

Regional Seabird  
Conservation Plan  
Pacific Region

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*SPECIES PROFILES*  
*HAWAII & U.S. PACIFIC*  
*ISLANDS*

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**REGIONAL SEABIRD  
CONSERVATION PLAN**

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U.S. FISH AND WILDLIFE SERVICE  
PACIFIC REGION

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Commonly Used Codes in Pacific Is. Species Profiles.

BCC	bird of conservation concern 2002 (BCR)
BCR	Bird Conservation Region
BCR 67	Hawaiian Islands Bird Conservation Region
BCR 68	U.S. Pacific Islands Bird Conservation Region
C	candidate for threatened or endangered status
CNMI	Commonwealth Northern Mariana Islands
E	endangered
FDM	Farallon de Medinilla, CNMI
HC	high concern (NAWCP rank - national/regional)
HI	highly imperiled (NAWCP rank - national/regional)
IUCN	International Union for the Conservation of Nature
km	kilometer
LC	low concern (NAWCP rank - national/regional)
LT/NT	lower risk/near threatened (IUCN rank)
m	meter
MC	moderate concern (NAWCP rank - national/regional)
NAWCP	North American Waterbird Conservation Plan
NCR	not currently at risk (NAWCP rank - national/regional)
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park System
NWHI	Northwestern Hawaiian Islands
T	threatened
USGS	U.S. Geological Survey
USPI	U.S. Pacific Islands
V	vulnerable (IUCN rank)

## Short-tailed Albatross [Steller's Albatross] *Phoebastria albatrus*

STATUS: Federal: E    State: HI-E    IUCN: E    NAWCP: HC/HC

### Distribution, Population Status and Trends

Short-tailed Albatross (STAL) once ranged throughout the North Pacific breeding on islands in Japan and Korea. Today they breed only on Torishima and Minami-kojima, Japan.<sup>1,2</sup> Birds regularly visit the NWHI and individual birds have laid eggs at Midway Atoll in various years since at least the 1990s, but accounts of successful nesting are unsubstantiated.<sup>3</sup> STAL disperse widely throughout the temperate and subarctic North Pacific from Japan through California. Birds are concentrated along the edge of the continental shelf in the northern Gulf of Alaska, Aleutian Is., and Bering Sea and they are often found close to shore in these areas, and along the U.S. west coast.<sup>5,6,7,8</sup> Immatures remain at sea for several years before returning to breed.<sup>4</sup>

STAL, once the most abundant North Pacific albatross, numbered in the millions until the late 19th century when the lucrative millinery trade developed.<sup>9</sup> By the 1930s, STAL had almost been wiped out. The last remaining breeding population on Torishima was considered extinct after World War II,<sup>10</sup> however, in 1950, a small number was found and the population began a slow recovery.<sup>11,12,13</sup> In 2002, the world population was estimated at approximately 1,700 individuals (including breeding and non-breeding birds), with 200-250 at Minami-kojima and 1,500 at Torishima.<sup>14</sup> Worldwide annual population growth is >6% per year.<sup>15,16</sup>

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	no	1	65d	140d	Oct-Jun	scrape	surface dip	pelagic, near-shore

### Ecology

STAL, largest of the North Pacific albatrosses, breed on oceanic islands and atolls.<sup>4</sup> On Torishima, they nest on open ground on fairly steep volcanic ash slopes next to clumps of grass or shrub. On Minami-kojima, they nest on a rocky terrace of a steep cliff. STAL are colonial and breeding phenology is similar to the other North Pacific albatrosses with egg laying from late October through November and chick fledging in June.<sup>4,17</sup> STAL are monogamous with high rates of mate retention and philopatry. As many as 25% of breeding age adults may not return to the colony at any given year.<sup>3,16</sup> STAL feed their young until the time of their departure from breeding grounds in June.<sup>4</sup> Juveniles remain in immature plumage, mottled white on dark brown throughout the body, until adult plumage develops at about age five; the yellow-tinged head is a

characteristic of a fully developed plumage.<sup>4</sup> Age at first breeding is 5-6 years on average.<sup>3</sup>

STAL are surface feeders and scavengers, and are frequently encountered around fishing vessels. They feed more inshore than the other North Pacific albatrosses, often in sight of land.<sup>18</sup> In Japan, their diet consists of shrimp, squid, and fish which include bonito, flyingfish, and sardines.<sup>19,20,21</sup> There is no data on life span of the STAL but probably is similar to the other North Pacific albatrosses. Average survival rate is 96%.<sup>3,16</sup>

## **Conservation Concerns and Activities**

The primary STAL breeding colony at Torishima is located on an active volcano and there is significant threat of mortality and major habitat loss from volcanic eruptions. Within the last century, Torishima experienced five eruption events with the most recent one occurring on August 11, 2002. Past eruptions have destroyed much of the original breeding site leaving sparsely vegetated steep slopes of loose volcanic soil. Without the protection provided by vegetation, eggs and chicks are at greater risk of mortality from monsoon rains, sand storms, and wind.<sup>22</sup> Current population enhancement efforts in Japan are concentrated on habitat stabilization in the original colony on Torishima, as well as enticing breeding birds to alternate sites on Torishima which are less likely to be affected by lava flows, mud slides, or erosion.<sup>3</sup>

Concentration of the entire breeding population at just two islands, Torishima and Minami-kojima, makes STAL extremely vulnerable to catastrophic events. Midway Atoll has been identified as a possible site for establishing a breeding colony.<sup>3</sup> Midway is a logical candidate because STAL regularly visit and have displayed reproductive capacity (*e.g.*, courtship dances and egg laying); however, it is unknown whether decoys and recorded colony sounds will prove effective in attracting breeding birds or if STAL will thrive at this location.

Bycatch in commercial fisheries is another serious threat. Federal agencies are actively coordinating with industry and others to minimize STAL bycatch and U.S. fishers are required to employ multiple seabird avoidance measures. At sea, marine pollution, plastics, and oil spills are also threats.<sup>20</sup> Minami-kojima is disputed territory of Japan and China and consequently little biological research or management is conducted at this breeding site. Oil development in contested areas may be a problem in the future.

**References:** 1. Hasegawa 1984; 2. King 1981; 3. USFWS 1999; 4. Tickell 2000; 5. Sanger 1972; 6. USFWS unpublished data. 7. McDermond and Morgan 1993; 8. Sherburne 1993; 9. Yamashina in Austin 1949; 10. Austin 1949; 11. Tickell 1973; 12. Tickell 1975; 13. Ono 1955; 14. H. Hasegawa, pers. comm 2002; 15. Hasegawa 1982; 16. Cochrane and Starfield in press; 17. Hasegawa 1980; 18. Harrison 1990; 19. Hattori 1889; 20. Fujisawa 1967; 21. Toshima Society 1967; 22. H. Hasegawa, pers. comm.1997.

### **Prioritized Conservation Actions**

1. Continue efforts to establish a breeding colony on Midway by using decoys and sound recordings or new techniques as they are developed.
2. Support research and development of new gear type and/or fishing methods that reduce or eliminate bycatch and work with regulatory agencies and fishing industry to ensure compliance with regulations.
3. Support activities and actions outlined in Recovery Plan.

### **Regional Contacts**

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**DRAFT**

## Black-footed Albatross (Black Albatross) *Phoebastria nigripes*

STATUS: Federal: BCC (67,68)    State: HI-T    IUCN: V    NAWCP: HI/HI

### Distribution, Population Status and Trends

Black-footed Albatross (BFAL) breeding distribution is almost entirely restricted to the Hawaiian Is. with the exception of small breeding colonies off Japan.<sup>1,2,3,4</sup> Within the Hawaiian Is., the largest colonies occur on Laysan and Midway. Smaller colonies exist on Kure, Pearl and Hermes, Lisianski, French Frigate Shoals, Necker, Nihoa, Kaula, Kaua'i, and O'ahu.<sup>1</sup> During the breeding season, adults range mostly to the north and east of the Hawaii colonies. Adults brooding chicks forage closer to the colonies (hundreds of kilometers), but the length of trips increases dramatically after brooding and many birds transit to continental shelf areas off North America while feeding chicks.<sup>24</sup> Nonbreeding birds disperse throughout the north Pacific between 20° and 58° N.<sup>5,6</sup> Compared to Laysan Albatross, BFAL is more eastern in its at-sea distribution and occurs regularly in large numbers off the coast of Canada and the U.S.<sup>6,7</sup>

The world population is estimated at approximately 58,000 breeding pairs in 2003-2004 breeding season.<sup>6</sup> Greater than 95% of the world population nest in Hawaii, primarily in the NWHI; the majority of the population breed on Laysan (19,500 pairs) and Midway (20,400 pairs) (2003-2004 nest counts). Within the USPI, breeding colonies once existed on Johnston, Wake, and the Northern Mariana Is.<sup>1,8</sup> The population rebounded from a drastic population decline at the turn of the century primarily due to exploitation, however, over the past decade breeding populations have declined at the largest Hawaiian colonies.<sup>6,9,10</sup>

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	no	1	65d	140d	Nov-Jun	scrape	surface dip, scavenge	pelagic

### Ecology

BFAL nest on low coral and sand islands. They tend to nest on the upper slopes of open sandy beaches or dunes, sometimes among shrubs.<sup>1,11</sup> Breeding phenology is similar to other North Pacific albatrosses with egg laying from November through December and chick fledging in mid-June.<sup>12,13</sup> Sexes are similar although males are slightly larger than females, with a longer bill.<sup>15</sup> Pairs are highly philopatric and mate retention is high.<sup>16,17</sup> Birds do not always breed every

year.<sup>5,14</sup> Immature plumage is similar to adults, but first-year birds lack the white ring around the bill and white feathers at the base of the tail.<sup>18</sup> Age at first breeding is  $\geq 5$  years and probably averages 7-8.<sup>19,20</sup>

BFAL are surface feeders, taking food by dipping and scavenging at the ocean's surface. They are also frequently encountered around fishing vessels and will scavenge ship offal.<sup>21</sup> Feeding aggregations of BFAL are common, but they rarely feed with other species.<sup>22</sup> In Hawaii, the diet includes fish eggs, squid, deep-water crustaceans, fish, and zooplankton.<sup>21</sup> BFAL eat eleven times as many flyingfish eggs (>40% of their diet) as compared to the Laysan Albatross.<sup>5,21</sup> The oldest-known BFAL lived to 43 years.<sup>6</sup>

### **Conservation Concerns and Activities**

Between 1990-94, it is estimated that >23,000 BFAL perished on longline hooks set in the North Pacific swordfish fishery.<sup>6</sup> An estimated 1,831 birds were killed annually between 1994-98 in the Hawaii longline fishery, alone.<sup>6</sup> In addition, birds were lost to demersal longline fisheries in Alaska. Both Alaska and Hawaii instituted regulations requiring mandatory mitigation measures to minimize bycatch. The Hawaiian longline fishery for swordfish was closed in 2001 but most fishers simply moved their base of operation to California where they were not required to employ mitigation measures. BFAL were taken in this California-based fishery but the magnitude of the kill is unknown. In 2004, mitigation measures were required in the California based fishery and the Hawaii based fishery was scheduled to reopen with new restrictions to protect turtles.

Albatross control programs at Midway, to protect airfield operations, resulted in the death of tens of thousands of albatross in the 1950s and 1960s. In addition, buildings, lights, antenna wires, and even introduced ironwood trees have created barriers that killed many BFAL at Midway each year.<sup>5</sup> Organochlorine levels in BFAL were higher than other albatross species and were high enough to increase the risk of eggshell thinning and subtle embryonic effects that decrease egg viability.<sup>23</sup> On Midway, organochlorine contamination probably reduced productivity by 2-3% during the 1994-95 breeding season.<sup>23</sup> Plastic and oil float on the ocean surface, and BFAL being surface feeders are particularly vulnerable to these types of pollution.<sup>5,6</sup> BFAL nest close to the shoreline and they are especially vulnerable to storm waves. Storm tides wiped out several

hundred BFAL chicks on sandy islets at French Frigate Shoals in 1980-81.<sup>22</sup> Sea level rise associated with global warming poses a significant threat to this species. In the past, introduced predators such as rats impacted populations on Kure and Midway, however, rats have since been eradicated at all major breeding locations. Rats, cats, and mice occur on Wake, Johnston, and the Northern Mariana Is. and may hinder recolonization at these locations.

**References:** 1. Whittow 1993; 2. Harrison *et al.* 1984; 3. Hasegawa 1982; 4. Hasegawa 1984; 5. Harrison 1990; 6. Cousins and Cooper 2000; 7. Sanger 1974a; 8. McDermond and Morgan 1993; 9. Lewison *et al.* 2002; 10. E. Flint, USFWS, pers. comm. 11. Tickell 2000; 12. Woodward 1972; 13. Fisher 1969; 14. Rice and Kenyon 1962a; 15. Whittow 1993; 16. Bailey 1952; 17. Fisher 1971; 18. Bourne 1982; 19. Rice and Kenyon 1962b; 20. Robbins 1966; 21. Harrison *et al.* 1983; 22. USFWS 1983c; 23. Ludwig *et al.* 1997.

## Prioritized Conservation Actions

1. Design and implement a statistically rigorous population monitoring program. Design and implement a banding and recovery program to determine age-specific survival rates and population trends.
2. Compile, analyze, and report USFWS data collected since 1975 and complete a status assessment.
3. Analyze and report demographic information from 50 years of banding data.
4. Support efforts to estimate mortality from all U.S. and foreign longline fisheries.
5. Determine the population impacts of mortality in longline fisheries.
6. Design and implement a monitoring program to assess the effects of all sources of albatross mortality including fisheries bycatch.
7. Support continued research and development of mitigation measures and practices to prevent mortality in fisheries.
8. Eradicate introduced predators on USPI where BFAL historically bred *i.e.*, Wake, Johnston, and the Northern Mariana Is.

## Regional Contacts

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## Laysan Albatross *Phoebastria immutabilis*

STATUS: Federal: BCC (67,68)    State: None    IUCN: None    NAWCP: HC/HC

### Distribution, Population Status and Trends

Laysan Albatross (LAAL) breeding range centers in Hawaii with the largest colonies on Midway and Laysan.<sup>1,2</sup> Smaller colonies exist on islands off of West Mexico and the Bonin Is., Japan.<sup>1</sup> On the main Hawaiian Is., colonies exist on Kaua'i, O'ahu, Moloka'i, and Ni'ihau. LAAL nest on all of the NWHI. Breeding adults forage primarily to the north and northwest of Hawaii, to the Gulf of Alaska and the Aleutian Is.<sup>3</sup> During nonbreeding periods, adults disperse widely throughout the north Pacific.<sup>1</sup> Compared to Black-footed Albatross, LAAL tends more to the west in its at-sea distribution.<sup>2,4</sup>

There are approximately 630,000 breeding pairs worldwide (2003-04 estimate)<sup>1</sup>; the largest colonies are at Midway and Laysan, with approximately 441,000 and 145,000 pairs, respectively in 2003-04.<sup>17</sup> These estimates are considerably higher than 2002-03 estimates. There is concern that the population is declining, but the annual breeding population can be quite variable between years and more accurate demographic data are needed. The breeding range is expanding.<sup>1</sup>

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	no	1	65d	165d	Nov-Jul	scrape	surface dip	pelagic

### Ecology

LAAL nest predominantly on low coral and sand islands. They tend to select nest sites closer to vegetation than Black-footed Albatross and typically nest on flat ground.<sup>1,6</sup> However, LAAL will nest on rocky areas (*e.g.*, Kaula and Nihoa).<sup>7</sup> Breeding phenology is similar to the other North Pacific albatrosses with egg laying in Nov-Dec and chick fledging in early-July.<sup>1,7</sup> Sexes are similar, although males tend to be larger.<sup>8</sup> Pairs are philopatric and mate retention is high. About one-fifth of the experienced adults do not breed in a typical year.<sup>2</sup> Immature plumage is similar to that of adults.<sup>1,8</sup> Sexual maturity is reached at around 8-9 years (range 6-12 years).<sup>9</sup>

LAAL are surface feeders, taking food by dipping and scavenging at the ocean's surface.<sup>1,7</sup> They occasionally follow ships to scavenge refuse.<sup>10</sup> Feeding aggregations are common, but they

almost never feed in association with other species.<sup>11</sup> In Hawaii, the diet consists of squid, deep-water crustaceans, fish, and flyingfish eggs.<sup>12</sup> LAAL eat twice as much squid (>50% of the diet) as compared to Black-footed Albatross.<sup>2,12</sup> The oldest-known LAAL was 51 years.<sup>13</sup>

## Conservation Concerns and Activities

Thousands of albatross were killed annually in high seas drift net fisheries that reached a peak of operation during the 1980s until an international ban on the fisheries in 1993.<sup>14</sup> More recently, thousands of LAAL are killed each year by longline fisheries.<sup>14,15</sup> Regulations now require U.S. longline fisheries to implement mandatory mitigation measures to minimize bycatch in Alaska, Hawaii, and California.

