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BIOLOGICAL CONTROL OF THE TARO PLANTHOPPER, *TAROPHAGUS PROSERPINA* KIRK., IN THE FEDERATED STATES OF MICRONESIA

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ABSTRACT

The planthopper, *Tarophagus proserpina* Kirk., has always been an important insect pest of taro *Colocasia esculenta* on many islands in the FSM. The introduction of egg-sucking mirid bug predator, *Cyrtorhinus fulvus* Knight, proved successful in controlling the planthopper on taro on main islands of Kosrae and Yap, and the outlying atolls of Nukuoro and Mwoakilloa, Pohnpei. One year after introducing the predator, the population of planthopper was reduced to a very low level and since then its population has become low in all the taro plantings on these islands and atolls.

Key Words: *Tarophagus proserpina, Cyrtorhinus fulvus,* biological control, taro, Micronesia.

INTRODUCTION

The Federated States of Micronesia, an independent nation, consists of 4 island states (Kosrae, Pohnpei, Chuuk, and Yap) and more than hundreds of low lying atolls in the North Pacific, scattered between Guam and Hawaii. On these islands and atolls, taro or *Colocasia esculenta* is considered as an important food crop.

Taro is used for food and is considered an important food item being served in traditional ceremonial activities and on ordinary occasions. On the island of Kosrae, the government has set a priority to increase acreage for taro production to meet domestic needs, and also to export the corms to other islands in the FSM, Guam, Saipan and the Marshall Islands. On low lying atolls such as Mwoakilloa and Nukuoro, taro is considered one of the major food crops of outer islanders. It has been observed during several visits to those islands and atolls that the planthopper *Tarophagus proserpina* Kirk., is a serious pest on taro (Esguerra *et al.* 1990, Esguerra, 1988). In some south pacific island countries such as Solomon Islands and Papua New Guinea, the taro planthopper is also considered a major pest of taro (Howell, 1982). Infested plants are usually stunted with brown leaves and corms extremely small. Islanders always complain about the low yields of the crop and they suspect that the planthoppers are primarily responsible for the low yields. In addition, these planthoppers are known to transmit virus diseases such as Feathery Mosaic Virus in the Philippines and Alomae-Bubone in some south pacific island countries (Howell, 1982). Because of the fragility of island ecosystems, farmers do not resort to spraying their taro patches with insecticides. Besides, there are no registered insecticides for use on taro in the Federated States of Micronesia. Hence, farmers can not spray insecticides on taro to control planthoppers. The only practical method, therefore,

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to control an established population of planthoppers is the introduction of an effective natural enemy that can keep their population below damaging levels throughout the year.

The mirid bug, *Cyrtorhinus fulvus* Knight, is a specific predator of the taro planthopper. It is credited for keeping the taro planthopper population at low levels in many south pacific islands (Waterhouse and Norris, 1987). On the main island of Pohnpei, the planthopper on taro is kept under control primarily by the mirid bug (Esguerra *et al.* 1990, Schreiner 1989). However, not until 2 to 3 years ago has this predator been present to control the planthopper on Kosrae, Yap, Mwoakilloa and Nukuoro. This paper presents the effect of introducing the mirid bug predators on the suppression of the planthopper population on taro on these islands and atolls.

MATERIALS AND METHODS

Kosrae - Island State

On October 27 1993, egg-sucking mirid bug predators, *C. fulvus,* were collected from a taro patch in Nanpohnmal, Pohnpei. The predators were placed in gallon-sized ice cream cups provided with cut taro petioles and covered with muslin clothes. The containers with the predators enclosed were brought to the laboratory to prepare for shipment to Kosrae, an island 400 miles East of Pohnpei. Prior to shipment, each container was examined under a dissecting microscope to detect and remove any other organisms inadvertently collected before handcarrying them on the plane.

Sixty two (62) mirid bugs in their nymphal instars were released in a taro plantation infested with planthoppers at the Agriculture Station and forty nine (49) predators released in a taro plantation similarly infested with planthoppers in Malem Municipality. A technician from Kosrae Department of Agriculture and Land was taught the technique of carefully releasing the predators on upper leaf surfaces of taro.

A day before releasing the predators, 100 taro plants were selected at random to establish a prerelease base line planthopper population, and to determine the presence of any local planthopper enemies.

Three post release surveys were conducted at 5 months, 1 year, and 2 years after releasing the mirid bug predators. The survey involved counting the number of planthoppers and predators on 100 taro plants randomly selected at each release site.

Mwoakilloa

On October 8 1993, 25 mirid bug predators in rearing cups were handcarried to the island about 90 miles Northeast of Pohnpei. Predators were carefully released in a taro patch infested with planthoppers on the inhabited Kahlap atoll. Prerelease counts of planthoppers were taken from 100 randomly selected taro plants.

