



# Department of Defense Legacy Resource Management Program

PROJECT 09-438

## **Department of Defense Island Restoration Opportunities in the Tropical Indo-Pacific through Removal of Introduced Rats**

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# Project Final Report

## For Legacy Resource Management Program

Project Number: 09-438

### Department of Defense Island Restoration Opportunities in the Tropical Indo-Pacific through Removal of Introduced Rats

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## Introduction

Introduced rats are known to dramatically affect island biodiversity (Varnham 2010). Rodents have been removed from approximately 300 islands worldwide, demonstrating that eradication of rats can be a valuable tool for natural resources conservation (Howald et al 2007). The Department of Defense (DoD) can utilize this tool to more economically realize conservation benefits detailed in their Integrated Natural Resources Management Plans (INRMPs), as well as to protect personnel health and mission integrity. For example, the US Air Force awarded an FY11 contract to US Fish and Wildlife Service (FWS) to eradicate rats from Wake Atoll, an installation in the tropical Pacific. On Wake, rats predate seabirds and may have extirpated several seabird species from the island. Rats may also be impacting a range of other biota and ecological processes on Wake, such as precluding native *Pisonia/Cordia* forest regeneration and reducing land crab abundance. Moreover, in 2008, rats twice chewed through an electric cable controlling the barrier cable across the airfield required for safe operation of fighter aircraft. In one instance, F-22s were grounded until a C-17 mission could be flown to the island with replacement parts and technicians. The costs of the F-22 mission delays, coupled with the costs of the C-17 mission, were estimated to exceed \$1M (Tiffany Patrick, pers. comm.). To date, the DoD has been involved in one other rat eradication, on Midway Island in conjunction with FWS and US Department of Agriculture (Murphy 1997).

The following document, funded in full by the DoD Legacy Resource Management Program, is a compilation of islands in the tropical and sub-tropical Indian and Pacific (Indo-Pacific) oceans in which the DoD owns or leases, or has management stake in at least a portion of the land area. Also included in this compilation are some non-DoD islands in the same region that have been or may be proposed (due to globally significant populations of rare or threatened species) as mitigation sites for DoD activities on adjacent islands. The islands analyzed here are those for which rat removal, or in the case of already rat-free islands, maintenance in a rat-free state, may be a feasible action for the benefit of the island's native biodiversity and/or the military mission. Twenty-three islands/island groups are included in this analysis. They are:

- Ka`ula Island, Hawaii
- Lehua Island, Hawaii
- Johnston Atoll
- Wake Atoll
- Kwajalein Atoll, Marshall Islands
- Aguijan, Mariana Islands
- Farallon De Medinilla, Mariana Islands
- Anatahan, Mariana Islands
- Sarigan, Mariana Islands
- Guguan, Mariana Islands
- Alamagan, Mariana Islands
- Pagan, Mariana Islands
- Agrihan, Mariana Islands
- Asuncion, Mariana Islands
- Maug, Mariana Islands
- Uracas, Mariana Islands
- Oki-daito Jima
- Tori Shima, Okinawa
- Kume Jima, Okinawa
- Idesuna Jima, Okinawa
- Ukibaru Jima, Okinawa
- Senkaku Islands
- Diego Garcia

Islands were excluded from this analysis if they were greater than 100 square kilometers (approximately the size of Campbell Island, New Zealand – the largest island rat eradication conducted to date), or otherwise pose significant challenges due to high levels of human habitation. Therefore, the following islands with DoD presence were eliminated from this compilation: Kauai, Oahu, and the Big Island in Hawaii; Guam, Rota, Tinian, and Saipan, in the Marianas; and Okinawa, Tsuken Jima, Ie Jima and Etajima in Japan. Four additional islands were identified during the review process by the DoD Legacy Resource Management Program and the non-profit organization Island Conservation. One of these, Lehua Island in Hawaii, was added to the analysis after it was stated that subsequent to a failed eradication in 2009, there may be support for a second eradication attempt for which DoD could consider

partially funding as mitigation for take of Newell's Shearwaters elsewhere. The other three islands were excluded from the analysis. These included Kaho'olawe in the Hawaiian Islands, Sonsorol in the Republic of Palau, and Mona in the Caribbean. Kaho'olawe was excluded as it has been abandoned as a Navy training range and its ownership/management has been turned over to the Kaho'olawe Island Reserve Commission through the State of Hawaii. Kaho'olawe does not support species or habitats threatened by DoD activities elsewhere and therefore would not serve as a logical mitigation site (Mansker, pers. comm.). Islands in the Republic of Palau are rich in biodiversity and have valuable island restoration potential. Nevertheless, the lack of DoD presence in this country precludes a natural link for mitigative action. Mona, in the Caribbean, is out of the geographic scope of this document due to this author's lack of knowledge regarding the resources and DoD contacts in this region, as well as regions of the Mediterranean and African tropics/subtropics.

Also excluded from this analysis were rat eradication opportunities within larger islands. Although global progress has been made at constructing predator-proof fences and eradicating introduced rodents from enclosed habitats within islands, an analysis of restorable areas within these larger islands is outside the scope of this document.

For each island discussed, the following information is presented: island jurisdiction (i.e., ownership and DoD's relationship to the island), island location, island size, island habitat, human population size, presence of rare, threatened, endangered (RTE) and other sensitive species (those species which are likely negatively impacted by rats), and presence of other introduced mammals. For the RTE and sensitive species classifications, U.S. Endangered Species Act status and, for non-U.S. lands, any local protection status or classifications are provided. Although this list does not intend to prioritize islands for eradication based on ecological or military benefit, island size and human population size can serve as proxies for relative ease of eradication, and presence of RTE and sensitive species and presence of other introduced mammals can serve as proxies for biodiversity restoration potential.

The information collected for this document was garnered from various sources within DoD and also readily available to the public via internet. Some of the information may need further verification if and when a program for rodent eradication or other conservation action on a particular island is initiated. The DoD Legacy Resource Management Program and this author can assist with identifying current points of contact within the various military commands for additional information about the islands. It is hoped that the information contained in this document will provide background support to Natural Resources Managers at the relevant installation-level Commands for inputting rat-eradication projects into Integrated Natural Resource Management Plans and Natural Resource Program budgets, if those managers indeed decide that such conservation action justifiably supports their program and/or the military mission. It is also hoped that the information presented here can assist in communicating to DoD Environmental leadership within the Armed Forces Pest Management Board, the DoD Legacy Resource Management Program, and the four DoD services, the breadth of opportunity provided by this type of conservation action. This document was executed through Cooperative Agreement W912DY-09-2-0015 with the US Army Corps of Engineers, Huntsville Alabama.

