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## **The Risk to Hawai'i from Snakes**

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**In lieu of an abstract, here is a brief excerpt of the content:**

## **The Risk to Hawai'i from Snakes**

*Fred Kraus and Domingo Cravalho*

### **Abstract**

We assessed the risk to Hawai'i's native species and human quality of life posed by the introduction of alien snake species. An examination of Hawai'i Department of Agriculture records from 1990 to 2000 indicated hundreds of credible snake

sightings in the state, mostly of free-roaming animals that were not recovered. These snakes arrived primarily through smuggling of pet animals, but some snakes are accidentally introduced as cargo stowaways. Most recovered specimens are of species potentially capable of inflicting substantial harm to native birds and the poultry industry if they become established. Some may affect native freshwater fish. An analysis of the frequency with which snakes are smuggled into the state, the suitability of the local environment to snake welfare, and the ecological threats posed by recovered snake species leads us to conclude that snakes pose a continuing high risk to Hawai'i. Mitigation of this threat can only be achieved by altering the human behavior leading to their widespread introduction. There are a variety of reasons why this behavior has not been successfully curtailed heretofore, and we propose a series of measures that should reduce the rate of snake introduction into Hawai'i. Failure to achieve this reduction will make successful establishment of ecologically dangerous snakes in Hawai'i a virtual certainty.

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Considerable efforts have been expended by the federal and State of Hawai'i governments over the past several years to exclude brown tree snakes, *Boiga irregularis* (Merrem), from Hawai'i because of the recognized threat that they pose to the state's remaining native birds, its tourist and electrical industries, and quality of life. Federal activity is largely based on Guam, where efforts are directed to keeping snakes out of the transportation network via trapping, searching of outbound cargo with snake-detecting dogs, erection of barrier fences, and reduction of prey bases—all focused around port areas. Prevention efforts by the State of Hawai'i consist of searching most inbound flights from Guam with canine units to verify that the flights are snake-free and responding to likely *B. irregularis* sightings with search and trapping efforts utilizing agency staff and volunteers. Since establishment of a comprehensive federal interdiction program on Guam in January 1995, only one verified *B. irregularis* has turned up in Hawai'i (dead), whereas seven (at least three alive) had been detected in the period 1981-1994 (Fritts et al. 1999). It appears that this interdiction program has been effective in reducing the frequency with which *B. irregularis* reaches Hawai'i.

Unfortunately, *B. irregularis* is widely viewed in Hawai'i as the only snake

threat to the state's native species and economy, and reduction of the likelihood of receiving *B. irregularis* from Guam has frequently been interpreted as synonymous with success in reducing the threat of snakes to Hawai'i. This conclusion, however, is excessively optimistic. As discussed by Rodda et al. (1997) and Loope et al. (2001), the ecological attributes that have made *B. irregularis* an ecological disaster in Guam are shared with hundreds of other snake species worldwide, which could prove equally devastating to naive faunas endemic to other oceanic islands in Polynesia or [End Page 409] Micronesia, should they be introduced. Recognition of this fact has led the State of Hawai'i to prohibit importation and possession of all snake species within the state; however, we argue that enforcement of this prohibition has not been commensurate with the real threats posed by snakes to Hawai'i. Herein we assess the ecological risk posed to Hawai'i by snakes.

## Materials and Methods

We assessed Hawai'i Department of Agriculture (HDOA) interception/capture records of snakes to identify the frequency with which snakes appeared in the state for the 10-yr period from June 1990 to June 2000. We were concerned only with credible sightings and, hence, excluded obvious hoaxes, misidentified items such as radiator hoses or eels, and sightings of the widely established blind snake, *Ramphotyphlops braminus* (Daudin), present in Hawai'i since 1930 (Oliver and Shaw 1953). Data recorded by HDOA, when available, included species identification, date of report/capture, location of sighting, and...

## The Risk to Hawai'i from Snakes<sup>1</sup>

Fred Kraus<sup>2</sup> and Domingo Cavalho<sup>3</sup>

**Abstract:** We assessed the risk to Hawai'i's native species and human quality of life posed by the introduction of alien snake species. An examination of Hawai'i Department of Agriculture records from 1990 to 2000 indicated hundreds of credible snake sightings in the state, mostly of free-roaming animals that were not recovered. These snakes arrived primarily through smuggling of pet animals, but some snakes are accidentally introduced as cargo stowaways. Most recovered specimens are of species potentially capable of inflicting substantial harm to native birds and the poultry industry if they become established. Some may affect native freshwater fish. An analysis of the frequency with which snakes are smuggled into the state, the suitability of the local environment to snake welfare, and the ecological threats posed by recovered snake species leads us to conclude that snakes pose a continuing high risk to Hawai'i. Mitigation of this threat can only be achieved by altering the human behavior leading to their widespread introduction. There are a variety of reasons why this behavior has not been successfully curtailed heretofore, and we propose a series of measures that should reduce the rate of snake introduction into Hawai'i. Failure to achieve this reduction will make successful establishment of ecologically dangerous snakes in Hawai'i a virtual certainty.

CONSIDERABLE EFFORTS HAVE BEEN expended by the federal and State of Hawai'i governments over the past several years to exclude brown tree snakes, *Boiga irregularis* (Merrem), from Hawai'i because of the recognized threat that they pose to the state's remaining native birds, its tourist and electrical industries, and quality of life. Federal activity is largely based on Guam, where efforts are directed to keeping snakes out of the transportation network via trapping, searching of outbound cargo with snake-detecting dogs, erection of barrier fences, and reduction of prey bases—all focused around port areas. Prevention efforts by the State of Hawai'i consist of searching most inbound flights from Guam with canine units to verify

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