Post release surveys occurred 5 months and 1 year after release of the predators on taro. The survey determined the abundance of both the planthopper and its predator.

Nukuoro

During the boat trip to the Southern Islands of the FSM on February 10 1994, 14 *C. fulvus* nymphs were released on a taro patch infested with planthoppers. Prerelease counts of planthoppers were done from 100 plants selected at random. Because of irregular boat trips to the islands, post release survey was done 1 year after introducing the predatory mirid bug.

Yap

Despite low planthopper population in the two selected sites, 5 mirid bug predators were released on a taro field at the Agriculture Station and 25 predators released in a Demonstration Farm on December 7 1993. Because of the long distance involved and expensive cost of travel, one post release count was done 2 years after releasing the predators.

Data on average number of both planthoppers and predators were summarized and presented in Table 1.

RESULTS AND DISCUSSION

The effect of introducing the mirid bug predators on the population of the taro planthopper is shown in Table 1.

On Kosrae, the population of planthoppers remained high since insecticide spraying on the taro patch could not be done. Most taro plants looked unthrifty, and showed browning of leaf edges as shown in Fig. 1 & 2. The average number of planthoppers in each plant was 31 at the Agriculture Station and 62 in a taro patch in Malem Municipality. No parasites and predators were observed attacking the planthoppers on both sites.

Five months after the mirid bug predators were introduced, the planthopper population slightly increased on taro. However, the predators were established and showed an average of less than 1 on each plant.

One year and two years after predator introduction, *C. fulvus* reduced the population of planthoppers in both sites. Some of the predators were collected from the two sites where they were established. These predators were then released in

Table 1. Effect of introducing the predatory mirid bug on the population of Taro planthopper.

Location	Mean Number of Taro Planthopper and Predator [1]						
	Prerelease count	5 months after release of mirid bug		1 year after release of mirid bug		2 years after release of mirid bug	
	Planthopper	Planthopper	Predator	Planthopper	Predator	Planthopper	Predator
Kosrae							
Ag. Station	31.14	33.30	0.66	1.42	0.83	3.52	0.66
Malem	61.7	26.38	0.85	13.47	1.86	-	-
Mwoakilloa							
Kahlap	97.7	1.60	0.60	8.02	0.65	-	-
Nukuoro Is.	66.6	-	-	12.07	1.31	-	-
Yap							
Ag. Station	13.0	-	-	-	-	2.50	0.36
Demo Farm	6.9	-	-	-	-	4.40	0.51

[1] Based on 100 taro plants selected at random.

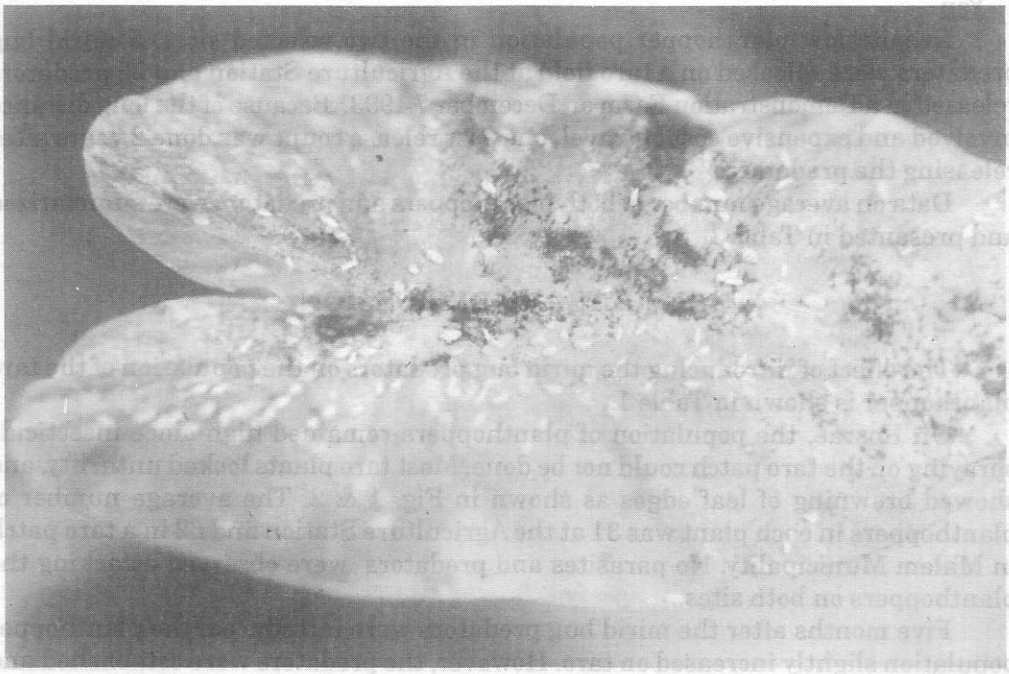

Figure 1. A taro leaf heavily infested with planthoppers.

