

VIII. ALIEN ARTHROPOD CONTROL

Analysis of Potential Impacts

Arthropods, segmented animals with hard exoskeletons and jointed appendages, are the most diverse group of animals on earth today. Arthropods are insects, spiders, centipedes, and crustaceans, and are found in all habitats from the bottom of the oceans to the tops of the highest mountains. Arthropod species introduced outside their natural range represent a threat to natural systems because they can deplete native arthropod food resources and prey on native species, sometimes driving natives to extinction. Alien species that successfully establish populations within the Mauna Kea Science Reserve (MKSR) could out-compete or exclude native species, such as the Wēkiu bug, lycosid wolf spider, and other native resident arthropods.

Wēkiu bugs are food for other native arthropods. Native predators of the Wēkiu bug are thought to include the lycosid wolf spider and possibly some small sheetweb spiders (Family Linyphiidae). Wēkiu bugs escape from the lycosid wolf spider by hiding in interstitial spaces in the cinder that are too small for the spiders to penetrate. Wēkiu bugs could be vulnerable to introduced alien predators small enough to access these hiding spaces.

Alien species are those that occur outside of their natural range. Accidentally introduced alien arthropods arrive in the United States at the rate of about 11 new species per year (Sailer 1983). It has been estimated that more than 3,200 alien arthropods have been accidentally or intentionally introduced in Hawai'i (Howarth and Mull 1992). About 2,500 of these species have established resident populations. Alien arthropods appear in virtually every Hawaiian habitat from sea level to the summits of the highest mountains.

Many insect introductions are regarded as beneficial (i.e., honeybees and biological control agents), but some are feared as potentially dangerous (i.e., ants, spiders, and wasps). The populations of some introduced species have reached destructive numbers and caused serious environmental damage to natural areas. The decline of Hawaiian endemic arthropod populations, resulting from accidental introduction of alien arthropods, is well documented (Howarth 1985).

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MKSR could result in the reduction and possible elimination of many native arthropods, including the Wēkiu bug.

Perhaps the greatest alien threat to the Wēkiu bug is the Argentine ant, (*Linepithema humile*). Although they are relatively small (even for ants), the Argentines nevertheless are quite prolific. Colonies create anywhere from 20 to 100 queens, each producing vast numbers of eggs that keep the colony growing and expanding. In order to feed all the ants that build up in a single colony, Argentine ants utilize and monopolize every available food resource. Vulnerable food resources include not only the wind-borne food of the Wēkiu bug, but also the resident native arthropods themselves. Especially vulnerable to ants are the small, immature, nymph stages or instars of the Wēkiu bug.

Although the actual life cycle of the Wēkiu bug is unknown, most species of Heteroptera have five instars after emerging from eggs. As nymphs grow they must periodically shed their rigid skin, called an exoskeleton, and replace it with a larger one. After the last instar, the insect will molt to become a reproductive adult.

Figure VIII-3. The Argentine ant, (*Linepithema humile*), a potential threat to the Wēkiu bug, is common in lowlands on all main islands in Hawaii. Photo courtesy Jack Kelly Clark.



The Argentine ant occurs in several areas in Hawai‘i, including high elevation sites such as Haleakala National Park on Maui, Hawai‘i Volcanoes National Park, and up to 8,500 feet on Mauna Kea. Extensive sampling along the observatory access road resulted in no captures, and the summit area is believed to be currently free of ants (Wetterer et al. 1998).

Other ant species of concern are the big-headed ant, (*Pheidole megacephala*), the long-legged ant, (*Anoplolepis longipes*), the fire ants, (*Solenopsis geminata* and *S. papuana*),

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Figure VIII-6. Alien hunting spiders, (Clubionidae), are native to South America and have the potential to impact Wēkiu bug populations. *Photo courtesy Washington State University Cooperative Extension.*



The probability for the introduction of a serious predator is small. It is important, however, to prevent the establishment of alien species in or near Pu‘u Hau ‘Oki. Wēkiu bugs and other native Hawaiian arthropods in the crater are rare and need protection. Alien arthropod control is therefore an essential consideration during Outrigger Telescope construction and operation.

Alien Arthropod Control Recommendations

The following actions are recommended to prevent the establishment of alien arthropods on Pu‘u Hau ‘Oki. If these recommendations are followed, no significant impact to Wēkiu bug populations should occur as a result of alien arthropod introductions during the construction and operation of the Outrigger Telescopes.

Recommendation VIII-1: Earthmoving equipment should be free of large deposits of soil, dirt and vegetation debris that could harbor alien arthropods.

- (a) **Pressure-wash to remove alien arthropods.**

Alien arthropods can arrive at the summit by two general pathways. First, alien species already on the Island can spread to new localities. Second, alien species can arrive with shipping crates and containers. In order to block the first pathway, heavy equipment, trucks, and trailers should be pressure-washed before being moved to the construction site at Pu‘u Hau ‘Oki.

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Earthmoving equipment and large vehicles and trailers often sit at storage sites for several days or weeks between jobs. Most of these storage sites are located in industrial areas and usually support colonies of ants and other alien arthropods. These species often use stored equipment as refuges from rain, heat, and cold. Ants will colonize mud and dirt stuck to earthmoving equipment and could then be transported to uninfested areas. Spiders occupy stored equipment, looking for food or escaping predation by hiding in protected niches. Once transported to the summit, these species could migrate to Wēkiu bug habitat.

Pressure-washing of equipment before transportation to the construction site at Pu‘u Hau ‘Okī will remove dirt and mud and wash away ants, spiders and other alien arthropods, thereby reducing the chances of transporting these species to the summit area.

(b) Eradicate ant infestations at equipment storage sites and staging areas.

Eradicating ants at contractor storage yards and staging areas on the Island of Hawai‘i will significantly decrease the chances of ants infesting equipment and vehicles. Ant control programs should be initiated in storage yards and staging areas where equipment, vehicles, and construction materials are stored prior to use during Outrigger Telescope construction. A certified pest-control professional should design the ant control programs. In no case should baits or pesticides be placed on equipment to be transported the summit area.

(c) Inspect large trucks, tractors, and other heavy equipment before proceeding up the observatory access road.

Tractor-trailer rigs, earthmoving machinery, and other heavy equipment should be inspected before proceeding up the observatory access road. This inspection should be recorded in the contractor’s log book.

Recommendation VIII-2: All construction materials, crates, shipping containers, packaging material, and observatory equipment should be free of alien arthropods when delivered to the summit.

(a) Inspect shipping crates, containers, and packing materials before shipment to Hawai‘i

Alien arthropods can be transported to Hawai‘i via crates and packaging. Only high quality, virgin packaging materials should be used when shipping supplies and equipment. Pallet wood should be free of bark and other habitat that can facilitate the transport of alien