Predation by cats, dogs, and rats impact populations; LAAL colonies at Kilauea Point, Kaua'i are protected by fences and rats have been eradicated on all NWHI. Predators are controlled near the colony at Kaena Pt., O'ahu, but remain a problem. Between 1954-1964, control measures at Midway to reduce risk of collisions with aircraft, resulted in the death of tens of thousands of albatross.<sup>16</sup> Nesting LAAL are thwarted at Pacific Missile Range (Kaua'i), Dillingham Airfield (O'ahu) and Marine Corps Base Hawaii (O'ahu) by egg collections to ensure aircraft safety. At Midway, lead based paint has contaminated the soil around old military buildings and chicks ingesting the lead exhibit deformities or die. Buildings, lights, antenna wires, and even introduced ironwood trees have created barriers that kill many LAAL on Midway.<sup>2</sup>

Golden-crown beard, an invasive weed, is well established on Midway and Pearl and Hermes. This aggressive weed limits LAAL nesting densities and provides habitat for mosquitoes that spread avian pox. Over the past three decades, management of nesting habitat on Midway has led to an increase in numbers.

**References:** 1. Whittow 1993; 2. Harrison 1990; 3. Fernandez *et al.* 2001; 4. Shuntov 1974; 5. E. Flint pers. comm. 6. Fisher 1972; 7. USFWS 1983; 8. Tickell 2000; 9. Fisher 1975; 10. Sanger 1974b; 11. Gould 1971; 12. Harrison *et al.* 1983; 13. C. Robbins, pers. comm. 14. McDermond and Morgan 1993; 15. Cousins and Cooper 2000; 16. Harrison *et al.* 1984; 17. USFWS unpubl. data.

## Prioritized Conservation Actions

1. Design and implement a statistically rigorous population monitoring program. Design and implement a banding and recovery program to determine age-specific survival rates and

population trends.

2. Compile, analyze, and report USFWS data collected since 1975 and complete a status assessment.
3. Analyze and report demographic information from 50 years of banding data.
4. Review population sampling design at Laysan and design a sampling program to estimate breeding populations at Midway.
5. Support efforts to estimate mortality from all U.S. and foreign longline fisheries.
6. Determine the population impacts of mortality in longline fisheries.
7. Design and implement a monitoring program to assess the effects of all sources of albatross mortality including fisheries bycatch.
8. Support continued research and development of mitigation measures and practices to prevent mortality in fisheries.
9. Eradicate introduced predators on USPI where LAAL historically bred or are establishing new colonies *e.g.*, Wake, Johnston, and Kaena Pt, O'ahu.
10. Control exotic vegetation at Midway, Pearl and Hermes, and Kure Atoll that degrades nesting habitat *e.g.*, golden-crown beard.
11. Work with the DOD in Hawaii to investigate the potential for albatross nesting areas on the main islands where albatross would not interfere with or endanger airfield operations.
12. Remove lead contaminated soil around old buildings and building sites at Midway or otherwise eliminate the availability of the lead to albatross.
13. Eradicate mosquitos (introduced vectors for avian pox) from Midway Atoll.

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## Hawaiian Petrel *Pterodroma sandwichensis*

STATUS: Federal: E    State: HI-E    IUCN: E    NAWCP: HI/HI

### Distribution, Population Status and Trends

Hawaiian Petrels (HAPE) range over the central tropical Pacific but nest only in Hawaii.<sup>10</sup>

Dark-rumped Petrels were recently split into two species: *Pterodroma sandwichensis* in Hawai'i and *P. phaeopygia* on Galapagos.<sup>1</sup> Accounts and archeological evidence indicate HAPE were common at all elevations on the main islands until humans arrived.<sup>9,10</sup> Today, there are very small populations scattered widely on Maui, Kaua'i, Hawaii, and probably Moloka'i, Lana'i, and sea stacks off Kaho'olawe.<sup>10,13</sup> At-sea, birds are more abundant near the islands during the breeding season and range up to 1,300 km from colonies.<sup>11</sup>

Based on pelagic observations, the total population, including juveniles and subadults, was estimated at 20,000, with a breeding population of 4,500-5,000 pairs.<sup>8,11</sup> Approximately 1,000 pairs nest in Haleakala National Park, Maui.<sup>10</sup> There is also a small colony on Mauna Loa, Hawai'i. Kaua'i populations are difficult to assess, but potentially a large portion of the population nest on this island.<sup>8</sup> Overall population trends are unknown. Numbers breeding on Maui appear stable<sup>10</sup> and have increased in areas of Haleakala NP with active predator management.<sup>6</sup> On Hawaii populations may be declining due to predation by introduced predators.<sup>10</sup>

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	no	1	55d	110d	Apr-Dec	burrow	surface seizer	pelagic

### Ecology

Pushed to the limits of their habitat, HAPE live in the cold, xeric environment above 2,500 m in national parks on Hawai'i and Maui. In contrast, on Kaua'i they nest at lower elevations in densely vegetated, rainy environments.<sup>8</sup> The birds are colonial and nest in burrows, crevices in lava, or under ferns. Burrows are 1-9 m deep.<sup>10</sup> HAPE are monogamous and show a high degree of mate and nest-site fidelity.<sup>10</sup> Birds are nocturnal at the colony and appear to stage on the water, nearshore prior to flying in to the nests.<sup>8</sup> Both sexes incubate and the 55 day incubation period is usually broken into 4-5 incubation shifts.<sup>10</sup> Chick are brooded for 1-6 days and then fed every 2-3

days, on average.<sup>9,10</sup> Age at first breeding is unknown but likely 5-6 years and Simons<sup>9</sup> found 89% of the adult population breeds each year.

Prey is taken by dipping, surface-seizing, pattering, and scavenging often in association with tuna or other subsurface predators.<sup>7,14</sup> HAPE have been observed feeding during the day but their diet indicates they may also feed extensively at night.<sup>9,14</sup> Squid dominates the diet followed by fish (goatfish and lantern fish most common) and crustaceans.<sup>9,10</sup>

## Conservation Concerns and Activities

The most serious threat to adult survival and reproductive success is predation by introduced predators. The Haleakala colony is raided by mongooses, cats, and rats, which have caused breeding failure rates >70%.<sup>10</sup> Feral cats and mongooses are now controlled in accessible areas. Feral goats also cause mortality by trampling burrows. Fences were constructed at Haleakala NP to control goats and pigs, but accidentally killed 31 petrels from 1976-1993. Since then, modification of the fences has reduced collisions. Reproductive success is significantly higher in fenced areas with active predator management.<sup>6</sup> Axis deer numbers are increasing on Maui, and they pose a new threat since they are not excluded by the fences.<sup>6</sup> Research on the Mauna Loa colony suggests feral cats are a key predator. The remoteness of the nesting sites here make predator control difficult, and therefore this colony is extremely vulnerable. Bright lights in the flight corridor to the ocean can disorient fledglings. Collisions with powerlines also cause mortality.

**References:** 1. Pratt and Pratt 2001; 2. T. Telfer, pers. comm; 3. Harris 1970; 4. Harrison 1987; 5. Howell and Pyle 1997; 6. Hodges and Nagata 2001; 7. Pitman 1986; 8. Ainley et al. 1997b; 9. Simons 1985; 10. Simons and Hodges 1998; 11. Spear *et al.* 1995; 12. Tomkins and Milne 1991; 13. Day *et al.* 2003; 14 Pitman and Ballance 1997.

## Prioritized Conservation Actions:

1. Work with NPS, the state of Hawaii, and other land managers to control introduced predators and ungulates in the area of important colonies.
2. Work with Kaua'i Power and Electric to develop solutions to mortality caused by powerlines (*e.g.*, different spatial array, strategic tree planting, visual deterrents).
3. Survey Lana'i and Kaho'olawe to determine if HAPE are nesting. Locate and determine the

size of Kau'ai colonies. Outline and implement a population monitoring program.

4. Maintain a program to shield lights to reduce their effects on petrels and continue recovery efforts for grounded fledglings.

### **Regional Contacts**

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**DRAFT**

## Herald Petrel *Pterodroma arminjoniana*

STATUS: Federal: BCC 68    State: None    IUCN: None    NAWCP: HC/HC

### Distribution, Population Status and Trends

Several polymorphic populations of Herald Petrels (HEPE) occur in the tropical and subtropical Atlantic, Indian and Pacific Oceans.<sup>1</sup> In the tropical Pacific, *P. a. heraldica* breeds on Raine Is. (off Australia), Tonga, Samoa, Cook, Marquesa, Tuamotu, Gambier, and Pitcairn island groups and Easter Is.<sup>1</sup> It disperses as far north as Hawai'i, but generally occurs south of the Equator.<sup>1,4</sup> Several authors have proposed full species status for the Pacific HEPE: *P. heraldica*.<sup>4</sup> Wide-ranging in the central Pacific, with birds dispersing northward through the tropics and central Pacific to about 40°N.<sup>7</sup>

In the USPI, HEPE breed Mt. Lata of the Ta'u Unit of the American Samoa National Park.<sup>3,6</sup> The only specimen of HEPE known from Samoa was collected on 6 May 1988.<sup>6</sup> Several dozen were seen in the days leading up to this collection. Lack of sightings since 1988 suggests this species population is decreasing or is now extirpated on Ta'u.<sup>3</sup> World-wide population trend is unknown but likely in decline.

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	no	1	60?d	100?d	May-?	surface	surface seizing	pelagic

### Ecology

HEPE are austral winter breeders that nest on cliff ledges, slopes, or ridges up to 1,000 m.<sup>1</sup> On the north side of Ta'u, the HEPE colony is in the nearly impenetrable vine thickets found above 670 m.<sup>5,6</sup> There are three distinct color morphs and the birds at American Samoa were light morph.<sup>6,7</sup> Nests are on the surface and birds visit the nesting colony during the day.<sup>1,4</sup> Phenology on Ta'u is difficult to assess given the limited data, but birds appear to be courting in May and on eggs or chicks in Jul.<sup>6</sup> In other locations, birds will visit the colony throughout the year.<sup>7</sup>

The diet consists of squid, fish, and other invertebrates such as sea striders.<sup>8</sup> Prey is taken by dipping or surface-seizing and feeding takes place frequently at night.

## Conservation Concerns and Activities

Predator eradication is needed on breeding islands, where HEPE suffer cat and rat predation at most locations. In July 2001, Norway rats were discovered on the summit of Ta'u, American Samoa.<sup>3</sup> Rats may have arrived with construction materials to repair hurricane damage in the 1980s and 1990s. The last observation of HEPE in American Samoa was in 1989. None were seen during several visits between 1999-2002, suggesting that the colony may have been extirpated by rats.<sup>3</sup> However, given that many species are aseasonal breeders in the tropics, this species may still be extant on the island.

**References:** 1. del Hoyo *et al.* 1993; 2. Engbring and Ramsey 1989; 3. M. Rauzon pers. comm.; 4. Pratt *et al.* 1987; 5. Pyle 1988; 6. Pyle *et al.* 1990; 7. Harrison 1985; 8. Imber *et al.* 1995.

## Prioritized Conservation Actions

1. Implement rat control at Ta'u as soon as possible.
2. Continue austral winter surveys at Ta'u to verify HEPE presence/absence.

## Regional Contacts

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Peter Pyle - PRBO Conservation Science

## Tahiti Petrel *Pterodroma (Pseudobulweria) rostrata*

STATUS: Federal: BCC    State: None    IUCN: LR/NT    NAWCP: HC/HC

### Distribution, Population Status and Trends

Tahiti Petrels (TAPE) are endemic to the eastern and subtropical south Pacific, ranging from Mexico to Taiwan. Three subspecies are recognized, but recent work indicates that TAPE are a distinct species from Beck's Petrel and should be in the genus *Pseudobulweria*. Breeds in Society, Samoa, Fiji, and Marquesa islands and New Caledonia; possibly Tonga. In the USPI, breeds in American Samoa on the islands of Ta'u, Tutuila, and possibly Olosega: on Mt. Lata, American Samoa National Park, Ta'u Unit;<sup>5</sup> and, on Ta'u Mountain in the Tafuna plain, Tutuila.<sup>3</sup> They have been reported from Olosega but no evidence of the colonies was found in 1999, however, colonies could exist in inaccessible cliff areas. Some experts speculate that Ta'u birds may be a separate species. Feathers were collected for DNA analysis and submitted to the Smithsonian Institute, and sound recordings have been archived in the Cornell Library of Sounds. At sea, birds are most abundant in the vicinity of the breeding islands; during the austral winter, small numbers recorded north of the equator in the central Pacific, but the main wintering range is presumed to be west of the breeding islands towards Australia.<sup>9</sup>

Seabird surveys of Ta'u in 2001 indicate about five miles of summit rim habitat that TAPE likely use in addition to surrounding cliffs. Based on the estimated density of birds and potential nesting habitat, perhaps 1,000 pairs may breed over the island summit areas of this island.<sup>7</sup> Population trend is likely decreasing since Norway rats have colonized the island top of Ta'u.

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	no	1	60?d	100?d	Nov-Dec	cavity	surface seizing	pelagic

### Ecology

TAPE breed on forested mountain slopes, rims and craters of volcanic islands, at altitudes from 200-2,000 m.<sup>10</sup> Bird nest in loose colonies that can be up to 12 km inland.<sup>10</sup> A partially diurnal species in the Society Islands, TAPE are seen flying along mountain ridges in late afternoon.<sup>7</sup> Birds are normally nocturnal on land, coming and going at dusk and dawn.<sup>1</sup> Nests are in burrows or cavities and the rainforest nesting habitat is characterized by large tree root systems, with open

chambers under trees and vines that were made by generations of TAPE diggings. TAPE are austral summer breeders and lay their single egg in Dec, at Ta'u colonies. Chicks fledge in Jun.

Diet is unknown, but probably consists of fish and squid. Pratt et al.<sup>1</sup> labels TAPE as solitary birds of the open ocean that will follow ships, but birds have been observed in mixed-species feeding flocks in the Central Pacific, where small fish and squid are the typical diet.<sup>9</sup>

## Conservation Concerns and Activities

Feral cats and rats affect TAPE populations throughout range. A newly discovered Norway rat infestation at the Ta'u colony is a major threat to the island population and a control program is under consideration by NPS.<sup>7</sup> Bright lights affect birds affect TAPE in the Society Is. and the recovery of downed birds on American Samoa, indicates that lights or obstacles are a problem on these islands also.

**References:** 1. Pratt et al. 1987; 2. Enticott and Tipling 1997; 3. Muse and Muse 1982; 4. Baker 1952; 5. Pyle *et al.* 1990; 6. Wiles *et al.* 1987; 7. O'Connor and Rauzon 2004; 8. S. & J. Rouys, New Caledonia, pers. comm.; 9. King 1967; 10. del Hoyo et al. 1992.

## Prioritized Conservation Actions

1. Work with NPS and Government of American Samoa to implement rat control at Ta'u colonies.
2. Determine location and extent of American Samoa colonies and document population size. Develop a program to monitor trends.
3. Determine taxonomic status of the Samoan population (e.g, DNA, morphometrics) and the Pacific distribution.
4. Conduct research to collect basic life history information for USPI populations.
5. Determine the magnitude of the problem bright lights and obstacles pose for this species.

## Regional Contacts

Mark Rauzon. - Marine Endeavors, Oakland, CA

David Duffy - University of Hawaii at Manoa, Oahu, HI

Rick Monello - American Samoa National Park, Tutuila, American Samoa

## Phoenix Petrel *Pterodroma alba*

STATUS: Federal: BCC    State: None    IUCN: V    NAWCP: HI/HI

### Distribution, Population Status and Trends

Phoenix Petrel (PHPE) is endemic to the tropical Pacific and breeds in the Line, Phoenix, Marquesas, Tonga, Tuamotu, and Pitcairn islands.<sup>12</sup> Efforts to confirm their presence in recent years has been unsuccessful on the Marquesas, Tuamotus, Tonga islands. Currently PHPE are thought to nest at 10 locations.<sup>11</sup> U.S. islands in the Line and Phoenix groups do not currently host this species but decades of infestation by rats and cats may have extirpated populations or prevented colonization. At sea they are present in small numbers in the central Pacific, north to the Hawaiian Is.<sup>13</sup>

The population center appears to be at Kiritimati, Kiribati (Christmas I., Line Islands).<sup>11</sup> In 1980-82, this colony, estimated at 20,000-25,000 birds, was believed to be the largest in the world.<sup>1,2</sup> Phoenix Is., Kiribati, may host significant numbers, but this is unconfirmed. Globally the range is contracting, populations are declining, and all colonies are threatened.

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	yes?	1	60?d	100?d	year-round	scrape	dipping?	pelagic

### Ecology

PHPE nest on the ground on low coral or sand islands. Breeding occurs throughout the year, but two distinct peaks exist: roughly Nov to Feb and Apr to Jul.<sup>7,14</sup> Banding data strongly suggest that the breeding population on Kiritimati is made up of two groups, both breeding annually but at opposite seasons.<sup>15</sup> PHPE is a diurnal species, which helps determine presence/absence, since it more conspicuous than other nocturnal petrels. Birds nest on the surface but eggs at Kiritimati were often laid in sheltered locations.<sup>14</sup>

The diet consists primarily of squid, and lower proportions of other invertebrates (*e.g.*, water striders) and fish.<sup>14</sup>

### Conservation Concerns and Activities

The world status of PHPE is extremely precarious; it is threatened by feral cats, rats, rabbits, human encroachment and poaching, El Niño flooding, and sea level rise expected with global warming. The Polynesian rat is depleting the Kiritimati populations, and the recent arrival of black rats there has serious implications.<sup>8</sup> Rat control efforts have begun there, and the Polynesian rat was eradicated from Motu Upua in 2002.<sup>9</sup> Predator-free islets (Motu Tabu and Motu Upua) in the main lagoon and land-locked Isles Lagoon area are critical, but an atoll-wide plan for PHPE conservation and rat eradication remains unfunded.<sup>8</sup> Feral cats prevent the species from nesting on the main island and sporadic cat control on Kiritimati has failed to limit predation. Rats appear to have been eradicated from Oeno and perhaps Ducie Is. in the Pitcairn Group in 1997, allowing some reproductive success.

