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ENDANGERED SPECIES IN THE PACIFIC ISLANDS: THE ROLE OF ANIMAL DAMAGE CONTROL

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ABSTRACT: With the establishment of the U.S. Department of Agriculture's, Animal Damage Control operational program in Hawaii, the agency has expanded its activities to include protecting endangered species in Hawaii, American Samoa, and may soon be operating in Guam and the Commonwealth of the Northern Marianas. Endangered species recovery plans and technical reports of species in the Pacific Islands outline a role for the Animal Damage Control program in recovery efforts.

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INTRODUCTION

To determine the role of U.S. Department of Agriculture, Animal Damage Control (ADC) in protecting endangered species in the Pacific Islands, one need go no further than to the recovery plans and technical reports of birds, mammals, reptiles, and plants that have suffered the most from man's presence in the region over the years. These documents, prepared by teams of field biologists, and the action plans which they present, are prescriptions for treatments toward the recovery of these species in the Pacific Islands, many of which require measures to control introduced vertebrate pests.

The ADC operational program is relatively new to the Pacific Islands. Cooperative projects began in 1986 to provide wildlife management assistance to civilian airports and military air bases to control birdstrike hazards in the State of Hawaii. Since then, the program has naturally expanded to include work on crop depredations, nuisance wildlife problems, and the protection of endangered species from introduced vertebrate pests. The Hawaii program, which is a district operation managed out of the State Director's office in Olympia, Washington, has also undertaken projects in the territory of American Samoa and is expected to begin operations that will eventually benefit endangered species recovery efforts in the territory of Guam and the U.S. Commonwealth of the Northern Marianas.

THE HAWAIIAN ISLANDS

According to a recent publication on the status of Hawaii's natural heritage, entitled, *Hawaii's Extinction Crisis: A Call to Action* (Hawaii Department of Land and Natural Resources et al. 1991), Hawaii is known for having 75 percent of the historically documented extinctions of plants and animals in the United States. Of the 70 remaining native bird species in the Hawaiian Islands, 30 are listed on the U.S. Endangered Species List. Of the 209 species of plants listed as endangered in the United States, 18 percent are from the Hawaiian Islands.

Wetland Species

ADC's operational program in Hawaii began taking part in the effort to protect endangered species when it entered into a cooperative agreement with the U.S. Fish and Wildlife Service's Hawaiian and Pacific Islands National Wildlife Refuge Complex to protect four endangered Hawaiian waterbirds on the Service's refuges on the islands of Oahu and Molokai. The Hawaiian Waterbird Recovery Plan (USFWS 1985) for the Hawaiian coot (*Fulica americana alai*), the Hawaiian moorhen (*Gallinula chloropus sandvicensis*), the Hawaiian stilt (*Himantopus mexicanus knudseni*), and the koloa or Hawaiian duck (*Anas wyvilliana*) identified predation from feral cats (*Felis domesticus*), feral dogs (*Canis familiaris*), introduced rats (*Rattus* spp.), mongooses (*Herpestes auropunctatus*), and the cattle egret (*Bulbulcus ibis*) as major factors in waterbird mortality which significantly inhibit the recovery of the endangered species. To reduce predation by these five species, ADC specialists trap and remove them from James Campbell National Wildlife Refuge (NWR), Pearl Harbor NWR, and Kakahaia NWR on a year-round basis. The effort has been very labor intensive since the standard method for predator control in areas inhabited by endangered waterbirds has been by live capture in cage traps baited with food. Continuous immigration by the predators into a control area also adds to labor demands which keeps costs relatively high. Because of the apparent need for year-round operations, steps are being taken to refine our trapping operations by using more stable attractants, such as lures, and more humane methods of holding live-trapped animals, such as providing food, water, and shelter, to allow less frequent trap checking in an effort to achieve better labor efficiency.

