

LIST OF THE INSECT AND MITE PESTS OF SUGAR CANE IN PORTO RICO.¹

By E. GRAYWOOD SMYTH.

I. ACARINA.

1. *Oligonychus viridis?* (family Tetranychidæ).

COMMON NAME: Sugar-cane red-spider.

DAMAGE: Attacks leaves, especially undersides, causing white marks by extraction of chlorophyll.

DISTRIBUTION: Probably entire Island.

FOOD PLANTS: Sugar cane and grasses.

ENEMIES: A Cecidomyid fly; a Coccinellid and a Staphylinid beetle; and *Franklinothrips vespiformis*.

CONTROL: Dusting or spraying with sulphur mixtures; heavy infestation uncommon, hence spraying unnecessary.

2. *Uropodus* sp. (undetermined) (family Uropodidæ).

COMMON NAME: Sugar-cane root mite.

DAMAGE: Eats into, severs, and sometimes tunnels the roots. Damage sometimes serious.

DISTRIBUTION: North coast; possibly entire Island.

FOOD PLANTS: Sugar cane; other hosts not observed.

ENEMIES: None thus far recorded.

CONTROL: Crop rotation; maintenance of vigorous growth.

3. *Tarsonemus spinipes* Hirst (family Tarsonemidæ).

COMMON NAME: Sugar-cane rust mite.

DAMAGE: Forms flat, rusty-brown blisters on stem and leaf sheathes.

DISTRIBUTION: Entire Island; other West Indies.

FOOD PLANTS: Sugar cane; no others known.

ENEMIES: None recorded.

CONTROL: Dipping seed in lime-sulphur solution, or other strong disinfectant; clean cultivation between crops.

¹This list includes all the insects that have been found repeatedly feeding upon the cane plant, *Saccharum officinarum*, though a considerable number of them have not been found breeding on cane. Lack of time has prevented the making or securing of accurate determinations in many cases. Distribution and food plants, of species occurring also in other localities, have been taken from such sources as were available. The author acknowledges having made free use of previous lists published by Messrs. Van Dine and Jones, former entomologists of this Station. There are twenty-six species in the present list which have not been previously recorded to the writer's knowledge as attacking sugar cane in Porto Rico.

The orders have been arranged according to Brues and Melander, the families according to Banks in the Acarina, Scudder in the Orthoptera, Blatchley and Leng in the Coleoptera, Dyer in the Lepidoptera, and Van Duzee in the Homoptera.

II. ORTHOPTERA.

4. *Schistocera pallens* Thunb. family Acrididæ).
 COMMON NAME: Larger field grasshopper.
 DAMAGE: Nymphs and adults attack foliage.
 DISTRIBUTION: South coast; other West Indies; South America.
 FOOD PLANTS: Sugar cane, field crops, grass, etc.
 ENEMIES: Animal—Birds; mongoose; lizards; tree frogs.
 Arthropod—Tarantula; centipede; Bombyiid fly; certain wasps; a Cicindellid (*Tetracha*).
 Fungus—Possibly *Botrytis rileyi*.
 CONTROL: Use of poison baits; night collection with lanterns; arsenical sprays on foliage where live stock do not have access.
5. *Schistocerca columbina* Brunn. (family Acrididæ).
 COMMON NAME: Common field grasshopper.
 DAMAGE: Attacks foliage, eating edges of leaves.
 DISTRIBUTION: Entire Island; other West Indies; Central and South America.
 FOOD PLANTS: Sugar cane, grass, and many crops.
 ENEMIES: Same as those of preceding species.
 CONTROL: Same as for preceding.
6. *Plectrotettix (Scyllina) gregarius* Walk. (fam. Acrididæ).
 COMMON NAME: Green-back grasshopper.
 DAMAGE: Attacks foliage; may become injurious when very abundant.
 DISTRIBUTION: Entire Island; St. Thomas; Haiti.
 FOOD PLANTS: All tender green vegetation.
 ENEMIES: The same as those of *Schistocerca*.
 CONTROL: By use of poison baits, or arsenical spraying.
7. *Sphingonotus haitensis* Sauss. (family Acrididæ).
 COMMON NAME: Dusky ground grasshopper.
 DAMAGE: Eats foliage, especially of young cane.
 DISTRIBUTION: Porto Rico; Haiti; Cuba; Mexico.
 FOOD PLANTS: Any vegetation growing close to ground.
 ENEMIES: Same as of those preceding.
 CONTROL: By use of poison baits.
8. *Neoconcephalus (Conocephalus) mexicanus* Sauss. (family Tettigoniidæ).
 COMMON NAME: Green cone-headed katydid.
 DAMAGE: Attacks foliage; splits leaf in laying eggs.
 DISTRIBUTION: Greater Antilles; southern U. S.; Mexico; Central and South America.
 FOOD PLANTS: Sugar cane; grasses; many crops and trees.
 ENEMIES: Animal—Mongoose; birds; lizards; tree frogs.
 Arthropod—Centipede; large spiders; wasps.
 Fungus—None recorded.
 CONTROL: Arsenical sprays; trap lights at night.

