

Introductions for Biological Control in Hawaii: 1979 and 1980

P.Y. LAI, G.Y. FUNASAKI, S.Y. HIGA¹

The Plant Pest Control Branch (formerly Entomology Branch) of the Hawaii Department of Agriculture has maintained a beneficial organism introduction program for many years. This paper provides notes on the status of some pests and their purposely introduced natural enemies and a list of insects introduced and released for biological control during 1979 and 1980 (Table 1). All beneficial introductions are thoroughly screened and studied in a quarantine facility and must go through a clearance process prior to being released.

WEED PEST CONTROL

Ageratina riparia (Regel) K. & R. (Hamakua pamakani)

Three organisms contributing to the control of Hamakua pamakani are the stem galling tephritid, *Procecidochares alani* Steyskal, the leaf defoliating pterophorid, *Oidaematophorus* sp., and the leaf spotting fungus, *Cercospora* sp. (introduced by Dr. E.E. Trujillo, University of Hawaii Plant Pathologist). *P. alani* was initially released on Hawaii Island in 1974, *Oidaematophorus* sp. in 1973 and *C. sp.* in 1975.

The combined activities of these purposely introduced beneficial organisms have contributed by severely reducing thickets of Hamakua pamakani on the island of Hawaii. Desirable forage grasses have replaced pamakani in 16,000 to 20,000 ha of pasture lands. Many of these previously heavily infested lands have been restored to productive use.

Salsola pestifer A. Nelson (Russian thistle)

Through the cooperation of the USDA Biological Control of Weeds Laboratory, Albany, California, two beneficial coleophorids, *Coleophora parthenica* Meyrick and *C. klimeschiella* Toll, were introduced to aid in the control of Russian thistle, a noxious weed that infests about 320 ha of rangelands on Hawaii. Releases were made at Waimea in August and September 1980. Both insects are host specific and have been released in Russian thistle infested areas of California, Washington, Idaho, Nevada, Wyoming, Texas and many other States (L. Andres, pers. comm.).

INSECT PEST CONTROL

Aleurodicus dispersus Russell (spiraling whitefly)

The spiraling whitefly was discovered in Honolulu during September 1978 and rapidly dispersed throughout the island of Oahu. Heavy infestations occurred

¹Hawaii Department of Agriculture, Honolulu, Hawaii 96814.

on over 100 different species of plants. The whitefly subsequently was found on Maui in 1979 and on Kauai, Hawaii and Lanai during 1980.

In October 1978, plans were initiated to conduct a biological control program to reduce the environmental and socioeconomic impact of *A. dispersus*. A search was conducted in Tropical America, and in May 1979, a coccinellid, *Nephaspis amnicola* Wingo, was introduced into Hawaii. *N. amnicola* adults were released initially in October following quarantine studies. Two additional species of coccinellids, *Delphastus pusillus* (LeConte) and an undescribed species of *Nephaspis*, and two aphelinids, *Encarsia ?haitiensis* Dozier and *Encarsia* sp., were studied and released during 1980. Thus far, *N. amnicola*, *D. pusillus* and *E. ?haitiensis* have become well established and have been major contributing factors in lowering *A. dispersus* populations in various localities on Oahu and Maui. Releases of beneficial insects are continuing on all infested islands.

Carpophilus hemipterus (L.) and *C. humeralis* (Fab.) (pineapple souring beetles)

Propagation and releases of the staphylinid, *Philothalpus analis* Erichson, continued on Maui during 1979 and 1980. Although a total of 17,156 adults has been released on Maui and Lanai, there is no indication that *P. analis* is established in the field. A cooperative agreement between the Hawaii Department of Agriculture and Maui Land & Pineapple Company to search for other natural enemies of the souring beetles was established on July 1, 1979. A search in Kenya, Africa resulted in the introduction during December 1979 of an undescribed species of *Zeteticontus* (Encyrtidae), a larval parasite of *Carpophilus* spp. This promising control agent currently is undergoing host specificity studies in the quarantine facility.

Plutella xylostella (L.) (diamondback moth)

This cabbage pest was a perennial problem during 1979 and 1980 in cabbage-producing areas of Kula and Omaopio, Maui. A braconid, *Apanteles plutellae* Kurdjumov, was reintroduced from the West Indies through the courtesy of the Commonwealth Institute of Biological Control, Trinidad. Propagation of *A. plutellae* was conducted in the Kahului insectary, and adult releases commenced in November 1980 in cabbage growing areas on Maui. To date, there is no indication of establishment (*A. plutellae* was previously introduced and liberated on Hawaii and Maui during 1973 but no recoveries have been made from these 1973 releases).

