rico. Dr. Alex. Wetmore records it eaten by the tody, and it also serves as an item of food for the crested lizard. Dr. W. A. Hoffman found adults inside dead branches of "flamboyan" (*Delonix regia*) in the patio of the School of Tropical Medicine, and they have been noted burrowing inside hibiscus twigs at Mayagüez; in "mangle" (*Rhizophora mangle*) at Loíza; in "burro" (*Capparis flexuosa*) at Santa Isabel; as well as resting on dead wood and on orange tree at Ponce; in coffee groves at Ciales and Villalba, and resting on cotton at Guayanilla. From a larva found inside a pod of "aroma" (*Acacia farnesiana*) at Boquerón on April 24, 1923, an adult was reared: possibly indicating the normal, but more probably an atypical host for the immature stages.

Probatius umbraticus J. DuVal, found in southern Florida and Cuba, was listed from Puerto Rico by Dr. Gundlach, and has since been collected by Mr. R. G. Oakley at Ponce on "moca" (*Andira jamaicensis*).

Eugamandus oakleyi was described by Mr. W. S. Fisher (1935-57) from a single specimen collected by Mr. R. G. Oakley in decaying wood at Matrullas Dam, near Orocovis. It is 5.75 mm. long, 3.0 mm. wide, "short, oblong, strongly convex, subopaque, uniformly reddish or yellowish brown, each elytron ornamented laterally with an irregular, black pubescent vitta."

Eugamandus brunneus was described by Mr. W. S. Fisher (1935-58) from material collected by Mr. R. G. Oakley from vegetable debris at Indiera in the mountains north of Yauco, being "very closely allied to *oakleyi* Fisher, but much smaller and more slender, and differs in having tubercles on each elytron arranged in two longitudinal rows".

Eugamandus flavipes Fisher (1935-58), collected by Mr. R. G. Oakley at Villalba, also "is allied to *oakleyi* Fisher, but differs in having the elytra evenly convex, arcuately declivous posteriorly, and each elytron armed with only two distinct tubercles".

Cyrtinus eugeniae, described by Mr. W. S. Fisher (1935-60) from material collected by Mr. R. G. Oakley at Aibonito on "pomarroza" (*Eugenia jambos*), is only 2.0 mm. long, 0.63 mm. wide, "elongate, feebly shining;

head, pronotum and abdomen dark reddish brown; antennae, legs and elytra slightly paler, the latter dark reddish brown along lateral margins”.

Cyrtinus oakleyi, described by Mr. W. S. Fisher (1935-62), who named it for the Plant Quarantine Inspector who intercepted it at Indiera, in the mountains north of Yauco, is only 1.75 mm. long, 0.6 mm. wide, being “allied to *eugeniae* Fisher, but differs in being strongly shining, in having the pronotum as wide as long, and each elytron ornamented with two reddish brown spots”.

Cyrtinus subopacus Fisher (1935-61), of which the type is from Adjuntas, is 2.5 mm. long and 0.75 mm. wide, “allied to *eugeniae* Fisher, but differs in being larger and subopaque, and in having the punctures on the elytra elongate”.

Chrysomelidae: Leaf Beetles

Chrysomela, the type genus of the Chrysomelidae, is derived from two Greek words meaning “gold” and “fruit.” Only a few of the species found in Puerto Rico are golden, but many are iridescent or brightly colored. *Lema dorsalis* Olivier, for instance, has a shining orange pronotum, broad diagonal and transverse bands of yellow on deeply punctured purplish-blue elytra, dark orange head, black eyes and antennae, and blue-black legs. Slender and usually less than 5.0 mm. long, in size and brightness of coloration it is typical of the family. A widely distributed species, with a range including Mexico, Central and northern South America and most of the Antilles, it is especially abundant in the western part of Puerto Rico, notably around Mayagüez, where it was first collected by Dr. Gundlach.

Lema nigripes, described from Puerto Rican material collected by Dr. Gundlach, by Herr Julius Weise in his “Beitrag zur Chrysomeliden—und Coccinelliden—Fauna Portorico’s” (Archiv fur Naturgeschichte, 51 (1): 144-168, pl. 8. Berlin, 1885), and not since found elsewhere, has not only black legs, but also black antennae and eyes, an orange yellow body and dark blue elytra. Since Dr. Gundlach’s collection of the type, it has been found in many localities in the more humid parts of the Island. Dr. Stuart T. Danforth found it eaten by Adelaide’s warbler, and it has been noted in the stomach of the crested lizard. Dr. Alex. Wetmore found beetles of this genus eaten by the ani, tody, wood pewee, black and white warbler and the honey creeper. Nothing is known of the immature stages of these beetles, or even of the preferred host plants eaten by the adults, for most have been swept from grass or weeds, or collected resting on croton flowers, or on foliage of cocozelle squash or commelina.

Lema polita, described from Puerto Rico by J. T. Lacordaire in his “Monographie des Coleopteres Subpentameres de la Famille des Phyto-

phages, Vol. 1" (Mem. Soc. Royal Sci. Liege, 3: 355. Liege, 1845), and not since found elsewhere, is entirely black except for blue elytra. Recent collections have been made at Río Piedras and at Bayamón. Dr. Stahl lists this species as *Lema placida* Lacordaire, and also lists from Puerto Rico *Lema poeyi*, which Lacordaire had described from Cuba, and *Lema confusa* Chevrolat, neither of which has since been found here.

Pachybrachis mendica Weise (1885-153), endemic in Puerto Rico, where it was first collected by Dr. Gundlach, has since been found on Mona Island by Prof. J. A. Ramos. Dr. Stuart T. Danforth found it on acacia at Guánica and Tallaboa, and Mr. R. G. Oakley on *Randia mitis* at Ponce. Other specimens collected by Mr. Oakley on mangrove at Ponce and Guánica were thought by Mr. H. S. Barber to be a new species of *Pachybrachis*.

Pachybrachis praetextata, an endemic species described by C. G. L. Eduard Suffrian, "Zur Kenntniss der Nordamerikanischen Cryptocephalen" (Linnaea 6: 282-3 & 7: 203. 1852) has not since been noted in Puerto Rico.

Cryptocephalus, meaning "concealed head," is the name given to those Chrysomelid beetles which have "the head so deeply immersed in the strongly convex thorax that it can be scarcely or not at all seen when viewed from above."

Cryptocephalus nigrocinctus, described by Suffrian (1852(6)-282), an endemic species found only here, is by far the most abundant of the genus locally: almost entirely blue-green to dull purplish brown in color. *Cryptocephalus tristiculus* Weise (1885-147) is apparently the same species, not since reported from outside of Puerto Rico. Individuals vary greatly in size, smoothness of punctation of thorax, the size and distinctness of the pale mark on the central portion of the basal segment of the abdomen, and in general color; most of the females being blue-green and most of the males dull purplish-brown, but with no sharp distinction between intergrading forms. In thirty specimens collected from the leaves and terminal shoots of mangrove (*Rhizophora mangle*, *Laguncularia racemosa* and *Conocarpus erecta*) on the shores of Laguna San José, near Río Piedras, July 4, 1923, all combinations and variations were noted, as detailed in "Insectae Portoricenses" (1923-112). Two of these individuals showed traces of the yellow spots from which Herr Weise may have derived his name *tristiculus*, and one collected December 8, 1939 in a cane field at Fajardo distinctly shows six yellow spots margining the prothorax and three on each elytron. Dr. Gundlach lists both names, and Mr. H. S. Barber identifies most specimens submitted as *C. tristiculus*. Despite the abundance of the adults, nothing is known locally of the immature stages. The adults have been found generally in the more humid portions of the Island, from the coast to

the interior valleys, but not in the mountains, and only rarely on the xerophytic south coast. They feed on the leaves, and sometimes on the flowers, of a great variety of host plants, mostly weeds of no value, or trees, and only incidentally on economic crops. Indeed, altho one might consider that their morphological variations are matched by the non-selectivity of their host preferences; when found on one plant, rarely are they also feeding on near-by alternate hosts. The list of those on which they have been observed feeding includes the flowers of mango at Mayagüez, of *Inga laurina* at Yauco, and of the wild marguerite (*Bidens pilosa*) at Cidra; and the leaves of orange at Arecibo and Adjuntas, of grapefruit at Río Piedras, Vega Baja and Mayagüez, of cotton at Arecibo, Aibonito, Algarrobo and Quebradillas, of pepper at Ponce, of cassava at Lares, of roses at Río Piedras and Aibonito, of tobacco at Cayey, of "fresas" (*Rubus rosaefolius*) at Cayey, of *Stigmaphyllon tomentosum* at Ciales, of "jagüey" (*Ficus stahlii*) at Ponce, of "guano" (*Ochroma pyramidale*) at Cayey, of eucalyptus at Mayagüez, of seagrape (*Coccoloba wifera*) at Humacao Playa, of "capá cimarrón" (*Cordia borinquensis*) at Camuy, of "sauce" or Humboldt's willow (*Salix chilensis*) at Florida, of *Psidium guajava* at Juncos and Cayey, of *Dalbergia hecastophyllum* at Humacao, Algarrobo and Tortuguero, of "icaco", (*Chrysobalanus icaco*) at Pt. Salinas, of *Inga laurina* at Lares, of *Inga vera* at Mayagüez and Río Piedras, of "almendro" (*Terminalia catappa*) at Arecibo. It may be presumed that many other native and introduced plants may also at times serve as food for the adults.

Because of the abundance of these beetles, they are eaten by all the species of arboreal lizards, and even by the local iguana, *Ameiva exsul*. Dr. Stuart T. Danforth reports finding them eaten by the black-throated blue and the northern parula warblers, and Dr. Alex. Wetmore noted that some species of *Cryptocephalus* were eaten by five species of warblers, the redstart, vireos and also by the oriole, martin, swallow, wood pewee, flycatcher, patchary, kingbird and tody. Quite aside from the intrinsic beauty of these quaint little sculptured Chrysomelids, they might be considered esthetically valuable because to such a large extent they serve as food for vireos and warblers.

Cryptocephalus perspicax Weise (1885-151), an endemic species not found outside of Puerto Rico, is bright yellow in color, the light brown prothorax and elytra usually having large, but sometimes small, yellow spots. It is not nearly so abundant as the blue-green species, but adults are to be found feeding on much the same plants, altho not at the same time or at the same locality. Dr. E. A. Schwarz determined those from Quebradillas feeding on the leaves of seagrape (*Coccoloba wifera*), later confirmed by Mr. A. J. Mutchler, and subsequent records are on leaves of *Inga vera* at Río Piedras; on *Inga laurina* at Mayagüez, Ponce, Aibonito

and Comerio; on *Dalbergia hecastophyllum* at Pt. Salinas; on *Myrcia* sp. at Ciales; on "moca" (*Andira jamaicensis*) at Mameyes; on *Solanum torvum* at Río Piedras. Adults have been found in the stomachs of the lizards *Anolis stratulus* and *Anolis gundlachi*, and presumably they are eaten by vireos, warblers and other small insectivorous birds.

Cryptocephalus stolidus Weise (1885-149), as identified by Mr. A. J. Mutchler, has bright yellow elytra of which only the punctures are brown, or, to quote Weise's description, "elytris profundo punctatostriatis." Adults have been collected on the leaves of *Solanum torvum* at Ciales, Mr. R. G. Oakley found it on *Ficus* at Ponce, and Dr. Stuart T. Danforth had specimens from Guánica and Aibonito. It occurs only in Puerto Rico. As illustrated by Weise, the above two species seem quite distinct, but in an extensive collection from various localities and hosts, all sorts of gradations occur, some beetles being almost entirely brown with very small yellow spots, while others are almost entirely yellow. Of the eight specimens which Mr. Thos. H. Jones collected on *Inga vera* at Comerio, showing the maximum variation, which he thought might represent "perhaps two species mixed," the presence of intermediates presumably indicates that all are the same species.

Cryptocephalus multiguttatus Suffrian, of which specimens as determined by Mr. H. S. Barber were collected by Dr. Stuart T. Danforth at Faro de Cabo Rojo, and of which numerous specimens were found by Prof. J. A. Ramos on Mona Island, also occurs in Hispaniola. By Weise it is compared with his "rufobrunneus" *Cryptocephalus krugi* (1885-148), which has 22 spots on the two elytra. Previously known only from Puerto Rico, Prof. J. A. Ramos has specimens determined as "near" this species from Mona Island. Dr. Stuart T. Danforth had specimens from Ponce, Yauco and Mayagüez, and reports (1931-87) it eaten by the Jamaican vireo.

Cryptocephalus tortuosus Suffrian, a Cuban species, is listed by Herr Weise from Puerto Rico without comment, and Dr. Gundlach has this record, and also that of *Cryptocephalus polygrammus* Suffrian (1852-85), of which the type is from Puerto Rico. Leng & Mutchler (1917-210) list the Cuban and Jamaican *Cryptocephalus viridipennis* Suffrian. Specimens to which these names might be applied have not since been found in Puerto Rico, altho numerous individuals have been intercepted by Mr. R. G. Oakley in southern Puerto Rico to which specific names were not assigned by Mr. H. S. Barber.

Diachus nothus, described by Weise (1885-152) as a *Cryptocephalus*, is much smaller than any of the previous species, and can be readily distinguished by its bright yellow pronotum and iridescent blue elytra. Dr. Gundlach lists it, and notes, "no en Cuba, donde vive *C. pusio* Suffrian,

que es muy parecido". As *Cryptocephalus pusio*, Dr. Alex. Wetmore reports it eaten by the tody, Elainea, cliff swallow, parula warbler and honey creeper, but none was found in the stomach contents of any of the lizards examined. Mr. H. S. Barber noted the occurrence of smaller, non-typical varieties from Puerto Rico which have black elytra, but yellow head and legs, while the smallest ones are entirely black or piceous. Like the larger *Cryptocephalus*, these smaller and brighter or darker beetles also feed on the leaves of *Inga vera* and *Inga laurina* in the coffee groves of the mountains or on grapefruit foliage in the groves along the coast, and Mr. R. G. Oakley found them on the flowers of "pomarrosa" (*Eugenia jambos*) at Aibonito.

Triachus cerinus LeConte, described from Florida, is among the smallest of the Chrysomelids. According to the identification by Mr. H. S. Barber, it was found by Mr. R. G. Oakley on the flowers of *Randia mitis* at Ponce.

Chlamisus straminea Suffrian, described originally from Cuba, was first recorded from Puerto Rico as a species of *Chlamys* found by Dr. Alex. Wetmore in the stomach contents of the northern parula warbler. Later, specimens were collected by Mr. R. G. Oakley at Ponce on *Dioscorea* and *Ocotea*, and on flowers of "pomarrosa" (*Eugenia jambos*) at Aibonito. The flowers of pomarrosa at Aibonito also harbored other small Chrysomelids identified by Mr. H. S. Barber as species of *Exema*.

Lamprosoma longifrons Lacordaire, listed from Puerto Rico by Weise (1885-154) and by Dr. Gundlach, has subsequently been collected by Mr. R. G. Oakley on "pomarrosa" (*Eugenia jambos*) in the mountains back of Ponce, and on undetermined host at Indiera, in the mountains back of Yauco.

Nodonota wolcotti a bronze-black beetle, shining, finely and evenly punctured, each puncture with a short white hair; antennae, tibiae and tarsi brown, was described by Mr. G. E. Bryant in his "New Species of Phytophaga" (Ann. & Mag. Nat. Hist., 13 (9): 299. London, March 1924) from material taken on sagebrush or wild croton at Aguadilla. It is a conspicuous and relatively common insect of "yerba bellaca" (*Croton humilis*), not only in the more xerophytic parts of Puerto Rico but also on Mona Island. One individual has been found hiding in an Attelabid egg-roll of seagrape (*Coccoloba uvifera*) at Mameyes, and others intercepted at Luquillo on the beach. It has also been intercepted on "mabf" (*Colubrina reclinata*) at Mayagüez, and by Mr. R. G. Oakley at Guánica, and on cotton flowers and wild morning glory at Ponce.

Colaspis alcyonea Suffrian, a Cuban species listed by Weise (1885-155) and Dr. Gundlach from Puerto Rico, is represented in subsequent collection by a single specimen taken by Mr. Thos. H. Jones on weeds in a clearing on El Yunque, identified by Dr. E. A. Schwarz as probably this

species. It is an elongate brownish beetle with light greenish iridescence most marked on pronotum and head.

Alethaxius puertoricensis, described by Mrs. Doris Blake (Jour. Washington Acad. Sci., 35 (10): 327. Washington, D. C., 1945) from material from El Yunque, is a small, pale yellow-brown Chrysomelid, of which the males are "without the elytral warts and rugosities" characterizing the females.

The male of *Alethaxius yunquensis*, one of "Seven New Species of West Indian Chrysomelidae (Coleoptera)" (Proc. Ent. Soc. Washington, 48 (5): 111-119, pl. 1. Washington, D. C., June 21, 1946) described by Mrs. Blake from males collected by Dr. P. J. Darlington, is "4.0 mm. in length, oblong, shining cupreous with greenish lustre above" and is characterized by the uneven depressions on the pronotum.

The female of *Alethaxius semicostatus* Blake (1946-118) "is by far the largest species yet known from the West Indies", being "6.0 mm. in length, oblong, shining cupreous, prothorax uneven and with toothed margin".

Alethaxius meliae "also occurs in Puerto Rico", according to Mrs. Blake (1946-119).

Metachroma antennalis, a shining brown endemic Chrysomelid of Puerto Rico, described by Weise (1855-155) as "rufo-testacea", 3.3 mm. long, was found by Dr. Alex. Wetmore in the stomach contents of the oriole and several warblers. At times, this beetle may become very abundant, and outbreaks of adults have been reported attacking cotton at Quebradillas in June 1922, and the foliage of rose bushes at Aguirre in 1932. When less numerous, they have been found hiding during the daytime in the bracts of the squares and bolls of cotton, in spider nests or in the curled-up leaves of various plants. They are attracted to light at night, sometimes in large numbers. All the records of occurrence are in the western part of the Island: Arecibo, Hatillo, Guajataca, Aguadilla, Guánica Lagoon, Ponce, Coamo and Aguirre, and apparently this species is not found high in the mountains or in eastern Puerto Rico.

The Cuban *Metachroma liturata* Suffrian was first reported from Puerto Rico by Dr. Alex. Wetmore as forming an item of the food of the oriole, and later Mr. H. S. Barber identified as this species the beetles collected by Mr. R. G. Oakley on "ucar" (*Bucida buceras*) at Juana Díaz.

The Hispaniolan *Metachroma wolcottii* Bryant, as identified by Mr. H. S. Barber, was also found on "ucar" (*Bucida buceras*) at the same time and locality that the Cuban species of this genus was collected by Mr. Oakley. To numerous other beetles of this genus intercepted in coffee groves in the mountains, and on guava bushes at Bayamón, Aibonito and Villalba, and on various other hosts in the higher mountains, Mr. Barber assigns no specific name, considering them to represent one or more new species.

To the Puerto Rican representative of "The Species of *Myochrous* from the West Indies (Coleoptera)" (Proc. Ent. Soc. Washington, 49 (1): 22-28, pl. 1. Washington, D. C., January 15, 1947) Mrs. Doris Blake assigns the name *portoricensis*. It is 5.0 to 6.0 mm. in length, "oblong, piceous, covered with grayish yellow, closely appressed scales, the thorax with three teeth along the side, not so deeply punctate", the type having been collected in February 1899 at Arroyo by Mr. August Busck. Specimens found in the stomach of the killdeer at Guánica Lagoon in May 1912 by Dr. Alex. Wetmore are also cited by her, and it may be presumed that others listed by Dr. Wetmore, eaten by the ani, woodpecker, flycatcher, cliff swallow, honey creeper, vireos and warblers, are of this species, which apparently was exceptionally abundant at the time of his investigation on the food of "The Birds of Porto Rico". The specimens later swept from swamp vegetation at Boquerón, identified by Mr. G. E. Bryant as *Myochrous armatus* Baly, agree with Mrs. Blake's description of *portoricensis*, and presumably indicate that but a single species occurs in Puerto Rico. All records are of occurrence on the south side of the Island: by Dr. P. J. Darlington and Prof. J. A. Ramos at Guánica Lagoon, and by Dr. Luis F. Martorell, resting on cane leaf at Salinas.

Leucocera laevicollis Weise (1885-156) is a large, plump, iridescent blue Chrysomelid, "nigro-violacea, subtus interdum cyanea, long 6.0 mm.", according to the original description of specimens which presumably Dr. Gundlach had collected at Mayagüez. The next record is from near Río Piedras, where in December 1922 these beetles were found on *Malpighia coccigera* in the Seboruco woods, opposite the Isle of the Caves, Laguna San José, and again on the same host and at the same locality in June 1923. In September 1936, Prof. J. A. Ramos made extensive collections at Mayaguez, the species subsequently becoming so abundant on its specific host as to be discussed in the 1939 report of the Mayagüez (Federal) Agricultural Experiment Station (1940-116), as follows:

"In April numerous bright steel-blue beetles about 7 millimeters long were noted feeding on the young leaves of the native red cherry, cereza colorada (*Malpighia puniceifolia* L.) at Mayagüez. The feeding of both the larvae and the adults of this insect prevented the normal leafing of five small trees that were being used for ornamental purposes on the station grounds. Towards the latter part of May, or about 6 weeks after injury became conspicuous, practically all the leaves had been consumed and the bark of the twigs up to slightly more than three-fourths of an inch in diameter were being fed upon. So extensive and severe was the subsequent feeding that the trees were kept leafless, one of the trees died, and most of the remaining trees were being killed by girdling".

