# Waterbirds around the world

## A global overview of the conservation, management and research of the world's waterbird flyways

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*Cover photography:* Whooper Swans *Cygnus cygnus* arriving at Martin Mere, England. Photo: Paul Marshall. (www.paulmarshallphotography.com)

# Potential impacts of marine fisheries on migratory waterbirds of the Afrotropical Region: a study in progress

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## ABSTRACT
A study of the potential impacts of marine fisheries on AEWA-listed waterbirds of the Afrotropical Region is described. A total of 43 waterbirds of eight families forage in marine waters in the region. Nearly one-third are gulls and terns, the rest of the assemblage being made up of a penguin, cormorants, a gannet, pelicans, phalaropes and a grebe. Only four of the species are considered to be globally threatened, and three of these are southern African endemics. Nearly half the species considered are breeding residents. Palearctic migrants make up the next largest category. The listed species are affected by a broad range of fisheries, both directly by mortality and indirectly by competition for resources. The fisheries of most concern are longlining, demersal trawling and purse-seining. The species most affected are the African Penguin *Spheniscus demersus*, Cape Gannet *Sula (Morus) capensis*, Cape Cormorant *Phalacrocorax capensis* and Great Crested Tern *Sterna bergii* in southern Africa, and probably Palearctic gulls and terns further north on the Continent. These species are recommended for future study and monitoring.

## INTRODUCTION
The First Session of the Meeting of the Parties to the African-Eurasian Migratory Waterbird Agreement (AEWA), held in Somerset West, South Africa, in November 1999, adopted Resolution 1.4 "International Implementation Priorities for AEWA 2000-2004" that listed a number of projects considered to be of international importance and for which international cooperation was needed (AEWA 1999, 2000). Funding to undertake Project 24 "Study of the potential impacts of marine fisheries on migratory waterbirds" was not attained by the AEWA Secretariat until the end of 2001. For a number of years, there has been significant concern about the potential impacts of commercial marine fisheries on bird populations. Whereas research has been conducted on seabird species (e.g. Tasker *et al*. 2000), there has been no overview on the potential impacts on waterbirds listed within Annex 2 of AEWA, a number of which are known to feed on marine prey. Such a review would identify candidate species and areas for more detailed study or monitoring.

In May 2002, a contract was awarded by the AEWA Secretariat to the Avian Demography Unit, University of Cape Town, to undertake the study. Following discussion, it was agreed that the study would be a "desk study", reviewing published and unpublished ("grey literature") sources, and would be largely restricted to the Afrotropical Region (Africa south of the Sahara). A first consideration of the species then listed within AEWA revealed that 33 species foraged to a greater or lesser extent in marine Afrotropical waters (here defined as commencing below low-water mark, and thus excluding birds that forage in the inter-tidal zone, such as most waders (shorebirds) and the large wading birds (Ciconiiformes).

A CAMP (Conservation Assessment and Management Plan) workshop held jointly by the Avian Demography Unit, University of Cape Town, and the IUCN/SSC Conservation Breeding Specialist Group in Cape Town, South Africa, in February 2002 recommended that 10 species of southern African breeding coastal seabirds should be nominated by South Africa for inclusion within Annex 2 of AEWA (du Toit *et al*. 2003). The workshop report included draft nomination texts which were then submitted by South Africa to the AEWA Secretariat. These nominations were accepted by the Second Session of the AEWA Meeting of the Parties, held in Bonn, Germany, in September 2002 (AEWA 2002), and were added to those birds to be included within the review of marine fisheries impacts, giving a total of 43 species spread over eight families (Table 1).

## METHODS
For each species, a literature review has been conducted and a species account has been drafted under the headings: description and taxonomy, distribution, migration and movements, habitat, breeding, population size and trends, foraging behaviour and diet, potential and actual impacts of marine fisheries, other related conservation concerns, and recommendations. The text of each species account is to be accompanied by a distribution map and a selected bibliography. An example of a species text, that for Great Crested Tern *Sterna bergii*, is given as Appendix 1.

Regional reviews of Afrotropical commercial marine fisheries in relation to potential impacts on waterbirds are to be undertaken separately for three regions: western (Mauritania to Congo), southern (Angola to Mozambique) and eastern (Tanzania to Sudan).

