this, only *T. brontispae* established and *H. brontispae* did not (Lange, 1950). In 1963, *T. brontispae* was introduced and established into French Polynesia for the control of *B. longissima* (Millaud, 1966). In 1973, *T. brontispae* was introduced into American Samoa from New Hebrides for *B. longissima* control (Cochereau, 1973).

Since the observation of infestation of Palau coconut beetle, *B. palauensis*, on Guam in late 1973, efforts were made to introduce *T. brontispae* for biological control. In mid 1974, shipments of *T. brontispae* were received from Saipan, New Hebrides, New Caledonia, and British Solomon Islands. Initially, parasite releases were made in Maite and Sinajana. In early 1975, the field recovery of this parasite was made and further field releases were continued until 1977. Initial observations in Sinajana and Maite showed remarkable recovery of the *B. palauensis* infested trees after the establishment of *T. brontispae*.

Table 1. Percentage of Parasitism by *T. brontispae* on *B. palauensis* during erarly 1980

VILLAGE	% OF PARASITISM
Agana Heights, Maina	32
Agat, Santa Rita	34
Asan	76
Barrigada, Harmon	22
Dededo	12
Mangilao	16
Mongmong, Toto	2
Sinajana	72
Tamuning, Tumon	18
Yigo	26
Yona	48

During early 1980, an islandwide survey was done to estimate the parasitism by *T. brontispae* and the results are presented in Table 1. To determine parasitism, 50 last instar larvae and pupae were field collected from each village and incubated in the laboratory for the emergence of the parasites. The percentage of parasitism varied from as low as 2% in certain areas to a maximum of 76% in some other areas.

In addition to *T. brontispae*, an earwig, *Chelisoches morio* F., which lives on coconut palms was also found to feed on the larvae of *B. palauensis*.

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Predator Deterrent Effect of *Leucaena leucocephala* on the Coccinellid, *Cryptolaemus montrouzieri*[1]

Leucaena leucocephala (Lam.) DeWit, a native of Latin America, grows luxuriently on limestone plateaus of Guam and other Mariana Islands. It probably was introduced into Guam around 1860 by the Spaniards. In 1945, the United States Navy spread the seeds throughout Guam to revegetate the island in order to remedy the damages done to the vegetation during World War II (Fosberg, 1959). The possible uses of *L. leucocephala* as a forage crop and in biomass production have been reviewed by the National Academy of Sciences (1977) and Jones (1979).

In early 1977, the spherical mealybug,

[1] Contribution No. 11, Guam AES.

Nipaecoccus vastator (Maskell) (Pseudococcidae, Homoptera), was observed to cause severe scorching and defoliation of large strands of *L. leucocephala*. Since then, this mealybug has been causing extensive defoliation of *L. leucocephala* during the dry season and, during the rainy season, most of the mealybugs got washed away.

A detailed morphological description of *N. vastator* has been given by Avasthi and Shafee (1977). This mealybug has a geographical distribution from the Middle East to Hawaii along the tropical and subtropical belt.

Ali (1957) and Al-Rawy, et al., (1977), have listed its important host plants in India and Iraq, respectively. The host plants of *N. vastator* recorded on Guam are: *Leucaena leucocephala* (Lam.) DeWit, *Leucaena insularum* var. *guamensis* Fosberg & Stone, *Jatropha gossypifolia* L., *Annona muricata* L., *Artocarpus heterophyllus* Lamarck, *Murraya koenigii* (L.) Spoenig, *Nyctanthes arbor tristis* L., *Nerium indicum* Miller, *Hibiscus syriacus* L., *Citrus* spp., *Phyllanthus amarus* Scham. & Thonn., *Euphorbia hirta* L., *Solanum melongina* L., *Carica papaya* L., *Psidium guajava* L., *Artocarpus altilis* (Parkins) Fosb., *Asparagus officinalis* L., *Grevillea robusta* A. Cunn., *Psophocarpus tetragonolobus* L., *Lycopersicon esculenum* Miller, *Jacaranda mimosifolia* D. Don., *Casuarina equisetifolia* J. R. & G. Forst., *Albizia falcataria* (L.) Fosb., *Tamarindus indica* L., *Persea americana* Mill., *Acalypha indica* L., *Tabebuia pentaphylla* (L.) Hemsley, *Intsia bijuga* (colebr.) O. Ktze, and *Serianthus nelsonii* Merrill.

N. vastator is found primarily on *L. leucocephala* on Guam and spreads to other economic crops during the dry season.

Surveys conducted during 1978–79 revealed that the adults and grubs of the Australian lady beetle, *Cryptolaemus montrouzieri* (Coccinellidae, Coleoptera) are active predators of *N. vastator* feeding on host plants other than *L. leucocephala*. No grubs or adults of *C. montrouzieri* were found to prey on *N. vastator* feeding on *L. leucocephala*.