Following the Hawaiian Waterbird Recovery Plan, Denver Wildlife Research Center (DWRC) was contracted to develop a chemical toxicant to control mongoose in endangered species habitat in Hawaii (Keith et al. 1987). The studies found that mongoose were highly susceptible to diaphacinone in low concentrations. In 1991, a Special Local Needs label (under the Federal Insecticide, Fungicide, and Rodenticide Act) was approved by the Hawaii Department of Agriculture to use diaphacinone in a 0.1 percent concentration in raw hamburger. ADC and others (National Park Service, Hawaii Department of Land and Natural Resources) are in the process of applying the bait in operational conditions. We expect the bait to reduce labor by about 50 percent if it is optimally distributed. ADC specialists will begin field application of the diaphacinone in a cooperative predator control project with the U.S. Marine Corps at their Nuupia Ponds Wildlife Sanctuary—an important production area for the endangered Hawaiian stilt—in Kaneohe, Oahu. According to their respective recovery plans (USFWS 1983d, 1983c),

refinements in the control of the mongoose and other mammalian predators will also benefit the endangered nene (*Branta sandvicensis*), the Hawaiian dark-rumped petrel (*Pterodroma phaeopygia sandwichensis*), and the Newell's manx shearwater (*Puffinus pujfinus newelli*).

Feral mallards (*Anas platyrhyncos*) introduced as pets to low elevation wetlands have been identified as a threat to the recovery of the koloa The Hawaiian Waterbird Recovery Plan also calls for maintaining the genetic integrity of the koloa, which will readily interbreed with the feral mallard. The koloa is closely related to the mallard but is considered a distinct species. To maintain the koloa as a genetically distinct entity, hybridization with the mallard (or other related waterfowl) must be prevented. ADC is in a position to assist the State of Hawaii and the U.S. Fish and Wildlife Service in the implementation of a statewide domestic mallard reduction program. ADC has already assumed the lead in preventing the spread of introduced bulbuls (*Pynconotus cafer* and *P. jocusus*) among the Hawaiian Islands. Bulbuls are agricultural pests but are presently confined to the Island of Oahu. Our efforts and those of the Hawaii Governor's Agriculture Coordinating Committee and the Hawaii Farm Bureau Federation have involved public education, detection, and removal of any bulbul sighted on Oahu's neighboring islands. It would be rather simple to also apply these activities to remove feral mallards from the Hawaiian environment.

In an unexpected way, ADC has been working with the endangered koloa and the nene as birdstrike hazards at Lihue Airport on the Island of Kauai. While there are no historic records of the nene being on Kauai, fossil discoveries suggest that they were once part of the avif uana of all the main islands (Olson and James 1982). During the El Nino event of 1982-1983, the hurricane Iwa—which is the Hawaiian name of the great frigatebird (*Fregata minor palmerstoni*)—hit the Island of Kauai. A small private flock of about a dozen nene escaped during the storm. The population grew steadily, and in 1992 is estimated to be about 75 birds. The nene routinely feed on the short grass along the runways and taxiways of Lihue Airport. In December 1991, a commercial airline pilot reported a flock of 19 nene flying just above his Boeing 737 jet airliner, perpendicular to his line of approach as he landed at Lihue Airport's Runway 35. ADC has initiated Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service and has requested a permit to haze the geese from aircraft movement areas. ADC and the airport are now implementing long-grass management as a way to keep the geese and other birds away from the runways.

The koloa have been more of a problem at Lihue Airport having been involved in six birdstrike incidences since 1990. The population of koloa increased dramatically around the airport when adjacent surrounding lands of monotypic fields of sugarcane were developed into a luxury resort area, featuring a man-made lagoon complex with islands of exotic wildlife, two 18-hole golf courses with waterhazards and an irrigation impoundment, horse stables, and pastures. The U.S. Fish and Wildlife Service has allowed ADC to study the efficacy of relocating the koloa to wetlands in other parts of the Island, and we have asked to study the movements of the ducks in the airport environment in order to incorporate land use management to prevent ducks from being hit by aircraft.

Forest Species

Recovery plans for endangered native Hawaiian forest birds have also been prepared by the U. S. Fish and Wildlife Service for the islands of Kauai (USFWS 1983a), Maui-Molokai (USFWS 1984), and Hawaii (USFWS 1983b). The plans identify predation from rats, mongoose, feral cats, and dogs but also mention that indirect threats from feral pigs (*Sus scrofd*), goats (*Capra hircus*), cattle (*Bos taurus*), sheep (*Ovis aries*), mouflon (*Ovis musimon*), and axis deer (*Axis axis*) are factors that threaten the survival and recovery of forest bird species and their habitats.