Phaedon sp. is the identification by Mr. H. S. Barber of beetles intercepted by Mr. R. G. Oakley at Indiera at Km. 22 on the Yauco-Lares road.

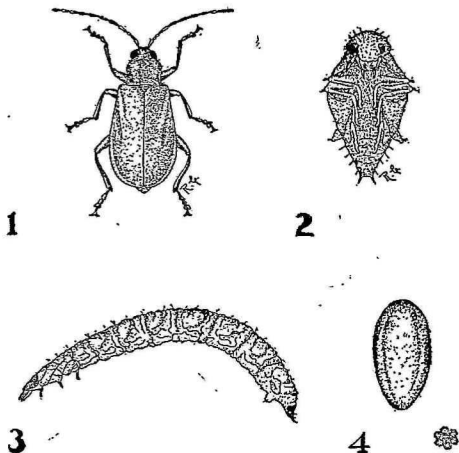
Of the very numerous species of *Diabrotica* which occur in the neotropics, Puerto Rico actually has less than half of the few listed. *Diabrotica aeruginea* Fabricius has not been collected here since the original record from Puerto Rico. The record of the Costa Rican *Diabrotica dorsoplagiata* Jacoby in Puerto Rico is apparently due to the confusion of names of the two countries. Dr. Stahl's name of *Diabrotica thoracica* Fabricius is in synonymy with *Diabrotica quadriguttata* Olivier, listed by Weise and Dr. Gundlach, but no specimen to which these names might be applied has since been found here. *Diabrotica impresa* Suffrian has not been collected recently.

Diabrotica annulata Suffrian, as identified by Mr. H. S. Barber, has been intercepted on squash at Barceloneta and on wild cucumber at Villalba, but it is by no means abundant, or tending to become a pest of cultivated cucurbits.

Diabrotica bivittata Fabricius and *Diabrotica innuba* Fabricius are common economic species, each having a black head, shining bright orange-red prothorax, closely and densely punctured yellow elytra, black on the central margin and in a broad median band, so that Fabricius' name of *bivittata* (two-banded) applies equally well to either species. The larger is *innuba*, of which the "legs are partly black, elytral apices dentate"; the smaller *bivittata* has "legs entirely testaceous, elytral apices not dentate", to quote from Dr. E. A. Schwarz, veteran systematic and economic coleopterist. These are specifically pests on cucurbitaceous plants, having been repeatedly collected on cucumbers, melon, squash, pumpkin, canteloupe, watermelon, Chinese cabbage and wild cucumber in all the more humid parts of the Island, feeding chiefly on the flowers, of which they are exceptionally fond, but more rarely eating the tender young leaves. By accident, they may be sometimes found resting on other vegetation. Both are listed by Drs. Stahl and Gundlach, and by Weise, giving *Diabrotica pallipes* Olivier in synonymy with *D. bivittata*. Leng & Mutchler record *D. innuba* from Culebra Island. Mr. R. H. Van Zwaluwenbug noted the occurrence of both species on beans as well as on cucurbits, Mr. W. V. Tower conducted preliminary tests in control by spraying with Bordeaux and arsenate of lead, while Mr. D. W. May, Director of the Mayagüez Station, mentions them as being eaten by the newly introduced Surinam toad, *Bufo marinus*. At Río Piedras, Mr. Thos. H. Jones had noted their preference for flowers, but the first intensive life-history studies were made by Dr. Richard T. Cotton as presented in his paper on the "Insects Attacking Vegetables in Porto Rico" (Jour. Dept. Agr. P. R., 2 (4): 265-317, illus. San Juan, October 1918). "The beetles lay their small yellow eggs in the soil around the roots of plants, and the larvae,

which are slender, white, worm-like creatures, feed on and tunnel in the roots".

The light bluish-green *Diabrotica graminea*, possibly thus named by Mr. J. S. Baly in his "Descriptions of Uncharacterized Species of *Diabrotica*" (Trans. Ent. Soc. London, 4: 443. London, December 1886) because of its grass-like color, occurs only in Puerto Rico and on Vieques Island. Undescribed at the time that Dr. Gundlach was here, it surely must have been collected by him, and possibly is what he and Weise list



Diabrotica graminea Baly: 1, adult, 2, pupa, 3, fully-grown larva, all about five times natural size; 4, egg, very greatly enlarged, with detail of sculpturing below. (Drawn by R. T. Cotton.)

as *Diabrotica quadriguttata* Olivier, and Dr. Stahl as *Diabrotica thoracica* Fabricius. Leng & Mutchler list it from Vieques Island, and Dr. C. W. Hooker considered it most "abundant on the south side of Porto Rico". Admittedly it may not be as common at Mayagüez as elsewhere, Dr. Stuart T. Danforth having few specimens from the immediate environs of the "Sultana del Oeste", but distribution seems to be quite general thruout the Island. Dr. Alex. Wetmore found this beetle to have been eaten by the ani, tody, petchary and grasshopper sparrow, but we have no record of

its being eaten by the introduced toad, or any of the endemic lizards. As to hosts, Mr. R. H. Van Zwaluwenburg mentions beans, squash, sugar-cane and bucare, and both Mr. D. L. Van Dine and Mr. E. G. Smyth note its occurrence on sugar-cane. Mr. Thos. H. Jones also found it "very common on leaves of sugar-cane, but with injury most severe on corn and okra, on flowers of cowpeas and to the foliage of *Spondias lutea* and *Amaranthus spinosus*". Other plants on which it has been noted in abundance are: tomatoes, eggplant, wild eggplant, pepper, potato, peas, pigeon peas, cundeamor, crotalaria, lima bean, soybeans and orange. At times, the flowers of angel's trumpet, *Datura suaveolens*, are filled with these beetles, and one may capture the entire contents by closing the entrance. Dr. R. T. Cotton, in his final report on this Chrysomelid, noted that it "attacks almost all vegetable crops, and is very abundant on okra, feeding on petals, pollen and pistil of the flowers", in his earlier "Report on Tobacco and Vegetable Insects" (Fifth Report, Board Comm. Agr. P. R., 1915-16, pp. 86-99. San Juan, 1917) having published illustrations of all stages, technical descriptions, life-history and methods of control.

Galerucella wolcottii, described by Mr. G. E. Bryant as one of his "New Species of Phytophaga (Coleopt.)" (Ann. & Mag. Nat. Hist., 14 (9): 247-252. London, August 1924), the type found feeding on flowers of *Cordia corymbosa* between Carolina and Laguna San José, has since been found on *Gouania polygama* at Arecibo, as identified by Mr. H. S. Barber. It is "elongate, greyish brown, finely and closely pubescent; prothorax testaceous, with a central and two lateral depressions; elytra with four longitudinal greyish stripes, and a feble greyish stripe between the second and third. L. 4 mm.", "closely allied to *G. varicornis* Wse."

The large, coarse, pubescent leaves of the "moral" (*Cordia sulcata*) are often noted with an abundance of small holes, so numerous that more of the leaf has been eaten than is left behind. Rarely does one find the insect responsible, for it feeds only on the most tender foliage, but collections were made at Mayagüez in 1923 on this host of beetles which were determined by Dr. E. A. Schwarz as *Galerucella varicornis* Weise (1885-157), presumably described from material collected at Mayagüez by Dr. Gundlach. Prof. J. A. Ramos has made additional collections since at Mayagüez, but the insect is not confined to the Mayagüez region, as specimens have been found at Ponce, Villalba and El Verde (Río Grande).

Galerucella obliterated, described by A. G. Olivier in his "Entomologie 6" (93: 635. Paris, 1808), is a third endemic species of this genus from Puerto Rico, all three of which are found only here. Small beetles, the stripes on their elytra curved, collected feeding on the leaves of *Lantana camara* at Río Piedras, are presumed to be this species.

Luperodes antillarum, described by Mrs. Doris Blake as one of her "Ten

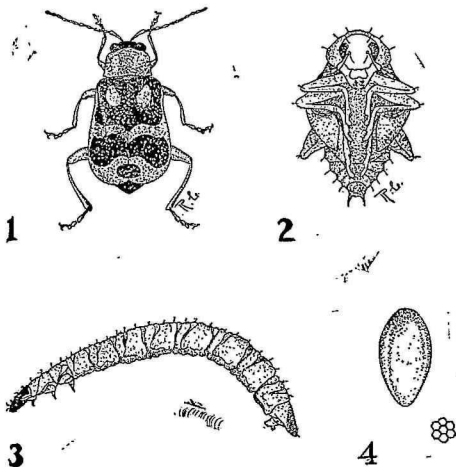
New Species of West Indian Chrysomelidae (Coleoptera)" (Proc. Ent. Soc. Washington, 39 (4): 67-88, pl. 1. Washington, D. C., April 27, 1937), is "elongate oblong, about 4. mm. long, shining dark blue, with deep brown or piceous antennae and yellow legs; thorax sparsely, elytra more coarsely and more densely punctate", of which the type was collected by Dr. Richard T. Cotton at Río Piedras on *Jussiaea suffruticosa*. Additional collections have been made on this host at Loiza, by Dr. Stuart T. Danforth at Yabucoa and on the margin of Cartagena Lagoon, and by Mr. E. G. Smyth at light at Guánica. Doubtless numerous other instances of occurrence have been unobserved because of the similarity of this species to *Altica occidentalis* Suffrian in color, approximate size and host, the most obvious difference being the color of the legs, those of the *Altica* being black.

Ectmesopus vitticollis is one local representative of "A New Genus of Galerucinae (Coleoptera) from the West Indies" described by Mrs. Doris Blake (Proc. Ent. Soc. Washington, 42 (5): 95-104, pl. 1, Washington, D. C., May 28, 1940), of which the type was collected at Ponce by Mr. R. G. Oakley on "hediondilla" (*Peirania polyphylla*). It is "from 3 to 4 mm. long, oblong oval, shining, reddish yellow, usually with piceous markings on occiput of head, a short vitta on either side of prothorax, a dark line along edge of femora and tibiae, and blue or violet elytra, breast and abdomen more or less dark. Antennae of male with 10th joint much enlarged".

Ectmesopus zonatus Blake (1940-100) was collected by Dr. P. J. Darlington in the Maricao Forest at an elevation of 3,000 feet. It is "about 3.5 mm. long, oblong oval, shining yellow brown, with piceous occipital band running behind eyes and a piceous vitta on either side of the prothorax; elytra with the base and apical half lustrous green, and irregular pale yellow brown band in middle, femora with a piceous streak on edge". Both species are presumably rare, as no other collections are known.

Cerotoma ruficornis Olivier (1791-200), of which the type was from the French West Indian island of Guadeloupe, has precedence over the name *Cerotoma denticornis* Fabricius (1792-24), of which the type is from Venezuela. It is under the latter name, however, that Drs. Stahl and Gundlach list this bright red and black pest of beans in Puerto Rico, despite the correct synonymy given by Weise. For the numerous individuals lacking the two irregular black bands across the middle of the elytra, Weise (1885-157) proposed the varietal name *blandula*. At Río Piedras, Mr. E. G. Smyth noted that these "semi-immaculate adults occur 1 to 5 of the normal form". The name *Cerotoma trifurcata* Forster, unfortunately used by Dr. C. W. Hooker (1913-34), refers to this species, and should not be considered a distribution record for the continental species, which does not occur in Puerto Rico. In addition to the early

records on beans, cowpeas and squash, this beetle has been collected on lima beans, and, if not feeding, at least resting on sweet potatoes, cucumber, peppers and sugar-cane. It occurs in abundance in all the coastal regions of Puerto Rico, in all the other Greater Antilles and in most of the Lesser Antilles, as well as in northern South America, Central America and Mexico. In most of these countries it is presumably an introduced species, for it has not been found on Mona, Desecheo, Culebra or Vieques Islands.



The Bean Chrysomelid Beetle, *Cerotoma ruficornis* Olivier: 1, adult, 2, pupa, 3, larva, all about six times natural size; 4, egg, and detail of sculpturing on egg-shell, greatly enlarged. (Drawn by R. T. Cotton.)

Dr. Richard T. Cotton made careful studies on its life-history, publishing (1916-95) illustrations of all stages and recommendations as to methods of control. Since the advent of DDT, the latter are somewhat dated, for 3% DDT dust is very effective in control, entirely avoiding the possibility of injury to host by arsenicals. He found that the female beetles lay their eggs in the soil around the roots of the host plant. "They are a deep yellow in color when first laid, but soon change to a dark reddish-brown. They are elliptical in form, with a surface roughened with small hexagonal pits.

Length 0.6 mm., width 0.3 mm. The eggs hatch at the end of eight days, and the emerging larvae, almost white in color, begin at once to feed on the roots of beans. The larvae feed for a period of from twenty-five to thirty days before pupating. When mature they are white in color, slender, tapering gradually from the head caudad. Head, thoracic and anal plates black, the anal segment with a fleshy proleg. Length 8.0 mm., width 1.0 mm. The pupal stage lasts for a period varying from five to eight days, depending on weather conditions. The pupa is white in color, slender, naked, and furnished with a few scattering hairs. Length 3.5 mm. The beetles may be controlled by collecting them when they first appear and their numbers are few. A small cheese-cloth net may be used for this purpose, and as the beetles are quite sluggish in their movements, they are easily captured and destroyed". Rather surprisingly, Dr. Alex. Wetmore identified none of these beetles in the stomach content of the birds he examined, but Mr. D. W. May noted that they had been eaten by the newly introduced Surinam toad, and they have been found in the stomach of the little grass lizard, *Anolis pulchellus*.

Asbecesta violacea Allard, an Old World species, occurs in Cuba, and in Puerto Rico has been found only at Guánica, collections having been made there by Dr. Stuart T. Danforth, and by Mr. R. G. Oakley on "abeyuelo", *Colubrina ferruginosa*.

Phyllotreta fallaciae Csiki, listed from Puerto Rico by Weise and Dr. Gundlach as *P. fallax* Suffrian, has not since been collected here.

Phyllotreta guatemalensis Jacoby, as determined by Mr. G. E. Bryant and confirmed by Mr. A. J. Mutchler, was found at Mayagüez in enormous numbers on "jazmín de río" *Cleome gynandra*, and *C. spinosa*, by Rev. R. E. Danforth, the father of Dr. Stuart T. Danforth, in February 1923. They were later noted at Mayagüez in February 1931, and repeatedly since, the only other record being at Coamo in April 1928. Dr. Alex. Wetmore found them eaten by the tody and the cliff swallow. These beetles are about 2.0 mm. long, with dark blue-green head, prothorax and elytra dark blue, evenly and densely punctured, the body black to blue-black in color.

Aphthona auripennis Suffrian, as determined by Mrs. Doris Blake, has been collected by Dr. Stuart T. Danforth at Tortuguero Lagoon, at Manatí on crotalaria, at Juana Díaz and at Mayagüez. Prof. J. A. Ramos (1947-43) found "adults very numerous, feeding on the leaves of *Stigmaphyllon lingulatum*" on Mona Island.

Aphthona compressa Suffrian, which Herr Weise (1885-162) notes "variirt in der Grösse auserordentlich (von 2-4 mm. Länge, und 1.2-2.5 mm. Breite)", also appears to vary considerably in coloring, its prothorax being bright orange to red, and its elytra blue or purple. After

studying all the specimens in the Río Piedras collection, and many others, Mrs. Doris Blake proposes the name *Homoschema*: "A New Genus of Flea-Beetles from the West Indies" (*Psyche* 57 (1): 10-25, pl. 2. Cambridge, March 1950).

Homoschema latitarsum Blake (1950-16), TYPE from Maricao Forest, others from Indiera and Adjuntas, occurs only in the mountains of Puerto Rico, other collections having been made on coffee at Utuado and Maricao.

The TYPE of the dark-breasted *Homoschema nigriventre* Blake (1950-18) is from Ponce, intercepted by Mr. R. G. Oakley, others from Parguera, San Germán, Manatí, Algarrobo, Sardinera and Río Piedras, also from Mona Island, St. Thomas and St. Croix, U.S.V.I., 2.5 to 3 mm. long, 1.5 mm. wide, with violaceous elytra. *Homoschema fraternum* Blake (1950-19), the TYPE from San Juan, has a narrower aedeagus.

Homoschema obesum Blake (1950-22), the TYPE from El Vigia, Ponce, intercepted by Mr. R. G. Oakley, others from Yauco, Boquerón, Mayagüez, and Algarrobo, 3.2 to 4 mm. long, 2 to 2.8 mm. wide, also with violaceous elytra, is not to be distinguished from the others on the basis of host preference, for all coastal species have been taken on "bejuco de toro", *Stigmaphyllon* (or *Stigmatophyllum*) *tomentosum*, "bejuco de buey", *Banisteria laurifolia*, and other Malpighiaceae.

Aphthona maculipennis Jacoby is a smaller brown beetle with two lighter spots on each elytron. Mr. Thos. H. Jones collected adults feeding on the leaves of *Phyllanthus lathyroides* at Río Piedras, as identified by Dr. E. A. Schwarz. Others collected by Mr. R. G. Oakley on *Myrcia cerifera* at Guánica may be this species.

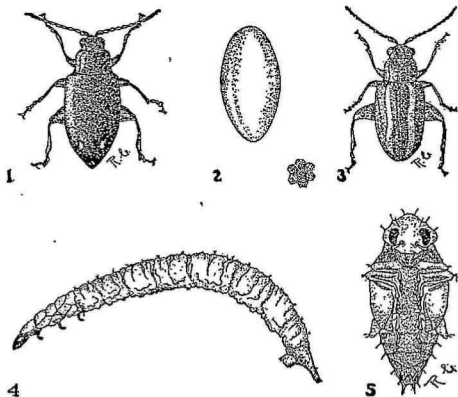
The Cuban *Longitarsus seminulum* Suffrian, as identified by Mr. G. E. Bryant, is a small brown Chrysomelid swept from grass in a salty waste at Salinas.

Longitarsus varicornis Suffrian, a small brown flea beetle of extended distribution, found in the Gulf Coast States, Mexico and Central and northern South America, as well as in Cuba and Puerto Rico, was noted by Weise (1885-162) and listed by Dr. Gundlach. At times it may occur in enormous abundance, as on *Heliotropium indicum* at Río Piedras and Caguas, on *Psidium guajava* at Coloso, and on tomatoes at Villalba, hosts botanically as widely separated as the localities were geographically where the outbreaks were noted. Specimens from Mona Island, collected by Prof. J. A. Ramos at light, were undetermined as to species by Mr. H. S. Barber.

Dr. Alex. Wetmore reports finding the remains of a flea beetle identified as a species of *Glyptina* in the stomach contents of a tody, *Todus mexicanus*, but nothing corresponding to this had previously been reported or has since been collected.

Systema basalis Jacquelin-Duval, "La Pulga Americana" of Puerto Rican tobacco growers, is merely listed by Weise, but Dr. Gundlach notes,

"ambos sexos diferen mucho", or, more correctly, the sexes differ considerably from each other. Altho both are generally piceous with greenish luster, the males are smaller and each elytron has a broad median longitudinal golden stripe; the females have faint basal and apical spots on the elytra. Dr. Stahl lists this species as *Haltica basilea* Jacq., and possibly during his lifetime it was not an economic pest of tobacco, for Mr. O. W. Barrett, the first Entomologist at the Mayagüez Station, noted (1904-448) it only on Russian sun-flower. To be sure, it does occur on many other hosts than tobacco, Mr. R. H. Van Zwaluwenburg listing beans, okra and beets, and it is often noted on sugar-cane, but most plants on which it



"La Pulga Americana," *Systema basalis* J. Duval: 1, adult female, 3, adult male, 4, fully-grown larva, 5, pupa; all from eight to ten times natural size, 2, egg, greatly enlarged. (Drawn by R. T. Cotton.)

feeds are solanaceous: eggplant, potato and tomato. Anyone attempting to grow temperate zone garden flowers may find few to many beetles feeding on them; marigold, dahlia, coreopsis, everlasting and others having been noted as attacked.

The list of other observed hosts includes squash, carrots, sweet potato, *Solanum indicum*, *Phaseolus aurens*, *Arracasia xanthorrhiza*, *Portulaca oleracea*, *Valerianodes cayennense*, *Verbesina alata*, *Pluchea odorata*, *Lantana camara*, *Bidens pilosa*, *Synedrella nodiflora*, and *Moluchia tomentosa*, any one of which may be the principal, rather than merely an alternate host plant. The beetle occurs in other of the Greater Antilles, in Cuba

being possibly most abundant during the autumn on the common sunflower, *Helianthus annuus*, feeding on the tender leaves of young plants, but not an economic pest on tobacco or cotton. It was one of the "Common Insect Pest (which) prefer other Host Plants in Haiti" (Jour. Ec. Ent., 20 (2): 429. Geneva, April 1927), cotton being the crop attacked there. Mr. C. C. Gowdey does not even list it in his "Catalogus Insectorum Jamaicaensis" of 1926, altho it is known to occur there. Dr. Richard T. Cotton made life-history studies, publishing (1916-90 to 93) illustrations of all stages, a list of host-plants and recommendations as to methods of control. Possibly because the elytra of these beetles are so characteristic and could be identified so easily, mixed up with the other contents of birds' stomachs, they have been reported by Dr. Alex. Wetmore as eaten by the killdeer, cliff swallow, grasshopper sparrow, mozambique, yellow-shouldered blackbird and yellow warbler. Dr. Stuart T. Danforth found them eaten by the yellow-shouldered blackbird and by the northern water thrush. Mr. D. W. May claimed that they were eaten by the newly introduced Surinam toad, altho later examinations of its food did not include these rapidly moving fleabeetles. Nor are lizards successful in catching them. Indeed, it is doubtful if any other animal present in the environment has much effect on the abundance of these beetles, for they disappear too swiftly to be caught by anything but the most alert bird.

