

AN ANNOTATED BIBLIOGRAPHY OF PORTO RICAN CANE INSECTS.*

By E. GRAYWOOD SMYTH.

- (1) 1880. STAHL, A.
La Enfermedad de la Caña de Azúcar en Puerto Rico, 1880.
- (2) 1882. STAHL, A.
Fauna de Puerto Rico. Clasificación sistemática de los Animales que Corresponden a Esta Fauna y Catálogo del Gabinete Zoológico del Doctor A. Stahl en Bayamón, Puerto Rico. Imprenta del "Boletín Mercantil," 37 Calle de la Fortaleza, San Juan, 1882, pp. 249.
Insectos, pp. 169-213. Lists *Sphenophorus sericeus* Latr. (= *Metamasius hemipterus* Linn.), *Laphygma frugiperda* S. & A., and *Gryllotalpa hexadactyla* (= *Scapteriscus vicinus* Scud.).
- (3) 1884. UMPIERRE, MANUEL FERNÁNDEZ.
Distintas Causas que Perjudican a la Caña Durante su Existencia, pp. 70-76. In Manual Práctico de la Agricultura de la Caña de Azúcar, Puerto Rico. Imprenta del Boletín Mercantil, calle de la Fortaleza, Núm. 37, San Juan, 1884, pp. 199.
Mentions grass-worms, moth stalk-borer and mealy-bug.
- (4) 1886. BALY, J. S.
Descriptions of Uncharacterized Species of Diabrotica. In Trans. Ent. Soc., London, 1886. Part IV (December, 1886), pp. 443-445.
From P. R., *Diabrotica graminea* sp. n., p. 443.
- (5) 1886. QUEDENFELDT, E.
Neuse und seltnere Kafer von Portorico. In Berliner Entomolog. Zeitschrift, pp. 119-128.
- (6) 1887. GUNDLACH, JUAN.
Fauna Puerto-Riqueña. Anales de la Sociedad Española de Historia Natural, Tomo XVI, Cuad. 1, Madrid, Alcalá 11, 31 de mayo de 1887.
Insectos, pp. 347-658.
- (7) 1889. KRUGER, DR. W.
Das Zuckerrohr und seine Kultur, p. 312.
Records *Delphax saccharivora* Westw.
- (8) 1895. TUERO, FERNANDO LÓPEZ.
Enemigos de la Caña y Modo de Combatirlos, Capítulo IV, pp. 63-74. Enfermedad de la Caña de Azúcar, pp. 105-123. In La Caña de Azúcar en Puerto Rico, su Cul-

* References are arranged chronologically, but alphabetically under each year. Anonymous articles are indicated by dashes.

tivo y Enfermedad. Tipografía de "Boletín Mercantil," calle de la Fortaleza 24, San Juan, 1895.

Under "Clasificación del Insecto," pp. 114-115, discusses "el caculo" as belonging to genus *Leucothyros* and including 5 species, his descriptions of which seem to include *Phyllophaga*, *Dyscinetus* and *Ligyris*. Figures (Lámina 2) the egg, larva, pupa and adult of *Phyllophaga* sp.

(9) 1900. BUSCK, A.

Notes on a Brief Trip to Puerto Rico in January and February, 1899. *In* U. S. D. A., Bu. Ent., Bul. 22 (n. s.), 1900, pp. 88-92.

Mentions *Diatraea saccharalis*, *Sphenophorus sexguttatus* Drury, a lemellicorn larva, and *Dactylopius sacchari* as cane pests, and discusses the *changa* as a tobacco pest.

(10) 1900. PERGANDE, T. and COCKERELL, T. D. A.

List of Coccidæ Collected by Mr. A. Busck in Puerto Rico, 1899. *In* U. S. D. A., Bu. Ent., Bul. 22 (n. s.), 1900, pp. 92-93.

Lists *Dactylopius sacchari* Ckll, from three localities on cane.

(11) 1901. GARDNER, F. D.

Ann. Rept., P. R. Agr. Expt. Sta., U. S. D. A., for 1901 (Ann. Rept. Office Expt. Stations, Washington, June 30, 1901), pp. 381-415.

Scapteriscus didactylus, p. 414.

(12) 1901. ————

Notes from Correspondence. *In* U. S. D. A., Bu. Ent., Bul. 30 (n. s.), pp. 97-98.

Diaprepes abbreviatus sent in by J. W. Van Leenhoff from Porto Rico.

(13) 1902. BARRETT, O. W.

The Changa or Mole-Cricket (*Scapteriscus didactylus* Latr.) in Porto Rico. Bul. 2, P. R. Agr. Expt. Sta., U. S. D. A., Mayagüez, Sept. 13, 1902, pp. 19, fig. 1.

Dealt with as pest of "tobacco, cane, and small crops."

(14) 1903. FERNALD, MRS. M. E.

Catalogue of the Coccidæ of the World. Bul. 88, Hatch Expt. Sta., Mass. Agr. College, Mar. 1903, pp. 360.

Lists *Pseudococcus sacchari* (Ckll.) on sugar cane from Porto Rico (p. 109).

