

## A LIST OF THE COCCIDAE OF PORTO RICO.

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From time to time various entomological workers have published references to the *Coccidae* of Porto Rico, but the list of twenty-three species collected on the island in 1899 by Mr. August Busck is, so far as known to the writer, the only attempt ever made to enumerate the Porto Rican scale-insects. This list appeared in 1900 in Bulletin No. 22, new series, of the Division of Entomology, United States Department of Agriculture, the determinations having been made by Messrs. T. Pergande, T. D. A. Cockerell, and C. L. Marlatt. In connection with this list it is stated that only one coccid, *Aspidiotus destructor*, had been previously recorded from Porto Rico, this being in a reference in the *Canadian Entomologist* for 1895, the material having been taken by Mr. J. D. Hall in the city of San Juan.

Some of the *Coccidae* of the island, especially those attacking citrus trees, are referred to somewhat fully in the publications of the Porto Rico Agricultural Experiment Station. In these articles Messrs O. W. Barrett and W. V. Tower have treated the greatest number of species and given the most extended economic accounts.

Much attention has been given to the parasitic fungi attacking the scale-insects of citrus trees by the workers of the Porto Rico Insular Experiment Station. They have recommended the planting of windbreaks in orchard areas to furnish suitable conditions for the development of these fungi, which under favorable circumstances become very efficient enemies of the scale-insects. Mr. J. R. Johnston published in 1915 a bulletin on the entomogenous fungi of the island, and in it made several references to those attacking *Coccidae*. The insect parasites and predators of Porto Rican scale-insects have, on the other hand, received but little attention. Messrs. O. W. Barrett, F. S. Earle, and D. L. Van Dine mention parasites of *Lepidosaphes beckii*, *Saissetia hemisphaerica*, and *Aspidiotus sacchari*, respectively, but do not give their scientific names. Apparently the only insect enemies of the scale-insects specifically recorded from Porto Rico are *Aspidiotiphagus citrinus* and *Cocci-*

*doxenus portoricensis*. The former is mentioned in the following statement by Mr. E. K. Carnes, which appeared in the Monthly Bulletin of the State Commission of Horticulture of California, Vol. 1, No. 8, page 398. In connection with data on the introduction of beneficial insects into California, Mr. Carnes states: "From Prof. C. W. Hooker, Mayagüez, Porto Rico. First shipment: *Lepidosaphes beckii*, *Chrysomphalus aonidum*. *Aspidiotiphagus citrinus* issued in considerable numbers. Second shipment: same material. Very few *A. citrinus* issued." *Coccidoxenus portoricensis* was described by Mr. J. C. Crawford from "the wax scale," collected in San Juan by Mr. Tower.<sup>1</sup>

This scarcity of references would indicate—considering what has already been published on the scale-insects of the island—that this group has few insect enemies in Porto Rico. This, however, is not the case, parasitism of many species being common.

In the present paper the idea has been to list all the species previously recorded from the island, with the locality, host-plant, the name of the writer, and a reference to the publication from which the data is taken. Added to this are the names of the species not heretofore recorded from Porto Rico, as well as new host-plants and localities for those already known to be present. No attempt has been made to include those species mentioned by other writers by genus or common names only, and where no more definite locality than "West Indies," with reference to any species, is given in a publication, that species has been omitted. While no endeavor has been made to summarize what has already been done on the island on the life-histories of the various species, natural and artificial methods of control, etc., I believe the bibliography is quite complete and the reader will find much of interest in the publications mentioned.

The data now presented for the first time are taken from the notes and specimens in the collection formerly belonging to the Experiment Station of the Porto Rico Sugar Producers' Association, and now at the Experiment Station of the Board of Commissioners of Agriculture of Porto Rico. All of the specimens have been examined by Mr. E. R. Sasser, formerly of the United States Bureau of Entomology, and now with the Federal Horticultural Board. The writer wishes especially to thank Mr. Sasser for his kindness in making the determinations and reading over the manuscript. Without his assistance the publication of this list would not have been possible. I wish also to thank Mr. D. L. Van Dine, formerly

<sup>1</sup> Descriptions of New Hymenoptera, No. 6, No. 1979. From Proc. U. S. Nat. Mus. Vol. 45, pp. 241-260. May 23, 1913. pp. 248-249.