Systema varia, described by Weise (1885-164) from specimens collected by Dr. Gundlach in Puerto Rico, presumably at Mayagüez, is known only from the western end of the Island. It has two narrow yellow bands on each elytron, the prothorax and body being a dull yellow. An outbreak of these fleabeetles in December 1923 made it temporarily a serious pest on young cotton seedlings at San Germán and Lajas, and Prof. J. A. Ramos later swept it from weeds at Boquerón.

Specimens of *Disonycha weisei* Csiki, the name to which Weise's "nigrocoerulea" *pallipes* (1885-159) is now referred, have not been found in Puerto Rico since Dr. Gundlach's original collection.

Disonycha spilotrachelata, described by Mrs. Doris Blake (Bull. Brooklyn Ent. Soc. 23 (2): 93-98. Brooklyn, April 1928) with the type from Haiti, others from Tortuguero Lagoon, Puerto Rico, is "brown, pronotum 5-7 spotted, elytra with a common sutural vitta uniting with narrow sub-marginal one, a discoidal median vitta on either elytron not reaching apex". Besides the type which Dr. Stuart T. Danforth had collected on the shores of Tortuguero, he had others from Aguadilla, and Prof. J. A. Ramos found it at Faro de Cabo Rojo.

Disonycha chlorotica Olivier is listed from Puerto Rico by Weise and Drs. Stahl and Gundlach. Of specimens recently collected at Adjuntas, Mr. H. S. Barber gives the doubtful identification of the Guadeloupe

Oxygona pallens F., noting that "a closely related Cuban specimens has been labeled *Disonycha chlorotica* Oliv., but can hardly be that species". Dr. Stuart T. Danforth had specimens from Maricao and Mayagüez identified as *Oxygona pallens* F., presumably by Mr. A. J. Mutchler. Other specimens to which these names have doubtfully been assigned were collected on sweet potato at Villalba and on *Cacara tuberosa* at Ponce.

The Cuban *Disonycha interstitialis* Suffrian, a yellowish-brown, densely punctured flea beetle listed by Weise and Dr. Gundlach, has since been found on "roble" (*Tabebuia pallida*) and on *Jasminum sambac* at Bayamón, on *Quercus thompsonii* at Ponce, and, without host records, at Mayagüez, Aguada, Orocovis and Guánica.

To specimens now lost, Dr. Stahl had assigned the name *Disonycha ambulans* Suffrian.

Disonycha eximia Harold, the presently accepted name for what Mr. G. E. Bryant identified as *Disonycha laevigata* Jacoby, occurs in northern South America, Central America and some of the West Indies. It is a bright orange-red flea beetle; the eyes, antennae except two basal segments, apical half of tibiae and all of tarsi, black and finely pubescent; elytra bright green, shining, impunctate, which when first found in Puerto Rico, occurred in such enormous numbers as to be reported as "An Important New Pest of Beets in Porto Rico" (Jour. Ec. Ent., 16 (5): 459-460. Geneva, June 1924). Concerning it, the Rev. R. E. Danforth made "Notes on the Life-History of *Disonycha laevigata* Jacoby in Porto Rico" (Jour. Ec. Ent., 17 (3): 415-416. Genera, June 1924). The first record in Puerto Rico of this beetle is in August 1921, feeding on the foliage of the weed "bledo" or "blero", species of *Amaranthus*, in great abundance at Yauco and Guánica. At that time, during the cane grinding season, boats came at frequent intervals from La Romana, Dominican Republic, and it is possible that this is an introduced pest from Hispaniola, where it had been known because of its injuries to beets (at Haina, R. D., in 1920). By 1923 it had spread along the west coast to Mayagüez, where Mr. R. E. Danforth had recorded its abundance on "beets, chard, eggplant and many other vegetables", to Hatillo on the north coast, where the "yerba de sal" (*Philoxerus vermicularis*) on the beach was being eaten. Within a few years it was being intercepted on cucumbers at Bayamón, on beans and asparagus at Palo Seco, and on corn, peppers and cucumbers at Loíza, and on the weed "jamón con huevo" (*Achyranthes bettzickiana*). Dr. Stuart T. Danforth had specimens from Utuado, Juncos, Humacao and Ponce, indicating a dispersion to all parts of the Island. He found the remains of this beetle in the stomach contents of an ani at Cartagena Lagoon. It is also recorded as being eaten by the crested lizard, but is possibly too active to be often caught by the introduced toad. The enormous numbers noted resting

on pineapple at Arecibo presumably followed the elimination of "bledo" by weeding, comparable to a similar abundance on beans and sugar-cane at Guánica following weeding, and indeed all records on other than plants of the Chenopodiaceae and Amaranthaceae may be considered as accidental. Injuries to beets may not come at all, or may not develop until an abundance of foliage has formed, but instances have been noted of attack on the first tender leaves of seedlings just a few inches high. Such young seedlings must be mechanically protected with cold frames or wire screens, if they are to get a start in a region where, or at a time when these beetles are numerous. It is possible that DDT sprayed on the soil surrounding may kill the beetles attacking very small plants, but this has not been tested in the field.

Lactica megaspila was described by Mrs. Doris H. Blake as one of "Seven New Flea Beetles from the West Indies (Coleoptera-Chrysomelidae)" (*Psyche*, 55 (3): 141-149, pl. 1. Cambridge, September 1948) from collections made by Mr. Carlos M. Matos at Villalba in June 1934. It is 3.1 mm. long, 1.6 mm. wide, "oblong ovate, shining, yellow brown, antennae with the outer joints dark, elytra with four large dark spots having a greenish lustre, two at base and the other two at the apex of the elytra."

Altica jamaicensis F., one of the largest and most abundant of flea beetles in Puerto Rico, is iridescent dark blue in color, all stages of which, except the pupal, one may expect to see on plants of the various species of *Jussiaea*. Correctly listed by Weise, with *Haltica plebeja* Olivier in synonymy, Dr. Gundlach uses Olivier's name, and notes that the beetles are "común en Cuba". Dr. Richard T. Cotton, in reporting on the "Life-History of *Haltica jamaicensis* Fabr." (*Jour. Dept. Agr. P. R.*, 1 (3): 173-5. San Juan, July 1917), notes that the adults may also survive feeding on the foliage of garden beans; the females lay from 500 to 800 eggs on the leaves of the host plant, pupae are formed in the ground, and the total period from egg to adult is 39 days. The killdeer, tody and cliff swallow were noted by Dr. Alex. Wetmore to have fed on these beetles, and Dr. Stuart T. Danforth found them eaten by the golden warbler and the northern water thrush. They occur on the host plants wherever present, from near the coast to high on El Yunque, those living in the mountains being somewhat larger than those found at sea-level. Exceptionally, these beetles may be found feeding on the leaves of other than the normal host plants: dozens on crape myrtle (*Lagerstroemia indica*) at Río Piedras, several on "mangle" (*Laguncularia racemosa*) near Laguna San José, or resting on seagrape at Guanajibo Dam, on ñame or wild eggplant at Mayagüez.

Altica occidentalis Suffrian feeds on the foliage of all of the various species of *Jussiaea*, and is exactly the same color of iridescent blue as

A. jamaicensis, but is much smaller. From the very similar, yellow-legged *Luperodes antillarum* Blake, which is of the same size, it may be readily distinguished by its black legs. Listed by Weise and Drs. Stahl and Gundlach, it has most recently been attentively observed by Prof. James G. Needham, who, in studying the "Insects from the Seed Pods of the Primrose Willow, *Jussiaea angustifolia*" (Proc. Ent. Soc. Washington, 43 (1): 2-6, fig. 6. Washington, D. C., January 1941), noted that the female "lays her eggs by twos and threes at the end of the pods". Mr. E. G. Smyth found the adults coming to light at Guánica, and they have also been found resting on leaves of sugar-cane there, as well as at Toa Baja and at Bayamón, and on Vieques Island. In September 1935, the tender leaves of a hedge of crape myrtle (*Lagerstroemia indica*) at Río Piedras, were attacked by these beetles, and some of *Luperodes antillarum* Blake, while a month later, when a fresh crop of new leaves was put forth, a few of *Altica jamaicensis* also appeared to share them with the smaller beetles.

Of *Altica rufa* Illiger, listed by Weise and Dr. Gundlach as *Lactica scutellaris* Olivier, Dr. Stuart T. Danforth had specimens, as determined by Mr. A. J. Mutchler, from Adjuntas, Villalba and Mayagüez. The adults are bright red in color, the females laying orange-colored eggs on the leaves of *Trema micrantha* at Indiera, in the mountains north of Yauco. These flea beetles are not confined to the mountains, however, as individuals have repeatedly been swept from weeds and grass at Río Piedras, and others have been collected on eggplant at Arecibo.

No specimen of the Cuban *Altica gravidula* Suffrian, listed by Weise, has been found in Puerto Rico since the original collection by Dr. Gundlach.

Mr. H. S. Barber has identified some beetles collected on coffee and banana at Ponce, and from the postoffice hedge of "café de la India" (*Chalcas* or *Murraea exotica*) in San Juan as being a species of *Altica* near *pupurascens* Suffrian, and others as *Altica liturata* Olivier. A small elongate blue-black beetle with purplish and greenish reflections, collected on Mona Island by Prof. J. A. Ramos, he considered to belong to a "genus near *Altica*, *Hermaeophaga* or *Syphrea*, probably new".

Dicoelotrachelus violaceus was described by Mrs. Doris Blake from Puerto Rico as one of "Six New Species of West Indian Chrysomelidae" (Proc. Ent. Soc. Washington, 50 (5): 121-7, pl. 1. Washington, D. C., May 1948), the type having been collected at Ponce by Mr. R. G. Oakley. It is "about 3.0 mm. in length, oblong, shining; antennae, head, thorax, scutellum and legs reddish or yellowish brown; elytra violaceous, undersurface brown; thorax with a deep transverse sulcus across the middle."

Glyptobregma cyanellum was described by Mrs. Doris Blake (1948-126) from types collected by Mr. R. G. Oakley on "bejuco de corrales" (*Seriania polyphylla*) in the mountains north of Ponce, and on the leaves of other

plants there and at Adjuntas. It is "from 2 to 3 mm. in length, broadly oblong oval, lustrous blue-violet or sometimes with a blue-green thorax; the antennae, lower part of face, legs and undersurface brownish or yellowish; thorax at the base about the same width as the elytra".

Glyptobregma portoricense, described by Mrs. Doris Blake as belonging to "A New Genus of Flea Beetles from the West Indies" (Jour. Washington Academy of Sciences, 37 (3): 92-95, fig. 5. Washington, D. C., March 15, 1947), is "about 3-4 mm. in length, oblong oval, pale yellow brown, the elytra tending to be a little darker, faintly shining, eyes very large, thorax irregularly and coarsely punctate, elytra semicostate between the partly geminate rows of punctures". Its enormous eyes nearly meet at the vertex. The type was intercepted by Mr. R. G. Oakley at Ponce on *Quercus thompsonii*, others on this host are from Orocovis, and collections have also been made at Bayamón, San Juan and Guánica, on other trees or with the host not recorded.

Pseudoepitrix hoffmani described by Mr. G. E. Bryant (Ann. & Mag. Nat. Hist., 20 (118): 446. London, 1927) for Dr. W. A. Hoffman of the School of Tropical Medicine, who collected the type material, has since been found at Mayagüez, Las Marías and Aguadilla. It is "elongate, light yellow brown, shining, about 2.0 mm. long, with rather prominent eyes", and "the groove behind the tubercles is an inverted V", according to Mrs. Blake (1941-175).

Millions of iridescent blue flea beetles about 3.0 mm. long, elytra very minutely punctured, were found resting on the leaves of an unidentified tree on a hill northeast of Guayama, January 23, 1922. Described by Mr. G. E. Bryant (Ann. & Mg. Nat. Hist., 13 (9): 302. London, 1924) as a species of *Haltica*, these are now known under the name of *Hermaeophaga cubana* Bryant, altho the type is from Puerto Rico, and, so far as is known, no additional specimen has been collected here or anywhere else.

Hermaeophaga cylindrica, described as a *Haltica* by Weise (1885-160) and thus listed by Dr. Gundlach, is a somewhat more slender, greenish iridescent flea beetle, repeatedly collected since on "yerba bellaca" (*Croton humilis*) and other wild crotons, often skeletonizing the leaves when they are abundant. It has been noted at Ponce, Yauco, Guánica, Mayagüez and Guajataca, and presumably it is this species which occurs on wild crotons on Mona Island.

Crepidodera asphaltina Suffrian, originally described from Cuba, was collected by Dr. Gundlach in Puerto Rico, and discussed by Weise. It has since been found on squash at Vega Baja, on pepper at Loíza, and Dr. Stuart T. Danforth had specimens from Barranquitas, as determined

by Mrs. Doris Blake. Presumably it was to specimens of this species to which Dr. Stahl applied the name *Crepidodera hirtipennis* Melsheimer.

Epitrix cucumeris Harris, "La Pulga Negra" of Puerto Rican tobacco growers, is the most common and troublesome of the flea beetles attacking tobacco. It also feeds on other Solanaceous plants, such as potatoes, tomato and eggplant, both cultivated and wild. After Dr. Richard T.

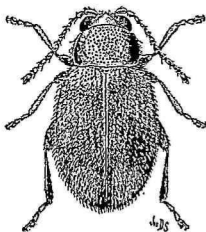


Flea Beetle Injury to Tobacco. (Drawn by Francisco Seín.)

Cotton had worked out its life-history (1916-87), publications by Mr. J. D. More on "Las Pulgas del Tabaco" (Circ. No. 50, Est. Expt. Insular, pp. 8, fig. 3. Río Piedras, October 1921), and by Mr. Luis A. Catoni on the "Plagas de Insectos que atacan la Planta del Tabaco" (Revista Agr. P. R., 7 (5): 45-50. San Juan, 1921) discussed the economic aspects of its presence, and methods of control. Since the advent of DDT as an

insecticide, these have been revised, at least for protecting the younger plants. Indeed, since DDT is less poisonous to human beings than arsenate of lead, its use even on the maturing leaves is to be recommended. Dr. Gundlach and Weise gave only the name *Epitrix fuscata* DuVal for this little black flea beetle, over which Harris' name has the priority, regardless of its being so inappropriate for a pest which in Puerto Rico attacks only Solanaceous plants. Most local records are from the interior of the Island, where tobacco is most extensively grown, but it occurs everywhere, and is recorded from Ponce as well as at Jácome Alto, where it was almost the only insect present on potatoes.

Epitrix fasciata Blatchley is the presently accepted name for the brown tobacco flea beetle of Puerto Rico, which in all previous records is called *Epitrix parvula* Fabricius. As such it is listed by Weise and Dr. Gundlach,



The brown Tobacco Flea Beetle, *Epitrix fasciata* Blatchley, twenty times natural size. (After Morgan & Gilmore.)

mentioned by Dr. Alex. Wetmore as having been eaten by the cliff swallow and by Dr. Stuart T. Danforth as eaten by the northern parula warbler, as well as by Dr. Charles E. Gage in "The Tobacco Industry in Puerto Rico" (Circ. No. 519, U. S. Dept. Agr., pp. 54, fig. 18, ref. 11. Washington, D. C., March 1939), quoting the references by Mr. R. H. Van Zwaluwenburg, Mr. G. B. Merrill at Aibonito, and Dr. Richard T. Cotton. It is a somewhat less abundant species than the black tobacco flea beetle, and is less specialized in its hosts, sometimes being noted in abundance on the leaves of sugar-cane, but not eating them, and Dr. Cotton found it "on *Cleome spinosa*, *Leptilon canadense*, *Lycopersicon esculentum*, *Solanum nigrum*, *Solanum torvum*, tomato and eggplant", and it is recorded from *Physalis angulata* and potato.

Very few Puerto Rican tobacco growers have departed from their accustomed practise of using arsenate of lead or Paris green for the control

of all insects attacking the leaves of tobacco, despite the fact that many new and more desirable insecticides are now available. To date, no experiments have been conducted locally to test even DDT. In consequence, no recommendations can be made as to the effectiveness of this, lindane, the Hyman products and many others, despite the presumption in their favor. The same or similar flea beetles on potatoes in the States, and the common potato beetles and leafhoppers are ever so much more effectively controlled by DDT and the other new insecticides that average yields have almost doubled. The same effect is hardly to be expected in Puerto Rico on tobacco, but the cost of control might be considerably decreased if more effective insecticides were generally used.

Heikertingerella krugi, which Weise (1885-163) described as a *Homophyla*, is "ovali-hemosphaerica, testacea, nitida, pectore femoribusque posticis brunneis, prothorace elitrisque parce subtilissimeque punctulatis, fere laevibus, long 2. mm.". Dr. Stuart T. Danforth had specimens, as determined by Mrs. Doris Blake, from Matrullas, Villalba and Aibonito, but it is not confined to the mountains, for Prof. J. A. Ramos collected it at Mayagüez and San Germán, as did Mr. R. G. Oakley at Ponce.

Podagrica cyanipennis Weise, as determined by Mr. H. S. Barber, was intercepted on *Volkameria aculeata* at Ponce by Mr. R. G. Oakley. This was described by Weise (1885-165) from the nearby island of St. Thomas as "ovata, convexa, rufa, nitida, antennis infuscatis, elytris laete cyaneis, minus subtiliter punctulatis, ponehumeros transversim impressis, long 4. mm."

Chaetocnema apricaria Suffrian is an exclusively Cuban species, according to Mrs. Doris Blake, who, in describing "New Species of *Chaetocnema* and other Chrysomelids (Coleoptera) from the West Indies" (Proc. Ent. Soc. Washington, 43 (8): 171-180, pl. 1. Washington, D. C., November 29, 1941), attempts to "straighten out the identity of the species of the *Chaetocnema* in the West Indies that in the past have been labeled indiscriminately as *C. apricaria* (Suffrian)". Listed as a *Plectroscelis* by Weise, and by Drs. Gundlach and Stahl, the Puerto Rican material is divided by her among four distinct species.

Chaetocnema brunnescens Horn, collected originally at Key West, Florida, by Dr. E. A. Schwarz, presumably on mangrove, is primarily a West Indian species, found in the Bahamas, and along the coast of Hispaniola, Puerto Rico and St. Thomas. The brownish curved slits so often noted on the underside of the leaves of mangrove (*Rhizophora mangle*) are due to the activities of this species, definitely recorded from Laguna San José, Martín Peña, Dorado and Mayagüez, and by Dr. W. A. Hoffman on Santiago Island at Humacao Playa. Similar injury to "rosa de ciénaga"

(*Ginoria rohrii*) was observed at Boquerón in May 1923, when the adults were present in great abundance, and noticeably not very active in jumping away when disturbed. At the time, Dr. E. A. Schwarz was of the opinion that this beetle was not responsible for the injury, and that it did not feed on the plants on which it was found. Mrs. Blake definitely identifies it as the same species which he collected at Key West: "paler brown; a greenish metallic lustre and a conspicuously punctate head, larger and more elongate than the other West Indian species".

Chaetocnema elachia, "a much smaller species, very tiny, with a very much more finely punctate thorax", is described by Mrs. Blake as "oblong oval, about 1.5 mm. long, shining deep brownish black, with legs (except the dark hind femora) and antenna paler, elytra not depressed" from material collected by Mr. August Busck on Vieques Island in February 1899. It is also recorded from Río Piedras, collected by Mr. Thos. H. Jones on wild morning glory, and to this species may possibly be referred those fleabeetles sometimes found in almost destructive abundance on the leaves of sweet potato.

Chaetocnema perplexa Blake, is also often taken on *Convolvulus* elsewhere than in Puerto Rico, and occurs in Bermuda, Cuba and Hispaniola, the only specimen of this *confinis* group, as identified by her, from Puerto Rico being one intercepted by Mr. R. G. Oakley at Ponce on tomato leaf.

Chaetocnema laticeps Blake, of which the type is from Trou Caiman, Haiti, has been collected at Guánica Lagoon. It has an "unusually broad head and wide interocular spaces, as well as punctate upper and lower surface," according to Mrs. Blake.

Chaetocnema nana Jacoby, as determined by Mr. G. E. Bryant, was found in great abundance on grass growing in salty land near Salinas in August 1921.

As to all the other records from Puerto Rico: on squash at Guaynabo, on cassava at Loíza, on tomato at Jayuya, on *Guilandina crista* and *Scirpus validus* at Ponce, on *Volkameria aculeata* at Boquerón, of being eaten by the lizard, *Anolis krugii*, and Dr. Wetmore's records of being eaten by the ani, the yellow and parula warblers, only re-examination of material will indicate to which species of *Chaetocnema* each should be assigned.

Blepharida irrorata Chevrolat, listed by Weise and Dr. Gundlach, has since been collected on *Matayba* at Ponce by Mr. R. G. Oakley.

Omophoita albicollis Fabricius, a very active brown fleabeetle, with bright yellow pronotum and five yellow spots on each shining brown elytron, is probably what Weise and Dr. Gundlach list as *Oedionychis 10-guttata* Fabricius. Dr. Stahl gives the name *Oedionychis aequinoctialis* F., Dr. E. A. Schwarz identified specimens as *Homophoeta aequinoctialis* Fbr., and Mr. C. A. Frost as *H. equinoctialis* L. The specimens from

Belém do Pará, Brasil, identified by Mr. G. E. Bryant as *Homophoeta aequinoctialis* L., and those from British Guiana have the central yellow spot on the elytra oval; on all those from Vieques Island and Puerto Rico it is a narrow transverse band: an obvious difference between two similar species with similar continental distribution, of which *albicollis* only occurs in the West Indies. Wild heliotrope (*Heliotropium* or *Tiaridium indicum*) was found heavily infested by these beetles at Caguas by Dr. Richard T. Cotton, and Mr. F. Seín noted the same host being eaten at Boquerón. As this is a common weed in cultivated land, records of the beetles resting on sugar-cane and other plants at many localities in various parts of the Island are to be expected.