## A PRELIMINARY ANALYSIS
### Taxonomic and threatened status
Most (31; 72%) of the 43 marine-foraging species are gulls and terns. Cormorants (five species) form the next largest grouping. The pelecaniform order is also represented by one gannet and two pelicans. There are single species of grebes and penguins and two phalaropes (Table 1).

Only four of the 43 species have been accorded globally threatened status by the World Conservation Union (BirdLife International 2004). Three are southern African endemic species (African Penguin *Spheniscus demersus*, Vulnerable; Cape Gannet *Sula (Morus) capensis*, Vulnerable; and Bank Cormorant *Phalacrocorax neglectus*, Endangered). The fourth is the Vulnerable Socotra Cormorant *P. nigrogularis*, which is a non-breeding visitor to the Afrotropical Region (Gulf of Aden and southern Red Sea). No species has been categorized as

**Table 1. Waterbird species listed in Annex 2 of the African-Eurasian Migratory Waterbird Agreement that forage within Afrotropical marine waters.**

| |
|---|
| **SPHENISCIDAE** |
| African Penguin *Spheniscus demersus** |
| **PODICIPEDIDAE** |
| Black-necked Grebe *Podiceps nigricollis* |
| **PELECANIDAE** |
| Great White Pelican *Pelecanus onocrotalus* |
| Dalmatian Pelican *Pelecanus crispus* |
| **SULIDAE** |
| Cape Gannet *Sula (Morus) capensis** |
| **PHALACROCORACIDAE** |
| Crowned Cormorant *Phalacrocorax coronatus** |
| Bank Cormorant *Phalacrocorax neglectus** |
| Great Cormorant *Phalacrocorax carbo** |
| Socotra Cormorant *Phalacrocorax nigrogularis* |
| Cape Cormorant *Phalacrocorax capensis** |
| **SCOLOPACIDAE** |
| Red-necked Phalarope *Phalaropus lobatus* |
| Grey Phalarope *Phalaropus fulicaria* |
| **LARIDAE** |
| White-eyed Gull *Larus leucophthalmus* |
| Sooty Gull *Larus hemprichii* |
| Audouin's Gull *Larus audouinii* |
| Kelp Gull *Larus dominicanus** |
| Heuglin's Gull *Larus heuglini* |
| Armenian Gull *Larus armenicus* |
| Yellow-legged Gull *Larus cachinnans* |
| Lesser Black-backed Gull *Larus fuscus* |
| Great Black-headed Gull *Larus ichthyaetus* |
| Grey-headed Gull *Larus cirrocephalus** |
| Hartlaub's Gull *Larus hartlaubii** |
| Common Black-headed Gull *Larus ridibundus* |
| Slender-billed Gull *Larus genei* |
| Mediterranean Gull *Larus melanocephalus* |
| Little Gull *Larus minutus* |
| Sabine's Gull *Xema sabini* |
| Gull-billed Tern *Sterna nilotica* |
| Caspian Tern *Sterna caspia* |
| Royal Tern *Sterna maxima* |
| Lesser Crested Tern *Sterna bengalensis* |
| Great Crested Tern *Sterna bergii* |
| Sandwich Tern *Sterna sandvicensis* |
| Roseate Tern *Sterna dougallii* |
| Antarctic Tern *Sterna vittata** |
| Common Tern *Sterna hirundo* |
| Arctic Tern *Sterna paradisaea* |
| Little Tern *Sterna albifrons* |
| Saunders's Tern *Sterna saundersi* |
| Damara Tern *Sterna balaenarum* |
| White-cheeked Tern *Sterna repressa* |
| Black Tern *Chlidonias niger* |

*Species added to Annex 2 of AEWA in 2002 following nomination by South Africa.
Note: Taxonomy, nomenclature and sequence after AEWA (2002).

Critically Endangered. Five species have been categorized as Near Threatened, including an additional three southern African endemics: the Crowned Cormorant *P. coronatus*, Cape Cormorant *P. capensis* and Damara Tern *Sterna balaenarum*, and two gulls, White-eyed *Larus leucophthalmus* and Audouin's *L. audouinii*. The White-eyed Gull is endemic to the Red Sea; Audouin's Gull is a non-breeding visitor to the western Afrotropics (Mauritania and Senegal) from the Mediterranean.

