

# Insects Attacking Water Hyacinth In The West Indies, British Honduras And The U.S.A.

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As a continuation of the studies of potential biotic controlling agents for water hyacinth, *Eichhornia crassipes*, surveys additional to those reported previously (Bennett and Zwölfer, 1968 and Bennett, 1968) have been undertaken and studies on the biologies and host ranges of certain of the insects have been carried out in Trinidad. The purpose of these investigations, undertaken at the request of and financed by the Ministry of Overseas Development, London, England, is to select species which are adequately host specific and are capable of causing sufficient damage to water hyacinth to warrant their introduction into African and Asian countries of the Commonwealth for the control of this weed. The studies are of course of interest to the other countries where water hyacinth is a serious aquatic weed.

## SURVEYS

In the investigations reported previously, Bennett and Zwölfer (*op cit*) discussed the results of a collecting trip to northern South America. Subsequently limited surveys have been carried out in Jamaica, St. Vincent, Barbados and Trinidad in the West Indies, in British Honduras and in Florida, Louisiana and Texas, USA. With the exception of Trinidad, these surveys were all of relatively short duration, hence the list of species attacking water hyacinth in these areas is not claimed to be complete.

### (a) British Honduras

*Eichhornia crassipes* was examined along the banks of the river near Stann Creek in June, 1968. Although stands of the weed were quite extensive, *E. crassipes* has apparently not been present on this water course for more than a few years. The stems of several hundred plants were cut near the base, but no evidence of lepidopterous or coleopterous borers was noted. The grasshopper, *Cornops scudderi* Bruner was fairly common, but only moderate damage to the leaves was evident. The entomophagous grasshopper, *Plugis teres* (De G.) was also present.

A report that water hyacinth was common at Central Farm proved erroneous. The species there and mistaken for *E. crassipes* proved to be *Pontederia lanceolata*. A stem-mining fly, *Hydrella* sp. (Ephydriidae), was reared from this plant.

### (b) Florida

Bennett and Zwölfer (1968) reported damage by a noctuid presumed to be *Arzama densa* Wlk. During the past year, collecting was undertaken at Fort Lauderdale and Belle Glade in June, 1968, again at Belle Glade and West Palm Beach in October and a third time in early March, 1969, in the Belle Glade and West Palm Beach areas. Adults were reared confirming that the species was *Arzama densa* and as reported by Vogel and Oliver (1969), it may have

considerable potential for the control of water hyacinth under certain conditions. Larvae and adults of one curculionid, *Sphenophorus pontederiae* Chttn. were collected from the basal parts of the stems and adults of another, *Onchylis nigrirostris* (Boh.), from the leaves of water hyacinth. The leaf-mining mite, *Orthogalumna terebrantis* Wallwork was also encountered in several localities. Damage by grasshoppers and arctiids was also noted, but the species involved are apparently generalised plant feeders and do not restrict their activities to water hyacinth.

### (c) Jamaica

Water hyacinth was examined on two water courses; the Rio Cobre below the dam near Bog Walk and the Fresh River, south of the Kingston-Spanish Town Road. Another member of the Pontederiaceae *Heteranthera reniformis* growing in profusion side by side with *Eichhornia crassipes* near Caymanas Bridge was also inspected. Several other locality records obtained from herbarium specimens were also visited but due to the intensive prolonged drought, many of the streams and ponds were completely dry and water hyacinth was not encountered.

The leaf-mining mite *Orthogalumna terebrantis*, the red spider mite *Tetranychus* sp., the grasshopper *Orphulella punctata* (DeG.), the cockroach *Neoblatella detersa* Wlk. and an unidentified leaf hopper were the commoner insects and mites encountered.

### (d) Barbados and St. Vincent

Although isolated patches of *E. crassipes* were examined in both of these W.I. islands, no promising insects or mites were encountered.