In 1987, ADC prepared a report (Ohashi 1988) evaluating federal, state, and private feral pig management programs in the State of Hawaii for Hawaii's Natural Areas Reserve System Commission which is charged with the administration and management of 18 reserves established to preserve in perpetuity, relatively unmodified communities of natural flora, fauna, and geological sites (HRS Chapter 195). More recently, the Hawaii Department of Land and Natural Resources requested an assessment and development of a monitoring protocol for predator and rodent populations in two forested areas within the Natural Areas Reserve System on the Island of Oahu. The two sites contain populations of the endangered Oahu tree snail (*Acantinella* spp.) which are threatened by rats and probably mongooses as well. ADC has been asked to provide recommendations for controlling these mammalian predators and could be involved in the implementation of control operations.

One area where ADC has implemented direct control operations to protect forest habitat is on the Island of Lanai where the endangered plant the Lanai sandalwood (*Santalum freycinetianum* var. *lanaiense*) and six candidate endangered plants are found (USFWS 1991a). The landowner, on advise from The Nature Conservancy and the Hawaii Department of Land and Natural Resources, took aggressive steps to control the apparent irruption of introduced axis deer that threatened the main watershed and the economy of the Island. The control effort included opening the private property to 22 weekends of public hunting. In addition, Island residents were allowed exclusive hunting opportunities on about half the land in the control area throughout the control period. ADC was relegated the other half which was the more remote, steep, and rugged terrain of Lanaihale where hunter use was typically low and carcass retrieval was hazardous. The combination of operations was apparently successful as estimates of deer numbers obtained through aerial surveys indicated that the population in the control area was down by 45 percent of precontrol estimates. While it was necessary to continue the control effort, the landowner—apparently due to cost cutting measures—did not continue the cooperative program.

U.S. TERRITORIES

Other U.S. territories and affiliates in the Pacific Area also have their share of related vertebrate pest problems. There are 22 species of plants, mammals, birds, and reptiles listed as threatened or endangered in Guam, the Commonwealth of the Northern Marianas, the Federated States of Micronesia, Belau, the Marshall Islands, and American Samoa (USFWS 1991a, 1991b).

American Samoa

Polynesian rats (*R. exulans*) were considered a significant factor in the degradation of the ecosystem of Rose Island, Rose Atoll NWR, American Samoa. Populations of the endangered hawksbill turtle (*Eretmochelys imbricata*), the threatened green sea turtle (*Chelonia mydas*), migratory seabirds, and the native vegetation were threatened by a high population of rats. The U.S. Fish and Wildlife Service and the Department of Marine and Wildlife Resources for the Government of American Samoa, requested the assistance of the ADC program to develop and implement an operation to eradicate the Polynesian rat from Rose Island.

The New Zealand government had published accounts of their successful application of Talon-G rodenticide, containing brodifacoum, to eradicate rats from larger islands in New Zealand (Taylor and Thomas 1989). After consultation with Denver Wildlife Research Center and their Hilo Field Station, ADC made a decision to use Talon-G in a product called WeatherBlok (manufactured by ICI Americas) on Rose Island. Although the rodenticide was not a restricted use product, it was not registered for field application and therefore ADC applied for a Section 18 - *Specific Emergency Exemption* (40 CFR Part 166) from the U.S. Environmental Protection Agency (EPA). In October 1990, the EPA granted ADC the authority to use WeatherBlok on Rose Island.

Three trips to Rose Island were made between October 1990 and September 1991. On Trip One (October 1990), biologists trapped 656 rats over 8,633 trap nights for a rate of 0.076 rats per trap night. The population on the 6.07 ha island was estimated to have been about 2,000 rats. Application of WeatherBlok was made and bait acceptance was excellent. At the end of the first operation there was optimism that the control operation had achieved total eradication. A total of 263 dead and dying rats were found after having been affected by the bait (Morrell et al. 1990). On a follow-up visit (Trip Two, May 1991), however, trapping for 1,139 trap nights yielded one female rat (0.0009 rats per trap night). Bait stations were resupplied with WeatherBlok and plans were made to return to Rose Island to finish the job. On Trip Three (August 1991), the WeatherBlok rodenticide was reapplied, but bait removal was not readily apparent. Simultaneously, the biologists trapped for 5,765 trap nights and captured four rats, for a rate of 0.0007 rats per trap night.