(15) 1903. GARDNER, F. D.

Annual Rept. of the P. R. Agricultural Experiment Station for 1902. *In* Ann. Rept., Office Exp. Stations for June 30, 1902, Washington, 1903, pp. 331-357.

Discusses may-beetle and larva (p. 343) and gives

- extract of Bul. 2 of same station, dealing with changa (pp. 343-352).
- (16) 1904. BARRETT, O. W.
Control of the Brown Ant (*Solenopsis germinata* Fabr.) in Orange Orchards. Cir. 4, P. R. Agr. Expt. Sta., U. S. D. A., May 9, 1904, pp. 3.
Discussed as a citrus pest. Mentions *Lachnosterna* sp. (p. 3).
- (17) 1904. BARRETT, O. W.
Report of O. W. Barrett, Entomologist and Botanist. In Ann. Rept., P. R. Agr. Exp. Sta. for 1903 (Ann. Rept. Office Exp. Stations, June 30, 1903), Washington, 1904, pp. 429-450.
Discusses white ants (*Eutermes morio*?) (pp. 442-443), *changa* (pp. 443-447), *Exophthalmus spengleri* (p. 446) and the larva of a weevil (apparently *Sphenophorus*) (p. 448).
- (18) 1904. EARLE, F. S.
Report on Observations in Porto Rico. In Ann. Rept., P. R. Agr. Exp. Sta., U. S. D. A., for 1903 (Ann. Rept. Office Exp. Stations, June 30, 1903), Washington, 1904, pp. 454-468.
Note on *Lachnosterna* sp. (p. 459) and a small ant, presumably *Solenopsis*, injuring orange trees.
- (19) 1905. BARRETT, O. W.
Report of the Entomologist and Botanist. In Ann. Rept., P. R. Agr. Exp. Sta., U. S. D. A. for 1904 (Ann. Rept. Office Expt. Stations, June 30, 1904), Washington, 1905, pp. 387-399.
Discusses *Solenopsis germinata* on citrus (p. 388), also the *changa*, the termite (*Eutermes morio*), the weevil (*Exophthalmus spengleri*) and 4 Lamellicorn beetles (p. 396).
- (20) 1905. KELLOGG, VERNON L.
American Insects, New York, Henry Holt and Company, 1905, pp. 694, plates.
Scapteriscus didactylus in Porto Rico, p. 161.
- (21) 1905. VAN LEENHOFF, J., JR.
Tobacco Investigations in Porto Rico during 1903-4. Bul. 5, P. R. Agr. Exp. Sta., U. S. D. A., Mayagüez, 1905, pp. 47.
Note on control of *changa*, p. 13.
- (22) 1906. COOK, MELVILLE T.
Informe del Departamento de Patología Vegetal. In Primer Informe Anual, Estación Central Agronómica de Cuba, Apr. 1, 1904, to June 30, 1905, Habana, 1906, pp. 147-207.
Note on damage of *changa* in P. R., p. 198.

- (23) 1906. EVANS, W. H.
Exhibitions and notes, p. 22. *In Proc. Hawaiian Ent. Soc.*, I (1905), Apr. 3, 1906, p. 22.
Mentions the fire flies (*Pyrophorus*) and *Scapteriscus didactylus* Latr. in Porto Rico.
- (24) 1906. HENRICKSEN, H. C.
Report of the Horticulturist. *In Rept. on Agr. Investigations in P. R.*, 1905 (Bul. 171, Office Exp. Stations, U. S. D. A., 1906), pp. 23-41.
Notes May-beetle (pp. 24-28), brown ant (p. 28) and *Exophthalmus spengleri* (p. 27) among citrus pests.
- (25) 1906. MAY, D. W.
(Report of Special Agent in Charge.) *In Rept. on Agr. Investigations in P. R.*, 1905 (Bul. 171, Office Exp. Stations, U. S. D. A., 1906), pp. 1-21.
Mentions *Diatraea saccharalis* Fab. damaging cane.
- (26) 1907. TOWER, W. V.
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Notes the May-beetle and leaf-weevil, *Diaprepes spengleri* (p. 26), among citrus pests, and *Diatraea saccharalis* (p. 28) as damaging cane.
- (27) 1908. MAY, D. W.
Summary of Investigations. *In Ann. Rept., P. R. Agr. Exp. Sta. for 1907, Mayagüez*, May 4, 1908, pp. 1-15.
Mentions *changa* and ants (p. 10) in relation to cane planting.
- (28) 1908. TOWER, W. V.
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- (29) 1908. TOWER, W. V.
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Discusses *Diaprepes* (p. 31) and *Lachnosterna* (p. 32) as citrus pests, *changa* (p. 39) as tobacco pest and mealy bugs (p. 36), *Sphenophorus* sp. and *Xyleborus* sp. (p. 37) as cane pests.
- (30) 1908. WHEELER, DR. WM. M.
The Ants of Porto Rico and the Virgin Islands. *Bul. Am. Mus. of Nat. Hist.*, Vol. 24, Feb. 7, 1908, pp. 117-158, pls. 2.
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- (33) 1909. TOWER, W. V.
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Mentions the *changa* and the white grub as important cane pests, p. 44.
- (35) 1910. MOORE, E. L.
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Discusses the *changa*, p. 143.
- (36) 1910. TOWER, W. V.
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Discusses injury to cane by *Lachnosterna* larvæ (p. 25).
- (37) 1911. JOHNSTON, J. R.
First Rept. of the Pathologist. *In* Bul. 1, Exp. Sta., P. R. S. P. A., Río Piedras, 1911, pp. 35-48.
Mentions white grub and root diseases (pp. 36-37), root diseases and flies (p. 39), red rot and borers (p. 45), and toprot and moth borer (p. 47).
- (38) 1911. TOWER, W. V.
Report of the Entomologist. *In* Ann. Rept., P. R. Agr. Exp. Sta. for 1910, Mayagüez, July 17, 1911, pp. 31-34.
Discusses cane insects of Cuba compared with those of Porto Rico, pp. 33-34.
- (39) 1911. TOWER, W. V.
Insects Injurious to Citrus Fruits and Methods for Combatting Them. Bul. 10, P. R. Agr. Exp. Sta., U. S. D. A., Mayagüez, May 8, 1911, pp. 35, pls. 5.
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sp. (p. 10), and *Solenopsis geminata* (p. 11), among citrus pests.