Omophoita cyanipennis Fabricius is very striking in appearance because of its dark iridescent blue elytra, most of the rest of the beetle, including its greatly enlarged hind femora being yellow in color. It occurs in all the Greater Antilles, and in St. Thomas and St. Croix, but has not been found on Vieques, Culebra or Mona. Listed as an *Oedionychis* by Weise and Dr. Gundlach and Dr. Stahl, the habits of the female have recently been noted by Prof. James G. Needham (1941-5) as she "lays her eggs in clusters of a dozen or more on the underside of the leaves" of the primrose willow, *Jussiaea angustifolia*. Adults have also been found on other species of *Jussiaea*, but Mr. E. G. Smyth considered them "general feeders, on *Verbesina*, *Valerianodes*, *Pluchea*, *Physalis* and other plants". Repeatedly noted resting on leaves of sugar-cane, they were in such abundance on the leaves of mangrove at Laguna San José near Río Piedras, and on *Volkameria aculeata* at Boquerón as possibly to indicate these latter as true host plants.

Oedionychus bicolor Linnaeus, superficially similar in general appearance to *Omophoita cyanipennis*, is somewhat shorter, its elytra are a lighter and somewhat greenish blue, as are also its distended hind femora. According to Mrs. Blake (1940-173), "it occurs in Puerto Rico, and the Virgin Islands (St. John, St. Thomas, St. Croix, Virgin Gorda)", the records from Cuba and Hispaniola referring to other species. The French Botanist Ledru (1780) refers to this beetle in Puerto Rico under the generic name of *Altica*, and Weise and Dr. Gundlach as an *Oedionychis*. In March 1923, it was found in great abundance at Pt. Salinas (between Palo Seco and Toa Baja) on *Volkameria aculeata*, the other records being on unidentified hosts at Laguna San José and at Dorado. Its very limited distribution in Puerto Rico, practically confined to the San Juan area, has been modified by a single record at Ponce by R. G. Oakley, and others at Guánica by Prof. J. A. Ramos.

Oedionychis decemguttata Fabricius, listed by Weise and Dr. Gundlach,

has not since been found in Puerto Rico, and it may be presumed that their record refers to *Omophoita albicollis* Fabricius.

Hadropoda morrisoni, the most abundant of the seven "New Species of *Hadropoda* Suffrian from the West Indies" (Bull. Mas. Comp. Zoölogy, 92 (8): 413-41, pl. 4. Cambridge, August 1943) described by Mrs. Doris Blake from Puerto Rico, is presumably what Dr. Gundlach listed under the name *Hadropoda ferruginea* Suffrian. The type is from Maricao, and altho most collections have been made in the mountains, at Adjuntas, Corozal, Cidra, and at Indiera in the mountains above Yauco, Mr. A. S. Mills found individuals on the coast at Loíza Aldea. These beetles were so abundant in the summer of 1941 at Aguas Buenas as to completely destroy rose bushes, but this is the only host record. They are "about 2 mm. in length, oblong oval, faintly shining under the fine, closely appressed, pale pubescence, pale yellow brown with two apical joints of the antennae and a median elytral spot, dark brown".

Hadropoda barberi Blake (1943-440) is a short, plump species, 2 mm. long, with oval elytra, wingless, the type from Villalba and others from Adjuntas on areca "palm" (*Areca catechu*), collected by Mr. R. G. Oakley.

Hadropoda eugeniae Blake (1943-422) is exceptionally large, 4.5 mm. long, with raised spots on the elytra like warts, and a "dense curling pubescence", the type collected by Mr. R. G. Oakley on "pomarrosa" (*Eugenia jambos*) at Indiera in the mountains above Yauco.

Hadropoda rugosa Blake (1943-427), the type from El Yunque, collected by Dr. P. J. Darlington, is 3.5 mm. long and has fewer pronounced warts.

Hadropoda oakleyi Blake (1943-422) is named for the "interceptor" of the type. It is "between 2 and 3 mm. in length, finely pubescent, pale yellow brown, with numerous dark elytral spots". It was collected on "pomarrosa" (*Eugenia jambos*) at the Natale finca in the mountains above Yauco.

Hadropoda tabebuiae Blake (1943-437), 3 to 4 mm. long, of which most specimens were from coffee groves near Adjuntas or on "roble" (*Tabebuia pallida*) in the mountains above Ponce, is of very variable depth of coloration, "some being nearly piceous, while others are pale, some have a dark thorax and pale elytra, while others have a pale thorax and dark elytra. The dense golden pubescence is particularly noticeable in dark specimens".

Hadropoda varicornis Blake (1943-423), 2.7 mm. long, has "spotted elytra combined with varicolored antennae". The type was collected by Mr. R. G. Oakley on *Ocotea* at the Torres finca, in the mountains above Ponce.

Ochthispa loricata, described by Weise (1885-166) from specimens collected by Dr. Gundlach, presumably at Mayagüez, is an elongate, reddish-brown Chrysomelid with the outer humeral and apical angles of its quad-

rangular elytra expanded into prominent horns. Adults "were very common near Macuto, Venezuela, feeding on sea-grape leaves", as reported in "Notes on the Insects of the Sea-Grape, *Coccoloba wifera* (L.) Jacq., in Porto Rico" (Jour. Ent. Research, 17 (1): 49-52, ref. 6. London, July 1926), but only recently have they again been found in Puerto Rico: at Mayagüez by Dr. H. L. Dozier, and by Mr. L. Courtney Fife, in 1935.

The specific name of *Hilarocassis exclamatoris* Linnaeus is suggested by the narrow, interrupted black band on the disc of each elytron of this large, straw-colored tortoise beetle: the largest occurring in Puerto Rico. As a *Mesomphalia* it is listed by Weise and Dr. Gundlach, but in recent years it has been excessively rare. Dr. Alex. Wetmore found it in the stomach contents of a cuckoo, but it is not again recorded until an outbreak occurred in the summer of 1936 at Ponce, which was so noticeable that photographs of the insect were reproduced in "El Imparcial". Most of the adults collected at this time were resting on "higuereta" (*Ricinus communis*) and presumably this is the host, but no larvae were seen. For over a year thereafter, scattered adults were to be found in cane fields: at Guánica, Aguadilla and Manatí.

The type of *Aedmon sericellum*, described by Mr. Hamlet Clark in his "Catalogue of the Halticidae in the Collection of the British Museum" (p. 131. London, 1860), is from Puerto Rico. No specimen to which this name might be assigned has since been collected.

A single specimen of a small brown Chrysomelid found on swamp vegetation at Boquerón in May 1923 was determined by Mr. G. E. Bryant as *Hypolampsis inornata* Jacoby, a Mexican species not elsewhere known. Additional specimens of this genus, identified by Mr. H. S. Barber, as "near" this species, have subsequently been found by Mr. R. G. Oakley on a variety of hosts in southwestern Puerto Rico, and by Prof. J. A. Ramos at Adjuntas and Maricao.

Megistops fictor, described by Weise (1885-162) from specimens collected by Dr. Gundlach in Puerto Rico, is another small brown beetle, "long 3 mm., brunneus, elytris subtilissime granulato-punctatis, macula basali lineolisque 3 ante apice dilute luridis". Mr. R. G. Oakley has since found this beetle on "roble" (*Tabebuia pallida*) at Guánica.

Megistops liturata Olivier, as determined by Mr. H. S. Barber, was collected by Mr. R. G. Oakley on *Scirpus validus* and *Tabebuia pallida* at Ponce. It is probably this Hispaniolan species which Dr. Luis F. Martorell found on "cupey" (*Clusia rosea*) on Mona Island.

From *Mayepea dominicensis* at Guánica, Mr. R. G. Oakley intercepted beetles identified by Mr. H. S. Barber as a species of *Argopistes*.

Chalepus sanguinicollis Linnaeus is a slender, elongate, blue-black beetle, 7-8 mm. long, with the base of elytra and pronotum red, found in Argentina

and Brasil, as well as in Cuba, Hispaniola, Puerto Rico, Vieques, St. Thomas, St. Croix and Grenada. It is listed by Weise and by Drs. Stahl and Gundlach as *Odontota axillaris* Duv., and numerous individuals have since been collected resting on a wide variety of plants in all the more humid parts of the Island. Prof. J. A. Ramos has most recently found it on Mona Island.

Chelymorpha multipunctata Olivier, listed by Weise and Dr. Gundlach and identified by Dr. E. A. Schwarz as *Chelymorpha polysticha* Boheman, is the more common of the oblong-oval, convex, brick red tortoise beetles of this genus which occurs in Puerto Rico. It has an abundance of black spots on the elytra, arranged quite regularly in rows on the disc, but tending to break up into groups of black punctures along the lateral margins. It is apparently not so common as formerly, for Mr. August Busck collected numerous specimens at Fajardo in February 1899. Two specimens were recently noted resting on sugar-cane: at Juncos and at Loíza; Dr. Richard T. Cotton found it on egg-plant at Juncos; Mr. Thos. H. Jones one on wild morning glory at Río Piedras; Prof. J. A. Ramos one at Mayagüez; and Dr. Stuart T. Danforth had one from Barros and found another eaten by the oriole at Cartagena Lagoon.

What is now listed as subspecies *geniculata* Boheman of *Chelymorpha cassidea* Fabricius was considered a valid species by Weise. Listed by Dr. Gundlach, it is not at all common, altho Dr. Richard T. Cotton (1918-308) mentioned it as a pest of sweet potatoes. It has fewer spots on the elytra and more on the pronotum.

Deloyala guttata Olivier, listed by Weise and Drs. Stahl and Gundlach as a *Coptocycla*, is a tortoise beetle which when alive is bright golden in color, broadly oval, subdepressed, with the margins of its thorax and elytra broadly expanded, very thin and transparent, the humeral angles black. It is often found on wild morning glory, and more rarely on sweet potato vines. Dr. Alex. Wetmore noted it as eaten by the ani, kingbird, cliff swallow, mockingbird, yellow-shouldered blackbird, oriole and grasshopper sparrow, and Dr. Stuart T. Danforth found it eaten by the semipalmated sandpiper at Cartagena Lagoon. As *Coptocycla signifera* Herbst it was listed by Mr. Thos. H. Jones (1916-6) as a pest of sweet potato, and by Dr. R. T. Cotton (1918-307), the latter noting that "the peculiar-shaped, yellowish larvae also feed on the leaves, but do not cause nearly as much damage as do the adults". This tortoise beetle occurs in all the Greater Antilles, the United States, Central America and Brasil, and in Puerto Rico has been collected at Ponce, Yauco and Boquerón, as well as in the more humid regions of both coast and mountains. In October and November of 1939, these beetles were noted in great abundance on sugar-cane at Guánica, the adults having been forced to migrate from small vines of

morning glory when these were weeded from the cane fields and their margins.

Four species of *Metriona* are listed from Puerto Rico, the type of that which C. H. Boheman in his "Monographia Cassididarum" (3: 333. 1865) describes as *Coptocycla glaucina* being from the Island, altho this is not listed by Weise, who gives only *Coptocycla bisbinotata* Boheman.

Metriona quadrisignata Boheman, as identified by Mr. H. S. Barber, of specimens collected at Ponce, is also represented in the Stuart T. Danforth collection by specimens from Aibonito. Prof. A. J. Ramos made collections in the Maricao and Guánica Forests; those from the mountains, when alive, being singularly beautiful, looking like pieces of gold against the dark green vegetation.

The Cuban and Hispaniolan species *Metriona subsignata* Boheman is listed from Puerto Rico, but is represented by no recent collection. Indeed, the only tortoise beetles recently noted to which this name may refer were found in great abundance on wild morning glory and on sweet potato foliage by Prof. J. A. Ramos at Mayagüez in July 1943. They had two golden stripes on the black background of each elytron, and seem identical with others from Haina, Dominican Republic, which Dr. E. A. Schwarz had identified as *Metriona propinqua* Boheman.

Bruchidae (Mylabridae): Bean and Pea Weevils

The bean and pea weevils do not have the pronounced beak of the true weevils, but are short little thick-bodied beetles with the tip of the abdomen not covered by their short elytra. The females of many species lay individual eggs in the immature bean or pea, the larva develops inside, often emerging as an adult in a country far distant from that in which it originated. Others are able to oviposit in dried legumes in storage, and several generations may develop before the infested beans are discarded as valueless for human consumption. Thus the records of occurrence of several of the economic species in Puerto Rico may refer to finding them in dried beans or peas actually present in Puerto Rico at the time of the collection of the specimens, but which had been grown and become infested in the United States, Spain or Venezuela. After the infestation of the dried legumes becomes apparent in Puerto Rico is too late to prevent or avoid injury.

Bruchus pisorum Linnaeus, the cosmopolitan pea weevil, may, or may not attack peas here, but adults have been repeatedly been collected here, their host being dried peas from other countries. Usually but a single grub develops in one pea, and the species can not reproduce in dry peas.

The single record of the broad bean weevil, *Bruchus rufinanus* Boheman,

as determined Mr. E. G. Smyth, is of being reared in Puerto Rico from broad beans from Spain.

Acanthoscelides amicus Horn, found in Texas, Arizona and lower California infesting the seeds of the screw bean or tornillo, is reported from Puerto Rico.

Acanthoscelides centrimaculatus Allard, is recorded by Dr. Gundlach from Puerto Rico under the name *Bruchus cinerifer* Chevrolat, with the note: "Tambien se encuentra en la flor del Júcaro (*Terminalia*) en la Ciénaga de Zapata en Cuba". No specimen has since been collected here which can be referred to this, the only Bruchid mentioned by Dr. Gundlach.

The record of *Acanthoscelides livens* Suffrian is based on a doubtful determination by Dr. E. A. Schwarz of a single reddish-brown Bruchid collected from the arrows of sugar-cane at Río Piedras.

Acanthoscelides dominicanus Jekel, originally determined as a *Bruchus* by Mr. G. E. Bryant, and subsequently re-determined by Messrs. H. S. Barber and A. J. Mutehler, has repeatedly been reared from the pods of "aroma" (*Acacia* or *Vachellia farnesiana*) and of mesquite or "bayahonda" (*Prosopis* or *Neltuma juliflora*), at Guánica and Boquerón, in the southwestern corner of the Island. From "yerba de San Martín" (*Savagesia erecta*) growing in the Guánica Forest, Prof. J. A. Ramos has reared these weevils. The adult is an elongate, light brown beetle, with a group of irregular darker spots on the disc of the elytra so short as to leave exposed almost a third of the abdomen.

Acanthoscelides obtectus Say, the cosmopolitan bean weevil, has been repeatedly reared from dry beans imported from the United States and from Venezuela. Possibly it is a permanent resident, for we have one record of its occurrence in white beans grown locally, but none in red beans. After the primary infestation in the field, succeeding generations of females are able to oviposit in dry beans held in storage, so that eventually all beans are completely destroyed.

Acanthoscelides ochraceicolor Pic, as determined by Mr. H. S. Barber, was found by Mr. R. G. Oakley in the flowers of "guácima" (*Guazuma ulmifolia*) at Ponce.

Mr. J. C. Bridwell identified as "close to *prosopis* LeConte" the *Acanthoscelides* weevils which Mr. D. L. Van Dine reared from pods of "algarrobo" (*Hymenaea courbaril*) at Río Piedras in April 1911. Similarly somewhat doubtful is the identification by Mr. H. S. Barber of *Acanthoscelides podagricus* F. for the weevils which Prof. A. J. Ramos reared from pods of *Ichthyomethia piscipula* at Faro de Cabo Rojo.

Acanthoscelides SALLAEI Sharp was identified by Mr. H. S. Barber for weevils collected by Mr. R. G. Oakley at Ponce, but others from southwestern Puerto Rico he thought to be only "near" this species.

Acanthoscelides xanthopus Suffrian, a Cuban Bruchid, was identified by Mr. H. S. Barber from Puerto Rican material: collections at Mayagüez by Prof. J. A. Ramos and at Guánica by Mr. R. G. Oakley. Other Bruchids collected at Ponce on flowers of *Randia mitis*, and of *Peirania polyphylla*, are "near" this species.

Callosobruchus chinensis Linnaeus, a cosmopolitan cowpea weevil, has often been reared in Puerto Rico from cowpeas originating elsewhere, but it may indeed be established here, as it has once been reared from dry pigeon peas at Río Piedras by Mr. A. S. Mills.

The southern cowpea weevil, *Callosobruchus maculatus* Fabricius, as determined by Mr. H. S. Barber, has been collected on moca at Ponce, on avocado at Utuado and at San Juan. The variety *barbicornis* Fabricius is listed by Leng & Mutchler. This cosmopolitan species, commonly referred to under the synonym of *Mylabris quadrimaculatus* Fabricius, the four-spotted bean weevil, has several times been found destroying cowpeas imported from the States, and once has been collected from infested dry peas from Georgia.

Mr. J. C. Bridwell names "A New *Amblycerus* affecting Seeds of *Prosopis chilensis* in Puerto Rico and Hispaniola" (Jour. Agr. Univ. P. R., 27 (3): 133-5. Río Piedras, September 11, 1944) *martorelli*, after Dr. Luis F. Martorell, who reared the type material from seed-pods of *Neltuma juliflora* at Guánica. This is a reddish-brown beetle, from 5 to 6.5 mm. long, "uniformly yellowish cinereous above and pale beneath", which is also found in Hispaniola, where it was reared from the same host, mesquite or "bayahonda".

Zabrotes subfasciatus Boheman (= *Spermophagus pectoralis* Sharp), the Mexican bean weevil, another cosmopolitan Bruchid, has been reared from beans and peas from the States and from Venezuela. Because of its temporary abundance from outside sources, it may come to light in large numbers, or be found in the stomachs of birds, as it is reported by Dr. Alex. Wetmore as eaten by the flycatcher, wood pewee and parula warbler.

Caryobruchus giganteus Chevrolat, as a *Pachymerus*, is listed from Puerto Rico by Leng & Mutchler.

Anthribidae: Fungus Weevils

Homocloeus conspersus, described by Herr P. Wolfrum in his short paper "Ueber Anthribiden von Cuba" (D. E. Z., 1930, pp. 25-32) from Puerto Rican material, is presumably the same species as that repeatedly intercepted by Mr. R. G. Oakley: on moca at Ponce, on coffee at Adjuntas and on guava at Aibonito. Unfortunately, none of the specimens in this family collected by Mr. Oakley in Puerto Rico, and identified only to genus by Mr. L. L. Buchanan, was available to Herr Wolfrum for description.

On dead wood at Indiera, in the mountains north of Yauco, Mr. Oakley found a new species of *Gymnognathus*, and a new species of *Neanthribus* on pomarrosa in the mountains north of Ponce.

Ormiscus micula Jordan, described from Grenada, and present also in St. Vincent, is the only named species of this genus present in the West Indies. Numerous specimens of *Ormiscus* have been collected in Puerto Rico, however, Dr. Stuart T. Danforth having them from Tortuguero Lagoon and from Coamo. At least two distinct species were intercepted by Mr. Oakley in the Ponce region: found resting on trees or rotten wood, or on the flowers of *Inga laurina* in the mountains above Yauco.

Brachytarsus sp. was the determination given by Dr. E. A. Schwarz to some small spotted Anthribid beetles found at Boquerón in 1923 in pods of "aroma" (*Acacia farnesiana*), but not since noted.

Euxenus anthocerooides Wolfrum (1930-31) is known only from the type from Puerto Rico.

Brentidae: Primitive Weevils

Paratrachelizus linearis Suffrian, described originally from Cuba, was found both there and in Puerto Rico by Dr. Gundlach "debajo cortezas". It is typical in appearance of these extremely elongate Brentid or Brenthid weevils, but has a short head behind the eyes, and an entirely smooth but dull, dark reddish-brown body, without markings.

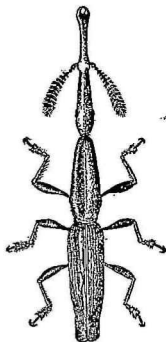
Stereodermus exilis Suffrian, described originally from Cuba, is the only species of this genus recorded from any of the West Indies. *Stereodermus* species is the determination by Mr. L. L. Buchanan of the specimen intercepted by Mr. Stuart D. Whitlock at Mayagüez on decaying wood.

Belopherus maculatus Olivier is found in the larger of the Greater Antilles, being listed by Dr. Gundlach from Puerto Rico as *Belophorus militaris* Olivier "debajo de la corteza muerta". It is usually not more than an inch long, mostly shining dark brown in color, with lighter yellowish eyes and elongate spots on its deeply striate elytra, the outer posterior angles of which are produced in sharply pointed horns. All records are of occurrence in the mountains, under the dead bark of trees, or resting on the trunks of trees or mountain palms.

Brentus volvulus Fabricius varies greatly in size, some individuals being scarcely an inch long, while others are twice as long. Its deeply striate elytra are marked with four elongate yellowish spots, often tending to become confluent, but normally sharply separated. It occurs along the coast of Puerto Rico, as well as in the lower mountains, not only under dead bark of trees and on their trunks, but also on corn and cotton, a pair having been found on grapefruit blossoms at Mayagüez. At the highest

elevations, these elongate beetles have been found on coffee leaves and in virgin forest.