## References

- Howald, G., C.J. Donlan, J.P. Galvan, J. Russell, A. Samaniego, Y. Wang, D. Veitch, P. Genovewi, J. Parkes, M. Pascal, A. Saunders, and B. Tershy. 2007. Invasive rodent eradications on islands. *Conservation Biology*. 21: 1258-1268.
- Mansker, Michelle. Personal Communication. Army Garrison Hawaii.  
[Michelle.Mansker@us.army.mil](mailto:Michelle.Mansker@us.army.mil)
- Murphy, J. G. 1997. Rat Eradication on Sand Island, Midway National Wildlife Refuge. Wildlife Services. Honolulu, HI.
- Patrick, Tiffany. Personal Communication. Hickam Air Force Base. Current contact:  
[tiffany.patrick@usmc.mil](mailto:tiffany.patrick@usmc.mil)

Varnham, K (2010). Invasive rats on tropical islands: Their history, ecology, impacts and eradication.  
RSPB Research Report No. 41. Royal Society for the Protection of Birds, Sandy, Bedfordshire,  
UK. ISBN 978-1-905601-28-8

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# Ka`ula Island

**Jurisdiction/DoD Interest:** Navy Region Hawaii. Portion used as inert ordnance and live fire target range.

**Location:** N 21°39' W 160°32'

**Size:** 44 hectares (ha)

**Habitat:** Steep, rocky barren partially submerged crater rim.

**Human Population:** 0

**RTE and sensitive species:** Hawaiian Monk Seal (*Monachus schauinslandi* – ESA Endangered), Black-footed albatross (*Phoebastria nigripes*), Laysan Albatross (*Phoebastria immutabilis*), Blue-gray Noddy (*Procelsterna cerulea*), Sooty Tern (*Sterna fuscata*), Gray-backed Tern (*Sterna lunata*), Christmas Shearwater (*Puffinus nativitatis*), Bulwer's Petrel (*Bulweria bulwerii*), Wedge-tailed Shearwater (*Puffinus pacificus*), Band-rumped Storm Petrel (*Oceanodroma castro* – ESA Candidate) (observed offshore)

**Introduced mammals/predators:** *Rattus exulans*, *Mus musculus*

**References:**

U.S. Navy. 2010. Pacific Missile Range Integrated Natural Resources Management Plan.



# Lehua Island

**Jurisdiction/DoD Interest:** State of Hawaii. Potential Newell's Shearwater (*Puffinus auricularis newelli*) mitigation site for operations at Pacific Missile Range Facility (Navy Region Hawaii).

**Location:** N 22°01' W 160°06'

**Size:** 115ha

**Habitat:** Steep, rocky barren partially submerged crater rim.

**Human Population:** 0

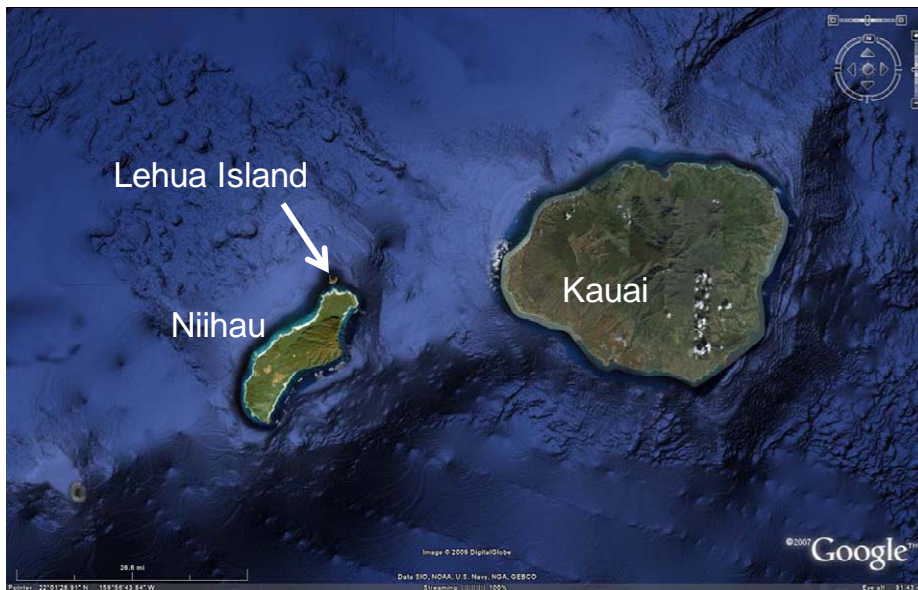
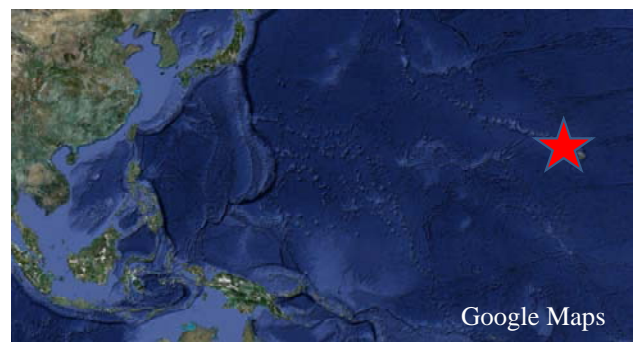
**RTE and sensitive species:** Hawaiian Monk Seal, Black-footed albatross, Laysan Albatross, Newell's Shearwater (ESA – Threatened), Christmas Shearwater, Bulwer's Petrel, Wedge-tailed Shearwater, Band-rumped Storm Petrel

**Introduced mammals/predators:** *Rattus exulans*. Note, a rat eradication was attempted in 2009 but failed, making the political and regulatory context for a second eradication more challenging.

## References:

Holmes, Nick. Personal Communication. Island Conservation. [nick.holmes@islandconservation.org](mailto:nick.holmes@islandconservation.org)  
<http://en.wikipedia.org/wiki/Lehua>

VanderWerf, E.A., K.R. Wood, C. Swenson, M. LeGrande, H. Eijzenga, and R.L. Walker. 2007. Avifauna of Lehua Islet, Hawaii: Conservation Value and Management Needs. Pacific Science. 61: 39–52.



## Johnston Atoll

**Jurisdiction/DoD Interest:** U.S. Air Force (Pacific Air Forces) maintains jurisdiction over the emergent land area. FWS maintains an overlay National Wildlife Refuge over the land and surrounding waters. US Air Force is working to fully transfer administrative responsibilities of the island over to FWS. There is no current military mission other than some long-term monitoring of environmental contaminants.

**Location:** N 16°44' W 169°32'

**Size:** Emergent land area: 267ha. 4 islets: Johnston Island (241ha), Sand Island (9ha), North Island (10ha), and East Island (7ha)

**Habitat:** Flat atoll; open vegetation

**Human Population:** 0

**RTE and sensitive species:** Bulwer's Petrel, Wedge-tailed Shearwater, Christmas Shearwater, Sooty Tern, Gray-backed Tern, Bristle-thighed Curlew (*Numenius tahitiensis*), green sea turtle (nesting, *Chelonia mydas* – ESA Threatened), Hawaiian Monk Seal

**Introduced mammals/predators:** *Mus musculus*, *Rattus* sp. (possible)

**References:**

<http://www.fws.gov/johnstonisland/index.html>

U.S. Air Force. 2000. Johnston Atoll Integrated Natural Resources Management Plan

U.S. Fish and Wildlife Service. 2011. Status: Eradication of Yellow Crazy Ants on Johnston Atoll. Technical report. 2pp.





# Wake Atoll

**Jurisdiction/DoD Interest:** US Air Force, 611<sup>th</sup> Air Support Group out of Elmendorf Alaska

**Location:** N 19°18' E 166°38'

**Size:** 739ha

**Habitat:** Low-lying coral atoll; open vegetation mixed with thick scrub and forest. Composed of three islands, Wake, Wilkes, and Peale. Wake is connected to Wilkes via causeway and to Peale via a sandbar at low tide.

**Human Population:** Just over 100 people

**RTE and sensitive species:** Laysan Albatross, Black-footed Albatross, Wedge-tailed Shearwater, Christmas Shearwater, Sooty Tern, Gray-backed Tern. Wake INRMP proposes a project to translocate endangered Guam Rail (*Gallirallus owstoni*) to serve as ecological surrogate for extinct Wake Rail (*Gallirallus wakensis*).

**Introduced mammals/predators:** *Rattus exulans*, *R. tanezumi*, feral cats (3 individuals remain post cat eradication, no apparent reproduction).

**References:**

Rauzon, M.J., W.T. Everett, D. Boyle, L. Bell, and J. Gilardi. 2008. Eradication of Feral Cats at Wake Atoll. Report to DoD Legacy Office.

