

BIRDS ON THE OUTER CAYS OF THE TURKS AND CAICOS ISLANDS

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Abstract.—We surveyed outer cays of the Turks and Caicos in June 2002, and found large proportions of the Caribbean breeding populations of Brown Noddy (*Anous stolidus*), Bridled Tern (*Sterna anaethetus*), and Sooty Tern (*Sterna fuscata*). Numbers of the first two species are the greatest known from the Caribbean. Internationally important numbers were found also of White-tailed Tropicbird (*Phaethon lepturus*), Magnificent Frigatebird (*Fregata magnificens*), Laughing Gull (*Larus atricilla*), Royal Tern (*Sterna maxima*), Sandwich Tern (*Sterna sandvicensis*), Roseate Tern (*Sterna dougallii*), and Least Tern (*Sterna antillarum*). Other bird species seen are noted. Comments are made on conservation requirements.

Key words: bird records, breeding seabirds, conservation, Turks and Caicos Islands

Resumen.—LAS AVES DE LOS CAYOS EXTERIORES DE LAS ISLAS TURKS Y CAICOS. En Junio del 2002, hicimos muestreos en los cayos más externos de las islas Turks y Caicos y se encontraron elevados valores poblacionales de *Anous stolidus*, *Sterna anaethetus* and *Sterna fuscata* con respecto a las poblaciones nidificantes en el Caribe. Los valores de las dos primeras especies son los mayores conocidos para el Caribe. Además se encontraron valores poblacionales importantes internacionalmente de *Phaethon lepturus*, *Fregata magnificens*, *Larus atricilla*, *Sterna maxima*, *Sterna sandvicensis*, *Sterna dougallii* and *Sterna antillarum*. También fueron observadas otras especies de aves. Se hacen comentarios sobre las necesidades de conservación.

Palabras claves: aves marinas nidificantes, conservación, registro de aves, Islas Turks y Caicos

THE AVIFAUNA OF THE TURKS AND CAICOS Islands (TCI) includes 204 recorded species, of which 57 are recorded as breeding and 110 as regularly occurring non-breeding species (Bradley 1995, updated by Pienkowski 2002 and additional records). Surveys of the water- and land-birds of the main islands have been conducted, largely to facilitate conservation management (Ground 2001, Pienkowski 2002).

The small cays of both the Caicos and the Turks Banks, as well as some cliffs, stacks, and wetlands of the main islands, are important breeding sites for substantial numbers of seabirds (Buden 1987, Bradley 1995, White 1998), but there has been no or little documentation of numbers. Although the Turks & Caicos Department of Environmental and Coastal Resources (DECR) made facilities available to student visitors to count seabirds in recent years, this unfortunately did not result in data available for conservation use. Both the need to have such data available and also the preparation of an Important Bird Areas analysis for Turks and Caicos (Pienkowski 2005) necessitated a survey of the seabird cays. In this paper we report results of a survey, which took place in early June 2002.

STUDY AREA

The Turks and Caicos Islands lie between the Bahamas, Cuba, and Hispaniola. Together with south Florida, the Bahamas and north Cuba, they are part of a platform of rocks formed as limestone deposited in shallow seas as the crust slowly subsided. Rocks of the area, to a depth of several thousand metres, are of marine origin, except for some fossil soils and sand dune rock (aeolian limestone). The region has had a marine environment from the time of its formation until the present (Sealey 1994).

The Turks and Caicos Islands are on two shallow banks (Turks Bank of 254 km² and the larger Caicos Bank at 5334 km²), with deep ocean between them. The maximum altitude is about 50 m asl. There are further shallow banks (Mouchoir, Silver, and Navidad) to the southeast, but without islands; some of these banks are within TCI territory. They are important for whales and probably for feeding seabirds. The Bahamas lie on separate banks to the northwest, and share some aspects of the geography. Substantial proportions of the submerged banks are less than 2 m deep. There are also about 38,000 ha of intertidal sand banks and mud flats. Of the 500 km² (50,000 ha) total dry land (dry most of the time) area of the Turks and Caicos Islands, 26,669

ha (>50% of the land area) are wetlands.

On the Caicos Bank, the largest islands lie along the northern edge (Fig. 1). Several very small cays important for breeding seabirds lie on the south edge of the Caicos Bank (about 30 to 50 km south of the larger islands on the north edge of the Bank). Providenciales, North, Middle, and South Caicos are inhabited. The smaller Turks Bank includes the inhabited islands of Grand Turk and Salt Cay, and numerous smaller, uninhabited cays, several of which are important for seabirds.

METHODS

Small power boats were used to visit the cays. All cays were viewed initially from the boat. In the case of some small, rocky cays with few birds, or with the birds essentially viewable on sea cliffs or slopes, numbers were estimated from the boat. In the case of larger cays, cays with large bird populations, and those with birds on land not viewable from the sea, landings were made and ground surveys undertaken. In the case of cays with few or moderate numbers of birds in relatively open ground, direct estimates were generally easily made. In these cases, two or three observers counted the same sections independently, and reached good agreement. The difficulties in counting large seabird colonies in (usually tropical) areas of ground cover are well known (Bibby *et al.* 2000). A combination of the methods indicated by Bibby *et al.* (2000) were used. These included:

(1) Direct counts of apparently occupied nests (hereinafter called "AONs") were made of small to medium colonies on open ground. The criteria we used for AON are detailed by Bibby *et al.* (2000) and essentially included occupied or recently occupied nests, as evidenced by the presence of eggs, remains, chicks, or adults sitting tight and apparently incubating eggs or brooding chicks.

