THE HAITIAN COFFEE TREE CRICKET

By CHARLES H. ARNDT, formerly Director of the Coffee Station, and HERBERT L. DOZIER,* Entomologist, Service Technique, Port-au-Prince, Haiti

Haiti is very fortunate in that many serious coffee diseases and insect pests are not found in that country. This is somewhat offset, however, by the damage caused by a native tree cricket, recently described as *Chremon repentinus* Rehn.[1] This species in its sum total of features is probably nearest *Stenogryllus* Saussure, a genus also known only from Santo Domingo. It is related to some African forms and it was at first thought that the species might possibly have come to Haiti in early slave ships.

DISTRIBUTION

This cricket was not recognized as a serious pest until recent years when the damage it caused to young coffee plantations was observed. It is assumed that this insect is confined to the island of Hispaniola as it has not been reported to date from any other country where coffee insects have been seriously studied. It is widely distributed in Haiti and its work has been observed in the Massif de la Hotte, Rochelois Plateau, Massif de la Selle and the Massif du Nord, from sea level to an altitude of 4,000 feet.

ECONOMIC IMPORTANCE AND HOST PLANTS

It may possibly be a misnomer to call this insect "The coffee tree cricket" because it is indigenous to the island while coffee is an introduced plant. It has found coffee a very suitable plant for egg deposition and probably causes more damage to it than to any other plants of economic importance, thereby justifying the popular name assigned to it.

In the Fond-des-Negres valley this cricket lays numerous eggs in the stems of cotton but the damage does not seem to be serious on this host except in some instances where the stem becomes infected by parasitic fungi through the egg punctures. Other plants in which eggs are laid but on which the damage is of relatively little economic importance are Spanish cedar, *Cedrella odorata;* "Bois chene", *Catalpa longissima* (frequent); "Bois d'Orme", *Guazuma ulmifolia* (occasional); "Bois crapaud", *Psychotria*

[1] A New Genus of Eneopterinae from Hispaniola, Trans. Amer. Ent. Soc., 50: 87–92, 1930.

* Co-authors.

Brownei (frequent); castor oil, *Ricinus communis* (rare); mahogany, *Swietenia mahogani* (frequent); *Piper* spp. (occasional); *Russelia equisetiformis* (frequent); petioles of "Pistache des Indes", *Stercula apetela;* sour orange, avocado, saman, and cacao (rare). The terms in brackets indicate the relative frequency with which the egg punctures are found on the various plants as observed at the Fond-des-Negres coffee station. Native plants in which an abun-

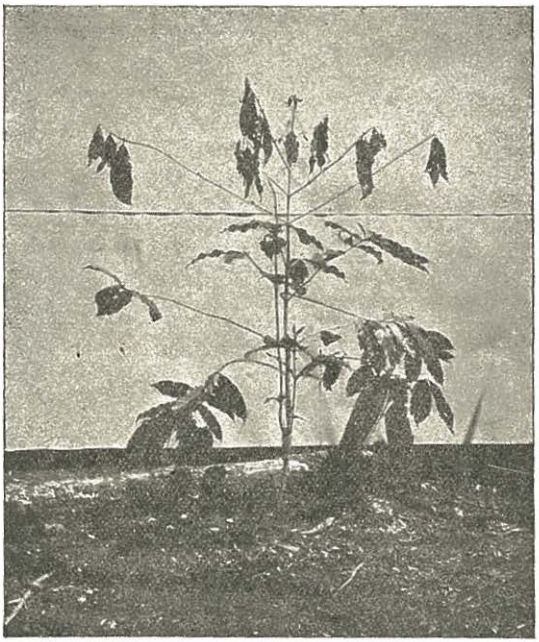

FIG. 1.—Wilting and Death of the Top of a Young Coffee Tree Following Egg Punctures by the Coffee Tree Cricket, and Subsequent Infection of the Stem by the *Fusarium* Fungus; Note Accessory Up-right Shoots Which Developed After the Injury.

dance of eggs can usually be found are "liane barrique", *Trichostigma octandra,* and two species of *Hamelia,* one of which is the common "bois corail" of the gardens, *Hamelia erecta.* Eggs have also been found in the stems of two native weeds, one belonging to the Menthaceae, the other to the Compositae. All plants of the latter two groups listed are mostly weeds which grow along water courses. Emphasis should therefore be placed on keeping all areas around the plantation free of these weeds.