Rats and cats were eradicated from Howland, Baker and Jarvis islands and in 2001 an acoustic play back recorder designed to attract PHPE was installed at Jarvis Island (322 km from Kiritimati).<sup>10</sup> To date there is no evidence of PHPE at the island.

**References:** 1. Jones 2000; 2. Garnett 1984; 3. Bell and Bell 1998; 4. Mathews and Iredale 1914; 5. Bourne 1975; 6. J.A. Bartle, pers. comm.; 7. Flint 2002; 8. Everett *et al.* 2002; 9. L. Jones, pers. comm.; 10. E. Flint, pers. comm.; 11. Birdlife International 2000; 12 del Hoyo 1992; 13. King 1967; 14. Ashmole and Ashmole 1967.

### **Prioritized Conservation Actions**

1. Work with other nations in Oceania and especially Kiribati to enact conservation measures for PHPE.
2. Expand efforts to assess the suitability of U.S. islands to support PHPE and if suitable work with international partners to attract or translocate PHPE to U.S. islands within the historic range where exotic predators have been eradicated.
3. Support Kiribati in efforts to eradicate rats and other predators from their islands, monitor for new introductions (*e.g.*, black rats), educate school children about PHPE, and support the nomination of Kiritimati as a World Heritage Site.

### **Regional Contacts**

D. Anderson- DOC/SPREP, New Zealand

Mark Rauzon - Marine Endeavours, Oakland, CA

William Everett - Endangered Species Recovery Council, La Jolla, CA

## Bonin Petrel *Pterodroma hypoleuca*

STATUS: Federal: None    State: None    IUCN: None    NAWC: M/M

### Distribution, Population Status and Trends

Bonin petrels (BOPE) range throughout the central Pacific with colonies in Hawaii and Japan (Bonin and Volcano islands).<sup>2</sup> At-sea, during the breeding season birds are rarely seen south of 20°N.<sup>8</sup> During the non-breeding season, a few stay in the vicinity of Hawaii but most disperse widely over the subtropical north Pacific, north and west of Hawaii towards Japan.<sup>2,5</sup>

In Hawaii, BOPE nest on the NWHI from French Frigate Shoals to Kure; the main breeding colonies are at Lisianski (150,000-250,000 pairs), Laysan (50,000-75,000 pairs), and Midway (32,000).<sup>1</sup> Estimates from Midway are 10 year old (1994) and the population has increased since the removal of rats in 1997. Historically BOPE bred on the main islands but colonies here are now extirpated.<sup>7</sup> Midway Atoll supported ~500,000 BOPE in the 1930s, but populations were decimated by rats introduced in 1943.<sup>6,4</sup> Global population trends are unknown but trends in Hawaii are increasing as birds recolonize Midway and Kure atolls following rat eradication.

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	no	1	49d	82d	Dec-Jun	burrow	surface, dip	pelagic

### Ecology

BOPE are winter breeders, nesting on islands with sandy soil where they excavate burrows. BOPE are monogamous and exhibit high rates of mate retention.<sup>1</sup> Adults return to the colonies in Aug; they are nocturnal on the colonies. The first eggs are laid in mid-Jan and both parents share in incubation; shifts at Midway averaged 6-8 days.<sup>1</sup> Chicks are fed a rich oil by both parents, on average, every 2 days.<sup>11</sup> Chicks fledge at approximately 82 days and plumage is almost indistinguishable from adults. Late fledging chicks may be killed or forcibly ejected from burrows by Wedge-tailed Shearwaters returning to nest.<sup>2</sup> Chicks are assumed to be independent of adults after fledging and preliminary data indicate they return to the natal island at 1 year.<sup>2</sup>

BOPE are fairly unique among *Pterodroma* petrels in having a diet that consists mainly of fish (rather than squid), especially lanternfish and hatchetfish; they also eat squid.<sup>4,9</sup> BOPE are

believed to feed at night since most of their diet consists of deepwater species that migrate to the surface at night.<sup>9</sup> Usually solitary at sea, they sometimes occur in mixed species flocks.<sup>10</sup>

## Conservation Concerns and Activities

Historically, BOPE have suffered from mammalian introductions to breeding islands. Introduced rabbits devegetated Lisianski and Laysan Is. in the early 1900s resulting in population declines for many seabird species, due to soil erosion, destabilization of burrows, and sand storms that filled burrow entrances.<sup>12</sup> Rabbits were eradicated in 1923.<sup>12</sup> Rats were introduced to Midway and Kure in the 1940s in conjunction with military activities and over a 40 year period BOPE populations at Midway declined from ~500,000 to 5,000. Rats (black and Polynesian) were eradicated from both islands in the 1990s and populations of all small ground nesting seabirds are rebounding. BOPE are nocturnal at the colonies and easily disoriented by artificial lighting, causing fatal collisions; the Service has removed or modified artificial lights and overhead wires at Midway to address this problem. Introduced plants such as golden crown-beard and buffleggrass degrade nesting habitat: the shallow root system provides poor soil stabilization and the dense thickets of crown-beard reduce access. Introduced ants at Kure may attack nestlings but more important they facilitate destruction of native vegetation by introduced scale insects.

**References:** 1. Grant, *et al.* 1983; 2. Seto and O'Daniel 1999a; 3. Woodby 1988; 4. Harrison 1990; 5. Harrison 1985; 6. Hadden 1941; 7. Olson and James 1984; 8. King 1967; 9. Harrison *et al.* 1983; 10. Fefer *et al.* 1984; 11. Pettit *et al.* 1982; 12. Ely and Clapp 1973.

## Prioritized Conservation Actions

1. Develop and implement a monitoring program; monitor population recovery at Midway and Kure post.
2. Eradicate golden crown-beard at Midway, Kure, and Pearl and Hermes and prevent introductions elsewhere. Eradicate buffleggrass from Laysan.
3. Investigate the ecology and effects of introduced ants and scale insects, including direct and indirect impacts on BOPE survival, reproductive behavior and reproductive performance. Investigate means to control or eradicate ants and scale without damaging the native/endemic fauna.
4. Conduct long-term demographic studies to document population trends, survival rates,

reproductive success, and to acquire accurate estimates of the breeding populations.

**Regional Contacts**

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**DRAFT**

## Bulwer's Petrel *Bulweria bulwerii*

STATUS: Federal: None    State: None    IUCN: None    NAWCP: M/M

### Distribution, Population Status and Trends

Bulwer's Petrel (BUPE) is a pantropical, highly pelagic species. In the Pacific Ocean, BUPE breed on the Phoenix, Marquesas, Bonin, Volcano, and Hawaiian Is. groups, and probably in the Marshalls.<sup>3,5</sup> At sea distribution is not well documented but Hawaiian birds appear to disperse to the southeast of Hawaii after the breeding season, probably to winter in the central and eastern Pacific.<sup>6</sup>

The global population size is unknown but the Pacific population exceeds 100,000 pairs. The largest colony is at Nihoa (75,000-100,000 pairs) where approximately 97% of the Hawaiian population and a large percentage of the Pacific population nest.<sup>1</sup> During the last century, BUPE nested on all of the NWHI except Kure, islets off the main Hawaiian Is. and a few remote sites on the main islands. BUPE were “abundant” at Midway before rats were introduced in 1943; they no longer breed at Midway.<sup>4</sup> At Johnston Atoll, a growing colony supports 60-80 pairs.<sup>7</sup> Population trends globally and in the USPI are unknown.

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	no	1	44d	62d	Apr-Aug	crevice	surface seizing	pelagic

**Ecology** (from Megyesi and O’Daniel unless otherwise noted)

BUPE nest under cover in crevices, caves, rock and coral rubble, under vegetation or debris, and in man-made structures. Breeding is highly colonial. Most birds arrive at the Hawaiian colonies in Apr, egg laying occurs from mid May to mid Jun, and most young are fledged by early Oct.<sup>8</sup> Pairs are monogamous, with high mate and site fidelity. Both sexes share in incubation; shifts at Laysan averaged 9.5 days<sup>8</sup> and at Johnston males averaged 10.2 and females 5.8 days. Young are brooded for <5days after which at least one adult returned to the nest almost every night at Laysan.<sup>8</sup> Chicks fledge after two months, but before flight feathers are fully developed. Birds return to the colonies at 2 years of age but most do not nest until 6 years. The oldest known bird was 24 years.

BUPE are solitary foragers. They migrate to areas of upwelling, feeding mainly on fish (lanternfishes and hatchetfishes) and squid, but also crustaceans and sea-striders.<sup>4</sup> Most of their prey are bioluminescent and migrate from deep water to the surface and night where they are

caught at night by surface-seizing.<sup>4</sup>

## Conservation Concerns and Activities

Predation by rats and cats occurs throughout the BUPE range. Rats eliminated BUPE from Sand Is., Midway Atoll. However, rat eradication at Midway and Kure Atolls is helping BUPE to reestablish a breeding population and spur species recovery. The effects of house mice are unknown. In NWHI, surf and high winds associated with storms can cause loss of chicks or eggs. The Johnston Atoll colony is susceptible to hurricane surge.<sup>3</sup> The extreme concentration of a large proportion of the Pacific population at one island renders this species vulnerable to catastrophic events at this location.

**References:** 1. Harrison *et al.* 1984; 2. del Hoyo *et al.*; 1992; 3. Megyesi and O'Daniel 1997; 4. Harrison 1990; 5. King 1967; 6. King 1970 in Megyesi and O'Daniel 1997; 7. USFWS unpubl. Data.; 8. USFWS 1983.

## Prioritized Conservation Actions

1. Baseline studies of reproductive behavior and performance and population ecology are needed for this poorly known species.
2. Eradicate mice from Midway and Johnston Atolls.
3. Control or eradicate feral cats and rats from islets off the main Hawaiian Is. and at main island site such as Marine Corps Base Hawaii, Kaneohe Bay, Pyramid Beach.

## Regional Contacts

Beth Flint - USFWS, Pacific Remote Islands NWR Complex, Honolulu, HI  
David Smith - Hawaii Department of Forestry and Wildlife, Honolulu, HI

## Wedge-tailed Shearwater ('U'a kani) *Puffinus pacificus*

STATUS: Federal: None    State: None    IUCN: None    NAWCP: L/L

### Distribution, Population Status and Trends

Wedge-tailed Shearwaters (WTSH) are widespread throughout the tropical and subtropical Indian and Pacific Oceans.<sup>1</sup> In the Pacific they breed from the Bonin Is. off Japan to the Revilla Gigedo Is. off Mexico. At sea, birds are most abundant near the colonies during the breeding season.<sup>9</sup> After the breeding season, Hawaiian birds probably migrate south to the Equatorial Countercurrent and east.<sup>9</sup>

WTSH are abundant, with a worldwide population well over one million pairs.<sup>1</sup> In the USPI, most birds breed in Hawaii with smaller colonies on Johnston, Howland, Baker, and the Mariana islands. Approximately 270,000 pairs breed in Hawaii and <2,000 pairs on the other islands of the USPI.<sup>2,4,6,7</sup> The largest colonies are at Laysan (125,000-175,000 pairs), Nihoa (30,000-40,000), and Lisianski (10,000-30,000).<sup>2</sup> WTSH also nest in the main Hawaiian islands (40,000-60,000 pairs); most nest on small offshore islets such as Manana and Moku Lua islands off O'ahu, with 10,000-20,000 pairs, each.<sup>2</sup> Although abundant and widespread, global populations are far below historical levels due primarily to human harvest, introduced predators, habitat degradation by introduced herbivores, and possibly competition with commercial fisheries.<sup>1</sup> In the USPI, most of the colonies have not been surveyed for 20-25 years, so trends cannot be assessed. However, eradication of cats and rats at Midway, Kure, Johnston, Howland, Baker, and islands off the main Hawaiian Islands resulted in population increases as these sites.

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	no?	1	54d	100d	Jun-Dec	burrow	contact dipping	pelagic,

### Ecology

There are two color phases: a light and a dark morph. Light phase birds predominate at all breeding colonies north of 10<sup>0</sup>N, except the Marianas where only dark phase birds occur.<sup>9</sup> WTSH excavate burrows and nesting habitat is typically flat ground, plateaus, slopes or cliff tops. Pairs are monogamous and mate retention is strongly influenced by a pair's success the previous season.<sup>12</sup> Breeding generally occurs during the local summers in the subtropics but breeding cycles are less seasonal at equatorial colonies.<sup>9</sup> In Hawaii nesting is very synchronous. Birds return to the colonies in late-Feb or early-Mar and most eggs are laid in Jun. Both parents incubate and shifts at Manana ranged from 4-12 days.<sup>10</sup> Most chicks hatch from late-Jun through

mid-Aug and most young fledge in Nov. Birds return to breed at four years.<sup>3</sup>

Most sightings of WTSH at sea are of single birds or small groups, but foraging birds are most often seen in large multi-species flocks associated with predatory fish, that drive prey to the surface.<sup>9</sup> In Hawaii, the diet consists largely of larval goatfish, flyingfish, squirrelfish and flying squid.<sup>11</sup> WTSH often follow trawlers and other fishing boats discharging offal.

## Conservation Concerns and Activities

Introduced predators are the greatest threat to WTSH in the USPI. Rats and cats have been eradicated from the NWHI and most of the remote USPI and WTSH but they still exist on the main Hawaiian Islands, Wake, and the Marianas. Predator control in the main Hawaiian Is. has helped onshore colonies become established and maintain themselves (*e.g.*, Mokapu Peninsula, Ka'ena Point, O'ahu; Kilauea Pt., Kaua'i). Artificial lights disorient fledglings, which collide with power lines and vehicles on the main Hawaiian Is. Human trespass at colonies can cause burrow collapse. At the two largest colonies (Laysan and Nihoa) endemic finches readily predate eggs that are left unattended (*e.g.*, due to researcher disturbance). Introduced Common Mynas were significant egg predators at Kilauea Pt., Kaua'i,<sup>13</sup> but placing chicken eggs treated with bird repellent throughout the colony, significantly lowered predation rates.<sup>14</sup> Contaminants including mercury, lead and organochlorines have been detected in Hawaiian birds and experimentally applied oil reduced breeding success.<sup>15</sup> Because shearwaters associate with the tuna schools, by-catch and overfishing may pose significant threats.

**References:** 1. del Hoyo et al. 1992; 2. Harrison 1990; 3. Whittow 1997a; 4. USFWS unpubl. data; 5. L. Hayes, pers. com.; 6. Stinson 1995; 7 Reichel 1991; 8. Jones 2000; 9. King 1974; 10. Shallenberger 1973; 11. Harrison *et al.* 1983; 12. Fry *et al.* 1986; 13. Byrd *et al.* 1983; 14 Byrd and Moriarty 1980; Fry *et al.* 1983.

## Prioritized Conservation Actions

1. Control introduced animals at main island Hawaiian colonies (*e.g.*, Black Pt., Ka'ena Pt., Mokapu, O'ahu; Ho'okipa, Maui; Kilauea Pt., Kaua'i) and eradicate cats and rats at Wake.
2. Investigate and monitor the levels and effects of contaminants. Determine the vulnerability of WTSH to oil spill contamination and the incidence of oiling.
3. Research into the ecology of seabirds, their prey, and schooling predatory fish that drive prey to the surface. Model the system to predict the effects of overfishing on seabirds.

## **Regional Contacts**

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Robert Shallenberger - The Nature Conservancy, Hawaii, HI

**DRAFT**

## Christmas Shearwater (black shearwater) *Puffinus nativitatis*

STATUS: Federal: BCC 67,68    State: None    IUCN: None    NAWCP: HC/HC

### Distribution, Population Status and Trends

Christmas Shearwaters (CHSH) range throughout the tropical and subtropical central Pacific. They breed on small, remote islands in the Hawaiian, Line, Phoenix, Society, Marquesas, Marshall, Pitcairn, Tuamotu, and Austral islands; and islands off Easter Is. in the eastern Pacific.<sup>2</sup> Extirpated from the Bonin, Minami Torishima (Marcus) and Wake islands. At-sea they are most abundant offshore of the breeding islands.<sup>6</sup> It is assumed that juveniles, non-breeders and most adults disperse after breeding to tropical and subtropical waters, although some breeding adults in the tropics may be sedentary.

Global population size is not known but probably numbers in the several tens of thousands pairs.<sup>7</sup> In this region, they breed on the Hawaiian Islands from Kaula to Kure, Johnston, Jarvis, and American Samoa. In Hawaii, the total population is probably <3,000 pairs; the largest colonies are on Laysan (1,500-2,000) and Lisianski (400-600).<sup>2</sup> Global population trends are unknown but several known colonies are declining *e.g.*, Christmas Is. supported large colonies numbering about 6,000 pairs in the 1980s but populations in 2002 were probably less than 3,000 (M. Rauzon pers. comm.) In Hawaii and the USPI, populations appear to be stable to increasing because of active predator eradication programs at Midway, Kure, and Johnston.