Liriomyza spp. (leafminers)

The biological control of leafminers was initiated in June 1975 and continued through 1980. During this 5½ year span, a total of 31 species of parasites was introduced from the exploratory program and from the USDA Beneficial Insect Research Laboratory, Newark, Delaware. They were studied in the quarantine facility and subsequently 19 species were approved for mass propagation and released in the field. To date, only two species have become established and appear consistently in parasite effectiveness evaluations. One is a eulophid, *Chrysotomyia punctiventris* (Crawford), from California-Mexico and the other is an undescribed species of *Cothonaspis* (Cynipidae) from Texas. Three other parasites have been recovered occasionally from the field but their establishment is considered doubtful.

SNAIL PEST CONTROL

Achatina fulica Bowdich (giant African snail)

Population of the giant African snail continued to cause concern to residents on Kauai and, to a lesser degree, to residents in the Kona area on the island of Hawaii. The Hawaii Department of Agriculture has an ongoing bait application program in untenanted public lands and a carnivorous snail release program in areas with high *A. fulica* populations. Two species of carnivorous snails, *Gonaxis quadrilateralis* (Preston) and *G. kibweziensis* (Smith), have been released on Kauai and surveys indicated establishment of *G. quadrilateralis* in the Poipu area. Only *G. quadrilateralis* was released in Kona, but no recoveries of progeny have been made from that area. Residents have been baiting their own properties and collecting and destroying *A. fulica* found on their premises. In spite of this cooperative effort, *A. fulica* continued to multiply and spread, especially on Kauai during and after wet winter months. An appropriation is being requested from the 1981 Legislature so that the Hawaii Department of Agriculture can increase its effort to contain *A. fulica* on Kauai and in the Kona District of Hawaii.

ACKNOWLEDGMENTS

Assistance by domestic and foreign collaborators and our staff is gratefully acknowledged. Determinations of coccinellids and parasitic wasps by specialists of the Systematic Entomology Laboratory of the U.S. Department of Agriculture and University of Hawaii were invaluable.

TABLE 1. Introductions for Biological Control in Hawaii: 1979 and 1980.

Pest	Organism Introduced	Source	Sender	Date of Initial Release	No. Released 1979-1980	Release Site
<i>Achatina fulica</i> Bowdich (giant African snail)	* <i>Gonaxis kibweziensis</i> (Smith) (Pulmonata: Streptaxidae)	Palau, Caroline Islands	D. Otobed	Mar. 1979	430	Kauai
<i>Aleurodicus dispersus</i> Russell (spiraling whitefly)	<i>Nephaspis amnicola</i> Wingo (Coleoptera: Coccinellidae)	Honduras, Central America, Trinidad, West Indies	R.M. Burkhart	Oct. 1979	56,504	Oahu, Maui Kauai, Hawaii
	<i>Nephaspis</i> (undes. sp.) (Coleoptera: Coccinellidae)	Trinidad, West Indies	R.M. Burkhart	Sept. 1980	523	Oahu
	<i>Delphastus pusillus</i> (LeConte) (Coleoptera: Coccinellidae)	Trinidad, West Indies	R.M. Burkhart	June 1980	5,760	Oahu, Maui, Hawaii, Kauai
	<i>Encarsia ?haitiensis</i> Dozier (Hymenoptera: Aphelinidae)	Trinidad, West Indies	R.M. Burkhart	May 1980	9,020	Oahu, Kauai, Maui, Lanai, Hawaii
	<i>Encarsia</i> sp. (Hymenoptera: Aphelinidae)	Trinidad, West Indies	R.M. Burkhart	Oct. 1980	210	Oahu
<i>Liriomyza</i> spp.	* <i>Chrysocharis</i> <i>?giraulti</i> Yoshimoto (Hymenoptera: Eulophidae)	Trinidad, West Indies	R.M. Burkhart	Oct. 1980	1,260	Oahu

TABLE 1. Cont.

Pest	Organism Introduced	Source	Sender	Date of Initial Release	No. Released 1979-1980	Release Site
	<i>Chrysocharis</i> sp. (Hymenoptera: Eulophidae)	Trinidad, West Indies	R.M. Burkhart	Dec. 1980	610	Oahu
	** <i>Halticoptera patellana</i> Walker (Hymenoptera: Pteromalidae)	Trinidad, West Indies	R.M. Burkhart	June 1980	721	Oahu
<i>Plutella xylostella</i> (L.) (diamondback moth)	* <i>Apanteles plutellae</i> Kurdjumov (Hymenoptera: Braconidae)	CIBC, Trinidad, West Indies	M. Yaseen	Nov. 1980	1,205	Maui
<i>Salsola pestifer</i> A. Nelson (Russian thistle)	<i>Coleophora klimeschiella</i> Toll (Lepidoptera: Coleophoridae)	USDA, BCWL, Albany, California	A.H. Krueger	Aug. 1980	65	Hawaii
	<i>Coleophora parthenica</i> Meyrick (Lepidoptera: Coleophoridae)	USDA, BCWL, Albany, California	A.H. Krueger	Aug. 1980	84	Hawaii

*Reintroduction of species previously introduced and released but not found to be established.

**Reintroduction of an established species.