Talon-G in the WeatherBlok bait proved to be a highly successful control tool, with most of the rats being eliminated during the first trip's operations. There remains, however, a small remnant population of rats on Rose Island that are not being affected by the rodenticide, perhaps due to lowered bait acceptance, perhaps even avoidance. The continued presence of such a small population of rats is still a major concern for both the U.S. Fish and Wildlife Service and the Territorial Department of Marine and Wildlife Resources, since the population may eventually grow to its former level and again become a threat to the island ecosystem (Murphy and Ohashi 1991). For this reason, ADC has been asked to continue the control operation until the rats have been completely eradicated from Rose Island.

The Denver Wildlife Research Center has recommended a change in both the bait and rodenticide as the next logical step in the eradication operation of rats on Rose Island. Tests conducted by the Hilo Field Station showed that bromethalin was highly effective for controlling Polynesian rats (Tobin et al. 1991), and Vengeance (Bio Roussel) which contains 0.01 percent bromethalin was suggested as a suitable follow-up to WeatherBlok. ADC is currently in the process of applying for 24(c) - *Special Local Needs* (under the Federal Insecticide, Fungicide, and Rodenticide Act) label to use Vengeance and WeatherBlok to complete the eradication project in 1992.

Guam and the Northern Marianas

The decline of Guam's native forest birds is attributed to the introduced brown tree snake (*Boiga irregularis*), which is an arboreal, nocturnal predator. The snake population has reached high densities on Guam and there is concern that the snakes may be carried to other islands in the Pacific Area and cause similar ecological havoc (Engbring and Fritts 1988). The snake has been found on Saipan and there have been six brown tree snakes found in Hawaii in the past 10 years.

The recovery plan for Guam's endangered forest birds calls for the research, development, and implementation of control methods on brown tree snakes as part of the recovery effort which also involves captive propagation and reintroduction of the Micronesian rail (*Rallus owstoni*) and Kinfisher (*Halcyon cinnamomina cinnamomina*), Mariana crow (*Corvus laperouse*), Guam broadbill (*Myiagrafreycineti*) and Bridled white-eye (*Zosterops conspicillata conspicillata*) (USFWS 1990a). The snake has also been mentioned as a possible source of mortality for the endangered Mariana moorhen (*Gallinula chloropus guami*) (USFWS 1991c), Vanikoro swiftlet (*Aerodramus vanikorensis bartschi*) (USFWS 1991d), and the Mariana fruitbat (*Pteropus mariannus mariannus*) (USFWS 1990b) which also occur in the Mariana Archipelago.

The recovery efforts for endangered species in the Marianas may benefit from ADC's involvement with the control of the brown tree snake on Guam. Following strategies outlined by the U.S. Fish and Wildlife Service in a report on the brown tree snake (Fritts 1988), ADC has proposed the establishment of snake-free zones around major transportation facilities to prevent the spread of the snake to other Pacific Islands. The operational use of control technologies developed by the U.S. Fish and Wildlife Service and others will determine their application to recovery efforts. Denver Wildlife Research Center, under cooperative agreement with the U.S. Fish and Wildlife Service, has been testing the fumigant methyl bromide to kill snakes in cargo shipping containers and will work toward registering the product. The U.S. Fish and Wildlife Service is proposing overlay refuge status on Department of Defense lands in Guam to protect the endangered fruitbat and the habitat of the rail and other species. Without effective brown tree snake control, the chances for the recovery of these species is considered to be poor.

SUMMARY

We have described ADC's current involvement with endangered species in the Pacific Islands. These descriptions only touch upon the much greater role available to both research and operational segments of the programs in the Pacific Islands where vertebrate pest control expertise is needed in the recovery of a long list of endangered species that have been adversely affected by human activities.

Every one of ADC's current activities in the Pacific Islands has been a result of driving forces outside the agency.

By remaining innovative, open, and adaptable, we can continue to lead the field and provide our expertise appropriately to fulfill the needs of federal, state, territorial, international, public and private concerns for the recovery of endangered species threatened by vertebrate pests.

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