(2) Mapping and quadrat counts were used in larger colonies. Nests in these colonies were usually under cover of vegetation, producing a severe case of the conflict identified by Bibby *et al.* (2000): keeping disturbance to less than half an hour but obtaining enough data for useful estimates. We mapped the distributions of different apparent densities or markedly different habitats, both in relation to published maps and charts, and by using a portable Global Positioning System

(GPS) device. Use of the maps and charts was made easier because the nesting cays were small, and the areas of colonies large in relation to the cays. Sample counts of nests were then made within the areas of similar density. Because of low visibility through vegetation under which birds were generally nesting, quadrats were generally smaller than the examples given by Bibby *et al.* (2000).

(3) Flushing counts were used in some cases, generally in addition to one of the other methods. Bullock and Gomersall (1981) and Bibby *et al.* (2000) report a fairly reliable relationship, across several species, showing that three flushed terns equate to two breeding pairs. Observations during our study suggest that this will under-estimate the number of breeding pairs in the Turks and Caicos colonies because many terns did not leave their nests even when humans were a few metres away and many terns were already in the air giving alarm calls. We believe this was due to the density of the vegetation under which many birds were nesting. Numbers estimated are given to 1 or 2 significant figures, to avoid giving misleading implications of higher precision.

The following areas were visited on the dates indicated: 1 June 2002, cays in the vicinity of western Providenciales and West Caicos; 3 June 2002, SE Caicos Bank, including Ambergris, Bush and Seal Cays; 4 June 2002, SW Caicos Bank, including Fish Cay, and further checks on West Caicos and SW Providenciales; 5 June 2002, cays off northern North and NW Middle Caicos; 7 June 2002, cays south-east of Grand Turk, including Penniston Cay from the sea; 8 June 2002, Big Sand Cay, and landing on Penniston Cay.

Financial limitations precluded visits to all seabird sites, notably several cays near South Caicos. Priority was given to remote cays from which data were most lacking and which are most difficult to visit, as well as less remote cays known to be important. Totals given will consequently be underestimates for Turks and Caicos as a whole, although less so for priority seabird species than for others.

RESULTS

Appendix 1 summarizes results for those areas visited and which held significant numbers of birds. In addition, particular aspects of the coverage of other areas are noted below.

West Caicos.—The whole coast was viewed closely from the boat, and landings were made at several locations along the east coast, conditions on

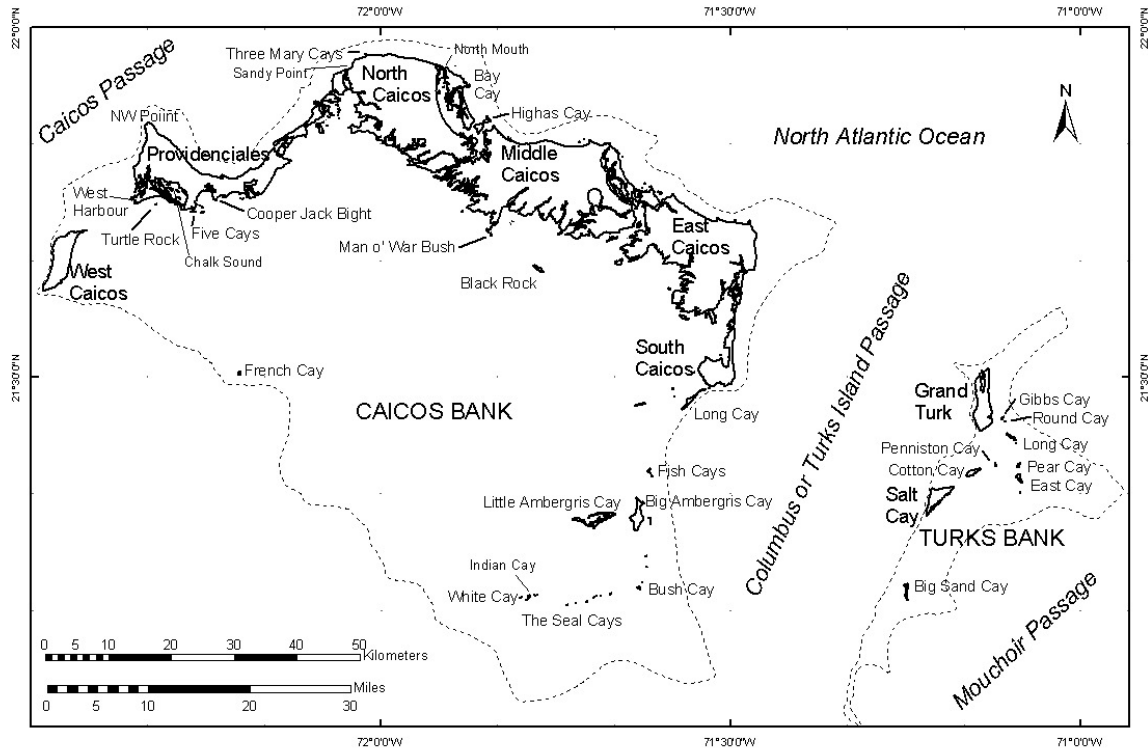


Fig. 1. Map of the Turks and Caicos Islands, showing Banks, main islands, and most of locations named in the text.

the west coast not being suitable. The interior of the island was not examined. Five Black-bellied Plovers (*Pluvialis squatarola*) were seen along the east coast, two Royal Terns (*Sterna maxima*) at the SW point, and a Laughing Gull (*Larus atricilla*) at Company Point. Single Ospreys (*Pandion haliaetus*) were seen along the east coast, Company Point, and Logwood Point.