NATURE OF INJURY

These crickets are very inconspicuous, hiding during the day beneath rubbish, old leaves, etc., and feeding at night. During the egg-laying period the females may be readily found at night by

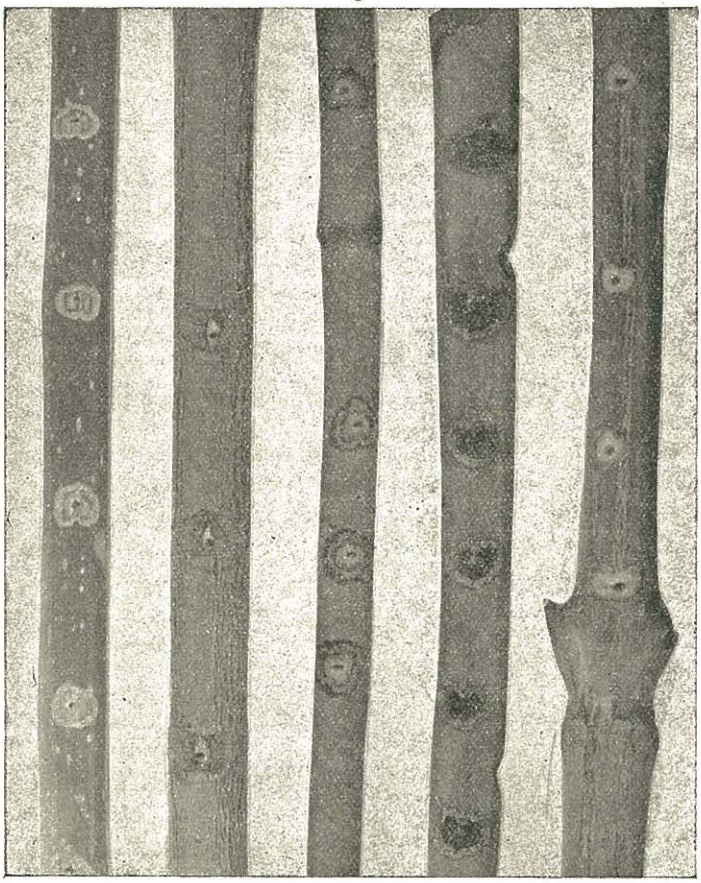

FIG. 2.—Stems of "Liane Barrique", *Trichostigma octandra*, Cotton and Coffee Showing Egg Punctures of *Chremon repentinus* Rehn, Natural Size.

searching among the coffee trees with a flash-light. They are then easily captured while in the act of oviposition. The males are very rarely found and are much less abundant than the females.

One's attention is usually first attracted to the injury by this

insect by what appear to be holes in the recent growth of the upright stems. These "holes" are made by the removal of the bark from the wood over a somewhat rounded area of about 5 mm. in diameter (Fig. 2). In the center of this area will be seen a small hole which extends into the pith. This hole is made mostly by the ovipositor for the insertion of the eggs into the pith of the stem. From three to six yellowish eggs are laid lengthwise in the pith above and below the hole. Stems from 5–9 mm. in diameter which