When considered on a regional basis, it is noteworthy that six of the nine threatened and near threatened species are endemic to southern Africa. The absence from the Afrotropics of threatened gulls and terns is also noticeable, with only two of the 31 species being considered as near threatened.

## Migratory and regional status

Nearly half (19; 44%) of the 43 AEWA species under consideration are breeding residents of the Afrotropical Region (although some of these may also be regarded as intra-African migrants). Twenty-three (53%) are Palearctic migrants, of which eight species also have breeding populations within the Afrotropical Region. A single species, the Antarctic Tern *S. vittata*, is a non-breeding visitor from the Southern Ocean to southern Africa.

The regional distribution of AEWA marine-foraging Afrotropical species shows some intriguing patterns (Table 2). Not surprisingly, there are more Palearctic visitors to western and eastern Africa than to southern Africa. Perhaps most significant is that southern Africa supports more breeding species than do the other two regions. On a taxonomic basis, southern Africa supports the largest numbers of pelecaniform species (due to the presence of four species of marine cormorants, three of which are

**Table 2. Regional distribution and origins of marine-foraging AEWA-listed species within the Afrotropical Region.**

| | Region | | |
|---|---|---|---|
| **Category** | **Western** | **Southern** | **Eastern** |
| Breeders | 4 | 14 | 8 |
| Breeders/Palearctic migrants | 5 | 1 | 5 |
| Intra-African migrants | 2 | 2 | 0 |
| Palearctic migrants | 14 | 7 | 12 |
| Southern Ocean migrants | 0 | 1 | 0 |
| **Totals** | **25** | **25** | **25** |

**Table 3. Taxonomic distribution of marine-foraging AEWA-listed species within the Afrotropical Region.**

| | Region | | |
|---|---|---|---|
| **Taxon** | **Western** | **Southern** | **Eastern** |
| Penguins | 0 | 1 | 0 |
| Grebes | 1 | 1 | 1 |
| Pelicans and allies | 3 | 6 | 4 |
| Phalaropes | 1 | 1 | 1 |
| Gulls | 9 | 4 | 9 |
| Terns | 11 | 12 | 10 |
| **Totals** | **25** | **25** | **25** |

endemic to the region), but supports less than half the number of gulls that occur in the other two regions, since a number of Palearctic migrant gulls do not venture that far south (Table 3).

### Impacts of marine fisheries

Southern African fisheries are mainly by trawl, purse-seine and longline, whereas western African fisheries are more diverse, with a significant artisanal component (as is the case for eastern Africa). Each of these fisheries impacts upon seabirds in negative and in positive ways, as summarized below.

### Longline fisheries

Longline fisheries are well known for their injurious effects on many seabird populations, mainly members of the Procellariiformes (albatrosses and petrels). However, there is little evidence that AEWA species are significantly affected within the Afrotropics. The exception may be the Cape Gannet, which has been recorded caught on longlines off South Africa and Namibia (Cooper & Ryan 2003). Although evidence is lacking, gulls may be at risk in western Africa, since the migrant visitors Audouin's Gull and Yellow-legged Gull *L. cachinnans* are killed by longlines set in the Mediterranean Sea (Cooper *et al*. 2003). Longlining does offer some advantages to seabirds, in the form of discarded offal and non-target species, but this has not been assessed within the Afrotropics.

### Trawling

Demersal trawling off southern Africa is an important source of food (discards and offal) for several AEWA species, most especially the Cape Gannet, and to a lesser extent the Kelp Gull *L. dominicanus* (Abrams 1983, Ryan & Moloney 1988). However, birds may become trapped in trawls, and be killed or injured by collisions with trawl warps (S.L. Petersen pers. com., pers. obs). Published information is lacking from elsewhere within the Afrotropics.

### Purse-seining

This type of fishery acts indirectly by reducing the food supply of several AEWA species. Significant examples are a suite of species that prey upon small shoaling fish in southern African waters (African Penguin, Cape Gannet, Cape Cormorant and Great Crested Tern; see, for example, Crawford & Dyer 1995 and Crawford 2003). Quantitative information from the western Afrotropical Region is largely absent, but several species of terns are known to consume fish prey also taken by purse-seine and beach-seine fisheries (Brenninkmeijer *et al*. 2002, Veen *et al*. 2003).

