

- DEYRUP, M. AND J. TRAGER. 1986. Ants of the Archbold Biological Station, Highlands Co., Florida (Hymenoptera: Formicidae). Florida Entomol. 69: 206-228.
- HOFFMEISTER, J. E. AND H. G. MULTER. 1968. Geology and origin of the Florida Keys. Geol. Soc. Amer. Bull. 79: 1487-1502.
- JOHNSON, C. 1986. A north Florida ant fauna. Insecta Mundi 1: 243-246.
- LUBIN, Y. D. 1984. Changes in the native fauna of the Galapagos Islands following invasion by the little red fire ant, *Wasmannia auropunctata*. Biol. J. Linn. Soc. 21: 229-242.
- NAVES, M. A. 1985. A monograph of the genus *Pheidole* in Florida (Hymenoptera: Formicidae). Insecta Mundi 1: 53-90.
- PECK, S. B. AND H. F. HOWDEN. 1985. Biogeography of scavenging scarab beetles in the Florida Keys: post Pleistocene land-bridge islands. Canadian J. Zool. 63: 2730-2737.
- SMITH, D. R. 1979. Superfamily Formicoidea. Pp. 1312-1467 in K. V. Krombein, P. D. Hurd, Jr., D. R. Smith, B. D. Burks (eds.). Catalog of Hymenoptera in America north of Mexico. Smithsonian Institution Press, Washington, D.C.
- SMITH, M. R. 1936. The ants of Puerto Rico. J. Agric. Univ. Puerto Rico 20: 819-875.
- SNELLING, R. R. In press. Taxonomic notes on Nearctic species of *Camponotus*, subgenus *Myrmentoma* (Hymenoptera: Formicidae) in J. C. Trager, ed., Advances in Myrmecology. Florida and Fauna Publications, E. J. Brill Inc., NY.
- SNELLING, R. R. AND G. C. WHEELER. 1979. The taxonomy, distribution and ecology of California desert ants. Report Bur. Land Manage., U.S. Dept. Interior, Riverside, CA. 335 pp.
- WARD, P. S. 1985. The Nearctic species of the genus *Pseudomyrmex* (Hymenoptera: Formicidae). Quaest. Entomol. 21: 209-246.
- WHEELER, W. M. 1916. Ants collected in Trinidad by Professor Roland Thaxter, Mr. F. W. Urich, and others. Bull. Harvard Mus. Comp. Zool. 60: 323-330.
- WILSON, E. O. 1964. The ants of the Florida Keys. Breviora 210: 1-14.

**BIBLIOGRAPHY OF THE
NEOTROPICAL CORNSTALK BORER,
DIATRAEA LINEOLATA (LEPIDOPTERA: PYRALIDAE)**

L. A. RODRIGUEZ-DEL-BOSQUE, J. W. SMITH JR.
Department of Entomology
Texas A&M University
College Station, Texas 77843-2475

AND

H. W. BROWNING
Texas Agricultural Experiment Station
2415 East Highway 83, Weslaco, Texas 78597

ABSTRACT

A bibliographic revision of the neotropical cornstalk borer (NCB), *Diatraea lineolata* (Walker) is presented. The bibliographical entries include information on distribution, taxonomy, host plants, biology, damage, and control of the NCB. However, only a few references cited include substantial and complete information on the NCB. Most of the citations include brief local observations and preliminary information on this species.

The NCB has been poorly studied in spite of its wide distribution and importance as a pest of corn in the neotropical region.

RESUMEN

Se presenta una revisión bibliográfica sobre el barrenador neotropical del maíz (BNM), *Diatraea lineolata* (Walker). Las citas bibliográficas incluyen información sobre su distribución, taxonomía, plantas hospederas, biología, daños y control. Sin embargo, pocas referencias presentan información substancial y completa sobre el BNM; la mayoría de los reportes incluyen breves observaciones locales e información preliminar sobre este insecto. El BNM no se ha estudiado adecuadamente a pesar de su amplia distribución e importancia como plaga del maíz en la región neotropical.

The most economically important species of the genus *Diatraea* Guiling are *saccharalis* (Fabricius), *grandiosella* Dyar, and *lineolata* (Walker) because of their wide distribution and injury to graminaceous crops, principally sugar cane, *Saccharum officinarum* L., corn, *Zea mays* L., and sorghum, *Sorghum bicolor* (L.) Moench. Morrison et al. (1977) and Chippendale et al. (1985) prepared a bibliography for *D. grandiosella*, and Roe et al. (1981) for *D. saccharalis*, however, no attempt has been made to locate, summarize, and interpret the literature on *D. lineolata*.

The neotropical cornstalk borer (NCB), *D. lineolata*, described from Venezuela by Walker (1856), is after *D. saccharalis*, the most widely distributed species of *Diatraea*. It occurs in the Bahamas, Cuba, Grenada, Tobago, Trinidad, Mexico, Central America and most of equatorial South America north of the Amazon River (Box 1950c). Within the continental United States, it only occurs in the Rio Grande Valley, Texas (Anonymous 1966a).

The host plants of *D. lineolata* are more limited than *D. saccharalis*, but similar to *D. grandiosella*. The larva is a destructive borer of corn, and is classified as a "domestic" species since no true wild-grass host is known (Myers 1935b, Box 1951b). The NCB also has been reported from teosinte, *Euchlaena mexicana* Schrad., Guatemala grass, *Tripacum laxum*, wheat, *Triticum aestivum* L., sorghum, very rarely from sugar cane (Box 1950a, 1950c, 1951b), johnsongrass, *Sorghum halepense* (L.) (Van Leerdam 1981), and rice, *Oryza sativa* L. (Angeles et al. 1960). Damage to corn includes defoliation, interference to the vascular system by tunnelling in the stalk, lodging due to stalk weakening, and damage to the ear (Overman 1970).