West Providenciales.—At sea between West Caicos and Providenciales, eight Brown Noddies (*Anous stolidus*) were seen, with a Laughing Gull, a Bridled Tern (*Sterna anaethetus*) and ca 15 Brown Noddies on water and feeding west of Providenciales.

Along the west-facing shore of Providenciales, between North West Point and West Harbour, the following were seen: six Short-billed Dowitchers (*Limnodromus griseus*), six Royal Terns and singles of each of American Oystercatcher (*Haematopus palliatus*), Laughing Gull and Brown Pelican (*Pelecanus occidentalis*). There was some concentration at the mouth of the Frenchman's Creek marsh complex, but sea conditions did not allow entry into the extensive marsh area, where numerous waterbirds were likely present.

Turtle Rock.—On this small rock lying about

2 km south of Providenciales, we saw one White-tailed Tropicbird (*Phaethon lepturus*) and three Bridled Terns (*Sterna anaethetus*) in hollows or ledges and they were probably nesting. Numbers could be somewhat higher. Landing was impracticable.

SW Providenciales.—From West Harbour eastward, along Froggin' Bay, Providenciales, 24 White-tailed Tropicbirds flew off cliffs, in situations suggesting nest sites. We also saw one Laughing Gull. Near the mouth of Silly Creek, we saw eight White-tailed Tropicbirds, four Laughing Gulls, and a Reddish Egret (*Egretta rufescens*), but saw no birds in the main body of Chalk Sound, despite passing close to the cays. We found eight White-tailed Tropicbirds and a Laughing Gull along Little Cay, Taylor Bay, and Sapodilla Bay, just west of Five Cays.

Five Cays.—At this group of small rocky cays lying near Providenciales, we saw the following: **William Dean Cay.**—We found a pair of White-tailed Tropicbirds and a young Laughing Gull. **Pusey Cay.**—We found one Laughing Gull, and one White-tailed Tropicbird. **Sim Cay.**—We saw four White-tailed Tropicbirds, two Bridled Terns, and one Laughing Gull. **Bay Cay.**—No birds were visible. **Middle Cay.**—At least ten Bridled Terns on

ledges and one American Kestrel (*Falco sparverius*) were seen.

Cooper Jack Bight and Rock.—We saw only two White-tailed Tropicbirds. We did not survey the other shores of Providenciales. However, visits on other occasions suggest little likelihood of significant numbers of breeding seabirds. The north shore, in particular, is mainly sea-washed beach, now much disturbed by people, and not a suitable habitat even for nesting terns.

North of North and Middle Caicos.—The north shore of North Caicos was viewed from a boat as far east as Highas Cay, off Middle Caicos. Sea conditions prevented visits farther east. We did not visit other coasts of the main islands of North, Middle, East, and South Caicos. Many of these have been the subject of detailed work (Pienkowski 2002), and major seabird colonies of the species on which this paper centres are not expected, except for those breeding in irregular marshlands.

We saw three Laughing Gulls at Sandy Point, an Osprey at a nest on the middle of the **Three Mary Cays**, small rocky cays, where we also saw a few Bridled Terns. Two Least Terns (*Sterna antillarum*) were at **Pumpkin Bluff**. An Osprey was at a nest west of **North Mouth**.

In **Bay Cay** and **East Bay Beach**, we recorded two Greater Flamingos (*Phoenicopterus ruber*), nine Brown Pelicans, three Laughing Gulls, two Royal Terns, one Osprey, one Yellow-crowned Night-Heron (*Nyctanassa violacea*), and small numbers of shorebirds too distant for identification.

On a **rock off N of Highas Cay** there were 20 AONs (as defined in Methods) of Bridled Terns and 10 AONs of Brown Noddies. At the north point of **Highas Cay** there were ca 20 White-tailed Tropicbirds in the air off and on cliffs, one Green Heron (*Butorides virescens*), and one Brown Pelican.

South of North & Middle Caicos.—**Man o'War Bush**, an islet of red mangrove (*Rhizophora mangle*) lying off the southern marsh of Middle Caicos, is a traditional nesting site for Magnificent Frigatebirds (*Fregata magnificens*). There were ca 35 nests with young, mainly large but one small, with only 10 adults near. **Black Rock**, a low cay with a few patches of mangrove in the shallow water several km south of Middle Caicos, is probably too low to afford a safe nesting site. Here we recorded three Ospreys, ca 20 Laughing Gulls, and ca 100 Black-bellied Plovers. Although several herons and terns were resting, light and distance were too poor for species identification. We saw a Royal Tern, two

Brown Noddies, and 12 Laughing Gulls feeding at various locations along our line of passage over the Caicos Bank.