### (e) Trinidad

In addition to the preliminary surveys reported earlier (Bennett and Zwölfer, 1968) regular samples of water hyacinth were examined in northern Trinidad and occasional collections were made in the southern part of the island. In addition to the promising species reported previously i.e. *Acigona ignitalis* Hmps., *Epipagis albiguttalis* Hmps., *Cornops longicorne* (Bruner) and *Tydrellia* sp., the curculionid *Neochetina* sp. (the same species reported earlier from the northern South American survey as *N. bruchi* Hulst) was encountered in southern Trinidad. The Pyralid *Samea multiplicalis* Guenée has also been reared from water hyacinth during April, 1969.

## NOTES ON CERTAIN SPECIES ENCOUNTERED DURING THE SURVEY

Only those species which by observations or by other criteria are considered to have a narrow host range are discussed in detail.

*Cornops scudderi* Bruner (Orthoptera, Locustidae)

Dr. A. B. Gurney, USDA specialist in Orthoptera, who determined the specimens of this grasshopper from British Honduras remarked "This species was described from Guatemala. Whether it is a distinct species from *C. aquaticum* Bruner and *C. longicorne* De G., will have to await revisionary studies."

*Arzama densa* Wlk. (Lepidoptera, Noctuidae) (Fig. 1 & 2)

In Florida, where the only host recorded previously was pickerel weed (Kimball, 1965), *Arzama densa* was encountered at several localities and a fairly high level of attack was noted during June and July, 1968. For example at Belle Glade, 17 of 25 plants examined on June 22, and 21 of 25 plants examined on July 5, were attacked; 14 of 25 plants examined at Fort Lauderdale on June 25, were attacked. Infestations were considerably lighter at Belle Glade in October, but 42 of 50 plants at Loxahatchee were infested. In March, 1969, the level of attack was very low although both large and small larvae were encountered. These observations suggest that several over-

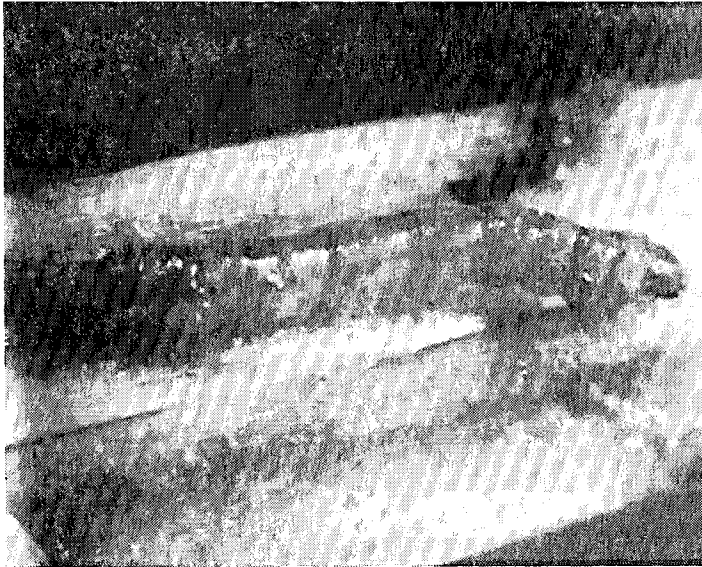


Figure 1. Larva of *Arzama densa*—side view.

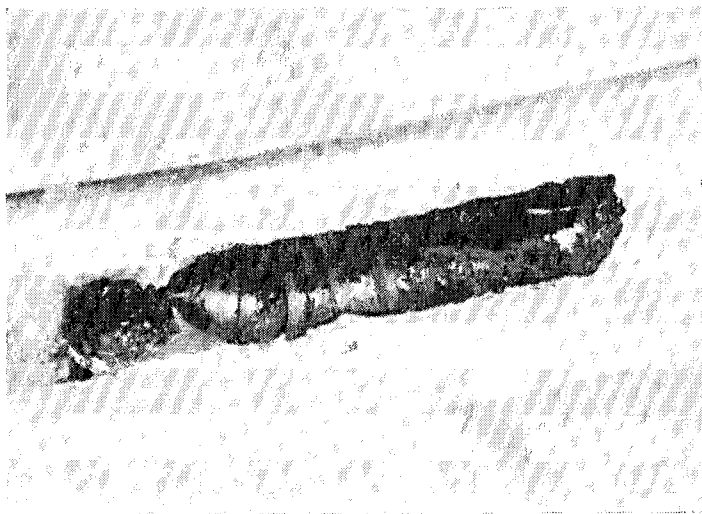


Figure 2. Pupa of *Arzama densa* in situ.