9. *Neoconocephalus cinereus* Thunb. (family Tettigoniidæ).
 COMMON NAME: Brown cone-headed katydid.
 DAMAGE: Both nymph and adult eat foliage.
 DISTRIBUTION: Porto Rico; Jamaica.
 FOOD PLANTS: Sugar cane and other vegetation.
 ENEMIES: Same as those of *N. mexicanus*.
 CONTROL: Arsenical sprays and trap lights.
10. *Microcentrum triangulatum* Brunn. (family Tettigoniidæ).
 COMMON NAME: Broad-winged katydid.
 DAMAGE: Eats the foliage; less common on cane than two preceding species.
 DISTRIBUTION: Porto Rico; St. Thomas; Guadeloupe.
 FOOD PLANTS: Sugar cane; citrus; many other crops.
 ENEMIES: Same as those of preceding.
 CONTROL: Arsenical sprays and trap lights.
11. *Cyrtoxiphus gundlachi* Sauss. (family Gryllidæ).
 COMMON NAME: Little green tree-cricket.
 DAMAGE: Always present on foliage; extent of injury not known. Eats the parenchyma of leaf, apparently.
 DISTRIBUTION: Porto Rico; Cuba; Jamaica; southern U. S.; Mexico; St. Vincent; Nicaragua; Brazil.
 FOOD PLANTS: Sugar cane; citrus; banana; most crops.
 ENEMIES: Birds, lizards, tree-frogs, spiders and predacious bugs. No parasites yet recorded.
 CONTROL: Amenable to contact sprays.
12. *Orocharis vaginalis* Sauss. (family Gryllidæ).
 COMMON NAME: Brown tree-cricket.
 DAMAGE: Conceals in terminal leaf coil and injures tender foliage.
 DISTRIBUTION: Porto Rico; Santo Domingo; Cuba.
 FOOD PLANTS: Sugar cane, citrus, and other crops.
 ENEMIES: Same as of preceding species.
 CONTROL: Light traps; arsenicals applied to foliage.
13. *Scapteriscus vicinus* Scud. (family Gryllotalpidæ).
 COMMON NAME: *Changa*, or mole-cricket.
 DAMAGE: Attacks roots and buds; damage very severe in sandy soils.
 DISTRIBUTION: Greater and Lesser Antilles; south-eastern United States; Central and South America.
 FOOD PLANTS: Sugar cane; lawn grass; all cultivated crops.
 ENEMIES: Animal—Birds; lizards, especially the ground lizard, *Ameiva exul*; the mangoose.
 Arthropod—Tarantula; centipede; the fire-ant; a wasp (*Garrinæ*); *Tetracha infuscata*.
 Fungus—None known.
 CONTROL: Poison baits (Paris green and flour; phosphorus and corn meal; white arsenic, molasses and dry manure); trap lights; protection of ground lizard; sprinkling ground with strong soap solution; planting cane with part of eyes above ground.

III. THYSANOPTERA.

14. *Frankliniella* sp. (family Thripidae).
 COMMON NAME: Yellow cane thrips.
 DAMAGE: Works and breeds between coiled terminal leaves, scarifying leaf surface. Suspected of transmitting the mottling disease.
 DISTRIBUTION: Abundant on south coast, less so on north side of Island.
 FOOD PLANTS: Sugar cane; possibly some wild grasses.
 ENEMIES: Predacious bug, near Triphleps; probably also Coccinellids, and predacious thrips.
 CONTROL: Spraying with contact poisons; covering young plants, before attack, with bunting cloth; clean cultivation between crops.
15. *Haplothrips* (?) *tibialis* Hood. ? (family Thripidae).
 COMMON NAME: Black cane thrips.
 DAMAGE: Works and breeds near tips of leaves of young cane, causing some spotting. Damage not severe.
 DISTRIBUTION: North coast, so far as recorded.
 FOOD PLANTS: Sugar cane and grasses.
 ENEMIES: *Franklinothrips vespiformis*.
 CONTROL: Not sufficiently injurious to require control.
16. *Podothrips semiflavus* Hood. (family Thripidae?).
 COMMON NAME: Thrips.
 DAMAGE: Works between leaves; collected by T. H. Jones.
 DISTRIBUTION: Recorded from south coast of Island.
 FOOD PLANTS: Sugar cane and Para grass.
 ENEMIES: None recorded.
 CONTROL: Not required.

IV. ISOPTERA.

17. *Eutermes morio* Lath. (family Termitidae).
 COMMON NAME: Termite, white-ant, or "comején."
 DAMAGE: Sometimes riddles the seed-cane in the soil. Rarely attacks standing cane.
 DISTRIBUTION: Entire Island.
 FOOD PLANTS: Partly dry cane stalks; bark of trees; dead wood; timbers.
 ENEMIES: Lizards; birds (eat the flying form); bats; no others observed.
 CONTROL: London purple or white arsenic powder on nest; kerosene; coal-tar creosote and kerosene; mercury bichlorid dissolved in water; white arsenic and washing soda boiled together, mixed with distillate; fumigation.