Brentus vulneratus Gyllenhal, listed in 1780 by the Botanist Ledru from Puerto Rico as *Brentus nasutus* F., and subsequently by Drs. Stahl and Gundlach as *Brentus turbatus* Boheman, occurs also in Mexico and Central America, as well as in others of the Greater Antilles. No recent collection from Puerto Rico is recorded, but possibly those individuals with concavely outwardly distended posterior margins of the elytra may be assigned to this species, those with normally curved and neatly tucked-in elytra being *Brentus volvulus*. Most of these large beetles are heavily



Brentus volvulus F., twice natural size. (Drawn by F. Maximilien.)

infested with the nymphs of Uropodid mites: a strange choice it would seem, if the mites are expecting rapid transportation, for their hosts are decidedly slow-moving, at least in the daytime. Nothing is known of the immature stages of these beetles, and we can merely presume that the larvae are borers in rotten wood.

Scolytidae: Bark & Timber Beetles

Hypothenemus eruditus Westwood, as identified by Dr. M. W. Blackman, was collected by Dr. Donald De Leon at Camp Doña Juana, Villalba, in a small dead pole of "maricao" (*Byrsonima spicata*), and in dead twigs of "masa" (*Tetragastris balsamifera*) at Ciales.

Hypothenemus of a species near *parvus* Hopkins, as determined by Dr.

M. W. Blackman, has entirely different habits, adults having been intercepted in orange fruits at Ponce and Mayagüez, in fruit of "maga" (*Montezuma speciosissima*) at Vega Alta, in dry tobacco at Loíza and in dry pigeon peas at San Juan. Dr. Hopkins described *parrvus* from females 1.0 mm. in length collected by Dr. E. A. Schwarz at Cayamas, Cuba "from old cotton bolls."

Stephanoderes brasiliensis Hopkins, as determined by Dr. M. W. Blackman, was reared by Dr. Donald De Leon from larvae in the stems of *Derris elliptica* being grown at Río Piedras: a possible clue as to how an insect described from Pernambuco, Brazil should be found in Puerto Rico. In fact, however, this species had been definitely identified by Dr. Blackman several years before its collection by Dr. De Leon, but after the introduction in 1930 of the host material: from adults intercepted in decayed flower-stalks of banana at Bayamón, from orange fruit at Ponce, from almendra fruit at San Germán, from dry guava fruit at Corozal, from grapefruit at Bayamón. The most recent identification, as "near," is of material collected by Dr. W. A. Hoffman from dead branches of flamboyán (*Delonix regia*) in the patio of the School of Tropical Medicine.

Stephanoderes near *brunnea* Hopkins was the identification by Dr. M. W. Blackman of beetles intercepted by Mr. R. G. Oakley in mangrove seed balls at Ponce. Dr. Hopkins described *brunnea* from females 1.35 mm. long, collected at Brownsville, Texas by Mr. H. S. Barber, "body stout, dark brown, shining."

Stephanoderes buscki Hopkins, as determined by Dr. M. W. Blackman, has been repeatedly intercepted in pods of "algarrobo" (*Hymenaea courbaril*), at San Juan, Arecibo and Ponce; in tamarind (*Tamarindus indica*) pods from San Juan and Ponce, and in mummied guava fruit at Peñuelas. The type of *buscki* was collected by Mr. August Busck in Trinidad, B. W. I.

Stephanoderes georgiae Hopkins was found in the same mummied guava fruit from Peñuelas, associated with *S. buscki*. The type of *georgiae* is from the State of Georgia, U. S. A.

Stephanoderes near *ferruginea* Hopkins was the determination by Dr. M. W. Blackman of beetles found by Dr. Luis F. Martorell infesting the dried seed pods of "emajaguilla" (*Thespesia populnea*) along the road from Guayanilla to Ponce.

Stephanoderes "near, but not *hampeii* Ferrari" was the determination by Dr. M. W. Blackman of beetles reared from mummied or cull *excelsa* coffee berries from Lares in 1941. Mr. Francisco Seín found no larvae in green berries of *excelsa*, or in those of which pulp surrounded the beans, but only in the mummied fruit, and none in any kind of berries of *arabica* coffee, even those which were mummied on trees in the same grove as the *excelsa*

trees. Search for other *excelsa* trees in Puerto Rico indicated that the mummied fruits from these scattered trees were also infested, and that the beetle had not previously been noted because the few trees at Lares were the first to yield enough berries to be commercially processed.

Stephanoderes near *guatemalensis* Hopkins was the identification by Dr. M. W. Blackman of beetles intercepted at Arecibo in decaying papaya fruit. The type of *guatemalensis* was from cacao fruit.

Stephanoderes opacifrons was described by Dr. A. D. Hopkins in his "Classification of the Cryphalinae, with Descriptions of new Genera and Species" (Report No. 99, Office of the Secretary, U.S.D.A., pp. 1-75, pl. 4. Washington, D. C., 1915) from females 1.1 mm. long, dark brown, opaque, collected by Mr. August Buseck in January 1899 at Aguadilla, Puerto Rico. No specimen identified as this species has since been found in Puerto Rico.

Stephanoderes near *texanus* Hopkins was the identification by Dr. M. W. Blackman of beetles intercepted on citron at Palo Seco.

Stephanoderes trinitatis Hopkins, as identified by Dr. M. W. Blackman, was collected by Dr. Donald De Leon from a dead twig of "guaraguao" (*Guarea trichilioides*) at Patillas, associated with another species of *Stephanoderes* which could not be identified. The type of *trinitatis* was collected by Mr. August Buseck at Monteserrat, Trinidad, B. W. I., with no host indicated.

Additional species of *Stephanoderes* doubtless occur in Puerto Rico, for Dr. Hopkins did not assign a name to those collected from dying twigs of Australian silver oak (*Grevillea robusta*), nor have many intercepted since been identified. The lizards *Anolis pulchellus*, *Anolis stratulus* and *Anolis cristatellus* eat these beetles in considerable numbers, but seldom many at any one time. They also eat considerable numbers of similar small beetles of the genus *Xyleborus*, which are often twice as large or larger than *Stephanoderes*. The *Xyleborus* beetles are a considerable item in the food of the cliff swallow, as noted by both Dr. Alex. Wetmore and by Dr. Stuart T. Danforth. The barn swallow and the spotted sandpiper were found by Dr. Danforth to eat *Xyleborus* beetles, and Dr. Wetmore found them in the stomach contents of the parula and yellow warblers, and of the honey creeper.

Xyleborus affinis Eichhoff is possibly the most abundant species of the shot-hole borer beetles, and has an extremely wide distribution, being found from as far north as New Jersey in the United States "in oak stumps," in most of the countries of Central America, in many of the West Indies and especially in all of the Lesser Antilles where sugarcane is grown, to tropical South America, including Argentina. Dr. Hopkins notes in his description (1915-64) of *Xyleborus sacchari* from St. Vincent that "this is at once distinguished from specimens identified by Eichhoff as *X. affinis*,

and received from his type series, in the smaller size and more shining front and also in the distribution," but Dr. M. W. Blackman in April 1935 wrote: "I regard *Xyleborus sacchari* Hopkins as no more than a variety of *X. affinis* at best, and in a long series of so-called *sacchari*, typical *affinis* appear usually to be present." Formerly it was of very considerable economic importance because of heavy infestations of sugar-cane, more especially of the old Otaheite or white cane, which was one of the original varieties on which the industry was based. Otaheite cane grows well on virgin soil, but is poorly adapted to old, worn-out soils, and was entirely displaced where more vigorous varieties were developed. At the present time it is doubtful if any of this variety can be found anywhere in the world. The newer varieties of sugar-cane are practically or entirely immune to attack by these shot-hole borer beetles, which in recent years have not been noted on sugar-cane anywhere in Puerto Rico. Nevertheless, *Xyleborus affinis* is still a serious pest, attacking coconut palm tree trunks, and what appear to be perfectly healthy trees of *Albizia lebeck*, sometimes perfectly healthy trees of *Inga vera* and *Inga laurina*, and is almost invariably present in the trunks of these coffee shade trees which show any indication of disease or injury from some other cause. It is very difficult to prove that in every case of infestation the tree was previously injured or diseased, but it is quite possible that these beetles may attack those which were perfectly sound, as were the stalks of Otaheite cane when they were attacked. Fortunately, most coconut palms and most coffee shade trees escape attack, but *Albizia lebeck* at present seems particularly susceptible, just as was Otaheite cane years ago. Blatchley & Leng (1916-619) quote from Hubbard that "a solitary female starts the galleries, in each of which five or six eggs are deposited. The young, hatching, feed upon the ambrosia which glistens on the walls like hoar frost. The pupae are formed lying free in the galleries, and in somewhat over a month from the egg the perfect beetles appear. In time, besides the mother, 15 or 20 offspring females have become adult, but only one or two males are commonly found. A second generation may be started, but usually the seasoning of the wood threatens failure of food fungus and the younger females depart to found new colonies in fresh tree trunks. Many kinds of trees are attacked: maple, orange, pine, oak and ash being especially mentioned by Hubbard," for Florida. In addition to sugar-cane, coconut palms, coffee shade trees and *Albizia lebeck*, in Puerto Rico, interceptions of these beetles have been made from guava fruits at Cabo Rojo and orange fruit at Ponce by Mr. R. G. Oakley, from dry crotalaria pods, and at light at Mayagüez and Bayamón.

Xyleborus torquatus Eichhoff, another widely distributed neotropical shot-hole borer beetle, previously recorded from Puerto Rico, was identified

by Dr. W. H. Anderson as being probably the species principally responsible, with *X. affinis*, for killing the trees of *Albizia lebeck* in the Río Piedras region in 1944-45.

Xyleborus amplicolis Eichhoff, the type from Puerto Rico, originally described in the Berliner Entomologische Zeitschrift (1868-280), has not since been found, either here or elsewhere.

Dr. M. W. Blackman identified the beetles intercepted by Mr. R. G. Oakley in orange fruit at Ponce as being a species of *Xyleborus* near *bispinatus* Eichhoff, this being a species known only from Brasil.

Xyleborus confusus Eichhoff occurs from Mexico southward thru Central America and all of tropical South American into Argentina, as well as in the West Indies, with records from most of the Lesser Antilles. As determined by Dr. W. H. Anderson, it was collected at light on Mona Island by Prof. J. A. Ramos (1947-44), the only record of a shot-hole borer from Mona. In Puerto Rico, beetles were collected from dying coconut palm trees at Cabo Rojo, as identified by Dr. A. D. Hopkins, and subsequent collections have been made from dead or dying palm trees at Camuy, San Lorenzo and Loíza, in no instance being associated with *Xyleborus affinis*. All stages, as identified by Dr. Hopkins, were present in great abundance under the bark and in burrows just underneath the bark of dead "bucare" (*Erythrina poeppigiana*) trees at Cayey. Dr. Donald De Leon collected an adult on the bark of a "moca" (*Andira jamaicensis*) tree at Ponce, and others have been intercepted in orange fruit at Aguadilla and at light at San Juan.

Xyleborus ferrugineus Fabricius "viene por la noche a las luces de las casas" in Puerto Rico according to Dr. Gundlach.

Xyleborus fuscatus Eichhoff, as determined by Dr. M. W. Blackman, was collected by Dr. Donald De Leon boring in the trunk of dead "almácigo" (*Bursera simaruba*) trees near Guayama.

Xyleborus grenadensis Hopkins, "at once distinguished from *affinis* by the shining declivity (but) nearly allied to *X. torquatus*," was found associated with *fuscatus* by Dr. De Leon in the dead trunk of "almácigo," and collected by him in abundance at light in the Guánica Forest, as well as high in the mountains at Maricao under the dead bark of "granadillo" (*Buchenavia capitata*).

Xyleborus inermis Eichhoff, listed by Mr. R. H. Van Zwaluwenburg (P.R. 810), and by Dr. Alex. Wetmore as eaten by the cliff swallow and the honey creeper, has subsequently been identified by Dr. M. W. Blackman from adults intercepted in mango at San Juan.

Coccotrypes bassiaevora Hopkins was identified by Dr. M. W. Blackman from beetles intercepted by Mr. R. G. Oakley in orange fruit at Ponce.

Coccotrypes rolliniae Hopkins was identified by Dr. M. W. Blackman

from beetles reared from the seeds of the palm *Neowashingtonia robusta* at Río Piedras by Mr. Francisco Seín. The type was from the seeds of *Rollinia octopetala* at Belém do Pará, Brasil.

Chalcohyllus securigerus, described by Dr. M. W. Blackman as one of "New Genera and Species of Bark Beetles of the Subfamily Micracinae (Scolytidae, Coleoptera)" (Proc. U. S. National Museum, 29, (3165): 341-365, pl. 2. Washington, D. C., 1943) on p. 364, is from a type intercepted by Mr. R. G. Oakley on dead wood at Yauco, P. R., and another from Haiti on "bois chandelle" (*Amyris balsamifera*).

Ambrosiodmus lecontei Hopkins was identified by Dr. M. W. Blackman from material collected by Dr. Donald De Leon at El Verde Camp, Río Grande, in dying terminals of "cedro" (*Cedrela mexicana*), and in dead twigs of "aceitillo" (*Zanthoxylum flavum*) at Maricao.

Of the beetles collected by Dr. Donald De Leon which Dr. Blackman did not assign to species are a *Pterocyclon* on "tabonuco" (*Dacryodes excelsa*), associated with a new species of *Ambrosiodmus*, at El Guineo Camp at Villalba.

Anisandrus sp. was the determination by Dr. M. W. Blackman of a beetle intercepted by Mr. R. G. Oakley in dead wood at Guayanilla.

Pycnarthrum sp. nov. was the determination by Dr. M. W. Blackman of beetles found by Dr. Luis F. Martorell breeding and boring in the bark of a recently cut tree of *Artocarpus communis* in Guajataca Gorge at Quebradillas.

Dendrosinus bourreriae, described by Dr. E. A. Schwarz as "A New Scolytid from Florida" (Proc. Ent. Soc. Washington, 22: 220-26. Washington, D. C., 1920), was intercepted in orange fruit at Ponce by Mr. R. G. Oakley, as identified by Dr. M. W. Blackman.

Hexacolus sp. nov. was the determination by Dr. M. W. Blackman of beetles intercepted in a dead tree at Matrullas Dam by Mr. R. G. Oakley.

Platypodidae: Wide-headed Ambrosia beetles

Platypus compositus Say, a continental species of the southern United States, Mexico and Brasil, has been identified by Dr. M. W. Blackman from material collected by Dr. Donald De Leon from a log of "tabonuco" (*Dacryodes excelsa*) at El Guineo Camp, Villalba.

Platypus excisus Chapuis is a Central American species which Dr. M. W. Blackman identified from an abundance of beetles coming from blackened tunnels in logs of the coffee shade tree, *Inga vera*, at Aibonito.

Platypus poeyi Guérin-Ménéville "talandra la madera en dirección de la corteza al corazón" according to Dr. Gundlach.

Beetles intercepted at light by Mr. S. D. Whitlock at Mayagüez were

identified by Dr. M. W. Blackman as a species of *Platypus* near *porrectus* Chapuis.

Platypus punctulatus Chapuis is recorded from Puerto Rico (Blackwelder 1947-790).

Platypus ratzeburgi Chapuis, as identified by Dr. A. D. Hopkins, has been found in great abundance coming from logs of the coffee shade trees, *Inga vera* and *Inga laurina*, from Lares and Ciales, and is presumably present thruout the coffee regions.

Platypus rugulosus Chapuis, a widely distributed continental species, from lower California to Argentina, was first identified from Puerto Rican material by Dr. A. D. Hopkins who examined beetles collected by Mr. Thos. H. Jones at light at Mameyes. It has since been intercepted at light at Mayagüez, in a grapefruit grove at Barceloneta and on flowers of *Inga vera* at Aibonito. Dr. Donald De Leon found it abundant at light at Guánica Forest, in broken limbs of "moca" (*Andira jamaicensis*) at Ponce, and in the mountains at El Guineo Camp, Villalba in logs of "tabonuco" (*Dacryodes excelsa*). It has been reared in large numbers from logs of "almácigo" (*Bursera simaruba*) at Camuy, and, judging by the number of records, is the most abundant of the Platypodid beetles in Puerto Rico.

Platypus schaumii, described from Puerto Rican material by Félicien Chapuis in his "Monograph des Platypides" (Memoirs de la Soc. Royale des Sci. Liege, 20: 181, 1885 or 1886), has not since been found here.

Platypus subcostatus Jacq. DuVal, described from Cuba, is listed by Dr. Gundlach from Puerto Rico, but has not recently been found here.

Dr. Alex. Wetmore found that 41% of the stomach contents of the cliff swallow consisted of beetles of the genus *Platypus*. As many as 400 of these beetles were eaten at a single meal, and several birds had taken 200 or over. Near Aguadilla, in June, the swallows were capturing large numbers for their young, carrying them in the back of the mouth and below the tongue in a well-moistened mass." They form an important fraction of the food of the wood pewee and the green mango, and are also eaten by the black swift, the tody, the woodpecker, the honey creeper, and by the parula and black and white warblers. Lizards in coffee groves also eat these beetles emerging from coffee shade trees, dead, dying or cut for charcoal, and in the stomachs of *Anolis evermanni*, *Anolis stratulus* and *Anolis gundlachi*, the beetles have been found in considerable abundance. Whole beetles have been found embedded in amber in Hispaniola.

Curculionidae: Weevils

Artipus monae Wolcott, described ("IBSup" 1941-102) from weevils collected by Dr. Luis F. Martorell on beefwood (*Casuarina equisetifolia*) foliage on Mona Island, is "elongate oblong, piceous, everywhere densely

clothed with dull silvery scales, often tarnished to a faded brown in larger individuals." Prof. J. A. Ramos (1947-48) swept them in abundance from Sardinera and Uvero Beaches, and Dr. Martorell noted adults feeding on the foliage of *Amyris elemifera* in April 1944. It is quite possible that the same species is also present in Puerto Rico, specimens intercepted on leaves of castor bean at Ponce and on "mabí" at Mayagüez having been identified as a species of *Artipus* by Mr. L. L. Buchanan.

Lachnopus coffeae, long before it was named and described by Sir Guy A. K. Marshall among "Some Injurious Neotropical Weevils (Curculionidae)" (Bull. Ent. Research, 13 (1): 59-78, pl. 2, fig. 4. London, May 1922), was well known to coffee growers, and its injuries to the tender growth of coffee described by Don Guillermo Quintanilla as the "Enfermedad de los Cafetales en Adjuntas: La Plaga de la Vaquita" (La Reforma

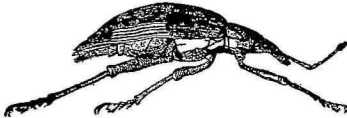


Lachnopus coffeae Marshall, six times natural size. (Drawn by G. N. Wolcott.)

Agricola, año 3, No. 12, pp. 217-224. San Juan, November 1896), and by Mr. J. W. Van Leenhoff in the "Report of the Coffee Specialist" (in Ann. Rpt. P. R. Agr. Expt. Station for 1905, pp. 46-47. Washington, D. C., 1906). Mr. R. H. Van Zwaluwenburg, in discussing the "Insects Affecting Coffee in Porto Rico" (Jour. Ec. Ent., 10 (6): 513-17. Concord, December 1917), gives the most extended account up to that time, even noting the parasitism of its eggs by a Chalcid wasp, which was later very imperfectly described as *Tetrastichus vaquitarum* Wolcott. These shining, black and white beetles have the "integument piceous, with the legs, antennae and apex of rostrum reddish brown, clothed above and below with small, convex, shiny, subcircular or very shortly ovate, white scales, mostly not contiguous; the elytra usually with three very irregular transverse subdenuded patches. Length 5.5-6.25 mm., breadth 1.8-2. mm.," to quote from Sir Guy's original description. They occur thruout the lower

coffee regions, primarily feeding on the tender leaves of coffee, but have also been found eating tender orange and grapefruit leaves along the north coast, while Mr. R. G. Oakley intercepted them on chinaberry at Ponce. Even in captivity they may live nearly two months, the females laying small clusters of oval eggs glued between two leaves, from which maggots hatch in from ten to fourteen days. Falling to the ground, the grubs enter thru cracks and feed on the roots of plants. The appearance of the adults usually coincides with a flush of new growth on the coffee trees, so that despite the damage caused by them, it is quickly repaired and replaced with additional foliage. The application of arsenicals to these shiny tender leaves is hardly practical, and no attempt at control, even by hand picking, is normally attempted by coffee growers.

Lachnopus coffeae, var *montanus* Marshall (1922-62), the type from Indiera, equidistant from Lares, Maricao and Yauco, "differs from the typical coast form in being somewhat larger and having the legs markedly

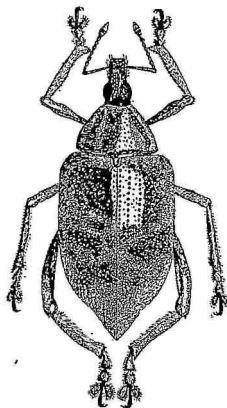


Lachnopus coffeae var. *montanus* Marshall, six times natural size. (Drawn by G. N. Wolcott.)

paler; the scales on the upper surface are much sparser and more evenly distributed, and they are also rather smaller and more nearly circular; most of them being very pale blue or bluish white; on the other hand the stripe of white scaling along the side of the sternum is much denser and more sharply defined." This most beautiful variety is economically comparable to the coastal form, occurring in the coffee groves at the higher elevations, and having also been noted feeding on the tender leaves of *Cestrum macrophyllum* at Cialitos, and of *Isandrina emarginata* in the pass between Cayey and Salinas.