Despite its wide distribution, the biology and ecology of *D. lineolata* have been studied only in Trinidad (Hynes 1942, Kevan 1943, 1944), and Nicaragua (van Huis 1981). Some preliminary studies were conducted in Venezuela (Box 1950a) and Guatemala (Painter 1955). Oviposition by NCB occurs primarily on the upper leaves of corn (Kevan 1944) at late whorl and tasseling (van Huis 1981). The average egg mass size observed in the field is two (Overman 1970, van Huis 1981) although this number is increased greatly under laboratory conditions (Kevan 1944, van Huis 1981). In Trinidad, the duration from egg to adult was seven to nine weeks with six to eight instars (Kevan 1943). A larval aestivation occurs during the dry season with pupation commencing at the onset of rain. The diapausing larva is characterized by the change from a spotted to an immaculate morph (Hynes 1942, Kevan 1943, 1944, van Huis 1981). Aestivation provides the species with a mechanism for survival during dry, host plant-free periods (Kevan 1944).

Studies on suppression methods for NCB are limited, although some natural enemies (parasites) and host plant resistance studies have been reported (Peairs & Saunders 1980). Van Huis (1981) reported a complete integrated pest management study on corn, including *D. lineolata*, in Nicaragua.

Taxonomic confusion of NCB in the early literature led to several erroneous reports (Box 1935b, 1949). Published references to *D. lineolata* in sugar cane in British Guiana and Trinidad actually refer to *D. impersonatella* (e.g. Urich 1910, 1915, Wolcott 1913, Bodkin 1913, Cleare 1922, 1923, Box 1926), in Mexico to *D. grandiosella* (e.g. Van Zwaluwenburg 1923, 1926a, 1926b, Morrill 1925, Anonymous 1927, Van Dine 1929, Osborn & Phillips 1946), and in corn and sugar cane in the United States to *D. grandiosella* (e.g. Dyar 1911, Barnes & McDunnough 1917, Morrill 1919, Holloway & Loftin 1919a,b, Vorhies 1919, USDA 1922, Howard 1923, Anonymous 1925). In addition, the NCB has been mistakenly reported attacking sugar cane in Dutch Guiana by Van Dine (1929), in Cuba by Van Dine (1926, 1929), and in Venezuela by Box (1927a). Finally, the NCB has been confused with *D. grandiosella* attacking corn in northeastern Mexico and south Texas, where the latter species has been erroneously reported by Elias (1970) and Cevallos-Davila (1970). Examination of specimens from several comprehensive surveys failed to detect *D. grandiosella* in this area (Agnew et al. in press).

NCB was referred to as *Zeadiatraea lineolata* in the literature after Box (1955) established this new genus based on morphological characters. However, Bleszynski (1966) returned *lineolata* and other species to *Diatraea*, their original genus.

Bibliographical entries were obtained from the following sources: Biological Abstracts (1927, Vol. 1 through 1988, Vol. 84, No. 1), Entomology Abstracts (1969, Vol. 1 through 1987, Vol. 18, No. 11), Review of Applied Entomology, Series A (1913, Vol. 1 through 1987, Vol. 75, No. 11), and literature citations in the reviewed articles themselves. We also used the National Agricultural Library and Biosciences Information Services computerized literature search system in the library of the Texas A&M University.

Most references cited are on file with the authors. The references are listed alphabetically by author(s). Depending on the type of information given, a number after each reference indicates the following categories:

- (1) Distribution and catalog/listing.
- (2) Taxonomy and morphology.
- (3) Biology and ecology.
- (4) Economic damage and host plants.
- (5) Biological control.
- (6) Host plant resistance.
- (7) Chemical control.
- (8) Erroneous reports for other species.

Only a small portion of the references cited here include substantial information on NCB; the majority either make brief mention of NCB or are misidentifications with other species. We included many Mexican and Central American local reports since they are not commonly cited in the literature. Unfortunately, with a few exceptions, most of them either include general information or represent only preliminary observations on NCB. Because *D. lineolata* has been poorly studied in spite of its wide distribution and importance as a pest of corn, more detailed studies are needed on its biology, ecology, and control.

BIBLIOGRAPHY

- Abarca, M., A. Cortes I. and S. Flores C. 1958. The sugarcane borers in Mexico; an attempt to control them through parasites. Proc. 10th Int. Cong. Entomol. 4:827-34. (1,5)
- Agnew, C. W., L. A. Rodríguez-del-Bosque and J. W. Smith, Jr. Misidentifications of Mexican stalkborers in the subfamily Crambinae (Lepidoptera: Pyralidae). Folia Entomol. Mex. (in press) (2)

