

NAMIBIA

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Layard's Tit-babbler *Sylvia layardi*. (ILLUSTRATION: MARK ANDREWS)

GENERAL INTRODUCTION

The Republic of Namibia extends from c.17°S to 29°S and from 14°E to 21°E. The total land surface area is 823,988 km², making it one of the larger countries in Africa. Namibia lies on the west coast of Africa, facing the Atlantic Ocean, and possesses 1,470 km of coastline. The country extends nearly 1,300 km from north to south and up to 930 km from west to east, with the Caprivi Strip extending a further 450 km to the east. Namibian independence in March 1990 resulted in the country being restructured into 13 regions: Kunene, Omusati, Oshana, Ohangwena, Oshikoto, Okavango, Caprivi, Otjozondjupa, Omaheke, Erongo, Khomas, Hardap and Karas. Five regions form the border with Angola in the north. The southern extent of the country, where it borders South Africa, is defined by the Orange river and the Kalahari Gemsbok National Park of South Africa. The Caprivi Strip borders Angola and Zambia along its northern edge, Botswana to the south and Zimbabwe to the east.

The 1991 national census estimated Namibia to be home to 1.43 million people and, with a population growth-rate of 3.1% per year (among the world's highest), it is estimated that the country supported 1.84 million people in 1999. With a total land surface area covering 3% of Africa, the country supports barely 0.2% of the continent's human population, and has one of the world's lowest population densities. People are distributed very unevenly, with 60% of the population living north of Etosha Pan (where nine people/km² is the norm). This contrasts sharply with Namibia's southern regions where population densities are as low as one person per 4 km². Twenty-eight percent of the population live in 57 urban areas; the remainder subsist in rural areas. Windhoek, the capital, alone accounts for a third of the total urban population; the rest is divided among Oshakati, Rundu, Rehoboth, Swakopmund, Keetmanshoop, Tsumeb and Walvis Bay.

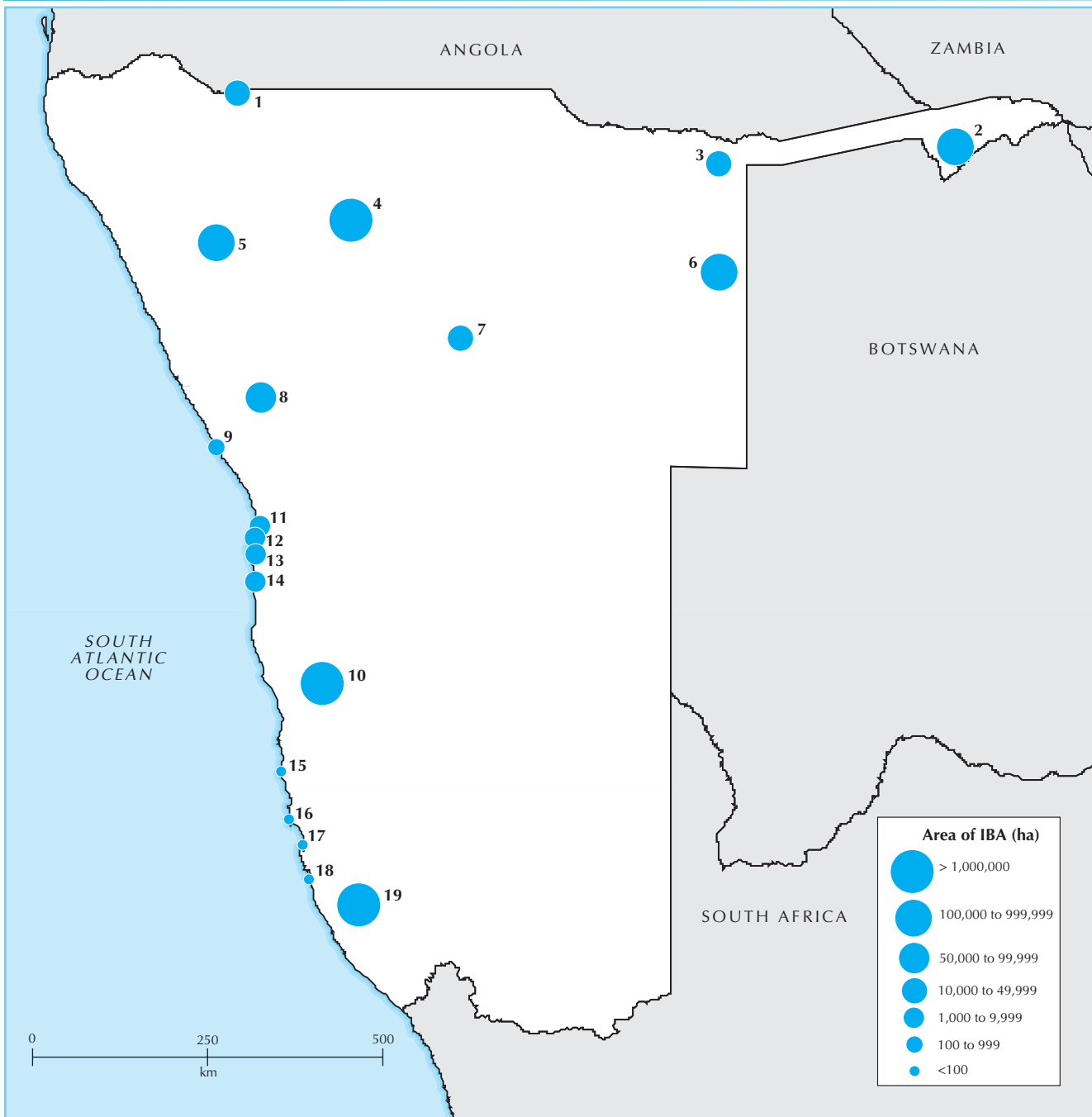
Namibia can be divided into four geographic regions: the Namib desert, the Namib escarpment, the Central Plateau and the Kalahari sandveld.

The Namib desert and coastal plain cover about 15% of Namibia. The coastal plain stretches over 2,000 km from the Olifants river in South Africa to the Carunjamba river in southwestern Angola. This relatively narrow belt extends roughly 80–200 km inland, reaching an elevation of up to 1,000 m, where it meets the Namib escarpment. Wherever the escarpment is absent, the desert is effectively delimited by the 100 mm annual rainfall isohyet. Throughout its range, the Namib desert is criss-crossed by many dry riverbeds, which occasionally flow after heavy rains. North of the Kuiseb river the Namib desert dunes give way to vast gravel-plains that extend uninterruptedly to the Ugab river. Dotted across this stark landscape are several inselbergs of granite, schist and limestone. Where the coastal plain tapers northwards into Angola, the perennial Cunene river traverses it.