Rauzon, M.J. D. Boyle, W. T. Everett, and J. Gilardi. 2008. The Status of the Birds of Wake Atoll. Atoll Research Bulletin No. 561.

US Air Force 2008. Wake Atoll Integrated Natural Resources Management Plan.



# Kwajalein Atoll

**Jurisdiction/DoD Interest:** US Army Kwajalein Atoll (USAKA)/ Reagan Test Facility leases all or portions of 11 of the 99 islets in the atoll from the Republic of the Marshall Islands. 5 of these 11 contain significant stands of native habitat.

**Location:** N 8°45' - 9°25' E 166°45' - 167°50'

**Size:** Emergent land area of the entire atoll is 16.4km<sup>2</sup>. USAKA islands within the atoll are as follows: Kwajalein 303ha; Roi Namur 161ha; Meck 22ha; Omelek 3.2ha; Legan 7.3ha; Eniwetak 6ha; Ennylabegan 50ha (only central portion is leased by USAKA); Gagan 2.4ha; Illeginni 12.5ha; Gellinam 2ha; Ennugarret 9.7ha

**Habitat:** Low-lying atoll with heavily forested areas intermixed with military cantonment, urban and rural Marshalese settlements, and ruderal areas.

**Population:** Approximately 15,000 across the whole atoll. ~13000 (Ebeye island), 2280 (Kwajalein); 229 (Roi-namur); some Marshallese families (Ennylabegan);

**RTE species or habitats:** Coconut crab (*Birgus latro*), Wedge-tailed Shearwater, Bristle-thighed Curlew, Black-naped Tern (*Sterna sumatrana*), green sea turtle (nesting), hawksbill turtle (nesting, *Eretmochelys imbricata*—ESA Endangered)

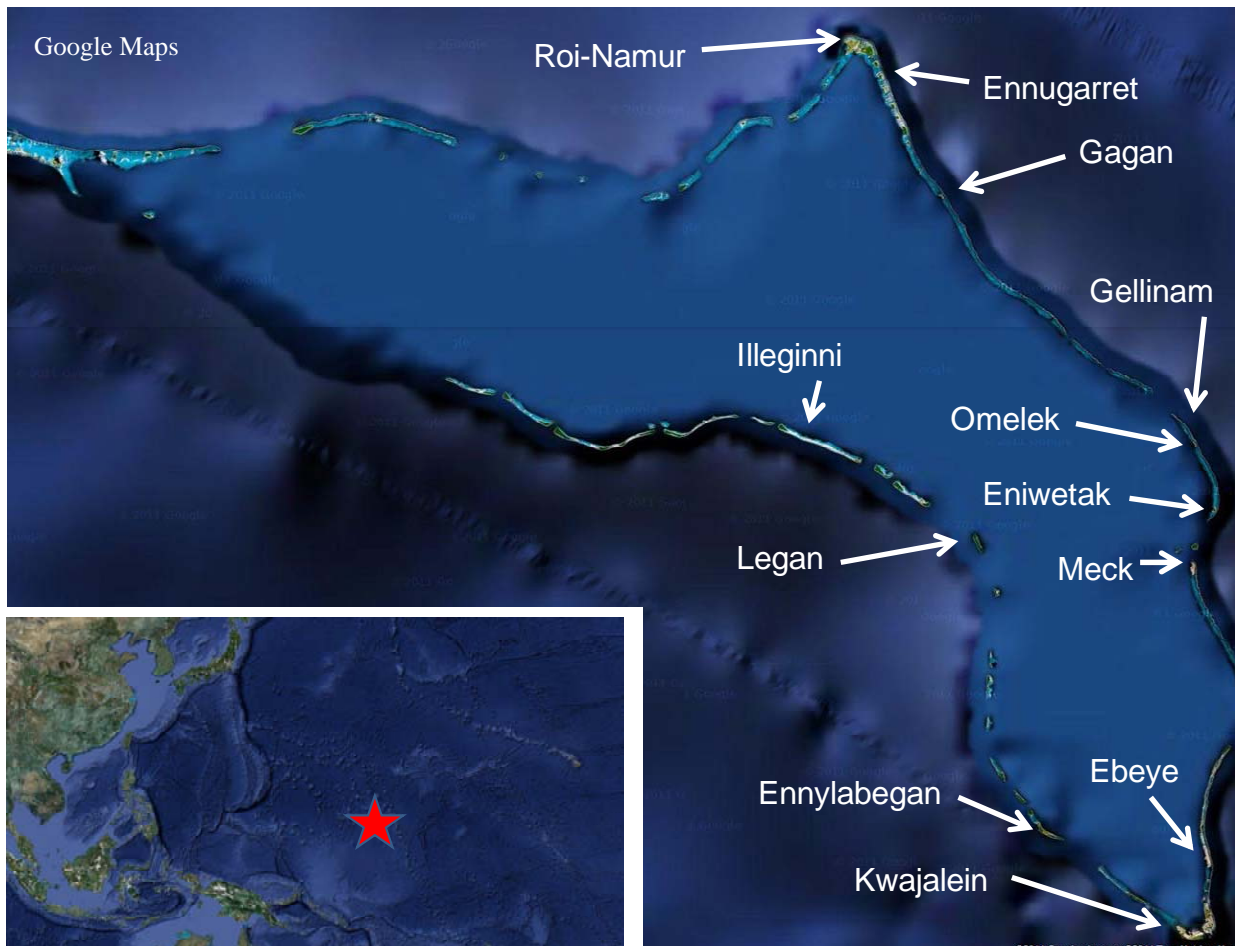
**Introduced mammals/predators:** Feral cats, feral dogs, *Rattus rattus*, *R. norvegicus*, *R. exulans*, mice unknown

## References:

FAA July 2009. Environmental Assessment for Pegasus Launches at the U.S. Army Kwajalein Atoll Ronald Reagan Ballistic Missile Defense Site. 51pp.

<http://www.smdc.army.mil/RTS.html>

US Fish and Wildlife Service 2010. US Army Kwajalein Atoll Terrestrial Resource Survey.