Entomologist of the Experiment Station of the Porto Rico Sugar Producers' Association, and Mr. J. R. Johnston, formerly Plant Pathologist of the same station. Both have collected a number of species and Mr. Johnston has made the determinations of many of the host-plants: Since the time of my leaving Porto Rico my successor, Mr. G. N. Wolcott, has added some data to the list. Mr. R. T. Cotton of the same station, and Mr. R. H. Van Zwaluwenburg, Entomologist of the Porto Rico Agricultural Experiment Station at Mayagüez, have also added a number of new records from recent determinations.

The system that has been followed in making up the bibliography may be explained as follows: After each reference to records of other writers in the text, one or more numbers will be found in parentheses. The first number refers to the number preceding the author's name in the "Bibliography," found at the end of the list. The number, or the numbers, that may follow the first number indicates the page, or pages, on which the particular reference will be found.

In preparing the list Mrs. Fernald's catalogue of the *Coccidae* of the world has been followed. Special effort has been made to give the correct Latin names of the host-plants with the heretofore unpublished notes. The local Spanish common names of plants, given in quotations, are from the "Flora Portoricensis," by Professor Ignatius Urban, and the paper by Cook and Collins, "Economic Plants of Porto Rico," published by the Smithsonian Institution.

#### SUBFAMILY *Monophlebinae*.

##### *Icerya montserratensis* Riley and Howard.

Mr. Busck collected it in 1899 "on orange, Mayagüez, January 20," and on the same host at Bayamón. (2-92.) Mr. Tower recorded it in 1908 on the orange. (16-38.) Taken at Santurce (near San Juan) on twigs and undersides of leaves of an undetermined tree; at Río Piedras on the undersides of leaves of "caimito," *Chrysophyllum argenteum* Jasq., and at Mayagüez on "maricao" (*Byrsonima spicata*), *Casearia sylvestris*, coconut palm (*Cocos nucifera*), "guamá" (*Inga laurina*), "guava" (*Inga vera*), "saman" (*Pithecolobium saman*), and guava or "guayaba" (*Psidium guajava*).

#### SUBFAMILY *Ortheziinae*.

##### *Orthezia insignis* Dougl.

Collected on an undetermined plant at Dorado, on *Eupatorium*

*odoratum* at Comerío, on *Gignonia* sp. and *Ipomoea tiliacea* at Río Piedras, and on *Coleus* sp., *Hamelia patens*, *Ipomoea fastigiata*, *Lactuca* sp. and *Lantana camara* at Mayagüez.

SUBFAMILY *Conchaspinae*.

*Conchaspis angraeci* Ckll.

Found on branches of an ornamental croton (*Codiaeum* sp.), in garden at Mameyes.

SUBFAMILY *Dactylopiinae*.

*Asterolecanium aureum* Bdv.

Taken by Mr. Busck on the leaves of "a fiber plant" in San Juan in 1899. (2-92.)

*Asterolecanium bambusae* Bdv.

Collected by Mr. Busck "on bamboo" at Bayamón and at Utuado. (2-92.) The writer has taken it on bamboo at Río Piedras.

*Asterolecanium lanceolatum* Green.

Taken on leaves of bamboo at Río Piedras.

*Asterolecanium pustulans* (Ckll.)

Mr. Busck took this species "on *Anona muricata*" at San Juan and "on some leguminous plant" at Guayama. (2-92.) Mr. Barrett reported it in 1904 on the fig (*Ficus carica*) at the Mayagüez Experiment Station (1-446) and Mrs. Fernald records it from Porto Rico. (6-52.) It has been found on "escoba" (*Sida antillensis*) and "jazmín" (*Jasminum sambac*) at Río Piedras by the writer, and on *Grevillea robusta*, *Castilloa* sp., and *Inga vera* at Mayagüez.