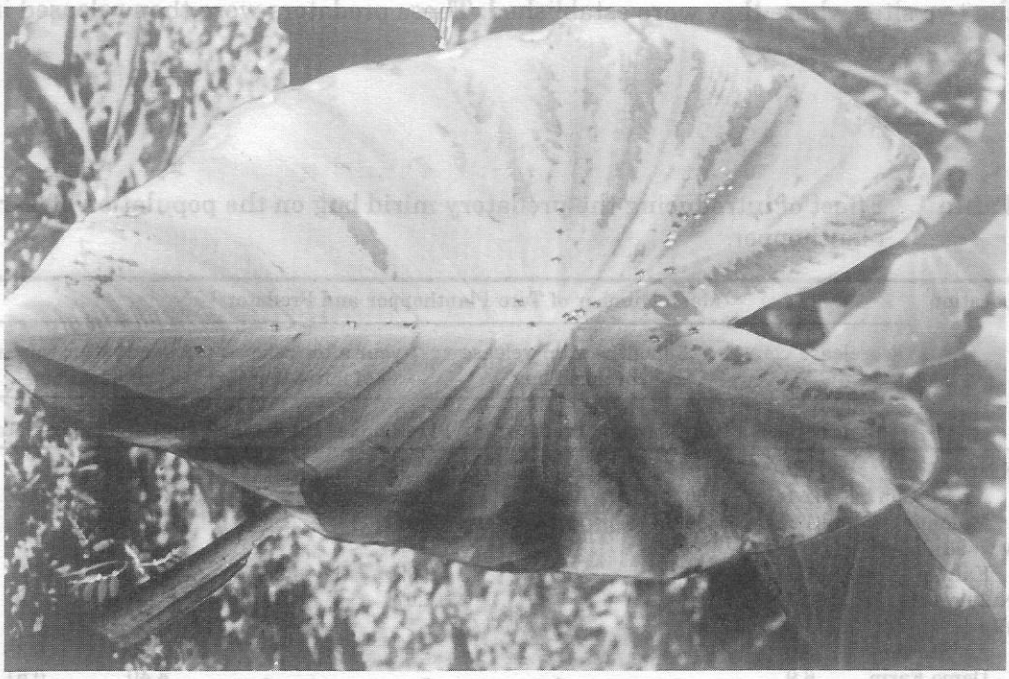

Figure 2. Browning of leaf edges of a taro leaf as a sign of planthopper infestation.

taro patches in Utwe and in Tafunsak Municipalities to facilitate the spread of predators throughout the island. In August 1996 during a visit to the island of Kosrae, it was observed that the predators were present on taro patches in areas where they were not released in Utwe and in Malem Municipalities.

Compared to those in other islands and atolls, the taro in Mwoakilloa was infested with the greatest number of planthoppers. An average of 98 planthoppers occurred on each plant. Five months and one year after introducing the predators, the planthopper population was drastically reduced to a very low level and most of the leaves were rendered planthopper-free. This effect appears to be due to the establishment and control provided by the released predator.

Similarly on Nukuoro, initially the planthopper population was high, with an average of 67 per plant. One year after releasing the mirid bug predators, the population of the planthoppers was considerably lower than during the pre release surveys.

Yap appeared to have the lowest taro planthopper population of all the islands and atolls. Taro plants included in the prerelease surveys at each of the two release sites revealed average populations of 13 and 7 planthoppers per plant, respectively. The prerelease surveys were conducted on newly planted taro patches. It is likely that the low numbers found in these areas is due to lack of sufficient time to establish a planthopper population. Initial surveys at these sites showed no apparent damage to the taro patches from planthoppers, and surveys conducted two years after predator release produced similar findings. The predator apparently contributed to the failure of the planthopper to become established at the release sites.

The success of the mirid bug predator, *C. fulvus,* in controlling populations of planthoppers is attributed to its ability to easily become established on taro and to voraciously feed on eggs of the planthoppers which were laid on petioles and midribs of leaves. Additionally in the small islands, no primary parasites were present to interfere with *C. fulvus* effectiveness as a natural enemy. In many south pacific island countries where the predator was introduced to control planthoppers, it was reported to be a successful biological control agent (Waterhouse and Norris 1987) because of its ability to become readily established on those taro patches infested with planthoppers (Fig. 3).

