BULLETIN NO. 23 THE CHANGA OR WEST INDIAN MOLE CRICKET

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PORTO RICO AGRICULTURAL EXPERIMENT STATION,
D. W. MAY, Agronomist in Charge.
Mayaguez, P. R.

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THE CHANGA OR WEST INDIAN MOLE CRICKET.

BY

R. H. VAN ZWALUWENBURG,
Entomologist.

UNDER THE SUPERVISION OF
STATES RELATIONS SERVICE,
Office of Experiment Stations,
U. S. DEPARTMENT OF AGRICULTURE.

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LETTER OF TRANSMITTAL.

PORTO RICO AGRICULTURAL EXPERIMENT STATION,
Mayaguez, P. R., March 20, 1917.

SIR: I have the honor to transmit herewith a manuscript by R. H. Van Zwaluwenburg, entomologist of the station, on the Changa or West Indian Mole Cricket. The changa or mole cricket, by far the most destructive insect known to the agriculturist in Porto Rico, causes enormous losses justifying the long series of investigations made of its life history and methods of control. This bulletin, which is the second publication by the station on the changa, carries the investigations much further than the first. It is not intended as final, however, as efforts will be continued to find more effective means of control, such as the discovery and introduction of natural checks.

I recommend that the manuscript be published as Bulletin No. 23 of this station.

Respectfully,

D. W. MAY,
Agronomist in Charge.

DR. A. C. TRUE,
Director States Relations Service,
United States Department of Agriculture, Washington, D. C.

Recommended for publication.
A. C. TRUE, *Director.* --- --- --- --

Publication authorized.
D. F. HOUSTON,
Secretary of Agriculture.

[1] On leave.

THE CHANGA OR WEST INDIAN MOLE CRICKET.

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IMPORTANCE.

The most serious insect pest of general agriculture in Porto Rico is the West Indian mole cricket (*Scapteriscus vicinus*) or "changa," as it is popularly called on this island. The latter name is derived from the fancied resemblance of the insect's head to that of a monkey (chango). Although other insects may be more destructive to special crops, as, for example, white grubs to sugar cane and flea beetles (*Epitrix* spp.) to tobacco, the changa causes such serious damage to agriculture in general that it takes first rank as an insect depredator. Barrett in 1902 (2, p. 5)[1] stated that "the changa's damages to tobacco, cane, and small crops in the island amount to probably more than $100,000 annually." Improved control measures have greatly reduced the loss to cane and especially to tobacco since that time. It is to the general gardener that the changa now does most harm. It should be recognized, however, that much damage done to miscellaneous crops by other crickets and by cutworms is mistakenly attributed to the changa, which, on account of its conspicuous size, is well known to even the most casual observer.

The mole cricket is found in neighboring tropical countries having about the same soil and climatic conditions as Porto Rico, but it is only in this island that the insect has become of serious importance in agriculture. Possibly some very effective parasite, as yet undiscovered, holds it in check in its other habitats, or, perhaps, a combination of circumstances, such as suitable soil conditions, favorable cultivation methods, and absence of certain predacious enemies, is the cause of the insect's greater destructiveness in Porto Rico.

[1] Figures in parentheses refer to the bibliography found on pp. 25–28; other figures refer to footnotes.

CLASSIFICATION AND SYNONYMY.

The changa is a member of the insect order Orthoptera, which contains the roaches, walking sticks, mantids, grasshoppers, locusts, and crickets, and is said to number at least 10,000 known species.[1] According to recent systems of classification[2] the mole crickets, with their fossorial forefeet, form the family Gryllotalpidæ, but they were formerly considered as a subfamily of the cricket family Gryllidæ. The changa is the only mole cricket known to occur in Porto Rico.

The species was first described by Scudder in 1869 (41). Gundlach and Stahl both mention the insect as *Gryllotalpa hexadactyla*, which is a quite different species and is not known to occur in Porto Rico. Saussure in 1870 considered this species to be merely a variety of *S. didactylus*. Rehn and Hebard have recently published the opinion that "the species found abundantly in the southeastern United States, the West Indies, and portions of South America, and which has been frequently recorded as *S. didactylus*, represents instead *vicinus* of Scudder. This species is very closely related to *didactylus* of Latreille (described from Surinam and found elsewhere in South America and northward to Costa Rica), but is somewhat heavier." As given by Scudder in his table for the separation of species of Scapteriscus (41, p. 7), *S. vicinus* differs from *S. didactylus* in that the tibial dactyls almost or quite touch at the base, whereas in *S. didactylus* they are distant from each other at the base by at least one-half the width of the dactyls. Rehn and Hebard consider *S. agassizii* of Scudder synonymous with *S. vicinus*.[3]

HISTORY AND DISTRIBUTION.