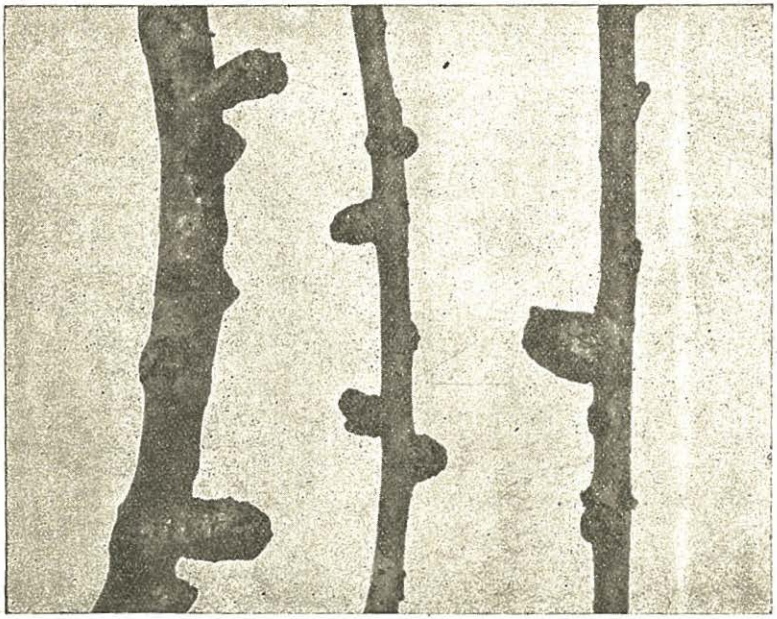

FIG. 3.—Hypertrophy of Stem of Haitian Oak, *Catalpa longissima*, a Condition Which Frequently Occurs After Oviposition Punctures by *Chremon repentinus*, Reduced.

are still green, with the wood soft, and having a large amount of pith seem to be preferred. Holes are rarely made in stems in which the wood has become well hardened. For this reason few punctures are made on the laterals because their wood becomes hardened before they are of a sufficient diameter to interest the crickets for oviposition.

The removal of the bark by the cricket over a larger area than is necessary for the insertion of the ovipositor for egg-laying, seems

to be a habit adaptation to prevent the plant from closing the hole rapidly by a callus formation and thus smothering the developing eggs. The holes are, nevertheless, frequently closed by a callus when they are made on rapidly enlarging stems. This frequently occurs on the Haitian oak where very noticeable hypertrophies as large as 1×1.5 cm. may be formed (Fig. 3).

The egg punctures themselves would injure the coffee plants little if it were not for secondary effects. The first of these is the tendency of the punctures to weaken the stems mechanically so that they are likely to break later when the laterals above the punctures set a heavy crop of berries. This weakening effect would be much less and of relatively little importance if it were not for the frequent infection of the xylem through these holes by parasitic fungi. A species of Fusarium * (Fig. 4) is the organism most commonly attacking the wood through these punctures, causing a discoloration of the vascular cylinder, but occasionally *Cercospora coffeicola* is the infecting fungus.

The *Fusarium* first attacks the pith and then grows into the wood and bark. White masses of fruiting mycelium appear on the surface of the stem adjacent to the infected puncture. The bark and pith become dark in color and the cricket eggs are frequently destroyed. It is only rarely that an old cricket hole is found which is not infected by some fungus. Frequently the infection does not occur until after the eggs have hatched, or if infection has occurred earlier the growth of the mycelium will not be sufficient to destroy the eggs. When young stems are infected, the stem above the point of attack is frequently killed. The leaves of the top will suddenly wilt, then become brown, and later brownish-black before falling. In certain plots at the Coffee Station at Fond-des-Negres as many as 60 per cent of the tops of the coffee trees were killed by such infections which followed cricket punctures. The egg punctures are usually from 2 to 3 cm. apart although occasionally they may be placed closer and at times the punctures may be opposite each other. As many as fifty-two punctures have been counted on a 60 cm. length of a coffee stem. The largest number of punctures observed for a single stem was 218 in a 340 cm. portion of a *Trichostigma octandra* stem.

* Provisionally determined by Dr. C. D. Sherbakoff, as very similar to if not identical with *Fusarium martii* A. & W.