The Namib escarpment forms a discontinuous narrow belt between the Orange and the Swakop rivers before disappearing in the central parts of Namibia. Three hundred kilometres farther north it emerges once again as a thin transition zone between the desert and the central highland plateau. Namibia's highest peaks are dispersed throughout this range, including the Gamsberg (2,347 m), Erongos (2,319 m), Brandberg (2,573 m), and Baynes mountains (2,038 m). The altitudinal gradient, isolation and ecotonal nature have been key factors influencing the escarpment's biological diversity. The extensive network of rivers and stream beds that cross it act as important microhabitat corridors for species moving across this rugged environment. Several endemic vertebrates, invertebrates and plants are known to occur in this zone.

Above the escarpment, the Central Plateau, Namibia's primary water catchment area, extends to the east. This zone extends from Otavi in the north to the Orange river in the south. The Kaokoveld mountains in the north-west are characterized by broadly incised drainage valleys and occasional inselbergs. The central Khomas Hochland plateau varies in altitude from 2,302 m to 1,000 m, averaging 1,700 m. The plateau abruptly meets the escarpment, giving rise to several steep mountain passes, leading into extensive

Map 1. Location and size of Important Bird Areas in Namibia.



drainage systems characterized by vast sedimentary plains. The most distinctive feature is undoubtedly the Fish River Canyon in the south—the world’s second-largest canyon.

To the east, dropping off the plateau, a deep, red, sand sea known as Kalahari sandveld is encountered. Its western limit is Etosha Pan, where white alkaline soils dominate. Kalahari sandveld is generally covered in grass and occasional thorn-tree species, becoming broadleaved further north.

Offshore, there is an area of intense ocean upwelling, which gives rise to very high marine productivity but low species richness.

Rainfall scarcity and unpredictability dominate Namibia’s climate. It has an average rainfall of c.250 mm per year; north-central Namibia receives on average 500 mm per year and all of the Caprivi Strip is above this mean. Namibia is classified as an arid country. More than 80% of the rain is recorded between November and March, occurring predominantly as thunderstorms. The extreme south-west is an exception, receiving most of its rain in winter, whilst the Namib desert depends almost entirely on coastal fog for precipitation.

Rainfall increases from west to east and from south to north. Annual evaporation rates are as high as 3,700 mm per year and as

much as 83% of precipitation is lost via evaporation. Of the remaining 17%, plants transpire 14%; only 2% enters drainage systems, of which only 1% eventually reaches the groundwater-table.

High daily temperature fluctuations are frequent in Namibia, especially in the desert where temperature buffers, such as vegetation and moisture, are almost absent. Closer to the coast the ocean acts as a thermal moderator with daily temperatures seldom fluctuating more than 5°C.

The scarcity of water in the Namib region is the result of high-pressure air cells drifting south and anti-cyclonic winds from the Equator descending over Namibia as dry air. Thick fog is generated along the coastline as pockets of moist air, reaching the coast from the mid-Atlantic, cool over the Benguela Current and are subsequently pushed inland. These fogs are the only source of water for many species in the desert.

Based on annual precipitation, the Namib can be divided into three sections: coastal, central and inland. Coastal zones receive less than 5–20 mm rainfall per year but up to 180 days of thick coastal fog. In the central Namib, 40–80 km from the shoreline, rainfall can be 20–50 mm per year, temperatures are higher, and fogs reach here only 40 days a year. Further inland, fogs are rare,

temperatures rise sharply and mean annual rainfall varies from 50 mm to 85 mm per year.

Namibia has three broad vegetation-types: desert, savanna and woodland.

The northern Namib, better known as the Skeleton Coast, is characterized by vast tracts of gravel-plains and pale sand, sparsely covered by the reed-like grass *Cladoraphis*. Gravel-plains and a sea of small hummock-dunes mark the central Namib, mainly between the Kuiseb and Huab rivers. Dune-fields occur from the Huab river to the Cunene. A community of clustered shrubs such as *Zygophyllum*, *Psilocaulon* and *Salsola* have colonized this substrate. *Zygophyllum* and *Arthroaerua* grow in isolated patches in the vast inland gypsum plains. Over 100 species of lichen occur throughout the coastal plains, most commonly where fog sustains them and few plants survive. The famous *Welwitschia* occurs on the gravel-plains, especially in drainage channels.

Inland, the vegetation becomes gradually denser and where water collects, for example in drainage lines and pans, *Acacia* and *Asclepias* are common. The onset of rains can often transform these areas into prairies of *Stipagrostis* grass. Confined to riverbeds, particularly the lower reaches of the Kuiseb, the !Nara *Acanthosicus* grows abundantly.

A sea of shifting sand-dunes covers the southern Namib, which extends south from the Kuiseb river to Lüderitz, almost 350 km south. Only hardy grass species, such as *Stipagrostis*, survive in this part of the desert. South of Lüderitz, rainfall patterns switch from exclusively summer rainfall to winter rainfall, and the arid desert grades into a highly species-rich semi-arid Karoo, prolific in succulent species. A quarter of Namibia's flora is found in this area; many species are endemic to this portion of the succulent Karoo, including the well-known *Pachypodium namaquanum* or 'halfmens' (half human).

South-east of Etosha Pan and covering the rising topography of the Central Plateau, one finds mountain savanna and Karstveld. Around Tsumeb, Grootfontein and Otavi, a pocket of higher rainfall, this savanna is characterized by tree species of *Kirkia*, *Berchemia*, *Fockea*, *Cyphostemma*, *Combretum* and *Pachypodium* (the northern territory counterpart of the 'halfmens'). *Lonchocarpus* and *Terminalia* are also present, but restricted to sandy substrates.

Further south a thorny dense savanna, aptly named thorn-bush savanna, sprawls southward to dominate most of Namibia's central region. Dense stands of intertwined *Acacia* canopies are a result of decades of intense grazing and consequent bush encroachment.

Highland savannas cover both the Khomas Hochland in central Namibia and the mountains surrounding Windhoek. *Acacia*, *Combretum* and *Tarchonanthus* are common and widespread trees

characteristic of this savanna. Large *Acacia* specimens are found along riverbeds and in deep alluvial deposits.

The shrubby landscape extending from Rehoboth south to the Orange river is known as dwarf-shrub savanna. Large shrubs such as *Parkinsonia*, *Catophractes* and *Acacia* are common and *Boscia* is occasionally interspersed between these.

