

A checklist of birds recorded in Guam's marine habitats

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Abstract—Seventy-seven species of birds, plus five hypothetical species, are listed for various marine habitats on Guam, Mariana Islands. Visiting shorebirds and seabirds predominate the list. Predation, over-development of important sites, and human disturbance are key conservation concerns.

Introduction

This checklist contains 77 species of birds that have been recorded in marine habitats on Guam (13°28'N, 144°45'E), Mariana Islands (Table 1). Included are 27 species of seabirds, 41 shorebirds and herons, four ducks, and five land birds. Only five of the species currently nest on the island, while 68 others are visitors that arrive annually or less frequently. Four land birds that were extirpated from the island or became extinct during the 1980s are listed because of their past use of mangroves. Five additional species are included as hypothetical species or were identified to genus only because definitive documentation of their occurrence is lacking.

Guam is the largest (541 km²), most populous (about 155,000 people), and southernmost island in the Marianas. For this report, I recognize five types of marine habitats that are used by birds, as follows:

Offshore waters: These extend from the island's fringing reef margins into deep open water. Within this zone are six submerged banks located 22-85 km southwest of Guam, and Rota Banks 19 km to the north, that are attractive to pelagic seabirds because of their baitfish populations. These pinnacles range in size from about 0.5-35 km² and rise to within 30-150 m of the ocean's surface.

Lagoons: Apra Harbor (14.7 km²) and Cocos Lagoon (10.7 km²) are two sizable areas of relatively shallow and calm water enclosed by barrier reefs or breakwaters. Water depths reach 55 m.

Reef flats: This habitat comprises the intertidal and subtidal zones between the shoreline and outer reef edge. Guam's largest reef flats occur along its southern and central coasts and reach widths of up to 800 m. About 69 km² of reef flat are present on the island.

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Beaches and rocky shorelines: Guam has about 125 km of shoreline, which is defined here as the zone between the high and low tide lines. Sandy beaches occur throughout much of the island, while rocky shorelines predominate along the northeast coast.

Mangroves: This forest type grows on protected mud sediments and is tidally inundated. Tree heights range from 3-12 m, with *Rhizophora* spp., *Bruguiera gymnorrhiza*, *Lumnitzera littorea*, and *Avicennia marina* being the major species (Fosberg 1960, Moore et al. 1977). About 70 ha of mangroves occur on the island, with the largest areas found in Apra Harbor and Merizo.

Historically, studies of Guam's avifauna have emphasized resident land and freshwater birds, many of which are unique to the island or Micronesia, rather than visiting and often far ranging marine-associated species. Early collectors and observers devoted less of their efforts to studying seabirds and wading birds, as evidenced by the smaller numbers of specimens obtained for these species groups (Quoy & Gaimard 1824-1826, 1825, 1830-1835, Kittlitz 1836, Oustalet 1895, 1896, Hartert 1898, Seale 1901, Safford 1905, Coultas 1931). The authors of several post-World War II publications continued the trend of concentrating on non-marine birds (Stophlet 1946, Marshall 1949, Kibler 1950, Hartin 1961). Baker (1951) provided the first comprehensive examination of Micronesian birdlife, with much information presented on Guam's seabirds and wading birds. His work remains an important historical contribution. In recent decades, additional studies have yielded considerably more data on marine species, with many taxa documented for the first time (e.g., Drahos 1977a, Jenkins 1978, Maben & Wiles 1981, Williams & Grout 1985, Wiles et al. 1987, 1993, 2000). In just the last 20 years, the number of marine birds reported for the island has increased from 48 species (Jenkins 1983) to the 77 species noted in this list. Important summaries of seabird and shorebird abundance on Guam (Reichel 1991, Stinson et al. 1997a, 1997b) and migration routes (Williams & Williams 1988) have appeared during the last two decades. Maben (1980a) is the only researcher to conduct a large number of censuses of seabirds in offshore waters around the island. Other useful information on particular species has been published by Drahos (1977b), Jenkins (1981, 1983), Maben (1980a, 1980b, 1981a, 1981b), Conry (1987), Aguon & Wiles (1991, 1992), and Wiles et al. (1993, 2000).