Lachnopus curvipes Fabricius is a considerably larger beetle than the endemic *coffeae*, and occurs also in Jamaica, Tortola of the Virgin Islands, and St. Barthélemy and St. Vincent of the Lesser Antilles. L. A. Auguste Chevrolat (1876-227) records the first collections by Dr. Stahl and Gundlach. One may presume that many of the records of this species being eaten by birds of the coffee groves and of the virgin forests, as recorded by Dr. Alex. Wetmore, include those of the at-that-time-undescribed *coffeae*. The birds noted are the cuckoo, ani, owl, kingbird, petchary, flycatcher,

mockingbird, vireo, parula warbler, honey creeper, yellow-shouldered black bird, oriole, mozambique, tanager, spindalis, grossbeak and grasshopper sparrow. The lizards *Anolis pulchellus* and *Anolis cristatellus* also feed on these weevils, as does also the introduced toad, *Bufo marinus*, but hardly in sufficient numbers to appreciably effect their abundance. The adults occur at all seasons of the year and in every part of the Island, with the possible exception of the higher mountains, feeding on a great variety of host plants, including such economic plants as cotton, orange, grapefruit, cabbage, swiss chard, watermelon, lima bean, and numerous weeds, bushes



Lachnopus curvipes F., six times natural size. (Drawn by G. N. Wolcott.)

and trees. The damage to most economic plants is negligible, but the attack of these beetles on the flowers and tender fruit of cultivated grape at Ponce in April 1939 was serious, and necessitated the immediate adoption of hand collection if any fruit was to be obtained.

Lachnopus kofresi Wolcott, described ("IPSup" 1941-104) from an abundance of material collected by Dr. Luis F. Martorell from the underside of the leaves of cultivated eggplant being grown at that time on Mona Island, has its integument entirely black, and has no scales, only short, silvery hairs on tibiae and tarsi. It is quite common on Mona Island, and adults have been found resting on the stems or leaves of numerous plants and shrubs.

Lachnopus seini Wolcott ("IB" 1936-302) is similar in size and appearance to *coffea*, but is "entirely and evenly clothed with very small, convex, shiny, subcircular scales, with no constant areas of denudation," having been found feeding on the tender leaves of *Rapanea ferruginea* at Indiera, the type material collected by Mr. Francisco Seín, and subsequent collections on the same host made at Aibonito.

Lachnopus trilineatus Chevrolat (1876-228) was described from type material collected in Puerto Rico by Dr. Gundlach, of which no subsequent collection has been made.

Lachnopus valgus Fabricius is listed by Dr. Gundlach from Puerto Rico, but has not since been found here. The type is from St. Barthélemy in the Leeward Islands, and it is also recorded from Anguilla.

Lachnopus yaucona Wolcott ("IB" 1936-302) is somewhat larger than *coffea*, its integument light brown, its scales light yellow in color, the type material having been collected on *Rapanea ferruginea* at Indiera by Mr. Francisco Seín in August 1933. No subsequent collection has been made.

Apodrosus argentatus Wolcott ("IP" 1924-130) has piceous to black integument, "evenly and closely covered with small, subcircular, silvery scales, interspersed, scantily on head, more thickly on prothorax, with black scales; length 4.0-4.5 mm., breadth 1.8-2.0 mm.," the type from *Dalbergia ecastophyllum* at Pt. Cangrejos, others on this host at Pt. Salinas, Mameyes and Boquerón. Its habitat is the beaches of Puerto Rico and Mona Island, adults having been found in abundance on "abeyuelo" (*Colubrina ferruginosa*) at Guánica and on Mona; intercepted on "mabí" (*Colubrina reclinata*) at Mayagüez, on tamarind and *Peirania* at Ponce by Mr. R. G. Oakley, noted feeding on the leaves of "mangle botón" (*Conocarpus erecta*) at Faro de Cabo Rojo, and of "guayacán" (*Guaiacum officinale*) at Guánica and Salinas.

Apodrosus wolcottii Marshall (1922-59), "fairly closely covered above with small, nearly circular, pinkish-bluff scales having a distinct coppery sheen," was found feeding on the leaves of the coffee shade tree (*Inga vera*) at Río Piedras, and since noted on this host at Cayey, and intercepted on the flowers of *Inga laurina* at Adjuntas. It has also been intercepted on vanilla at Adjuntas, but is most often noted resting on coffee leaves: at Añasco, Indiera, Maricao, Jájome Alto and Manatí.

Compsus maricao Wolcott ("IP" 1924-125), has "integument shining black, densely clothed, except for denuded areas and ridges, with light blue-green scales; length 13.0 mm., breadth 4.5 mm.," the type a single female from Maricao which had just laid eggs between coffee leaves. Mr. R. H. Van Zwaluwenburg had previously collected a specimen in the mountains above Mayagüez which he had presented to the U. S. National

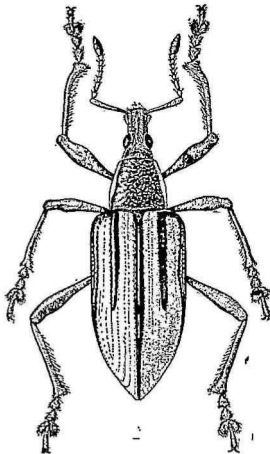
Museum. Recently others have been found: resting on *Eugenia* at Jayuya, and feeding on the leaves of *Cecropia peltata* at Villalba.

Compsus luquillo sp. nov., differs from *maricao* in the color of scales, which are bright yellow in living material, becoming somewhat greenish in museum specimens, and most noticeably in that the median denuded ridge on each elytron extends less than half-way to the base. Near the apex it is joined by a curving lateral ridge extending to the base, where it is joined by a short submarginal ridge. *Compsus maricao* has three parallel ridges extending from the base of the elytron to apex, and one short submarginal ridge. Both are similar in general appearance to *Compsus zebra* Marshall (1922-199) from Colombia, but the dorsum of the prothorax of the Puerto Rican species is broadly and deeply concave and undenuded, while the sutural margin of the elytra is elevated and denuded; quite the reverse of the apparent contour of *zebra*. The largest specimen of *maricao* measures 13.0 mm. in length; the smallest specimens of *luquillo* somewhat exceed this, the type is 18.0 mm. long, collected feeding on the leaves of "camasey" (*Miconia prasina*), at El Verde Camp, Rfo Grande, August 22, 1947, one of a pair; three others on the same host at the same locality, July 4, 1946. Admittedly, the differences between *Compsus maricao* and *Compsus luquillo* are no greater than between the named extreme forms of *Diaprepes abbreviata* L., but the variations in *Compsus* correspond to the distinct geographical regions after which they are named, and, to date, no intermediate has been found.

Diaprepes abbreviata Linnaeus, after the statement of Sir Guy A. K. Marshall (1915-627) "is not only the older and therefore more correct name, but is also in general use in the West Indies," has been generally accepted as the name to be applied to the common "vaquita" of Puerto Rico: the sugar-cane root-stalk borer weevil. Dr. Stahl calls it *Prepodes doublieri* Guerin; Dr. Gundlach follows Chevrolat (1876-227) in listing *Diaprepes distinguendus* Boheman as not in synonymy with *Diaprepes comma* Boheman; and Dr. W. Dwight Pierce in his beautifully illustrated paper on "Some Sugar Cane Root-Boring Weevils of the West Indies" (Jour. Agr. Research, 4 (3): 255-271, pl. 5. Washington, D. C., June 15, 1915) calls the "weevil root-borer" of sugar-cane in Puerto Rico *Diaprepes sprengleri* Linnaeus, of which he recognizes three varieties: *abbreviatus* Olivier, *comma* Boheman and *sprengleri* Linnaeus, separable on the basis of scale coloration and denuded elytral ridges. Economically at least, the "vaquita" is but a single species: a large, black, leaf-feeding weevil, attractively scaled with white, cream, yellow, pink or chestnut, of which the larvae bore in the root-stalk of sugar-cane or the roots or tubers of many other hosts.

The variation in the scale coloration and the extent of denudation of the

elytral ridges of the adults of *Diaprepes abbreviata* may be only a reflection of the variation in duration of the stages of the immature forms resulting from intense parasitization by *Tetrastichus haitiensis* Gahan of the eggs which are laid normally in late spring. Indeed, so few grubs survive from egg-clusters laid in May and June, when the parasite is most abundant, that it would appear that the weevil primarily owes its survival to the eggs laid by a comparatively few exceptional and abnormal females emerging from the ground at other times of year when the parasite is scarce or absent.



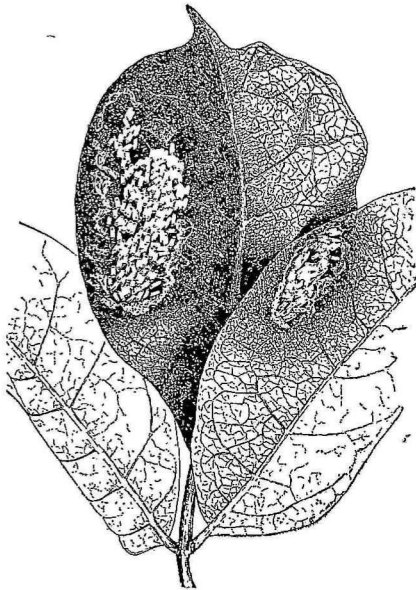
The Sugar-Cane Weevil Root-Stalk Borer, *Diaprepes abbreviata* L., five times natural size. (Drawn by H. Bradford.)

Despite the most intensive investigations on "The Sugar Cane Weevil Root Borer" (Bulletin No. 14, Insular Expt. Station, Río Piedras, pp. 19, fig. 11. San Juan, April 14, 1915) by Mr. Thos. H. Jones, this parasite was not found by him in Puerto Rico at that time, but awaited discovery in Haiti, reared from the egg-clusters of the quite similar *Exophthalmus quadrivittatus* Olivier, in 1928. Dr. Herbert Osborn Jr. found that this *Tetrastichus* was abundant in Puerto Rico, not only being present in egg-clusters laid between the leaves of "jagüey" (*Ficus stahlii*) growing along the margins of certain fields of Central Aguirre at Santa Isabel, where he

made his first collections in 1932, but generally thruout the Island. In conducting "The Citrus Pests Investigation in the Windward & Leeward Islands, British West Indies, 1937-1942" (Imperial College of Tropical Agriculture, pp. 66, pl. 2, ref. 20. Port-of-Spain, August 1942), Mr. R. G. Fennah found this and *Tetrastichus marylandensis* Girault present in many of the Lesser Antilles. Neither occurs in Barbados, but attempts at introduction from Puerto Rico failed because the female parasite was unable to parasitize the eggs when laid between the tough tips of cane leaves; an almost universal place of oviposition by *Diaprepes* females there, but comparatively rare in Puerto Rico.

Dr. Alexander Wetmore, in conducting his survey of the economic food habits of the "Birds of Porto Rico" (Professional Paper, Bulletin No. 326, U. S. D. A., pp. 1-140, pl. 10. Washington, D. C., 1916), was possibly most successful in showing the value of birds when dealing with *Diaprepes abbreviata*. To be sure, the insect is not controlled by birds, otherwise it would not be an economic pest, but birds eat large numbers of adults and certainly prevent its being a more injurious pest. The weevils occur not only in cane fields, where birds are comparatively scarce, but more abundantly in field margins, in the trees along roadways and on forest margins, or in upland pastures reverting to forest, just such habitats as are preferred by most land birds. He found that it constituted 18% of the stomach contents of the pechary, 17% of the kingbird, 11% of the flycatcher, 10% of the mozambique, 7% of the ani, 2% of the owl and nearly 2% of the yellow-shouldered blackbird. Dr. Stuart T. Danforth noted the abundance of the beetles in the environs of Cartagena Lagoon, and that they were eaten by the owl, the mangrove cuckoo, the oriole and the ani. They are somewhat large to be eaten by lizards, but the crested lizard, *Anolis cristatellus*, eats many of them. The introduced Surinam toad, *Bufo marinus*, finds them not as easy to catch as May beetles, for they do not return to the ground after the first emergence from their pupal cell, and fall to the ground only when disturbed, nor are they nocturnal, like the May beetles. At periods when May beetles or other black Scarabaeid beetles are abundant, the toads concentrate of these more readily available items of food, but at other times they may eat considerable numbers of vaquitas. No such notable reduction in the abundance of *Diaprepes* followed the introduction of the toad as was the case for May beetles, however, indicating the comparatively minor role played by the toad in their natural control. Nevertheless, coincident with the scarcity of toads in the last few years, such large numbers of *Diaprepes* grubs occurred in some fields on the south coast during 1948 and 1949 as to cause serious losses. Large amounts of crude benzene hexachloride containing 12.5% of gamma isomer were applied in some of these fields at the rate of eight pounds per acre. This

amounts to only one pound per acre of gamma isomer, an amount insufficient to kill grubs, in any stage of growth. White grubs are somewhat more susceptible to the new insecticides than are the legless *Diaprepes* grubs, and for heavy infestations of large grubs in the soil, not less than

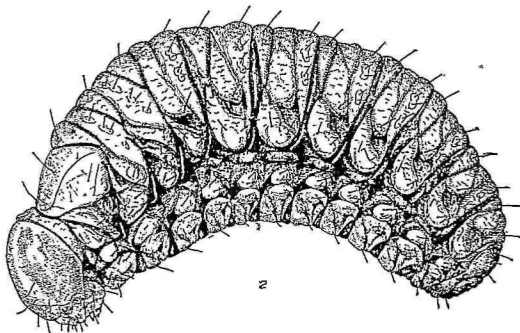


Egg-clusters of *Diaprepes abbreviata* L., between leaves of "jobo" (*Spondias mombin*), twice natural size. (Drawn by Francisco Sefn.)

two pounds per acre of aldrin or two pounds of lindane must be used. Preliminary tests indicate that *Diaprepes* adults are readily killed by spraying infested host trees with 1% chlordan or 1% dichlorodiphenyldichlorethane (DDD), and it may be presumed that several of the other new insecticides will prove equally, or even more effective. Infested citrus trees should not be sprayed with DDT however, as by destroying scale insect parasites, the eventual result is a mass infestation by scale insects

made more difficult to control because biological control has ceased to function.

As was abundantly proved in working out "The Life History of *Diaprepes abbreviatus* L., at Río Piedras, Puerto Rico" (Jour. Agr. Univ. P. R., 20 (4): 883-914, fig. 5, ref. 21. Río Piedras (October 1936) January 1937), the fungus *Metarrhizium anisopliae*, or the "Green Muscardine," takes a heavy toll on larvae, pupae and adults, at least in captivity, and may be presumed to do so also in the field, when conditions are favorable for its development. Indeed, it may be considered an indication of the inherent vitality of the insect that despite all the various factors of natural control, it still seems to be as abundant in Puerto Rico now as at any time in the past.



Larva of *Diaprepes abbreviatus* L., five times natural size. (Drawn by H. Bradford.)

The oval-elongate eggs of *Diaprepes abbreviatus* are laid in clusters of varying size between the tougher leaves of numerous trees, more especially those on the tender leaves of which adults are feeding, but possibly quite as often between the leaves of trees uneaten by adults. Comparatively rarely in Puerto Rico are the eggs laid between the split tips of the leaves of sugar-cane, but as suggested by Mr. Fennah, that "Otiorthynchids Oviposit between Paper" (Jour. Ec. Ent., 26 (6): 1172-3. Geneva, December 1933) indicates that "places for egg-laying are chosen on account of their physical attributes of flatness, stiffness, and opposability of plane surfaces." A thin film of sticky, transparent plastic surrounds the cluster on all sides, holding the two opposed leaves together no matter how slippery they may be, but as this film hardens, it loses much of its sticking power, enabling the

hatching grubs to escape from between the leaves upon hatching. It is such a powerful adhesive, however, that when the eggs are laid between paper, chosen in preference by the females rather than any kind of leaves, the grubs can not escape. This suggests a method of partial control that might prove practical in a young citrus nursery.

The variability in behavior essential to survival is at once displayed by the grubs in "The Larval Period of *Diaprepes abbreviatus* L." (Jour. Dept. Agr. P. R., 17 (3): 257-64, pl. 1, ref. 2. San Juan, November 14, 1933),



Larva of *Diaprepes abbreviata* L., in rootstalk of sugar-cane, one-half natural size. (Drawn by Francisco Seín.)

and more noticeably in "The Diapause Portion of the Larval Period of *Diaprepes abbreviatus* L." (Jour. Agr. Univ. P. R., 18 (3): 417-28, fig. 2, ref. 1. Río Piedras, October 27, 1934). Altho most often noted boring in the root-stalks of sugar-cane, the grubs have been found in the tubers of "ñame" and "yuca," in seed corn just beginning to sprout, and in the tap-roots of seedlings of pepper, papaya, grapefruit and mahogany. It may be presumed that they feed on any kind of live roots or tubers available, by preference choosing those of sufficient size that they may bore within them, rather than feeding from the outside, as do white grubs.

The adults feed on the leaves of sugar-cane, cotton, citrus, coffee and all

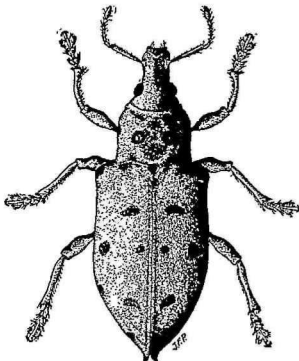
kinds of native and imported vegetables, as well as of practically every endemic and foreign tree. Those feeding on leaves sprayed with arsenicals or barium fluosilicate may be killed, but the effect of DDT is mostly as a repellent, causing them to choose some other unsprayed tree on which to rest, copulate and feed. Handpicking from pigeon pea bushes planted between cane fields is extensively practised in Barbados, but is hardly practical in Puerto Rico, where so many other kinds of vegetation offer equally attractive shelter for the adults. Hand collection of the grubs was at one time extensively attempted at Guánica in connection with the hand collection of white grubs, but at the present time, attempts at control in Puerto Rico are sporadic and limited in scope. Typical adults have been collected in Hispaniola, Mona Island, in all parts of Puerto Rico, on Vieques and in most of the Lesser Antilles, including Barbados.

Recent outbreaks of grubs, seriously injuring cane fields on the east and southern coasts during 1948 to 1950, re-emphasized the need for effective chemical control. Grubs feeding within the host plant are naturally protected by its tissues from contact with insecticidal chemicals, and the migrating fully-grown grubs in the pre-diapause period are remarkably resistant to extraneous materials present in the soil. The just-hatched grubs, however, are very susceptible to aldrin (Hyman 118), as little as half a pound per acre mixed with the soil being effective in killing them, and no diminution in its toxicity has been noted after being mixed with soil for a year and a half. Others of the newer insecticides are much less toxic, *Diaprepes* grubs surviving in soil mixed with 2 lbs. of chlordan, but not with as much as 5 lbs. chlordan, 10 lbs. of rhothane (DDD), or 20 lbs. of DDT. Ten pounds per acre of the gamma isomer of benzene hexachloride somewhat retards rapidity of growth, but the amount requisite for control has not been determined, and would be commercially impractical for commercial use.

Diaprepes capsicalis Marshall (1922-59), listed also by Dr. Blackwelder (1947-803) as an *Exophthalmus*, has the "integument black or piceous, fairly densely clothed above and below with brown or brownish-grey scaling, often with a coppery reflection; elytra with a pale dot about the middle of interval five. Length, 8-12 mm." It has been found only in Puerto Rico. Described from material collected by Dr. Richard T. Cotton at Río Piedras feeding on the foliage of garden peppers, it is possibly more abundant in the mountains, having been noted eating "fresas," the fruit of *Rubus rosaefolius*, at Jájome Alto, and also on the ground under fresa bushes at Jájome Alto a year later; on the ground in a sweet potato field being plowed at Cidra; intercepted at Jayuya, and on carrots at Villalba. Concerning a long series of unlabeled specimens in the collection at Río Piedras, one can only surmise as to the identity of the collector and the data of their collection. In the stomach contents of an ani, shot at La

Florida by Dr. Luis F. Martorell, was found the remains of one of these beetles.

Exophthalmus quindecimpunctatus Olivier (1807-300), described from Puerto Rico and known only from there, listed by Chevrolat (1876-227) and by Drs. Gundlach and Stahl as a *Prepodes*, was first noted in recent times by Dr. Luis F. Martorell in August 1940 eating the foliage of "corcho prieto" (*Torrubia fragrans*), on the mountain road to Maunabo from his home town of Yabucoa, and subsequently found in even greater abundance in October and December of the same year on the same host. It is quite possible that Olivier had but a single specimen in hand when preparing his

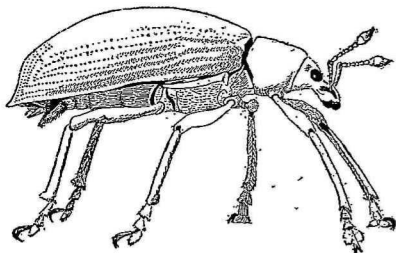


The Corcho Prieto Weevil, *Exophthalmus quindecimpunctatus* Olivier, four times natural size. (Drawn by José F. Pietri.)

description, for the number of spots varies depending on the amount of denudation of the beautiful iridescent metallic green scales from the black integument. Four black spots are usually to be noted on the prothorax, two above and one at each side; on each elytron are from five and one-half to eight and one-half, each spot quite round and distinct if present at all. Host trees have a much wider distribution in Puerto Rico, but no beetles have been found on trees at other points on the Island, except most recently at the mountain pass of El Collao, between Cayey and Salinas, thirty miles distant from Yabucoa.