The major part of the eastern half of the country is covered by vast stretches of deep, red sand-dunes that form part of the Kalahari system. The vegetation in the southern Kalahari grows along distinct longitudinal red sand-dunes, interspersed by hard calcrete dune-valleys and pans. *Acacia* and *Boscia* trees dominate the vegetation. Rain brings a prolific growth of grasses, annual herbs and Cucurbitaceae. Camel-thorn savanna stretches from east of Windhoek to the Botswana border and is particularly common and widespread throughout the central Kalahari. It is an open savanna with trees gathered in small bush clumps, mostly consisting of *Acacia*, *Grewia*, *Rhus* and *Ozoroa*.

Mopane woodland extends north of the Ugab river, covering the northern Cunene, Omusati and Oshana regions. *Colophospermum mopane* is the most characteristic species of this woodland type, and often forms large monospecific stands.

Tall, woodier forest-type woodland is particularly prolific along omurambas and around oshanas (open, flat drainage-channels) in the Oshikoto, Ohangwena and Oshana regions. Dense stands of wild date-palm *Phoenix* are common along the Okavango river, whilst riverine thickets of *Acacia*, *Peltophorum* and *Lonchocarpus* grow on the alluvial banks of the river. To the north-east, this forest-type woodland gradually closes up, forming closed-canopy woodland, with trees of *Pterocarpus*, *Burkea*, *Ricinodendron*, *Strychnos* and *Bauhinia* being characteristic.

A unique woodland-type grows along and in most ephemeral desert rivers along Namibia's western borders, including major rivers such as the Omaruru, Swakop and Kuiseb. Hardy, drought-resistant species growing on the riverbanks include *Acacia*, *Faidherbia*, *Tamarix*, *Salix* and *Ziziphus*. These linear oases form corridors suitable for the migration of woodland species in an otherwise unsuitable desert environment.

Desertification, or land degradation, resulting in reduced productivity in the arid, semi-arid and subhumid areas of Namibia, is a major environmental problem. Indicators of desertification in Namibia include: lowering of groundwater-tables; high silt-burdens in flooding rivers; loss of woody vegetation, grasses and shrubs; bush encroachment; increased salt content of soils; and decreased soil fertility.

Direct causes of desertification in Namibia include: dams or waterholes reducing nomadic movements of herders, contributing

Table 1. Summary of Important Bird Areas in Namibia.

19 IBAs covering 108,400 km²

IBA code	National code ¹	Site name	Administrative region	Criteria (see p. 11; for A2/A3 codes, see Tables 2/3)										
				A1	087	A2 s045	s046	A10	A3 A11	A12	A4i	A4ii	A4iii	
NA001	N002	Epupa-Ruacana	Kunene	✓	✓					✓				
NA002	N003	Eastern Caprivi wetlands	Caprivi	✓					✓				✓	
NA003	N004	Mahango Game Reserve and Kavango river	Caprivi	✓					✓				✓	
NA004	N005	Etosha National Park	Kunene	✓						✓			✓	✓
NA005	N006	Hobatere	Kunene			✓				✓				
NA006	N007	Bushmanland (Tsumkwe) Pan system	Otjozondjupa	✓					✓				✓	
NA007	N008	Waterberg Plateau Park	Otjozondjupa	✓						✓				
NA008	N009	Brandberg mountain	Erongo			✓				✓				
NA009	N010	Cape Cross lagoon	Erongo	✓									✓	✓
NA010	N011	Namib-Naukluft Park	Hardap	✓		✓	✓			✓	✓		✓	
NA011	N012	Mile 4 saltworks	Erongo	✓									✓	✓
NA012	N013	30-Kilometre Beach: Walvis-Swakopmund	Erongo	✓									✓	
NA013	N014	Walvis Bay	Erongo	✓									✓	✓
NA014	N015	Sandwich Harbour	Erongo	✓									✓	✓
NA015	N017	Mercury Island	Karas	✓									✓	✓
NA016	N018	Ichaboe Island	Karas	✓									✓	✓
NA017	N019	Lüderitz Bay islands	Karas	✓									✓	✓
NA018	N020	Possession Island	Karas	✓									✓	✓
NA019	N021	Sperrgebiet	Karas	✓			✓				✓		✓	✓
Total number of IBAs qualifying:				17	1	3	2	3	6	2	15	3	9	

1. Simmons et al. (1998).

to overgrazing and tree-cover reduction; inappropriate provision of artificial water-points; inappropriate irrigation and other crop-cultivation practices; absentee farm management; emergency grazing allowed in highly marginal areas; and inappropriate fencing in arid areas. Attempts are being made to reverse desertification trends and to manage Namibia's natural resources appropriately.

Overgrazing by livestock, a lack of browsing ungulates, and high-frequency burning have all led to a dramatic bush-encroachment problem in Namibia, especially in the northern parts of the country, since the 1940s. The removal of grass makes more water and nutrients available for trees and bush, while the relative absence of browsers, such as game (e.g. kudu, impala), allows continuous recruitment of bushes, forming dense thickets. Furthermore, severe grazing results in the decline of the more palatable perennial grasses and shrubs, as unpalatable bush and plants ultimately replace them. Bush-thickening results in a decrease in the capacity of the affected areas to support livestock. Depending on the degree of encroachment, carrying capacities for livestock have declined by between 20% and 80%. Bush control and natural megaherbivore-driven reduction of thornveld can reduce the problem. The best long-term solution is to implement judicious range management, the emphasis being on maintaining realistic stocking densities and on resting rangeland during its active growing season.

Although Namibia holds only 1.8 million people, it is also the driest country south of the Sahara, and population growth is alarming, at 3.1% per year. About 33% of Namibia's people live on just two percent of the land, in the Cuvelai drainage area on Namibia's north-central border with Angola (Mendelsohn *et al.* 2000). The primary concern is that Namibia has a very low and highly variable rainfall pattern, and experiences periodic droughts. To counteract the unreliable rainfall supply, many dams have been constructed, which dramatically affect the maintenance of ecosystem functioning in ephemeral rivers. It is envisaged that most of Namibia's water will in the future be drawn from the perennial northern wetlands, or from even further north. One of these projects is the Eastern National Water Carrier. This is an integrated long-distance water-supply scheme that is designed to supply the drier central portion of Namibia with water from the Kavango river (which flows into Botswana to form the Okavango Delta). Only with good planning and management, based on sound environmental assessments and a will to conserve water, Namibia's most precious natural resource, will the country be able to meet the challenge and avoid conflicts over this limited resource in the foreseeable future.