### Traps

Traps set for Cape Rock Lobster *Jasus lalandii* have been known occasionally to entrap and drown Bank Cormorants in southern African waters, but this is not thought to be a significant cause of mortality (Cooper 1981, 1985). However, over-fishing of rock lobster may be adversely affecting this Endangered and decreasing species indirectly, since the lobster forms an important part of its prey in most of its breeding range (unpubl. data)

### Gill nets

Gill and set nets have occasionally drowned African Penguins in South African waters (pers. obs). However, as these nets are mainly used within sheltered bays and estuaries, the drownings that they cause are not thought to be a significant cause of mortality to the species.

Great Crested Terns *Sterna bergii* breeding on Robben Island, South Africa. Photo: Dieter Oschadleus.

### Indirect fishery impacts

Discarded gear can lead to entanglements and ingestion, as has been reported for Great Crested Terns in southern Africa (Cooper *et al*. 1990). All of the species under consideration are potentially at risk, but information on species and regional differences is essentially lacking. The catching of birds, such as gannets and terns, by fishers for food nowadays is largely restricted to artisanal fisheries, although hard evidence is generally lacking.

## CANDIDATE SPECIES FOR MONITORING

The following species are suggested for further study and monitoring to assess the effects of marine fisheries on their populations within the Afrotropical Region. Within the southern African region, continued demographic and dietary studies of the African Penguin, Cape Gannet, Cape Cormorant, Bank Cormorant and Great Crested Tern are warranted, following on from the large body of work undertaken over the last 50 years (e.g. Crawford 2003 and references therein). In the western and eastern regions, far less is currently known, and new studies should continue to concentrate on those migrant and resident gulls and terns which are known or are thought to overlap in their prey with commercial fisheries (e.g. Brenninkmeijer *et al*. 2002, Veen *et al*. 2003).

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## APPENDIX 1

### GREAT CRESTED TERN *STERNA BERGII*

Family: Laridae

Other names: Swift, Crested, Greater Crested Tern

### Description

The Great Crested Tern is a large, slender marine tern with long, narrow, strongly angled wings, a long deeply forked tail, a yellow bill and black legs and feet. It is grey above and white below with a black cap and a shaggy crest. Breeding adults have a black cap covering the upper forehead, crown and nape. The cap covers the eye and is separated from the bill by a narrow white forehead. Non-breeding adults differ from breeding birds in that the forehead is white, merging into a black-spotted or streaked crown. The hind crown and crest are matt black and may have faint white grizzling. The crest feathers are shorter and more rounded than those of adults in breeding plumage. The juvenile has a brownish black head and the crown is more mottled forming a paler cap. Juvenile upperparts are grey with brown and white mottling and barring.

### Distribution

Five subspecies have been recognized, four of which occur within the Afrotropical Region:

- *S. b. bergii* (smallest and palest subspecies) is endemic to southern Africa, with records extending from Luanda, Angola, in the west to Maputo, Mozambique, in the east. Breeding by *bergii* has been recorded at 27 localities, from Swakopmund, Namibia, to Stag Island, Algoa Bay, Eastern Province, South Africa.
- *S. b. enigma* occurs from the Zambezi Delta, Mozambique, south to Durban, KwaZulu-Natal, South Africa, and is believed to breed on islands off Mozambique and Madagascar.
- *S. b. thalassina* (largest and darkest race) breeds in East Africa and the central Indian Ocean.
- *S. b. velox* breeds in the Red Sea, East Africa, Arabian Sea, Persian Gulf and the northern Indian Ocean.

Note: only the African and south-western Asian populations are included in Appendix II of the Bonn Convention on Migratory Species.