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	no	1	54d	96d	Mar-Aug	under vegetation	pursuit plunge	pelagic

### Ecology

CHSH nest under vegetation or in rock crevices. Birds return to the colony at night and are most active in early evening and early morning.<sup>8</sup> CHSH are monogamous but mates are not always retained in subsequent years.<sup>2</sup> Breeding birds return to the colonies in Feb and a single egg is laid in Mar-Jun (slightly earlier phenology at Johnston).<sup>2</sup> Both parents participate in incubation, with shifts lasting ~5days.<sup>9</sup> One or both parents returned almost every night to feed chicks at Laysan in 1979.<sup>9</sup> Fledglings are almost indistinguishable from adults at fledging and are probably independent of parents once they depart the colony; adults continue to visit the nest site after chicks have left.<sup>9</sup>

CHSH feed far offshore, in mixed species flocks over predatory fish that drive prey to the surface.<sup>4,10</sup> The diet of CHSH in Hawaii is almost equally split between fish and squid, caught by pursuit-plunging, pursuit-diving, and occasionally surface-seizing.<sup>4</sup> Goatfish, flyingfish, and scad were the most common fish in the diet.<sup>4</sup>

## Conservation Concerns and Activities

Worldwide, populations at many island groups are declining due to feral cats and rats (*e.g.*, Kiritimati).<sup>1</sup> In the USPI, colonies at Midway, Kure, Jarvis, and Johnston all suffered significant declines after predators were introduced but are now rebounding. The colony at Wake was extirpated but one individual was observed after cat control was initiated.<sup>5</sup>

**References:** 1. Haley 1984; 2. Seto 2001; 3. L. Hayes, pers. comm.; 4. Harrison *et al.* 1983; 5. M. Rauzon, pers. comm. 6. King 1967; 7. del Hoyo *et al.* 1992; 8. Harrison 1990; 9. USFWS 1983; 10. Ballance and Pitman 1999.

## Prioritized Conservation Actions

1. Support Kiribati in efforts to control/eradicate cats at Kiritimati.
2. Control exotic vegetation at Midway and Kure atolls and restore native vegetation.
3. Work with DOD to eradicate rats and cats from Wake.

## Regional Contacts

Nanette Seto - USFWS, Migratory Birds and Habitat Programs, Portland, OR.

Maura Naughton - USFWS, Migratory Birds and Habitat Programs, Portland, OR.

Mark Rauzon - Marine Endeavours, Oakland, CA

## Newell's Shearwater ('A'O) *Puffinus auricularis newelli*

STATUS: Federal: T    State: HI-T    IUCN: V    NAWCP:HI/HI

### Distribution, Population Status and Trends

Newell's Shearwater (NESH), a subspecies of Townsend's Shearwater, is endemic to Hawai'i. The largest colonies are on Kaua'i,<sup>1</sup> the only island without introduced mongoose. Smaller colonies exist on Hawai'i and Moloka'i - reports of nesting on O'ahu, Maui and Lana'i are unconfirmed. Their marine range extends principally from the south and east of the Hawaiian Is. to the eastern tropical Pacific, especially near the Equatorial Counter Current and, more specifically, the Inter-tropical Convergence Zone.<sup>4</sup> During the breeding season, some birds forage west and north of the Hawaiian Is. and the central part of their marine range moves northward.<sup>1</sup> During the nonbreeding season they are absent from the waters within several hundred kilometers of the Hawaiian Is.<sup>5</sup>

NESH have experienced significant population declines. Apparently abundant at the time of Polynesian colonization, the species was thought to be extinct by 1908.<sup>1</sup> Subsistence hunting and predation by introduced rats, pigs, and dogs were the likely causes of decline. They were rediscovered at sea in 1947, confirmed breeding on Kaua'i in 1967,<sup>5</sup> and began to make a comeback, but since then the species has continued to suffer declines. Recent demographic models suggest declines from an estimated population of 84,000 birds (range 57,000-115,000) in the late 1980s and early 1990s.<sup>2</sup> Ornithological radar studies have confirmed a decline, especially after Hurricane Iniki in Sep 1992, which caused considerable damage to the forests on Kaua'i and occurred when chicks were near fledging. Ornithological radar data from 1993 and 1999 indicate a 13% annual decline,<sup>3</sup> and radar studies in 2001 indicated a 62% decline from 1993.<sup>11</sup> The Save Our Shearwaters Program (SOS), which has operated since 1978, may also provide an index of population size and fecundity.<sup>7</sup> Numbers of birds recovered by SOS have declined steadily since reaching a peak in 1987; numbers in 2000 were 21% of what they were in 1987.<sup>7</sup>

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	no	1	62d	92d	Jun-Nov	burrow	pursuit plunge	pelagic

**Ecology** (from Ainley *et al.* 1997 unless otherwise noted)

Highly pelagic, year-round. Most NESH nest high (160-1200m) on the steep mountainous terrain of Kaua'i, usually on slopes in excess of 65°, in dense uluhe fern thickets. Limited breeding also

occurs on forested cinder cones in the Puna District, Hawai'i.<sup>6</sup> Radar studies indicate that significant numbers may nest in the Waipio Valley, Hawaii. In Apr, adults return to renovate or dig new burrows. Egg laying is very synchronous in early Jun. NESH lay a single white egg that is incubated by both parents. The chick is fed a diet of regurgitated squid and fish by parents who forage hundreds of kilometers offshore, returning in darkness to the colony. Feeding NESH are often associated with tuna. In the fall, fledglings climb a tree trunk or rock ledge to be free of entangling vegetation and launch into the darkness. Fledglings visually orient by following river valleys to the coast, where they spend three years at sea before returning to land. Fledglings are independent of parents.

### **Conservation Concerns and Activities**

Street and resort lights, concentrated near the coastlines, disorient or blind fledglings, which then fall to the ground and are unable to regain flight. Each year, thousands of fledglings are grounded and many are killed by cars, cats and dogs. Others succumb to starvation and dehydration.

Rapidly expanding coastal development has changed the Kaua'i skyline significantly since the 1980s. The conservation project Save Our Shearwaters began recovering and releasing downed shearwaters in 1978.<sup>6</sup> Since then, nearly 30,000 shearwaters have been recovered and released. Early experiments with shaded lamps at resorts reduced fallout by 40%.<sup>9</sup> Additionally, "Operation Shades" is a project to fit street lights with covers which direct light downward, and in the early 1980s, Kaua'i Electric Co. installed hoods on streetlights in areas with heavy fallout. Adults do not appear to be as vulnerable to lights as fledglings, but they do collide with utility wires that intersect their flight paths to the sea. Construction of a Kaua'i Electric powerplant and associated lines in a known NESH "flight corridor" is proposed and poses an additional threat.<sup>10</sup>

Over the past 150 years, >75% of the island forests have been lost. Large tracts of remaining forest are protected but habitat degradation by introduced plants and herbivores are an unknown threat. Habitat in peripheral colonies is also lost to cinder mining at the privately owned Pu'ulena and Heiheiahulu colonies in Puna on the island of Hawai'i. Introduced predators are a major concern: Kaua'i is the only main island without mongooses, but there are periodic unconfirmed sightings of this predator. Rats, cats, pigs and other introduced mammals are serious threats, even on islands without mongooses. Hurricanes, fishery interactions, and disease may also play a role in population decline and recovery.

**References:** 1. Ainley *et al.* 1997; 2. Ainley *et al.* 2001; 3. Day *et al.* 2000; 4. Harrison 1990; 5. King and Gould 1967; 6. Reynolds and Ritchotte 1997. 7. Day and Cooper 2001; 8. T. Telfer, pers. comm 9. J. Sincock, pers. comm.; 1984. 10. E. Flint, pers. comm.; 11. Day *et al.* 2003.

## **Prioritized Conservation Actions**

1. Evaluate colonies for conservation measures. Compile a GIS database of NESH locational data (*e.g.*, colony, flyway) and conduct a structured ranking for restoration projects based on estimated probability of increasing productivity and survival.
2. Initiate or maintain predator control and habitat conservation measures (*e.g.*, trapping, toxicants, fencing) at key colonies. Research/monitoring to evaluate the effects of control.
3. Refine and expand radar studies to monitor population trends, locate colonies, and investigate behavior. Evaluate and standardize an island-wide monitoring program.
4. Work with Kauai Electric to minimize the effects of powerlines (*e.g.*, burial, different spatial arrangement, strategic tree planting).
5. Reduce fallout of fledglings due to bright lights. Work with partners to shield lights and reduce light output especially during critical periods. Identify fallout areas on other islands where light shielding may be needed.
6. Research into light attraction (*e.g.*, colors) to minimize this threat.
7. Continue collaboration with Save Our Shearwater program.
8. Develop partnerships with private landowners focused on NESH conservation.

## **Regional Contacts**

Robert Day and Brian Cooper, - ABR, Inc., Fairbanks, AK

Tom Telfer - Hawaii Department of Forestry and Wildlife, Kauai, HI

Larry Spear and David Ainley - H. T. Harvey & Associates, Alviso, CA

R. David - Kauai Electric consultant

Michelle Reynolds - USGS, Pacific Islands Ecosystem Research Center, Volcano, HI

## Audubon's Shearwater *Puffinus lherminieri*

STATUS: Federal: None    State: None    IUCN: None    NAWCP: HI/HC

### Distribution, Population Status and Trends

Widespread and abundant, Audubon's Shearwaters (AUSH) are pantropical breeders found throughout the Atlantic, Indian and Pacific Oceans. Several (9-10) subspecies are recognized and *P. l. dichrous* breeds in the central Pacific.<sup>2,5</sup> Detailed genetic analysis of *P. lherminieri/assimilis* taxonomy may show that the taxonomy of this group must be completely rearranged. In USPI, AUSH breed in the Line Islands and American Samoa. At sea, birds are usually within 160 km (100 mi) of breeding islands and migration is not known to occur.<sup>6</sup>

Global population may be several tens of thousands of breeding pairs.<sup>2</sup> Although this species is widespread and locally abundant, populations have declined from historical levels, including extirpation from many breeding sites. Colonies in American Samoa are located on Ta'u and Tutuila, where numbers are unknown but small. In the Line Is. group, numbers are increasing at Jarvis I. (approximately 100 pairs) in response to cat eradication, but decreasing at Kiritimati (possibly 2,000 pairs) where the long-term future is not secure.<sup>3,4</sup>

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	no	1	50d	62-75d	Jul-	burrow	pursuit diving	pelagic

### Ecology

AUSH nest in a variety of habitats. In American Samoa, they nest on steep cliffs and at Jarvis in sandy loam under *Sesuvium*.<sup>4</sup> Very little is known of the life history of this species from the USPI. Elsewhere (information from del Hoyo<sup>2</sup>) they are colonial, nesting in rock crevices or burrows. Incubation is 49-51 days, with individual shifts of 2-10 days. Chicks are brooded for 3-7 days and fledged in 62-75 days. In the Galapagos Sexual maturity at 8 years.<sup>2,3</sup>

AUSH have been recorded diving 6-35 m deep at Cousin Is., Seychelles, contradicting the hypothesis that tropical shearwaters do not specialize in underwater foraging.<sup>1</sup> Birds off Samoa typically feed on the surface but they will dive for prey; they are usually seen feeding in mixed-species flocks.<sup>7</sup> Diet consists of fish, squid and crustaceans and they sometimes forage near fishing boats.

## Conservation Concerns and Activities

Historically, Samoans hunted AUSH at night with dogs, pulling them from burrows.<sup>7</sup> Pigs, dogs, rats, and cats on nesting islands threaten the survival and reproductive success of these small birds. Many colonies vulnerable to extinction. Norway rats likely limit birds at Ta'u, American Samoa, as well as at other colonies worldwide. The establishment of a colony on Jarvis Is. in 1995 was only possible through cat removal.<sup>4</sup>

**References:** 1. Burger 2001; 2. del Hoyo *et al.* 1992; 3. Jones 2000; 4. M. Rauzon, pers. comm; 5. Clements 2000; 6. King 1967; 7. Muse and Muse 1982

## Prioritized Conservation Actions

1. Monitor growth of the colony at Jarvis
2. Systematic surveys to identify location and size of colonies in Samoa. Monitor colonies to document trends.
3. Work with NPS and the Government of American Samoa to implement predator control at Samoan colonies.
4. Support international efforts in Kiribati to implement predator control (*e.g.*, cats and rats at Central Lagoon, Kiritmati).

## Regional Contacts

Mark Rauzon - Marine Endeavors, Oakland, CA

Rick Monello - American Samoa National Park, Tutuila, American Samoa

## Band-rumped Storm-Petrel ('oe'oe, 'owe'owe, 'ake'ake, Harcourt's and Maderian Storm-Petrel) *Oceanodroma castro*

STATUS: Federal: C, BCC    State: HI-T    IUCN: None    NAWCP: HI/HI

### Distribution, Population Status and Trends

Band-rumped Storm-Petrels (BANP) are a widespread species with breeding sites in the Atlantic and Pacific Oceans. They breed in three archipelagoes in the Pacific: Japan, Galapagos and Hawaii. Colonies in Japan and Galapagos may consist of many thousands of birds,<sup>2</sup> but the size of the Hawaiian population is unknown and may number no more than 100 pairs.<sup>3</sup> Highly pelagic, BANP are observed around Kaua'i, and their marine range extends from the main islands through the NWHI and tropical Pacific, especially near the Equatorial Counter Current. There is little mixing of Pacific breeding populations.<sup>3</sup> Birds are highly pelagic during the non-breeding season, but some individuals at other colonies are sedentary; visiting colonies irregularly throughout the year.<sup>1</sup>

Historically, BANP were abundant and widespread in Hawaii judging from its numbers in midden sites and lava tubes on O'ahu, Hawai'i, and Moloka'i.<sup>7</sup> The Hawaiian population is now a tiny remnant, judging from the paucity of recent encounters.<sup>2</sup> Confirmation of nesting areas were made during a 2001 visit to the hanging valley of Pohakuao, Kaua'i.<sup>4</sup> BANP are known from 12 sites on Kaua'i at elevations around 610 m, and from Hawai'i and Maui at elevations >1,200 m.<sup>4,6</sup> Population size and trend are unknown but suspected to be critically low. There are perhaps 100 pairs at each colony but observations at sea suggest larger populations.<sup>2,8</sup> The breeding population on Kaua'i was estimated at 171-221 pairs in 2002.<sup>11</sup>

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Behavior</u>	<u>Marine Habitat</u>
1	no	1	42d	64-73d	May-Sep	crevice	pattering	pelagic

### Ecology

Very little is known about BANP in Hawaii and most of the data presented here are from other populations. BANP remains the only Hawaiian breeding bird whose nest is undescribed. Nesting habitat includes the very steep hanging valleys of Kaua'i vegetated with shrubs and grasses and the barren lava flows high on the volcanos of Maui and Hawai'i.<sup>4,11</sup> Birds excavate burrows or nest in natural cavities.<sup>4</sup> Recovery of downed fledglings in Oct indicates that eggs are laid in May-Jun, chicks hatch in Aug, and fledge in Oct.<sup>4</sup> BANP are long-lived (15-20 years), and probably do not breed until 3-7 years.<sup>1,2,5</sup>

No diet information is available for Hawaiian birds but elsewhere they eat small fish and squid and some crustaceans.<sup>4</sup> Solitary feeders, BANP are most frequently observed alone or in the company of other BANP. Foraging in the Atlantic is often associated with upwellings.<sup>9</sup>

## **Conservation Concerns and Activities**

BANP need predator-free environments to flourish. Introduced rats, mice, cats, mongoose, pigs, and owls are all potential predators on the main Hawaiian islands. Predator control at Haleakala National Park and Mauna Loa in Hawaii Volcano National Park should reduce predation pressure. Power lines at high elevations are suspected to cause some mortality.<sup>4</sup> Street lights concentrated near the coastlines disorient fledglings, which fall to the ground and are unable to regain flight. Colonies require protection and possibly management. Assessment of BANP status is critical. The Hawaiian population is potentially isolated from other breeding populations and recolonization, if island populations are extirpated, may be difficult.

**References:** 1. del Hoyo, *et al.* 1992; 2. Harris 1969; 3. Harrison *et al.* 1990; 4. Slotterback 2002; 5. Ainley 1984; 6. Wood *et al.* 2001; 7. Olson and James 1982; 8. L. Spear, pers. comm. 9. Haney in Slotterback 2002. 10. Crossin 1974; 11. Wood *et al.* 2002.

## **Prioritized Conservation Actions**

1. Determine size, status, and distribution of Hawaii population.
2. Locate and describe nests and conduct basic life history investigations to assess needs and conservation status.
3. Identify factors limiting populations, determine the impacts of predation, and formulate conservation and recovery actions.

## **Regional Contacts**

Ken Wood. - National Tropical Botanical Garden

M. LeGrande, M. - University of Hawai`i at Manoa, O`ahu

Dave Boynton - Hawaii State Department of Education

John Slotterback - USGS, Pacific Islands Ecosystem Research Center, Volcano, HI

Eric Vander Werf - USFWS, Pacific Islands FWO, Honolulu, HI

## Tristram's Storm-Petrel (Sooty Storm-Petrel) *Oceanodroma tristrami*

STATUS: Federal: BCC 67    State: None    IUCN: NT    NAWCP: M/HC

### Distribution, Population Status and Trends

Tristram's Storm-Petrel (TRSP) nest on islands in Hawaii and Japan.<sup>1</sup> In Japan they nest on the Volcano, Izu, and possibly Bonin island groups; in Hawaii they nest in the NWHI but no colonies are located in the main Hawaiian Is and their bones are not found in archeological excavations on the main islands.<sup>4,2,7</sup> TRSP are rarely seen south of Hawaii, away from breeding islands. They range across the subtropical central and western Pacific into waters off Japan.