- Aguilar-Anzueto, L. 1985. Determinación específica de insectos fitófagos del maíz (*Zea mays* L.), en dos municipios del Estado de Chiapas. Resúmenes del XX Congreso Nacional de Entomología. Cd. Victoria, Tamaulipas, México. pp. 102-3. (1,4)
- Aldrich, J. M. 1925. Two species of the Tachinidae genus *Lixophaga*, with notes and key (Diptera). Proc. Ent. Wash. 26(6):132-6. (1,5)
- Andrews, K. L. 1984. El manejo integrado de plagas invertebradas en cultivos agronómicos, hortícolas y frutales en la Escuela Agrícola Panamericana. Proyecto Manejo Integrado de Plagas en Honduras. E.A.P./A.I.D. Ministerio R.R.N.N. El Zamorano, Honduras. 35 pp. (1,4)
- Angeles, N., W. Szumkowski, and P. D. Paredes. 1960. *Diatraea saccharalis* (F.), plaga del arroz en Venezuela. Agron. Trop. 9:127-32. (4)
- Anonymous. 1925. Proceedings of the 6th Conference Western Plant Quarantine Board. Denver, Colorado. Calif. Dept. Agric. Spec. Pub. 54, 100 pp. [Rev. Appl. Entomol. 13:637]. (8)
- Anonymous. 1927. Insect pests of sugarcane (including utilization of parasites). Proc. 2nd Conf. Internat. Soc. Sugar Cane Technol. pp. 57-62. [Rev. Appl. Entomol. 17:464]. (8)
- Anonymous. 1957. Pests of corn (Mex. Agr. Program). The Rockefeller Found. Program in the Agricultural Sciences. Annual Report 1956-1957. pp. 264-9. (4,5)
- Anonymous. 1959. Biological control studies (Mex. Agr. Program). The Rockefeller Found. Program in the Agricultural Sciences. Annual Report 1958-1959. pp. 151-3. (5)
- Anonymous. 1960. Pests of corn (Mex. Agr. Program). The Rockefeller Found. Program in the Agricultural Sciences. Annual Report 1959-1960. pp. 76-7. (7)
- Anonymous. 1966a. Neotropical corn borer, *Zeadiatraea lineolata*. USDA Coop. Econ. Ins. Rep. 16(33):801. (1,4)
- Anonymous. 1966b. Neotropical corn borer, *Zeadiatraea lineolata*. USDA Coop. Econ. Ins. Rep. 16(36):876. (1,4)
- Anonymous. 1966c. Outbreaks and new records. FAO Plant Prot. Bull. 14(5):124-5. (1,4)
- Anonymous. 1967a. Neotropical corn borer, *Zeadiatraea lineolata*. USDA Coop. Econ. Ins. Rep. 17(2):15. (1,4)
- Anonymous. 1967b. Neotropical corn borer, *Zeadiatraea lineolata*. USDA Coop. Econ. Ins. Rep. 17(9):139. (1,4)
- Anonymous. 1967c. Neotropical corn borer, *Zeadiatraea lineolata*. USDA Coop. Econ. Ins. Rep. 17(28):615. (1,4)
- Anonymous. 1968. Neotropical corn borer, *Diatraea lineolata*. USDA. Coop. Econ. Ins. Rep. 18(42):978. (1,4)
- Anonymous. 1969a. Neotropical corn borer, *Diatraea lineolata*. USDA. Coop. Econ. Ins. Rep. 19(2):19. (1,4)
- Anonymous. 1969b. Neotropical corn borer, *Diatraea lineolata*. USDA. Coop. Econ. Ins. Rep. 19(34):660. (1,4)
- Arnaud, P. H. Jr. 1978. A host-parasite catalog of north American *Tachinidae* (Diptera). USDA Misc. Pub. No. 1319. p. 414 (1,5)
- Barnes, W. and J. McDunnough. 1917. Check list of Lepidoptera of Boreal America. Decatur, Illinois. p. 141. (1)
- Beg, M. N. and F. D. Bennett. 1971. Accidental introduction of *Diatraea centrella* (Moschi) into Abaco, Bahamas, and attempts at its control. Proc. Int. Soc. Sugar Cane Technol. 14:418-23. (4)
- Beg, M. N. and F. D. Bennett. 1973. Insects associated with sugarcane on Abaco Island, The Bahamas. Proc. of the 1973 Meeting of the West Indies Sugar Technol., Barbados. West Indies Sugar Assoc. (Inc.) pp. 228-45. [Rev. Appl. Entomol. 64:1999]. (4)

Bennett, F. D. 1965. Tests with parasites of Asian graminaceous moth-borers on *Diatraea* and allied genera in Trinidad. Commonwealth Ins. Biol. Control. Tech. Bull. 5:101-16. (5)

Bennett, F. D. 1966. Preliminary studies with *Jaynesleskia jaynesi* Aldrich, a potentially important Tachinid parasite of *Diatraea* spp. Proc. of the 1966 Meeting of British West Indies Sugar Technol. pp. 309-10. [Rev. Appl. Entomol. 60:210]. (5)

Bennett, F. D. 1969. Tachinid flies as a biological control agent for sugarcane moth borers. pp. 117-48. In Pests of Sugarcane, J. R. Williams, J. R. Metcalf, R. W. Mungomery, and R. Mathes (eds.). Elsevier Publ. Co., New York. 568 pp. (5)

Bennett, F. D. 1971. Current status of biological control of the small moth borers of sugarcane *Diatraea* spp. (Lepidoptera-Pyralidae). Entomophaga. 16(1):111-24. (4,5)

Bennett, F. D., M. J. W. Cock, and F. A. Diaz. 1983. *Allorhogas* sp. n. (Braconidae) a potential biological control agent for graminaceous stem borers from Mexico. ISSCT Entomol. Newsl. 14:9-12 [Rev. Appl. Entomol. 72:733] (5)

Berry, P. A. 1959. Entomología económica de El Salvador. Bol. Tec. 24. Serv. Coop. Agr. Salvadoreño Americano. Ministerio de Agr. y Gan. Santa Tecla, El Salvador. p. 120. (4)

Bleszynski, S. 1966. Studies on the Crambinae (Lepidoptera). Part 43. Further taxonomic notes on some tropical species. Acta Zool. Cracov. 11:451-98. (2)

Bleszynski, S. 1967. Studies on the Crambinae (Lepidoptera). Part 44. New neotropical genera and species. Preliminary checklist of neotropical Crambinae. Acta Zool. Cracov. 12(5):39-100. (1)

Bleszynski, S. 1969. The taxonomy of the Crambinae moth borers of sugar cane. pp. 11-59. In Pests of Sugarcane, J. R. Williams, J. R. Metcalf, R. W. Mungomery, and R. Mathes (eds.). Elsevier Publ. Co., New York. 568 pp. (2)

Bleszynski, S. and R. J. Collins. 1962. A short catalogue of the world species of the family Crambidae (Lepidoptera). Acta Zool. Cracov. 7(12):197-389. (1)

Bodkin, G. E. 1913. Insects injurious to sugar-cane in British Guiana, and their natural enemies. J. Board of Agric. Br. Guiana. 7(1):29-32. [Rev. Appl. Entomol. 1:521-2]. (8)