V. HYMENOPTERA.

18. *Solenopsis geminata* Fabr. (family Formicidae).
 COMMON NAME: Fire-ant, or "hormiga brava."

DAMAGE: Injures cane indirectly by sheltering mealybugs and aphids from their enemies; also a menace to cane cutters. Causes lesions where fungi may enter.

DISTRIBUTION: Practically entire Western Hemisphere, in warmer climates.

FOOD PLANTS: No direct injury to cane, but injures citrus, cowpeas, egg-plants, banana trees, etc.

ENEMIES: None recorded.

CONTROL: Spraying with kerosene emulsion recommended; crop rotation and clean cultivation best means. London purple can be sprinkled on ant hills.

VI. COLEOPTERA.

19. *Apate francisca* Fab. (family Bostrychidæ).

COMMON NAME: Rough-headed stem borer.

DAMAGE: Riddles the standing stalks (rarely).

DISTRIBUTION: Entire Island.

FOOD PLANTS: Coffee, citrus, mahogany, flamboyant, china-berry, *Salix humboldtiana*, Casuariana, Picramnia, Prosopis, gaudule bean and sugar cane.

ENEMIES: Birds and lizards; no insect enemies recorded.

CONTROL: Drop carbon bisulphide into burrow and plug entrance; extirpate and burn infested plants.

20. *Phyllophaga vandinei* Smyth (Scarabæidæ).

COMMON NAME: Sugar-cane white-grub (May beetle; "ca-culo").

DAMAGE: Larvæ eat roots to great extent; costs one sugar "central" over a thousand dollars per annum to control.

DISTRIBUTION: Western third of Island.

FOOD PLANTS: Grubs eat all roots; adults nearly all foliage.

ENEMIES: Animal—Blackbirds; other birds; mongoose; the larger lizards; chickens; hogs; rats and mice. Arthropod—Centipede; tarantula; larger spiders; *changa* (of eggs and larva); Scoliid wasps(?); larva of Pyrophorus; 2 Tachinid flies.

Fungus—*Metarrhizium anisopliae*.

Bacterial—*Micrococcus nigrofaciens*.

CONTROL: Night collection of adults from foliage, or by shaking from trees and bushes onto sheets, and collection of grubs at plowing; protection of blackbirds by banding palm trees against rats; introduction of toads and skunks.

21. *Phyllophaga portoricensis* Smyth (family Scarabæidæ).

COMMON NAME: Common white-grub.

DAMAGE: Grubs attack the roots; adults do injury to foliage when abundant.

DISTRIBUTION: Eastern two-thirds of Island; Vieques.

FOOD PLANTS: Roots of all crops; foliage of many plants, especially flamboyant, palms, and banana trees.

ENEMIES: The same as those of *P. vandinei*.

CONTROL: Same as for preceding species.

22. *Phyllophaga guanicana* Smyth (family Scarabæidæ).

COMMON NAME: Guánica white-grub.

DAMAGE: Grubs attack roots, adults foliage. Not so injurious as *P. vandinei*.

DISTRIBUTION: Guánica district of the Island.

FOOD PLANTS: Grubs attack all roots, indifferently; adults prefer foliage of certain trees.

ENEMIES: The same as those of *P. vandinei*.

CONTROL: Same as for preceding species.

23. *Phyllophaga citri* Smyth (family Scarabæidæ).

COMMON NAME: Citrus white-grub.

DAMAGE: Grubs attack roots of all crops; adults eat foliage.

DISTRIBUTION: Entire Island except southwest corner; also Vieques.

FOOD PLANTS: Grubs eat roots of all crops; adults prefer foliage of citrus, guava, Acalypha, young palms, and Malvaceæ.

ENEMIES: The same as those of *P. vandinei*.

24. *Phytalus insularis* Smyth (family Scarabæidæ).

COMMON NAME: Little brown May-beetle.

DAMAGE: Attacks cane roots, but seldom to injurious extent.

DISTRIBUTION: Entire Island.

FOOD PLANTS: Grubs probably eat all roots; adults prefer foliage of grass, corn, Lantana, amaranth, and certain shrubs.

ENEMIES: Animal—Same as those of *P. vandinei*.

Arthropod—Same as preceding, with exception of Tachinid flies.

Fungus and bacterial—Same as of *Phyllophaga*.

25. *Dyscinetus (Chalepus) trachypygus* Burm. (family Scarabæidæ).

COMMON NAME: Dull black hard-back (in U. S.; the rice grub).

DAMAGE: Adults injure seed-cane and buds; larvæ bore into underground stalks.

DISTRIBUTION: Greater Antilles; southeastern United States.

FOOD PLANTS: Sugar cane, grasses, and root crops.

ENEMIES: Same as those of May-beetle, except Tachinid flies.

CONTROL: Trap lights; poison baits; clean cultivation.

26. *Dyscinetus barbatus* Fabr. (family Scarabæidæ).

COMMON NAME: Shining black hard-back.

DAMAGE: Adults and larvæ injure the underground stems, when abundant.

DISTRIBUTION: Porto Rico; possibly other Greater Antilles; Barbuda; St. Kitts.

FOOD PLANTS: Sugar cane, grasses and root crops.