*Phenacoccus gossypii* Towns. and Ckll.

Collected "on cotton," Humacao, by Mr. Busck. Following the data there is the note, "New to the West Indies." (2-92.) In 1902 Mr. H. Maxwell-Lefrey, in an article on scale-insects of the West Indies, gave "Porto Rico" after *Phenacoccus helianthi* var. *gossypii*. (14-298.)

*Pseudococcus calceolariae* (Mask.).

Mr. E. E. Green, the well-known authority on *Coccidae*, after examining specimens of sugar-cane mealy-bugs sent him from Río

Piedras, stated that they "agreed exactly with examples of *Pseudococcus calceolariae* Mask.," his determination being based "upon comparison with typical examples received from the late Mr. Maskell himself." (12-461.) Mr. Johnston records the fungus, *Aspergillus flavus*, as occurring on this mealy-bug in Porto Rico. (11-14.)

*Pseudococcus citri* (Risso.).

Mr. Barrett mentioned this mealy-bug (as *Dactylopius citri*) in 1904 as an enemy of citrus stock with the note, "is not common." (1-445.) Mr. Tower has published concerning it as a pineapple pest (20) and Dr. C. W. Hooker mentioned its occurrence in coffee plantations. (10-35, 37.)<sup>1</sup>

I have taken specimens of a mealy-bug, which Mr. Sasser states is close to *Pseudococcus citri*, on the roots of three plants at Río Piedras. They were as follows: celery (*Apium graveolens*), corn or "maíz" (*Zea mays*), and a grass, probably *Sporobolus jacquemontii*.

*Pseudococcus nipae* (Mask.).

This is probably the most omniverous mealy-bug on the island. It has been collected as follows: on coconut palm (*Cocos nucifera*), Santurce; on guava or "guayaba" (*Psidium guajava*), on *Anthurium acaule*, on sour-sop or "guanábano" (*Anona muricata*), on "caimito" (*Chrysophyllum argenteum*), and on *Musa paradisiaca* var.,<sup>2</sup> Río Piedras; on sea grape or "uvero" (*Coccoloba uvifera*) and on "aguacate" (*Persea gratissima*) at Naguabo.

According to Mr. Johnston, the fungi, *Cephalosporium lecanii* and *Empusa fresenii*, occur on this mealy-bug. (11-19, 21.)

*Pseudococcus sacchari* (Ckll.).

Mealy-bugs are important pests of sugar cane in Porto Rico and practically all previous references regarding them are listed under this species. Listed as *Dactylopius sacchari*, it was taken by Mr. Busck "on sugar cane" at Bayamón, Mayagüez, and at Humacao in 1899 (2-92), and it is recorded by Mrs. Fernald from Porto Rico. (6-109.) Mr. Van Dine published references to its occurrence on

<sup>1</sup> Doctor Hooker stated that the ant, *Myrmelachista ambigua ramulorum* Wheeler, feeds on the honey-dew secreted by this mealy-bug. What is more interesting, however, is the accompanying statement made by Doctor Hooker, regarding the connection between this ant and "a large, fleshy, pink scale of the subfamily Coccinae, probably as yet undescribed." He observed that these Coccids "are carried by the ants into canals eaten out along the pith of the smaller new growth which will bear the next season's fruit. The growth is thus weakened to such an extent that when bent down by the pickers at the next harvest it breaks easily." Much of the coffee is thus lost.

<sup>2</sup> I have not tried to distinguish between the varieties of *Musa paradisiaca*, commonly known in English as bananas and plantains and in Spanish as "guineos" and "plátanos."

the island in 1911 (21-18, 29), 1912 (22-19, 20), and 1913 (23-251, 252, 253, 255, 256). (24-31.)

Dr. E. P. Felt has described a cecidomyiid, *Karschomyia cocci* (5-304), the larvae of which were taken by Mr. Van Dine in colonies of *Pseudococcus sacchari* (?) on sugar cane.

*Chaetococcus bambusae* (Mask.).

Collected on "Bamboo" at Mayagüez.

SUBFAMILY Coccinae.

