

ESTABLISHMENT OF SOME RECENT IMMIGRANT INSECTS  
IN HAWAII VOLCANOES NATIONAL PARK

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Between 1961 and 1978 over 300\* new immigrant arthropods were recorded in the State of Hawaii. Most of these were discovered on O'ahu but a few were first recorded from the neighbor islands such as the false dandelion gall wasp which was discovered on the Mauna Loa Strip Road in June 1966 and the bristly rose "slug" which was discovered in Volcano on 6 October 1973.

While most of these newly reported organisms were insects, some were mites and miscellaneous arthropods.

Between 1966 and 1978, 11 of these immigrant insects were recorded in Hawaii Volcanoes National Park. Undoubtedly there are others which have not been detected in the Park to date or reported by other sources not available to the writer.

With the exception of a sphingid, Theretra nesus (Drury), most of the Park immigrants are firmly established.

A summary of exotic insects which reached Hawai'i Island from O'ahu is presented in Table 1 and their relationship to the Park flora and other organisms is discussed.

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\* Proc. Haw. Ent. Soc.

1) Xylosandrus compactus (Eichhoff). (Black twig borer)

This is a tiny black beetle that bores into the twigs, branches, and boles of living trees. The male is brownish in color, smaller than the female, and about 1 mm or less in length. The female excavates a small chamber in the pithy portion of the twig or stem and deposits 30 or more white eggs in this niche. Upon hatching, the legless larvae feed on ambrosia fungus which is stored in dorsal pouches of the female and liberated for the developing brood.

Together with this fungus the black twig borer has become an important enemy of fruit trees, ornamentals, orchids, and native and exotic forest trees in Hawai'i. Over 100 hosts have been recorded.

This beetle has strong host preferences and will attack vigorous seedlings as well as mature trees. Often young trees are top killed and gradually succumb. Trees that have been weakened by drought or other factors are readily susceptible to borer and associated fungus organisms.

The first host record in the Park was at Waha'ula in October 1975, where it was found infesting twigs and branches of the native lama, Diospyros ferrea.

The altitudinal range of X. compactus is sea level to 914 m elevation and of the 11 new Park insects listed in this paper, this beetle has the greatest plant pest potential.

2) Coptosoma xanthogramma (White). (Black stink bug)

The black stink bug was collected at Kukalau'ula anti-goat enclosure, 244 m elevation on Canavalia kauensis, 18 March 1977 --a new host and Park record. It is the first known representative of the family Plataspidae to become established in the Hawaiian Islands (Beardsley 1967).

The adults are black in color, broadly oval in shape, about 2 mm long, and odiferous when handled.

The nymphal stages vary in color and, like the adults, prefer to feed on the succulent growth of host plants. Both adults and nymphs have sucking mouth parts.

With one or two exceptions, legumes are the principal hosts and both exotic and native species are represented in the coastal areas of Hawaii Volcanoes National Park.

The bugs are gregarious with as many as 1000 adults and nymphs being observed on a four foot branch of a Sesbania tree on windward O'ahu.

An egg parasite\*, Trissolcus sp., was reared from parasitized eggs collected on O'ahu in January 1968, and at Hilo, Hawai'i, in February 1968. It is very likely established in the Park and hopefully keeping the black stink bug below pest levels.

According to P. M. Marsh, United States Department of Agriculture Taxonomist, this parasite probably came in with its host from the Philippine Islands.

3) Psylla uncatoides (Ferris & Klyver). (Acacia psyllid)

In July 1970 this important pest of koa (Acacia koa) was found at high population levels on terminal foliar growth, Mauna Loa Strip Road, 1645 m elevation. This was also the first record of this forest pest on Hawai'i Island.

It is a native of Australia and occurs in New Zealand and California. The major hosts are Acacias and Albizzias. In addition to koa, another species (A. koaia) occurring at Kawaihae Uka, Mt. Kohala, was heavily attacked in the early 1970's by P. uncatoides.

The adults are small, about 1 mm or less in length and resemble a tiny cicada. There are five nymphal instars and both nymphs and adults are gregarious and have sucking mouth parts.

Leeper and Beardsley (1973, 1976) studied the Acacia psyllid in Hawaii Volcanoes National Park and at the A. koaia sanctuary, Kawaihae Uka, Mt. Kohala, and concluded in their initial study that imported natural enemies were needed for the control of this new immigrant pest.