The Hawaiian population was estimated at <10,000 pairs with the largest colonies located at Nihoa (2,000-3,000 pairs), Laysan (500-2,500 pairs), and Pearl and Hermes Reef (~1,800 pairs).<sup>4,5</sup> Smaller colonies exist at Necker, French Frigate Shoals, and possibly Lisianski.<sup>5</sup> Historically colonies existed on Midway and Kure but were probably extirpated by rats; individuals have been found on land and TRSP may recolonize these islands now that rats have been eradicated at both locations.<sup>2,4</sup> TRSP populations are likely below historic levels with the extirpation of colonies at Midway and Kure, but more recent population trends are unknown.<sup>2</sup>

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Behavior</u>	<u>Marine Habitat</u>
1	no	1	40-45d	85-90d	Nov-	burrow	pattering	pelagic

### Ecology

TRSP are winter breeders and are nocturnal at the colonies. Nest sites are colonial, in recesses in rock scree or burrows that they excavate under vegetation. Nests are often under rocks, piles of mined guano, or in sandy loam substrate beneath vegetation.<sup>4</sup> Information on breeding phenology is limited but birds return to the colonies in Nov, eggs are laid between Dec-Feb, and both sexes incubate the egg.<sup>4,2</sup> Egg neglect is probably minimal at most of the large colonies where finches would quickly find and eat unattended eggs. The chick is fed by regurgitation until May and most adults and young are gone by Jun.<sup>2,4</sup> There is no information on age at first breeding but storm-petrels often begin breeding at 3-5 years.<sup>3</sup> TRSP may live approximately 15-20 years.<sup>1</sup>

Diet information is limited, but in Hawaii they eat mainly small fish and squid, and occasionally planktonic insects and crustaceans.<sup>6</sup> Prey is caught by pattering and snatching from the surface. TRSP rarely approach land except to breed and typically feed alone or with conspecifics.<sup>8</sup>

## Conservation Concerns and Activities

Because they are small, ground nesters, the introduction of cats or rats leads to high levels of mortality and rapid extirpation of colonies. Rats have caused a population decline on the Torishima and Izu, islands, Japan. Black rats probably caused the extirpation of TRSP from Midway and Polynesian rats their extirpation from Kure. Recently TRSP have been caught in mist nets on Sand I., Midway and have responded to audio recordings but nesting has not been documented. TRSP habitat on Pearl and Hermes Atoll and Kure may become limited if golden crown-beard continues to expand uncontrollably.<sup>5</sup> The effects of house mice are unknown. Introduced ants have been noted on dead chicks but it is unknown if they had any role in the mortality.

**References:** 1. del Hoyo, *et al.* 1992; 2. Slotterback 2002; 3. Ainley 1984; 4. Rauzon *et al.* 1985; 5. E. Flint, USFWS, pers. comm. 6. Harrison *et al.* 1983; 7. Olson and James 1982; 8. Crossin 1974.

## Prioritized Conservation Actions

1. Determine population size, status and trends in Hawaii. Design and implement reliable population monitoring program.
2. Eradicate mice from Midway and establish attraction programs if TRSP do recolonize naturally.
3. Eradicate golden crown-beard at Pearl and Hermes Reef, Midway, and Kure.
4. Determine the effects of introduced ants.
5. Research into basic life history traits, demography, and limiting factors.

## Regional Contacts

Beth Flint - USFWS, Pacific Remote Islands NWR Complex, Honolulu, HI

## Polynesian Storm-Petrel (White-throated Storm-Petrel) *Nesofregatta fuliginosa*

STATUS: Federal: BCC68    State: None    IUCN: V    NAWCP: HI/HI

### Distribution, Population Status and Trends

Polynesian Storm-Petrel (POSP) have a fairly limited distribution in the central Pacific. They breed in the Line, Phoenix, Austral, Society, Gambier and Marquesas island groups; historically they bred, and may still breed, in Samoa, Vanuatu, and Fiji.<sup>8</sup> POSP is one of the largest storm-petrels in the Pacific.<sup>9</sup> The genus is monotypic but several color morphs have been described. An all dark morph was described from Samoa,<sup>4</sup> and often referred to as the Samoan Storm-Petrel. At sea, POSP are widely distributed along the equator with the majority of birds between 10°N and 10°S.<sup>9</sup> Most abundant south of the equator to about 8° S along the northern edge of the South Equatorial Current and east to the Marquesas<sup>14</sup> Concentrations occur around the breeding islands *e.g.*, the Line and Phoenix islands.<sup>9</sup>

POSP historically nesting on all of the islands of American Samoa and were most abundant on the Manua Islands, but the population may now be extirpated.<sup>11</sup> Twenty years ago, fairly large flocks were still observed at sea between Western and American Samoa and occasionally a bird is still seen flying over the islands, so POSP may still breed here in very low numbers.<sup>13</sup> Although they nest in the Line and Phoenix groups, nesting was not recorded for the USPI in these groups (although a single bird was recorded on Howland in the 1960s). However, 3 birds were seen on Jarvis Is. in 2000, following rat and cat eradication.<sup>12</sup> The world population is very small and declining at many locations. POSP may recolonize and flourish on Howland, Baker and Jarvis now that they are free of introduced predators.

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	no	1	?	?d	year-round	crevice	dip, patter	pelagic

### Ecology

POSP nest in the shade of coral rock and under vegetation on atolls and islands. They may also nest in burrows and rock crevices on island cliffs in Samoa, but they do not excavate their own burrows.<sup>9</sup> Breeding occurs year-round with a peak of nesting that varies between islands. Even on a single island the peak of nesting activity can vary quite significantly between years.<sup>9</sup> Little is known about the life history of this species. Birds are generally nocturnal on the colony with the greatest activity occurring around dusk.<sup>9</sup> However, birds have been observed flying into the

island in the middle of the day to feed a chick<sup>9</sup>

POSP are usually solitary or associated with their own species, normally they do not occur in mixed-species feeding flocks.<sup>9</sup> Unique flight behavior at sea, wherein birds “kick off” a wave, glide, and then “kick off” again.<sup>9</sup> Diet is poorly known but likely includes small squid, fish and crustaceans.<sup>10</sup> A strong Equatorial Undercurrent upwelling occurs around Jarvis and this may promote availability of planktonic food resources attractive to POSP.<sup>6</sup>

## **Conservation Concerns and Activities**

Historically, Samoans hunted POSP with dogs.<sup>11</sup> Human consumption and introduced predators are probably the reason POSP no longer breed here. POSP could still occur on remote cliffs in American Samoa. Norway rats have been recorded at the summit of Mt. Lata, Ta'u, but the vertical cliffs may provide a refuge, like the Waimea Canyon cliffs on Kaua'i do for Band-rumped Storm-Petrel.<sup>6</sup> Prospecting birds have been observed at Jarvis following cat and rat eradication and colonies may flourish at these locations. The effects of introduced house mice are unknown but they could limit colonization at Jarvis.

**References:** 1. Schreiber and Schreiber 1984; 2. Thibault 1988; 3. Garnett 1984; 4. Pratt, et al. 1987; 5. Everett et al. 2002; 6. M. Rauzon, pers. comm.; 7. B. Bell, pers. comm.; 8. del Hoyo et al. 1992; 9. Crossin 1974; 10 BirdLife 2000; 11. Amerson et al. 1982; 12. USFWS unpubl. Data; 13. Muse and Muse 1982; 14. L. Spear, pers. comm..

## **Prioritized Conservation Actions:**

1. Eradicate mice from Jarvis Is.
2. Systematic survey of all potential and former nesting islands to determine current status and abundance.
3. Coordinate with and support international conservation efforts, especially at Kiribati and Gambiers.

## **Regional Contacts**

Beth Flint - USFWS, Pacific Remote Islands NWR Complex, Honolulu, HI  
Mark Rauzon - Marine Endeavors, Oakland, CA

## Masked Booby (Blue-faced Booby) *Sula dactylatra*

STATUS: Federal: None    State: None    IUCN: None    NAWCP: HC/MC

### Distribution, Population Status and Trends

Masked Boobies (MABO) have a pantropical distribution.<sup>1,2</sup> There are four subspecies; *S. d. personata* breed on islands in the central and western Pacific.<sup>3</sup> Within the USPI, the largest colonies are on Howland, Baker, and Jarvis Is; however, a significant portion of the population nest on the NWHI. Breeding adults are mostly sedentary and immatures disperse throughout the tropical seas.<sup>4,5</sup> Birds forage in offshore and pelagic waters. They are most abundant in the vicinity of breeding islands, but they can be encountered far out at sea.<sup>4</sup> During nonbreeding periods, adults may visit sites 1,000-2,000 km from breeding colonies.<sup>6,7,8</sup>

The world population is widely distributed, and therefore difficult to estimate but is thought to be several hundred thousand birds.<sup>1</sup> Within the USPI, there are approximately 8,300 breeding pairs with 1,200 pairs on Jarvis I. and over 1,500 pairs each on Howland and Baker Is.<sup>9</sup> Approximately 2,500 pairs occur in the Hawaiian Is, most in the NWHI.<sup>10</sup> In the Mariana Is., approximately 700 pairs breed on Farallon de Medinilla (FDM), Uracus, Guguan, and Maug.<sup>11,12</sup> Wake Atoll was recently recolonized by bird banded at Johnston. Small colonies also occur in American Samoa and Palmyra.<sup>4,13,14</sup> Population trends in the USPI appear stable with increasing numbers on Wake, Howland, and Baker Is.

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
2	yes	1	44d	120d	aseasonal	scrape	plunge dive	pelagic

### Ecology

MABO breed on oceanic islands and atolls. They tend to nest on open ground often near a cliff edge or on low sandy beaches or rocky ground.<sup>1,15</sup> Breeding is fairly synchronous, but timing varies depending on locality.<sup>15</sup> MABO are sexually dimorphic; females weigh slightly more than males and the males' bills are a richer, brighter yellow than the females' during breeding.<sup>1,15</sup> Sexes are most easily distinguished by voice with males producing a thin whistle and females having a loud, honking voice.<sup>1,2</sup> MABO are monogamous and at least 45% of pairs on Kure retained their mates through a second breeding season.<sup>16</sup> Two eggs are laid, but broods are typically reduced to one chick by siblicide. Adults continue to feed young after they fledge, up to six months in some extreme cases.<sup>15</sup> Juveniles remain in immature plumage until full adult plumage develops at 20 months.<sup>2</sup> Sexual maturity begins around 3-4 years and most birds return to their natal colony to

breed.<sup>1,16,17</sup> Adults sometimes take a rest year between breeding attempts.<sup>2,15</sup>

MABO form "clubs" or aggregations of non-breeding birds on the fringe of breeding colonies.<sup>2</sup> MABO feed by plunge-diving and can be found feeding more than 150 km from land.<sup>15</sup> They are often solitary feeders, but most commonly found feeding in flocks with other species associated with schooling tuna. In Hawaii, flyingfish were the most important prey but diets also included squid and adult mackerel scad.<sup>15</sup> The oldest-known bird was 23 years. On Kure, annual adult mortality <8.6%; mortality between independence and age four is 72%.<sup>17</sup>

### **Conservation Concerns and Activities**

Habitat destruction, disturbance, introduced predators, and feral ungulates limit populations. MABO breed on islands with human populations but they are exceptionally vulnerable to human disturbance.<sup>1,5</sup> Introduced predators such as rats and cats have negatively impacted populations.<sup>15</sup> Eradication of feral cats from Howland and Baker Is, resulted in the rebound of populations. Navy bombing affects populations on Farallon de Medinilla. Overfishing of tuna could potentially have an impact on the availability of prey.<sup>15</sup> Commercial-size mackerel scad is important in the diet of MABO, and potential effects of commercial fisheries are unknown.<sup>15</sup> El Niño-Southern Oscillation conditions can cause breeding failure in the Central Pacific.<sup>5</sup>

**References:** 1. Anderson 1993; 2. Nelson 1978; 3. Clements 2000; 4. King 1967; 5. Carboneras 1992; 6. Clapp and Wirtz 1975; 7. Nelson 1978; 8. O'Brien and Davies 1990; 9. Forsell 2002; 10. Harrison *et al.* 1984; 11. Reichel 1991; 12. Lusk *et al.* 2000; 13. Banks 1992; 14. Rauzon and Everett in prep; 15. Harrison 1990; 16. Kepler 1969; 17. Woodward 1972.

### **Prioritized Conservation Actions**

1. Limit human disturbance to colonies.
2. Eradicate cats and rats on Wake and Palmyra and elsewhere in USPI where MABO occur.

### **Regional Contacts**

Robert Pitman - NOAA-Fisheries, Southwest Fisheries Center, San Diego  
Beth Flint - USFWS, Pacific Remote Islands NWR Complex, Honolulu, HI

## Brown Booby *Sula leucogaster*

STATUS: Federal: None    State: None    IUCN: None    NAWCP: HC/MC.

### Distribution, Population Status and Trends

Brown Boobies (BRBO) have a pantropical distribution. There are four subspecies; *S. l. plotus* breed on islands in the central and western Pacific.<sup>2</sup> Within the USPI, BRBO occur in the greatest numbers in the Hawaiian Is. Breeding adults are mostly sedentary and immatures disperse throughout the tropical seas.<sup>4,5</sup> They are distributed more nearshore than Masked and Red-footed Boobies and they are rarely seen >80 km from the nearest land.<sup>3</sup> Little is known of movements during nonbreeding periods, however, adults have been found up to 2,900 km from breeding sites.<sup>1</sup>

Worldwide, the number of BRBO is estimated at 221,000 - 275,000 pairs; 50,000 - 70,000 pair of *S. l. plotus*.<sup>1</sup> About 3,200 pairs nest in the USPI. Approximately 900, 750, and 700 pairs occur in Hawaii, the Marianas, and American Samoa, respectively. Smaller colonies exist on Palmyra, Howland, Baker, Jarvis, Wake, and Johnston islands. The world population has declined dramatically over the past 200 years and possibly only 1-10% of historic populations remain.<sup>1</sup> Currently, the USPI population appears stable with populations on Wake, Howland, and Baker islands gradually rebounding following eradication or control of feral cats.

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
2	yes	1-2	43d	85-105d	aseasonal	surface	plunge dive	nearshore

### Ecology

BRBO breeding range overlaps with that of Masked and Red-footed Boobies on oceanic islands and atolls.<sup>4,5</sup> Nesting occurs on flat ground often on cliff ledges, but they will also nest on sandy islands and bare coral atolls.<sup>1</sup> Nests vary from a scrape in the sand to a fairly well-formed pile of twigs and grasses. Breeding is synchronous, but timing varies depending on locality and occurs throughout the year.<sup>1</sup> Sexes are dimorphic, with females significantly larger than males and males have gray-blue skin around the eyes.<sup>1,4</sup> Sexes are also distinguishable by voice; males produce a high-pitched whistle and females a low, honk.<sup>1</sup> BRBO are monogamous but maintenance of long-term pair bonds varies by location.<sup>1</sup> Pairs lay 2 eggs, but brood is often reduced to 1 chick as

a result of siblicide.<sup>1</sup> Post-fledgling care varies considerably from a little over a month, up to 37 weeks.<sup>1,6</sup> Juveniles remain in immature plumage for 2 years. Age of first breeding is typically 4-5 years.<sup>1,5</sup>

BRBO feed by plunge-diving and feeding is often solitary, but they may be found in feeding flocks with other species.<sup>1,5</sup> They forage in nearshore waters, ranging from 8-70 km from land, and feed mostly on flyingfish, squid, mackerel scad, juvenile goatfish, and anchovy.<sup>5,7</sup> The oldest-known bird was 26 years, but they probably live to at least 30 years.<sup>1,8</sup> Adult survivorship was 93.2% at Kure.<sup>10</sup> On Johnston, survival from fledging to breeding ranged from 30-40% in an 18-year study.<sup>1</sup>

## Conservation Concerns and Activities

Habitat destruction, disturbance, introduced predators, and feral ungulates limit populations. A major threat to BRBO has been the loss of habitat to development and human disturbance; newer pairs especially vulnerable at the beginning of the breeding season.<sup>1</sup> Introduced predators such as feral cats and rats have negatively impacted populations.<sup>5</sup> The recent eradication of feral cats on Baker, Howland, and Jarvis Is. will hopefully result in long-term increases. In the Mariana Is., BRBO are subject to live bombing conducted on Farallon de Medinilla by the U.S. military. At Johnston Atoll birds are killed by recreational troll fishers and this may be a problem in other areas also. In American Samoa, hunting pressure on BRBO was high during historic times and may still occur today.<sup>9</sup> El Niño-Southern Oscillation events can cause breeding failure in the Pacific.<sup>1,11</sup>

**References:** 1. Schreiber and Norton 2002; 2. Clements 2000; 3. King 1967; 4. Carboneras 1992; 5. Harrison 1990; 6. Nelson 1978; 7. Harrison *et al.* 1983; 8. Simmons 1967; 9. Amerson *et al.* 1982; 10. Tershy 1998; 11. Woodward 1972.