ENEMIES: Animal—Same as those of Phyllophaga.

Arthropod—Centipede; tarantula; larger spiders; *changa* (of eggs and larvæ); larva of *Pyrophorus luminosus*; possibly Scoliid wasps.

Fungus—*Metarrhizium anisopliae*.

CONTROL: Trap lights; poison baits; clean cultivation and deep plowing; cultivation of grass land.

27. *Ligyris tumulosus* Burm. (family Scarabæidæ).

COMMON NAME: Brown hard-back.

DAMAGE: Adults injure stem and buds at surface of ground; larvæ bore underground stems.

DISTRIBUTION: Greater Antilles; St. Vincent; Nevis; Guadeloupe; St. Bartholomew; Barbados; Trinidad.

FOOD PLANTS: Sugar cane; grasses; root crops; breeds in decaying organic matter.

ENEMIES: Animal—Birds; bats; mongoose; larger lizards; poultry; hogs; rats and mice.

Arthropod—Centipede and tarantula; larger spiders; *changa*; *Pyrophorus luminosus*; *Campso-meris dorsata*.

Fungus—*Metarrhizium anisopliae*.

CONTROL: Poisoned green manure plowed under; poisoned mash baits; trap lights; avoidance of organic fertilizers; destruction of grubs in manure heaps; frequent and deep cultivation.

28. *Strategus quadriveatus* Beauv. (family Scarabæidæ).

COMMON NAME: Coconut rhinoceros beetle.

DAMAGE: Adults occasionally tunnel stems of standing cane, to such extent that the cane falls over.

DISTRIBUTION: Porto Rico; Santo Domingo; Haiti.

FOOD PLANTS: Adults feed on sugar cane and young palms; larvæ mature in rotting wood.

ENEMIES: Animal—Herons; owls; mongoose; hogs and poultry; rats.

Arthropod—None thus far recorded.

Fungus—Green Muscardine fungus.

CONTROL: Collection in evening by boys with nets; light traps; trash (dead wood) traps for grubs; use of Green Muscardine in trash traps; poison bait.

29. *Strategus titanus* Fabr. (family Scarabæidæ).

COMMON NAME: Sugar-cane rhinoceros beetle.

DAMAGE: Larvæ bore in "cepas" (underground stems) and decrease sap flow.

DISTRIBUTION: Porto Rico; Jamaica; Cuba; Vieques; Virgin Islands.

FOOD PLANTS: Larvæ eat cane stalks, also rotting wood.

ENEMIES: The same as those of *S. quadriveatus*.

CONTROL: Same as for preceding species.

30. *Diabrotica graminea* Balz. (family Chrysomelidæ).

COMMON NAME: Green flower-beetle.

DAMAGE: Adults feed to some extent upon the foliage, and larvæ upon the roots.

DISTRIBUTION: Entire Island.

FOOD PLANTS: Flowers and foliage of many plants, including most vegetables as well as sugar cane.

ENEMIES: Animal—Birds; lizards; tree-frogs.

Arthropod—Spiders; ants; predacious bugs; *changa* (eats the larvæ).

Fungus—None recorded.

CONTROL: Spraying trap crops with arsenicals; sweeping foliage with nets or with tarred frames; shaking beetles from trap crops like okra or Cleome.

31. *Diaprepes spengleri* Linn. (family Curculionidæ).

COMMON NAME: Sugar-cane root-weevil.

DAMAGE: Larvæ bore large roots and bases of stalks; adults eat foliage to some extent.

DISTRIBUTION: Porto Rico; Vieques.

FOOD PLANTS: Sugar cane, citrus, Leguminosæ, Malvaceæ, and many other cultivated crops.

ENEMIES: Animal—Mongoose; birds; lizards; frogs.

Arthropod—Centipede; spiders; *changa* (eats larvæ); fire-ant. No parasites recorded.

Fungus—Metarrhizium.

CONTROL: Shaking from foliage (citrus) onto sheets, then destroying; turning hogs into cane fields at plowing, to consume stubble; poisoning of trap crops with arsenicals; frequent shallow plowing when possible; heavy fertilization of plants.

32. *Metamasius hemipterus* Linn. (family Curculionidæ).

COMMON NAME: Sugar-cane stalk-weevil.

DAMAGE: Larvæ bore and breed in cane stalks.

DISTRIBUTION: Porto Rico; Virgin Islands; Windward Islands; Demerara.

FOOD PLANTS: Sugar cane; dead or injured palm trunks; banana trunks (rarely). Adults sometimes attack fruit.

ENEMIES: Animal—Same as preceding.

Arthropod—Centipede and spiders. No insect enemies recorded, except the fire-ant.

Fungus—Green Muscardine.

CONTROL: Destruction of infested canes; cutting cane close to ground (as beetle breeds abundantly in stubble); destruction of adults by means of trap piles of decayed fruit or peels.

33. *Xyleborus* sp. (possibly *X. perforans* Woll.) (family Ipidæ).

COMMON NAME: Sugar-cane shot-hole borer.

DAMAGE: Perforates standing stalks; also attacks seed cane in the ground.