lapping generations occur annually. Larvae and pupae of *A. densa* were collected near Baton Rouge, Louisiana, and near Orange, Texas, in June, 1969.

Unfortunately, despite the level of attack in the warmer months, water hyacinth continues to produce new plants and to maintain stands of high density. However, there is evidence that natural enemies may play an important role in checking the effectiveness of *Arzama*. Three species of parasites, the tachinid fly *Lydella thompsonae* Hertig, the ichneumonid *Campopletes* sp. nr. *oxylus* (Cress) and another undetermined Hymenopteran were encountered in Florida in June and July. An egg-parasite, *Telenomus arzamae* Riley has also been recorded from this host from the District of Columbia, presumably from eggs laid on pickerel weeds. In March, 1969, a number of water hyacinth stems bored by *Arzama* had been damaged further by birds presumably seeking the larvae as food. Accordingly, if subsequent studies indicating that *A. densa* is adequately host specific, its introduction into parts of the world where it does not occur should be strongly recommended. In the absence of its specific natural enemies in these areas it may be more effective than it is in Florida or Louisiana.

A review of the literature suggested that there may have been erroneous host records for this species. In an attempt to clear up this, inquiries were made to Dr. R. I. Sailer, who in a letter dated September 25, 1968, provided the following information obtained from Dr. E. L. Todd; "The food plant reference to *Typha* sp. for *Arzama densa* (Walker) cited by Leonard, (1926) probably was the result of a misidentification. Forbes, (1954) does not mention that host and states the food plant is pickerel weed. Distribution of *densa* according to Forbes is the District of Columbia to Florida and Mississippi. I can add Louisiana. The species is apparently double brooded in the Gulf States." Dr. Todd thinks that the genus *Bellura* is congeneric with *Arzama* and the three species described in that genus are conspecific. Further, he considered that most of the species now standing under the name *Arzama* are no more than populations of *A. obliqua*. This would leave *Arzama* as a genus consisting of three species, distinguishable on the basis of genitalia. He is further inclined to suspect that *densa* may be no more than a food plant phenotype." Vogel and Oliver (1969) have investigated the biology and controlling potential of this species in Louisiana and concluded that "... there is a possibility that this insect can be used as an aid in reducing populations of this noxious weed where it is adversely affecting navigation and fish habitats" especially if biotic factors which reduce its field populations could be reduced.

*Samea multiplicalis* Guenée (Lepidoptera, Pyralidae)

Kimball (1965) records the food plant of this species in Florida as *Eichhornia crassipes*. Bennett (1966) studied this species as a potential controlling agent for *Salvinia auriculata* and noted that it attacked *Pistia stratiotes* in the field. Bennett and Zwölfer (1968) also reported its occurrence on *E. crassipes* under somewhat abnormal conditions in Brazil. More recently, the author has observed larvae of this species on *Salvinia* in Florida. It also attacks small rapidly developing plants of water hyacinth growing in close proximity to heavily infested *Pistia stratiotes* in Trinidad.

Bennett (*loc cit*) conducted a series of feeding tests on economic plants in which no damage to plants apart from

aquatic weeds occurred, and accordingly recommended the introduction of *S. multiplicalis* into other areas for the control of *Salvinia*.