## Prioritized Conservation Actions

1. Limit human disturbance to colonies.
2. Eradicate feral cats and rats on Wake, Palmyra, and elsewhere in the USPI.
3. Investigate the effects of commercial and recreational fisheries on BRBO.

## **Regional Contacts**

Elizabeth Schreiber - National Museum of Natural History, Smithsonian Institution.

Beth Flint - USFWS, Pacific Remote Islands NWR Complex, Honolulu, HI

**DRAFT**

## Red-footed Booby (White Booby) *Sula sula*

STATUS: Federal: None    State: None    IUCN: None    NAWCP: HC/MC.

### Distribution, Population Status and Trends

Red-footed Boobies (RFBO) have a pantropical distribution, that overlaps Masked and Brown Boobies.<sup>1,2</sup> There are three subspecies; *S. s. rubripes* breed in the central and western Pacific.<sup>3</sup> RFBO nest throughout the USPI. At-sea distribution is pelagic; feeding flocks occur hundreds of kilometers from land.<sup>4</sup> Breeding adults are mostly sedentary with immatures roosting in and around colonies on islands other than their natal island.<sup>1,4</sup> Little is known about adult movements outside of the nesting season.<sup>1</sup>

The world population was estimated at <300,000 pairs in 1996.<sup>1</sup> In the USPI, there are approximately 19,000 pairs. The largest colonies occur on Palmyra (6,250 pairs) and the Hawaiian Is. (6,000 pairs).<sup>5</sup> Approximately 2,600 and 2,000 pairs nest in the Mariana Is. and American Samoa, respectively. Smaller colonies exist on Howland, Baker, Jarvis, Johnston, and Wake.<sup>6,7,8</sup> The world population has been severely reduced over the last two centuries.<sup>1</sup> The USPI population appears stable with an increasing trend for Hawaii. Numbers have decreased in the Mariana Is, particularly on FDM.<sup>14,15</sup>

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	yes	1	45d	100-140d	aseasonal	stick	plunge	pelagic

### Ecology

RFBO, the smallest booby species, breeds on oceanic islands and atolls.<sup>1,2</sup> Unlike Masked and Brown Boobies, they roost and nest on shrubs and trees, but they will utilize bare ground, cinder blocks, or low piles of vegetation.<sup>1,2,4</sup> Nests are made of twigs, grass, and other vegetation. Breeding is fairly synchronous but occurs throughout the year, and timing varies by locality.<sup>1,4</sup> Several color phases exist, ranging from all brown to all white.<sup>1,11</sup> In the Hawaiian Is., RFBO are almost exclusively white morphs. On other islands in the USPI, they are also mostly white morphs, although intermediate plumages do occur.<sup>4,11</sup> RFBO are sexually dimorphic; females tend to be larger than males and males have a lime green or bluish patch near the eyes prior to breeding. They are monogamous and generally retain their mates throughout subsequent breeding

seasons.<sup>1</sup> They lay 1 egg and continue to feed the young 1-2 months after fledging.<sup>1,2</sup> Sexual maturity begins around 3-4 years and most birds return to their natal colony to breed.<sup>1,4</sup> Adults usually breed every year but sometimes take a “rest” year.<sup>1,4</sup>

In Hawaii, RFBO feed mainly on flyingfish and squid, taking a larger proportion squid than other boobies.<sup>9</sup> Other prey items include mackerel scads, saury, and anchovies.<sup>4</sup> RFBO often depart the colony to feed well before daylight but most return to roost on the colony at night.<sup>2,4</sup> RFBO feed by plunge-diving and are solitary feeders, but may be found foraging in flocks with other species. They forage further from land than other boobies, except possibly the Masked Booby.<sup>11</sup> Annual adult survival was estimated at 90% in a 2-year study at French Frigate Shoals.<sup>12</sup> On Johnston Atoll, survival of chicks to breeding ranged from 27-52% depending on year.<sup>1</sup> The oldest-known living bird was 22 years.<sup>13</sup>

## Conservation Concerns and Activities

Habitat destruction, disturbance, introduced predators, and feral ungulates limit populations. Introduced predators such as the mongoose, cats, and rats have negatively impacted populations.<sup>1,2,4</sup> A major factor affecting populations is habitat loss and disturbance due to development and introduced species (*e.g.*, ungulates, woodrose vine). Destruction of large areas of mangrove forests in the Mariana Is. and American Samoa may have once been important habitat for RFBO. In the Mariana Islands on Farallon de Medinilla, live bombing conducted by the U.S. military have contributed to the destruction of nesting habitat.<sup>14,15</sup> On Maug, the exotic woodrose vine, is overwhelming nest sites.<sup>16</sup> Introduced scale insects at Rose and Palmyra atolls are threatening the *Pisonia* forests. Research will be initiated in 2004 at Palmyra to look at potential mechanisms for control or eradication. On the main Hawaiian Is., habitat has been restored and protected at several locations and RFBO numbers are increasing. At one of these sites on O’ahu, on lands managed by the U.S. Marine Corps, nesting sites are subject to wild fires fueled by invasive vegetation.<sup>17</sup> Human predation on adults, chicks, and eggs occurs within the Mariana Is. and American Samoa.<sup>16,18</sup> El Niño-Southern Oscillation conditions can cause total or partial breeding failure in some locations by rendering prey unavailable.<sup>19,20</sup>

**References:** 1. Schreiber *et al.* 1996; 2. Carboneras 1992; 3. Clements 2000; 4. Harrison 1990; 5. Harrison *et al.*

1984; 6. Reichel 1991; 7. Amerson and Banks 1982; 8. Forsell 2002; 9. Harrison *et al.* 1983; 10. Au and Pitman 1986; 11. Nelson 1978; 12. Hu 1991; 13. Clapp *et al.* 1982; 14. Whistler 1996; 15. Lusk 2000; 16. Pratt 1985; 17. Rauzon and Drigot 1999; 18. Amerson *et al.* 1982; 19. Shreiber and Shreiber 1989b; 20. Schreiber 1994.

## **Prioritized Conservation Actions**

1. Limit human, feral ungulate, and other disturbance to colonies.
2. Eradicate or control feral cats, dogs, rats, and other introduced predators at or near colonies.
3. Investigate techniques to eradicate or control woodrose vine on Maug.
4. Work with USGS and other partners to investigate control or eradication techniques to address the threat to tropical rainforests, from introduced scale insects and ants.

## **Regional Contacts**

Mark Rauzon - Marine Endeavors, Oakland, CA

Beth Flint - USFWS, Pacific Remote Islands NWR Complex, Honolulu, HI

Lisa Ballance - NOAA-Fisheries, Southwest Fisheries Center, San Diego

Robert Pitman - NOAA-Fisheries, Southwest Fisheries Center, San Diego

**DRAFT**

## Great Frigatebird (Iwa, Man o' War Bird) *Fregata minor*

STATUS: Federal: None    State: None    IUCN: None    NAWCP: MC/MC.

### Distribution, Population Status and Trends

Great Frigatebirds (GRFR) have a pantropical distribution which overlaps with Lesser Frigatebirds.<sup>1</sup> There are five subspecies; *F.m. palmerstoni* breed on isolated islands in the western and central Pacific.<sup>2</sup> GRFR nest throughout the USPI and the largest colonies are located in Hawaii. At sea, birds can be found any distance from land, but they are most abundant within 80 km of breeding and roosting sites.<sup>3</sup> Adults are mostly sedentary but immatures and nonbreeders disperse widely throughout the tropical seas.<sup>9</sup>

The world population is estimated at 500,000-1,000,000 birds.<sup>1</sup> Approximately 20,000 birds nest in Hawaii.<sup>4</sup> Smaller colonies exist on the other USPI islands including two small colonies in the Mariana Is. on Maug and Farallon de Medinilla (FDM).<sup>5</sup> Population trends in the USPI appear stable, except on FDM.<sup>6,7</sup> On Howland, Baker, and Jarvis, population levels have rebounded due to the eradication of feral cats.

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	yes	1	55d	140d	aseasonal	stick	surface dipping	pelagic

### Ecology

GRFR breed on remote, small islands building stick platform nests in bushes, mangroves, or on low vegetation. GRFR nest on the ground at Howland, Baker, and Jarvis Is. Breeding occurs throughout the year depending on locality, with preference shown egg laying in the dry season.<sup>1</sup> GRFR are sexually dimorphic; females tend to be 25% heavier than males and males display an inflated scarlet gular pouch early in the breeding season.<sup>1</sup> GRFR are monogamous, but it is extremely rare that a pair will remain together for subsequent breeding attempts.<sup>1</sup> Females breed biannually, sometimes every 3-4 years.<sup>1,8</sup> Post-fledging care, which continues for 5-18 months, is provided by females. Sexual maturity begins around 8-10 years and most birds return to the natal colony to breed.<sup>1</sup>

Frigatebirds are highly specialized for aerial existence but tiny feet and reduced legs are useless

for walking or swimming.<sup>3</sup> They have extremely low wing-loading and exhibit quick maneuverability in flight.<sup>10</sup> They do not rest on the water or plunge in pursuit of prey, but can spend extended periods 'on the wing'.<sup>1,10</sup> Their diet consists mostly of flyingfish and squid which they capture at or above the water's surface.<sup>8,11</sup> Frigatebirds are notorious for kleptoparasitism, but most of their food is obtained by fishing.<sup>8,11</sup> They feed in waters >22°C in the pelagic zone, usually in mixed flocks over tuna schools.<sup>1,3</sup>

## Conservation Concerns and Activities

Habitat destruction, disturbance, and introduced predators limit populations. Introduced predators such as rats and feral cats can have devastating effects.<sup>9</sup> In the past, Polynesian rats have caused total nest failures on Kure.<sup>9</sup> On Howland, Baker, and Jarvis, the recent eradication of feral cats resulted in the rebound of population levels for both GRFR and LEFR on these islands.

Approximately 500 birds, predominantly immatures, roost on Wake.<sup>8</sup> Recent efforts to eradicate cats at Wake are very promising, and GRFR may also be nesting at Wake (M. Rauzon pers. comm.). GRFR were extirpated as a breeding species from Wake by feral cats. The small colony on FDM has been negatively impacted by live bombing conducted by the U.S. military on the island.<sup>7</sup> Over-fishing of tuna could potentially have an impact on the availability of prey. El Niño-Southern Oscillation conditions can cause breeding failure in the Central Pacific.<sup>1</sup>

**References:** 1. Orta 1992b; 2. Clements 2000; 3. King 1967; 4. Harrison *et al.* 1984; 5. Stinson 1995; 6. Croxall *et al.* 1984; 7. T. de Cruz, pers. comm. 8. Rauzon and Everett in prep; 9. Harrison 1990; 10. Weimerskirch *et al.* 2003; 11. Harrison *et al.* 1983.

## Prioritized Conservation Actions

1. Eradicate cats and rats on Wake I. and elsewhere within the USPI.

## Regional Contact

Don Dearborn - University of Texas, Austin, TX

Beth Flint - USFWS, Pacific Remote Islands NWR Complex, Honolulu, HI

## Lesser Frigatebird *Fregata ariel*

STATUS: Federal: BCC 68 State: None IUCN: None NAWCP: HC/HC.

### Distribution, Population Status and Trends

Lesser Frigatebirds (LEFR) have a pantropical distribution which coincides, but is smaller than that of Great Frigatebirds.<sup>1,2</sup> LEFR comprise three subspecies; *F. a. ariel* breed in the western and central Pacific. Within the USPI, the largest colonies occur on Baker, Howland, and Jarvis.<sup>3</sup> At sea, birds are most abundant within 80 km of breeding and roosting islands, although they can be found any distance from land.<sup>4</sup> Immatures and non-breeders disperse throughout tropical seas.<sup>5</sup>

The world population is estimated at several hundred thousand birds.<sup>1</sup> Within the USPI, there are at least 10,000 pairs of breeding birds with approximately,<sup>8</sup> 100, 1,925, and 800 pairs on Baker, Howland, and Jarvis, respectively.<sup>3</sup> Smaller colonies exist at American Samoa.<sup>6</sup> LEFR are absent as a breeding subspecies from the Marianas, Johnston, and Wake. Nonbreeding birds have been recorded as rare visitors in Hawaii<sup>7</sup>; they do not breed here except for a bird that hybridized with GRFR at Tern Is. Within the USPI, the LEFR population appears stable, with population levels increasing on Baker, Howland, and Jarvis due to the recent eradication of feral cats.

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	yes	1	45d	140d	aseasonal	stick	surface dipping	pelagic

### Ecology

Breeding takes place on small, remote tropical islands. Nests are stick platforms on trees and bushes.<sup>1</sup> However, when suitable vegetation is not available birds nest on bare ground. Breeding occurs throughout the year at different localities with some preference for nesting in the dry season.<sup>1</sup> LEFR are sexually dimorphic with females tending to be 25% heavier than males and males displaying an inflated scarlet gular pouch early in the breeding season.<sup>1</sup> They are monogamous, but it is unlikely that pairs remain together for future breeding attempts.<sup>1</sup> Females can only breed successfully every 2-3 years since post-fledging care is provided by the female and can last 4-6 months. Age to sexual maturity is unknown<sup>1</sup> but probably similar to GRFR of 8-10 years. LEFR return to their natal colony to breed.<sup>1</sup>

Frigatebirds are highly specialized for aerial existence with a low wing-load that enables them to be among the nimblest of fliers.<sup>1,8</sup> Their legs and feet are stunted and useless for walking or swimming.<sup>4</sup> They do not rest on the water or plunge in pursuit of prey, but can spend long periods 'on the wing' when there is sufficient wind.<sup>8,9</sup> They feed in waters >22°C in the pelagic zone, usually in mixed flocks over tuna schools.<sup>1,4</sup> Their diet consists primarily of flyingfish and squid which they capture at or above the water's surface.<sup>9</sup> Frigatebirds are notorious for kleptoparasitism, but obtain most of their food by direct capture.<sup>9,10</sup>

## Conservation Concerns and Activities

Immediate threats facing LEFR are introduced predators, human disturbance, and habitat destruction. Feral cats decimated LEFR breeding populations on Howland and Baker and cat eradication programs implemented by USFWS have resulted in the recovery of frigatebird populations on these islands. Over-fishing of tuna could potentially have an impact on the availability of prey. El Niño-Southern Oscillation conditions can cause partial or total breeding failure.<sup>1</sup>

**References:** 1. Orta 1992a; 2. Clements 2000; 3. Forsell 2002; 4. King 1967; 5. Harrison 1990; 6. Amerson and Banks 1992; 7. Pratt *et al.* 1987; 8. Weimerskirch *et al.* 2003; 9. Nelson 1975; 10. Harrison *et al.* 1983.

## Prioritized Conservation Actions

1. Eradicate cats and rats on USPI where LEFR occur or could potentially breed *e.g.*, Wake.

## Regional Contacts

Dearborn, D. - University of Texas, Austin, TX

Beth Flint - USFWS, Pacific Remote Islands NWR Complex, Honolulu, HI

## Red-tailed Tropicbird (Silver Bo'sunbird) *Phaethon rubricauda*

STATUS: Federal: None    State: None    IUCN: None    NAWCP: MC/MC.

### Distribution, Population Status and Trends

Red-tailed Tropicbirds (RTTR) have an Indo-Pacific distribution which coincides with, but is smaller than, White-tailed Tropicbirds, running between 35° N and 30° S.<sup>1,2,3</sup> There are four subspecies; *P. r. melanorhynchos* breed in the central and western Pacific.<sup>4</sup> The largest USPI breeding colonies occur in the NWHI.<sup>5</sup> Breeding adults are mostly sedentary; however, they avoid land when not breeding and are among the most pelagic and solitary of seabirds.<sup>1,5,6</sup> At sea, RTTR are evenly distributed throughout their range.<sup>1,7</sup> Little is known about their movements outside the breeding season.

World population is estimated at 17,000-21,00 pairs; with an estimated 12,000-14,000 pairs in the Pacific.<sup>1,3</sup> Within the Hawaiian Is., approximately 9,000-12,000 pairs are distributed primarily throughout the NWHI, with large concentrations on Midway and Laysan Is.<sup>5</sup> On Johnston I., there are approximately 1,900 pairs.<sup>8</sup> Smaller colonies exist in American Samoa, Palmyra, Johnston, Wake, Jarvis, Howland, Baker, and the Mariana Is. The world population seems stable in many areas and may be increasing in some areas; however, there is a lack of information on past population estimates so comparisons are difficult.<sup>1</sup> Within the USPI, the RTTR population appears stable overall with increasing populations on Johnston and possibly Midway.