Ennugarret  
FWS 2010

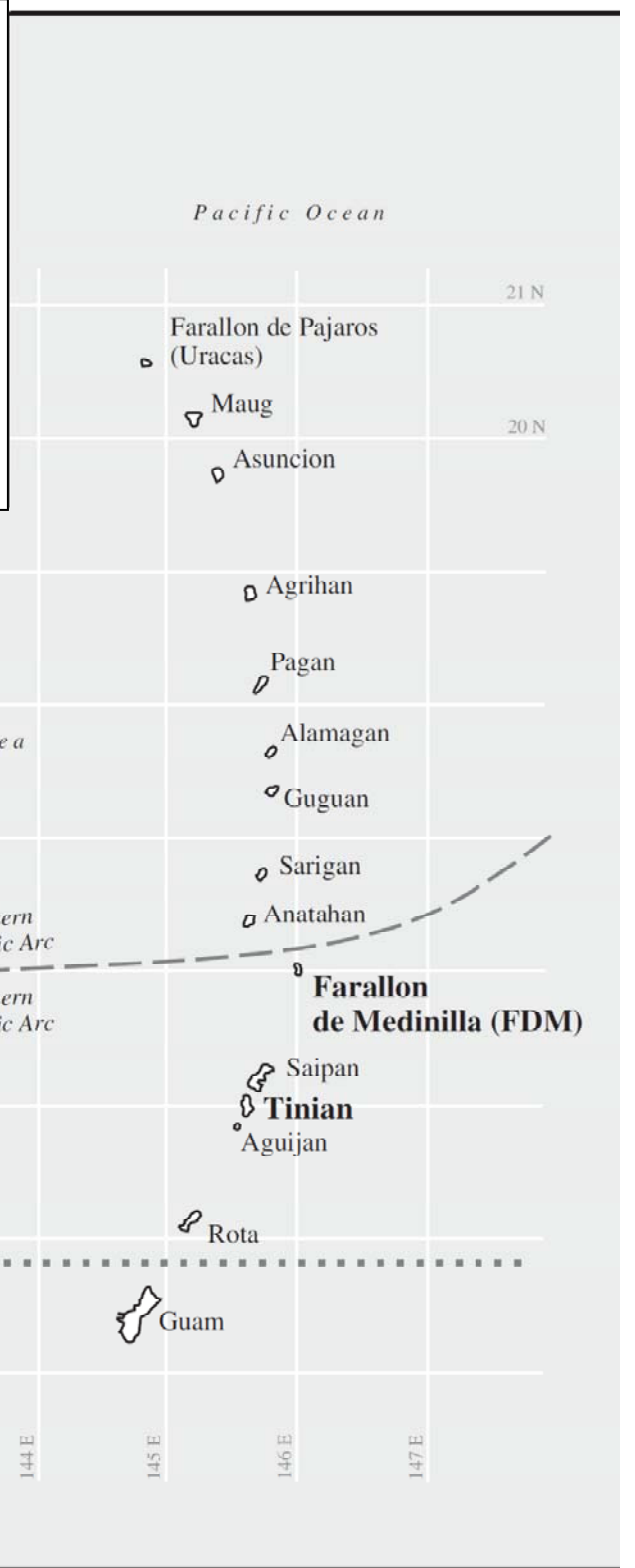


Kwajalein Island  
[www.krsjv.com/Pages/KwajaleinLife.aspx](http://www.krsjv.com/Pages/KwajaleinLife.aspx)



South end of Roi-Namur  
[jankocian.smugmug.com](http://jankocian.smugmug.com)

# Mariana Islands



## Mariana Islands considered

- \*Aguijan
- \*Farallon de Medinilla
- \*Anatahan
- \*Sarigan
- \*Guguan
- \*Alamagan
- \*Pagan
- \*Agrihan
- \*Asuncion
- \*Maug
- \*Uracas

US Navy, 2004

## Aguijan (Agiguan), Marianas

**Jurisdiction/DoD Interest:** Commonwealth of the Northern Marianas Islands (CNMI). Navy has been thinking about removing goats/rats/lantana as mitigation to offset impacts on Tinian as a result of US Marine Corps training.

**Location:** N 14°51' E 145°34'

**Size:** 709ha

**Habitat:** Mostly non-native secondary forest with some native forest.

**Human Population:** 0

**RTE or sensitive species or habitats:** Vanikoro swiftlet (= Mariana gray swiftlet *Aerodramus bartschi* – ESA Endangered), Micronesian megapode (*Megapodius laperouse laperouse* – ESA Endangered), Mariana fruit bat (*Pteropus mariannus mariannus* – ESA Threatened), Pacific sheath-tail bat (*Emballonura semicaudata* – ESA candidate), Nightingale reed warbler (*Acrocephalus luscini* – ESA Endangered, presence unknown), Langford tree snail (*Partula langfordii* – ESA candidate), Humped tree snail (*Partula gibba* – ESA candidate), coconut crab

**Introduced mammals/predators:** Monitor lizards, feral goats, *Rattus* sp., mice unknown

### References:

Amidon, Fred A., Ann P. Marshall, and Curt C. Kessler. 2011. Status of the Micronesian Megapode in the Commonwealth of the Northern Mariana Islands.

Division of Fish and Wildlife, CNMI. 2005. Comprehensive Wildlife Conservation Wildlife Strategy for the Commonwealth of the Northern Mariana Islands.

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US Navy. 2004. Integrated Natural Resources Management Plan. Farallon De Medinilla and Tinian Military Lease Areas. Commonwealth of the Northern Mariana Islands.



## Farallon De Medinilla, Marianas

**Jurisdiction/DoD Interest:** Owned by CNMI. Navy leases the island for live fire training. Biological Opinion for Marianas Islands Training 2010 contains a conservation measure for the eradication of rats for this island.

**Location:** N 16°01' E 146°04'

**Size:** 83ha

**Habitat:** Exposed and rocky

**Human Population:** 0

**RTE or sensitive species:** Micronesian Megapode, Mariana fruit bat (transient), Bristle-thighed Curlew, Sooty Tern, coconut crab

**Introduced mammals/predators:** *Rattus exulans*

**References:**

<http://www.fpir.noaa.gov>

US Navy. 2004. Integrated Natural Resources Management Plan. Farallon De Medinilla and Tinian Military Lease Areas. Commonwealth of the Northern Mariana Islands.



## Anatahan, Marianas

**Jurisdiction/DoD Interest:** CNMI. The Navy began implementation of a conservation recommendation from the 1999 Mariana Training EIS for the removal of feral ungulates from Anatahan. That effort halted after the volcano began erupting in 2003.

**Location:** N 16°35' E 145°67'

**Size:** 32.21km<sup>2</sup>

**Habitat:** Mostly ash covered post-explosion, with some forest remnants

**Human Population:** 0. Used to be a village present before 2003 eruption.

**RTE and sensitive species:** Micronesian Megapode, Mariana fruit bats, Gray-backed Terns, coconut crabs (possibly extirpated post eruption)

**Introduced mammals/predators:** Monitor lizards, feral pigs, feral cats, *Rattus exulans*. Feral goats apparently eradicated. Mice unknown.

### References:

Amidon, Fred A., Ann P. Marshall, and Curt C. Kessler. 2011. Status of the Micronesian Megapode in the Commonwealth of the Northern Mariana Islands.

Division of Fish and Wildlife, CNMI. 2005. Comprehensive Wildlife Conservation Wildlife Strategy for the Commonwealth of the Northern Mariana Islands .

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Pepi, Vanessa. Personal Communication. Naval Facilities Engineering Command, Pacific. Current contact: Vanessa.e.pepi@usace.army.mil



Photo: Curt Kessler

## Sarigan, Marianas

**Jurisdiction/DoD Interest:** CNMI. It is designated a Conservation Island by CNMI Division of Fish and Wildlife regulations. US Navy implemented a conservation recommendation from the 1999 Mariana Training EIS, which involved removing feral goats and pigs from Sarigan, completed by 2000.

**Location:** N 16°42' E 145°47'

**Size:** 497ha

**Habitat:** Forested (reforesting mix of coconut forest and native forest and grasslands). Dense understory. Rugged hillsides.

**Human Population:** 0

**RTE and sensitive species:** Coconut crab, Micronesian Megapode, Mariana fruit bat, Gray-backed Tern, Mariana Fruit Dove (*Ptilinopus roseicapilla* – listed as threatened and endangered by CNMI), Bridled White-eye (*Zosterops conspicillatus* – ESA Endangered, translocated to island)

**Introduced mammals/predators:** Monitor lizards, feral cats, *Rattus* spp.. Feral goats, pigs, and cattle eradicated. Mice unknown.

### References

Amidon, Fred A., Ann P. Marshall, and Curt C. Kessler. 2011. Status of the Micronesian Megapode in the Commonwealth of the Northern Mariana Islands.

Division of Fish and Wildlife, CNMI. 2005. Comprehensive Wildlife Conservation Wildlife Strategy for the Commonwealth of the Northern Mariana Islands.