I follow the listing criteria of previous checklists of birds for the region (Pyle & Engbring 1985, Reichel & Glass 1991, Stinson 1994), whereby a species' occurrence is accepted based on a catalogued museum or agency specimen, published photograph, or sufficiently documented sighting. For this list, the geographic boundaries of Guam extend to the standard limit of 200 miles (320 km) offshore or half the distance to a neighboring island, whichever is smallest. Taxonomic sequence and nomenclature generally follow the American Ornithologists' Union (1998, 2000), with additional information drawn from Pratt et al. (1987) and King (1997).

In Table 1, only the highest level of species documentation is presented, with specimens given the highest ranking, followed by photographic records, and lastly sightings. I did not make an exhaustive search of specimens held in museums for this report and have provided specimen numbers only when readily known to me. I have particularly relied on Baker (1951) for information on specimens collected before World War II, although he did not list specific specimen numbers. Also, I did not verify the continued presence of specimens reported to be held in the Museum National d'Histoire Naturelle, Paris (MNHP) by Oustalet (1895, 1896) and The Natural History Museum, Tring, United Kingdom (BMNH) by Hartert (1898). Abbreviations of other institutions named in Table 1 are: American Museum of Natural History, New York (AMNH), B.P. Bishop Museum, Honolulu, Hawaii (BPBM), Florida Museum of Natural History, University of Florida, Gainesville, Florida (UF), Guam Division of Aquatic & Wildlife Resources, Mangilao, Guam (GDAWR), Museum of Vertebrate Zoology, University of California, Berkeley, California (MVZ), and National Museum of Natural History, Washington, D.C. (USNM). Little scientific collecting of non-resident birds has occurred on Guam since the war, and many of the rare species recorded more recently have been documented only through sight records. Resident birds are those that currently nest on the island or its offshore islets. Visitors do not breed on Guam, but are species that either routinely migrate through Micronesia or are vagrant to the region, being far from their normal geographic range. Habitat information is based on published accounts and my own observations from 1981-2000 for Guam only, and does not include data for other Mariana Islands or other locations in a species' geographic range. References cited in Table 1 include those that first documented a species for Guam, plus others that describe its occurrence or natural history on the island.

Discussion

The number of marine bird species recorded for Guam will undoubtedly increase with further study. The island's shorebirds and wading birds are already fairly well known in terms of their occurrence and abundance (Maben 1980b, 1981b, Jenkins 1981, Williams & Williams 1988, Stinson et al. 1997b), and it is doubtful that many more species will be documented. In contrast, a considerable number of pelagic seabird species have probably not yet been detected. Potential new species include a dozen taxa already documented from elsewhere in the Mariana Islands (Table 2), plus some others that reportedly range seasonally into central and western Micronesia, such as the Providence Petrel (*Pterodroma solandri* (Gould, 1844)), Kermadec Petrel (*P. neglecta* (Schlegel, 1863)), Cook's Petrel (*P. cookii* (Gray, 1843)), Flesh-footed Shearwater (*Puffinus carneipes* Gould, 1844), Buller's Shearwater (*P. bulleri* Salvin, 1888), South Polar Skua (*Stercorarius maccormicki* (Saunders, 1893)), Pomarine Jaeger (*S. pomarinus* (Temminck, 1815)), and Parasitic Jaeger (*S. parasiticus* (Linnaeus, 1758)) (Harrison 1985, del Hoyo et al. 1992, 1996). Ornithologists and bird-watchers