In certain places, mostly on the boundaries of the large national parks in the north, conflict exists between wildlife management and the neighbouring communities. Elephant *Loxodonta africana* frequently move out of protected areas to raid and destroy crops. Lions *Panthera leo* are also problematic, eating domestic stock such as donkeys, horses, sheep, goats and cattle.

Mining has been an integral part of the Namibian economy for over 50 years. Mining, however, carries environmental costs, including landscape alteration, damage to vegetation (which in the sensitive arid-zone landscape may take thousands of years to recover), and impacts on natural animal populations. Once mining is over, the area is scarred by abandoned mines with trenches, pits and mountains of tailings littering the landscape. It is now a requirement that mines be rehabilitated after the minerals have been removed. For the foreseeable future, mining will continue to anchor Namibia's economy, provide employment, and support a variety of secondary industries. But in the long term, it will be tourism, fisheries and agriculture that will provide employment. Namibia will therefore have to ensure that the life of its mines is maximized but that their impact on the environment is minimized.

ORNITHOLOGICAL IMPORTANCE

Namibia regularly hosts close to 660 bird species or c.30% of Africa's and 5.8% of the world's bird species respectively. At least 459 terrestrial species breed within Namibia (Brown *et al.* 1998). Well-represented families include the typically arid-adapted larks (Alaudidae; over 75% are endemic or near-endemic), bustards (Otidae) and coursers (Glareolidae).

Table 2. The occurrence of restricted-range species at Important Bird Areas in Namibia. Sites that meet the A2 criterion are highlighted in bold. Species of global conservation concern are highlighted in bold blue.

087 – Western Angola Endemic Bird Area (one species in Namibia; one site meets the A2 criterion)			
IBA code:	001		
<i>Estrilda thomensis</i>	✓		
s045 – Namibian escarpment Secondary Area (three sites meet the A2 criterion)			
IBA code:	005	008	010
<i>Namibornis herero</i>	✓	✓	✓
s046 – Namib desert Secondary Area (two sites meet the A2 criterion)			
IBA code:	010		019
<i>Certhilauda erythrochlamys</i>	✓	✓	

Namibia regularly holds significant numbers of five globally threatened species and 14 globally near-threatened species. The globally threatened species are *Egretta vinaceigula**, *Gyps coprotheres*, *Falco naumanni*, *Grus paradisea* and *Grus carunculatus** (all classed as Vulnerable). *Certhilauda burra*, a Vulnerable species, was erroneously listed for Namibia in Collar *et al.* (1994), but does not occur in the country. The near-threatened species are *Spheniscus demersus**, *Morus capensis**, *Phalacrocorax coronatus**, *P. neglectus**, *Phoenicopterus minor*, *Circus maurus*, *C. macrourus*, *Haematopus moquini**, *Gallinago media*, *Glareola nordmanni*, *Sterna balaenarum**, *Spizocorys sclateri**, *Namibornis herero** and *Estrilda thomensis**. Namibia holds particularly important populations of those species marked with an asterisk (*).

Despite the high incidence of localized and near-endemic taxa in Namibia, it holds only a tiny portion of a single Endemic Bird Area (EBA), the Western Angola EBA (EBA 087 in Stattersfield *et al.* 1998: Table 2). The only restricted-range species of this EBA that occurs in Namibia is *Estrilda thomensis*. The ranges of the other two restricted-range species in Namibia, *Certhilauda erythrochlamys* (the only bird confined to geopolitical Namibia) and *Namibornis herero*, define the Namib desert Secondary Area (number s046 in Stattersfield *et al.* 1998) and the Namibian Escarpment Secondary Area (s045) respectively (Table 2). Their distributions are non-overlapping at a local level, although they both occur in the huge Namib-Naukluft Park. The recent recognition of two additional restricted-range lark species occurring in Namibia, *Certhilauda barlowi* and *C. curvirostris* (Ryan *et al.* 1998; Ryan and Bloomer 1999), suggests that there may be an as-yet unrecognized EBA in the succulent Karoo at the Namibian/South African border.

It is widely agreed that the Namibian deserts and escarpment are evolutionary nodes holding many endemic taxa, including a suite of endemic and near-endemic birds that have individual ranges exceeding 50,000 km²; their conservation is almost entirely Namibia's responsibility. Key species include *Francolinus hartlaubi*, *Eupodotis rueppellii*, *Poicephalus rueppellii*, *Agapornis roseicollis*, *Tockus monteiri*, *Ammomanes grayi*, *Turdoides gymnogyns*, *Namibornis herero* (range is smaller than 50,000 km²), *Achaetops pycnopygius* and *Lanioturdus torquatus*. Two other species, *Phoeniculus d. damarensis* and *Parus c. carpi*, are almost certainly endemics, but their specific status requires scrutiny.

Three main biomes occur in Namibia (Table 3). For the purpose of choosing Important Bird Areas (IBAs) under the A3 criterion (biome-restricted assemblages of bird species), Namibia's woodlands along the Angolan border and in the north-east of the country were included within the Zambezian biome (A10), its arid savanna and Kalahari vegetation-types were included within the Kalahari-Highveld (A11) biome, and its desert areas within the Namib-Karoo biome (A12). Namibia's woodlands support 16 out of the 67 species restricted to the Zambezian biome, while its savannas hold 12 of the 13 species restricted to the Kalahari-Highveld biome and its deserts support 19 of the 23 species restricted to the Namib-Karoo biome. For the latter two biomes, no other country holds more such species.

To add to this remarkable terrestrial diversity, Namibia has a varied coastline holding a string of rocky islands. These provide

Table 3. The occurrence of biome-restricted species at Important Bird Areas in Namibia. Sites that meet the A3 criterion are highlighted in **bold**. Species of global conservation concern are highlighted in **blue bold**. Any other species with a restricted range are highlighted in **blue**.