In economic literature this injurious mole cricket has always been treated under the specific name *didactylus*, a name, as above stated, now applied to a closely related species. The first mention of the insect as a pest appeared in 1836 in letters from A. M'Barnet, of St. Vincent (32), who described the cricket as injurious to pastures and to cane plantings. Although the pest is named only as the "mole

[1] Sharp, D. Insects, I. Cambridge Natural History, vol. 5, p. 201. London, 1895.

[2] Brues, C. T., and Melander, A. L. Key to the Families of North American Insects, p. 14. Boston and Pullman, Wash., 1915.

[3] Since the above was written Mr. James A. G. Rehn, in a letter dated Apr. 7, 1917, has defined the range of *Scapteriscus vicinus* and *S. didactylus* as follows: "The limits of its [*S. vicinus*] range appear to be, as far south as Las Palmas, Chaco, Argentina, and Santa Cruz de la Sierra and Puerto Suarez, Bolivia; west to the Rio Pacaya, Peru; east to Piauhy, Brazil; and north to Colombia and Venezuela and through the West Indies, occurring also in eastern Georgia. The range of true *didactylus* appears to be limited to a relatively circumscribed area in northeastern South America from eastern Venezuela through the Guianas to lower Amazonian Brazil. This information on *didactylus* has not been published as yet, but is clearly evident from material in our collections."

cricket," the insect in question is without doubt this species. Harris in 1862 (27) mentioned this species under the name *Gryllotalpa didactyla*, as destructive to sugar cane in the West Indies.

Gundlach in 1886 (25) was the first writer to record the changa from Porto Rico. He states that it is not common in Cuba, but does considerable damage in Porto Rico, at least in the vicinity of Mayaguez. In 1887 the same writer (26) notes the flight of adults to lights and again mentions the insect as being especially abundant in Mayaguez. Brunner von Wattenwyl and Redtenbacher in 1892 (7) mention collecting this species in St. Vincent during January, and give the following localities as habitats of the insect: Haiti, Panama, Peru, Uruguay, and Argentina. In 1895 Fernando López Tuero, of the Spanish Agronomic Station at Rio Piedras, Porto Rico, gave a popular account of the changa as a pest of sugar cane (31) with notes on its life history.

The first extensive account of the changa was published in 1902 by Barrett (2), entomologist and botanist of the Porto Rico Agricultural Experiment Station. Like most of the previous writers, he used the specific name *didactylus*. He outlined the habits of the insect and gave recommendations for its control. According to him the changa has been very troublesome in Porto Rico only since the hurricane of 1876, which is supposed to have destroyed most of the insect's bird enemies. After 1885 the insect seemed to decrease slightly in numbers until the hurricane of August, 1899. It is the common belief in Porto Rico that the insect was introduced into the island about 1850 in a load of guano brought to Mayaguez. The first estate in Porto Rico to abandon cane culture because of the changa's ravages is said to have been the one in Mayaguez upon which the experiment station is now located. At present the insect seems to be more numerous and troublesome in the eastern part of the island.

The changa has become well established in the southeastern United States. In 1912 Worsham and Reed (54) published an account of the mole cricket's habits and development and the damage done by it in the coastal counties of Georgia, where it has been known since 1899 (11). Prof. J. R. Watson, of Gainesville, Fla., writes[1] that flourishing colonies of this insect have become established in the vicinity of Tampa and Miami, and he suspects that the insect is generally distributed throughout Florida, although there are only three authentic records of it from the State, all of them from the southern part. According to Dr. W. E. Hinds,[2] the species is probably present generally throughout Alabama, and complaints of its

[1] Correspondence Sept. 29 and Nov. 16, 1916.
[2] Correspondence Oct. 25, 1916.

damage are not uncommon there. It is not known to occur in Louisiana.