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	yes	1	42-46d	67-91d	aseasonal	scrape	plunge dive	pelagic

### Ecology

RTTR breed mainly on oceanic islands and coral atolls. They tend to nest on the ground under vegetation in the understory of trees and less commonly in cavities of cliff faces.<sup>1,2</sup> Nests are scrapes that vary from a shallow depression in the sand to more elaborate structures consisting of twigs and leaves.<sup>1,5,9</sup> Breeding occurs annually, but timing varies depending on locality.<sup>1,5</sup> RTTR are monomphic, however, males tend to be slightly larger than females.<sup>1,6</sup> They are monogamous and partners stay together for years, especially if they breed successfully.<sup>5</sup> RTTR lay a single egg.<sup>1,2</sup> Chicks are semi-altricial (unique among Pelecaniformes) and covered with

down when they first hatch.<sup>1,10</sup> Adult feeding of chicks usually takes place midday between 1000 and 1400; none occur between dusk and dawn.<sup>1</sup> There is no post-fledgling care. Juveniles remain in immature plumage, all white with black bars and spot-like markings except on the throat and belly, until two years old.<sup>1</sup> First breeding usually occurs around two to four years.<sup>1,5</sup>

RTTR feed by plunge-diving. They feed singly most of the time; RTTR rarely feed among flocks but have been occasionally seen with flocks of Sooty Terns or shearwaters.<sup>3,5</sup> RTTR are attracted to ships presumably because flyingfish, their main prey, are scattered by ships.<sup>6</sup> In Hawaii, other prey include squid, mackerel scad, dolphinfish, truncated sunfish, and balloonfish.<sup>5,6</sup> The oldest-known living bird was 23 years.<sup>11</sup>

## Conservation Concerns and Activities

Habitat destruction, introduced predators, and feral ungulates limit populations. Introduced predators such as rats have severely impacted populations throughout USPI. Most RTTB that bred along the coast of Kaua'i have been eliminated, except for those that nest in cliffs that are inaccessible to most rats.<sup>5</sup> On Kure and Midway, rats have diminished populations.<sup>5</sup> On Midway, rats also destroyed native vegetation which is used by RTTB for nesting.<sup>12</sup> However, rats were eradicated on both islands and USFWS improved habitat conditions on Midway by removing invasive introduced vegetation and restoring native vegetation. On Howland, Baker, and Jarvis Is., cats were recently eradicated and local RTTR populations should increase. Cat eradication at Wake is nearing completion. In the Mariana Is., feral ungulates such as pigs uproot vegetation and have contributed to the reduction of nesting habitat for RTTB and other ground-nesting seabirds.<sup>13</sup> El Niño-Southern Oscillation conditions can cause breeding failure in the Pacific.<sup>14</sup>

**References:** 1. Shreiber and Shreiber 1993; 2. Orta 1992; 3. Gould *et al.* 1974; 4. Clements 2000; 5. Harrison 1990; 6. Harrison *et al.* 1983; 7. King 1970; 8. Hayes, pers. comm. 9. Fleet 1974; 10. Baicich and Harrison 1997; 11. Klimkiewicz and Futches 1989; 12. Tyler 1991; 13. Reichel 1991; 14. Shreiber and Shreiber 1989.

## Prioritized Conservation Actions

1. Eradicate introduced predators on USPI where RTTR occur.
2. Limit feral ungulate disturbance to colonies.

## **Regional Contacts**

Elizabeth Schreiber - National Museum of Natural History, Smithsonian Institution.

**DRAFT**

## White-tailed Tropicbird (Bo'sunbird) *Phaethon lepturus*

STATUS: Federal: None    State: None    IUCN: None    NAWCP: HC/MC.

### Distribution, Population Status and Trends

WTTR have a pan-tropical distribution; however, they are absent from the East Pacific and East North Atlantic Oceans.<sup>1,2</sup> There are six subspecies; *P. l. dorothea* breed in central and western Pacific.<sup>3</sup> The largest USPI breeding colonies occur on American Samoa and Hawaiian Is. Breeding adults are mostly sedentary and forage widely over the pelagic seas, often at distances up to 120 km from nesting sites. Nonbreeding adults are rarely found on land and tend to disperse widely, but distances and direction of dispersal is largely unknown.<sup>1,4</sup>

World population is difficult to estimate because of remoteness of many nesting islands, but probably is less than 200,000 breeding pairs.<sup>4</sup> Among the USPI, American Samoa holds the largest population of WTTR, which is estimated to be approximately 1,900 pairs. Within the Hawaiian Is., except for the odd pair or two nesting on Midway, WTTR do not breed in the NWHI but breed in the main Hawaiian Is.<sup>2</sup> The Hawaiian population is estimated to be approximately 1,800 pairs. Smaller colonies exist on Palmyra, Wake, and the Mariana Is. The world population is considered generally stable or slightly declining.<sup>4</sup> Within the USPI, population status is unknown.

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	yes	1	41d	77d	year-round	tree, cliff	plunge dive	pelagic, near-shore

### Ecology

WTTR breed on oceanic islands and offshore islets.<sup>1,2,4</sup> They prefer to nest in inaccessible spots on cliffs, but also nest in caves and tree hollows.<sup>4</sup> Nests have little to no material. Breeding occurs annually, but timing varies depending on locality.<sup>4</sup> WTTR are monomorphic. They are monogamous and partners stay together for years, especially if they breed successfully.<sup>2,4</sup> Clutch size is one egg; and chicks are semi-altricial (unique among Pelecaniformes) and covered with down when they hatch.<sup>1,5</sup> There is no post-fledgling care. Juveniles remain in immature plumage, yellow bill and head- and body-feathers primarily white with black barring, until the third year.<sup>1,6</sup> Few data are available on age of first breeding but may occur at four years old.<sup>2</sup>

WTTR feed primarily by plunge-diving but sometimes catch prey 'on the wing'.<sup>2,4</sup> They are highly pelagic and solitary feeders, but they sometimes congregate in small feeding groups.<sup>4</sup>

WTTR tend to follow ships in pursuit of flyingfish, their main prey item, that are scattered by

ships. In Hawaii, WTTR also feed on squid, mackerel scad, balloonfish, and crustaceans.<sup>2</sup> Life span is unknown, but they probably experience similar longevity to the closely related red-tailed Tropicbird of approximately 23 years.<sup>4,7</sup>

## **Conservation Concerns and Activities**

The main threats to WTTR are introduced predators and possibly disease. Introduced predators such as rats have severely impacted populations throughout the USPI; thus, availability of predator-free nest sites appear to be the single most important factor regulating WTTR populations.<sup>4</sup> On Guam, populations are probably extirpated due to predation by the brown tree snake.<sup>8</sup> Disease may be the cause of a dramatic population decline on O'ahu, however, more research is needed to confirm this.<sup>2</sup> WTTR nesting in Kilauea Crater on Hawaii are sometimes overcome by fumes during eruptions and fall into the molten lava.<sup>2</sup> Because WTTR primarily nest on inaccessible cliffs, monitoring and research of this species is difficult.

**References:** 1. Orta 1992; 2. Harrison 1990; 3. Clements 2000; 4. Lee and Wash-McGehee 1998; 5. Baicich and Harrison 1997; 6. Plath 1913; 7. Klimkiewicz and Futches 1989; 8. G. Wiles, pers. comm.

## **Prioritized Conservation Actions**

1. Eradicate rats and other introduced predators where WTTR occur.
2. Develop and implement survey protocols to assess and monitor populations.

## **Regional Contacts**

## Sooty Tern *Sterna fuscata*

STATUS: Federal: None    State: None    IUCN: None    NAWCP: MC/MC.

### Distribution, Population Status and Trends

Sooty Terns (SOTE) have a pantropical distribution.<sup>1,2,3</sup> There are eight subspecies; *S. f. oahuensis* breed in the central and south Pacific.<sup>1,2</sup> The USPI support significant populations with the largest colonies (>1 million) on Baker, Jarvis, Laysan, and Lisianski Is.<sup>4</sup> Breeding adults remain relatively close to colonies and forage up to 500 km from breeding islands.<sup>5,6</sup> During nonbreeding periods, they are highly pelagic and tend to avoid regions with cold-water upwelling.<sup>1,3</sup> Immatures disperse widely after fledging and remain at sea, sometimes not touching land for several years.<sup>3</sup>

The worldwide population is estimated to range from 18-23 million pairs.<sup>1</sup> In the USPI, there are approximately 3.2 million pairs, which includes 1.3 million in the Hawaiian Is. Other large colonies (>100,000 pairs) exist on Rose Atoll (American Samoa), Johnston, Wake, and Uracus (CNMI). Worldwide and USPI population trends appear stable.<sup>7</sup>

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	yes	1	30d	50d	aseasonal	scrape	surface dipping	pelagic

### Ecology

SOTE nest on oceanic islands and atolls in large dense colonies.<sup>1,3</sup> There are usually several subcolonies and each subcolony breeds very synchronously. SOTE tend to nest on the ground in sandy substrate with sparse vegetation.<sup>3</sup> They are monogamous and return to the same location to breed during subsequent years.<sup>3</sup> Clutch size is 1 egg, and when egg loss occurs early in the breeding season they will reneest.<sup>3</sup> SOTE continue to feed their young at least 2 weeks after fledging, but postfledging care may last longer.<sup>3,6</sup> They are monomorphic and rarely settle on water because their plumage quickly becomes waterlogged. Immature plumage is dark and immatures probably do not acquire adult plumage until their fourth year.<sup>3,8</sup> Sexual maturity begins around 4-10 years old.<sup>3,9</sup>

SOTE, the most pelagic of the tropical terns,<sup>10</sup> feed mainly by aerial-dipping, contact-dipping, and aerial capture, although occasionally by plunge-diving.<sup>1,3,4</sup> SOTE tend to feed in large flocks with other species in association with predatory fishes, such as yellowfin and skipjack tunas.<sup>3,4,7</sup> In Hawaii, they feed mainly on squid, goatfish, flyingfish, and mackerel scad.<sup>11</sup> The oldest-known

bird was 32 years.<sup>4</sup>

## Conservation Concerns and Activities

Introduced predators such as rats and cats have negatively impacted populations.<sup>4</sup> The eradication of cats and rats from Midway, Kure, Jarvis, Howland, and Baker should result in population increases at these locations. At French Frigate Shoals, cattle egrets take chicks.<sup>7</sup> Native predators such as Great Frigatebirds, Black-crowned Night Herons, Ruddy Turnstones, and Laysan Finches take chicks and eggs.<sup>3,4</sup> SOTE is vulnerable to oil pollution from tankers and spills. Over-fishing of tuna could potentially have an impact on the availability of prey.<sup>3</sup> El Niño-Southern Oscillation conditions can cause breeding failure in the Pacific.<sup>12</sup>

**References:** 1. Gochfeld and Burger 1996; 2. Clements 2000; 3. Schreiber *et al.* 2002; 4. Harrison 1990; 5. Flint 1991; 6. Gould 1974; 7. USFWS 1983; 8. Clancey 1977; 9. Harrington 1974; 10. King 1967; 11. Harrison *et al.* 1983; 12. Shreiber and Shreiber 1989.

## Prioritized Conservation Actions

1. Eradicate introduced rats, mice, and cats on USPI (*e.g.*, Palmyra, Wake (underway), and islets off main Hawaiian Is.).

## Regional Contacts

Beth Flint - USFWS, Pacific Remote Islands NWR Complex, Honolulu, HI

Elizabeth Schreiber - National Museum of Natural History, Smithsonian Institution.

## Gray-backed Tern (Spectacled Tern) *Sterna lunata*

STATUS: Federal: None    State: None    IUCN: None    NAWCP: MC/MC.

### Distribution, Population Status and Trends

Gray-backed Terns (GRAT) are endemic to the tropical and subtropical Pacific, but are most common in the central Pacific.<sup>1,2</sup> Within the USPI, the largest colonies are in the NWHI on Lisianski, Nihoa, and Laysan. Breeding adults are mostly sedentary and forage up to 370 km from land.<sup>2,3</sup> During nonbreeding periods, they are highly pelagic and occur far from breeding colonies, but their range is unknown.<sup>1</sup> At sea, GRAT are found in highly saline waters.<sup>4</sup> Immatures travel great distances after leaving the natal colony, however, limited data exist on exact movements.<sup>1</sup>

The world population size is unknown, but possibly on the order of 70,000 pairs.<sup>1</sup> Lack of adequate information on breeding phenology in many areas complicates estimates.<sup>1</sup> In the USPI, there are approximately 48,000 pairs, with 44,000 in Hawaii, 1,200 in the Mariana Is., and 1,000 pairs each on Howland and Baker. Smaller colonies occur on American Samoa, Johnston, and Jarvis. Worldwide trend is difficult to assess, given the lack of knowledge of past and present distribution and population sizes; however, the world population probably declined since a few populations have become extinct or declined.<sup>1</sup> In the USPI, the population appears stable but historical declines occurred at Howland, Baker, Jarvis, and Midway due to introduced predators.

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	yes	1	30d	50d	aseasonal	scrape	hover dipping	pelagic

### Ecology

GRAT breed on remote islands and atolls.<sup>1</sup> They tend to nest on rocky ledges of cliffs or sandy beaches often along vegetated edges bordering open areas.<sup>5,6</sup> On Midway and Kure, GRAT also nest along airport runways.<sup>7</sup> Their nests are simple, shallow depressions often in sand or gravel. Breeding is not highly synchronous and occurs throughout the year.<sup>8</sup> GRAT are monomorphic, but females are smaller in size than males.<sup>1</sup> Juveniles resemble adults, but have a mostly gray dorsal surface, white underparts, and forehead; they often appear "scaly" because of light fringes on their gray feathers. Age at which adult plumage is attained is unknown. The clutch is 1 egg and chicks are semi-precocial when hatched.<sup>1</sup> Adults continue to feed fledglings for an unknown period of time. Fledglings may remain at the colony up to 6 weeks after first flight.<sup>2</sup>

GRAT feed mainly by plunge-diving or contact/hover-dipping. They are described as an inshore, offshore, or pelagic feeder due to the geographical and seasonal differences in foraging habitat.<sup>1</sup> In Hawaii, their main prey is fish: five-horned cowfish, juvenile flyingfish, goatfish, round herrings, and dolphinfish.<sup>2</sup> GRAT also eat squid, crustaceans, mollusks, and marine and terrestrial insects.<sup>2</sup> GRAT can be found foraging in mixed flocks, especially with Sooty Terns and sometimes with Wedge-tailed Shearwaters.<sup>9</sup> The oldest-known GRAT was 25 years.<sup>1</sup>

## Conservation Concerns and Activities

Habitat destruction, disturbance, and introduced predators limit populations. In the USPI, their gravest threat is predation by introduced mammals such as rats and cats.<sup>2,7,10</sup> With the eradication of cats on Howland, Baker, and Jarvis, populations have been recovering. Predation by rats and habitat destruction caused GRAT to disappear from Sand I., Midway Atoll; however, after rat eradication, they have recolonized. GRAT are sensitive to disturbance, leaving their eggs when humans approach.<sup>2</sup> If disturbed, eggs and chicks are vulnerable to exotic and native predators such as Ruddy Turnstones, Bristle-thighed Curlews, Laysan and Nihoa Finches, and Great Frigatebirds.<sup>1</sup> Because GRAT tend to nest near the surf zone, nests are often lost to high tides.<sup>1,2</sup> On Kure and Johnston, collisions with guy wires of antenna systems have caused mortality.<sup>11</sup>

**References:** 1. Mostello *et al.* 2000; 2. Harrison 1990; 3. Dixon and Starrett 1952; 4. Ainley and Boekelheide 1983; 5. Amerson 1971; 6. Ely and Clapp 1973; 7. Woodward 1972; 8. USFWS, unpubl. data 9. Gould 1971; 10. Harrison *et al.* 1983; 11. Udvardy and Warner 1964.

## Prioritized Conservation Actions

1. Eradicate introduced rats, mice, and cats on USPI (*e.g.*, Palmyra, Wake (underway), and islets off main Hawaiian Is.).

## Regional Contacts

## Black Noddy (Hawaiian Noddy) *Anous minutus*

STATUS: Federal: None    State: None    IUCN: None    NAWCP: MC/MC.