*Pulvinaria psidii* Mask.

This species is often very abundant on the "jobo" tree. Mr. Tower reported it on orange and coffee. (16-38.)

We have taken it as follows: On mango (*Mangifera indica*), Río Piedras; on guava or "guayaba" (*Psidium guajava*), Río Piedras and Luquillo; on hog plum or "jobo" (*Spondias lutea*), Arroyo and Río Piedras; on a tree, *Rauwolfia tetraphylla*, Ponce.

*Ceroplastes ceriferus* (Anderson).

Collected on "almacigo" (*Elaphrium simaruba*) at Santa Rita, near Guánica, and on "yerba de San Martín" (*Sauvagesia erecta*) at Naguabo.

*Ceroplastes cirripediformis* Comst.

Found on an undetermined plant at Algarrobo.

*Ceroplastes floridensis* Comst.

Taken by Mr. Busck "on *Anona reticulata*." (2-92.) Mr. Barrett records it in 1904 as an enemy of citrus stock (1-445) and Mr. Tower in 1908 reported it "on the rose and orange." (16-38.) It has also been taken on *Rapanea guianensis* and *Ficus laevigata* at Río Piedras and on guava or "guayaba" (*Psidium guajava*) and mango (*Mangifera indica*) at Mayagüez.

*Vinsonia stellifera* (Westw.).

This interesting scale, the so-called "star-scale," is often present on the leaves of the rose apple, mango, and coconut. Mr. Busck took it on the latter host at "Catana" (probably a misspelling of Cataño) and Arroyo. (2-92.) Later, in 1904, it is mentioned by Mr. Barrett as occurring "commonly on the coconut" (1-447), and

the following statement by the same author may refer to this species, "An undetermined scale (*Vinsonia*?) occurs on the rose apple (*Jambos jambos*)."

 (1-446.)

It has further been taken as follows: On coconut palm (*Cocos nucifera*) Santurce; on "pomarrosa" or rose apple (*Jambos jambos*), Río Piedras and Mameyes; on mango (*Mangifera indica*), Santa Isabel; on *Agave sisalana*, *Musa* sp. and on guava or "guayaba" (*Psidium guajava*) at Mayagüez.

*Inglisia vitrea* Ckll.

On West Indian pigeon pea or "gandul" (*Cajanus indicus*) at Mameyes and at Comerío; on "achiote" (*Bixa orellana*) at Río Piedras.

*Coccus hesperidum* (Linn.).

Collected on "maguey" (*Agave sisalana*), at Río Piedras.

*Coccus mangiferae* (Green).

Collected on leaves of "pomarrosa" or rose apple (*Jambos jambos*) at Río Piedras; on mango (*Mangifera indica*) and *Cinnamomum zeylanicum* at Mayagüez. A fungus (*Cephalosporium lecanii*) is mentioned by Mr. Johnston as being common on this scale. (11-19.)

*Saissetia hemisphaerica* (Targ.).

A very comon species. Mr. Busck took it in 1899 as follows, the species being recorded as *Lecanium hemisphaericum*: "On eggplant, Catana, January 10." (2-92.) Mr. Barrett records it (as *Lecanium hemisphaericum*) on coffee, on "guanábano" (*Anona muricata*), on cassava, and states that it is "probably the most common scale on the orange here." (1-444, 445, 446, 447.) In the same year, 1904, Mr. Earle reported this species (as *Lecanium hemisphaericum*) as occurring on the orange and also wrote that a "Lecanium (probably *L. hemisphaericum*) is also at times abundant and destructive" to coffee. (4-458, 459, 463.) In 1906 Mr. van Leenhoff, Jr., mentioned *Saissetia hemisphaerica* as an enemy of coffee. (25-46.) Mr. Tower wrote of its injuries to citrus trees in 1907 (15-26), 1908 (16-32), 1909 (17-23) and 1911 (19-15). The writer has recorded it from eggplant. (13-4.)