- (40) 1911. VAN DINE, D. L.
 First Report of the Entomologist. Bul. 1, Exp. Station, P. R. Sugar Growers' Assn., Río Piedras, 1911, pp. 17-31.
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 Damage to Sugar-Cane Juice by the Moth Stalk-Borer (*Diatraea saccharalis* Fabr.). Cir. 1, Exp. Sta., P. R. S. P. A., Río Piedras, 1912, pp. 11.
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 Discusses insect (*Tiphia* and *Pyrgota*) and fungus (*Metarrhizium*) enemies of May-beetles, and the lady-beetle (*Cryptolæmus*) enemy of mealy-bugs.
- (47) 1912. VAN DINE, D. L.
 Rept. of the Entomologist (2d. Rept.). In 2nd Ann.

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A New Species of Tachinidæ from Porto Rico. *In* Proceedings Ent. Soc. of Washington, vol. XIV, No. 4, Jan. 10, 1912, pp. 198-200, pl. X.
Description of *Cryptomeigenia aurifacies* n. sp., reared from the "sugar cane May-beetle."
- (49) 1913. BALLOU, H. A.
Root Borers and Other Grubs in West Indian Soils. *In* Agricultural News, Barbados, for Mar. 29 (pp. 106-107), Apr. 12 (p. 122), Apr. 26 (pp. 138-139), May 10 (pp. 154-155). May 24 (pp. 170-171) and June 7, 1913 (p. 186; table).
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- (52) 1913. CROSSMAN, S. S.
"La Changa", *Scapteriscus didactylus*. *In* Second Rept., Board of Comm. Agr. of P. R., 1912-1913, pp. 32-35.
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- (53) 1913. FELT, E. P.
Three New Gall Midges (Diptera). *In* Canadian Entomologist, Vol. 45, No. 9, Sept. 1913, pp. 304-308.
Describes *Karschomyia cocci* n. sp. from Patillas, P. R., and *Mycodiplosis insularis* n. sp. from Río Piedras, P. R.; reared from mealy-bug on sugar cane and from red-spider.
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Two New Thysanoptera from Porto Rico. *In* Insector Inscitiæ Menstruus, Vol. 1, No. 6, June 1913, pp. 65-70, pl. 1.
Describes *Podothrips semiflavus* n. sp. from *Panicum barbinode* and sugar cane at Guánica, P. R.

- (55) 1913. HOOKER, C. W.
Entomological Conferences in Porto Rico. *In* Jl. Econ. Ent., Vol. 6, No. 1, Feb. 1913, pp. 148-150.
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Report of the Pathologist. *In* 3d. Ann. Rept. (Bul. 5) of Exp. Sta. P. R. S. P. A., Río Piedras, Aug. 1913, pp. 22-24.
Discusses use of Hawaiian beetle fungus against May-beetles (pp. 23-24), and of other fungi against cane pests.
- (58) 1913. JONES, T. H.
Some Notes on *Laphygma frugiperda* S. & A. in Porto Rico. *In* Jl. Econ. Ent., Vol. 6, No. 2, April, 1913, pp. 230-236.
Discusses this species and *Remigia repanda* Fab. as cane pests.
- (59) 1913. QUAINANCE, A. L.
Remarks on Some of the Injurious Insects of Other Countries. *In* Proc. Ent. Soc. Washington, Vol. 15, No. 2, June 10, 1913, pp. 54-83.
Mentions from P. R.: *Scapteriscus didactylus* Latr. (p. 57), *Pseudococcus sacchari* Ckll. (p. 63), and *Lachnosterna* spp. (pp. 76-77).
- (60) 1913. TOWER, W. V.
Rept. of the Entomologist's Inspection Trip to Santo Domingo. *In* 2nd. Rept., Board Comm. Agr. of P. R., 1912-1913, pp. 25-28.
Supposed identity of several Santo Domingo cane pests with those of Porto Rico.
- (61) 1913. VAN DINE, D. L.
The Insects Affecting Sugar Cane in Porto Rico. *In* Jl. Econ. Ent., Vol. 6, No. 2, April, 1913, pp. 251-257.
Resumé of all published information on cane insects of P. R. to that date, with discussion and original observations on each pest.