This was subsequently accomplished with the introduction of two species of lady bird beetles, Harmonia conformis and Diomus pumilio. To date, Diomus has not been recovered and since the aforementioned authors' last publication, Harmonia was found on koa at Hilina Pali and clustered in a weather shelter off the Mauna Loa Strip Road, 1646 m elevation on 25 October 1977--an indication that this beneficial lady bird beetle is well established in the Park. A number of these beetles were also found on the summit of Mauna Kea, 4205 m elevation on 21 August 1976. These were most likely wind borne.

4) Gilletea taraxaci Ashmead. (Dandelion gall wasp)

The dandelion gall wasp was collected from false dandelion (Hypochaeris radicata) on the Mauna Loa Strip Road, 1818 m elevation in June 1966, a new State record. It was subsequently found on Mt. Haleakala, Maui, at 3030 m elevation on the same host, 22 May 1969.

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\* Proc. Haw. Ent. Soc. 20(2): 261.

Since the false dandelion is an exotic weed, the gall wasp can be regarded as a beneficial immigrant.

5) Pollenia rudis (Fabricius). (Cluster fly)

This calliphorid parasite of earthworms was first observed at Kamuela, Hawai'i, in April 1968 and by 1969 had spread rapidly around the Island becoming very abundant in Hawaii Volcanoes National Park and vicinity.

The adults are nuisance pests of buildings, usually entering in late afternoons. Between 1969 and 1971, thousands of these flies were observed in the tack room of the stables located near the Tree Molds and in various homes.

In recent years cluster fly populations have been at low population levels except for brief upsurges. The reasons for this are not fully understood. Lowering of earthworm populations and adult predation by plovers, spiders, skinks, and other organisms may have been responsible.

6) Antianthe expansa (Germar). (Solanaceous treehopper)

The plant hosts of the solanaceous treehopper include Cestrum, Solanum, and Acnistus.

On 31 August 1977, nymphs of this insect were found on potted Nothocestrum by tree nursery personnel at Ainahou Nursery, 914 m elevation. This was the first record of the solanaceous treehopper in the Park as well as a new host record.

These are small bizarre insects having the head vertical and the nymphs are queerly ornamented with spines. The adults will sometimes move behind a leaf or around a branch to escape capture.

Both adults and nymphs have sucking mouth parts, occur in large numbers, and may have pest potential.

7) Papilio xuthus Linnaeus. (Citrus swallowtail)

According to the literature, the caterpillars of the citrus swallowtail butterfly feed on various kinds of citrus trees, lime berry, Triphasia trifolia, prickly ash, Zanthoxylum americana, and Fagara spp., all members of the family Rutaceae.

The attractive butterflies were first sighted in Volcano residential area in January 1974, and were officially recorded in Kailua, Kona, in June 1974.

In October 1977, National Park tree nursery personnel found citrus swallowtail caterpillars feeding on kawa'u'kua-kulu-kapa, Fagara (Zanthoxylum dipetalum), a new Hawai'i host record. The

caterpillars were found on young nursery stock in the old tree nursery.

Eggs were found on plants that were transferred to the new tree nursery but were not viable.

Three mature larvae pupated and two normal adults were placed in the Park collection.

8) Cladius difformis Panzer. (Bristly rose slug)

The bristly rose slug was found severely damaging rose foliage on 6 October 1973, in the Volcano residential area. The adults are small black wasps and are known as sawflies. They are parthenogenic and oviposit in the petioles and midribs of the leaves. The caterpillars are slug-like in appearance and have chewing mouth parts.

This was the first record of the Hymenopterous family Tenthredinidae in the State of Hawai'i and it was observed at Kilauea Military Camp in January 1977. The bristly rose slug is restricted to roses.

A similar sawfly is found on wild blackberry and is well established in Volcano, Kipuka Ki, Kipuka Puauulu, and in other Park localities. Blackberry is the preferred host but it will feed on 'akala, Rubus hawaiiensis. It was purposely introduced for biological control of wild blackberry.