Long Cay.—We inspected only the SE cliff side of Long Cay from the sea (near South Caicos, not to be confused with the cay of the same name on Turks Bank). At least 30 White-tailed Tropicbirds flew from the cliffs, and we saw 2 Brown Noddies at sea.

Fish Cays.—An Osprey was at the North end of the main cay and an old nest site in the centre of the cay, where we saw an American Kestrel and a pair of American Oystercatchers, a Laughing Gull, a juvenile Yellow-crowned Night-Heron and an adult Little Blue Heron (*Egretta caerulea*). On the bare rock slope on the east side of the cay we found a colony of ca 200 AONs of Roseate Terns (*Sterna dougalii*), with adults incubating. In dense vegetation north of the pool in the centre of the cay were at least 100 AONs of Brown Noddies, and probably rather more hidden in vegetation. At the southern end of the cay were at least 3 AONs of Brown Noddy, 25 AONs of Sooty Terns (*Sterna fuscata*), and 25 AONs Bridled Terns. There were dog tracks on the shore on the west side, indicative of a recent landing by humans with a free-running dog. Vegetation was mostly of prickly pear (*Opuntia stricta*), sand burr (*Cenchrus tribuloides*), railroad vine (*Ipomoea pes-caprae*), and seven-year apple (*Casasia clusiifolia*). A large part in the northeastern side was unvegetated rock. There was little sign of bird activity on the smaller SE Fish Cay, which was essentially bare rock.

Little Ambergris Cay.—This cay consists of several small cays surrounding a central lagoon, far removed from the larger cays of the Caicos Bank. An extremely long, shallow, submerged spit extends west from the Cay over the Bank. Resting on a sand spit were 30 Laughing Gulls, 30 Royal Terns, 200 Sandwich Terns (*Sterna sandvicensis*), and 300 Roseate Terns. Some terns, especially Sandwich, were in pair displays on the ground and in the air. In the same area we saw six Ruddy Turnstones (*Arenaria interpres*) and three Common Ground-Doves (*Columbina passerine*). Along the rest of the outer south shore of Little Ambergris Cay we saw a Brown Pelican and a Laughing Gull. We did not inspect the inner lagoon and marshes. In August 1999, these held a colony of Laughing Gulls.

Rocks between Big Ambergris Cay and Bush Cay.—There were no visible birds on these barren rocks.

Bush Cay.—Mangroves along southern shore, which probably gave the cay its name, were black mangrove (*Avicennia germinans*). Some buttonwood (*Conocarpus erectus*) were also present. The cay itself was largely covered in saltwort (*Batis maritima*), railroad vine (*Ipomoea pes-caprae*), and prickly pear (*Opuntia stricta*).

Almost all of this roughly triangular, mainly rocky cay, the longest axis of which is about 700 m, held ground-nesting terns of three species, with additional Brown Noddies nesting in mangrove bushes along part of the southern shore. Quadrat sampling of the ground nesting birds gave estimated AONs of 1750 Sooty Terns, 970 Bridled Terns, and 1750 Brown Noddies. A flush count of a section of this area gave minimum estimates of 1100, 670, and 1100. It was evident that a high proportion of the birds were not flushed from nests, so the quadrat-based estimate is probably more accurate. A further 1000 Brown Noddy AON were in the mangroves. Bridled Terns nested mainly in rocky hollows and towards edge of the cay. Sooty Terns and Brown Noddies were more generally spread, usually under some vegetation cover. Noddies also nested in mangrove bushes. Also recorded were 20 Laughing Gulls, nesting Common Ground-Doves, a pair of Gray Kingbirds (*Tyrannus dominicensis*), and a Green-tailed Warbler (*Microligea palustris*). Although this cay is a statutory sanctuary, with a permit required for landing, there were tracks of two dogs and one person on the beach – probably from earlier that day because they were fresh and unwashed by rain or tide.

Seal Cays.—There are numerous small rocks in the Seal Cays, which spread westwards from Bush Cay, to White Cay. Those with vegetation are dominated by prickly pear (*Opuntia stricta*) and sea oats (*Uniola paniculata*). The only ones on which significant numbers of birds were recorded (which tended to be the slightly larger, over about 1 ha, vegetated ones) were: **Pear Cay.**—There were 50 Brown Noddy AONs and a pair of Ospreys. **Shot Cay.**—We saw one Osprey on this small, bare rock. **Indian Cay.**—Landing on this rocky cay is not easy and was not attempted. However, much of it can be viewed well from the sea, from which it could be seen that the vegetation was essentially similar to White Cay (see below), which is only a few m away. This included correl (*Casasie calcisifolia*), wild guava, prickly pear, sand coast sedge (*Cyperus planifolius*), and seven-year apple. Sample counts

from the boat suggested bird densities similar to those on adjacent White Cay, giving estimated AONs of 1200 for Sooty Tern and 2800 for Brown Noddy. In addition, we saw an Osprey. **White Cay.**—Sample counts estimated 1200 AON for Sooty Tern and 2800 for Brown Noddy, equating to a density of nearly 1 nest per 10 m² for the latter. Nesting birds were mainly on eggs, but a few had young up to about 2 days old. In addition, we recorded: one Bridled Tern, six Laughing Gulls, two Ruddy Turnstones, and one Osprey.