A10 – Zambezi biome									
(16 species in Namibia; three sites meet the A3 criterion)									
IBA code:	001	002	003	004	005	006	007		
<i>Falco dickinsoni</i>		✓	✓						✓
<i>Centropus cupreicaudus</i>		✓	✓						
<i>Coracias spatulata</i>		✓	✓						
<i>Tockus bradfieldi</i>	✓	✓	✓	✓				✓	✓
<i>Parus rufiventris</i>			✓						
<i>Turdoides melanops</i>	✓	✓	✓	✓	✓	✓			✓
<i>Turdoides hartlaubii</i>	✓	✓	✓						
<i>Turdus libonyana</i>		✓	✓	✓					✓
<i>Thamnotaenia arnoti</i>		✓	✓						
<i>Calamanastes stierlingi</i>		✓							
<i>Cisticola pipiens</i>		✓	✓						
<i>Lamprotornis mevesii</i>	✓	✓	✓	✓					
<i>Lamprotornis acuticaudus</i>			✓						
<i>Nectarinia talatala</i>	✓	✓	✓	✓				✓	✓
<i>Lagonosticta nitidula</i>		✓	✓						
<i>Vidua obtusa</i>		✓							
Number of species recorded:	5	14	14	5	1	5	2		
A11 – Kalahari–Highveld biome									
(12 species in Namibia; six sites meet the A3 criterion)									
IBA code:	001	002	003	004	005	006	007	008	010
<i>Francolinus hartlaubi</i>				✓	✓		✓	✓	✓
<i>Pterocles burchelli</i>		✓	✓	✓	✓	✓	✓		
<i>Pocephalus rueppellii</i>	✓			✓	✓		✓	✓	✓
<i>Tockus monteiri</i>	✓			✓	✓		✓	✓	✓
<i>Turdoides gymnogenys</i>	✓			✓	✓		✓	✓	✓
<i>Erythropygia paena</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Calamanastes fasciolata</i>		✓	✓	✓	✓	✓	✓		✓
<i>Achaetops pycnopygius</i>	✓			✓	✓		✓	✓	✓
<i>Lanioturdus torquatus</i>	✓			✓	✓			✓	✓
<i>Lamprotornis australis</i>	✓	✓	✓	✓	✓	✓	✓		
<i>Philetairus socius</i>				✓				✓	✓
<i>Estrilda thomensis</i>	✓								
Number of species recorded:	8	4	4	11	10	4	9	8	8
A12 – Namib–Karoo biome									
(19 species in Namibia; two sites meet the A3 criterion)									
IBA code:	001	004	005	007	008	010	019		
<i>Neotis ludwigii</i>		✓	✓		✓	✓	✓		
<i>Eupodotis vigorsii</i>						✓	✓		
<i>Eupodotis rueppellii</i>			✓			✓	✓		
<i>Certhilauda curvirostris</i>									✓
<i>Certhilauda barlowi</i>									✓
<i>Certhilauda erythrochlamys</i>								✓	✓
<i>Eremalauda starki</i>		✓	✓	✓		✓	✓	✓	
<i>Ammomanes grayi</i>						✓	✓	✓	
<i>Eremopterix australis</i>							✓	✓	
<i>Cercomela tractrac</i>							✓	✓	✓
<i>Cercomela sinuata</i>									✓
<i>Cercomela schlegelii</i>								✓	✓
<i>Namibornis herero</i>		✓		✓		✓	✓		
<i>Sylvia layardi</i>			✓			✓	✓	✓	
<i>Eremomela gregalis</i>								✓	
<i>Euryptila subcinnamomea</i>								✓	✓
<i>Phragmacia substriata</i>									✓
<i>Onychognathus nabouroup</i>			✓		✓	✓	✓		
<i>Serinus alario</i>			✓					✓	✓
Number of species recorded:	2	4	5	1	8	15	15		
A13 – Fynbos biome									
(one species in Namibia; no sites meet the A3 criterion)									
IBA No:									019
<i>Francolinus capensis</i>									✓

platforms for seabird breeding colonies. Six seabird species, *Spheniscus demersus*, *Morus capensis*, *Phalacrocorax capensis*, *P. neglectus*, *P. coronatus* and *Larus hartlaubii*, and one shorebird, *Haematopus moquini*, have the majority of their global populations breeding on the nearshore islands of the cold waters of the Benguela Current, much of which is located off Namibia. The desert-breeding *Sterna balaenarum* is virtually restricted to Namibia when nesting. There are two embayments and several river mouths that are sufficiently protected to provide havens for hundreds of thousands of shorebirds. The central Namibian coast also has large areas of intertidal mudflats, and supports some of the largest concentrations of birds in Africa.

CONSERVATION INFRASTRUCTURE AND PROTECTED-AREA SYSTEM

Namibia's state-controlled protected-area network consists of 21 parks and recreation areas. Their cumulative size is equivalent to 13.8% of Namibia's total surface area. Although the network is extensive, three protected areas (Etosha Pan, Namib-Naukluft and Skeleton Coast) account for over 80% of it.

The suitability of adopting the IUCN protected-area classification into the Proposed Wildlife and Parks Management Act was considered at the 1997 workshop on the new Wildlife and Parks Management draft bill. Namibia's draft bill provides for seven categories that are modelled loosely on the IUCN system, including: strictly protected area, national park, multiple use park, people's park, site of interest, recreational interest and private park (Barnard 1998).

The Ministry of Environment and Tourism has recognized that the current body of legislation discriminates between communal and commercial farmers' rights on wildlife utilization. This has inevitably spurred a negative attitude to conservation by people living in communal areas. The legislation is being amended so that all communities can benefit from wildlife through innovative management and sustainable resource utilization. To achieve this, Namibia is implementing the community conservancy concept.

Conservancies are portions of land set aside for resource-conservation purposes and managed by multiple landholders, who share costs and benefits in an equitable manner. Conservancies may be established on both commercial (private) and communal (tribal) land. By enhancing habitat protection and boosting wildlife populations, conservancies are intended to draw foreign capital from tourism and sustainable utilization ventures. As of 2001, Namibia had 14 gazetted conservancies covering 38,500 km²—almost 5% of its surface area. Communal conservancies, encompassing huge areas, are being consolidated throughout the country. The Nyae Nyae conservancy alone encompasses 9,023 km² of the ecologically diverse Tsumkwe Pan region. Considering the unlikelihood of the state committing any further land to strictly protected areas, commercial and communal conservancies provide a suitable alternative.

Namibia also holds some 150 private nature reserves, encompassing 7,642 km² or 0.9% of its total area. Since game farming developed into an industry, farmers have been granted rights to benefit from wild animals on their farms. However, since game farms and nature reserves differ in legal status, particularly concerning game-hunting rights, there has been a 3% annual loss of private nature reserves since 1979. Nature reserves and game farms hold similar potential for species and habitat conservation.