DISTRIBUTION: Entire Island.

FOOD PLANTS: Sugar cane; no others recorded with certainty.

ENEMIES: Animal—Birds; bats; lizards.

Arthropod—Spiders; predacious bugs; ants.

Fungus—None recorded.

CONTROL: Destruction of infested canes; trap lights; deep planting and prompt planting of seed.

VII. LEPIDOPTERA.

34. *Prenes nero* Fabr. (family Hesperidæ).

COMMON NAME: Sharp-headed cane leaf-roller.

DAMAGE: Attacks foliage of young cane in larval stage.

DISTRIBUTION: Entire Island.

FOOD PLANTS: Sugar cane and grasses.

ENEMIES: Animal—Birds; lizards; frogs.

Arthropod—Ants; predacious bugs; a Braconid wasp.

Plant—A bacterial disease.

CONTROL: Spraying foliage with arsenicals.

35. *Prenes ares* Feld. (family Hesperidæ).

COMMON NAME: Round-headed cane leaf-roller.

DAMAGE: Larva attacks foliage; less common than preceding.

DISTRIBUTION: Entire Island.

FOOD PLANTS: Sugar cane and grasses.

ENEMIES: Same as those of preceding.

CONTROL: Not required.

36. *Atrytone vitellius* Fabr. (family Hesperidæ).

COMMON NAME: Smaller sugar-cane leaf-roller.

DAMAGE: Eats the margins of leaves, and conceals by tying edges of leaf together.

DISTRIBUTION: Entire Island.

FOOD PLANTS: Sugar cane, Sudan grass and wild grasses.

ENEMIES: These have not been studied.

CONTROL: Same as for species of *Prenes*.

37. *Laphygma frugiperda* S. & A. (family Noctuidæ).

COMMON NAME: Southern grass-worm.

DAMAGE: Larvæ attack young cane in terminal bud.

DISTRIBUTION: West Indies; United States; Mexico; Central and South America.

FOOD PLANTS: Sugar cane; corn; grass; vegetables; tomato fruit; truck crops.

ENEMIES: Animal—Birds; lizards; frogs; bats.

Arthropod—Ants, predacious bugs; wasps;

Ophion sp.; *Chelonus* sp.; a Braconid; several Tachinids; *Calosoma alternans*.

Plant—Three fungi, *Botrytis rileyi*, *Empusa sphaerosperma*, and *Cordyceps* sp.

CONTROL: Spraying or dusting with arsenicals; frequent cultivation to destroy pupæ.

38. *Cirphis* (*Heliophila latiuscula*) H. S. (family Noctuidæ).

COMMON NAME: Sugar-cane cutworm.

DAMAGE: Larvæ eat the foliage.

DISTRIBUTION: Entire Island; Santo Domingo.

FOOD PLANTS: Sugar cane, sorghums and grasses.

ENEMIES: Animal—Birds; bats; lizards; frogs.

Arthropod—Ants; predacious bugs; wasps; a Braconid and a Chalcidid; several Tachinids.
Plant—Green fungus, *Botrytis rileyi* and *Cordyceps* sp.

CONTROL: Not required.

39. *Mocis* (*Remigia*) *repanda* Fabr. (family Noctuidæ).

COMMON NAME: Grass looper.

DAMAGE: Larvæ attack foliage of young cane.

DISTRIBUTION: West Indies; eastern U. S.; South America.

FOOD PLANTS: Sugar cane and grasses.

ENEMIES: Animal—Same as of preceding.

Arthropod—Spiders, ants, predacious bugs and wasps; an Ichneumonid; a Braconid; a Tachinid.

Fungus—*Botrytis rileyi* and *Cordyceps* sp.

CONTROL: Not required, as attack to cane is uncommon.

40. *Diatraea saccharalis* Fabr. (family Pyralidæ).

COMMON NAME: Sugar-cane moth stalk-borer.

DAMAGE: Larvæ bore the stalk, weaken plant and reduce sucrose.

DISTRIBUTION: West Indies; southern U. S.; Mexico; Central and South America.

FOOD PLANTS: Sugar cane; corn; sorghum; Paspalum; rice.

ENEMIES: Animal—Same as those of the grass-worm.

Arthropod—Spiders; predacious bugs; a Tachinid fly; egg parasite, *Trichogramma minutum* Riley.

Fungus—*Isaria* (*Cordyceps*) *barberi*.

CONTROL: Prompt and regular uprooting and burning of deadhearts; discontinuance of trash burning; destruction of wild Paspalum grass; selection of seed; deep planting of seed; trap lights.

41. *Pyralid* (undetermined) (family Pyralidæ).

COMMON NAME: Sudan grass leaf-tyer.

DAMAGE: Larvæ have been found attacking cane leaves; damage to cane rare.

DISTRIBUTION: Probably entire Island.

FOOD PLANTS: Sugar cane; Sudan grass; other grasses.

ENEMIES: No parasites yet observed.

CONTROL: None required.

42. *Ereunites* sp. (?) (family Tineidæ).

COMMON NAME: Sugar-cane bud-moth.

DAMAGE: Larvæ bore through buds into stalk; occasionally severe.