Box, H. E. 1926. Sugar-cane moth borers (*Diatraea* spp.) in British Guiana. Bull. Ent. Res. 16:249-66. (8)

Box, H. E. 1927a. Eleventh report upon entomological work. Central Aguirre Sugar Co., Central Aguirre, P.R. 24 pp. [Rev. Appl. Entomol. 15:412-4]. (8)

Box, H. E. 1927b. Los parásitos conocidos de las especies americanas de *Diatraea* (Lepidoptera, Pyralidae). Rev. Ind. Agric. Tucuman. 18:53-61. (1,5)

Box, H. E. 1931. The Crambine genera *Diatraea* and *Xanthopherene* (Lep., Pyralidae). Bull. Ent. Res. 22:1-50. (1,2)

Box, H. E. 1933. Further observations on sugar-cane moth borers (*Diatraea* spp.) in St. Lucia. Introduction of the Cuban parasite, *Lixophaga diatraeae* Townsend. Report upon visit to St. Lucia, August-September, 1933. With an appendix on the recommended biological control of the white coffee-leaf miner (*Leucoptera coffeella*) in St. Lucia. 10 pp. [Rev. Appl. Entomol. 22:104]. (8)

Box, H. E. 1935a. New records and three new species of American *Diatraea* (Lep.: Pyral.). Bull. Ent. Res. 26:323-33. (1,4)

Box, H. E. 1935b. The species of *Diatraea* attacking sugar-cane in the New World. Proc. Int. Soc. Sug. Cane Technol. 5:470-6. (1,4)

Box, H. E. 1935c. The food plants of American *Diatraea* species. Imp. Col. Trop. Agric. Trinidad, Memoir. 11 pp. [Rev. Appl. Entomol. 24:22-23]. (1,4)

Box, H. E. 1938. Observations on sugar-cane moth borers (*Diatraea* spp.) in St. Lucia. III. The introduction and establishment of the Amazon fly (*Metagonistylum minense* Townsend) and control of *Diatraea saccharalis* Fabricius by means of this

parasite. Report upon a visit to St. Lucia, March-Abril, 1938. 25 pp. [Rev. Appl. Entomol. 27:182-3]. (1)

Box, H. E. 1947. Informe preliminar sobre los taladradores de la caña de azúcar (*Diatraea* spp.) en Venezuela. Bol. Tec. Dep. Ent. Minist. Agric. Venezuela. 117 pp. [Rev. Appl. Entomol. 37:273-4]. (4)

Box, H. E. 1948a. Notes on the genus *Diatraea* Guilding (Lepid., Pyralidae). Introduction and parts I, II and III. Bol. Ent. Venez. 7:26-59. (1)

Box, H. E. 1948b. Report upon specimens of *Diatraea* Guild. in the Paris museum with the description of a new species from Brazil (Lep., Pyral.). Rev. de Entomol. 19(3):419-22. (1)

Box, H. E. 1949. Notes on the genus *Diatraea* Guilding (Lepid., Pyral.). Parts IV and V. Rev. de Entomol. 20:541-55. (1,4)

Box, H. E. 1950a. Investigaciones sobre los taladradores de la caña de azúcar (*Diatraea* spp.) en Venezuela. Informe de progreso durante 1947-49. Bol. Tec. Div. Ent. Minist. Agric. Venezuela 2: 1-60 [Rev. Appl. Entomol. 39:92-4]. (3,4,5)

Box, H. E. 1950b. Report upon specimens of *Diatraea* Guilding (Lepidoptera, Pyralidae) in the Cornell University collection. J.N.Y. Entomol. Soc. 58:241-5. (1)

Box, H. E. 1950c. The geographical and ecological distribution of some neotropical species of *Diatraea* Guild. (Lep.: Pyralidae) and certain of their parasites. Int. Cong. Ent. 8:351-7. (1,4)

Box, H. E. 1951a. Informe preliminar sobre los barrenadores o "borers" de la caña de azúcar (*Diatraea*, *Chilo*) en México, a base de un viaje de reconocimiento efectuado durante marzo-abril, 1951, a las regiones cañeras: I Sinaloa, II Nayarit y XIV Huastecas, con observaciones complementarias. Un. Nal. Prod. Azuc. México, D.F. 93 pp. [Rev. Appl. Entomol. 39:431-2]. (1,4,5)

Box, H. E. 1951b. New species and records of *Diatraea* Guild. from northern Venezuela (Lepid., Pyral.). Bull. Ent. Res. 42:379-98. (1,4)

Box, H. E. 1952. Investigaciones sobre los taladradores de la caña de azúcar (*Diatraea* spp.) en Venezuela. El proyecto del combate biológico. Informe del progreso durante 1949-1951. Min. Agric. y Cria, Inst. Nac. Agric., Maracay. Bol. Tec. 5:1-52. [Rev. Appl. Entomol. 42:213-4]. (4,5)

Box, H. E. 1953a. Informe sobre las plagas insectiles que atacan a a caña de azúcar en México, a base de un viaje de recorrido efectuado durante mayo-julio, 1952, a las regiones cañeras: I Sinaloa, VI Balsas, VII Tehuacán, VIIIb Papaloapan, XII Veracruz-Central, XIII Costa de Veracruz y XIV Huasteca. Bol. Azuc. Mex. 44 suppl. México, D.F. 26 pp. [Rev. Appl. Entomol. 43:220-2]. (1,4,5)

Box, H. E. 1953b. The control of sugarcane moth borers (*Diatraea*) in Venezuela; a preliminary account. Trop. Agric. 30:97-113. (4,5)

Box, H. E. 1953c. The history and changing status of some neotropical insect pests. Trans. Int. Cong. Ent. 9(2):254-9. (1,4)

Box, H. E. 1955. New Crambine genera allied to *Diatraea* Guilding (Lepidoptera: Pyralidae). III. Proc. R. Ent. Soc. Lond. (B) 24:197-200. (2)