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Photo: Curt Kessler



## Guguan, Marianas

**Jurisdiction/DoD Interest:** CNMI. It is designated as a Conservation Island by CNMI Constitution. No expressed DoD interest, but contains endangered species affected by DoD activities elsewhere in the Marianas.

**Location:** N 17°19' E 145°51'

**Size:** 400ha

**Habitat:** Mixed dense native forest and recent lava flows

**Human Population:** 0

**RTE and sensitive species:** Coconut crab, Sooty Tern, Micronesian Megapode, Mariana fruit bat

**Introduced mammals:** *Rattus* sp. (believed to be *R. exulans*). Other rat species and mice unknown.

**References:**

Amidon, Fred A., Ann P. Marshall, and Curt C. Kessler. 2011. Status of the Micronesian Megapode in the Commonwealth of the Northern Mariana Islands.

Division of Fish and Wildlife, CNMI. 2005. Comprehensive Wildlife Conservation Wildlife Strategy for the Commonwealth of the Northern Mariana Islands.

Kessler, Curt C. 2011. Incidental Observations, Marianas Expedition Wildlife Survey 2010. USFWS.



Photo: Curt Kessler

## Alamagan, Marianas

**Jurisdiction/DoD Interest:** CNMI. No expressed DoD interest, but contains endangered species affected by DoD activities elsewhere in the Marianas.

**Location:** N 17°35' E 145°51'

**Size:** 11.2km<sup>2</sup>

**Habitat:** Mix of native and coconut forests and open grasslands

**Human Population:** Hunting and fishing encampments historically housed 10-25 people seasonally, but temporarily abandoned due to 2009 typhoon.

**RTE and sensitive species:** Coconut crab, possibly Sooty Tern, Nightingale Reed-warbler

**Introduced mammals/predators:** Monitor lizards, feral cattle, feral goats, feral pigs, feral dogs, feral cats, *Rattus* spp., mice unknown

**References:**

Amidon, Fred A., Ann P. Marshall, and Curt C. Kessler. 2011. Status of the Micronesian Megapode in the Commonwealth of the Northern Mariana Islands.

Division of Fish and Wildlife, CNMI. 2005. Comprehensive Wildlife Conservation Wildlife Strategy for the Commonwealth of the Northern Mariana Islands.

Kessler, Curt C. 2011. Incidental Observations, Marianas Expedition Wildlife Survey 2010. USFWS.



Photo: Amidon *et al* 2011

## Pagan, Marianas

**Jurisdiction/DoD Interest:** CNMI. Marine Corps is analyzing northern Pagan as a possible location for training as a component of the planned relocation of Marines from Okinawa to Guam.

**Location:** N 18°09' E 145°68'

**Size:** 47.2km<sup>2</sup>

**Habitat:** Volcanic, forested

**Human Population:** This island was inhabited until the early '80s. All people were evacuated when the volcano blew. Currently, hunting and fishing encampments house 20-30 people seasonally.

**RTE and sensitive species:** Nightingale Reed-warbler (extirpated), Micronesian Megapode, Mariana fruit bat, Mariana Common Moorhen (*Gallinula chloropus guami* – ESA Endangered, extirpated)

**Introduced mammals/predators:** Monitor lizards, feral goats, feral cattle, feral pigs, feral cats, *Rattus* spp., mice unknown

### References:

Amidon, Fred A., Ann P. Marshall, and Curt C. Kessler. 2011. Status of the Micronesian Megapode in the Commonwealth of the Northern Mariana Islands.

Division of Fish and Wildlife, CNMI. 2005. Comprehensive Wildlife Conservation Wildlife Strategy for the Commonwealth of the Northern Mariana Islands .

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Kessler, Curt C. 2011. Incidental Observations, Marianas Expedition Wildlife Survey 2010. USFWS

Williams, Laura. Personal Communication. Naval Facilities Engineering Command, Pacific.

[laura.l.williams@navy.mil](mailto:laura.l.williams@navy.mil)



## Agrihan

**Jurisdiction/DoD Interest:** CNMI. No expressed DoD interest, but contains endangered species affected by DoD activities elsewhere in the Marianas.

**Location:** N 18°46' E 145°40'

**Size:** 47.4km<sup>2</sup>

**Habitat:** Primarily coconut forest

**Human Population:** Hunting and fishing encampments house 10-12 people seasonally.

**RTE or sensitive species:** Coconut crab (extant?), Sooty Tern (status unknown), Micronesian Megapode, Mariana fruit bat, sea turtles (nesting, unknown species)

**Introduced mammals/predators:** Monitor lizards, feral goats, feral pigs, feral dogs, feral cats, feral cattle (unknown status), *Rattus* spp., mice unknown

**References:**

Amidon, Fred A., Ann P. Marshall, and Curt C. Kessler. 2011. Status of the Micronesian Megapode in the Commonwealth of the Northern Mariana Islands.

Division of Fish and Wildlife, CNMI. 2005. Comprehensive Wildlife Conservation Wildlife Strategy for the Commonwealth of the Northern Mariana Islands.

Kessler, Curt C. 2011. Incidental Observations, Marianas Expedition Wildlife Survey 2010. USFWS .



Photo: Curt Kessler

## Asuncion

**Jurisdiction/DoD Interest:** CNMI. It is designated as a Conservation Island by CNMI Constitution. No expressed DoD interest, but contains endangered species affected by DoD activities elsewhere in the Marianas.

**Location:** N 19°40' E 145°24'

**Size:** 740ha

**Habitat:** Approximately half forested with native forest species, some coconut forest. Remainder open habitat and lava fields.

**Human Population:** 0

**RTE and sensitive species:** Coconut crab, Sooty Tern, Micronesian Megapode, Mariana fruit bat

**Introduced mammals/predators:** *Rattus* sp., (believed to be *R. exulans*), mice unknown

**References:**

Amidon, Fred A., Ann P. Marshall, and Curt C. Kessler. 2011. Status of the Micronesian Megapode in the Commonwealth of the Northern Mariana Islands.

Division of Fish and Wildlife, CNMI. 2005. Comprehensive Wildlife Conservation Wildlife Strategy for the Commonwealth of the Northern Mariana Islands.

Kessler, Curt C. 2011. Incidental Observations, Marianas Expedition Wildlife Survey 2010. USFWS.

Williams, Laura. Personal Communication. Naval Facilities Engineering Command, Pacific.

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Photo: Laura Willaims

# Maug

**Jurisdiction/DoD Interest:** CNMI. It is designated as a Conservation Island by CNMI Constitution. No expressed DoD interest, but contains endangered species affected by DoD activities elsewhere in the Marianas.

**Location:** N 20°01' E 145°13'

**Size:** 3 islets totaling 210ha

**Habitat:** Rugged, steep exposed, with some coconut and native forest

**Human Population:** 0

**RTE and sensitive species:** Micronesian Megapode, Mariana fruit bat, sheath-tailed bat, coconut crab, Sooty Tern

**Introduced mammals/predators:** *Rattus* spp. (believed to be *R. exulans*), mice unknown

**References:**

Amidon, Fred A., Ann P. Marshall, and Curt C. Kessler. 2011. Status of the Micronesian Megapode in the Commonwealth of the Northern Mariana Islands.

Division of Fish and Wildlife, CNMI. 2005. Comprehensive Wildlife Conservation Wildlife Strategy for the Commonwealth of the Northern Mariana Islands.

Kessler, Curt C. 2011. Incidental Observations, Marianas Expedition Wildlife Survey 2010. USFWS.



## Uracas (Farallon de Pajaros)

**Jurisdiction/DoD Interest:** CNMI. It is designated as a Conservation Island by CNMI Constitution. No expressed DoD interest, but may contain endangered species affected by DoD activities elsewhere in the Marianas.