Table 1. A checklist of birds associated with marine habitats on Guam

Key to abbreviations: Status: RV = rare visitor, RV-1 = rare visitor with only one record from Guam, UV = uncommon visitor, CV = common visitor, UR = uncommon resident, CR = common resident, I = introduced, EX = extirpated, and EXT = extinct; habitat: BRP = beaches, rocky shorelines, and shallow or exposed reef flats, FW = freshwater habitats, IH = inland habitats, LG = lagoons, MG = mangroves, OW = offshore waters, OWL = offshore waters and over land; and documented distribution in the Mariana Islands: G = Guam only, SM = southern Marianas (Rota to Farallon de Medinilla), SNM = southern and northern Marianas. Notes: A = Safford's (1904) record of an albatross for Guam is insufficiently detailed to allow identification, but was probably a Black-footed Albatross (*Phoebastria nigripes* (Audubon, 1849)) (Reichel & Glass 1991). B = Wiles et al. (1993) reported that this bird was possibly a Great Cormorant (*P. carbo* (Linnaeus, 1758)).

Ref = references: 1. Aguon & Beck (1983), 2. Ashman (1983), 3. Baker (1951), 4. Beck (1985), 5. Conry (1987), 6. Dixon & Starrett (1952), 7. Drahos (1977a), 8. Engbring & Fritts (1988), 9. Gray (1859), 10. Hartert (1898), 11. Jenkins (1978), 12. Jenkins (1981), 13. Jenkins (1983), 14. King (1976), 15. King (1987), 16. Kittlitz (1832-1833), 17. Kittlitz (1836), 18. Maben (1980a), 19. Maben (1981a), 20. Maben & Wiles (1981), 21. Oustalet (1881), 22. Oustalet (1896), 23. Quoy & Gaimard (1824-1826), 24. Reichel & Glass (1991), 25. Safford (1904), 26. Seale (1901), 27. Stinson et al. (1997a), 28. Stinson et al. (1997b), 29. Wiles et al. (1987), 30. Wiles et al. (1993), 31. Wiles et al. (2000), 32. Wiles (unpubl. data), 33. Williams (1987), 34. Williams & Grout (1985).

Taxon	Type of Record	Status, Habitat, Range, and Other Notes	Ref
DIOMEDEIDAE			
Albatross (<i>Phoebastria</i> sp.)	sighting	RV, OW, A	24, 25
PROCELLARIIDAE			
Tahiti Petrel (<i>Pterodroma rostrata</i> (Peale, 1848))	photograph	RV-1, OW, G	29
Juan Fernandez Petrel (<i>Pterodroma externa</i> (Salvin, 1875))	USNM 597645	RV-1, OW, G	30
Streaked Shearwater (<i>Calonectris leucomelas</i> (Temminck, 1835))	USNM 611654, 611655	RV, OW, G	29, 31
Wedge-tailed Shearwater (<i>Puffinus pacificus</i> (Gmelin, 1789))	AMNH 332345	UV, may have nested on Guam before 1930, OW, SNM	3, 18
Short-tailed Shearwater (<i>Puffinus tenuirostris</i> (Temminck, 1835))	USNM 500222-500228, UF 39642	CV, migrates northward past Guam in large numbers during May, OW, SM	7, 32
Townsend's Shearwater (<i>Puffinus auricularis</i> Townsend, 1890)	sightings	RV, OW, SM, all records have been of the subspecies <i>P. a. newelli</i> Henshaw, 1900	7
Audubon's Shearwater (<i>Puffinus lherminieri</i> Lesson, 1839)	USNM 597584	RV, OW, SM	30, 31
HYDROBATIDAE			
Leach's Storm-Petrel (<i>Oceanodroma leucorhoa</i> (Vieillot, 1818))	sighting	RV-1, OW, SM	20

Table 1. A checklist of birds associated with marine habitats on Guam / (continued)