Box, H. E. 1956. New species and records of *Diatraea* Guilding and *Zeadiatraea* Box from Mexico, Central and South America (Lepid., Pyral.). Bull. Ent. Res. 47(4):755-76. (1)

Box, H. E. 1960. The species of *Diatraea* and allied genera attacking sugarcane. Proc. Int. Soc. Sug. Cane Technol. 10:870-6. (1,4)

Box, H. E. and P. Guagliumi. 1953. The insects affecting sugarcane in Venezuela. Proc. Int. Soc. Sug. Cane Technol. 8:553-9. (4)

Cardin, P. 1915. Caña de azúcar (*Saccharum officinarum*). Inf. Depto. Patol. Veg. & Entomol., Est. Exp. Agron. Santiago de las Vegas, Cuba. 3(1909-1915):112-7. (4)

Centro Internacional de Mejoramiento de Maíz y Trigo. 1969. Stem borer resistance.

Report 1968-1969, CIMMYT (International Maize and Wheat Improvement Center). El Batán, México. pp. 43-45. (6,8)

Centro Internacional de Mejoramiento de Maíz y Trigo. 1970. Stem borer resistance. Report 1969-1970, CIMMYT (International Maize and Wheat Improvement Center). El Batán, México. p. 38. (6)

Cevallos-Dávila, A. 1970. Reacción varietal del maíz a la infestación artificial de *Diatraea saccharalis* (Fabricius) y manejo del insecto en el laboratorio. Tesis M.C. ITESM. Monterrey N.L., México. 60 pp. (8)

Chippendale, G. M. 1979. The southwestern corn borer, *Diatraea grandiosella*: case history of an invading insect. Univ. Missouri. Agric. Exp. Station. Res. Bull. 1031. 52 pp. (1)

Chippendale, G. M. and K. L. Cassatt. 1985. Case history of the southwestern corn borer, *Diatraea grandiosella*. II. Annotated bibliography, 1977 to 1985. Misc. Publ. Entomol. Soc. Am. No. 60. 30 pp.

Cleare, L. D. 1922. Notes on small moth-borers of sugarcane in British Guiana. J. Bd. Agric. British Guiana. 15(4):163-184 [Rev. Appl. Entomol. 11:113]. (8)

Cleare, L. D. 1923. Notes on small moth-borers on sugarcane in British Guiana. Bull. Ent. Res. 13:457-68. (8)

Cock, M. J. W. 1982. *Telenomus* sp. (ex ova *Diatraea rufescens*) from Bolivia, a potential biological control agent for *Diatraea centrella*. Entomology Newsletter. 12:6-7 [Rev. Appl. Entomol. 71:111]. (5)

Cock, M. J. W. 1983. Host range testing of the tachinid *Diatraea* parasites *Palpozenilia diatraeae* Tns. and *Paratheresia claripalpis* (Wulp) (from Brazil and Ecuador). Entomology Newsletter. 15:8-15. [Rev. Appl. Entomol. 72] (5)

D'Aure, N. and J. L. Fontenia-Rizo. 1986. Zoogeografía del género *Diatraea* (Lepidoptera: Pyralidae) y su situación en Cuba. Ciencias Biológicas. 16:101-10. [Entomol. Abst. 18:118] (1)

Davis, E. G., J. R. Horton, C. H. Gable, E. V. Walter, and R. A. Blanchard. 1933. The southwestern corn borer. USDA Tech. Bull. 388. 61 pp. (1)

Díaz-Palma, R. O. 1957. Susceptibilidad de algunos mestizos de maíz al ataque del barrenador *Diatraea saccharalis* Fab. y *D. lineolata* Walker. Tesis Ing. Agr. ITESM. Monterrey, N.L., México. 22 pp. (6)

Dyar, H. G. 1911. The American species of *Diatraea* Guilding (Lepid., Pyralidae). Ent. News. 22:199-207. (8)

Dyar, H. G. and C. Heinrich. 1927. The American moths of the genus *Diatraea* and allies. U.S. Nat. Mus. Proc. 71(19), 48 pp. (1,2)

Elias, L. A. 1970. Maize resistance to stalk borers in *Zeadiatraea* Box, and *Diatraea* Guilding (Lepidoptera: Pyralidae) at five localities in Mexico. Dissertation. Kansas State University, Manhattan. 172 pp. [Diss. Abstr. Intl. 31(3):1331-2B]. (1,6,8)

Estrada, F. A. 1960. Lista preliminar de insectos asociados al maíz en Nicaragua. Turrialba 10:68-73. (1,4)

Flores C., S. 1955. Combate biológico del barrenador de la caña de azúcar. Agric. Tec. Mex. 1(1):16-37. (5)

Flores C., S. and M. Abarca R. 1961. Principales plagas de la caña de azúcar en México. IMPA, Boletín de Divulgación 4:47-58. (1)

Frohlich, G. and W. Rodewald. 1970. Pests and diseases of tropical crops and their control. Pergamon Press. Oxford. 371 pp. (4)

Fuchs, T. W. and J. A. Harding. 1979. Seasonal abundance of the sugarcane borer, *Diatraea saccharalis*, on sugarcane and other hosts in the Lower Rio Grande Valley of Texas. Southwes. Entomol. 4(2):125-31. (4)

Holloway, T. E. and U. C. Loftin. 1919a. Insects attacking sugar cane in the United States. J. Econ. Entomol. 12:448-50. (8)