C. fulvus also proved to be an effective predator when introduced to Hawaii from the Philippines (Clausen, 1979). Likewise, it was a highly effective predator of the taro planthopper since it was introduced to the main island of Pohnpei in 1947 and 1955 (Pemberton, 1954; Schreiner, 1989). In fact, the sources of mirid bug predators, *C. fulvus,* which were introduced to the main islands of Kosrae, Chuuk and Yap and outer atolls of Nukuoro and Mwoakilloa came from the main island of Pohnpei (Esguerra *et al.* 1990; Esguerra, 1988). Although it was mentioned earlier that the predators were introduced to Kapingamarangi and Nukuoro, they could not be recovered from taro patches prior to releasing them in 1994.

In the Federated States of Micronesia, the mirid bug predators are being distributed and released on taro patches where they have not been introduced before. Using this method, the spread and establishment of the predators can be facilitated on all the nations islands and atolls.

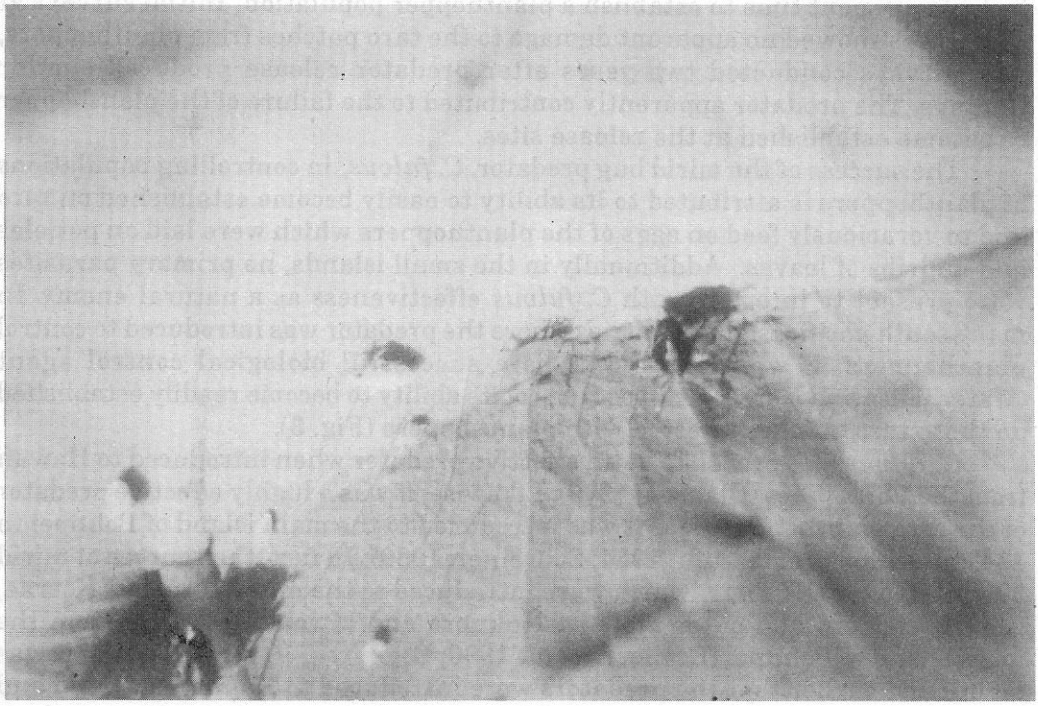

Figure 3. Yellow-colored nymph of the mirid bug predator, *C. fulvus,* on a taro leaf.

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REFERENCES

CLAUSEN, C.P. 1987. Introduced parasites and predators of arthropod pests and weeds: a world review. Agriculture Handbook 480. U.S. Dept. of Agriculture.

ESGUERRA, N.M. 1988. The taro leafhopper, *Tarophagus proserpina* Kirkaldy. CTAS/COM Entomology Bulletin No. 8: 1p.

ESGUERRA, N.M, J.A.PHILLIP, and W.S.WILLIAM. 1990. Survey of Pests of Crops in the Federated States of Micronesia (Entomology Portion). College of Micronesia Land Grant Program. Extension Report No. 1: 58 pp.

HOWELL, J. 1982. Pests of Taro, *Colocasia* sp. pp. 44-51. In: Lambert, M. (ed). Taro cultivation in the South Pacific. Handbook No. 22, South Pacific Commission, Noumea, New Caledonia.

PEMBERTON, C.E. 1954. Invertebrate consultants committee for the Pacific. Report for 1949-1954. Pacific Science Board, National Academy of Science Research Council. 56 pp.

SCHREINER, I. 1989. Biological control introductions in Caroline and Marshall Is. Proc. Haw. Ent. Soc. 29: 57-69.

WATERHOUSE, D.F. and K.R. NORRIS. 1987. Biological Control, Pacific Prospects. Inkata Press, Melbourne Australia.