Taxon	Type of Record	Status, Habitat, Range, and Other Notes	Ref
Matsudaira's Storm-Petrel (<i>Oceanodroma matsudaire</i> Kuroda, 1922)	BPBM 159517	RV, all records are from February to September, OW, SNM	1, 14, 31
PHAETHONTIDAE			
White-tailed Tropicbird (<i>Phaethon lepturus</i> Daudin, 1802)	USNM	RV, nested on Guam until about 1982, OWL-, SNM	8, 18, 25
Red-tailed Tropicbird (<i>Phaethon rubricauda</i> Boddaert, 1783)	sightings	RV, OWL, SNM	30
SULIDAE			
Masked Booby (<i>Sula dactylatra</i> Lesson, 1831)	sightings	RV, OW, SNM	29
Brown Booby (<i>Sula leucogaster</i> (Boddaert, 1783))	AMNH	UV, nested on Guam until late 1970s, OW and LG, a few birds still regularly roost on Orote Island, SNM	18, 26
Red-footed Booby (<i>Sula sula</i> (Linnaeus, 1766))	UF 39645, GDAWR	UV, OW, SNM	18, 25
PHALACROCORACIDAE			
Comorant (<i>Phalacrocorax</i> sp.)	sighting	RV-1, seen flying over inner Apra Harbor, B	30
FREGATIDAE			
Great Frigatebird (<i>Fregata minor</i> (Gmelin, 1789))	USNM 526407, UF 39683	RV, OWL and LG, SNM	18, 26
Lesser Frigatebird (<i>Fregata ariel</i> (Gray, 1845))	sighting	One possible record only, OW, SNM	24, 26
ARDEIDAE			
Yellow Bittern (<i>Ixobrychus sinensis</i> (Gmelin, 1789))	USNM, AMNH, MNHP, UF	CR, most common in IH, but also nests on offshore islets and feeds occasionally on shallow reef flats and in MG, SM	13, 17
Great Egret (<i>Ardea alba</i> (Linnaeus, 1758))	sightings	RV, most common in FW, but feeds occasionally on reef flats, SM	27, 30
Little Egret (<i>Egretta garzetta</i> (Linnaeus, 1766))	sightings	RV, most common in FW, but feeds occasionally on reef flats, SNM	27, 30
Pacific Reef-Egret (<i>Egretta sacra</i> (Gmelin, 1789))	USNM, AMNH, MNHP	UR, forages on BRF and in MG, nests on Cocos Island and offshore islets, SNM	13, 17
Black-crowned Night-Heron (<i>Nycticorax nycticorax</i> (Linnaeus, 1758))	USNM 596603	RV-1, MG, SM	30

Table 1. A checklist of birds associated with marine habitats on Guam / (continued)

Taxon	Type of Record	Status, Habitat, Range, and Other Notes	Ref
ANATIDAE			
Eurasian Wigeon (<i>Anas penelope</i> Linnaeus, 1758)	sightings	RV, most common in FW, but occurs rarely on reef flats, SNM	20, 27
Northern Shoveler (<i>Anas clypeata</i> Linnaeus, 1758)	sightings	RV, most common in FW, but occurs rarely on reef flats, SNM	7, 27
Northern Pintail (<i>Anas acuta</i> Linnaeus, 1758)	sightings	UV, most common in FW, but occurs rarely on reef flats, SNM	3, 27
Surf Scoter (<i>Melanitta perspicillata</i> (Linnaeus, 1758))	photograph	RV-1, OW, G	31
CHARADRIIDAE			
Black-bellied Plover (<i>Pluvialis squatarola</i> (Linnaeus, 1758))	USNM	RV, BRF and IH, SM	25, 28
Pacific Golden-Plover (<i>Pluvialis fulva</i> (Gmelin, 1789))	USNM, AMNH, MNHP	CV, BRF, MG and IH, SNM	17, 28
Mongolian Plover (<i>Charadrius mongolus</i> Pallas, 1776)	USNM, AMNH, MNHP	UV, most common on BRF, but also occurs in MG and IH, SNM	22, 28
Greater Sand-Plover (<i>Charadrius leschenaultii</i> Lesson, 1826)	sightings	RV, BRF, SM	28, 34
Snowy Plover (<i>Charadrius alexandrinus</i> Linnaeus, 1758)	sightings	RV, BRF and IH, SM	28, 29
Common Ringed Plover (<i>Charadrius hiaticula</i> Linnaeus, 1758)	sightings	RV, BRF and IH, SM	28, 34
Little Ringed Plover (<i>Charadrius dubius</i> Scopoli, 1786)	sightings	RV, BRF, G	28, 30
HAEMATOPODIDAE			
Eurasian Oystercatcher (<i>Haematopus ostralegus</i> Linnaeus, 1758)	photograph	RV-1, BRF and IH, G	20, 28
RECURVIROSTRIDAE			
Black-winged Stilt (<i>Himantopus himantopus</i> (Linnaeus, 1758))	USNM 600748	RV, most common in FW, but occurs rarely in MG, SM	28, 30
SCOLOPACIDAE			
Common Greenshank (<i>Tringa nebularia</i> (Gunnerus, 1767))	photograph	RV, most common in FW, but occurs occasionally on BRF, SNM	28, 34
Nordmann's Greenshank (<i>Tringa guttifer</i> (Nordmann, 1835))	sighting	one possible record only, BRF, G	33
Marsh Sandpiper (<i>Tringa stagnatilis</i> (Bechstein, 1803))	sightings	RV, most common in FW, but occurs occasionally on BRF, SM	4, 28
Common Redshank (<i>Tringa totanus</i> (Linnaeus, 1758))	photograph	RV, BRF and FW, SNM	28, 29, 30