Rodríguez-del-Bosque et al.: Cornstalk Borer Bibliography 183

- Holloway, T. E. and U. C. Loftin. 1919b. The sugar-cane moth borer. USDA Bull. 796. pp 10-11. (8)
- Howard, L. O. 1923. Report (1922-23) of the entomologists. U.S. Dept. Agric. 37 pp. [Rev. Appl. Entomol. 12:165-7]. (8)
- Hynes, H. B. N. 1942. Lepidopterous pests of maize in Trinidad. Trop. Agric. 19:194-202. (3,4,5)
- Jepson, W. F. 1954. A critical review of the world literature on the Lepidopterous stalk borers of graminaceous crops. Commonwealth Inst. Entomol. London. 127 pp. (1,4)
- Kaye, W. J. and N. Lamont. 1927. A catalogue of the Trinidad Lepidoptera Heterocera (moths). Mem. Dept. Agric. Trinidad & Tobago. 3:128-9. (8)
- Kevan, D. K. M. 1943. The neotropical cornstalk borer, *Diatraea lineolata* Walker and the sugarcane moth borer, *Diatraea saccharalis* (F.) as maize pests in Trinidad (B.W.I), with notes from Grenada. Trop. Agric. (Trinidad) 20:167-74. (3,4,5)
- Kevan, D. K. M. 1944. The bionomics of the neotropical cornstalk borer, *Diatraea lineolata* Wlk. (Lep., Pyral.) in Trinidad, B.W.I. Bull. Ent. Res. 35:23-30. (3)
- King, A. B. S. and J. L. Saunders. 1984. Las plagas invertebradas de cultivos alimenticios anuales en América Central. Overseas Development Administration, London. pp. 53-54. (1,3,4,5,7)
- Kirkland, R. L. 1982. Biology of *Iphiaulex kimballi* (Hym.: Braconidae), a parasite of *Diatraea grandiosella* (Lep.: Pyralidae). Entomophaga. 27(2):129-34. (5)
- Lacayo, L. 1977. Especies parasíticas de *Spodoptera frugiperda* (Smith), *Diatraea lineolata* (Wlk.) y *Trichoplusia ni* (Hbn.) en zonas de Managua y Masatepe. XXIII Reunión Anual del PCCMCA, Panamá, Panamá. pp. 1-28. (5)
- Loera-Gallardo, J. 1986. El gusano barrenador *Diatraea lineolata* (Walker) y su efecto en el rendimiento del maíz. Resúmenes del XXI Congreso Nacional de Entomología. Monterrey, N.L., México. pp. 177-8. (4)
- Mahadeo, C. R. 1980. Minor pests of sugar cane in Trinidad. J. Agric. Soc. Trinidad Tobago. 80(2):120-8. (3,4)
- Manrique-Gómez, F., A. I. Galindo-R., and N. G. Gonzalez-Hernandez. 1979. Fluctuación de las poblaciones de algunos insectos de importancia económica en la Comarca Lagunera de los Estados de Coahuila y Durango. VII Reunión Nacional de Control Biológico. Veracruz, México. pp. 10-38. [Rev. Appl. Entomol. 68:212]. (3)
- Mihm, J. A. 1984. Técnicas eficientes para la crianza masiva e infestación de insectos, en la selección de las plantas hospedantes para resistencia a los taladradores del tallo del maíz *Diatraea* sp. Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT), El Batán, México. 23 pp. (3,6)
- Morrill, A. W. 1919. Report of the entomologists. Ann. Rept. Arizona Comiss. Agric. & Hortic. 1917-1918, 10:29-73. [Rev. Appl. Entomol. 9:405-7]. (8)
- Morrill, A. W. 1925. Commercial entomology on the west coast of Mexico. J. Econ. Entomol. 18:707-16. (8)
- Morrison, W. P., D. E. Mock, J. D. Stone, and J. Whitwort. 1977. A bibliography of the southwestern corn borer, *Diatraea grandiosella* Dyar (Lepidoptera: Pyralidae). Bull. Entomol. Soc. Am. 23(3):185-90.
- Myers, J. G. 1931. Descriptions and records of parasitic Hymenoptera from British Guiana and the West Indies. Bull. Ent. Res. 22:267-77. (5)
- Myers, J. G. 1932a. Biological observation on some neotropical parasitic Hymenoptera. R. Entomol. Soc. Lond. Trans. 80:121-36. (5)
- Myers, J. G. 1932b. The original habitat and hosts of three major sugar cane pests of tropical America (*Diatraea*, *Castnia*, and *Tomaspsis*). Bull. Ent. Res. 23(2):257-71. (4)
- Myers, J. G. 1935a. Second report on an investigation into the biological control of West Indian insect pests. Bull. Ent. Res. 26(2):181-252. (4)