The most serious effect of the cricket injury to the stem lies in the effect of any injury to the upper portion of the coffee tree upon its configuration or shape. Such injuries to the upright stem remove

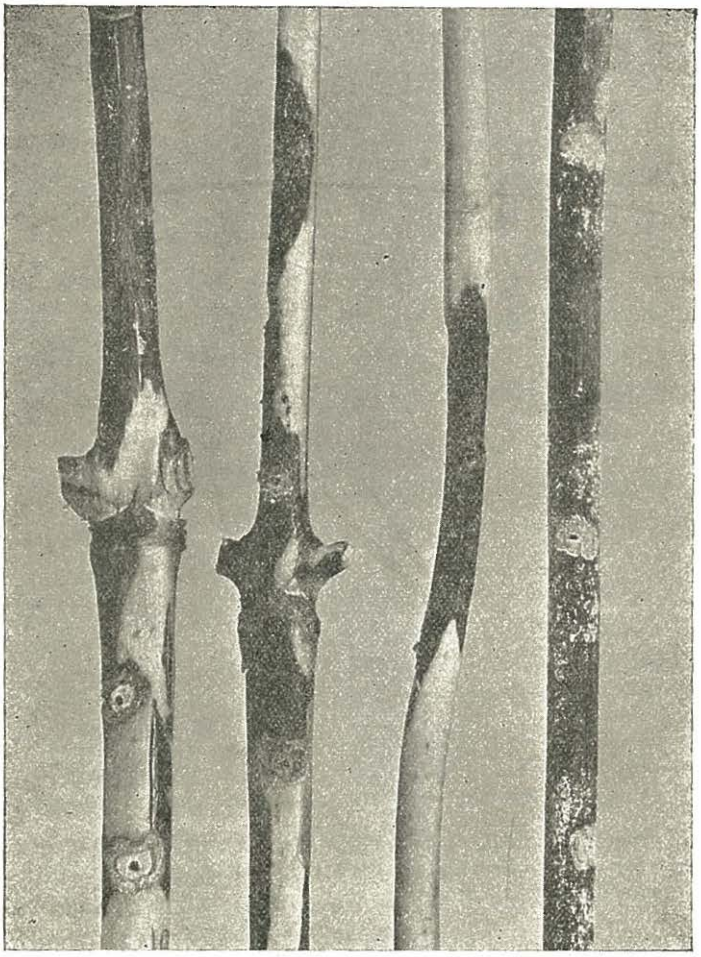

FIG. 4.—Coffee Stems Showing Various Degrees of Infection by *Fusarium* Disease, Following Egg Punctures, Natural Size.

the inhibition of the terminal bud on the normally dormant secondary buds. The removal of this inhibition results in the development of an entanglement of uprights and laterals which is very

difficult to control. When the trees are regularly damaged each year by injuries of this nature it is impossible to follow any particular system of pruning. The pruning will be difficult and will have to be directed toward the utilization of the less-injured and the uninjured shoots for the development of the fruiting branches. There is no question of the seriousness of the damage which may be caused by this cricket and unless some means is discovered to reduce its injury below that which has been observed at the Coffee Experiment Station, it will remain a serious handicap to commercial coffee growing on the Island. The older and less rapidly growing trees are less seriously injured because of the relatively lesser amount of stem in which eggs may be laid. Several observations indicate that this cricket causes more damage to coffee in sunny places than to plants located under shady conditions.

SEASONAL HISTORY

Egg-laying occurs most commonly after the rapid growth of the shoots begins in the spring, although it may occur at any time of the year when suitable young shoots are present. Eggs hatch from five to twelve months after deposition. All eggs of the same puncture hatch at about the same time, although eggs laid in the same stem but at different punctures may hatch at different times. Eggs which are laid in April, May, and June, will usually begin to hatch the following December. Most of them, however, will not hatch until several months later. The adults and nymphs are difficult to find but the very young ant-like nymphs may be found at almost any time of the year by searching carefully among the dense coffee foliage. They are most abundant from March to June.

The nymphs and adults seem to feed mostly at night and their food apparently consists mainly of scale insects, plant lice and other small insects. In our rearing cages they were constantly supplied with fresh *Saisettia hemispherica* and *Coccus viridis*, two scales commonly present on coffee foliage and stems. They appear to be distinctly cannibalistic when confined with each other in close quarters. One batch of nymphs hatched May 10th yielded a single male survivor which reached maturity August 10th, 1930. Other partial rearing records coupled with field observations show that the time from hatching to adult requires from eighty to ninety days.