Table 1. A checklist of birds associated with marine habitats on Guam / (continued)

Taxon	Type of Record	Status, Habitat, Range, and Other Notes	Ref
Spotted Redshank (<i>Tringa erythropus</i> (Pallas, 1764))	sightings	two possible records, BRF, G	12, 24
Wood Sandpiper (<i>Tringa glareola</i> Linnaeus, 1758)	MNHP	UV, most common in FW, but occurs rarely on BRF and in MG, SNM	22, 28
Wandering Tattler (<i>Heteroscelus incanus</i> (Gmelin, 1789))	USNM, AMNH	UV, most common on BRF, but also occurs in MG and FW, SNM	10, 28
Gray-tailed Tattler (<i>Heteroscelus brevipes</i> (Vieillot, 1816))	USNM, AMNH, MNHP	CV, most common on BRF, but also occurs in MG and FW, SNM	17, 28
Common Sandpiper (<i>Actitis hypoleucos</i> Linnaeus, 1758)	USNM, MNHP	UV, BRF, MG and FW, SNM	22, 28
Terek Sandpiper (<i>Xenus cinereus</i> (Güldenstädt, 1775))	photograph	RV, BRF, SNM	28, 34
Little Curlew (<i>Numenius minutus</i> Gould, 1841)	sighting	RV-1, BRF, SM	28, 34
Whimbrel (<i>Numenius phaeopus</i> (Linnaeus, 1758))	USNM, MNHP	CV, BRF, MG and IH, SNM	17, 28
Bristle-thighed Curlew (<i>Numenius tahitiensis</i> (Gmelin, 1789))	MVZ 95095	RV, BRF, SNM	15, 28
Far Eastern Curlew (<i>Numenius madagascariensis</i> (Linnaeus, 1766))	BMNH	RV, BRF and MG, SM	10, 28
Eurasian Curlew (<i>Numenius arquata</i> (Linnaeus, 1758))	sightings	RV, MG and IH, SM	28, 30
Black-tailed Godwit (<i>Limosa limosa</i> (Linnaeus, 1758))	USNM 600606	RV, most common on BRF, but also occurs in IH, SM	11, 28
Bar-tailed Godwit (<i>Limosa lapponica</i> (Linnaeus, 1758))	AMNH, BMNH	RV, most common on BRF, but also occurs in MG and IH, SM	10, 28
Ruddy Turnstone (<i>Arenaria interpres</i> (Linnaeus, 1758))	USNM, AMNH, MNHP	CV, BRF, MG and IH, SNM	23, 28
Great Knot (<i>Calidris tenuirostris</i> (Horsfield, 1821))	photograph	RV, BRF, SM	28, 30, 31
Red Knot (<i>Calidris canutus</i> (Linnaeus, 1758))	sightings	RV, BRF and FW, G	31
Sanderling (<i>Calidris alba</i> (Pallas, 1764))	AMNH, BMNH	RV, most common on BRF, but also occurs in MG and IH, SM	10, 28
Red-necked Stint (<i>Calidris ruficollis</i> (Pallas, 1776))	sightings	UV, most common on BRF, but also occurs in IH, SM	28, 34
Long-toed Stint (<i>Calidris subminuta</i> (Middendorff, 1853))	sightings	RV, most common in IH, but occurs occasionally on BRF, SM	28, 30
Pectoral Sandpiper (<i>Calidris melanotos</i> (Vieillot, 1819))	sightings	RV, BRF and IH, SM	28, 34
Sharp-tailed Sandpiper (<i>Calidris acuminata</i> (Horsfield, 1821))	USNM	RV, BRF and IH, but also occurs occasionally in MG, SNM	26, 28