**Location:** N 20°32' E 144°54'

**Size:** 200ha

**Habitat:** Sparsely vegetated volcano

**Human Population:** 0

**RTE and sensitive species:** Micronesian Megapode (possibly transient), Sooty Tern, coconut crab

**Introduced mammals/predators:** *Rattus* spp. (believed to be *R. exulans*)

**References:**

Amidon, Fred A., Ann P. Marshall, and Curt C. Kessler. 2011. Status of the Micronesian Megapode in the Commonwealth of the Northern Mariana Islands.

Division of Fish and Wildlife, CNMI. 2005. Comprehensive Wildlife Conservation Wildlife Strategy for the Commonwealth of the Northern Mariana Islands.

Kessler, Curt C. 2011. Incidental Observations, Marianas Expedition Wildlife Survey 2010. USFWS.



Photo: Curt Kessler

## Okidaito Jima (Okino Daito Jima, Rasa Island), Daito Islands

**Jurisdiction/DoD Interest:** DoD has use of this Japan-owned island as a target range via a Status of Force Agreement (SOFA) and once it's no longer needed it reverts back to the Government of Japan. It is a currently active range.

**Location:** approximately N 24°28' E 131°11'

**Size:** 115ha

**Habitat:** Coral, open scrub

**Human Population:** 0

**RTE and sensitive species:** Unknown. No surveys have been done to date

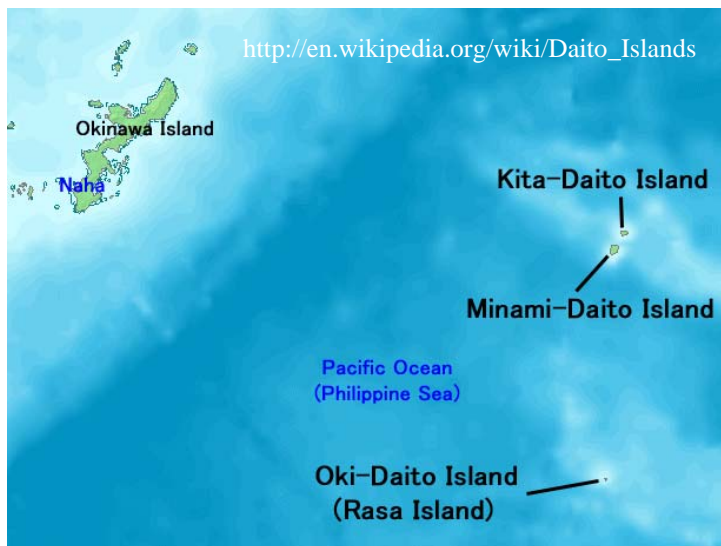
**Introduced mammals/predators;** Unknown. No surveys have been done to date.

**References:**

[http://en.wikipedia.org/wiki/Daito\\_Islands](http://en.wikipedia.org/wiki/Daito_Islands)

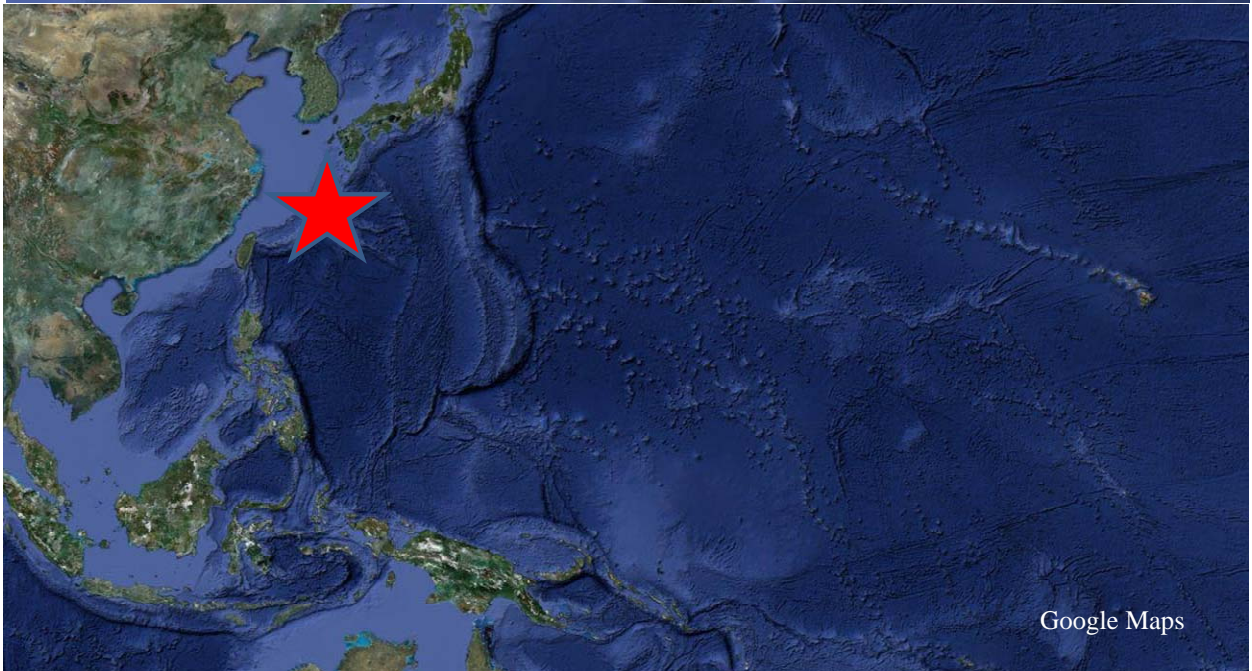
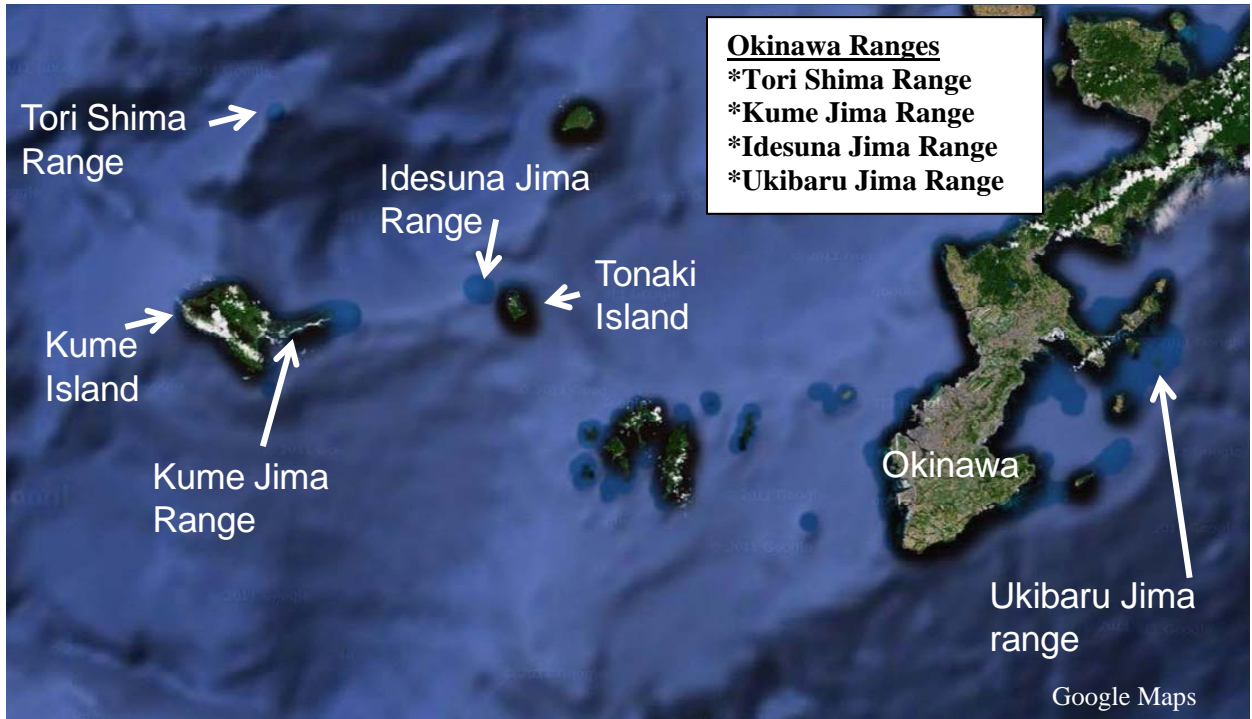
Nishibayashi, Teruyoi. Personal Communication. Naval Facilities Engineering Command, Far East.