French Cay.—French Cay is a small sandy cay of about 8 ha, about 50 km to the north-west of White Cay along the southern edge of the Caicos Bank. It is vegetated mostly by bay cedar (*Suriana maritima*), Nash's tree cactus (*Opuntia nashii*), saltwort, railroad vine, bay tansy (*Ambrosia hispida*), and sea purslane (*Sesuvium portulacastrum*). The bay on the western side of the cay held an Osprey, 16 Laughing Gulls and one Bridled Tern. At the northern end of the cay were ca 200 Brown Noddies on nests in bushes, 20 AONs of Sooty Terns, at least 20 AONs of Laughing Gulls, together with one flying pair of Bridled Tern, and 60 roosting individuals of each of Sooty Terns and Brown Noddies. Along the northern part of the eastern beach were five Brown Pelicans, five Laughing Gulls, one Royal Tern, 80 Brown Noddies, and a Sooty Tern roosting on the beach. An area of Bay Cedar bushes along the eastern side of the island included ca 1000 AONs of Brown Noddies and 20 AONs of Sooty Terns. A nearby area of Bay Lavender supported ca 1000 AONs of Brown Noddies, at a similar density. Ground Doves, probably nesting, were also in the open parts of this area. Derelict boats at the southern part of the eastern beach provided loafing, resting, and roosting sites for three Ruddy Turnstones, one Brown Pelican, a pair of Ospreys and several thousand Brown Noddies. A total count was impracticable, but when the Ospreys flushed a small proportion of these, we estimated there were about 2000 in the air. The southern end of the Cay was an extensive bushy area, supporting an estimated 9000 AONs of Brown Noddies and 90 AONs of Sooty Terns. The average density of Brown Noddies in the nesting areas was about one AON per 2 m². A Green Heron was seen on shore rocks at the south-west of the cay. Sooty Terns were seen feeding and drinking offshore.

Gibbs Cay.—We saw three Cattle Egrets (*Bubulcus ibis*), one American Kestrel, two Ospreys with a nest on a rock on the eastern side, and two Royal Terns flying over. This cay is frequently vis-

ited by diving and picnicking parties.

Round Cay.—It was not practicable to land, but we had good views of this dome-shaped cay from the boat, with AONs totalling 100 for Brown Noddies and 1 for Bridled Tern.

Rock off NE of Long Cay.—Two American Oystercatchers were seen.

Long Cay.—This narrow cay is about 2 km long, with a rocky, low cliff edge and flat, sandy top, with some areas of scrub. At the northern end of the cay, low bushes held ten AONs of Brown Noddies and one AON of Bridled Tern, together with a Green Heron. On the low eastern side, we found one Bridled Tern AON and six Brown Noddy AONs. On the western side there were 16 Brown Noddy AONs in bushes. We found most nesting seabirds in an area of bush about 750 m long by 60–100 m wide in the south-west of the cay. This held Brown Noddy nests at an average density of about 1 per 10 m², a total of 5960 AONs, with a much smaller number of Bridled Terns (60 AONs).

Rock S of Long Cay.—No birds were present.

Pear Cay.—This is a sparsely vegetated cay, about 500 m long, with a rocky edge and a sandy northern end. We saw 50 Laughing Gulls flying east of Pear Cay and one Royal Tern flying over, but no breeding seabirds. A pair of American Oystercatchers was probably nesting, as was a Yellow-crowned Night-Heron. There was an old Osprey nest.

East (formerly Pinzon) Cay.—This is a roughly triangular cay, about 1.5 km NW-SE, by about 800 m at the NW end. On a sandy spit at the NE point, we saw ten Laughing Gulls and 12 Sandwich Terns. Most of this cay is sandy, with cacti, low vegetation, and some scrub. A marshy inland area in the north housed a Laughing Gull colony of at least 100 AONs. We recorded a further 50 AONs in another area SE of the central ridge. At least 30 Least Terns were nesting on the eastern shore. We saw also a Cattle Egret (*Bubulcus ibis*) and two Roseate Terns flying by.

Penniston Cay.—This is a small cay about 700 m long by up to about 100 m wide. It consists of very sharp, uneven water-dissolved rock, with low scrub in places. Landing is difficult. In the northern half of the island we estimated 1200 Brown Noddy AONs and 240 Bridled Tern AONs. Brown Noddy average density was about 1 AON / 10 m². At the southern end of the cay we recorded a further 100 AONs of Brown Noddy and 1800 AONs of Bridled Tern. A detached rock at the southern end held 40

further Brown Noddy AONs, and three Brown Boobies (*Sula leucogaster*) flew up from this area and remained in the vicinity, suggesting that they were nesting. Thirty Magnificent Frigatebirds took to the air from the western side of the southern part of the cay and remained over the cay throughout our visit. There were no signs of active nests in the area that they rose from, although this is apparently the traditional nesting area. We found here remains of at least six dead frigatebirds, half of these looking relatively recent (weeks, rather than months). There was an old Osprey nest on the cay.

South of Grand Turk.—We saw two West Indian Whistling Ducks (*Dendrocygna arborea*) flying south towards Cotton Cay.

South of Salt Cay.—We saw two Audubon's Shearwaters (*Puffinus lherminieri*) at sea.