Table 1. A checklist of birds associated with marine habitats on Guam / (continued)

Taxon	Type of Record	Status, Habitat, Range, and Other Notes	Ref
Dunlin (<i>Calidris alpina</i> (Linnaeus, 1758))	photograph	RV, BRF and FW, SM	28, 34
Curllew Sandpiper (<i>Calidris ferruginea</i> (Pontoppidan, 1763))	sightings	RV, BRF and FW, G	28, 29
Ruff (<i>Philomachus pugnax</i> (Linnaeus, 1758))	sightings	RV, most common in IH, but occurs occasionally on BRF, SM	2, 28
Swinhoe's Snipe (<i>Gallinago megala</i> Swinhoe, 1861)	USNM 541024, BMNH	RV, most common in IH, but occurs rarely in MG, SM	10, 28
LARIDAE			
Black-headed Gull (<i>Larus ridibundus</i> Linnaeus, 1766)	sightings	RV, most common on BRF, but also occurs occasionally in IH, SM	11, 27
Slaty-backed Gull (<i>Larus schistisagus</i> Stejneger, 1884)	USNM 597590	RV-1, BRF, G	30
Gull-billed Tern (<i>Sterna nilotica</i> Gmelin, 1789)	sightings	RV, BRF and IH, SM	30, 31
Great Crested Tern (<i>Sterna bergii</i> Lichtenstein, 1823)	sightings	UV, OW, SM	6, 31
Common Tern (<i>Sterna hirundo</i> Linnaeus, 1758)	USNM 600556	RV, Apra Harbor and OW, SNM	27, 34
Black-naped Tern (<i>Sterna sumatrana</i> Raffles, 1822)	USNM 536698, 536699	RV, LG and OW, G	7
Little Tern (<i>Sterna albifrons</i> Pallas, 1764)	USNM 596319	RV, BRF and FW, SM	20, 27
Sooty Tern (<i>Sterna fuscata</i> Linnaeus, 1766)	USNM 526405, 536710	RV, OWL, SNM	7
White-winged Tern (<i>Chlidonias leucopterus</i> (Temminck, 1815))	MNHP, GDAWR, BMNH	RV, most common in IH, but occurs occasionally on BRF, SM	22, 27
Brown Noddy (<i>Anous stolidus</i> (Linnaeus, 1758))	USNM, AMNH, MNHP, BMNH	CR, Apra Harbor, OWL, and offshore islets and rocks, SNM	8, 19, 22
Black Noddy (<i>Anous minutus</i> Boie, 1844)	USNM 596318, 597644	CV, OW and Cocos Island, SNM	25, 30
White Tern (<i>Gygis alba</i> (Spartman, 1786))	USNM, AMNH, BMNH	CR, OWL and LG, nests on Cocos Island and at a few inland sites, SNM	8, 10, 19
COLUMBIDAE			
Island Collared-Dove (<i>Streptopelia bitorquata</i> (Temminck, 1810))	USNM, MNHP	CR, I, most common in IH, but occasionally nests in MG and feeds on beaches, SM	5, 17
Mariana Fruit-Dove (<i>Phainopepla roseicapilla</i> (Lesson, 1831))	USNM, AMNH, MNHP, BMNH	EX, was most common in IH, but also occurred in MG, SM	13, 16