A further 26,000 km² of land, known as the Sperrgebiet, effectively functions as a conservation area. Ever since the discovery of diamonds along the Namibian coast in 1907, this area has been declared off-limits to anyone other than mining companies. The buffer zone around the actively mined coastal strip has remained pristine and virtually free of disturbance. It is fortuitous that the area supports a high diversity of specialized flora and fauna, virtually endemic to the Sperrgebiet. An agreement exists between the diamond-mining company, NAMDEB, and the Namibian Government to minimize environmental damage during prospecting and mining operations. NAMDEB and the Ministry of Mines and Energy have initiated discussions with the Ministry of Environment

and Tourism to investigate the potential of sustainable ecotourism in the Sperrgebiet. This form of sustainable land-use may prove to be more compatible with the sensitive ecological functioning of the system and it may generate more long-term revenue.

Namibia is in the process of adopting a coherent and comprehensive new framework of environmental law, as the present legal parameters were inherited from the old South-West African subordinate legislation. Although the original body of legislation makes some provision to conserve biodiversity, it was clearly drafted with vague conservation ideals. The amendments to the Ordinance will explicitly bear in mind Namibia's unique and valuable biological diversity.

Parks and reserves are declared under the Nature Conservation Ordinance No. 4 of 1975, which, although outdated, is currently being revised and amended. However, Namibia is a party to a number of Conventions and Treaties that relate to resource utilization and their conservation. In the case of forestry, the Forest Act (No. 72 of 1968) embodies the demarcation, protection, management and trade of forest products. Specific protection for certain trees species is granted by the Preservation of Forest and Trees Ordinance (No. 37 of 1952).

To protect its marine resources, Namibia has claimed a 12-nautical-mile territorial sea along its 1,470 km of coastline, as well as a 200-nautical-mile Exclusive Economic Zone. Both these areas are protected in terms of the Territorial Sea and Exclusive Economic Zone of Namibia Act (No. 3 of 1990). However, specific protection for its marine diversity, its monitoring and exploitation (harvesting quotas) is granted by the Sea Fisheries Act (No. 29 of 1992). Because Namibia depends largely on its harvestable marine products, such as hake and pilchard, the Ministry of Fisheries and Marine Resources is renowned for having one of southern Africa's most aggressive and efficient law-enforcement approaches.

From the perspective of non-renewable resource exploitation, the Ministry of Mines and Energy has accepted that each new mining venture will aim to minimize environmental impact and will submit itself to an environmental assessment plan. This plan will address issues such as pollution, performance monitoring, environmental auditing and eventual decommissioning and rehabilitation. These aspects are incorporated in the Minerals Prospect and Mining Act (No. 3 of 1991), which incidentally makes similar stipulations on environmental protection with regard to offshore oil and gas exploitation in Namibian territory.

INTERNATIONAL MEASURES RELEVANT TO THE CONSERVATION OF SITES

Namibia acceded to the Ramsar Convention in 1995 and is currently processing a list of sites (including eight wetlands and three islands) suitable for inclusion in the list of Wetlands of International Importance. Thus far, the Etosha Pan/Cuvelai inland delta, Walvis Bay lagoon, Sandwich Harbour, and the Orange river mouth (jointly with South Africa) have been accepted as Ramsar Sites, and the Cape Cross lagoon has been proposed as a Ramsar Site.

Namibia's President, Dr Sam Nujoma, signed the Convention on Biological Diversity (CBD) at the Rio Earth Summit in 1992 and Namibia ratified the CBD in 1997. Namibia's constitution addresses the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. Furthermore, additional legislation claims sovereign ownership over all of Namibia's natural resources. Namibia is at present actively engaged in several biodiversity programmes, having employed, countrywide, a number of full-time professionals engaged in biodiversity research, as well as a national biodiversity coordinator. Other activities, such as park management plans, regional profiles, environmental education, Red Data book compilation and Namibia's National Biodiversity Country study, exemplify Namibia's commitment to the CBD.

Namibia's dubious honour of being the driest nation in sub-Saharan Africa prompted it, in 1994, to establish a National Programme to Combat Desertification, and it signed and ratified the Convention to Combat Desertification in 1997. Although Namibia does not generate any nuclear waste, it does mine uranium ore, and for this purpose, a strict Licensing and Security Act was drafted, in which among other issues, the import of hazardous waste

into Namibian territory is specifically banned. Namibia is in the process of acceding to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. Namibia is also a party to CITES, the World Heritage Convention and the Convention on Climate Change.

OVERVIEW OF THE INVENTORY

A total of 19 sites in Namibia qualify as globally Important Bird Areas (IBAs), covering a total area of c.108,400 km², which is equivalent to c.13% of Namibia's land surface area (Map 1, Table 1). Most of the sites are coastal or inland wetlands (Map 1).

Nearly all of the sites (17 out of 19) are important for species of global conservation concern, thus meeting the A1 criterion (Table 1). Five sites meet the A2 criterion, each holding a significant population of one or two restricted-range species (Table 1, Table 2). Epupa-Ruacana (NA001) is important for *Estrilda thomensis* of the Western Angola Endemic Bird Area (EBA), while those of the other sites are important for *Namibornis herero*. One of these latter sites, the huge Namib-Naukluft Park (NA010), is also important for another restricted-range species, *Certhilauda erythrochlamys*, although the species' distributions do not overlap in detail. Specifically included is the best site for the birds endemic to the Namib escarpment, Hobatere (NA005). This area, located to the east of Etosha National Park, and encompassing three quarter-degree squares, is predicted to contain 1% of the world population of *Namibornis herero*, a new finding. Hobatere Lodge offers partial protection to this site, even though it is afforded no legal protection. All of Namibia's endemic and near-endemic birds are contained within the IBA network, including *Certhilauda curvirostris* and the newly recognized *C. barlowi* within the diamond-mining area of the Sperrgebiet (NA019) in south-western Namibia.

A total of 11 sites meet the A3 criterion (Tables 1 and 3), comprising three sites important for Zambezi-biome species (together, these sites hold all 16 such species in Namibia), six sites important for Kalahari-Highveld species (together holding all 12 such species in Namibia), and two sites important for Namib-Karoo species (together holding all 19 such species in Namibia). Namib-Naukluft Park (NA010) is important for both of the latter biomes, reflecting the park's position at the transition between these biomes as well as its huge extent.