Big Sand Cay.—This, the southernmost cay on the Turks Bank and one of the most remote in the country, is about 2.5 km north-south, and up to about 400 m east-west. A wide sand shore lies along the southern half of the west side. The northernmost third of the cay, north of Beacon Hill, was covered with low vegetation including prickly pear, and held only small numbers of Brown Noddies and Sooty Terns. There was an old Osprey nest on one of the small old buildings associated with the former navigation beacon. An area of bushes on the west side of the central part of the cay held Sooty Terns at a high nesting density of 1.25 AON per m², giving a total of 25000 AONs. We made a flush-count check when about half the birds from 10% of this area flew up; these 1200 birds equated to 1800 nests, or 36000 in the area of the 25000 estimated from quadrats. To the south of this area, three fairly distinct sub-colonies, two in low bushes and one in 15 cm high vegetation, totalled a further 1200 AONs, and a loafing area of 200 birds was nearby. Farther south an area of prickly pear cover held an estimated 16000 AONs of Sooty Terns. South of this, four further groups nesting in low vegetation totalled 1600 AONs, with a further 600 AONs on rocky outcrops at the southern end of the cay. Amongst the Sooty Terns, mainly at the rocky edges, we estimated 240 Bridled Tern AONs and, at the southern rocky outcrops, 20 Brown Noddy AONs and six White-tailed Tropicbird AONs. On the wide sandbank at the southwest of the cay were at least 20 Least Terns AONs, mostly with young. We found several Common Ground-dove nests. We recorded also eight Laughing Gulls, one Roseate Tern, a pair and one separate American Oystercatcher, one Ruddy Turnstone, and one Green

Heron. On our arrival in West Bay, a yacht was already present, with a dinghy and people ashore; these returned to the yacht as our boat approached. The statutory Sanctuary status of the island was clearly not being observed.

DISCUSSION

Audubon's Shearwater (*Puffinus lherminieri*).—Given the nature of the survey, these hole-nesting birds which visit their nests at night, were seen only at sea. There are breeding records for “a small islet off Providenciales”, Long Cay and West Six Hill Cay, near South Caicos, and East Cay (Buden 1987), and local reports suggest significant breeding numbers on the small rocky cays off northwestern Middle Caicos, East Six Hill Cay, Middle Cay in the Five Cays, and NE East Caicos (Walsh-McGehee *et al.* 1998, Pienkowski 2002, 2005, 2006).

White-tailed Tropicbird (*Phaethon lepturus*).—The numbers recorded of this species will under-estimate totals for this species, because not all cliff areas likely to be used were covered, and because the survey method was not designed to detect all birds in nest burrows. There is some suggestion of distribution changes, as White (1998) advised birders to visit East Cay to see Tropicbirds, but we recorded none there.

Brown Booby (*Sula leucogaster*).—This species has been recorded from Penniston Cay since 1930 (Buden 1987) and breeding has long been suspected but not proved (Bradley 1995). The three birds flushed by this survey were probably nesting, but direct confirmation remains lacking. This is the only site in the country regularly used by this species.

Brown Pelican (*Pelecanus occidentalis*).—Brown Pelicans were widely recorded, but the numbers noted represent only a small proportion of the country's total, most occurring in the wetland areas on the larger islands (Pienkowski 2002, 2005).

Magnificent Frigatebird (*Fregata magnificens*).—The Penniston Cay colony has been known since a report of 25 pairs apparently breeding in 1966 (Buden 1987). The larger colony at Man o'War Bush on the south side of Middle Caicos was found (at least by ornithologists) more recently. Local opinion is that numbers there have been stable for many years. Our population estimates in 2000 and 2001 were about 60 AONs, and Walsh-McGehee *et al.* (1998) re-

ported 100-200 pairs. However, the apparent decline to 35 in the present survey may be seasonal, as the earlier counts were in April, and the breeding season is prolonged. The absence of nesting birds, and the presence of dead bodies, at Penniston is somewhat concerning, but no reason is apparent.

Osprey (*Pandion haliaetus*) and American Kestrel (*Falco sparverius*).—The wide distribution of Ospreys throughout the cays is notable, as well as the fairly wide distribution of Kestrels, not normally associated with seabird cays.

Common Ground-Dove (*Columbina passerina*).—We found these commonly on many cays, and most were nesting, with nests with eggs found on several cays.

American Oystercatcher (*Haematopus palliatus*).—Clearly territory-holding pairs were seen on several of the small cays, and the breeding population is evidently spread throughout the country.

Black-bellied Plover (*Pluvialis squatarola*) and Ruddy Turnstone (*Arenaria interpres*).—Summering, probably immature, birds of these arctic-breeding species were notable, especially the fairly large numbers of the Black-bellied Plover – despite most of the suitable habitat not being inspected. Numerous other personal observations also indicate high usage of shores throughout TCI by this species, especially in the non-breeding season.

Laughing Gull (*Larus atricilla*).—Although seen throughout the cays and islands, we found breeding colonies only on East Cay (internationally important at 2% of the Caribbean population; Anonymous 2003) and French Cay. A larger colony was found in north-eastern Little Ambergris Cay in 1999 (pers. obs.) but it was not possible to check this on this occasion.