*Sphenophorus pontederiae* Chttn. (Coleoptera, Curculionidae)

This weevil has been recorded previously only from pickerel weed *Pontederia cordata*, according to R. E. Warner (pers. comm). It was encountered only once during the present studies. Larvae and adults were present in the basal portions of plants and inter-connecting stems in an unthrifty patch of *E. crassipes* interspersed with *Lua- wiglia* and *Salix* at Belle Glade, Florida, in October, 1968. This weevil is considerably larger than the South American *Neochetina* and hence the damage caused by one individual is correspondingly greater. Further observations on this species are warranted. This species should not be confused with *Onychylus nigrirostris* (Boh.), another weevil which was collected on water hyacinth and pickerel weed at Fort Lauderdale in June, 1968, and in Louisiana in June, 1969. Miss R. E. Warner reports that *O. nigrirostris* has also been found on *Sagittaria*, *Scyrcpus*, *Nymphaea* and *Polygonum*. On pickerel weed and water hyacinth, the adults make elongate rectangular scars on the stems and leaves; the larvae were not seen.

*Neochetina* sp (Coleoptera, Curculionidae)

Preliminary surveys in 1968, in Trinidad, failed to indicate the occurrence of this species in north Trinidad or in the areas inspected in the South. However, in January, 1969, when water hyacinth, in a low lying area near Debe in southern Trinidad was examined the distinctive feeding marks of the adults on the leaves of water hyacinth were abundant and numerous adults sheltering during the day between the petioles and unopened leaves were present. Specimens of the weevil were sent to the USDA and Miss R. E. Warner confirmed that they were *Neochetina*, but as there may be a complex of species associated with the Pontederiaceae in South America, she considers that our species is not *bruchii*, but probably represents a new species. Accordingly, this species will also be studied in Trinidad as a basis for comparison with investigations on *N. bruchi* underway in Argentina, under the direction of Dr. D. Perkins.

*Orthogalumna terebrantis* Wallwork (Acarina: Oribatidae: Galumnidae) (Fig. 3 & 4)

This species, discussed under the name *Leptogalumna* sp. by Bennett and Zwölfer (1968), had at that time been recorded only from South America and hence was considered a promising species for release in the United States. However, in June, 1968, damage similar to that observed in South America was noted while examining water hyacinth near Belle Glade. Damage was again noted and specimens were collected at Fort Lauderdale a few days later and subsequently at a number of other localities in Florida. Specimens were also collected near Baton Rouge, Louisiana, in June, 1969. A heavy infestation was noted on the leaves of *E. crassipes* in the Rio Cobre and the Fresh River in Jamaica, W.I., in July, 1968. It was not seen in Barbados, St. Vincent or Trinidad.

At Fort Lauderdale, and Belle Glade, leaves of nearby pickerel weed and other aquatic plants were not infested by *O. terebrantis*. Similarly in Jamaica, it was not found on any plant except *E. crassipes*.

## PROGRESS ON HOST SPECIFICITY TESTS IN TRINIDAD

In Trinidad attempts have been made to study the life history and to determine the potential host range of three species—: *Cornops longicorne*, *Acigona ignitalis* and *Epipagis albiguttalis*. Details of the tests undertaken will not be given, but some of the more important aspects are presented.

*Cornops longicorne* Bruner (Orthoptera: Acrididae)

Under Trinidad conditions, the nymphal development period of *E. crassipes* varies from 35 to 60 days, and adults may live three months or longer. During this period each individual destroys several leaves. The results of host specificity tests are difficult to analyze. Adults and nymphs will, under starvation conditions in cage tests, feed on several species of plants. Nymphs were able to complete



Figure 3. *Eichhornia crassipes* damaged by the mite *Orthogalumna terebrantis*.

