

## Recent Introductions for Biological Control in Hawaii—VI

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This paper includes a list of new introductions and additional releases of beneficial organisms for biological control in Hawaii made since the last published listing (Davis, 1960). The list is presented in table form preceded by a few notes on the status of organisms recently introduced for the control of snail, weed and insect pests.

### Snail Pest Control

#### A. *Lymnaea ollula* Gould (liverfluke snail)

*Sepedon macropus* Walker: This introduced predator of liverfluke snails is now established on all major islands of the state (Oahu, Kauai, Maui and Hawaii). Taro [*Colocasia esculenta* (Linnaeus)] paddies appear to be the optimum habitat, but it has been recovered in stream and marsh areas on Oahu.

This species was complemented with the release of *Dictya abnormis* Steyskal, which has not been recovered to date, and *Sciomyza dorsata* Zetterstedt, which was liberated on 8th December, 1960. According to Dr. Clifford Berg who collected the original stock in Denmark, *S. dorsata* attacks pulmonate snails that have either voluntarily left the water or have been stranded by receding water levels. This should extend the area of effective predation beyond that of *S. macropus*.

#### B. *Achatina fulica* Bowdich (Giant African snail)

*Euglandina rosea* (Ferrusac): This carnivorous species continued as the most adaptable and abundant predator of snail and slug pests.

*Gonaxis kibweziensis* (Smith) and *G. quadrilateralis* (Preston): These effective predators were steadily increasing at most of the original release points. In frequent checks they were consistently observed devastating African snail egg clutches and feeding on juvenile *Achatina* up to 35 mm. long. Noteworthy were two field observations of *G. quadrilateralis* feeding on *A. fulica* individuals which measured 3 and 4 inches long respectively. A survey of all original release points indicated that *G. kibweziensis* was established in 7 of 15 release points while *G. quadrilateralis* was well established in 16 out of 21.

*Gulella wahlbergi* (Krauss): This snail predator was recovered on September 8th, 1960 in Nuuanu Valley, Oahu; the first recovery of this snail in Hawaii since its introduction in 1957 from Durban, South Africa.

TABLE 1.  
NEW INTRODUCTIONS AND ADDITIONAL RELEASES FOR BIOLOGICAL CONTROL IN HAWAII

Pest Needing Control	Organism Introduced	Source	Collector	Date Rel'd (1960)	Number	***Release Point
I SNAIL PESTS				****		
<i>Lymnaea ollula</i> Gould (liver fluke snail)	<i>Sciomyza dorsata</i> Zetterstedt (Diptera: Sciomyzidae)	Denmark	Dr. C. Berg	9 Dec.	530	Heeia, Oahu
II WEED PESTS						
<i>Eupatorium riparium</i> Regel (Hamakua pamakani)	* <i>Xanthaciura connexionis</i> Benjamin (Diptera: Tephritidae)	Mexico	Ing. Jimenez	20 Apr.	5	Round Top Drive, Oahu
<i>Schinus terebinthifolius</i> Raddi	* <i>Bruchus atronotatus</i> Pio (Coleoptera: Bruchidae)	Sao Paulo, Brazil	Dr. J. Fonseca	26 Apr. 26 Apr.	3,500 4,000	Kau District, Hawaii Heeia, Oahu
<i>Lantana camara</i> var. <i>aculeata</i> (L) Moldenke	<i>Plagiobammus spinipennis</i> Thomson (Coleoptera: Cerambycidae)	Jalapa, Mexico	N.L.H. Krauss	25 Apr. 29 Apr. 28 Apr. 24 May 25 May	17 9 larvae 7 larvae 12 50 larvae 50 larvae	Round Top Drive, Oahu Kunia, Oahu Heeia, Oahu Kealakekua Ranch, Hawaii Hawaiian Ranch Co., Kau, Hawaii
	* <i>Aerenicopsis championi</i> Bates (Coleoptera: Cerambycidae)	Vera Cruz, Mexico	N.L.H. Krauss	29 Apr.	9 larvae	Makiki Round Top Drive, Oahu