The following records are to be added: On "jasmin" (*Gardenia jasminoides*), the introduced pepper tree (*Schinus molle*), rose apple or "pomarrosa" (*Jambos jambos*), a cultivated shrub (*Graptophyllum pictum*), and alligator pear or "aguacate" (*Persea gratia*).

*sima*), Río piedras; on "marunguey" (*Zamia integrifolia*), Vega Alta; on *Sida* sp., on black nightshade or "mata-gallinas" (*Solanum nigrum* var. *americanum*), and on guava or "guayaba" (*Psidium guajava*), Luquillo; on coffee or "café" (*Coffea arabica*), and *Thunbergia erecta*, Mameyes; on "orozuz" or "pascueta" (*Leptilon canadense*), Ciales; on *Rauwolfia tetraphylla*, Ponce; on *Antigonon leptopus*, *Drypetes glauca*, and *Solanum seaforthianum* at Mayagüez.

Mr. Johnston records a fungus (*Cephalosporium lecanii*) as occurring on this scale. (11-19.)

*Saissetia nigra* (Nietn.).

Taken by Mr. Busek in 1899 as follows, being recorded as *Lecanium nigrum*: "On *Terminalia catappa*, San Juan, January 5. On cotton, San Juan, January 5 (var. *depressum* Targ.)." (2-92.) In Mrs. Fernald's catalogue this species is recorded from Porto Rico. (6-204, 205.)

Collected in addition as follows: On "anamú" or "cadillo pequeque" (*Pavonia typhalea*), Canóvanas; on cotton or "algodón" (*Gossypium barbadense*), Guánica; on China berry or "lilaila" (*Melia azedarach*), Fortuna (near Ponce); on the introduced pepper tree (*Schinus molle*), Río Piedras; on black nightshade or "mata-gallinas" or "yerba móra" (*Solanum nigrum* var. *americanum*), on *Sida* sp., and on China berry (*Melia azedarach*), Luquillo; on *Euphorbia sanguinea* at Mayagüez.

Doctor Howard has determined as *Arrhenophagus chinonaspidis* Auriv. a parasite reared from material on which *Saissetia nigra* and *Hemichionaspis minor* were present.

*Saissetia oleae* (Bern.).

In 1899 Mr. Busek took this species "on Calabassa tree, Lares, January 25. On honey locust, Adjuntas, January 30. On *Guazuma ulmifolia*, Guayama, February 4. On *Terminalia catappa*, Mayagüez, January 20." The genus is given as *Lecanium*. (2-92.)

Mr. Johnston collected *Saissetia oleae* on "madre de cacao" (*Erythrina glauca*) at Río Piedras, and it has been taken by the writer on "almendra" (*Terminalia catappa*) at Guánica. It has also been taken on orange oleander (*Nerium oleander*) and "berengena cimarrona" (*Solanum torvum*) at Mayagüez.

*Aclerda tokionis* (Ckll.).

Collected on stalk of sugar cane at Río Piedras.



SUBFAMILY *Diaspinae*.

*Chionaspis citri* Comst.

This species is one of the most injurious scale-insect pests of the citrus groves in Porto Rico. It was collected by Mr. Busck in 1899 "on lime" at Añasco (2-93) and is probably generally distributed over the island. It has been treated by Messrs. Barrett (1-445), Henricksen (8-27) and Tower (17-24, 25) (19-14, 15) in various publications of the Porto Rico Agricultural Experiment Station as an enemy of citrus trees.

Doctor Howard has determined a parasite reared by the writer from *Chionaspis citri* as *Aspidiotiphagus citrinus* (Craw.).

*Howardia biclavis* (Comst.).

Collected by Mr. Busck "on *Bixa orellana*" at San Sebastián and Añasco. (2-93.) I have taken it on the same host, which is known as "achiote," "achote," and "annato," at Río Piedras, and in addition it has been collected as follows: On "caimito" (*Chrysophyllum cainito*), and "mamey" (*Mammea americana*), Mameyes; on "algarrobo" (*Hymenaea courbaril*), on *Casearia arborea*, on silver oak, an introduced tree (*Grevillea robusta*), and on West Indian pigeon pea or "gandul" (*Cajanus indicus*), Río Piedras; on "palo de cucubano" (*Guettarda scabra*) and *Cordia* sp., Dorado; on "roble" (*Tecoma pentaphylla*) and *Acalypha wilkesiana* at Naguabo; on sapodilla or "níspero" (*Achras sapota*), *Coffea arabica*, *Doryalis cafra*, and *Plumiera rubra* at Mayagüez.