### Distribution, Population Status and Trends

Black Noddies (BLNO) have a pantropical distribution.<sup>1,2</sup> There are seven recognized subspecies and at least three breed in the USPI: *A. m. melanogenys* in the Hawaiian Is., *A. m. marcusii* on Wake and throughout Micronesia, and *A.m. minutus* in Samoa.<sup>1,3</sup> There is some discussion whether the birds nesting in the NWHI are *melanogenys* or *marcusii*.<sup>1</sup> Breeding adults are mostly sedentary remaining at colonies year-round and foraging within approximately 80 km of nesting islands.<sup>1,4,5</sup> Immatures probably remain at breeding colonies or travel to a nearby roosting sites.<sup>1</sup> In Hawaii, adults and immatures exhibit inter-island movement; however, it is unknown what proportion of the population is involved and whether birds return to their natal colony.<sup>1</sup>

The world population is estimated to be 1,000,000 - 1,500,000 pairs.<sup>1</sup> In the USPI, there are approximately 22,400 pairs; about 12,000 pairs in the Hawaiian Is. The largest colonies are at Midway (6,000 pairs) and Nihoa (5,000 pairs). Smaller colonies exist on American Samoa, Palmyra, Johnston, Wake, and the Mariana Is. Worldwide population trends appear stable.<sup>1</sup>

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	yes	1	30d	60d	aseasonal	tree	surface dipping	nearshore

### Ecology

BLNO nest on oceanic and offshore islands.<sup>1</sup> In the main Hawaiian Is. they nest on sea cliffs and in caves; at other locations, they nest on trees and bushes.<sup>6,7</sup> Breeding is asynchronous and occurs on an annual or bi-annual cycle. In Hawaii, egg laying begins in Nov, peaks in Dec- Jan and continues through Jun.<sup>7</sup> Mate retention is high and pairs retain their territory from year to year, often reusing the same nest.<sup>1,8</sup> BLNO are capable of successfully nesting twice in one year and some lay a second egg while tending the first chick.<sup>1,9</sup> BLNO feed their young up to 17 weeks after fledging.<sup>1</sup> Juvenile plumage is similar to adult plumage but the white cap is more sharply demarcated.<sup>1</sup> Age at which adult plumage is attained is unknown. Sexual maturity begins around two to three years.<sup>1</sup>

BLNO feed by hover-dipping and contact-dipping, and typically in multispecies flocks over foraging schools of predatory fish, especially tunas and jacks.<sup>4</sup> They feed mainly inshore (<10 km from shore) and sometimes within a few meters of the shoreline.<sup>7,10</sup> BLNO eat fish almost

exclusively, specifically small Atherinidae, and very small amounts of squid and crustaceans.<sup>9</sup> In Hawaii, they concentrate on larval and juvenile forms of goatfish, lizardfish, round herring, flyingfish, and gobies.<sup>7</sup> The oldest-known bird was 25 years.<sup>1</sup>

## Conservation Concerns and Activities

Predation by introduced mammals limits populations and commercial fisheries exploiting coastal predatory species such as skipjacks and tuna may reduce BLNO foraging opportunities.<sup>1</sup>

Zodiac/kayak tours of Kaua'i sea caves flush nesting BLNO. Removal of exotic ironwood trees at Midway to benefit albatross has reduced nesting habitat for BLNO; conversely, an invasion of ironwood is aiding recolonization on Wake. In the NWHI, nesting populations have increased on Tern and Kure since mid-1990s, probably because of increased shrub and tree nesting habitat, and decreased human disturbance.<sup>1</sup> Introduced scale insects at Kure are threatening the native shrubs at this island and golden crown-beard (an unsuitable structure for nesting) is invading. Because of their tendency to concentrate nearshore, BLNO could potentially be more affected than other seabirds by oil spills and oceanic dumping of waste.<sup>11</sup> There have been repeated sightings of BLNO contaminated with oil in the NWHI.<sup>12</sup>

**References:** 1. Gauger 1999; 2. Clements 2000; 3. Gochfeld and Burger 1996; 4. Ashmole and Ashmole 1967; 5. King 1967; 6. Howard and Moore 1984; 7. Harrison 1990; 8. Schreiber and Ashmole 1970; 9. Geiger 1999; 10. Diamond 1978; 11. Harrison *et al.* 1984; 12. Fefer *et al.* 1984.

## Prioritized Conservation Actions

1. Study impacts of disturbance by kayakers and caving on Kaua'i population.
2. Eradicate or control scale insects and golden crown-beard at nesting islands.
3. Determine the source of oil affecting BLNO.

## Regional Contacts

Beth Flint - USFWS, Pacific Remote Islands NWR Complex, Honolulu, HI  
V. Geiger

## Brown Noddy (Common Noddy) *Anous stolidus*

STATUS: Federal: None    State: None    IUCN: None    NAWCP: NCR/NCR

### Distribution, Population Status and Trends

Brown Noddies (BRNO) have a pantropical distribution.<sup>1</sup> There are five subspecies; *A.s. pileatus* breeds in the central and western Pacific.<sup>2</sup> Within the USPI, a significant portion of the population occurs in the Hawaiian Is. Breeding adults remain within sight of the colony, foraging in waters several tens-of-kilometers from the colony.<sup>3,4</sup> During nonbreeding periods, BRNO generally stay within 100 km of colonies.<sup>5,6</sup> Little is known of the movements of immatures.<sup>1</sup>

The world population is estimated at 500,000-1,000,000 pairs.<sup>1</sup> Within the USPI, there are about 135,000 pairs, which includes 112,000 pairs distributed throughout the Hawaiian Is. The largest colonies are on Nihoa and Kaula with 35,000 and 20,000 pairs, respectively. Smaller colonies exist on Johnston, Howland, Wake, Jarvis, and Mariana Is. Population trend is probably stable, but increasing at islands where predators were removed (*e.g.*, Midway, Kure).<sup>1</sup>

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	yes	1	31d	60d	aseasonal	scrape	surface dipping	pelagic

### Ecology

BRNO tend to nest on the ground, often on open slopes or under vegetation but may also nest on cliffs and trees.<sup>6,7</sup> In the Hawaiian Is., breeding is fairly synchronous with peaks occurring in both spring and summer.<sup>6</sup> Sexes are similar in appearance, but males are larger in size than females.<sup>1</sup> BRNO pairs stay together throughout the year; however, there is no information on mate retention through subsequent years.<sup>1</sup> Adults continue to feed their chicks for several weeks after they fledge, up to 3 months in some cases.<sup>6</sup> Juvenile plumage is similar to that of adults except white caps are smaller.<sup>6</sup> Sexual maturity begins around 3-7 years and it is unknown whether birds return to their natal colony to breed.<sup>1,6</sup>

BRNO feed by hover and contact-dipping in near-shore and off-shore waters.<sup>8</sup> They often feed in association with tuna schools and can be found in feeding flocks with other species. In Hawaii, two-thirds of the diet is fish (goatfish, lizardfish, mackerel scad, and flyingfish) and one-third is squid.<sup>8</sup> The oldest-known bird was 25 years.<sup>1</sup>

### Conservation Concerns and Activities

The largest threat is introduced predators, and where there are predators, BRNO nest in trees (e.g., Midway, Wake Atoll).<sup>1,9</sup> BRNO are subject to striking overhead wires and may possibly become entrapped in fishing gear.<sup>1</sup> Disturbance of the colonies can lead to increased predation by native predators: Great Frigatebirds take BRNO chicks from their nest, and Laysan and Nihoa finches also take unprotected eggs.

**References:** 1. Chardine and Morris 1996; 2. Harrison and Stoneburner 1981; 3. Morris and Chardine 1992; 4. Clements 2000; 5. Clapp *et al.* 1983; 6. Harrison 1990; 7. USFWS 1983; 8. Harrison *et al.* 1983; 9. Harrison *et al.* 1984.

### **Prioritized Conservation Actions**

1. Eradicate introduced predators where BRNO occur (e.g., Palmyra, Wake, Johnston).
2. Establish long-term studies of populations in several locations and study factors affecting breeding, survival, and reproductive success.

### **Regional Contacts**

Beth Flint - USFWS, Pacific Remote Islands NWR Complex, Honolulu, HI

DRAFT

## Blue Noddy (Blue-gray Noddy, Necker Island Tern) *Procelsterna cerulea*

STATUS: Federal: BCC 67, 68    State: None    IUCN: None    NAWCP: HC/HC.

### Distribution, Population Status and Trends

Blue Noddies (BGNO) are widely distributed throughout the Pacific.<sup>1,2,3,4</sup> Once considered conspecific with Gray Noddies, there are five subspecies and two occur in the USPI: *P. c. saxatilis* in the north Pacific and *P. c. nebouxi* in the south Pacific.<sup>1</sup> Within the USPI, most BGNO nest on the NWHI, with the largest colonies on Necker and Nihoa Is. Breeding adults are mostly sedentary and seldom encountered far at sea.<sup>5,6</sup> At Jarvis, a flock of feeding birds was observed near an Equatorial Undercurrent upwelling (M. Rauzon pers. comm) In Hawaii, adults are year-round residents but may exhibit inter-island movement.<sup>6</sup> Little is known of movements of immatures.

The world population is around 100,000 breeding pairs, although it is difficult to get an accurate count because BGNO nest in inaccessible sea cliffs.<sup>7</sup> In the USPI, there are about 3,600 pairs with approximately 3,500 pairs on Necker and Nihoa, combined. Elsewhere in the NWHI, La Perouse Pinnacle, French Frigate Shoals and Gardner Pinnacles have very small colonies. Significant colonies also occur on the high islands in American Samoa, Howland, Baker, and Jarvis. Birds once nested on Kaula<sup>8</sup> and there is some evidence that they once nested on Rota (CNMI).<sup>9</sup> Worldwide population trends is unknown.

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	yes	1	35d	50d	winter	crevice	surface dipping	nearshore

### Ecology

BGNO, smallest of the world's terns, occur on remote islands and atolls.<sup>6</sup> They tend to nest on exposed sea cliffs, sea stacks, or rocky outcrops, or sometimes in vegetation.<sup>6</sup> In Hawaii, BGNO avoid isolated cavities and form loose nesting aggregations among clustered cavities within ancient lava flows.<sup>6</sup> At Nihoa, breeding takes place from early Dec-Mar but occasionally extends into summer during years of inclement weather.<sup>10</sup> Little is known of breeding behavior.

BGNO feed by hover-dipping and surface-dipping and sometimes will forage with mixed flocks.<sup>10</sup> They are an inshore feeder.<sup>10</sup> They capture the smallest prey of any Hawaiian seabird, mainly larval lizardfishes, flounders, goatfishes and flyingfish; they also take squid and

crustaceans.<sup>12</sup> Depending on the season, their diet may consist of significant amounts of insects (e.g., sea striders).<sup>10,12,13</sup> The oldest-known bird was 11 years, but BGNO probably have greater longevity.<sup>6</sup>

## Conservation Concerns and Activities

Introduced predators such as cats and rats have negatively impacted populations.<sup>7</sup> The recent eradication of feral cats on Baker, Howland, and Jarvis (cat eradication at Wake is underway) will hopefully lead to long-term population increases. The Jarvis population was estimated >500 birds in 2004, up from “a few birds” prior to rat and cat eradication (M. Rauzon pers. comm.) The effect of mouse predation on this diminutive species is unknown. Predation by native predators such as Nihoa and Laysan Finches occurs and can cause considerable egg loss.<sup>14</sup> The colony on Kaula was possibly eliminated when the island was used as a bombing range by the U.S. military; breeding has not been confirmed there for fifty years.<sup>3,6</sup>

**References:** 1. Clements 2000; 2. Murphy 1936; 3. King 1967; 4. Edgar *et al.* 1965; 5. USFWS 1983; 6. Harrison 1990; 7. Gochfeld and Burger 1996; 8. Caum 1936; 9. Steadman 1992; 10. Rauzon *et al.* 1984; 11. Diamond 1978; 12. Harrison *et al.* 1983; 13. Ashmole and Ashmole 1967; 14. Ely and Clapp 1973.

## Prioritized Conservation Actions

1. Eradicate introduced predators at active and historic BGNO colony sites (e.g., Rota, Palmyra, Kaula, and Baker).
2. Develop and implement standardized survey protocols to determine current population size and status.

## Regional Contacts

Beth Flint - USFWS, Pacific Remote Islands NWR Complex, Honolulu, HI  
Mark Rauzon - Marine Endeavors, Oakland, CA

## White Tern (Fairy Tern, Manu O ku) *Gygis alba*

STATUS: Federal: None    State: None    IUCN: None    NAWCP: MC/MC

### Distribution, Population Status and Trends

White Terns (WHITE) have a pantropical distribution.<sup>1,2</sup> There are four subspecies; *G. a. alba* breed in central and western Pacific.<sup>2,3</sup> Breeding adults remain close to colonies, foraging primarily inshore in shoals and banks but sometimes in offshore waters.<sup>1</sup> During nonbreeding periods, they disperse from breeding grounds to sea but range is unknown.<sup>1</sup> Some adults are year-round residents (e.g., colony on O’ahu).<sup>4</sup> Little is known of immature movements.

World population is unknown but probably exceeds 100,000 pairs.<sup>2</sup> In the USPI, there are about 17,000 pairs with a large portion in the NWHI. Except for the small colony on O’ahu, WHITE is absent from the main Hawaiian Is and populations in the NWHI number approximately 15,000 pairs. The largest colonies, Nihoa and Midway, have 5,000 and 7,500 pairs, respectively. Other colonies exist in American Samoa, Howland, Baker, Wake, and Mariana Is. World and USPI population trends are unknown, however, populations appear stable within the NWHI.<sup>1,2</sup>

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
1	yes	1	33-41d	31-67d	Feb-Aug	none	surface diving	nearshore

### Ecology

WHITE tend to nest on volcanic pinnacles, on cliffs, or rocky slopes, in large bushes or trees, or on artificial substrates.<sup>1,5</sup> WHITE do not build nests but lay eggs wherever they find a suitable depression.<sup>4</sup> In Hawaii, breeding is aseasonal but most eggs are laid from Feb- Jun with a peak in March.<sup>1,6</sup> WHITE are monomorphic, monogamous, and partners remain together for several seasons returning to the same nest sites.<sup>1,4</sup> Clutch size is one and some breeding pairs may successfully raise two broods within a nesting season.<sup>1</sup> However, because of the precarious nature of their nest site, only a third to one half of their chicks hatch.<sup>4</sup> Post-fledging care can last up to 2 months.<sup>7</sup> Immature plumage is similar to that of adults, except body- and wing- feathers fringed with varying amounts of brown, base of bill black, and may have a dark spot behind eye.<sup>1</sup> There is no information on age adult plumage is attained. At Tern I., age at first breeding was 5 years.<sup>1</sup>

WHITE feed primarily by dipping- and surface-diving.<sup>1</sup> They often occur in mixed feeding flocks and usually in association with predatory fish.<sup>1,4</sup> In Hawaii, WHITE eat mainly juvenile goatfish

and flyingfish<sup>8</sup> Other prey items include squid, needlefishes, halfbeaks, dolphinfishes, and comb-toothed blennies.<sup>1,8</sup> The oldest-known bird was 42 years.<sup>1</sup>

### **Conservation Concerns and Activities**

Although WHITE exhibit lower vulnerability to introduced predators than most seabirds because of their ability to utilize remote (*e.g.*, sheer cliffs) nesting sites, introduced predators such as rats and cats have been the primary factor affecting populations.<sup>1</sup> Recent rat eradication projects conducted at Rose, Kure, and Midway Atolls have been successful; however, there is no data on WHITE response.<sup>1</sup> On Midway, introduced ants have been recorded attacking pipped eggs and incubating birds.<sup>1,4</sup> Overfishing may reduce foraging opportunities for WHITE.<sup>1,2</sup>

**References:** 1. Niethammer and Patrick 1998; 2. Gochfeld and Burger 1996; 3. Clements 2000; 4. Harrison 1990; 5. Rauzon and Kenyon 1984; 6. Harrison *et al.* 1984; 7. Howell 1978; 8. Harrison *et al.* 1983.

### **Prioritized Conservation Actions:**

1. Eradicate introduced predators where WHITE occur.
2. Determine current size of American Samoan population.

### **Regional Contacts**

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## Little Tern *Sterna albifrons*

STATUS: Federal: None    State: None    IUCN: None    NAWCP: HC/HC

### Distribution, Population Status and Trends

Little Terns (LITE) have a pantropical distribution.<sup>1,2</sup> There are six subspecies; *S. a. sinensis* occurs throughout the Pacific.<sup>1,2</sup> LITE recently expanded their range into the USPI and are present in small numbers on islands in Hawaii and Mariana Is.<sup>3,4,5</sup> Breeding adults remain close to colonies and forage within 3 km of the colony.<sup>2</sup> During nonbreeding periods, LITE may frequent tidal creeks, coastal lagoons, and sometimes are found far at sea.<sup>2</sup> Movement patterns by adults and immatures are not fully understood.

The world populations is estimated to be 70,000-100,000 pairs.<sup>2</sup> Recently, they were found nesting in small numbers at Pearl and Hermes, and Midway (<10 pairs each).<sup>3</sup> LITE were known as migrants in the Mariana Is. and were found breeding on Saipan in 1988.<sup>4</sup> Worldwide population trend is unknown.<sup>2</sup>

<u>Egg</u>	<u>Relay</u>	<u>Young</u>	<u>Inc</u>	<u>Fledge</u>	<u>Breed</u>	<u>Nest</u>	<u>Feeding Beh</u>	<u>Marine Habitat</u>
2-3	yes	2-3	65d	140d	spring	scrape	plunge dive	inshore

### Ecology

LITE occur on coastal areas and oceanic islands.<sup>2</sup> They tend to breed on sparsely vegetated sandy, rocky, or barren ground, but may also be found nesting on spits in estuaries and lakes, salt-marshes, rivers, and on reefs.<sup>2</sup> LITE breeding synchronously during the spring. Clutch size is 2-3 eggs. Adults are similar and juveniles resemble adults but have paler wings and black chevrons on mantle.<sup>2</sup> Age at first breeding is 3 years.<sup>2</sup>

They feed by plunge-diving in shallow water, usually at the edge of advancing tides.<sup>2</sup> LITE sometimes feed in groups, synchronously diving in the water to capture prey.<sup>2</sup> Diet consists of small fish, crustaceans, insects, annelids, and molluscs.<sup>2</sup> The oldest-known bird was 21 years.<sup>2</sup>

### Conservation Concerns and Activities

Worldwide LITE face many threats, especially habitat loss and disturbance.<sup>2</sup> They have expanded their range with small colonies in the USPI; these colonies should be protected. LITE are sensitive to human disturbance, including birdwatchers, which can cause nest failures.

**References:** 1. Clements 2000; 2. Gochfeld and Burger 1996; 3. Conant *et al.* 1991; 4. Reichel *et al.* 1989; 5. Wiles *et al.* 1987.

## **Prioritized Conservation Actions**

1. Monitor changes in distribution and abundance associated with range expansion.

## **Regional Contacts**

**DRAFT**