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Introduction of *Tiphia inornata* cocoons from Illinois (including tables).
- (63) 1913. VAN DINE, D. L.
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Insects Injurious to Sugar-Cane in Porto Rico, and Their Natural Enemies. *In* Jl. Board Agr., Brit. Guiana, Vol. 6, No. 4, pp. 199-203.
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Description of *Eutrixoides jonesii* gen. et sp. nov., from Porto Rico, reared from *Lachnosterna* (pp. 50-51).
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Report on a Trip to Demerara, Trinidad and Barbados During the Winter of 1913. *In* 3d Ann. Rept. (Bul. 5), Exp. Sta. P. R. S. P. A., Río Piedras, Aug. 1913, pp. 47-68.
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Report on a Trip to Demerara, Trinidad and Barbados During the Winter of 1913. *In* Jl. Econ. Ent., Vol. 6, No. 6 (Dec. 1913), pp. 443-457.
Extract of the preceding article.
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Useful Birds of Porto Rico. *In* Porto Rico Progress, Vol. 4, No. 13, pp. 13-14. (Noted from Experiment Station Record, Vol. 28, No. 8, June 1913, p. 751.)
Several species of herons found by Biological Survey to destroy *changa*.
- (69) 1913. ————
Destruction of Mole Crickets in Porto Rico by the Heron and Gauding. *In* The Agricultural News, Barbados, Sept. 27, 1913, p. 314.
Review of article in Exp. Sta. Record for June, 1913.

- (70) 1913. ———. ———.
An Entomological Visit to the United States. In *The Agricultural News*, Barbados, Oct. 25, 1913, p. 346.
Includes visit to P. R. and brief discussion of cane pests of the Island.
- (71) 1914. BALLOU, H. A.
Insect Pests of Sugar Cane in Antigua and St. Kitts. Pamphlet Series No. 75, Imp. Dept. Agr. for W. I., Barbados, 1914, pp. 45, pl. 1, figs. 20.
Notes *Strategus titanus* (p. 43) and *Diaprepes spengleri* (pp. 41-43) as occurring in P. R.
- (72) 1914. JONES, T. H.
Sugar-Cane Insects in Porto Rico. In *Jl. Econ. Ent.*, Vol. 8, No. 6, Dec. 1914, pp. 461-463. (See *Review Applied Ent.*, A, III, 3, March 1915, p. 134.)
Discusses known cane insect pests of the Island, including a number not before recorded (*Pseudococcus calceolariae*, *Aphis setariae*, *Preneis ares*, *Tetranychus* sp. and 2 species of thrips).
- (73) 1914. LENG, CHAS. W., AND MUTCHLER, A. J.
A Preliminary List of the Coleoptera of the West Indies as Recorded to January 1, 1914. *Bulletin of Am. Mus. Nat. Hist.*, Vol. 23, Art. 30, pp. 391-493, New York, Aug. 26, 1914.
Beetles known to attack cane listed from P. R. on pages 442, 454, 469, 478 and 480.
- (74) 1914. PIERCE, W. DWIGHT.
Description of Two New Species of Strepsiptera (Halcoptophagidæ) Parasitic on Sugar-Cane Insects. In *Proc. Ent. Soc. Washington*, XVI, 3, Sept. 1914, pp. 126-129.
Stenocranus saccharivorus parasitized by *Stenocranophilus quadratus* gen. et sp. nov. at Río Piedras, P. R., in Oct. 1912.
- (75) 1914. VAN ZWALUWENBURG, R. H.
Preliminary Check List of Porto Rican Insects, Mayagüez, Sept. 1914, pp. 62. (Additions to same, March 1915, pp. 15.)
Mimeographed list distributed to friends and museums. Cane pests listed, under orders.
- (76) 1914. WALTON, W. R.
Four New Species of Tachinidæ from North America. In *Proc. Ent. Soc. Washington*, XVI, 2, pp. 93-95. Washington, June 1914.
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Notes on the Life-History and Ecology of *Tiphia inornata*

