FURTHER ATTEMPTS TO ESTABLISH THE WEEVIL EGG PARASITE, *TETRASTICHUS HAITIENSIS* IN FLORIDA

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Abstract

In a further attempt to establish *Tetrastichus haitiensis* Gahan, an egg parasite of the weevil, *Diaprepes abbreviatus* (L.), releases of laboratory reared stock were made during 1970 and 1971 at Apopka and West Palm Beach, Florida. Recovery efforts made periodically during 1970-73 failed to provide evidence of establishment.

Diaprepes abbreviatus (L.), a curculionid pest of citrus and sugarcane in the West Indies, was first reported attacking citrus near Apopka, Florida, in 1964. By 1968, a quarantine area comprising ca. 2,500 acres of citrus had been established (Woodruff 1964, 1968). Expansion of the infested area and control measures undertaken by regulatory agencies were reported by Selhime and Beavers (1972). One of the biological control measures attempted has been the propagation and release of an exotic egg parasite, *Tetrastichus haitiensis* Gahan, collected in Puerto Rico and released at selected sites near Apopka (Sutton et al. 1972). Although recovery of 2 adult parasites from a weevil egg mass was reported (Sutton et al. 1972), the report did not represent positive establishment of *T. haitiensis* because it was made so soon after the parasites were released in 1969.

The present paper reports further attempts to establish *T. haitiensis* as a biological control agent for *D. abbreviatus* in an untreated citrus grove near Apopka and in a grove near West Palm Beach that was heavily infested with *Pachnaeus litus* (Germar), a citrus root weevil present in Florida. This second grove had been the site of an earlier attempt to establish *T. haitiensis*. In 1969, ca. 6,000 adult parasites were released in another area of this grove during September and November (R. A. Sutton, unpublished data). Seven weevil egg masses were recovered 11 November 1969; only 1 of these was parasitized and it contained only 4 *T. haitiensis* all of which failed to emerge. Two other recovery attempts were made in August and October 1970, but no parasitized egg masses were recovered. The parasites were identified by B. D. Burks, Systematic Entomology Laboratory, Agricultural Research Service, USDA, Washington, D. C.

Methods and Materials

The rearing procedure described by Sutton et al. (1972) was modified to a less time-consuming technique by attaching wax paper strips 15 × 2 cm to the tops of cages in which field-collected adults were held (Wolcott 1933). The weevils oviposited between the strips which were removed daily. After the paper strips were separated to expose the egg masses, they were attached to 13 × 35-cm cards which were formed into 9-cm-diam cylinders. Then the cards

were placed inside an 11 × 13-cm plastic container with adult parasites and held 1-2 days. After the egg masses had thus been exposed to the ovipositing parasites, the eggs were transferred to another container with an inverted funnel attached to the top. The outer surface of this container and the funnel were painted black because parasites exhibit photopositive behavior. The emerging parasites were collected in a clear 25-dram plastic vial attached to the stem of the inverted funnel. They could either be released at preselected sites or used to replenish the laboratory colony.

During 1970, ca. 4,000 parasites were released periodically (August-October) in the untreated grove near Apopka. (None of these parasites had previously oviposited.) In 1971, ca. 2,000 parasites were released (June-November) in the citrus grove near West Palm Beach which had a heavy infestation of *P. litus*. This grove was under a chemical control program for other pests.

Results and Discussion

During 1970, 56 weevil egg masses were collected at the release site near Apopka. Nine adult *T. haitiensis* emerged from 1 of the masses that was collected 1 October 1970. In 1971, 1972, and 1973, 65, 53, and 25 egg masses respectively were recovered, but none were parasitized.

During 1971, 8 releases were made in the West Palm Beach grove 20 June to 11 November, a total of ca. 2,000 parasites. Adult *P. litus* and weevil egg masses were collected at the time of each release except on 28 October; thus, host eggs were present at each release period.

Beginning January and continuing through December 1972, monthly collections of egg masses were made from the release site. Adult *P. litus* and egg masses were collected each month except in September. A total of 82 egg masses and 95 adult weevils were collected. No *T. haitiensis* were recovered, but almost all egg masses were parasitized by *Brachyufens* (= ufens) *osborni* (Dozier), a parasite of *P. litus* eggs previously reported present in Florida (Baranowski 1960). During 1973, 13 egg masses and 14 adults were collected in May and November. No *T. haitiensis* were recovered.

The recoveries of *T. haitiensis* reported here from Apopka cannot be considered to constitute establishment of this parasite in Florida since they were made shortly after release, as was also the previous instance in December 1969 when 2 *T. haitiensis* were recovered (Sutton et al. 1969). Thus *T. haitiensis* apparently has not become established in Florida.

Two possible reasons for the failures to establish *T. haitiensis* in Florida might be the cold winter temperatures at Apopka during which adult weevils have not been found and a possible lack of correlation between the life cycles of *T. haitiensis* and *D. abbreviatus* in Florida. Wolcott (1936) reported *T. haitiensis* as being most abundant during late spring but scarce during autumn and winter in Puerto Rico. In Apopka, most adult weevils, and presumably most egg masses, are present August-November. Also competition between *B. osborni* and *T. haitiensis* at West Palm Beach may be a factor that precludes establishment. However, this grove was being treated with insecticides, which may also be detrimental to the parasite (the one recovery made there was of unemerged dead adults). Nevertheless, inundative or supplementary releases of *T. haitiensis* during periods of peak populations of adult *D. abbreviatus* might give some measure of control in the infested area.

As noted, *B. osborni* has been recovered from weevil egg masses in West

Palm Beach; it has also been recovered occasionally in the Apopka area. However, other species of citrus root weevils are present at Apopka, notably *Pantomorus cervinus* (Boheman) and *Pachnaeus opalus* (Olivier), and it is not known whether these eggs containing *B. osborni* were *D. abbreviatus* or another species, due to the similarity of the egg masses. Nevertheless, in May 1972, ca. 200 *B. osborni* collected at West Palm Beach were released in the Apopka test grove; no parasitized egg masses have yet been recovered.

Literature Cited

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SEASONALITY IN NORTHERN FIELD CRICKETS—(Note). *Gryllus veletis* and G. *pennsylvanicus*, the northern spring and fall field crickets, respectively, are reproductively active during different seasons. Though similar or identical in much of their behavior (including male calling song), morphology, and ecology, they differ in their stage of winter diapause: *pennsylvanicus* diapauses as an egg and *veletis* as a late-instar nymph. This species-pair has figured prominently in a theory of sympatric speciation (R. D. Alexander and R. S. Bigelow, Evolution, 1960, 14:334; R. D. Alexander, Quart. Rev. Biol., 1968, 43:1). In the field, calling *pennsylvanicus* males appear between mid-July and early August, near the end of or shortly after the calling season of *veletis* males. Seasonal overlap is very slight at any latitude, and is less extensive and slightly later at more northerly localities (R. D. Alexander and G. H. Meral, Ohio J. Sci., 1967, 67:200). This note presents the first extensive seasonal data for these crickets for a locality other than Ann Arbor, Michigan. *(Cont'd. next page)*