DESCRIPTION OF STAGES

Egg (Fig. 5.)—Whitish in color, semi-translucent, elongate cylindrical. Without a distinct cap area differentiated, as is commonly found with many species of tree crickets. The head of the developing embryo is always oriented toward the opening. Average length 3.25 mm.; greatest width .788 mm.

FIG. 5.—Diagramatic longitudinal section of stem to show manner of oviposition.

Nymph.—First instar: Color reddish-brown, the abdomen darker; hind femora banded with white; basal third of antennae pale, remainder dark; cerci pale. Resembles a small ant. Length 3.5-5.2 mm.

Second instar: General color brownish-black, the base of abdomen and sides of thorax marked with yellowish-orange; a very narrow cross-band on abdomen pale; antennae black except pale base; cerci black. Length 5.2–8.3 mm.

Third instar: General color brownish-black, the thorax for the most part tawny, abdomen with narrow pale cross band; legs black except longitudinal pale markings and distinctly paler base of femora; antennae black, pale at base; cerci blackish at tips, lightening towards base. Length 8.3–11.4 mm.

Fourth instar: Color much lighter than in preceding stage; head except front part, thorax and legs, pale yellowish-testaceous, the thorax outlined with black borders, and the hind femora with several longitudinal black markings; antennae black, banded with yellow at base and about the middle; cerci pale, black at tip. Length 11.4–15.5 mm.

Fifth instar: Distinctly paler, the head pale except the eyes and front part, dark; thorax outlined with narrow black border; abdomen for the most part dark, central median portion of each segment pale; wing pads pale, the venation and outer sides somewhat darker; legs pale, with lineate longitudinal dark streaking on femora. Antennae yellow except a very narrow black band a short distance from the base; cerci pale; ovipositor pale. Length 15.5–22. mm.

Adult (Fig. 6)—General color of head, pronotum and legs pale ochraceous-orange; abdomen brown with pale ochraceous-orange evident on dorsal surface; fore part of head and eyes fuscous-

brown; antennae pale yellowish-orange; pronotum with the entire border margined with brownish-black; tegmina or wing covers a pale clay color, the veins dull yellow. Legs pale, ventral margins of the femora and dorsal surface of the middle and hind femora lineate with fuscous-brown. Ovipositor brownish-black. The sexes may be at once distinguished by the difference in shape and vena-

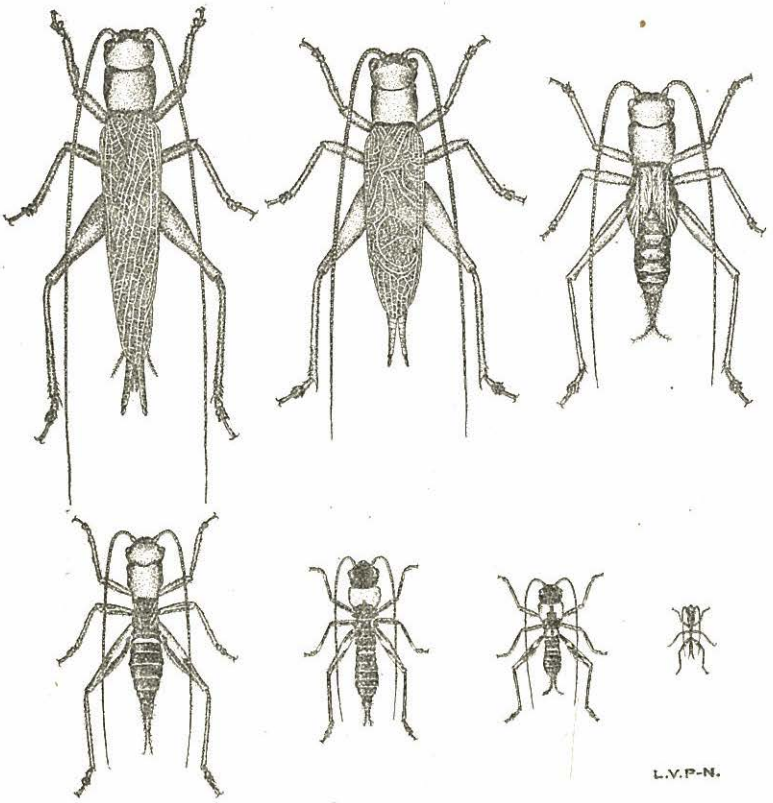

FIG. 6.—Adult Female and Male and Stages of Development of the Coffee Tree Cricket, Enlarged One-third.