- Say. *In* Jl. Econ. Ent., Vol. 7, No. 5, Oct. 1914, pp 382-389.
 Studies in connection with collection of cocoons for shipment to Porto Rico.
- (78) 1914. _____.
 Termites or White Ants. *In* Agricultural News, Vol. 13 No. 309, Feb. 28, 1914, p. 74.
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- (79) 1915. BALLOU, H. A.
 Notes on Porto Rico Insects. *In* The Agr. News, Barbados, Aug. 28, 1915, p. 282.
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- (80) 1915. CROSSMAN, S. S., AND WOLCOTT, G. N.
 Control of the Changa. Cir. 6, Insular Exp. Sta. of P. R. Río Piedras, 1915, pp. 3.
 Recommends a bait of flour and Paris green.
- (81) 1915. FISKE, R. J.
 Report of the Quarantine Inspection Work. *In* 3d Rept., Board Comm., Agr. of P. R., 1913-1914, San Juan, 1915 pp. 14-19.
 Mentions the fire ant (*Solenopsis geminata*) as "a very serious pest to the fruit, coffee, and sugar industry" (p. 19).
- (82) 1915. HOLLOWAY, T. E.
 Fighting the Sugar-Cane Borer with Parasites and Poisons. *In* The Louisiana Planter, Dec. 18, 1915, pp. 397-398.
 Discusses the effects of trash burning and of rain-fall on *Diatraea* in Porto Rico.
- (85) 1915. JOHNSTON, J. R.
 Report of the Work of the Department of Pathology. *In* 3d Report, Board Comm. Agr. of Porto Rico, 1913-1914, San Juan, 1915, pp. 63-64.
 Notes an experiment in the use of Green Muscardine fungus to control May-beetles.
- (84) 1915. JOHNSTON, JOHN R.
 The Entomogenous Fungi of Porto Rico. Bul. 10, Board Comm. Agr. of P. R., Río Piedras, Mar. 15, 1915, pp. 33, pls. 9.
 Fungi attacking cane insects: *Agrostalagmus albus* (p. 10), *Aspergillus flavus* (pp. 14-18), *Botrytis rileyi* (pp. 18-19), *Isaria barberi* (pp. 20, 24-25), *Empusa sphaerosperma* (pp. 22-23), *Isaria* sp. (pp. 25-26), and *Metarrhizium anisopliae* (pp. 26-28).

- (85) 1915. JONES, THOS. H.
 Report of the Department of Entomology. *In* Third Report, Board Comm. Agr. of P. R., 1913-1914, San Juan, 1915, pp. 19-25.
 Discusses work on May-beetles and their introduced parasites, and proposed work on other cane pests.
- (86) 1915. JONES, T. H.
 Aphides or Plant Lice Attacking Sugar-Cane in Porto Rico. Bul. 11, Exp. Sta. of Board Comm. Agr. of P. R., Mar. 15, 1915, pp. 19, pls. 2.
 Life-history and habits of *Sipha flava* Forbes and *Aphis setariae* Thos.
- (87) 1915. JONES, T. H.
 The Sugar-Cane Moth Stalk-Borer (*Diatraea saccharalis* Fabr.). Bul. 12, Exp. Sta. of Board Comm. Agr. of P. R., Río Piedras, Mar. 16, 1915, pp. 30, figs. 8.
 Life-history, parasites, control, etc.
- (88) 1915. JONES, THOMAS H.
 Insects affecting Vegetable Crops in Porto Rico. Bul. 192, U. S. D. A., Washington, Apr. 8, 1915, pp. 11, pls. 4.
 Discusses *Scapteriscus didactylus* Latr. (p. 4), *Diabrotica graminea* Bal. (p. 5), *Laphygma fungiperda* S. & A. (p. 7), and *Solenopsis geminata* Fab. (p. 9) as vegetable pests.
- (89) 1915. JONES, THOS. H.
 The Sugar-Cane Weevil Root-Borer (*Diaprepes spengleri* L.). Bul. 14, Exp. Sta., Board Comm. Agr. of P. R., Río Piedras, Apr. 14, 1915, pp. 19, figs. 11.
 Life-history, habits, parasites, control, etc.
- (90) 1915. PIERCE, W. DWIGHT.
 Some Sugar-Cane Root-Boring Weevils of the West Indies. *In* Jl. Agr. Research, Vol. 4, No. 3, Washington, June 15, 1915, pp. 255-263, pls. 4.
 Groups the forms of *Diaprepes* attacking sugar cane into 2 species, *famelicus* Oliv. and *spengleri* Linn., the latter of them having 6 varieties, 3 of which occur in Porto Rico. Gives briefly control measures.
- (91) 1915. SMYTH, E. G.
 Report of Work at the South Coast Laboratory. *In* 3d. Report, Board Comm. Agr. of P. R., 1913-1914, San Juan, 1915, pp. 40-53.
 Field habits and control of 3 species of *Lachnosterina*, 2 of *Dyscinetus*, 1 of *Ligyris* and 1 of *Strategus* (cane pests), and release of *Tiphia* wasps from Illinois.
- (92) 1915. TOWER, W. V.
 Report of the Secretary. *In* Third Report, Board Comm. Agr. of P. R., 1913-1914, San Juan, 1915, pp. 9-13.

Notes work "combating the *changa*" (p. 10), and of the traveling entomologist "obtaining parasites of the white-grub, *changa*, mealy-bug and moth-borer" (p. 11).