To verify the effect of *L. leucocephala*, 2nd, 3rd, and 4th instar grubs of *C. montrouzieri* were collected from *N. vastator* infested *Jatropha gossypifolia*. These were reared in the laboratory on *N. vastator* collected from *L. leucocephala* and *J. gossypifolia*. Feeding trials were conducted in petri dishes maintained in the laboratory at a room temperature of 28°C. Fresh mealybugs were provided every morning. As shown in Table 1, all 2nd and 3rd instar grubs of *C. montrouzieri* fed with *N. vastator* collected out of *L. leucocephala* died before pupation, and only one out of 14 of the 4th instar grubs survived. It is known that the monarch butterfly, *Danaus plexippus* (L.) and several other insects that feed on *Asclepias* and its relatives, or on genera in other families, selectively concentrate cardiac glycosides in various parts of its body to utilize these compounds as predator deterrents (Rothschild, 1972; Levin, 1976).

Table 1. Effect of host plants of *Nipaecoccus vastator* on the development of the larvae of the lady beetle, *Cryptolaemus montrouzieri*.

Host plants of *N. vastator*	*C. montrouzieri*		
	Instar	#Grubs	% Mortality
L. leucocephala	2nd	20	100
J. gossypifolia	2nd	15	46
L. leucocephala	3rd	20	100
J. gossypifolia	3rd	20	65
L. leucocephala	4th	15	93
J. gossypifolia	4th	16	56

The presence of the non-protein amino acid, mimosine, in large amounts up to 12% of the dry weight of the growing tips in *L. leucocephala* has been reported. The adverse effects of mimosine on non-ruminants and its by-product 3-Hydroxy-4(1H)-Pyridone (DHP) on ruminants have been reviewed by Hegerty, et al., (1964), Gray (1968), and Jones (1979). It is quite possible that either the amino acid, mimosine, or its degradative by-product DHP, is responsible for the field observation that *C. montrouzieri* does not feed on *N. vastator* which infests *L. leucocephala*, and for the mortality of the grubs in the laboratory.

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Recent Pacific Bibliographies-III

A number of bibliographies have been published since the second part of this series appeared [Micronesica 14(1): 124–125, 1978]. The first one was printed in 1971 [Micronesica 7(1–2): 238–239].

The most ambitious bibliographic project to be conducted in many years is the "Pacific Island Ecosystems" (PIE), a cooperative project of the office of Biological Services and Ecological Services of the U. S. Fish and Wildlife Service. PIE is a literature survey of information pertaining to the natural resources of Hawaii, Guam, American Samoa, and the Trust Territory of the Pacific Islands. The project appears in two parts. The largest is a computerized reference system of more than 15,000 titles which has been indexed and made "machine-readable." The printed report:

Byrne, J. E. (ed.). 1979. Literature review and synthesis of information on Pacific Island ecosystems. U. S. Fish and Wildlife Service, Office of Biological Services, Washington, D. C. FW/OBS-79/35.

is composed of status reports and literature reviews by ten consultants. These are:

1. Wildlife refuges and endangered species of the Hawaiian Islands and the Trust Territory of the Pacific Islands—G. J. Bakus.
2. Botanical summary of the terrestrial ecosystems of the Hawaiian Islands, American Samoa, and the U. S. Trust Territory of the Pacific Islands—G. Gerrish and K. W. Bridges.
3. Birds and their habitats on Pacific Islands—A. J. Berger.
4. Freshwater macrofauna and habitats in the Hawaiian Archipelago and U. S. Oceanic—A. S. Timbol.
5. Macrofloral marine ecology of Samoa, Micronesia, and Hawaii—M. S. Doty.
6. Coral reef ecosystems of the Pacific Islands: Issues and problems for future management and planning—R. W. Grigg.
7. Noncommercial marine invertebrates of Hawaiian, Samoan, and Micronesian waters—L. G. Eldredge.
8. Reef and shore fishes of the Hawaiian archipelago, Guam, American Samoa and the U. S. Trust Territory—J. E. Randall.
9. Status of harvested marine resources in the Hawaiian Islands and the Pacific Trust Territory—T. Smith and J. Stimson.
10. Socioenconomic development and ecosystem integrity in American-controlled Pacific Island locations—L. Mason.

The data base of this extensive program is available for public use. Additional information may be obtained from the FWS Regional Office (Lloyd Five Hundred Building, 500 N. E. Multnomah St., Portland, Oregon 97232).

The Northwestern Hawaiian Islands. An Annotated Bibliography was compiled by E. H. Bryan, Jr. also for the U. S. Fish and Wildlife Service, Hawaiian Islands and Pacific Islands National Wildlife Refuge Complex in 1978. This publication is more than just a bibliography. The geology, natural history, and archaeology, of each low sand and coral island in the northwestern chain is reviewed. A map is also provided for each one, as well as a tabular checklist for the land vertebrates, birds, and plants found throughout the islands. Following a 90-page alphabetical listing of published information is a 19-page survey of anonymously published newspaper and magazine articles. A detailed cross-referenced index is included.