Table 1. A checklist of birds associated with marine habitats on Guam / (continued)

Taxon	Type of Record	Status, Habitat, Range, and Other Notes	Ref
MELIPHAGIDAE			
Micronesian Honeyeater (<i>Myzomela rubratra</i> (Lesson, 1827))	USNM, AMNH, MNHP, BMNH	EX, was most common in IH, but also occurred in MG, SNM	13, 16
MONARCHIDAE			
Guam Flycatcher (<i>Myiagra freycineti</i> Oustalet, 1881)	USNM, AMNH, MNHP, BMNH	EXT, was most common in IH, but also occurred in MG, G	13, 21
Rufous Fantail (<i>Rhipidura rufifrons</i> (Latham, 1801))	USNM, AMNH, MNHP, BMNH	EX, was most common in IH, but also occurred in MG, SM	9, 13, 21

have rarely ventured far offshore of Guam to look for seabirds, with only one study involving regular travel more than 10 km from land (Maben 1980a). Dedicated seabird watchers are bound to add to our knowledge of the seasonal occurrence and abundance of all pelagic species near the island. In particular, surveys of Guam's submerged seamounts may offer some of the best opportunities for studying seabirds and finding new species.

Table 2. Species of birds associated with marine habitats not yet recorded from Guam, but documented historically from other Mariana Islands.

Key to abbreviations: Status: RV = rare visitor, UR = uncommon resident; habitat: BRF = beaches, rocky shorelines, and shallow or exposed reef flats, LG = lagoons, OW = offshore waters, and OWL = offshore waters and over land.

Species	Status & Habitat
DIOMEDEIDAE	
Laysan Albatross (<i>Phoebastria immutabilis</i> (Rothschild, 1893))	RV, OW
Black-footed Albatross (<i>Phoebastria nigripes</i> (Audubon, 1849))	RV, OW
PROCELLARIIDAE	
White-necked Petrel (<i>Pterodroma cervicalis</i> (Salvin, 1891))	RV, OW
Bonin Petrel (<i>Pterodroma hypoleuca</i> (Salvin, 1888))	RV, OW
Black-winged Petrel (<i>Pterodroma nigripennis</i> (Rothschild, 1893))	RV, OW
Bulwer's Petrel (<i>Bulweria bulwerii</i> (Jardine & Selby, 1828))	RV, OW
Christmas Shearwater (<i>Puffinus nativitatis</i> Streets, 1877)	RV, OW
HYDROBATIDAE	
Band-rumped Storm-Petrel (<i>Oceanodroma castro</i> Harcourt, 1851)	RV, OW
FREGATIDAE	
Lesser Frigatebird (<i>Fregata ariel</i> (Gray, 1845))	RV, OWL
ANATIDAE	
Tundra Swan (<i>Cygnus columbianus</i> (Ord, 1815))	RV, BRF
Red-breasted Merganser (<i>Mergus serrator</i> Linnaeus, 1758)	RV, BRF, LG
SCOLOPACIDAE	
Red-necked Phalarope (<i>Phalaropus lobatus</i> (Linnaeus, 1758))	RV, OW
LARIDAE	
Long-tailed Jaeger (<i>Stercorarius longicaudus</i> Vieillot, 1819)	RV, OW
Laughing Gull (<i>Larus atricilla</i> Linnaeus, 1758)	RV, BRF, LG
Herring Gull (<i>Larus argentatus</i> Pontoppidan, 1763)	RV, BRF, LG, OW
Gray-backed Tern (<i>Sterna lunata</i> Peale, 1848)	UR, OW, nests on several islands

Based on Glass et al. (1990), Reichel & Glass (1991), Stinson et al. (1991, 1995) and Wiles et al. (2000).