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# Okinawa Ranges



## Tori Shima Range, Okinawa

**Jurisdiction/DoD Interest:** DoD has use of this Japan-owned island as a target range via a SOFA and once it's no longer needed it reverts back to the Government of Japan. This island is managed by the US Air Force 18<sup>th</sup> Civil Engineer Group out of Kadena Air Base, Okinawa. US Air Force and Marine Corps run live fire exercises over the island.

**Location:** N 26°36' E 126°50'

**Size:** 4.1ha

**Habitat:** Open Sandy and Rocky islet, much of it washed over during large storms.

**Human population:** 0

**RTE and sensitive species:** Unknown. No surveys have been done to date.

**Introduced mammals/predators:** Unknown. No surveys have been done to date.

### References

<http://www.globalsecurity.org/military/facility/tori-shima.htm>

Komine, George. Personal Communication. Kadena Air Force Base. [george.komine.jp@kadena.af.mil](mailto:george.komine.jp@kadena.af.mil)



## Kume Jima Range, Okinawa

**Jurisdiction/DoD Interest:** DoD has use of this Japan-owned island as a target range via a SOFA and once it's no longer needed it reverts back to the Government of Japan. This island is managed by the US Air Force 18<sup>th</sup> Civil Engineer Group out of Kadena Air Base, Okinawa.

**Location:** N 26°20' E 126°48'

**Size:** 0.2ha

**Habitat:** Thick forest and scrub vegetation. Separated by narrow channel through the reef from Kume Island.

**Human population:** 0. Kume Island has a population of approximately 9,000.

**RTE and sensitive species:** None

**Introduced mammals/predators:** Unknown

**References:**

<http://www.globalsecurity.org/military/facility/kume-jima.htm>

<http://www3.pref.okinawa.jp/site/view/contview.jsp?cateid=14&id=632&page=1>

Komine, George. Personal Communication. Kadena Air Force Base. [george.komine.jp@kadena.af.mil](mailto:george.komine.jp@kadena.af.mil)



## Idesuna Jima Range, Japan

**Jurisdiction/DoD Interest:** DoD has use of this Japan-owned island as a target range via a SOFA and once it's no longer needed it reverts back to the Government of Japan. This island is managed by the US Air Force 18<sup>th</sup> Civil Engineer Group out of Kadena Air Base, Okinawa. The three other DoD services train there as well.

**Location:** Approximately N 26°23'02 E 127°06'

**Size:** 26ha

**Habitat:** Lowland and coastal scrub, open beach

**Human Population:** 0

**RTE and sensitive species:** *Maytenus diversifolia* – Japan Ministry of Environment (MOE) Vulnerable, *Pemphis acidula* – Okinawa Prefecture Red Book Near Threatened, Indian mulberry (*Morinda citrifolia* – Okinawa Prefecture Red Book Vulnerable), *Crossostphium chinense* – MOE Vulnerable, *Lepturus repens* – MOE Vulnerable, *Coenobita cavipes* – Natural Monument, *C. rugosus* – Natural Monument, *C. purpureus* – Natural Monument, loggerhead turtle (nesting, *Caretta caretta* – ESA Endangered), Osprey (*Pandion haliaetus* – Okinawa Prefecture Near Threatened), Kentish Plover (*Charadrius alexandrinus* – Okinawa Prefecture Near Threatened), Little Tern (*Sterna albifrons* – MOE Vulnerable), Okinawa five-lined skink (*Plestiodon marginatus* – MOE Near Threatened).

**Introduced mammals/predators:** None observed as of 2009.

### References:

Mark Ingoglia, Personal Communication. Pacific Air Forces. mark.ingoglia@hickam.af.mil  
US Air Force 2009. Threatened/Endangered and Protected Species Survey Report, Idesuna Jima Range, Kadena Air Base, Okinawa, Japan. 24pp.



Photo: US Air Force 2009

## Ukibaru Jima Range, Okinawa

**Jurisdiction/DoD Interest:** Japan. US Military and Japan's Self Defense Force conduct training operations at this range.

**Location:** N 26°18' E 128°00'

**Size:** 25ha

**Habitat:** Open forest and scrub vegetation

**Human population:** 0

**RTE and sensitive species:** Unknown. No surveys have been done to date.

**Introduced mammals/predators:** Unknown. No surveys have been done to date.

**References:**

<http://www3.pref.okinawa.jp/site/view/contview.jsp?cateid=14&id=639&page=1>

Sugiyama, Mitsugo. Personal Communication. Marine Corps Base Butler.

[mitsugu.sugiyama.ja@usmc.mil](mailto:mitsugu.sugiyama.ja@usmc.mil)



[www3.pref.okinawa.jp/site/view/contview.jsp?cateid=14&id=639&page=1](http://www3.pref.okinawa.jp/site/view/contview.jsp?cateid=14&id=639&page=1)

## Senkaku Islands, Japan

**Jurisdiction/DoD Interest:** Owned by Japan (but ownership recently disputed by China). US Navy has agreement with Japan for use of Kobisho and Sekibisho as Navy ranges. However, these have been inactive since 1978. The other three islands are also presented here as they may serve as mitigation sites if training resumes.

**Location:** Uotsuri Jima N 25°46' E 123°31'; Kobisho (Kuba Jima) N 25°56' E 123°41'; Sekibisho (Taisho Jima) N 25°55' E 124°34'; Minami Kojima N 25°45' E 123°36'; Kita Kojima N 25°45' E 123°36'.

**Size:** Uotsuri Jima 432ha; Kobisho 108ha; Sekibisho 6.1ha; Minami Kojima 46ha; Kita Kojima 33ha.

**Habitat:** Uotsuri Jima is forested with some scrub around the coastal area. The others are rugged, exposed and rocky with sparse vegetation.

**Human Population:** 0

**RTE and sensitive species;** Short tailed Albatross (*Phoebastria albatrus* – ESA Endangered; Minami Jima, and extirpated on Kobisho. Note: Short-tailed Albatross on Senkaku's appear to be genetically unique), Senkaku mole (*Mogera uchidai* – MOE Endangered; Uotsuri Jima).

**Introduced mammals/predators:** Not known if rats or mice are present. Feral goats present on Uotsuri Jima, implicated in decline of *M. uchidai*.

### References:

Eda, M., H. Koike, M. Kuro-o, S. Mihara, H. Hasegawa, H. Higuchi. 2011. Inferring the ancient population structure of the vulnerable albatross *Phoebastria albatrus*, combining ancient DNA, stable isotope, and morphometric analyses of archaeological samples. Conservation Genetics. DOI 10.1007/s10592-011-0270-5

[http://en.wikipedia.org/wiki/Senkaku\\_Islands](http://en.wikipedia.org/wiki/Senkaku_Islands)

Koichi Sato, PhD. J.F. Oberlin University, Tokyo, Japan.