- (93) 1915. VAN ZWALUWENBURG, R. H.
Report of the Entomologist. *In* Rept. P. R. Agr. Exp. Sta., U. S. D. A., for 1914, Mayagüez, July 10, 1915, pp. 31-35.
Discusses control of *Scapteriscus didactylus* (pp. 31-32), of May-beetles by a bacterium (p. 34), and gives note on *Diaprepes spengleri* (p. 35).
- (94) 1915. WOLCOTT, G. N.
Report of the Traveling Entomologist. *In* 3d. Rept., Board Comm. Agr. of P. R., 1913-1914, San Juan, 1915, pp. 25-40.
Introduction of May-beetle parasites from Illinois and account of trips to Cuba and Jamaica to secure cane insect parasites.
- (95) 1915. WOLCOTT, GEORGE N.
Influencia de la lluvia y la quemazón de la paja sobre la abundancia de *Diatraea saccharalis*. Cir. 7, Insular Exp. Sta. of P. R., Río Piedras, 1915, pp. 6.
- (96) 1916. BALLOU, H. A.
Fighting the Sugar-Cane Borer with Parasites and Poisons. *In* The Agr. News, Barbados, Apr. 22, 1916, pp. 138-139.
Reviews article by Holloway in Louisiana Planter, Dec. 18, 1915. Mentions effects of rainfall on *Diatraea* in P. R.
- (97) 1916. MARSHALL, G. A. K.
On New Neotropical Curculionidae. *In* Ann. and Mag. Nat. Hist., Vol. 18, No. 108, London, Dec. 1916, pp. 449-468.
Discusses the synonymy of species and varieties of *Diaprepes* characterized by Pierce (Jl. Agr. Research, June 15, 1915).
- (98) 1916. MERRILL, G. B.
Report of the Tobacco Insect Investigations. *In* 4th Report, Board Comm. Agr. of P. R., 1914-1915, San Juan, 1916, pp. 50-52.
Discusses control of *changa* (pp. 50-51).
- (99) 1916. SMYTH, E. G.
Report of the South Coast Laboratory. *In* 4th Report, Board Comm. Agr. of P. R., 1914-1915, San Juan, 1916, pp. 45-50.
Account of experimental work on white grubs, and table of life-history summaries of 8 species of Scarabæidæ, attacking cane.

- (100) 1916. STEVENSON, JOHN A.
Report of the Pathologist. *In* 4th Report, Board Comm. Agr. of P. R., 1914-1915, San Juan, 1916, pp. 33-44.
Work with the Green Muscardine (pp. 34-35).
- (101) 1916. TOWER, W. V.
Report of the Secretary and Director. *In* 4th Report, Board Comm. Agr. of P. R., 1914-1915, San Juan, 1916, pp. 9-16.
Notes briefly (p. 11) the year's work on cane pests and *changa*.
- (102) 1916. VAN ZWALUWENBURG, R. H.
Report of the Entomologist. *In* Rept. P. R. Agr. Exp. Sta., U. S. D. A., for 1915, Mayagüez, Nov. 23, 1916, pp. 42-45.
Discusses *Scapteriscus didactylus* (p. 42), *Eutermes morio* as a timber pest (p. 43), *Strategus quadriveatus* as a coconut pest (p. 44), *Apate francisca* as a mahogany pest (p. 44), and *Sipha flava* on cane (p. 45).
- (103) 1916. WETMORE, ALEX.
Birds of Porto Rico. Bul. 326, Bu. Biol. Sur., U. S. D. A., 1916, pp. 140, pls. 10. (= Bul. 15, P. R. Insular Exp. Sta.)
Gives stomach contents of majority of P. R. birds, enumerating cane pests.
- (104) 1916. WOLCOTT, GEORGE N.
Report of the Entomologist. *In* 4th Report, Board Comm. Agr. of P. R., 1914-1915, San Juan, 1916, pp. 17-22.
Gives summary of bulletins 11, 12 and 14, dealing with cane pests, by T. H. Jones.
- (105) 1916. _____
The Birds of Porto Rico. *In* the Agricultural News, Barbados, July 1, 1916, p. 219.
Review of Bulletin 326, U. S. D. A., by Alex Wetmore; discusses bird enemies of cane insects in P. R.
- (106) 1917. HUTSON, J. C.
Some Weevils of the genus *Diaprepes* in the West Indies. *In* The Agricultural News, Barbados, June 16, 1917, p. 186.
Gives table and distribution of species recently determined by Dr. Pierce.
- (107) 1917. HUTSON, J. C.
White Grubs Injuring Sugar-Cane in Porto Rico. *In* The Agricultural News, Barbados, July 14 (pp. 218-219), July 28 (p. 234), and Aug. 11, 1917 (pp. 250-251).
Review and discussion of article of same title by Smyth in Jl. Dept. Agr. of P. R., Vol. 1, No. 2, pp. 47-92.