9) Anua indiscriminata (Hampson). (Myrtaceous moth)

10) Theretra nesus (Drury). (Yam sphingid)

11) Macroglossum pyrrhostictum Butler. (Maile pilau hornworm)

The last three immigrants are among the most recent arrivals in the Park and their relationship to the Park flora has not been determined. The myrtaceous moth is a noctuid whose caterpillars feed on guava, eucalyptus, and possibly 'ohi'a foliage. The yam sphingid is doubtfully established and the maile pilau hornworm has not been found feeding on native Rubiaceae. Under laboratory conditions, however, the caterpillars have been reared to maturity on pilo, Coprosma sp. The adults are attracted to light and are frequently observed in the Park as well as Volcano District feeding on honeysuckle and impatiens flowers.

## LITERATURE CITED

- Beardsley, J. W. 1962. On accidental immigration and establishment of terrestrial arthropods in Hawaii during recent years. Proc. Haw. Ent. Soc. 18(1): 99-109.
- \_\_\_\_\_. 1965. Insect invaders, our unwelcome immigrants. Haw. Farm Science 14(3): 1-4.
- \_\_\_\_\_. 1967. Coptosoma xanthogramma (White) (Hemiptera: Plataspidae) a new pest of legumes in Hawaii. Proc. Haw. Ent. Soc. 19(3): 367-372.
- Davis, C. J. 1970. Black twig borer threatens native trees. Newsletter, Haw. Bot. Soc. 9(5): 38-39.
- Leeper, J. R., and Beardsley, J. W. 1973. The bioecology of Psylla uncatoides in the Hawaii Volcanoes National Park and the Acacia koaia sanctuary. Island Ecosystems IRP, US/IBP Tech. Rep. 23: 1-3.
- \_\_\_\_\_. 1976. The biological control of Psylla uncatoides (Ferris & Klyver) (Homoptera: Psyllidae) on Hawaii. Proc. Haw. Ent. Soc. 22(2): 307-321.

TABLE 1. Summary of some recent immigrant insects now established in Hawaii Volcanoes National Park.

Insect	First Record	Kaua'i	O'ahu	Moloka'i	Lana'i	Maui	Hawai'i	Hawaii Volcanoes National Park
1) <u>Xylosandrus compactus</u> (Eichhoff) (black twig borer)	1961 O'ahu	1964	1961	1974 (Jul)	1975 (May)	1968 (Oct)	1966 (Dec)	1975 (Oct)
2) <u>Coptosoma xanthogramma</u> (White) (black stink bug)	1965 O'ahu	1967 (Oct)	1965 (Sept)		1968 (Oct)	1967 (Sept)	1967 (Apr)	1977 (Mar)
3) <u>Psylla uncatoides</u> (Ferris & Klyver) (Acacia psyllid)	1966 O'ahu	1967 (Jun)	1966 (Mar)	1977 (Jun)	1971 (Feb)	1967 (Jun)	1970 (Jul)	1970 (Jul)
4) <u>Gilletea taraxaci</u> Ashmead (dandelion gall wasp)	1966 Hawai'i					1969 (May)		1966 (Jun)
5) <u>Pollenia rudis</u> (Fabricius) (cluster fly)	1955 O'ahu	1959 (Jul)	1955 (Sept)				1968 (Apr)	1969
6) <u>Antianthe expansa</u> (Germar) (solanaceous treehopper)	1971 O'ahu	1973 (Jun)	1971 (Jun)	1975 (Jun)	1975 (May)	1975 (Aug)	1972 (Nov)	1977 (Aug)
7) <u>Papilio xuthus</u> Linnaeus (citrus swallowtail)	1971 O'ahu		1971 (Apr)	1974 (Jul)	1974 (Sept)	1974 (May)	1974 (Jun)	1977 (Oct)
8) <u>Cladius difformis</u> (Panzer) (bristly rose slug)	1973 Hawai'i						1973	1977 (Jan)
9) <u>Anua indiscriminata</u> (Hampson) (myrtaceous moth)	1974 Oa'hu	1974 (Dec)	1974 (Aug)		1977 (Aug)	1975 (Feb)	1975 (Mar)	1977 (Dec)
10) <u>Theretra nesus</u> (Drury) (yam sphingid)	1974 O'ahu	1974 (Nov)	1974 (Aug)	1975 (Oct)	1975 (Sept)	1975 (Mar)	1975 (Jun)	1978 (Jan)
11) <u>Macroglossum pyrrhostictum</u> (Butler) (maile pilau hornworm)	1976 O'ahu	1976 (Nov)	1976 (Jun)				1976 (Oct)	1977 (Nov)