- Myers, J. G. 1935b. The ecological distribution of some South American grass and sugar cane borers (*Diatraea* spp. Lep., Pyralidae). Bull. Ent. Res. 26:335-42. (4)
- Ortega, A. 1974. Maize diseases and insects. Proc. World Wide Maize Improvement in the 70's and the role for CIMMYT. Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT). El Batan, Mexico. 41 pp. (1,4)
- Ortega, A. and C. de Leon. 1971. Plant proteccion. Proc. of the 1st Maize Workshop. CIMMYT (International Maize and Wheat Improvement Center). El Batan, Mex. pp. 95-102. (1,4)
- Ortega, A., S. K. Vasal, J. A. Mihm, and C. Hershey. 1980. Breeding for insect resistance in maize. pp. 371-419. In Maxwell, F. G. and P. R. Jennings (eds.). Breeding plants resistance to insects. John Wiley and Sons. N.Y. 683 pp. (1,4,6)
- Osborn, H. T. and G. R. Phillips. 1946. *Chilo loftini* in California, Arizona, and Mexico. J. Econ. Entomol. 39:755-9. (8)
- Overman, J. L. 1970. Relationship of resistance in maize (*Zea mays* L.) to two related species of Pyralidae: *Diatraea saccharalis* (F.) and *Zeadiatraea lineolata* (Wlk.). Dissertation. The University of Florida. 105 pp. [Diss. Abst. Intl. 31:6667B]. (6)
- Painter, R. H. 1955. Insects on corn and teosinte in Guatemala. J. Econ. Entomol. 48:36-42. (3,4,5)
- Peairs, F. B. and J. L. Saunders. 1980. *Diatraea lineolata* y *D. saccharalis*: una revisión en relación con el maíz. Agron. Costarric. 4(1):123-35. (3,4,5,6)
- Pschorn-Walker, H. and F. D. Bennett. 1970. Host suitability experiments with three tachinid parasites of *Diatraea* spp. in Barbados and Trinidad, W.I. Proc. Int. Soc. Sug. Cane Technol. 13:1331-41. (5)
- Quezada, J. R. 1979. Poblaciones remanentes de barrenadores en cañas de maíz. Bol. 1. Fac. de Ciencias y Humanidades, Univ. de el Salvador. San Salvador, El Salvador. 22 pp. (3,5)
- Reed-Gil, C. G. Estudio sobre la biología de campo, hospederas y poblaciones del barrenador *Diatraea saccharalis* Fabricius y *D. lineolata* Walker, en maíz. Tesis Ing. Agr. ITESM. Monterrey, N.L. México. 41 pp. (3,4,5)
- Riess H., C. M. and S. Flores C. 1976. Catálogo de plagas y enfermedades de la caña de azúcar en México. Serie Divulgación Técnica IMPA II. CNIA. 177 pp. (1,4)
- Risco, S. H. 1960. La situación actual de los barrenadores de la caña de azúcar del género *Diatraea* y otros taladradores en el Perú, Panamá y Ecuador. Rev. Peru. Entomol. Agric. 3(1):6-10. (4,5)
- Rodríguez-del-Bosque, L. A., J. W. Smith, Jr., and H. W. Browning. 1988. Damage by stalkborers (Lepidoptera: Pyralidae) to corn in northeastern Mexico. J. Econ. Entomol. (in press). (3,4)
- Roe, R. M., A. M. Hammond Jr., T. E. Reagan, and S. D. Hensley. 1981. A bibliography of the sugarcane borer, *Diatraea saccharalis* (Fabricius), 1887-1980. USDA, ARS, Agric. Rev. and Manuals S-20. 101 pp.
- Rolston, L. H. 1955. The southwestern corn borer in Arkansas. Ark. Agric. Exp. Stn. Bull. 553. 40 pp. (1)
- Saenz, L. and F. Sequeira. 1972. Especies parasíticas del gusano cogollero, *Spodoptera frugiperda* (J. E. Smith) y de barrenador del tallo del maíz, *Diatraea lineolata* (Wlk.), encontradas en los diferentes Campos Experimentales del PMMYSN. XVIII Reunión Anual del PCCMCA, Managua, Nicaragua. 6 pp. (5)
- Scaramuzza, L. C. 1933. Prospects for the control of the sugar cane moth stalkborer (*Diatraea saccharalis* Fab.) in Cuba by means of natural enemies. Proc. 6th Conf. Asoc. Tec. Azuc. Cuba. pp. 87-93. [Rev. Appl. Entomol. 22:185-6]. (5)
- Scaramuzza, L. C. 1939. The introduction of *Theresia claripalpis* V.D.W., into Cuba, and its artificial multiplication. Proc. Int. Soc. Sug. Cane Technol. 6:589-95. (5)
- Scaramuzza, L. C. 1945. Biological control of the sugarcane borer in Cuba by means of the fly *Lixophaga*. Mem. Asoc. Tec. Azuc. Cuba. 19:11-6. (5)
- Scaramuzza, L. C. 1956. Achievements in the biological control of the sugarcane borers *Diatraea* spp. (Lepidoptera: Pyralidae) in the Americas. Proc. Int. Cong. Entomol. 4:845-50. (5)
- Sequeira, R. A. 1987. Studies on pests and their natural enemies in maize and sorghum in Honduras. M.S. Thesis. Texas A&M University, College Station, Tx. 296 pp. (3,4,5)