Exophthalmus roseipes, described by L. A. Auguste Chevrolat (1876-ccxxvii) as a *Pachnaeus* and thus listed by Drs. Stahl and Gundlach, is another even more beautiful endemic weevil, found nowhere else than in

Puerto Rico. Unrubbed specimens are completely covered with light Niagara green scales; beneath and on antennae and legs silvery white, with the integument of the legs possibly sufficiently light-colored and roseate to merit the specific name given by Chevrolat. The beetles are lighter in color than the very tenderest of the citrus leaves on which they are most often noted feeding, and on which they may at times become an economic pest, but also occur on the leaves of such other beach shrubs as seagrape and icaco, and are possibly a most perfect match on the more tender leaves of *Dalbergia ecastophyllum*. Adults in captivity eat their own weight of leaves daily, thus despite their comparatively small size, when at all abundant in citrus groves, their attack on tender leaves becomes noticeable in the maturing leaves. Mr. W. V. Tower (1911-9) records



Exophthalmus roseipes Chevrolat, six times natural size.

(Drawn by G. N. Wolcott.)

their scarring of young fruit, but this is exceptional, and only their very exceptional abundance would justify spraying with arsenicals or DDT to prevent attack. Dr. Wetmore found none of these beetles eaten by any of the birds he collected, but they doubtless do form an important item in birds, food at the seasons when they appear. Mrs. Raquel Dexter (1932-5) found them eaten by the introduced toad, and they are unquestionably eaten by the lizards inhabiting citrus trees in sandy areas, or beach shrubbery.

Hylobius pales Boheman, as identified by Dr. E. A. Chapin, was intercepted in a room in San Juan. This is not a tropical insect, being found from Nova Scotia west to Lake Superior and south to Florida, adults living in and beneath the bark of pine trees, the larvae destroying the inner bark and the tender, newly-formed wood beneath.

Heilipus ustulatus, described from Puerto Rico by Antoine G. Olivier

(1807-198) and not since found elsewhere, was not listed by Drs. Stahl or Gundlach.

Anchonus suillus Fabricius, described originally from the Island of St. Barthélemy, was listed by Dr. Gundlach from Puerto Rico, and has been found since all around the Island, under boards or decaying wood on the ground. When collections of *Cosmopolites sordidus* were being made at Río Piedras from slices of banana corms, these dirty, black beetles were often found accompanying the larger, shiny black ones. Presumably they are more abundant than the scarcity of records would indicate, for they were found by Mrs. Dexter to have been eaten by the introduced Surinam toad, and they have also been found eaten by the crested lizard, *Anolis cristatellus*, and by the introduced bullfrog, *Rana catesbeiana*.

Genonotus angulicollis, described as an *Anchonus* by L. A. Auguste Chevrolat (1876-cxxviii) from Puerto Rico, and not since found elsewhere, was listed by Dr. Gundlach. The punctures on its elytra alternate with elongated warts with erect reddish-brown elongate scales; prothorax, beak and legs consist entirely of closely-set punctures. It has been found under the loose bark of a coffee shade tree, *Inga vera*, at Cayey, and under the dead bark of a tree on El Yunque.

A beetle identified as a species of *Sternechus*, as identified by Mr. L. L. Buchanan, was intercepted by Mr. R. G. Oakley on *Casearia* at Ponce, and others intercepted by him at Ponce on pomarrosa and on *Senegalia* flowers as species of *Smicronyx*.

Derelomus albidus, a Cuban weevil described by Suffrian, was listed from Puerto Rico by Dr. Gundlach. What may be the same was listed as a species of *Phyllotrox* from Puerto Rico by Dr. Alex. Wetmore as having been eaten by the "reinita" or honey creeper, *Coereba portoricensis*.

Cylas formicarius Fabricius, "el Piche de la Batata," occurs in all of the Greater Antilles and India, but to date, not in the Lesser Antilles. It is unquestionably the most serious pest of sweet potatoes in Puerto Rico, causing many tubers to be unsalable in the market if at all infested, and rejected for food for either man or beast if the infestation is at all general. Because the yellow, sweeter and more palatable varieties are greatly preferred by the piche, the general public, in purchasing the tubers in the market in quantities, discriminates against these more desirable kinds and accepts for human food the tougher, white varieties which are less nourishing because they contain less of carotene and consist mostly of fiber. The older and larger subterranean stems of the goat's foot morning-glory, a common weed tying together the sand on all beaches not regularly invaded by high tides, is also infested by the piche, making doubly difficult any attempt at control. The primary reason, however, why control is so difficult is that the bulk of sweet potato production is by small farmers, who

use the field as a storehouse of unharvested food, taking from it the larger tubers only as needed, and finally abandoning the field when most of the tubers are too badly infested. So far as known, the piche has no natural enemies and certainly no specific parasites.

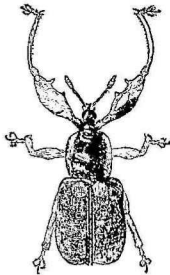
The adults developing from several larvae in a single tuber need not even leave its protection to mate and continue a second generation, until it is completely destroyed by the feeding tunnels. Dr. Richard T. Cotton observed "*Cylas formicarius* Fabr. in Flight" (Jour. Ec. Ent., 9 (5): 516. Concord, N. H., October 30, 1916) in moving streetcars at night, and it had been previously noted at light in Río Piedras as early as 1912. When exceptionally abundant, adults may swarm in fields of sweet potatoes, eating stems, midribs and the larger leaf veins, and under such conditions are readily killed by the application of arsenicals or other insecticides. Normally, however, adults are rarely seen above ground. They attack roots or fresh tubers beneath the surface of the soil, gaining access by means of cracks. If carefully selected slips, free from infestation, are planted, these may escape early infestation if rainfall is abundant, but the effect of drought on the heavier soil is to produce cracks giving ready access for the weevils. Sandy soil is less subject to cracking during drought, and plantings of sweet potatoes on such soil are less subject to early infestation. In all cases, however, early harvesting of the tubers as soon as they have matured is advisable, while the prompt destruction of infested culls will do much to prevent infestation of the succeeding crop. The real problem in control in Puerto Rico is how to apply known measures of repression to the actual conditions of field practise, for as long as sweet potatoes are grown mainly as a subsistence crop by small farmers, effective control of the piche is impossible. The scientific specific name of the weevil is most appropriate, for the adults are definitely ant-like in appearance, with shining metallic blue elytra, black head, constricted prothorax and legs of chestnut red.

Apion martinezi Marshall (1935-516) was originally described by Sir Guy A. K. Marshall under the name *Apion xanthoxyli* (preoccupied by *xanthoxyli* Fall in Texas) as one of "New West Indian Curculionidae (Col.)" (Annals and Magazine of Natural History, 14 (10): 621-631. London, December 1934), the type from Guánica Forest, reared from seeds of West Indian satinwood or "aceitillo" (*Zanthoxylum flavum*), by Oscar R. Torres. It was found to be almost equally abundant by E. Martínez in the seeds from another aceitillo tree at Camp Buena Vista, Maricao, elevation 2700 feet. The integument of these beetles is red-brown, above with yellow-brown scaling, varying or interspersed with grey or whitish scales, below with whitish scales; length 2.0 mm., width 1.1 mm. For the foresters attempting to propagate aceitillo, this is a very serious pest, for from nearly half to sometimes all the seed is destroyed by the larvae burrowing in it.

Of the habits of the adults, nothing is known. The seed-producing trees are too high to be sprayed by any equipment locally available, and no attempt at control has been made.

Apion subaeneum, described by Carl E. A. Gerstaecker, the type from Puerto Rico, is synonymous with his *portoricanum* (Stett. Ent. Zeit., 15 234-261, 265-280. Stettin, 1854). Mr. L. L. Buchanan is of the opinion that the *Apion* beetles intercepted by Mr. R. G. Oakley at Ponce, on flowers of the euphorbia "escambrón" (*Ricinella*) and on leaves of *Peirania* is of a different species from either of these.

Euscelus bipustulosus Jekel (1860-214), originally described as an *Attelabus* from Jamaica, is the determination of Dr. W. Dwight Pierce of the weevil leaf-roller of guava in Puerto Rico. As *Attelabus sexmaculatus*



The Guava Leaf-Roller, *Euscelus bipustulosus* Jekel, six times natural size. (Drawn by G. N. Wolcott.)

Chevrolat (1876-ccxxviii), the type from Puerto Rico presumably collected by Dr. Gundlach, it was listed by him and Dr. Stahl, and in Van Zwaluwenburg's list (P. R. 1024) feeding on *Psidium guajava* and *Eucalyptus*. Both specific names are equally applicable to these shining, reddish-brown weevils with spined and greatly expanded front femora, for they have two prominent golden pustules near the base of the elytra, and two additional golden spots laterally on each elytron. They occur in all parts of the Island where guava bushes grow, pairs coöperating in cutting strips of leaf tissue from the more tender leaves and rolling the strip up around the single egg until it forms a compact surrounding of nourishment for the larva. The egg is parasitized by *Poropoea attelaborum* Girault, a Trichogrammid wasp known only from rolls of these weevils. Altho guava foliage is normally preferred by these weevils, in nurseries of young eucalyptus, they may at times be-

come a serious pest, outbreaks having been noted on *Eucalyptus robusta* at Guavate, Cayey and at Patillas in 1940 and on *Eucalyptus citriodora* at Cayey in the same year. The tender leaves of the "almendro" (*Terminalia catappa*) have also been noted attacked at Río Piedras and at Bayamón.

Euscelus coccolobae Wolcott was described as an *Attelabus* ("IP" 1924-123) from paired adults which were feeding on and forming rolls of leaf tissue of seagrape (*Coccoloba uvifera*) about individual eggs, at Pt. Salinas. It is quite common on seagrape on all beaches, and on the leaves of "cucubano" (*Coccoloba laurifolia*) and "moralón" (*Coccoloba grandifolia*) in the interior of Puerto Rico. Shining, robust, dark purplish-red, their elytra with rows of deeply-impressed, quadrangular punctures, this Puerto Rican pest of seagrape differs from the Hispaniolan *armatus* Gyllenhal of seagrape most obviously in its blunter tooth posterior of the smooth area on the humerus. With stout, toothed femora and long, curved tibiae of the forelegs, they are well-fitted physically for rolling up a long strip of seagrape leaf tissue about the egg, the male and female working together to hold the strip tight until the drying of the tissue sets it in the desired position. They make no attempt to utilize the tough, older leaves, and even the tender tissue must be of just the right stage of pinkish-green tenderness for manipulation by the beetles. The leaf-rolls remain attached to the leaf indefinitely. Strips may dry too rapidly at mid-day and have to be abandoned, but at sunset so slowly that darkness sometimes overtakes the beetles still at work.

Myrmex pulicarius Boheman (1843-207), described as an *Otidocephalus*, the type from Puerto Rico, has been intercepted on "musgo" (*Pilea tenerima*) at Adjuntas and on guava at Arecibo.

Anthonomus pulicarius Boheman (1843-219), the type from Puerto Rico, but found also in Hispaniola, is a minor economic pest, Mr. R. H. Van Zwaluwenburg (1916-45) noting it as "a very small, dark, long-snouted weevil in the flower buds of egg-plant." Dr. Richard T. Cotton (1918-300) naming it the "Eggplant Bud weevil," observed that it "feeds on leaves and breeds in the flower buds. Eggs are laid in young developing buds and the small white legless larvae develop within the bud, causing it to dry up and drop off." Control is more difficult because wild eggplant (*Solanum torvum*) may also be infested, but fortunately the insect is normally not very abundant, despite occurrence in all parts of the Island.

Anthonomus annulipes Fisher was described from Puerto Rico (1888-488), and listed by Dr. Gundlach, but has not been identified from local material since.

Anthonomus dentipennis Chevrolat, the type from Puerto Rico (1876-cexxviii), probably collected by Dr. Gundlach, was listed by him with *A. krugi* Fisher (1888-487) in synonymy. Weevils doubtfully identified by

Mr. A. J. Mutchler as being this species were collected by Dr. Stuart T. Danforth at Boquerón.

Anthonomus costulatus Suffrian, described from Cuba and found also in southern Florida, has been repeatedly intercepted on guava: at Adjuntas, Aibonito and Río Piedras, as identified by Mr. L. L. Buchanan.

Anthonomus flavus Boheman, the type from Guadeloupe, was identified by Mr. L. L. Buchanan as being the minute grey weevil reared by Mr. A. G. Harley at Mayagüez from the bright red cherries of *Malpighia glabra*. To what are presumably identical specimens, swept from foliage of the West Indian cherry, *Malpighia punicifolia* L., at Río Piedras, he gives only the generic name. The injury produced by the development of the immature stages of this weevil in the fruit resembles that caused by the plum curculio: a crescentric russeting scar on the skin and puckering of the flesh underneath. Oviposition has not been observed, but the maggot confines its feeding to one area, and the pupa is formed in a chamber close to the seed. The first indication of transformation to adult is the conspicuous blackening of the eyes.

Anthonomus nigrovariegatus Fisher, the type from Puerto Rico (1888-488), probably collected by Dr. Gundlach, has not since been identified.

Besides these named species of *Anthonomus* known to occur in Puerto Rico, extensive interceptions, especially by Mr. R. G. Oakley in the Ponce region, have accumulated material in the U. S. National Museum of which Mr. L. L. Buchanan recognizes eighteen undescribed species. Apparently none is of economic importance, and none has been noted on cotton. The Mexican cotton boll weevil, *Anthonomus grandis* Boheman, found also in Central America, the southern United States, Cuba, and most recently in many sections of Haiti, is unknown to date in Puerto Rico.

Weevils intercepted by Mr. R. G. Oakley on flowers of "guácima" (*Guazuma ulmifolia*) at Ponce, and on flowers of the coffee shade tree (*Inga laurina*) at Adjuntas, were identified by Mr. L. L. Buchanan as a species of *Neomastix*.

Piazorrhinus sp. was the identification by Mr. L. L. Buchanan of weevils intercepted by Mr. R. G. Oakley at Ponce and Yauco.

A species of *Tychius* was listed by Dr. Alex. Wetmore as having been eaten by the cliff swallow.

Weevils intercepted at Ponce by Mr. R. G. Oakley on flowers of "escambrón" (*Randia mitis*) and of an "acacia" (*Senegalia*) were identified by Mr. L. L. Buchanan as a species of *Sibinia*, others from Ponce and Aibonito as a species of *Pyropus*, and some from *Ocotea* fruit at Adjuntas as a *Conotrachelus*.

Chalcodermus ebeninus Boheman is an entirely black, deeply punctured weevil first found on cowpeas at Río Piedras in 1912 by Mr. Thos. H.

Jones, of which identification was made by Dr. E. A. Schwarz. It was listed by Mr. R. H. Van Zwaluwenburg (1513), but this refers to the Río Piedras record, and the insect seems to be localized, normally not abundant, yet at times so numerous that half the cowpeas will be infested of those harvested from a single field. Because of its normal scarcity, no precautions are taken to prevent infestations of succeeding crops, and ordinarily none is necessary.

Chalcoedermus pupillatus Suffrian is a Cuban weevil first reported from Puerto Rico by Dr. Alex. Wetmore, having been found by him eaten by the mozambique. Dr. Stuart T. Danforth found it eaten by the pewee, and he had numerous specimens, as determined by Mr. A. J. Mutchler, collected at Mayagüez, Boquerón, Cabo Rojo, Yauco and Cartagena Lagoon. A weevil intercepted by Mr. R. G. Oakley on cotton at Ponce was identified by Mr. L. L. Buchanan as being a different species of *Chalcoedermus* from either of these two named species.

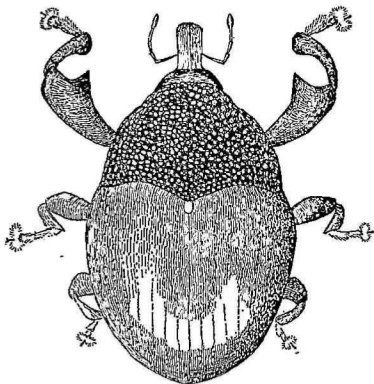
A species of *Rhyssomatus* was reported by Dr. Alex. Wetmore as being eaten by cuckoos and the ani, and specimens were intercepted on *Peirania* at Ponce by Mr. R. G. Oakley.

Neftarhinus mannerheimi was described by Francis P. Pascoe (1844-30) from Puerto Rico.

Pseudomopsis cucubano sp. nov., is oval, yellowish fawn to dark brown, length 5.0 mm. width 3.0 mm. Beak somewhat curved, shining, reddish brown, tending to become scaly and roughened towards the base (as is the head), in repose sunk deep in pectoral groove extending into the metasternum; antennae slender, elbowed, the scape as long as segments two and three combined, club elongate oval, the segmentation not marked. Eyes contiguous in front, coarsely faceted, in repose apparently subtriangular, partly covered behind. Circular light grey scales thickly, evenly but with no systematic arrangement cover the dark brown prothorax, wider than long but not as wide as elytra. Scutellum light grey, small but prominent. Elytra oval, narrowed towards base, yellowish fawn, irregularly darker towards margins; intervals 1 to 5 with whitish postmedian bands forming a crescent, broadest towards points. Intervals level, striae distinct, punctures near base as far apart as width of intervals, closer approaching apex. The first ventral segment of the abdomen most widely separates the coxae of the hind legs, its width equal to that of the next three combined and somewhat more than that of the fifth, all with light grey scales except apex of fifth, pygidium not exposed. Front femora prominently toothed. Described from six adults, reared from infested seeds of "cucubano" (*Coccoloba laurifolia*) or "ortegón" (*Coccoloba borinquensis*) at Garrochales (Arecibo), collected December 16, 1943 by Mr. José Marrero, the adults beginning to emerge from the seeds about March 20,

1944; generic determination by Mr. L. L. Buchanan, P. R. Acc. No. 112-44, other specimens in the U. S. National Museum intercepted by Mr. R. G. Oakley on *Coccoloba laurifolia* at Yauco and Ponce, not seen in preparing the description.

Pseudomus militaris, described as a *Rhynchaenus* by A. G. Olivier ("Entomologie" V. No. 83, p. 145. Paris, 1807), the type from Puerto Rico, has not since been collected, but weevils of this genus, as identified by Mr. L. L. Buchanan, have been collected on El Yunque by Dr. Luis F. Martorell, and intercepted by Mr. R. G. Oakley on decaying palms and



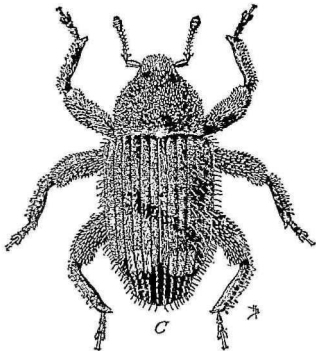
The Cucubano Seed Weevil, *Pseudomopsis cucubano* sp. nov., fifteen times natural size. (Drawn by G. N. Wolcott, original.)

on dead wood in the mountains back of Ponce, at Indiera, Guayanilla, Adjuntas and Villalba. These are comparatively large weevils, 7 to 8 mm. long, black and deeply punctured, with conspicuous whitish areas posteriorly on the elytra, and smaller ones elsewhere.

Euscapes porcella, described by Carl H. Boheman in Schönherr's "Genera et Sp. Curculionidum" (4 (1): 430. Paris, 1844), the type from Puerto Rico, has an extensive distribution in the West Indies, Central America, Mexico and southern Florida, where it is found "common beneath decaying stems of the water hyacinth next to the water's edge". It has been little collected in Puerto Rico except by birds, Dr. Alex. Wetmore having found it in the stomach contents of the cliff swallow, vireo, redstart,

ovenbird, three warblers, the honey creeper, yellow-shouldered blackbird, oriole, mozambique and grasshopper sparrow. According to Blatchley & Leng (1916-189), it is "brown, densely clothed with dark brown and clay-yellow scales, the latter covering the basal and apical thirds of elytra".

Euscepes postfasciata Fairmaire, much better known under the name of *bataatae* Waterhouse, under which it was re-described a year later, is the "scarabee" of sweet potatoes in the British Islands. It is by far the most serious pest of sweet potatoes in Barbados, and in some of the other Lesser Antilles, but in Puerto Rico is of minor importance by comparison with the "piche" (*Cylas formicarius*). First recorded from Puerto Rico by Van



The "Scarabee," *Euscepes postfasciata* Fairmaire, fourteen times natural size. (Drawn by Harry Bradford.)

Zwaluwenburg in his list (926) at Mayagüez on sweet potatoes and pomelo rind, it has most often since been noted in the Mayagüez region, with individual records from Arecibo, Río Piedras and Guayanilla. Mrs. Raquel Dexter found it eaten by the Surinam toad, but Dr. Wetmore found it eaten by no bird, and apparently it is too rare to be eaten by them or by lizards. It is readily distinguished from *Euscepes porcella* by the light colored scales being limited to a rectangular area of three intervals on the posterior third of the elytra.

In studying the "Birds of the Cartagena Lagoon" (Jour. Dept. Agr. P. R., 10 (1): 1-136, fig. 45, ref. 41. San Juan, January 1931), Dr. Stuart T. Danforth includes in the grass association a leguminous herbaceous

shrub: "sesbania" (*Sesban emerus*), which is attacked by a weevil, *Tylo-derma* sp. Despite its importance in his studies, for these weevils form a more or less appreciable factor in the food of sandpipers, the killdeer, ani, kingbird, yellow-shouldered blackbird, waterthrush and parula warbler, it has never been more exactly identified, the indefatigable Mr. Oakley never intercepted it in recent years, and Dr. Wetmore does not report it as forming an item of food for the birds that he collected.