DISTRIBUTION: Entire Island.

FOOD PLANTS: Sugar cane; no others recorded.

ENEMIES: No parasites thus far observed.

CONTROL: None yet worked out; seldom required. Time of planting affects the amount of infestation.

VIII. DIPTERA.

43. *Chætopsis* sp. (near *C. anea* Wied.) (family Ortalidæ).

COMMON NAME: Ear-corn maggot.

DAMAGE: Infests tunnels of *Diatraea* in the stalk, also leaf sheaths infested with mealybug, inducing progressive decay.

DISTRIBUTION: Entire Island.

FOOD PLANTS: Sugar cane tissue; worm-infested corn ears; decaying coconut fiber; etc.

ENEMIES: A Cynipid parasite observed; spiders; ants.

CONTROL: None usually required.

44. *Agromyza* sp. (undetermined) (family Agromyzidæ).

COMMON NAME: Cane and grass leaf-miner.

DAMAGE: Rarely mines the leaves of young cane; commonly mines grass leaves.

DISTRIBUTION: Probably entire Island.

FOOD PLANTS: Sugar cane, sorghum and grasses.

ENEMIES: Small Chalcidid wasp attacks larva and a Cynipid the pupa.

CONTROL: None required.

IX. HOMOPTERA.

45. *Cicadella* (*Tettigonia*) *sirena* Stal. (family Cicadellidæ).

COMMON NAME: Red-striped leafhopper.

DAMAGE: Adult and nymph occasionally attack cane; reared from cane.

DISTRIBUTION: Entire Island.

FOOD PLANTS: Sugar cane; citrus; coffee; sesame; garden plants.

ENEMIES: Animal—Birds; lizards; tree frogs.

Insect—*Conocephalus* (*Xiphidion*) sp.; predatory bugs. No parasites yet recorded.

Fungus—None yet recorded.

CONTROL: Not necessary.

46. *Kolla* (*Tettigonia*) *similis* Walk. (subfamily Cicadellinæ).

COMMON NAME: Green sugar-cane leafhopper.

DAMAGE: Sometimes abundant on young cane, but not directly injurious. Might transmit disease.

DISTRIBUTION: Greater Antilles; southeastern U. S.

FOOD PLANTS: Sugar cane; Para grass; some other grasses.

ENEMIES: Animal—Birds, lizards and tree frogs.

Insect—*Xiphidion* (?); *Zelus rubidus*; a Hy-menopterous egg parasite; Attid spiders.

Fungus—None recorded with certainty.

CONTROL: Sweeping grass and young cane with tarred frames; cutting grass near cane fields; crop rotation; introduction of parasites.

47. *Kolla* (?) sp. (not determined) subfamily Cicadellinæ).

COMMON NAME: Gray sugar-cane leafhopper.

DAMAGE: Quite common on young cane; no direct injury.

DISTRIBUTION: South coast and north-west coast.

FOOD PLANTS: Sugar cane and grasses.

ENEMIES: The same as those of preceding species.

CONTROL: None required.

48. *Jassid* (not yet determined) (subfamily Jassinæ).

COMMON NAME: Cane false-mottling leafhopper.

DAMAGE: Attacks leaves of young cane near tips, causing white streaks that resemble mottling disease.

DISTRIBUTION: North coast; possibly entire Island.

FOOD PLANTS: Sugar cane and grasses.

ENEMIES: No parasites yet observed.

CONTROL: Scarcely required.

49. *Balclutha* (*Gnatlodus*) sp. (subfamily Jassinæ).

COMMON NAME: Cane seed-head leafhopper.

DAMAGE: Very abundant, in all stages, in seed tassels. Doubtless injures fertility of seed.

DISTRIBUTION: Entire Island.

FOOD PLANTS: Sugar cane and false Para grass, *Eriochloa subglabra*; occasionally other grasses.

ENEMIES: Animal—Same as those of *Kolla*.

Insect—A Dryinid, *Chalcogonatopus* sp., infests sometimes over 50 per cent of adults and nymphs; a Mymarid parasitizes large per cent of eggs; a Syrphid fly.

Plant—A fungus, undetermined, parasitizes all adults after attack by Dryinid.

CONTROL: Keep cut, in vicinity of cane fields, the "malojillo" (*Eriochloa*) upon whose seeds it feeds through the year.

50. *Bothriocera* sp. (probably new) (family Fulgoridæ).

COMMON NAME: Gray fulgorid-fly.

DAMAGE: Taken rarely feeding on cane; does no damage.

DISTRIBUTION: Entire Island; Vieques.

FOOD PLANTS: *Citrus* spp.; *Palicourea* spp.; *Anona* spp.; *Piper aduncum*; sugar cane (rarely); etc.

ENEMIES: No insect parasites recorded. A fungus, *Isaria saussurei* Cooke (det. J. A. Stevenson), attacks insect heavily on *Palicourea* and *Piper*.

CONTROL: None required.