- Sequeira, R. A., F. E. Gilstrap, K. L. Andrews, D. H. Meckenstock, and H. Fuentes. 1986. Dinámica de poblaciones de *Diatraea lineolata* (Walker) en sistemas de cultivo de pequeños agricultores del sur en Honduras. XXXII Reunión Anual del PCCMCA, San Salvador, El Salvador. (3)
- Sequeira, R. A., F. E. Gilstrap, K. L. Andrews, D. H. Meckenstock, and H. Fuentes. 1986. Importancia de la hormiga brava, *Solenopsis geminata* en maíz y sorgo sembrados en cultura mixta en Choluteca, Honduras. XXXII Reunión Anual del PCCMCA, San Salvador, El Salvador. (5)
- Serrano-Cervantes, L., G. Henriquez-Martinez, J. A. Najera-Montes, Reyes, and R. A. Sequeira. 1986. Determinación de la ocurrencia de barrenadores, *Diatraea* (Pyralidae, Lepidoptera) y del nivel de control biológico nativo en El Salvador. XXXII Reunión Anual del PCCMCA, San Salvador, El Salvador. (3,5)
- Simmonds, F. J. 1958. The successful breeding of *Palpozenillia palpalis* (Ald.) (Diptera, Tachinidae) a parasite of *Diatraea* spp. Trop. Agric. 35(3):218-224. (5)
- Simmonds, F. J. 1963. Genetics and biological control. Canad. Entomol. 95(6):561-7. (5)
- Todd, C. J. and F. L. Thomas. 1930. Notes on the southwestern corn borer, *Diatraea grandiosella* Dyar. J. Econ. Entomol. 23:118-21. (1)
- Urich, F. W. 1910. Sugar cane insects in Trinidad. West India Bull. 12: 388-91. (8)
- Urich, F. W. 1915. Insects affecting the sugar cane in Trinidad. Bull. Dept. Agr. Trinidad & Tobago. 14:156-61. (8)
- U.S. Department of Agriculture. 1922. The Insect Pest Survey Bulletin 2(1):1-32. [Rev. Appl. Entomol. 10:331-2]. (8)
- Valle-Duarte, G. A. 1958. Biología de los barrenadores del maíz, *Diatraea saccharalis* (F.) y *D. lineolata* (Walker) y experimentos de control. Tesis Ing. Agr. ITESM. Monterrey, N.L., México. 105 pp. (3,4,7)
- Van Dine, D. L. 1926. The sugar cane moth stalkborer. Trop. Plant Res. Found. Bull. 2, 11 pp. [Rev. Appl. Entomol. 14:542]. (8)
- Van Dine, D. L. 1929. Parasites of sugar cane moth borers. J. Econ. Entomol. 22:248-68. (8)
- Van Dine, D. L. and L. D. Christenson. 1932. A revised list of the insects affecting sugar cane in Cuba. Int. Soc. Sug. Cane Technol. 4th Congress. Bull. 116. 3pp. (4)
- Van Emden, F. I. 1949. The scientific name of the common tachinid parasite of *Diatraea* spp. (Lep., Pyral.) in Central and South America, with notes on related species (Dipt.). Rev. Entomol. 20:499-508. (5)
- van Huis, A. 1975. *Diatraea lineolata* (Wlk.): Diapause and spatial distribution in sorghum stubbles in Nicaragua. Project FAO/UNDP/Nic/70/002, Progress Report No. 1. Managua. 12 pp. (3)
- van Huis, A. 1977. Duty travel report: Guatemala, El Salvador, Honduras, Costa Rica, Panama. Project FAO/UNDP/Nic/70/002. Report to FAO. Managua. 21 pp. (3)
- van Huis, A. 1981. Integrated pest management in the small farmer's maize crop in Nicaragua. Meded Landbouwhogeschool Wageningen. 81(6):1-221. (3,4,5,7)
- Van Leerdam, M. B. 1981. Parasitism of *Diatraea saccharalis* (F.) infesting Johnson grass, by the braconid parasite *Apanteles flavipes* (Cameron). M.S. Thesis. Texas A&M University, College Station, Tx. 67 pp. (4,5)
- Van Zwaluwenburg, R. H. 1923. Tachinids and Sarcophagids established in Mexico. J. Econ. Entomol. 16:227. (8)
- Van Zwaluwenburg, R. H. 1926a. Insects enemies of sugarcane in western Mexico. J. Econ. Entomol. 19:664:69. (8)
- Van Zwaluwenburg, R. H. 1926b. Some sugar cane insects of the Pacific Coast of Mexico. Bernice P. Bishop Mus. Spec. Pub. 11:51-52. [Biol. Abstr. 2: 1104]. (8)
- Velazquez-Hernandez, A. M. 1957. Zonas preferentes de ataque de *Diatraea saccharalis* F. y *D. lineolata* W. y experimentos de control químico. Tesis Ing. Agr. ITESM. Monterrey, N.L., México. 59 pp. (4,7)
- Vesey-Fitzgerald, D. 1935. Progress report for February and March, 1935. I. Division of Entomology, Sugar-cane Investigation Committee, Trinidad. (4)
- Vignes, W. G. des. 1983a. Rearing, release and recovery of *Allorhogas* sp. n. (Hymenoptera: Braconidae)—a potential biological control agent of *Diatraea* spp. in

Trinidad. Ent. Newsl., Int. Soc. Sug. Cane Technol. 14:34. [Rev. Appl. Entomol. 72:214]. (5)

Vignes, W. G. des. 1983b. Laboratory hosts for rearing *Allorhogas* sp. n., a potential biocontrol agent of *Diatraea* spp. on sugarcane in Trinidad. Ent. Newsl. 15:13. [Rev. Appl. Entomol. 72:327]. (5)

Vorhies, C. T. 1919. Entomology. Ann. Rept. Arizona Agric. Expt. Sta. 30: 437-8. [Rev. Appl. Entomol. 9:119]. (8)

Walker, F. 1856. List of the specimens of Lepidopterous insects in the collection of the British Museum. Part IX. London, 252 pp. (2)

Wolcott, G. N. 1913. Report on a trip to Demerara, Trinidad and Barbados during the winter of 1913. J. Econ. Entomol. 6:443-57. (8)

Youm, O. 1984. Stemborers attacking *Sorghum bicolor* (L.) Moench and *Zea mays* L. in the Lower Rio Grande Valley. M.S. Thesis. Texas A&M University, College Station, Tx. 84 pp. (3,4,5)

ACKNOWLEDGMENT

Approved by the Texas Agricultural Experiment Station as TA 22815.

DESCRIPTION OF *ATRICHOPOGON WIRTHI* NEW SPECIES (DIPTERA: CERATOPOGONIDAE) FROM LEAVES OF THE WATER LETTUCE (*PISTIA STRATIOTES*) IN FLORIDA

KAI LOK CHAN
Department of Zoology,
National University of Singapore,
Kent Ridge, Singapore 0511

JOHN R. LINLEY
Florida Medical Entomology Laboratory,
University of Florida,
200 9th Street S.E.,
Vero Beach, FL 32962

ABSTRACT

A new species of *Atrichopogon* (Diptera: Ceratopogonidae), whose immature stages are found on leaves of the water lettuce, *Pistia stratiotes* L., is described in all stages. The adults have a glossy black head and thorax, white abdomen, and dark terminal tarsal segments. The pupa possesses large, elongate tubercles and bears dark brown mediodorsal and dorsolateral pigmented spots on the first six abdominal segments. The larva is atypical, resembling those of the subgenus *Forcipomyia*. The larva does not resemble any of the *Atrichopogon* species figured by Ewen and Saunders (1958). The species is quite distinct and different from the seven described Florida species of *Atrichopogon* listed by Wilkening et al. (1985).

RESUMEN

Se describe en todas sus etapas una nueva especie de *Atrichopogon* (Diptera: Ceratopogonidae), cuya etapa inmadura se encuentra en hojas de la lechuga *Pistia*