Royal Tern (*Sterna maxima*), Sandwich Tern (*Sterna sandvicensis*), Gull-billed Tern (*Sterna nilotica*), and Common Tern (*Sterna hirundo*).—The first two species were recorded only in non-breeding situations (although in some cases in pairing displays) and the last two not at all. The breeding of the first three is thought to be fairly irregular, and in many cases using salt-pans and marshes on the larger islands. The irregularity is especially the case with the Gull-billed Tern (Pienkowski 2002, 2005). We found Little Ambergris Cay to be a resting area for internationally important proportions of the Caribbean populations of Royal Tern (2%), Sandwich Tern (4%) and Roseate Tern (3%; Anonymous 2003). Common Tern is on the edge of its breeding range but there have been frequent re-

cords in TCI for many years, probably resulting from the breeding colony found on East Caicos in 2004 (Pienkowski 2006).

Roseate Tern (*Sterna dougallii*).—The only breeding colony found was on Fish Cay, internationally important at 4% of the Caribbean breeding population (Anonymous 2003). White (1998) reported breeding on rocks south of Salt Cay.

Least Tern (*Sterna antillarum*).—We found two colonies on cays, but larger colonies occur on some of the larger islands (Pienkowski 2006).

Bridled Tern (*Sterna anaethetus*), Sooty Tern (*Sterna fuscata*), and Brown Noddy (*Anous stolidus*).—The general distribution of these three species in the area has been known for some time (*e.g.* Buden 1987), but a striking feature of the present survey was the number of the birds, as well as the differences between cays. For all three species, the numbers represented significant proportions of the Caribbean population. For Bridled Tern and Brown Noddy, the breeding numbers were of global significance and represented large proportions of the recorded Caribbean populations (Anonymous 2003).

Penniston Cay supported internationally important breeding numbers of Bridled Terns (1% of global and 33% of BirdLife International's estimate of Caribbean populations), with smaller, but still internationally important, numbers on other cays, primarily Bush Cay with some notably on Big Sand, Long, and Fish Cays.

Big Sand Cay's breeding Sooty Terns comprised an internationally important proportion of the Caribbean population (18% of the BirdLife figures), whereas Bush and Seal Cays (with smaller numbers on the other cays) held 2% of the Caribbean breeding population of Sooty Terns.

The cays held 5% of the global population of the Brown Noddy, with French Cay and Long Cay holding globally important numbers in their own rights. Internationally important breeding proportions, when viewed against the Caribbean population, were supported also on Penniston Cay and the Bush/Seal Cay group (particularly Indian and White Cays within the latter). The overall total was actually larger than BirdLife's estimate of the Caribbean breeding population, which therefore requires adjustment. On this basis, therefore, these Cays constitute numerically the most important breeding area for this species reported in the Caribbean.

Some nesting habitat differences between the species were evident. Bridled Terns favoured rocky

hollows, normally found in the cliffs around cays. However, there are wider bands of this habitat on some cays such as Bush Cay, and almost the whole of Penniston Cay consists of this habitat, accounting for the exceptional numbers there. All three species nested on the ground, usually under cover of some sort, usually vegetation for Sooty Tern and Brown Noddy. In addition, Brown Noddies nested abundantly in bushes. The densities of nests tended to vary considerably between cays but rather little within a habitat type on any one cay. Average densities of Brown Noddy nests ranged from 0.01–0.5 per m², with most around 0.1 per m². Those of Sooty Tern ranged from 0.01–1.25 per m². All these figures are thought to be under-estimates, because of the difficult nature of the terrain and vegetation. The Sooty Tern colony on Ascension Island in the mid-Atlantic stood at 194,000 pairs in 1997, at an average density of 2.12 per m² (Rowlands 2001).

Variability.—The annual variability in nesting for several species has been noted above. It is not known how much this relates to the other species. Dean (1999) reported thousands of Sooty Terns on French Cay and hundreds of Brown Noddies sitting on eggs. This is the reverse of the relative proportions of species surveyed there by us. However, Dean's survey was in early March and ours in early June. It is not known, therefore, whether this reflects a difference between years, or sampling of a regular annual pattern at different seasons in different years, or some other difference. The breeding cycle of Sooty Terns at Ascension Island in mid-Atlantic famously averages a 9.6-monthly, rather than annual, cycle (Ashmole 1963); this is probably as rapid a cycle as is possible in this fairly seasonless environment. At St Helena, 1300 km south of Ascension, the same species has an annual cycle (Rowlands *et al.* 1998). Clearly, more information is required on the biology of these species in the Turks and Caicos Islands before a formal monitoring programme could be developed.

Conservation.—The importance to the conservation of these birds of these cays is not in doubt. On the Caicos Bank, Bush, Seal, and French Cays constitute a statutory Sanctuary, while Little Ambergris and Fish Cays are a nature reserve of the Turks and Caicos National Trust, a not-for-profit membership-based conservation organisation established by statute. On the Turks Bank, Big Sand Cay, and Long Cay are statutory sanctuaries. Other small cays near Grand Turk constitute Grand Turk Cays Land and Sea National Park (a recreational category); Penniston Cay and East Cay need transferring from this to

sanctuary status. The sanctuary status is not widely realised, and there are many unauthorised landings from yachts, and probably boats carrying illegal immigrants, etc. More signage, public information, and enforcement are needed to make the protection effective.