51. *Oliaris* sp. (subfamily Cixiinae).
 COMMON NAME: Cottontail plant-hopper.
 DAMAGE: Quite common on young cane, but no injury thus far observed.
 DISTRIBUTION: Entire Island.
 FOOD PLANTS: Feeds upon a great variety of plants and trees. Younger stages not known.
 ENEMIES: No insect or fungus parasites observed.
 CONTROL: Not necessary.
52. *Ormenis* sp. (subfamily Flatinae).
 COMMON NAME: Moth-hopper.
 DAMAGE: Recorded by Van Dine¹ as "found breeding on cane leaves in one instance." Not observed on cane by the writer. Injury to cane inconsequent.
 DISTRIBUTION: Not recorded.
 FOOD PLANTS: Cannot be given, as species was not recorded.
 ENEMIES: Insect—A Hymenopterous parasite infests a large proportion of eggs of the two commoner species; a Syrphid larva feeds on eggs; a Dryinid rarely attacks nymphs.
 Fungus—*Metarrhizium anisopliae*, form *minor* (det. J. A. Stevenson), has been found by writer infesting many adults of a common species on coffee.
 CONTROL: Not required on sugar cane.
53. Derbid (not yet determined) (subfamily Derbinae).
 COMMON NAME: Veil-wing moth-hopper.
 DAMAGE: Sometimes very abundant at bases of mature cane. Injury not observed. Younger stages unknown.
 DISTRIBUTION: North coast.
 FOOD PLANTS: Sugar cane; a wild fern.
 ENEMIES: No insect or fungus enemies yet observed.
 CONTROL: None required.
54. *Stenocranus* (*Delphax*) *saccharivorus* Westw. (subfam. Delphacinae).
 COMMON NAME: West Indian cane-fly.
 DAMAGE: All stages on foliage; feeding punctures give entrance to disease; honeydew causes black mold on foliage. Becomes extremely abundant on plants in confinement, but is scarce under field conditions.
 DISTRIBUTION: Porto Rico; Santo Domingo; Jamaica; southern U. S.; Barbados.
 FOOD PLANTS: Sugar cane; can breed on grasses, but rarely does.
 ENEMIES: Animal—Birds; tree frogs; lizards, especially *Anolis pulchellus*.
 Arthropod—Spiders; *Zelus rubidus*; *Franklinothrips vespiformis*; a Mymarid egg parasite; a

¹In Jour. Econ. Ent., Vol. 6, No. 2, Apr. 1913, page 257.

Dryinid wasp; a Stylopid, *Stenocranophilus quadratus* Pierce, which is more beneficial than all other parasites combined.

Plant—A green fungus, not determined, rarely attacks adults.

CONTROL: Not required, due to lizards, parasites, and beating rains.

55. *Perkinsiella* sp. (undetermined) (subfamily Delphacinae).

COMMON NAME: White-lined plant-hopper.

DAMAGE: Sometimes common on young cane, but does no noticeable damage; breeds on rice.

DISTRIBUTION: Entire Island.

FOOD PLANTS: Sugar cane, rice and grasses.

ENEMIES: No parasites yet recorded; a predacious Mirid bug.

CONTROL: None required.

56. *Aphis setariae* Thos. (family Aphididae).

COMMON NAME: The brown cane aphid.

DAMAGE: Infests stalk at the base of leaf sheaths; occurs uncommonly, on isolated canes.

DISTRIBUTION: Porto Rico; southern U. S.: probably other Greater Antilles.

FOOD PLANTS: Sugar cane and grasses.

ENEMIES: Arthropod—Small spiders; Syrphid flies; several Coccinellid beetles; an internal parasite.

Fungus—Not recorded.

CONTROL: Too rare to require control. Thrives only when protected by the fire-ant, *Solenopsis geminata*, which builds earth shelters over colonies.

57. *Sipha flava* Forbes (family Aphididae).

COMMON NAME: Yellow sugar-cane aphid.

DAMAGE: Infests undersides of leaves, especially near tips of lower leaves; often becomes epidemic over considerable areas.

DISTRIBUTION: Porto Rico; southern U. S.; probably other Greater Antilles.

FOOD PLANTS: Sugar cane and grasses.

ENEMIES: Animal—A lizard, *Anolis pulchellus*.

Arthropod—Small spiders; Coccinellids; Syrphid flies.

Fungus—*Agrostalagmus albus* reported by J. R. Johnston; never observed by writer.

CONTROL: No artificial control practicable, except in seedling plots, as parasites effect control promptly.

58. *Aleyrodes* sp. (apparently new) (family Aleyrodidae).

COMMON NAME: Sugar-cane white-fly.

DAMAGE: Insignificant; attacks foliage, but appears to be rare.

DISTRIBUTION: Recorded only from Río Piedras by the writer.

FOOD PLANTS: None other than cane recorded.

ENEMIES: Parasitized by minute Hymenopteron.

CONTROL: None called for.

59. *Pseudococcus calceolariae* Mask. (family Coccidæ).

COMMON NAME: Pink sugar-cane mealybug.

DAMAGE: Attacks roots, and the stalks at the nodes, stunting growth and inducing rot beneath leaf sheaths.

DISTRIBUTION: West Indies; Demerara; southern U. S.; California; Hawaii; Fiji; New Zealand.