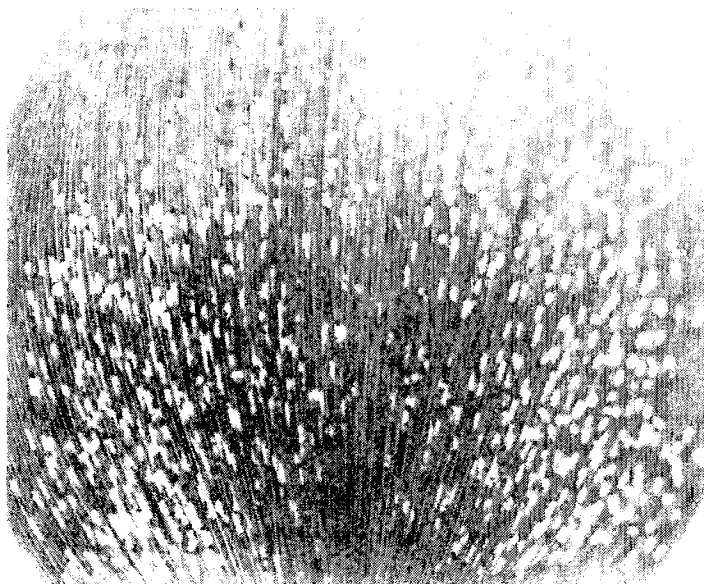


Figure 4. Leaf of *Eichhornia crassipes* damaged by *Orthogalumna terebrantis* (each pale area represents a single mite).

development on *Commelina* and the emerging adults lived for several weeks. However, the small diameter of stems of these plants render them unsuitable for oviposition. Adults which have been reared on *E. crassipes* and placed on *Commelina* will oviposit occasionally on the side of the cage, but none of these eggs thus obtained has hatched. In tank tests in which both *E. crassipes* and other test plants were offered adults and nymphs, confined their feeding activities to the former.

*Acigona ignitalis* Hmps. (Lepidoptera, Pyralidae)

Satisfactory techniques for rearing newly hatched larvae of this stem-borer to the pupal stage in excised sections of stems have not been developed, although a high proportion of individuals reared in living plants of *E. crassipes* for the first half of their larval period will complete development when placed in cut stems of the same host, if these are changed daily. Half-grown larvae also feed and live for several days when confined to stems of rice, sugarcane etc., but unless closely confined they leave these test plants. The most significant tests were those in which several hundred newly hatched larvae and eggs about to hatch were placed on living healthy plants including *Oryza*, *Saccharum*, *Commelina*, *Tradescantia*, *Zebra*, *Allium*, *Lactuca*, *Nasturtium* and *Eichhornia*. Although several larvae developed normally on *Eichhornia* only minor feeding occurred on any of the other plants and all larvae died in the first instar.

*Epipagis albiguttalis* (Lepidoptera: Pyralidae)

Although this species has been tested less extensively than the preceding species the results have been parallel.

### DISCUSSION

Surveys undertaken during the past year have considerably extended the known distribution of certain species and have added to the list of insects and mites that may be useful for the control of water hyacinth. The new distribution records for *Orthogalumna terebrantis*, i.e., Florida and Jamaica, and the absence of damage on other plants in these areas suggest the mite was introduced on *E. crassipes* possibly when the plant was first imported into these areas. It will be of interest to determine whether it has been introduced in the same manner to countries outside the American Continents. Studies undertaken by V. P. Rao and his colleagues in India, suggest that it does not occur there.

The fact that more than one species of *Neochetina* is associated with the Pontederiaceae points to the need for

further studies, both taxonomic and biological, and for great caution in ensuring that only one species is represented when evaluating host specificity tests. The occurrence of *Neochetina* sp. in south Trinidad, but its apparent absence in north Trinidad is also of interest. It is probable that it arrived on floating vegetation from the South American mainland, when the Orinoco River was in flood, but has not spread naturally to the northern part of the island.

The results of the studies by Vogel and Oliver (1969) and observations in Florida indicate that insects which have transferred to water hyacinth from the closely allied *Pontederia cordata* may be adequately host specific to include in the list of insects and mites to be considered for biological control in other parts of the world. In addition to *Arzama densa* previously placed in this category, (Bennett and Zwölfer, 1968) we can add *Sphenophorus pontederiae*.

Although host specificity tests with *Cornops longicorne*, *Acigona ionitalis* and *Epipagis albiguttalis* have continued in Trinidad, further studies are still required before the introduction of any of these can be recommended.

### ACKNOWLEDGMENTS

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