*Diaspis echinocacti* (Bouché.).

Mrs. Fernald records this species from Porto Rico. As food-plants in the various countries, where it occurs, the following are given: *Opuntia ficus-indica*, *Echinocactus ottonis*, *E. tenuispinus*, etc. (6-229, 230.) Mr. Busck lists *Diaspis calyptroides* Costa var. *opuntiae* Ckll. as having been collected at Ponce. (2-93.)

*Aulacaspis pentagona* (Targ.).

As is true elsewhere where it occurs, this coccid has a long list of food-plants in Porto Rico. Among cultivated plants the "papaya" or papaw suffers especially from its attacks.

In 1899 Mr. Busck took it "on castor-oil plant, Río Piedros (perhaps a misspelling of Río Piedras), January 17. On unknown tree, Bayamón, January 16. On peach, Adjunctas (probably Ad-

juntas), January 24. On honey locust, January 30. On mahagua, Fajardo, February 17." (2-93.) Mr. Earle in 1904 reported that it "occurs very commonly on the orange, as well as on various other trees and plants" (4-458) and that a scale, probably this species, was "killing a great many of the (papaw) trees." (4-467.) Mr. Barrett in the same year wrote, "very destructive to peach trees in the east part of the island; this species also attacks mulberry and papaw." (1-446.) In 1907 Mr. Tower stated, "very abundant all over the island, infesting peach, plum, mulberry, papaw, castor bean and other plants." (15-27.) The writer has recorded it from okra and pepper. (13-4.)

It has also been taken as follows: On willow (*Salix* sp.), Ponce; on "bruja" (*Bryophyllum pinnatum?*), Comerío; on "papaya" (*Carica papaya*), on West Indian pigeon pea or "gandul" (*Cajanus indicus*), Río Piedras; on "majagua" (*Paritium tiliaceum*), Mameyes; on "cadillo" (*Urena lobata*), Dorado; on castor bean or "higuerete" (*Ricinus communis*), Ciales; on "mamey" (*Mammea americana*) at Naguabo; on okra, *Hyptis* sp., *Solanum torrum*, *Trema micrantha*, and *Acalypha wilkesiana* at Río Piedras; on *Mangifera indica*, *Erythrina* sp. and oleander (*Nerium oleander*) at Mayagüez; on "emajagua" (*Paritium tiliaceum*), Adjuntas, and on cassava (*Manihot utilissima*) at Añasco.

*Hemichionaspis aspidistrae* (Sign.).

Collected on leaves of fern (*Nephrolepis exaltata* var. *bostoniensis*), at Río Piedras.

*Hemichionaspis minor* (Mask.).

A common species, sometimes found in company with *Saissetia nigra* (Nietn.), and *S. hemisphaerica* (Targ.). Taken by Mr. Busck "on eggplant, Catana, January 17. On *Guazuma ulmifolia*, Guayama, February 4" in 1899, being listed as *Chionaspis* (*Hemichionaspis*) *minor*. (2-93.) The writer has also recorded it from eggplant. (13-4.)

It has been taken as follows: On cotton or "algodón" (*Gossypium barbadense*), Guánica; on China berry or "lilaila" (*Melia azedarach*), Fortuna (near Ponce); on "yerba rosario" (*Aeschynomene sensitiva*) and ornamental croton (*Codiaeum* sp.), Naguabo; on "verbena" (*Valerianodes jamaicensis*), Río Piedras; on "berengena cimarrona" (*Solanum torrum*) and "cadillo" (*Triumfetta semitri-loba*), Luquillo; on *Lantana involucrata* at Mameyes; on *Asparagus spengleri* and "saman" (*Pithecolobium saman*) at Mayagüez.