Of the 15 sites that meet the A4i criterion (being important for waterbirds), three also meet the A4ii criterion (being important for seabirds) and nine meet the A4iii criterion (regularly holding at least 20,000 waterbirds). These figures reflect the importance of the Benguela Current and of the coastal wetlands, which boast large numbers of breeding gannets, penguins, and cormorants, as well as hundreds of thousands of migrant Palearctic waterbirds that congregate on the central coast. Inland wetlands that meet these criteria include some already protected areas such Mahango Game Reserve (on the Kavango river), East Caprivi's extensive wetlands and Etosha National Park. However, unprotected sites include Bushmanland Pans in the Tsumkwe District and the stretch of the Cunene river between Ruacana and the Epupa Falls. Some of these places have been amalgamated into very large sites because the systems are single units ecologically.

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GLOSSARY

koppie a hill or small mountain.

kloof a gorge.

inselberg an isolated mountain, typically in the desert.

mopane broadleaved deciduous woodland, dominated by the tree *Colophospermum mopane*.

SITE ACCOUNTS

Epupa–Ruacana

Admin region Kunene

Coordinates 17°24'S 14°15'E

Area 28,000 ha Altitude 1,000–1,500 m

NA001

A1, A2 (087), A3 (A11)

Unprotected

Site description

The Cunene river, like the Orange river, forms an east–west linear oasis of permanent freshwater across the northern Namib desert before reaching the Atlantic Ocean. It is a warm-water river, with highly variable annual flow volumes differing as much as 14-fold between high and low years. It also varies within years by as much as 11-fold between high flow in April and low flow in October. The lower Cunene is the 340 km stretch of river that forms the border between Namibia and Angola. The mouth is considered to be the lower part of the river within 4 km of the coast. Flow to the sea is never closed off, even though it may naturally slow to a trickle in September–October. Epupa Falls, about 190 km upstream, is the last major waterfall along this very steep river that flows for 1,050 km from source (in the Angolan highlands) to mouth. It also marks the proposed site for a hydroelectric dam, which would produce a body of water c.75 km in length. At present hydro-power in Namibia is only generated from the diversion weir located at Ruacana, the end point of this IBA. Either side of the river, rocky cliffs, wind-stripped plains and dune-fields mark its progress through the hyper-arid desert. The river is typically confined to rocky gorges for most of its 340 km journey along the border of Angola.

Riparian and marginal (mainly *Phragmites*) vegetation is confined to narrow strips along the riverbank. Where the river widens and braids into several channels, or mist generated from waterfalls creates a relatively humid environment, riverine vegetation occurs in profusion. *Hyphaene* palms are common and luxuriant at Epupa, attracting peripheral species found nowhere else in Namibia. On surrounding hillsides, mopane and *Commiphora* dominate. Nomadic pastoralists, the Ova-Himba, descendants of the Herero, number about 5,000, and are reliant on the river for water in the dry season. Extremely high temperatures (more than 40°C) are common here, and the river's effect as an oasis in a hostile environment then becomes most apparent.

Birds

See Box and Tables 2 and 3 for key species. The river and surrounding areas support over 300 bird species. River surveys have revealed c.92 wetland birds/10 km of river (comprising mainly herons), with more birds and species occurring in the western reaches. Where dense ribbons of palms fringe the river, birds occur at much higher densities (132 birds/10 km) than areas without palms (34 birds/10 km). The riparian fringe is home to two highly localized species found nowhere else in southern Africa. These are *Cichladusa ruficauda* and the near-threatened *Estrilda thomensis*. Both are associated with *Hyphaene* palms and adjacent riverine thickets. Several species have isolated populations here, hundreds of kilometres from their stronghold in the Okavango and adjacent wetlands. These include *Turdoides hartlaubii*, *Lagonosticta rhodopareia*, *Ploceus xanthops*, *Malaconotus blanchoti* and *Ceyx pictus*. A distinctive race of *Francolinus afer* also appears here, with the closest other southern African records being in eastern Zimbabwe. These species co-occur with near-endemics such as *Turdoides gymnogenys*, *Namibornis herero*, *Poicephalus rueppellii* and *Lanioturdus torquatus*.

Key species

A1	<i>Namibornis herero</i>	<i>Estrilda thomensis</i>
A2 (087)	Western Angola EBA: The single species of this EBA that occurs in Namibia has been recorded at this site; see Table 2.	
A3 (A11)	Kalahari–Highveld biome: Eight of the 12 species of this biome that occur in Namibia have been recorded at this site; see Table 3.	

Other threatened/endemic wildlife

Five species of fish are endemic to the river, of which a newly discovered (1997) species may become extinct if the proposed dam development goes ahead, since it breeds in shallow water on flooded banks. A snake new to science, *Coluber zebrius*, was recently discovered here. Elephants *Loxodonta africana* (EN) use the river as an oasis.

Conservation issues

The existence of this area is threatened by a proposal to build a hydroelectric scheme near Epupa Falls further upstream on the Cunene river. No fewer than nine dams have been proposed for the lower reaches of the river, four of them between Epupa and Ruacana, within the IBA. The first, at Epupa Falls, will be 17 times larger than Namibia's largest existing dam, flooding 75 km of river and an area of 200 km², including most of the IBA. During the time that it takes for the dam to fill and reach operational capacity (possibly four years), the resulting reduced or possibly zero water flow along the Cunene could have drastic effects on the river and its riparian vegetation. If the Epupa site (still optional) is chosen, the dam waters will inundate the primary area holding most of the national populations of *Estrilda thomensis* and *Cichladusa ruficauda*. Owing to annual draw-down, it is expected that none of the riverine vegetation would re-establish, effectively eliminating the most species-rich areas associated with the palm fringe. A dam at Baynes, the alternative site, would have a reduced impact owing to lower species-richness and fewer palms. The effect of the Ruacana diversion weir has been to create fluctuations in water-levels of 20–110 cm (depending on river width) within a 24-hour period. Fish reliant on flooding of levees have been severely affected and may eventually become extinct if these short-term fluctuations persist.

Further reading

Barnard (1997), Bethune (1995), Braine (1990), Broadly and Schatti (1997), Herremans and Simmons (1997), Holtzhausen (1991), Jarvis and Robertson (1997), Noli-Peard and Williams (1991), Simmons and Allan (in press), Simmons *et al.* (1993), Underhill and Brown (1997).

Eastern Caprivi wetlands

Admin region Caprivi

Coordinates 18°50'S 23°45'E

Area 468,000 ha Altitude 500–1,000 m

NA002

A1, A3 (A10), A4i

National Parks

Site description

Located in the eastern Caprivi bulge, this wetland system lies on Namibia's international border with Botswana, Zambia and Zimbabwe, and stretches from the Kwando river in the west, to the Zimbabwian border-post at Kazungula in the east. It is Namibia's largest single permanent wetland and is fed by two of the country's five perennial rivers. The area is divided into five geographically distinct zones: the Upper Kwando (137 km²), Lower Kwando and Linyanti Swamp (3,830 km²), the ephemeral Lake Liambezi (406 km²), the Chobe river and marsh (311 km²) and the Zambezi flood-plains (1,800 km²).