As this weevil appears to be still unnamed and undescribed, I am calling it *danforthi*, describing it from material loaned by Prof. J. A. Ramos, collected January 1935 at Cartagena Lagoon by Mr. V. Biaggi. Of uniform size, 5.0 mm. long and 2.2 mm. wide, it is larger than any species of *Tylo-derma* from the eastern United States except *foveolata* Say, which varies in size from 3 to 5.8 mm., and is otherwise quite distinct, listed by Mr. W. S. Blatchley and Dr. C. W. Leng (1916-491) from Florida, "in stems of the evening primrose." All mature specimens are dark reddish-brown, highly polished above, below dull; thorax impunctate but with scattered silvery hairs, plump pear-shaped, much longer than wide, rounded in front, widest a third of the distance from the base, concavely constricted above forelegs and behind eyes, slightly so even on vertex; elytra becoming parallel and straight at sides before base, sparsely and unevenly pubescent, evenly and deeply punctate, appearing furrowed on disc and towards apex.

Gasterocercus richteri Fischer, the type from Puerto Rico (1888-154), has not since been found.

Coelosternus armipes Boheman, known also from St. Vincent and Guadeloupe, is "A Little-Known Root-Weevil of Cassava (*Coelosternus sulcatus* Boheman)" (Jour. Dept. Agr. P. R., 14 (3): 159-163, fig. 1, pl. 3. San Juan, August 1930) which Dr. M. D. Leonard found at Comerío and on which he made life-history studies. More recently it has been found at Río Piedras, but in such small numbers that economically it is of negligible importance.

Numerous collections have been made of weevils belonging to the genus *Cryptorrhynchus* of which individuals vary so much in size and markings that no specific names have been assigned to them. One species is reasonably common on bark of coffee shade trees in the mountains, and possibly represents a single species.

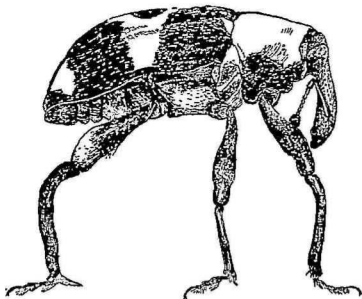
Lechriops psidii, described by Sir Guy A. K. Marshall (1922-69), the type from Puerto Rico, 2.0 mm. long, 0.9 mm. wide, is reddish-brown, densely covered with white, buff or yellowish brown scales. Reared from mummied guava fruit, it is one reason why *Psidium guajava* yields so little marketable fruit in Puerto Rico, for this little weevil occurs everywhere in the Island that guava bushes grow.

A weevil intercepted by Mr. R. G. Oakley in dead bark at Guánica was

determined by Mr. L. L. Buchanan as a species of *Copturus*, and one on "guácima" (*Guazuma ulmifolia*) at Boquerón as a species of *Tachygonus*.

Hypurus near *bertrandi* Perris is the redetermination by Mr. L. L. Buchanan of weevils reared by Mr. Thos. J. Jones from larvae mining in the leaves of portulaca, which Dr. E. A. Schwarz had originally identified as a new species of *Hypocoeliodes*. Mr. R. G. Oakley recently intercepted adults in the seed pods of a weed at Ponce.

Auleutes inspersus Champion was the determination by Sir Guy A. K. Marshall of weevils which Dr. Stuart T. Danforth found on *Jussiaea* at Mayagüez in October 1932, and had earlier found at Cartagena Lagoon,



Peridinetus signatus Rosenschold, six times natural size.
(Drawn by G. N. Wolcott.)

Caguas and at Las Marías. Numerous other beetles of this genus and possibly this species have been intercepted on a variety of other hosts.

"Allied to *Auleutes* and more closely so to *Hypocoeliodes*, but differing from both by the huge eyes, the more slender, subcylindrical, feebly-sculptured rostrum which rises abruptly from the head" is *Panophthalmus* "A New Genus and four new species of West Indian Curculionidae" (Mem. Soc. Cubana Hist. Natural, 10 (3): 145-152. Habana, 1936) erected by Mr. L. L. Buchanan to include *Panophthalmus puertoricanus*, of which the type was intercepted by Mr. R. G. Oakley, at Juana Díaz. It is 2.3 mm. long, 1.68 mm. wide, its dark "body clothed with minute, fuscous and golden subrecumbent hairs and setae and white scales; pronotum with large, medio-basal patch of scales; elytra with a transversely rectangular patch of scales and other scattered spots".

Peridinetus concentricus Olivier (1844-207), *Peridinetus maculatus* Rosenschoeld (1837-471) and *Peridinetus signatus* Rosenschoeld (1837-472) are names all of which presumably refer to the same distinctively marked beetle, which makes round holes in the leaves of "higuillo" (*Piper* spp.) and of which the larvae bore in the stems of the same host plants. It occurs in all the more humid regions of the Island where the host plants grow, as well as in Hispaniola and Cuba. In tropical South America, the same or similar hosts are to be noted with identical round holes in their leaves, eaten by adults varying only in degree of yellowish shading from the more sharply marked species of the West Indies. Chevrolat gives Olivier's name, but Dr. Gundlach lists this in synonymy with *signatus*; and *maculatus* separately. If *maculatus* is a distinct species in Puerto Rico, no specimen has been identified from here since the type collection. Dr. Stahl lists only *signatus*, and this is in Van Zwaluwenburg's list (P. R. 36): on *Piper peltatum*. Despite the comparative abundance of the beetles, there are no records of their being eaten by birds, lizards or the toad, but their escape may be due to their retiring habits, certainly not because of their conspicuous coloration.

Baris torquata Olivier, described as a *Rhynchaenus*, the type from Puerto Rico (1807-145), is a somewhat smaller but even more conspicuous weevil of shining black with extensive areas of dense white scales. Listed by Chevrolat and Drs. Gundlach and Stahl, it was noted by Dr. Wetmore as eaten by the cliff swallow and the mozambique, and it has since been found eaten by the crested lizard, *Anolis cristatellus*. Dr. Richard T. Cotton calls it (1918-300) the "Eggplant Stem Borer: a pest of both wild and cultivated eggplant. The adult feeds on foliage, the female lays small, white, oval eggs in a crescentic slit in the stem; the larva bores in stem and branches". It occurs only in Puerto Rico, but has been noted on its specific hosts in all parts of the Island.

Geraeus montanus sp. nov. Rhomboidal, convex. Black, with oval areas of dense white scales near base of elytra covering intervals 2 to 7; smaller, narrower transverse area two-thirds towards apex on intervals 3, 4 and 5; most conspicuously scaled also on apical half of episternum; prosternum, lateral margins of 3d and 4th abdominal segments and legs grey with less dense whitish scaling. Beak, large, stout, black, one-third length of body, curving at angle of 45° at middle; head impunctate, shining; eyes, large, dull black, not contiguous. Thorax closely and finely punctate, one-third wider than long. Elytra oval, with humeral angles distant from base, elytron three times as long as wide, deeply striate and closely punctate, intervals convex. Length, 2.7 mm.; width 1.2 mm.

Described from numerous adults on flowers of "botoncillo" (*Borreria verticillata*) at Barros (Matrullas Dam), October 10, 1939, which Mr. L.

L. Buchanan placed in the genus *Geraeus* and stated to be the same as others intercepted by Mr. R. G. Oakley at Villalba previously identified as a species of *Centrinus*. On May 1, 1940, Dr. Donald De Leon and Dr. Luis F. Martorell found additional specimens (and other weevils) on the flowers of "inmortal" (*Helichrysum bracteatum*) at Doña Juana Camp, Villalba, but these and those collected by Mr. Oakley at Villalba were not seen in preparing this description.

Diorymerellus politus Chevrolat (1880-307), with priority over *D. obliteratus* Champion (1908-252), the identification by Sir Guy A. K. Marshall of the first specimens sent from Puerto Rico, is an entirely black and very shiny weevil first found in the flower bracts of orchids on El Yunque and subsequently becoming a pest of vanilla of sufficient importance to merit notice in the Mayagüez Station Report for 1938 (p. 119).

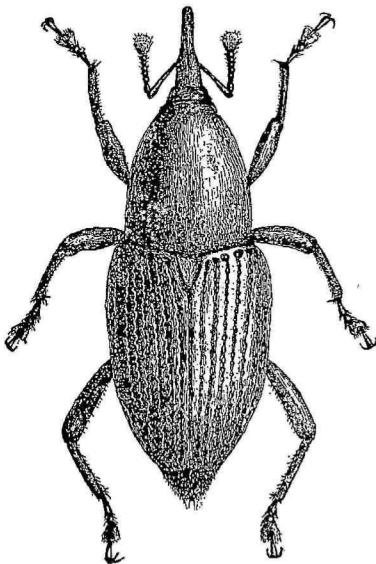
Anacentrinus sp. was the determination by Mr. L. L. Buchanan of weevils taken from the flowers of wild parsnip at Cayey in 1939.

Zygocharis sp. was the determination by Mr. L. L. Buchanan of weevils intercepted by Mr. R. G. Oakley on *Matayba*; those on pomarrosa at Ponce and on flowers of *Senegalia* at Ponce, represent two distinct species of *Catapastus*.

Ampeloglypter cissi was the name given by Sir Guy A. K. Marshall (1922-70) to some little Puerto Rican weevils with the "color uniform dark steel-blue above, the head, rostrum and lower surface blue black; length 2.0 mm.", found feeding on tender shoots of wild grape (*Cissus sicyoides*) at Río Piedras, July 5, 1921. A few individuals have been noted at Río Piedras in succeeding years, but never in such abundance as at the time of the type collection.

Metamasius hemipterus Linnaeus was first recorded from Puerto Rico under the name *Sphenophorus sericeus* Latreille by Dr. Stahl, by Dr. Gundlach with the note "en los troncos muertos de plátano (*Musa*)", and by Mr. Aug. Buseck (1908-89) as *Sphenophorus sexguttatus* Drury, injuring sugar-cane. In Van Zwaluwenburg's list (305) it is given as a pest in sugar-cane, coconut palm and *Lantana* sp. The rotten stalk borer of sugar-cane, or "el gorgojo de la caña podrida", is noted by Mr. D. L. Van Dine in all his accounts of the insects of sugar-cane as not a serious pest. Mr. E. G. Smyth (1919-142) in addition records it in "dead or injured palm trunks; in banana trunks, more rarely, with the adults sometimes attacking the fruit". It is a comparatively common insect, often coming to rest in an automobile, or noted in flight. Adults often alight on the sunny gallery of the agronomy building of the Experiment Station at Río Piedras. Dr. Wetmore found that the adults formed over 5% of the stomach contents of the mozambique and the kingbird, and smaller fractions of the food of the pechary, ani, oriole and yellow-shouldered blackbird, and Mrs. Raquel

Dexter that they are eaten by the Surinam toad. The Green Muscardine fungus, *Metarrhizium anisopliae*, also attacks the adults, as noted by Mr. J. A. Stevenson (1918-22), but is a comparatively minor factor in control. Field rats are of decisive importance in determining the abundance of this weevil, for the female normally lays her eggs in injured cane stalks that have been eaten by rats, and but rarely in such a minor injury as the

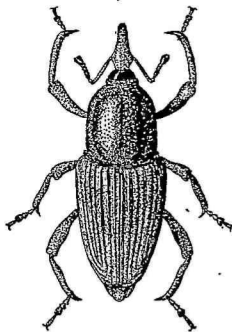


The Rotten Stalk Borer of Sugar-Cane, *Metamasius hemipterus* Linnaeus, eight times natural size. (Drawn by Francisco Seín.)

emergence tunnel of *Diatraea saccharalis*. As soon as the larvae have begun their development, the rotting cane stalk acquires a distinctive odor of acetic acid which becomes ever more pronounced as more of the stalk is infested. The larvae feed on the pith of cane, and when fully grown, wind about their bodies the long uneaten fibers to form a most characteristic pupal covering. All stages of development are often to be found present

in a single stalk, the lightly colored adults, half an inch long remaining within their pupal wrappings until they become fully darkened: black streaked with dark chestnut. Exceptionally, larvae may occur also in the stems of live banana plants, and adults feed on many kinds of decaying juicy vegetation, such as rotten fruits of mamey, papaya, mango, maga, guava and pineapple. The insect occurs in all parts of Puerto Rico, as well as in most of the Lesser Antilles and much of tropical South America.

Calendra pertinax Olivier, reported as a *Sphenophorus* ("IB" 1936-316), is based on a single specimen found crawling on a cane railroad track, March 1, 1924, near Carolina.

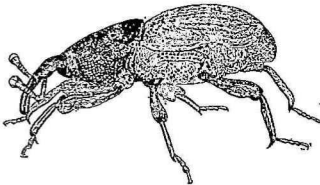


The Banana Corm Weevil, *Cosmopolites sordida* Germar, four times natural size. (Drawn by Fritz Maximilien.)

Calendra venustus Say, reported first by Mrs. Raquel Dexter (1932-5) as a *Sphenophorus* eaten by the Surinam toad, has also been collected at Mayagüez and Maricao by Dr. Stuart T. Danforth, identifications having been made of his material by Mr. A. J. Mutchler. This corn bill-bug or "elephant bug" has also been found in Cuba, and in the States "ranges from Maine to Wisconsin, south to Florida and Texas, common along the seashore of New Jersey" and often "taken beneath seaweed on the Gulf beach".

Cosmopolites sordida Germar, the banana corm weevil, was first noted in Bo. Malvilla, Vega Alta, in December 1921, but by early in 1922, it was found at Corozal, and in Bo. Cupey and at the Experiment Station at Río Piedras. Adults were identified by Sir Guy A. K. Marshall, who warned of the potential danger and recommended eradication if that were

still possible. The habits of adult and larva attacking the corm of live banana plants was ample indication of the advent of a new and serious pest, first known from the East Indies, and brought by man in infested corms to many of the countries of tropical America and Guadeloupe and Dominica of the Lesser Antilles. To date, this pest of bananas and plantains does not occur in Hispaniola, Cuba and Jamaica, naturally making the cost of production less in these islands than it is in Puerto Rico. Within the next few years after its first discovery at Vega Alta, it had spread to all the banana growing regions of the Island, Dr. Stuart T. Danforth having an abundance of specimens before 1930 from Mayagüez, Cabo Rojo, Yauco and generally in the mountainous areas of central and western Puerto Rico. Superficially, the legless grubs are indistinguishable from those of *Metamasius hemipterus*, which may at times occur in the still living portions of



The Banana Corm Weevil, *Cosmopolites sordida* Germar, four times natural size. (Drawn by Francisco Sefn.)

the stalks of bananas, but normally lives only in decaying or rotting tissue, while the grubs of *Cosmopolites* are in living corms. The entirely black adults are readily attracted to slices of corms placed in infested groves, as are also to some extent the adults of the striped *Metamasius*, and by persistent collecting from freshly cut corms one may greatly reduce infestation. It is impossible, however, by such means to entirely eliminate infestation, and even the exceptional grower can not be induced to maintain collections when few adults are taken from his traps. Mr. Francisco Sefn, experimenting with "Paring and Heat Sterilization of the Corms to Eliminate the Banana Root Weevil" (Jour. Agr. Univ. P. R., 18 (3): 411-16, pl. 1, fig. 2, ref. 2. Río Piedras, October 27, 1934), proved that placing the corms near a fire or submerging them in boiling water for a few minutes will not kill either eggs or larvae, but paring the corms eliminates the eggs and indicates the presence of the grubs in their tunnels. Such pared corms are very susceptible to reinfestation, and must be planted the same day in land not previously infested. Corms for planting may be freed from all stages of the weevil, without the bother and uncertainty of paring, and

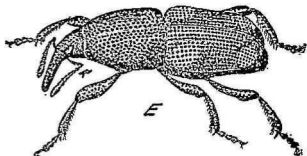
with no damage to the corm, by heat sterilization at 43°C. for EIGHT hours in a circulating atmosphere saturated with moisture. Such a sterilizer is somewhat expensive to construct, and can be used to advantage only by large growers, but its use avoids all danger of careless inspection, or not paring deep enough to eliminate all the weevils. Circular No. 103: "Para Combatir el Gorgojo del Plátano—Método de Mondar la Semilla" (Est. Expt. Agrícola, pp. 5-11, pl. 1, fig. 2. Río Piedras, November 24, 1934) proved so popular that the entire edition of 2,000 copies was distributed in less than three weeks, and this method of control has proved so effective in practise that the growing of bananas and plantains is still possible everywhere in Puerto Rico that farmers have adopted these recommendations.

The accidental introduction of *Cosmopolites sordida* occurred after the investigations on the food of birds and of lizards had been completed. Collections from corms were being made at the Río Piedras Station, however, when lizards were being reared there, and the adults were supplied to *Anolis cristatellus* in large numbers. The crested lizards ate the hard black weevils in considerable numbers, at first, but a steady and exclusive diet of them caused constipation, promptly relieved when other, softer and more readily digested insects were supplied. Mrs. Raquel Dexter found that adults are eaten by the Surinam toad, and presumably some terrestrial birds also feed on them. In Java, a Histerid predator, *Plaesius javanus* Erichson, attacks the immature stages of *Cosmopolites* in their tunnels in the corms, and, as related in the Mayagüez Station Report for 1938 (p. 101), adults of this beetle were imported from Fiji. In captivity in Puerto Rico, the adult Histerids fed on both larvae and pupae of *Cosmopolites*, but no trace has since been found of those released in a banana grove at Adjuntas. Indeed, when search was being made for these introduced beetles, a native earwig, the variety *gagathina* Burmeister of *Carcinophora americana* (P. de B.), was found in the tunnels, and in captivity fed on the larvae of the weevil. The practical banana or plantain grower can not depend upon any of these factors in natural control, or all of them combined, but must use the methods devised by Mr. Seín if he is to continue producing a commercially profitable crop.

Sitophilus linearis Herbst, originally described from St. Barthélemy, was first reported from Puerto Rico by Dr. Gundlach, that it "come las semillas del tamarindo". So far as known, the seeds of the tamarind (*Tamarindus indica*) are the only host, and the weevils infest the seeds in most of the countries where this tree has been introduced. They occur in all parts of Puerto Rico, sometimes in such abundance as to form an item in the food of the crested lizard, *Anolis cristatellus*.

Sitophilus oryzae Linnaeus is a cosmopolitan pest of rice, noted in Puerto

Rico by Drs. Stahl and Gundlach, the latter adding "muy dañina por la destrucción de los granos del maíz". Besides causing enormous damage to its normal hosts of corn and rice, it has been found in a seed of "mamey" (*Mammea americana*) at Isabela, resting under dead bark of "bucare" (*Erythrina poeppigiana*) at Cayey, and intercepted at San Juan in dry chick peas, in flame root and on tomato fruit, and at Carolina and Utuado in dry herbs. In international commerce, this weevil is imported and exported as an adult and in immature stages in its hosts, the record from Mona Island presumably due to the food supplies brought to that Island. Mr. O. W. Barrett (1905-396) at Mayagüez noted parasitism by *Pteromalus calandrae* Howard, and Dr. Wetmore reported finding this distinctively four-spotted weevil eaten by Latimer's vireo, both of which are insignificant factors in natural control. Mr. H. K. Plank, trying to find cheap, practical and simple methods for "The Control of Storage Insects in Corn Seed" (Jour. Ec., 39 (3): 314-19, fig. 1, ref. 8. Menasha, June 1946) notes that



The Rice Weevil, *Sitophilus oryzae* Linnaeus, ten times natural size. (After Cotton.)

"rolling the partly dry seed ears in hydrated lime gave the most satisfactory results" in maintaining viability and preventing attack by the rice weevil. In three or four days after harvest, the corn grains have dried sufficiently so that the lime, one part to forty parts of grain by weight, may be applied, the protection against attack thus afforded being better than when other dusts with known fungicidal properties are used, or the grain is fumigated with carbon bisulfide.

Nanus uniformis Boheman (in Schönherr), which Dr. Gundlach noted "se encuentra frecuentemente en la parte interior de una llagua de Palma real fresca", has subsequently been intercepted by Mr. R. G. Oakley in the pollen of a royal palm at Ponce.

The weevils intercepted by Mr. R. G. Oakley in rotten wood at Aibonito were identified by Mr. L. L. Buchanan as a species of *Micromimus*.

Cossonus canaliculatus Fabricius, first recorded by Leng & Mutchler from Puerto Rico, is a small black weevil which has recently been found under bark and chips of wood of "almácigo" (*Bursera simaruba*) at Salinas.

It occurs also in Trinidad, northern South America, Central America and Mexico, and of it *Cossonus vulneratus* Illiger is a synonym.

Cossonus impressus Boheman is the determination by Mr. A. J. Muchler of weevils collected on Mona Island for the American Museum of Natural History and listed in a "Supplement to Preliminary List of the Coleoptera of the West Indies" (Bull. Amer. Mus. Nat. Hist., 37 (5): 191-220. New York, February 13, 1917) by Dr. Charles W. Leng and Mr. Mutchler. Specimens collected by Dr. Stuart T. Danforth at Aibonito were thus identified by Mr. Mutchler, and Mr. L. L. Buchanan gave this determination to material intercepted in rotten wood by Mr. R. G. Oakley at Ponce and Aibonito.

Caulophilus latinasus Say was first reported from Puerto Rico by Dr. F. H. Chittenden as the "Broad-Nosed Grain Weevil" (Bur. Ent. Bull. #96, pt. 2, pp. 19-24. Washington, D. C., March 31, 1911) when on "February 3, 1899, living beetles were found in equal numbers with the rice weevil in shelled corn and chick-peas (garbanzos) purchased in a store by Mr. August Busck at Arroyo, Porto Rico". Dr. Alex. Wetmore found it eaten by the honey creeper, since which time it has not been recorded here. Indeed, it is doubtful if it is established in Puerto Rico at the present time.