Doctor Howard has determined as *Arrhenophagus chionaspidis* a parasite reared from material on which *Hemichionaspis minor* and *Saissetia nigra* were present.

*Pinnaspis buxi* (Bouché.).

Collected on leaves of a tree epiphyte belonging to the family *Bromeliaceae* at Mameyes; on *Philodendron* sp., Ciales; on "co-rozo" palm (*Acrocomia media*) and another palm (*Areca lutescens*) at Río Piedras.

*Leucaspis indica* Mar.

Collected on mango (*Mangifera indica*) at Mayagüez.

*Aspidiotus cyanophylli* Sign.

On a blue gum (*Eucalyptus* sp.) at Naguabo.

*Aspidiotus destructor* Sign.

Apparently the first scale-insect recorded from Porto Rico, this species is very common, especially on the undersides of the leaves of coconut palms. It is often so abundant on the older leaves of these palms that they turn yellow and die. It was first recorded in the Canadian Entomologist for 1895, page 261, by Mr. T. D. A. Cockerell, the specimens having been collected in San Juan by Mr. J. D. Hall. Mr. Busck took it "on banana leaves" at "Catana," and on the same host at San Juan and Arroyo. (2-93.) Mr. Barrett in 1904 stated that at Ponce many of the coconut trees were "dead or dying from attacks" of this coccid. (1-447.)

Mr. Van Dine collected *Aspidiotus destructor* from coconut palm (*Cocos nucifera*) at Santurce, and it has further been collected as follows: On silk oak (*Grevillea robusta*), on guava or "guayaba" (*Psidium guajava*), on *Musa paradisiaca* var., Río Piedras; on alligator pear or "aguacate" (*Persea gratissima*), Mameyes and Guayama; alligator apple (*Anona palustris*) and *Mammea americana*, Río Piedras; and on date palm (*Phoenix dactylifera*), Mayagüez.

Dr. Howard has examined a parasite reared from this scale by the writer and states that it "is apparently my *Aphedinus diaspidis*."

*Aspidiotus forbesi* Johnson.

Listed by Mrs. Fernald as occurring in Porto Rico and fifteen food-plants are given for the species in the countries where it is

known to occur. With the possible exception of "Jasmine," no tropical plants are included in the list. (6-259, 260.)

*Aspidiotus lataniae* Sign.

Collected on *Castilla* sp. at Mayagüez.

*Aspidiotus sacchari* Ckll.

Mentioned by Mr. Van Dine in 1911 (21-19, 31), 1912 (22-22) and 1913 (23-251, 257) (24-34) as occurring on sugar cane. It is a common but not serious enemy of this host. Mr. Van Dine has collected it at Guánica, Fortuna (near Ponce), Fajardo, and Canóvanas, and in addition it has been collected at Río Piedras and Humacao, all collections having been made from sugar cane. According to Mr. Hood, Mr. Sasser stated that it occurred with *Odonaspis* sp. which I took on the stalks of para grass or "malojillo" (*Panicum barbinode*) at Guánica. (9-70.)

*Pseudaonidia tesserata* (de Charm.).

From garden rose at Mameyes.

*Selanaspidus articulatus* (Morg.).

Collected by Mr. Busck "on orange leaves, El Yunque, February 18; about 2,000 feet altitude" in 1899. (2-93.) Has been mentioned by Mr. Barrett (1-445) and Mr. Tower (16-38) as an enemy of citrus trees. Mr. Tower, in 1909, stated that "*Pseudaonidia articulatus*" was "causing a little trouble" as an orange pest. (17-25.)

Taken by the writer on rose apple or "pomarrosa" (*Jambos jambos*) leaves at Río Piedras and on a blue gum (*Eucalyptus* sp.) at Naguabo. It has also been taken on *Anona muricata* and *Ficus nitida*, at Río Piedras.

*Chrysomphalus aonidum* (Linn.).