Birds inhabiting Guam's marine environments face a number of conservation threats. Adequate population data are lacking for resident species and complete surveys are badly needed to monitor changes in abundance. During the last century, most resident birds have decreased (Brown Noddies (*Anous stolidus* (Linnaeus, 1758)), White Terns (*Gygis alba* (Sparman, 1786)), and Yellow Bitterns (*Ixobrychus sinensis* (Gmelin, 1789))) or been lost entirely (White-tailed Tropicbirds (*Phaethon lepturus* Daudin, 1802), Brown Boobies (*Sula leucogaster*

(Boddaert, 1783)), and possibly Wedge-tailed Shearwaters (*Puffinus pacificus* (Gmelin, 1789)) (Coultas 1931, Baker 1951, Engbring & Fritts 1988). Extensive predation by non-native Brown Tree Snakes (*Boiga irregularis* (Merrem, 1802)) since the 1950s is one of the major causes of these declines (Savidge 1987, Engbring & Fritts 1988). Nesting by Brown Noddies and White Terns is now largely restricted to offshore locations that are free of snakes, such as Cocos Island, smaller islets, and rocks, although small numbers of both terns have recently resumed nesting in a few urban areas where snake abundance is apparently greatly reduced. Yellow Bitterns and Pacific Reef-Egrets (*Egretta sacra* (Gmelin, 1789)) also use Cocos Island and islets for breeding. Guam's only tropicbird colony disappeared from Amantes Point in the early 1980s after snakes invaded that part of the island. Snakes may have impacted nesting by Brown Boobies as well. Brown Tree Snake predation has also eliminated the land birds that formerly inhabited Guam's mangrove forests (Savidge 1987), with the exception of a few non-native Island Collared-Doves (*Streptopelia bitorquata* (Temminck, 1810)) that nest in isolated trees surrounded by water. Successful control of snakes remains the island's highest conservation priority. Prevention of the spread of snakes to Cocos Island and numerous islets is also crucial in preserving remaining populations of terns, bitterns, and reef-egrets.

Other predators of marine birds on Guam include monitor lizards (*Varanus indicus* (Daudin, 1802)) and rarely humans. Monitor lizards were deliberately introduced to Cocos Island in the late 1980s (McCoid 1996). Although their diet appears to consist primarily of crabs and other terrestrial animals (G. Wiles, unpubl. data), there is an observation of a monitor lizard capturing a juvenile bittern in the crown of a coconut tree (Aguon & Wiles 1992), suggesting that the eggs, nestlings, and perhaps adults of terns and reef-egrets are also potential prey items. Further study of predation rates is needed. Although there are no recent reports of people hunting marine birds on Guam, several incidents are known from about 1980 in which people raided the Brown Noddy colony at Anae Island to collect eggs and chicks for use as fishing bait (Maben 1980a; A. Maben, pers. comm.).

Overdevelopment of coastal areas has reduced shorebird use at some locations on Guam. Increased recreational use of beaches and reef flats by picnickers, fishermen, jet skiers, and others may be equally important in disrupting or supplanting bird activity (Stinson et al. 1997b). Several examples are presented here to illustrate these problems. One of the island's best shorebird sites, Duncas Beach and East Hagatña Bay, experienced considerable condominium and hotel construction during the 1980s and 1990s. As a result, shorebird use of the area has gradually declined due to increased beach visitation by tourists, residents, and dogs. During the early 1990s, careless construction activities associated with resort development likely disturbed the Black Noddy (*Anous minutus* Boie, 1844) roost on Cocos Island and caused the birds to abandon the island temporarily (Wiles et al. 1993). Colonies of Brown Noddies at Anae Island and Barracuda Rock off southern Orote Peninsula have also

suffered disturbance from commercial scuba diving boats anchored nearby. Dive boat operators have even deliberately frightened the Anae colony to amuse passengers with the large number of birds flying up. Fishermen pose a threat to a nesting colony of Yellow Bitterns on an islet near the Togcha River mouth by walking along the edges of the colony, which may frighten some young birds off their nests or even into the ocean, where they are swept away by currents.

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