- (108) 1917. HUTSON, J. C.
Sugar-Cane White Grubs in Porto Rico. *In* The Agricultural News, Barbados, Oct. 20, 1917, pp. 330-331.
Review and discussion of article on white-grubs by Smyth in Jour. Dept. Agr. of P. R., Vol. 1, No. 3, pp. 141-169.
- (109) 1917. JONES, T. H.
A List of the Coccidæ of Porto Rico. *In* Jl. of Board Comm. Agr. of P. R., Vol. 1, No. 1, Jan. 1917, pp. 1-16.
Lists *Pseudococcus calceolariae* Mask. (p. 4), *Ps. sacchari* Ckll. (p. 5), *Aclerda tokionis* Ckll. (p. 8) and *Aspidiotus sacchari* Ckll. (p. 12) as cane pests.
- (110) 1917. SMYTH, E. G.
The White-Grubs Injuring Sugar-Cane in Porto Rico, Part I, Melolonthids. *In* Jl. Dept. Agr. of P. R., Vol. 1, No. 2, Apr. 1917, pp. 47-92, pls. 8, and Vol. 1, No. 3, July 1917, pp. 141-169.
Researches into the life-history, damage, distribution, parasites, etc., of 4 new species of *Phyllophaga* (= *Lachnosterna*) and 1 new species of *Phytalus*.
- (111) 1917. SMYTH, E. G.
The White-Grubs Injuring Cane and Other Crops in Porto Rico. *In* Porto Rico Progress, San Juan, May 18, 1917.
Popular account of their injuries and life-histories.
- (112) 1917. SMYTH, E. G.
Report of the Entomological Department. *In* Ann. Rept. Insular Exp. Sta. of P. R., 1916-1917, Río Piedras, 1917, pp. 99-106.
Account of cane insects intercepted from Santo Domingo, and of fumigation of cane steamers (pp. 105-106).
- (113) 1917. STEVENSON, J. A.
Report of the Pathologist. *In* 5th Report, Board Comm. Agr. of P. R., 1915-1916, San Juan, 1917, pp. 35-74.
States (p. 68) that moth stalk-borer larvæ pass through uninjured when cane trash is burned.
- (114) 1917. STEVENSON, JOHN A.
Report of the Department of Pathology and Botany. *In* Ann. Rept., Insular Exp. Sta. of P. R., 1916-1917, Río Piedras, 1917, pp. 37-98.
Notes (p. 56) injury to cane experiments by *Diatraea*, *Diaprepes spengleri* and *Phyllophaga* spp.
- (115) 1917. TOWER, W. V.
Report of the Director. *In* 5th Report, Board Comm. Agr. of P. R., 1915-1916, San Juan, 1917, pp. 9-15.
Notes briefly work on *Diatraea saccharalis* (p. 14) and on *chança* (p. 15).

- (116) 1917. VAN ZWALUWENBURG, R. H.
Insects Affecting Coffee in Porto Rico. *In* Jl. Econ. Ent., Vol. 10, No. 6, Dec. 1917, pp. 513-517.
Discusses: *Apate fransisca* Fab. (p. 516) and the May-beetles and their two Tachinid parasites (p. 517).
- (117) 1917. WOLCOTT, G. N.
Report of the Entomologist. *In* 5th Report, Board Comm. Agr. of P. R., 1915-1916, San Juan, 1917, pp. 75-85, pl. 1.
Effect of rainfall and trash burning upon infestation of cane by *Diatraea saccharalis* (pp. 80-85).
- (118) 1918. COTTON, R. T.
Experimental Work on the Control of the White Grubs of Porto Rico. *In* Jl. Dept. Agr. of P. R., Vol. 2, No. 1, Jan. 1918, pp. 1-18.
Deals with the larvæ of *Phyllophaga*, mainly as sugar-cane pests. Summarizes work of other investigators.
- (119) 1918. COTTON, R. T.
Medios para Combatir los Gusanos Blancos. Cir. 12, Insular Exp. Sta. of P. R., Río Piedras, 1918, pp. 7.
Control measures for white-grubs.
- (120) 1918. COTTON, R. T.
Insects Attacking Vegetables in Porto Rico. *In* Jl. Dept. Agr. of P. R., Vol. 2, No. 3, Oct. 1918, pp. 265-317, figs. 67.
Discusses: *Changa* (p. 270), grasshoppers (p. 272), white-grubs (p. 274), *Laphygma frugiperda* (p. 288), *Diatraea saccharalis* (p. 290), fire ant (p. 296), and *Diabrotica graminea* (p. 302).
- (121) 1918. HUTSON, J. C.
The Production of Light in Certain Animals. *In* The Agricultural News, Barbados, Jan. 12, 1918, pp. 10-11.
Mentions larvæ of *Pyrophorus luminosus* as predacious on white-grubs in cane fields in P. R.
- (122) 1918. HUTSON, J. C.
The West Indian Mole Cricket or *Changa*. *In* The Agricultural News, Barbados, Apr. 6, 1918 (pp. 106-107, fig. 1), and Apr. 20, 1918 (p. 122).
Review and discussion of Bul. 23, P. R. Agr. Exp. Sta., U. S. D. A.
- (123) 1918. STEVENSON, J. A.
The Green Muscardine Fungus in Porto Rico. *In* Jl. Dept. Agr. of P. R., Vol. 2, No. 1, Jan. 1918, pp. 19-32, pl. 1.
Twenty-one out of 29 recorded insect hosts are cane pests.
- (124) 1918. STEVENSON, J. A.
A Check List of Porto Rican Fungi and a Host Index. *In*