### Movements

The southern African population is mobile. Adults leave breeding sites at the end of the breeding season and most move east to the Indian Ocean coastline of the Eastern Cape and KwaZulu-Natal, South Africa. Many fledglings move east from colonies in Namibia and Western Cape as shown by band recoveries. For example, a nestling banded at Lüderitz, Namibia, was recovered

at Umzumbe, KwaZulu-Natal (2 169 km), and a bird banded at Robben Island, Western Cape, was recovered at Sodwana Bay, KwaZulu-Natal (1 716 km). Other fledglings move substantial distances north, e.g. from Marcus Island, Western Cape, to Swakopmund, Namibia. Areas used by post-breeding adults and immatures overlap. Birds frequently change breeding sites between years, both changing sites of colonies at islands and moving between islands or mainland breeding localities.

The *thalassina* subspecies winters along the east African coast north to Kenya and Somalia and may move as far south as Durban, South Africa. Populations of *velox* breeding from the Persian Gulf eastwards appear to be sedentary or dispersive rather than migratory, but the population breeding in the Red Sea is partly migratory, wintering south along the east African coast to Kenya.

## Habitat

Great Crested Terns breed colonially on offshore islands, lagoons and salt pans. They may roost or loaf on sandy or rocky shores and less often on artificial structures such as boats, pilings and harbour buildings. In Namibia, they favour poles in cultivated oyster beds or raised salt encrustations in lagoons. They occur on their own or in flocks of up to several hundred birds, sometimes with gulls or other species of terns.

The species does not occur far out to sea, being restricted to the continental shelf usually within sight of land. It ventures inland at only a few localities when birds may forage at water bodies up to 3 km from the sea and cross narrow strips of land that separate water bodies, such a between Table and False Bays near Cape Town, South Africa.

Great Crested Terns *Sterna bergii* breeding on Robben Island, South Africa. Photo: Dieter Oschadleus.

## Breeding

Great Crested Terns breed in colonies, often in association with other seabirds. They are monogamous and the pair bond is maintained during the year and sometimes lasts from year to year. Mean colony size is significantly related to the abundance of pelagic fish prey. The nest consists of a shallow scrape in the sand on open flat or occasionally sloping ground. It is often unlined, but sometimes includes stones or the bones of cuttlefish *Sepia* spp. One, occasionally two, eggs are laid and incubated for 25-30 days during the months of January to early July in the Western Cape. Newly hatched chicks are very pale, with sparse black speckling. They are brooded and fed by both parents. Older chicks form crèches or loose groups. Young fledge at 38-40 days. Some fledged young accompany their parents after leaving colonies and most remain dependent until at least four months of age.

## Population size and trends

The species' total population within the Afrotropical Region is unknown. Best estimates follow:

| | | |
|---|---|---|
| Madagascar and Mozambique | *enigma* | 8 000-10 000 individuals |
| Eastern Africa & Seychelles | *thalassina* | 2 550-4 500 individuals |
| Red Sea & north-eastern Africa | *velox* | numbers unknown |
| Southern Africa | *bergii* | 20 000 individuals |

Note: The breeding population of *bergii* was 4 835 pairs in 1984 and 6 336 pairs in 2000 in South Africa, and up to 1 682 pairs have nested in Namibia.

## Food and feeding

In the Western Cape (1977-1986), fish formed 86% of all prey items consumed. The remainder was made up of cephalopods, crustaceans and insects. Prey size ranged from 7-138 mm in length and 0.1-30.0 g in mass. Shoaling pelagic fish, notably Anchovy *Engraulis capensis* and Sardine *Sardinops sagax*, are especially important in the diet. In Namibia, Great Crested Terns feed mainly on Pelagic Goby *Sufflogobius bibarbatus* and hakes *Merluccius* spp. Immature birds are often kleptoparasitized by Kelp Gulls *Larus dominicanus* in Namibia. On Stag/Seal Island in the Eastern Cape, young were mainly fed on *Petalichthys capensis*. Fiddler Crabs *Uca stenodactyla* have been reported as prey in Tanzania.

Great Crested Terns feed mostly at sea by plunge diving or by dipping and food is usually swallowed in mid air. They are restricted to the top one metre of the ocean and birds may forage up to 10 km from land in the breeding season.

## Impacts of marine fisheries

Although this species is not threatened in southern Africa, large fluctuations in numbers of Great Crested Terns breeding in the Western Cape of South Africa are significantly related to fluctuations in the abundance of pelagic fish on which they prey. These are intensively exploited by a purse-seine fishery, which could thus have deleterious indirect effects on prey availability.