The changa has been found in St. Croix,[1] but is so rare there that no noticeable damage has resulted. It is not known to be present in Santo Domingo, although Haiti is listed in its range. "A species of mole cricket, said to be the same as the Porto Rican changa, appeared in such numbers in Venezuela several years ago that the cultivation of cane had to be abandoned." (20, p. 348.)

The present known distribution of the changa is as follows: Georgia, Alabama, Florida, Cuba, Haiti, Costa Rica, Panama, Porto Rico, Culebra Island (P. R.), St. Croix, St. Vincent, St. Lucia, Trinidad, Barbados,[2] French and Dutch Guiana, Brazil, Uruguay, Argentina, and Peru.

GENERAL HABITS.

The changa is essentially a subterranean insect, as all its developmental stages are spent in burrows. These burrows when just beneath the surface of the ground may be traced with ease as raised lines of broken earth winding about promiscuously. The insect seldom leaves its burrows, and then generally at night. During the day an adult is occasionally seen scurrying over the ground, but it soon enters the soil.

As may be expected from the mechanical difficulties to be overcome in burrowing through a heavy soil, the changa is never found in heavy clay lands, but in light, loamy soils. As a result the insect is much more abundant in the alluvial lands of the coast and in the inland river valleys than in the mountainous parts of the island, the soils of which are for the most part heavy clay. It is particularly abundant in light, compressible soils which allow tunnelling without the removal of loosened material. The insect avoids tunnelling on very sloping land, doing most of its work on level areas, although in very heavily infested territory even hilled-up plants are damaged. The galleries dug by the changa are more or less permanent in the heavier, loamy soils, and are used by all the changas in the immediate vicinity. The insect responds to moisture changes, as in the dry season its tunnels are carried to a depth of some 12 inches, while during the rainy season they are to be found usually within 4 inches of the surface, the depth at which the egg chamber is placed varying similarly with the season. A prolonged drought often causes an overland migration of adults and nymphs under cover of night to more favorable breeding and feeding grounds.

[1] According to Mr. Holger Johansen, for some years a resident of that island.
[2] Correspondence from Mr. Wm. Nowell, Nov. 10, 1916.

The forefeet of the changa are powerful and remarkably adapted for digging, the joints of the foretibiæ and tarsi being so articulated as to form a sharp, curved, shearing apparatus. The hard, rounded prothoracic shield is well suited for shaping the sides of the tunnel by rotary movements as digging progresses and for firming the soil in the newly made galleries.

Although clumsy, owing to the weight of its specialized forelegs, the changa is a rapid runner, even on the surface of the ground, where it often accelerates its gait by short hops. In its underground galleries it is a very rapid traveler, moving forward or backward with equal ease. Changas of the first three stages are very active, hopping many times their own length and running with great agility. The saltatory power is lost in the later instars, as the forelegs become heavier, and in leaping, the insect often somersaults in midair. The adult is also a heavy, clumsy flier and after performing long swoops lands heavily. Migrating individuals have been recorded (54, p. 256) as soaring over tree tops, and such migration to the distance of a few miles is considered probable. Flight during daylight hours has not been observed in Porto Rico, but is recorded from Georgia (54, p. 262). The adults not uncommonly fly into lighted houses during the early evening, from dusk on, especially on damp, cloudy nights.

FEEDING HABITS AND FOOD PLANTS.

The changa feeds primarily on vegetables, animal food seeming to form only a small part of its diet. Almost any young plant growth is attacked. The insect remains underground and feeds from below, commonly selecting the crown of the plant as the point of attack. When the growth is very tender the insect consumes almost the entire sprout, pulling it into the soil while feeding until only the top leaves are left above ground. Sometimes the seedling is partially gnawed through at its base. Tender roots also are often eaten.

Of the staple crops, tobacco is the most seriously damaged. Owing to the use of the Paris green and flour mixture, the changa is not now so important a pest of this crop as it once was. Practically all the grasses serve as food for the mole cricket, "grama" (*Paspalum* sp.) and "yerba dulce" (*Eleusine indica*) being its favorites among the common wild species. When sugar cane is planted on loose or sandy soils the changa sometimes causes great damage to this crop. Its injury to the young canes often makes necessary a considerable amount of replanting before a stand can be obtained. The injury to cane is confined to the germinating seed and to the bases of the young shoots, which are partially gnawed through. The boring into