ACKNOWLEDGMENTS

For help in boat access to these difficult sites, we thank Captains Alessio Girotti and Allen-Ray Smith, and able crew Phillip Garneau. The cooperation of the Department of Environmental Resources, in particular Michelle Fulford-Gardiner, Judith Garland-Campbell, and Rob Wild, is appreciated in several regards, including the provision of permits to survey the statutory sanctuaries and nature reserves. The advice and guidance throughout of the Turks & Caicos National Trust and Executive Director, Ethlyn Gibbs-Williams, are greatly appreciated. For discussion and comment on many points, we thank Richard and Dace Ground, Patricia Bradley, and Tony White. We are grateful for additional information made available by local residents, notably Cardinal Arthur, Alton Higgs, and Telford Outton, particularly in the community meetings undertaken during research and conservation work by the Turks and Caicos National Trust and the UK Overseas Territories Conservation Forum. Some information has been gathered incidentally to work partly supported by the UK Foreign & Commonwealth Office's Environment Fund for Overseas Territories, the UK Overseas Territories Conservation Forum, RSPB, and WWF-UK.

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Appendix 1. Numbers of main species of birds found in main area. AON = Apparently Occupied Nest; AOT = Apparently Occupied Territory; other numbers = individuals.

Cay	White-tailed Tropicbird	Magnificent Frigatebird	Osprey	Black-bellied Plover	American Oystercatcher	Laughing Gull
WEST CAICOS shores			3	5		1
PROVIDENCIALES						
West shore					1	1
Turtle Rock	1 AON					
Froggin' Bay	24 AON					
Silly Creek	8 AON					4
Taylor & Sapodilla Bays	8 AON					1
Five Cays						
William Dean Cay	1 AON					1
Pusey Cay	1 AON					1
Sim Cay	4 AON					1
Middle Cay						
Cooper Jack Bight and Rock	2					
N OF NORTH & MIDDLE CAICOS						
Three Mary Cays			1 AON			
N shore of North Caicos			1 AON			3
Bay Cay & East Bay Beach			1			3
Rock N of Highas Cay						
N pt of Highas Cay	20 AON					
S OF NORTH & MIDDLE CAICOS						
Man o'War Bush		35 AON				
Black Rock			3	100		20
Long Cay, S Caicos	30 AON					
CAICOS BANK OUTER CAYS						
Fish Cay			1		1 AOT	1
Little Ambergris Cay - W end						30
Bush & Seal Cays						
Bush Cay						20
Pear Cay			1 AON			
Shot Cay			1			

Appendix 1. (Continued)

Cay	Royal Tern	Sandwich Tern	Roseate Tern	Least Tern	Bridled Tern	Sooty Tern	Brown Noddy
WEST CAICOS shores							
PROVIDENCIALES	2						
West shore							
Turtle Rock							
Froggin' Bay	6						
Silly Creek					3 AON		
Taylor & Sapodilla Bays							
Five Cays							
William Dean Cay							
Pusey Cay							
Sim Cay							
Middle Cay							
Cooper Jack Bight and Rock					2 AON		
N OF NORTH & MIDDLE CAICOS					10 AON		
Three Mary Cays							
N shore of North Caicos							
Bay Cay & East Bay Beach							
Rock N of Highas Cay							
N pt of Highas Cay				2			
S OF NORTH & MIDDLE CAICOS	2						
Man o'War Bush					20 AON		10 AON
Black Rock							
Long Cay, S Caicos							
CAICOS BANK OUTER CAYS							
Fish Cay							
Little Ambergris Cay - W end							
Bush & Seal Cays							
Bush Cay							
Pear Cay							
Shot Cay							

Appendix 1. (Continued)

Cay	White-tailed Tropicbird	Magnificent Frigatebird	Osprey	Black-bellied Plover	American Oystercatcher	Laughing Gull
Indian Cay			1			
White Cay			1			6
French Cay			1 AOT			20 AON
TURKS BANK CAYS						
Gibbs Cay			1 AOT			
Round Cay						
Long Cay					1 AOT	
Pear Cay					1 AOT	
East Cay						150 AON
Peniston Cay		30				
Big Sand Cay	6 AON				2 AOT	8
TOTAL AON/AOT	103	35	5		4	170
TOTAL individuals (counting AON/AOT as 2), rounded to 2 significant figures	110	100	21	110	11	430

Appendix 1. (Continued)

Cay	Royal Tern	Sandwich Tern	Roseate Tern	Least Tern	Bridled Tern	Sooty Tern	Brown Noddy
Indian Cay			200 AON		25 AON	25 AON	100 AON
White Cay					1	1200 AON	2800 AON
French Cay	1				1 AON	130 AON	11000 AON
TURKS BANK CAYS	2						
Gibbs Cay					1 AON		100 AON
Round Cay					60 AON		6000 AON
Long Cay	1						
Pear Cay		12	2	30 AON			
East Cay					2000 AON		1300 AON
Peniston Cay			1	20 AON	240 AON	44000 AON	20 AON
Big Sand Cay							
TOTAL AON/AOT	44		200	50	3332	48305	26930
TOTAL individuals (counting AON/AOT as 2), rounded to 2 significant figures	44	210	700	100	6700	97000	54000