- Jl. Dept. Agr. of P. R., Vol. 2, No. 3, July 1918, pp. 125-264.
Fungi attacking cane insects, pp. 134, 207, 208 and 218.
- (125) 1918. VAN ZWALUWENBURG, R. H.
Report of the Entomologist. *In* Rept., P. R. Agr. Exp. Sta., U. S. D. A., for 1916, Mayagüez, Feb. 5, 1918, pp. 25-28, pl. 1.
Discusses light trapping of May-beetles (pp. 25, 26), *Scapteriscus vicinus* (p. 25), and *Sipha flava* (p. 28). States that termite previously reported as *Eutermes morio* is *Cryptotermes* sp.
- (126) 1918. VAN ZWALUWENBURG, R. H.
The Changa or West Indian Mole Cricket. Bul. 23, P. R. Agr. Exp. Sta., U. S. D. A., Mayagüez, Feb. 12, 1918, pp. 28, pls. 3.
Considered "the most serious insect pest of general agriculture in Porto Rico." Bibliography of 54 titles appended.
- (127) 1918. VAN ZWALUWENBURG, R. H.
Some Means of Controlling Insects, Fungi, and Other Pests in Porto Rico. Cir. 17, P. R. Agr. Exp. Sta., U. S. D. A., Mayagüez, June 27, 1918, pp. 30.
Includes special control measures for cut-worms, *changa*, fire-ant, etc.
- (128) 1918. VAN ZWALUWENBURG, R. H.
Report of the Entomologist. *In* Rept. P. R. Agr. Exp. Sta., U. S. D. A., for 1917, Mayagüez, Sept. 20, 1918, pp. 33-34.
Notes light trapping of *changas*, *Strategus quadri-foveatus* as a coconut pest, and tests of cyanamid as remedy for white grubs (p. 34).
- (129) 1919. BALLOU, H. A.
The Toad in the West Indies. *In* The Agricultural News, Barbados, Nov. 29, 1919, pp. 378-379.
Discusses the proposed introduction of toads into Porto Rico to combat white-grubs (see number 132, this list).
- (130) 1919. COLÓN, E. D.
Report of the Director. *In* Ann. Rept., Insular Exp. Sta. of P. R. for June 30, 1918, Río Piedras, 1919, pp. 6-77.
Review of entomological work from 1913 to 1918, pp. 8-13; 29-59. Cane pests, pp. 8, 29-30, 32-33, 37-58.
- (131) 1919. HOLLOWAY, T. E. AND LOFTIN, U. C.
The Sugar-Cane Moth Borer. Bulletin No. 746, U. S. D. A., Washington, Apr. 18, 1919, pp. 74, pls. 10, figs. 12.

- Mentions climatic and fungus control (pp. 35-38) and parasites (p. 41) of *Diatraea* in Porto Rico.
- (132) 1919. SMYTH, E. GRAYWOOD.
 Report of the Division of Entomology. *In* Ann. Rept., Insular Exp. Sta. of P. R. for June 30, 1918, Río Piedras, 1919, pp. 109-129.
 Insect transmission of cane mottling disease (pp. 118-119), cane white-grub problem (pp. 119-120), hard-backs injuring cane (pp. 120-121), red-spider attacking cane (pp. 121-122), epidemic of yellow cane aphid (pp. 122-123), and *Eutermes morio* (pp. 126-127).
- (133) 1919. SMYTH, E. GRAYWOOD.
 Report of the Entomologist. *In* Ann. Rept., Insular Exp. Sta. of P. R. for year ending June 30, 1919, Río Piedras, 1919, pp. 27-31.
 Work on the transmission of the sugar-cane mottling disease by insects, pp. 28-30.
- (134) 1919. SMYTH, E. GRAYWOOD.*
 [Work of the] Division of Entomology. *In* Report of the Commissioner of Agr. and Labor of P. R., Bureau of Insular Affairs, War Dept., Washington, 1919, pp. 685-713.
 Mentions *Bothriocera* sp. as feeding on cane (p. 695), and discusses successful transmission of the cane mottling disease (p. 699) by means of *Stenocranus saccharivorus* Westw. and *Aclerda tokionis* Ckll. (the latter being a misdetermination for *Pulvinaria iceryi* Guer.).
- (135) 1919. ————
 Entomology in Porto Rico. *In* The Agricultural News, Barbados, Nov. 15, 1919, pp. 362-363.
 Review of the entomologist's report (Ann. Rept. P. R. Insular Exp. Sta.) for year ending June 30, 1918.
- (136) 1919. ————
 Skunks and Toads—A Warning. *In* The Agricultural News, Barbados, Nov. 15, 1919, p. 361.
 Discussion of proposed introduction of skunks and toads into P. R. to combat white-grubs.

* The following paragraphs of this report: Plant Quarantine (pp. 691-692), Division of Entomology (p. 694), Work on Citrus Insect Pests (p. 695), and Entomological Work (on Yellow-Stripe Diseases) (p. 699), though not credited to the writer, are taken verbatim from his annual report, and were unfortunately omitted from the Annual Report of the Experiment Station for the same year.