FOOD PLANTS: Sugar cane; probably grasses; several other plants in other localities.

ENEMIES: Animal—Blackbirds; honey-creepers; rats and mice; lizards.

Arthropod—Earwigs; a predacious bug, near *Triphleps*; a Eulophid parasite; a Cecidomyid, *Karschomyia cocci* Felt; *Franklinothrips vespiformis*; a Coccinellid, *Cryptolemus montrouzieri* (rarely).

Fungus—*Aspergillus flavus* and *Isaria* sp.

CONTROL: Treatment of cane seed; seed selection; use of self-stripping varieties; clean cultivation prior to planting; elimination of the fire-ant.

60. *Pseudococcus sacchari* Ckll. (family Coccidæ).

COMMON NAME: Gray sugar-cane mealybug.

DAMAGE: Practically the same as that of *P. calceolariae*, but less common.

DISTRIBUTION: Porto Rico; Barbados; Trinidad; Mexico; California; Hawaii; Mauritius.

FOOD PLANTS: Sugar cane and grasses.

ENEMIES: The same as of preceding species.

CONTROL: Same as for pink mealybug.

61. *Pseudococcus* sp.(?) (apparently undescribed) (family Coccidæ).

COMMON NAME: Sugar-cane leaf mealybug.

DAMAGE: Attacks the leaves and leaf sheaths, especially of young cane. Has caused death of cane in confinement. Rarely observed in fields.

DISTRIBUTION: Not yet determined. Collected at Río Piedras by the writer.

FOOD PLANTS: Sugar cane and grasses.

ENEMIES: A Eulophid parasite and the Cecidomyid keep it in control.

CONTROL: None required.

62. *Pulvinaria iceryi* Guer. (det. by H. Morrison) (fam. Coccidæ).

COMMON NAME: Sugar-cane leaf scale.

DAMAGE: Attacks the leaves only; multiplies rapidly. Has killed young plants in confinement. Rare in the fields.

DISTRIBUTION: Entire Island; Mauritius; Reunion Island.

FOOD PLANTS: Sugar cane; grasses (rarely).

ENEMIES: Two species of Hymenopterous parasites; a Cecidomyid larva.

CONTROL: Held in check by parasites.

63. *Aclerda tokionis* Ckll. (det. by E. R. Sasseer) (fam. Coccidæ).

COMMON NAME: Larger sugar-cane stalk scale.

DAMAGE: Attacks the stalk on or near leaf sheaths. **Rare.**
DISTRIBUTION: Porto Rico; California; Japan. Recorded from Río Piedras and Guayama by Wolcott; not observed by writer.

FOOD PLANTS: Sugar cane (Porto Rico); bamboo (California and Japan).

ENEMIES: None recorded.

CONTROL: Not required.

64. *Targionia (Aspidiotus) succhari* Ckll. (det. E. R. Sasseer) (fam. Coccidæ).

COMMON NAME: Smaller sugar-cane stalk scale.

DAMAGE: Occurs frequently on stalk at nodes, but **seldom** abundantly.

DISTRIBUTION: Porto Rico; Jamaica; Barbados; Antigua; Java.

FOOD PLANTS: Sugar cane and grasses.

ENEMIES: A Hymenopterous parasite observed.

CONTROL: None required.

X. ARTHROPLEONA.

65. *Degeeria* sp. (?) (family Entomobryidæ).

COMMON NAME: Green springtail.

DAMAGE: Always present on undersides of foilage. **Exact** nature of damage not yet determined. Of doubtful economic importance.

DISTRIBUTION: Entire Island.

FOOD PLANTS: Sugar cane; banana; cotton; foliage of many plants and trees.

ENEMIES: No predacious insect enemies or parasites thus far observed.

CONTROL: Not considered to be necessary.

PREVIOUS PUBLICATIONS OF THE YEAR (1919-1920).

1. Annual Report of the Insular Experiment Station of the Department of Agriculture and Labor (1918-1919) of Porto Rico.
2. Journal of the Department of Agriculture. Vol. III, No. 3, The Mottling or Yellow-Stripe Disease of Sugar Cane, by John A. Stevenson.
3. Bulletin No. 19. The Resistance of Cane Varieties to Yellow-Stripe or the Mosaic Disease, by F. S. Earle.
4. Boletín No. 20. Insecticidas y Fungicidas, por I. A. Colón.
5. Boletín No. 21. Abonos (1918-1919), por F. A. López Domínguez.
6. Circular No. 17. Recomendaciones sobre el Cultivo de la Caña de Azúcar en Puerto Rico, por F. S. Earle.
7. Circular No. 18. El Exterminio de la Garrapata, por J. Bagué.
8. Bulletin No. 22. Eradication as a Means of Control in Sugar-Cane Mosaic or Yellow Stripe. The Year's Experience with this Method, by F. S. Earle.
9. Circular No. 19. La Mezcla de Abonos por el Agricultor, por F. A. López Domínguez.
14. Boletín No. 22. (La Edición Española.) La Extirpación del Mosaico de la Caña como Medio de Represión, por F. E. Earle.