A serious enemy of citrus trees. In the publications of the Porto Rico Agricultural Experiment Station its occurrence on the island, fungi parasitic to it, and methods for its control have been discussed by Messrs. Earle (as *Aspidiotus ficus*) (4-459), Barrett (1-445), Henriksen (as *Chrysomphalus ficus*) (8-27) and Tower. (15-25, 26) (16-32) (17-24) (19-14, 15.) With the exception of the last reference, Mr. Tower mentions this scale as *Chrysomphalus ficus*.

It was collected by Mr. Busck in 1899 on *Terminalia catappa*, San Juan; on *Anona muricata*, San Juan; on oleander, Ponce; and

on *Musa*, Caguas. (2-93.) Mr. Carnes mentions having received it from Porto Rico. (3-398.) It has also been taken on *Ficus nitida* at Río Piedras and an sisal hemp (*Agava sisalana*) at Mayagüez.

*Chrysomphalus aurantii* (Mask.).

Mr. Busck took this species in 1899 "on *Anona muricata*, San Juan," and on the same host at Ponce. (2-93.) In 1904 M. Barrett reported it as an enemy of citrus stock, with the note, "rare but apparently spreading." (1-445.)

*Chrysomphalus biformis* (Ckll.).

On "maya" (*Bromelia pinguin*) at Mameyes; on *Agave sisalana* and "aguacate" at Río Piedras; on mango (*Mangifera indica*), Río Piedras, and on a cycad (*Cycas revoluta*), at Naguabo.

*Chrysomphalus dictyospermi* (Morg.).

On mango (*Mangifera indica*), at Río Piedras, and on a cycad (*Cycas revoluta*), at Naguabo.

*Chrysomphalus personatus* (Comst.).

Mr. Busck collected it "on plantain leaves, Caguas, January 11. On *Anona muricata*, San Juan, January 5. On banana leaves, Cātana, February 21. On coconut palm, Mayagües, January 20; Caguas, January 11." (2-93.) On coconut palm (*Cocos nucifera*), Santurce; on rose apple or "pomarrosa" (*Jambos jambos*), Río Piedras; on mango (*Mangifera indica*), Santa Isabel; on leaves of a tree (*Ficus* sp.) and on "mamey" (*Mammea americana*), Mameyes; and on a blue gum (*Eucalyptus* sp.) at Naguabo.

*Pseudischnaspis bowreyi* (Ckll.).

Collected on asparagus fern at Mayagüez.

*Pseudoparlatoria ostreata* Ckll.

Collected on *Solanum seaforthianum* and *Acalypha* sp. at Mayagüez.

*Lepidosaphes beckii* (Newm.).

This species has been more often mentioned as a pest of citrus orchards than any other scale-insect. The following workers have discussed it in the bulletins and annual reports of the Porto Rico

Agricultural Experiment Station: Messrs. Earle (4-457, 458), Barrett (1-445), Henricksen (7-401, 402) (8-27) and Tower (15-26) (16-32, 33) (17-23, 24) (18-24, 25) (19-13, 15). In Messrs. Earle's and Barrett's articles and in the first article by Mr. Henricksen the species is given as *Mytilaspis citricola*. Mr. Carnes, of California, mentions having received *Lepidosaphes beckii* in shipments of material from Porto Rico, from which it was hoped to introduce scale-insect parasites into that State. (3-398.) Mr. Johnson records the fungi, *Myriangium duriaei* and *Sphaerostilbe coccophila*, from this scale. (11-28, 29.)

The species was taken on ornamental croton (*Codiaeum* sp.) at Río Piedras by the writer.

*Lepidosaphes lasianthi* (Green).

Collected on leaves of croton (*Croton humilis*) at Río Piedras.

*Ischnaspis longirostris* (Sign.).

Taken by Mr. Busck "on coconut palm, Caguas, January 11; Catania (probably misspelling for Cataño), January 12; Mayagüez, January 20; Arroyo, February 3." (2-93.) Taken by the writer at Naguabo on *Citharexylum fruticosum*. It has also been taken on *Ixora ferrea*, *Asparagus spengleri* and *Acrocomia media* at Río Piedras.

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