tion of the tegmina. In the female the tegmina are very elongate, distinctly longer and more slender than with the male, the apices surpassing the tips of the tegmina. In the male the tegmina are broader with very different venation and with a sub-ovate tympanum. Length of male, 18.9–22. mm.; length of female, including ovipositor, 26 mm.

NATURAL ENEMIES

A very small ant has been observed to enter through the punctures, enlarge the holes, burrow though the pith from puncture to puncture, destroying the cricket eggs.

The *Fusarium* disease often infects and destroys the eggs through its mycelium.

In actively growing stems the holes are often closed by calluses and the eggs smothered.

The most important natural enemy of the coffee tree cricket, however, is a very small, elongated scelionid wasp which has only recently been described. As this original description was published in French a full translation of same is given here to enable recognition:

Leptoteleia arndti Dozier

Bul. No. 26, "Le Criquet Haïtien du Caféier", Service Technique, Port-au-Prince, Haiti, page 15.

This species is placed in Kieffer's genus *Leptoteleia* of which *Baryconus oecanthi* Ashmead is the genotype and is undoubtedly congeneric with the type species which is parasitic in the eggs of the snowy tree cricket, *Oecanthus niveus*, of the United States. *Leptoteleia oecanthi* differs from this new species in having a shorter ovipositor, black legs, a black scape and entirely black head, thorax, and abdomen.

General form and abdomen extremely elongate. Head and antennae black except the scape which is yellowish; thorax yellowish-orange except the meso and metathorax which is darker on dorsum; first abdominal segment dark but the others are yellow, each segment divided by orange annulation; legs orange-yellow except distal knees and tarsi of the middle pair, the tarsi of the hind pair with exception of the proximal third of first segment, and the distal third of tibiae of second and third pair of legs, which are fuscous.

Length, excluding ovipositor, 3.05 mm.; length of ovipositor, moderately exserted, .47 mm.; greatest width across humerals .458 mm.

Described from a large series that issued March 23–24, 1930 from eggs of *Chremon repentinus* Rehn, collected at Fond-des-Negres, Haiti, on February 19th. These eggs were laid during the previous summer (April–June) and no parasites issued from fresh eggs deposited during the two months previous, suggesting only a single generation each year.

Type female mounted in balsam on slide, deposited (U.S.N.M. type number 43,328) together with series of point-mounted and alcoholic specimens in the U. S. National Museum.

These scelionid parasites have been observed to hatch from February to June. The head of the developing cricket host is always oriented toward the opening while that of the egg parasite is always away from the opening.

CONTROL MEASURES

When a large continuous area is planted to coffee and this area can be kept free of other host plants which might serve as egg depositories, it may be possible to greatly reduce the injury and prevent further increase of the crickets by removing all of the stems in which eggs have been laid between the time of egg-lying and hatching. In many sections this would necessitate pruning before the completion of the coffee harvest and earlier than would be otherwise desirable. It would also involve a considerable sacrifice of the coffee crop of the succeeding year as many of the infested shoots will have produced laterals on which floral buds are maturing. The loss from this source, however, might be much less than that which would be produced if the crickets were allowed to multiply unhindered.

These prunings should not be burned immediately but should be collected and placed in a specially screened room so that the issuing egg parasites would be allowed to escape and carry on their benefical work.

It is hoped that some suitable, cheap, and safe material will be found that can be used to kill or smother the eggs in the stems. Substances that may injure or burn delicate plant tissues must be avoided. Experiments are planned using a pine tar oil product that has great penetrating properties and yet is non-injurious to the plant. This can be easily applied with a few strokes of a paint brush in the hands of unskilled laborers.

o–O–o