[http://www.no.emb-japan.go.jp/files/seminar24022011\\_notes.pdf](http://www.no.emb-japan.go.jp/files/seminar24022011_notes.pdf)

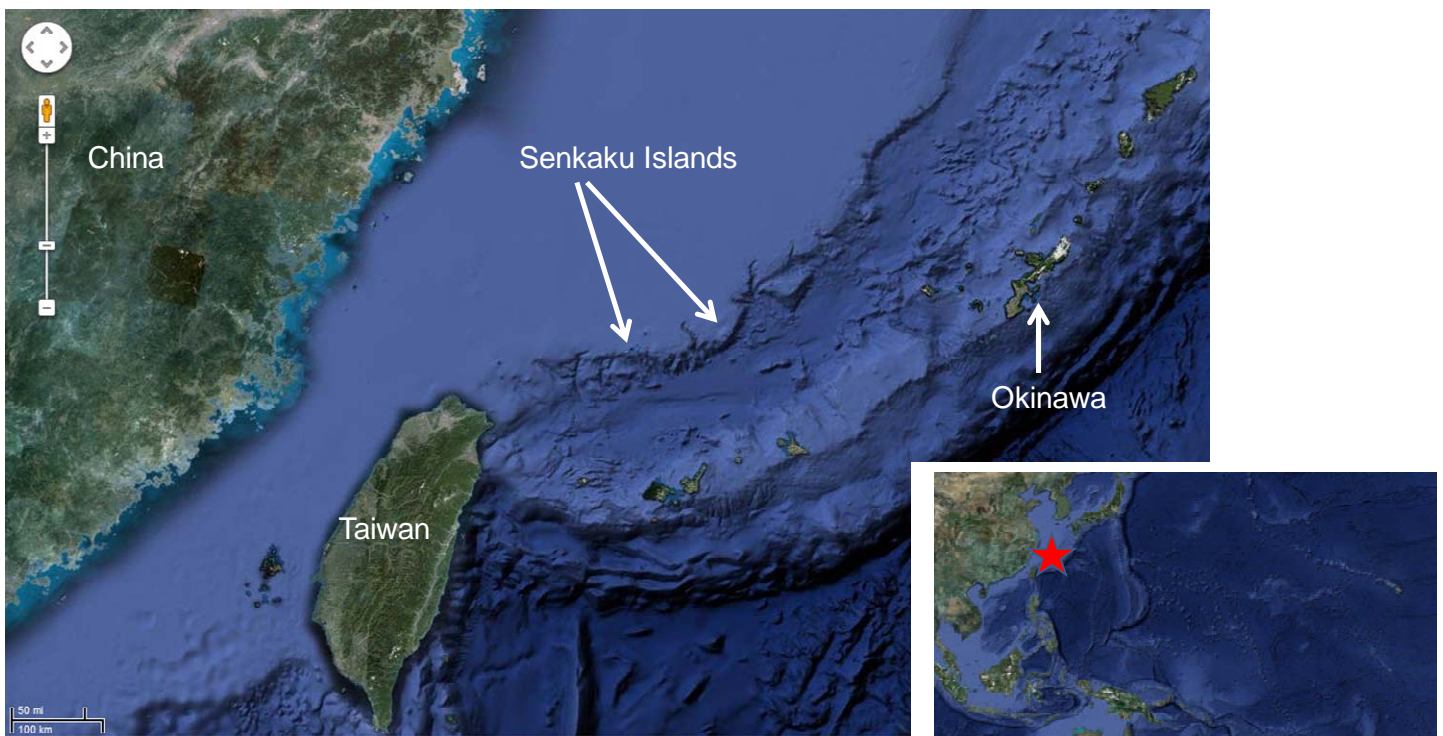
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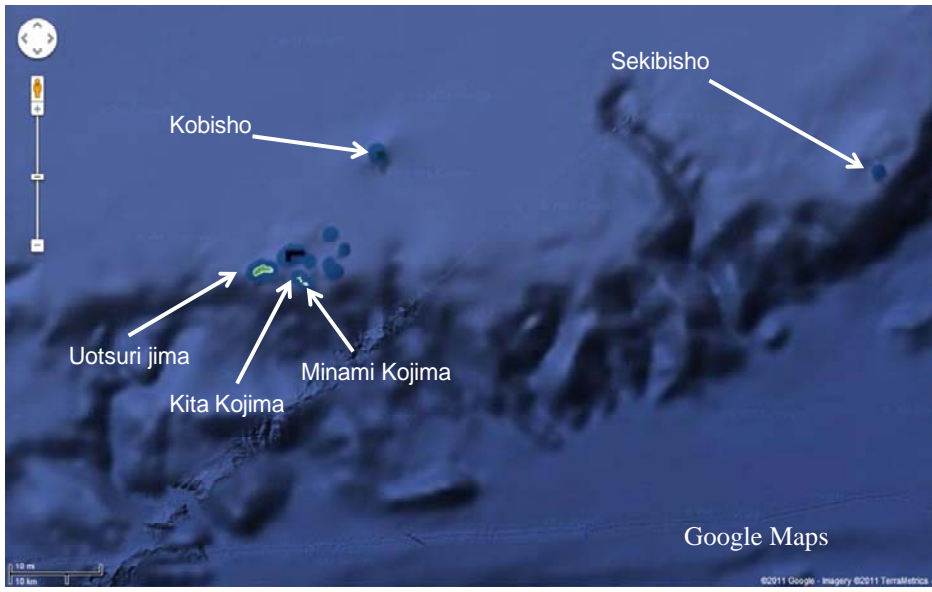
[teru.nishibayashi.ja@fe.navy.mil](mailto:teru.nishibayashi.ja@fe.navy.mil)

Ota, H., N. Sakaguchi, S. Ikehara, and T. Hikida. 1993. The Herpetofauna of the Senkaku Group, Ryukyu Archipelago. Pacific Science 47(3) pp248-255.

Vogt, Scott. Personal Communication. Navy Facilities Engineering Command, Far East.

[scott.vogt@fe.navy.mil](mailto:scott.vogt@fe.navy.mil)





Uotsuri Jima  
Photo Koichi Sato



Sekibisho  
Photo Koichi Sato



Kobisho  
Photo Koichi Sato



Kita Kojima (left)  
Minami Kojima (right)  
[http://en.wikipedia.org/wiki/Senkaku\\_Islands](http://en.wikipedia.org/wiki/Senkaku_Islands)

# Diego Garcia

**Jurisdiction/DoD Interest:** British Indian Ocean Territory. US Navy Region Japan leases approximately half of island. US Air Force operates a small tenant satellite tracking operation.

**Location:** S 7°26' E72°23'

**Size:** Emergent land area 30.0 km<sup>2</sup>. One large island and 3 small islets (7.49ha, 4.98 ha, and 2.0 ha)

**Habitat:** Densely forested, low-lying atoll.

**Human population:** Approximately 3,650

**RTE and sensitive species:** Wedge-tailed Shearwater, Audubon's Shearwater (*Puffinus iherminierii*), Black-naped tern, coconut crab, hawksbill turtle (nesting) green sea turtle (nesting), leatherback turtle (*Dermochelys coriacea*, possibly present – ESA-Endangered), olive ridley turtle (*Lepidochelys oliveacea*, possibly present – ESA Endangered).

**Introduced mammals/predators:** *Rattus rattus*, feral cats, feral donkeys (*Equus asinus*). Note, rats may not be present on three small islets. Mice unknown.

**References:**

US Navy. 2005. Diego Garcia Integrated Natural Resources Management Plan.