TABLE 1. (Cont.)  
NEW INTRODUCTIONS AND ADDITIONAL RELEASES FOR BIOLOGICAL CONTROL IN HAWAII

Pest Needing Control	Organism Introduced	Source	Collector	Date Rel'd (1960)	Number	***Release Point
III INSECT PESTS <i>Coccus viridis</i> (Green) (green scale)	* <i>Archaeoneda tricolor</i> <i>fijiensis</i> Crotch (Coleoptera: Coccinellidae)	Nandi, Fiji	N.L.H. Krauss	****		
				7 Jul.	50	Pali Golf Course Area, Oahu
				11 Jul.	25	Keauhou, Kona, Haw.
	<i>Coelophora atrolineata</i> Fairmaire (Coleoptera: Coccinellidae)	Nandi, Fiji	N.L.H. Krauss	14 Jun.	50	Waimea Valley, Kauai
				26 Apr.	100	Keauhou, Kona, Haw.
				23 Apr.	50	Lanikai, Oahu
26 Apr.				100	Tantalus, Oahu	
<i>Pseudaletia unipuncta</i> Haworth	<i>Apanteles militaris</i> (Walsh) (Hymenoptera: Braconidae)	Riverside, California	Dr. E. Schlinger	28 Apr.	50	Makaha, Oahu
				30 Apr.	32	Heeia, Oahu
				14 Jun.	100	Kailua, Oahu
				14 Jun.	50	Kokee, Kauai
				6 Jun.	250	Kahua Ranch, Hawaii
<i>Macrosiphum pisi</i> (Harris)	** <i>Aphidius smithi</i> Sharma and Rao (Hymenoptera: Braconidae)	Albany, Calif.	Mr. G. Finney	6 Jun.	350	Parker Ranch, Hawaii
				4 Nov.	350	Kekaha, Kauai
				11 Nov.	400	Ewa, Oahu

\*Previously introduced.

\*\*Introduced by Entomology Department, Experiment Station, HSPA.

\*\*\*Applies to initial releases only.

\*\*\*\*For Vol. 17(2):245, 1958 should be corrected to 1959.

*Tefflus zanzibaricus alluaudi* Sternberg: One adult of this predacious ground beetle was recovered by Insectary personnel at Mahinui, Kaneohe on 14th September, 1960. This species was originally introduced from Africa in 1952 and reintroduced in 1953, '57 and '59. This is the second recovery of this beetle on Windward Oahu.

### Weed Pest Control

Excellent progress was observed in the biological control of weed pests, notably lantana, *Lantana camara* var. *aculeata* (Moldenke), and emex, *Emex australis* Steinh. Both are aggressive range pests in the State.

On lantana, tremendous upsurges in populations of the introduced noctuid moth, *Hypena jussalis* Walker, occurred during the first and last quarters of the year; particularly on Hawaii, Maui and Kauai. Noteworthy on Hawaii was dieback of lantana to ground level which occurred near Keauhou Junction, Kona District, and which was attributed to incessant defoliation by the lantana tingid, *Teleonemia scrupulosa* Stål, and *H. jussalis*. Another defoliator, *Catabena esula* Druce, was extremely active in North Kona during the first quarter of the year and may be the dominating lantana insect in that region. Sparse and abnormal foliage seem to indicate that much plant vigor is being drained by continuous defoliation and that these symptoms may be a prelude to severe dieback or death of the plant. The pyralid moth, *Syngamia haemorrhoidalis* Guenée, was ubiquitous and dominant in some localities.

The exotic range pest, *Emex australis*, was under heavy attack at Makahalau, 4,000 ft. elevation on the Parker Ranch, Hawaii by the introduced stem boring and leaf feeding weevil, *Apion antiquum* Gyllenhal, during February and March. This weevil was liberated at Makahalau in 1957 in an emex infestation which encompassed approximately one quarter acre. Three years later a high population density of *A. antiquum* had built up and destroyed much of the emex in this area. From 4 pounds of infested emex stems collected at this site over 3,500 weevils issued.

There were three recoveries of beneficial insects introduced for the control of other weed pests namely: *Strepsicrates smithiana* Walsingham ex foliage of *Myrica cerifera* at Hilo, Hawaii; *Trichotaphe* new sp; and *Acinia fucata* Fabricius ex foliage and flower heads respectively of sour bush, *Pluchea odorata*, at Ewa, Oahu.

### Insect Pest Control

*Aphidius smithi* Sharma and Rao was introduced from California by the Entomology Department, Experiment Station of the Hawaiian Sugar Planters' Association for the control of the pea aphid, *Macrosiphum pisi* (Harris), on alfalfa. It was released on 11 November in a large alfalfa field at Ewa, Oahu. On the 31st of December numerous parasitized aphids were observed by HSPA entomologist J. W. Beardsley, and the establishment of this parasite appears assured.

**Miscellaneous**

Eleven barn owls from the Texas Zoo at San Antonio were released on November 11th below the former halfway house, Old Pali Road, windward Oahu for rodent control.

The exploratory phase of the Biological Control program was carried on by Mr. Noel Krauss and the propagation and testing of all organisms considered for liberation were conducted by Mr. Q. C. Chock, State Entomologist, assisted by C. J. Davis, Assistant State Entomologist and by Miss Mabel Chong, Insectary Supervisor. The assistance of collaborators in making shipments and determinations by the Insect Identification and Parasite Introduction Section, U.S. Department of Agriculture, and others is gratefully acknowledged.

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