The area is topographically featureless and almost completely flat—a key determinant in the unusual hydrological regime. Under flood conditions, the Kwando is essentially linked to the Zambezi, with water flowing from the Kwando into the Linyanti Swamp, about 10% of which finally reaches Lake Liambezi. This water is, however, insufficient to keep the lake level from dropping. When full, Lake Liambezi has an outlet to the Chobe river, which subsequently joins the Zambezi at Kazungula. When the Zambezi is in flood, the flow is reversed and water is pushed up the Chobe to Liambezi. Lake Liambezi and the flood-plain zone are thus only intermittently inundated, while the Zambezi, Kwando, Linyanti Swamp and Chobe Marsh are permanent features. The abrupt change in the direction of the Kwando river as it merges into the Linyanti system is due to the extensive geological faulting present in the area. Floodwaters channel down the Kwando between June and August and then swing north-east along the Chobe fault into the Linyanti Swamp. It may take up to six months for water to percolate through the *Phragmites/Cyperus* dominated reed-swamp, as less than one third of the area is open water. By 1997 Lake Liambezi was a dry lakebed, completely overgrown and partly farmed; these long-term dry/wet periods appear to be cyclical.

The Chobe Marsh, into which the Linyanti Swamp and Lake Liambezi drain when full, is more usually inundated by water backing up along the Chobe from the Zambezi river. The Zambezi floods typically last 4–6 weeks in March–April, before subsiding back into side channels and the main Chobe/Zambezi channels. However, the lower-lying flood-plains remain inundated for longer periods, and

support vast beds of papyrus and reed in a maze of small channels and islands. The climate of the region can be divided into two distinct seasons—a dry season between April and November, and a shorter wet season which stretches from the end of November to late March/early April. This is the wettest place in Namibia with rainfall averaging 740 mm per year, and sometimes exceeding 1,000 mm per year. The monthly average maximum temperature is about 30°C.

The area is surrounded by pristine riparian fringes, which are extremely rare in Namibia, as they have mostly been destroyed by human activity. The vegetation is dominated by trees of *Lonchocarpus*, *Garcinia*, *Syzygium* and *Diospyros*. The flood-plain consists of reedbeds, swamps, open flooded grasslands and papyrus. Two conspicuous species on the edge of the flood-plain are the wild date-palm *Phoenix* and baobab *Adansonia*.

■ Birds

See Box and Table 3 for key species. East Caprivi as a whole, and its wetlands in particular, holds one of the richest diversities of bird species anywhere in Namibia. The high diversity arises from a combination of wetland and tropical (passerine) species extending into this region. The most important features of this system are the swampy areas and flood-plains, which are important breeding habitat for wetland birds. These and other wetland species include *Egretta vinaceigula*, *Grus carunculatus*, *Ardeola rufiventris*, *Ephippiorhynchus senegalensis*, *Microparra capensis*, *Vanellus albiceps*, *V. crassirostris*, *Glareola pratincola*, *Macronyx ameliae* and *Circus pygargus*.

Key species

A1	<i>Egretta vinaceigula</i> <i>Grus carunculatus</i>	<i>Glareola nordmanni</i>
A3 (A10)	Zambezi biome: 14 of the 16 species of this biome that occur in Namibia have been recorded at this site; see Table 3.	
A4i	Breeding (pairs)	Non-breeding
	<i>Egretta vinaceigula</i>	30–200
	<i>Glareola nordmanni</i>	—
		100–500
		500–1,000

■ Other threatened/endemic wildlife

Threatened mammals occurring here include *Lycaon pictus* (EN) and thousands of *Loxodonta africana* (EN).

■ Conservation issues

Until recently, there were no conservation areas in existence in East Caprivi. On 1 March 1990, two conservation areas were proclaimed. One, the wetland Mamili National Park (32,000 ha), which is centred on Nkasa and Lupala Islands near the Linyanti Swamp in the south-western corner of East Caprivi. The surface area of water fluctuates, but at high floods some 80% of the area is inundated. This area provides essential protection for many swamp and flood-plain species. The other protected area, Mudumu National Park (101,400 ha) is mainly woodland, with small areas of wetland on the western fringes where it borders the Kwando river. In dry years it is possible that these parks will be the only areas in East Caprivi that are not overgrazed.

The two parks will, however, only be effective at maintaining the region's biodiversity if legislation and enforcement are improved, and wildlife education and communication programmes for the surrounding rural communities are continued. Involvement of local communities in the management of buffer zones and running of tourist camps has helped to alleviate current encroachment into these parks. The region's waterways have held the alien water-fern *Salvinia* since the 1950s. This weed has caused massive problems by clogging waterways and altering the functioning of the wetlands, and locally threatening other macrophytes with extinction. Currently the *Salvinia* infestation is under control owing to a successful biological-control programme initiated in 1981. The distribution of the weed has not changed, but the intensity of the infestation has been reduced and in some places is almost eradicated.

Organized poaching for ivory and hunting for meat are thought to be responsible for the demise of the herbivores that once teemed in this region. Uncontrolled army poaching during the guerrilla war also took its toll on wildlife. Campaigns by various government and non-government organizations have temporarily solved the problem; stocks are, however, drastically depleted and require a period to recover before sustainable harvesting can be implemented. Spraying of dieldrin and DDT to control tsetse fly *Glossina* and malaria has been widespread in the past and occasionally still occurs. Monitoring

programmes investigating toxicity levels in the resident human population and other non-target tertiary consumers are essential as these organisms could accumulate toxins.

The other greatest threat to the area is the grazing pressure exerted by a burgeoning population of over 100,000 head of cattle, 60% of which are estimated to be concentrated on the eastern flood-plain (30% of the area). With the drying out of Lake Liambezi, local inhabitants intensively fish the Chobe river with mosquito nets. This unsustainable level and unselective method of fishing may have detrimental consequences on the recovery of fish populations once floods return. Human disturbance to *Rynchops flavirostris* from waves caused by motorized boats destroys nesting sites. Disturbance causes adult birds to abandon their nests, exposing eggs and chicks to intolerable heat and additional predation pressure.

■ Further reading

Mendelsohn and Roberts (1997), Olivier and Olivier (1993), Schlettwein *et al.* (1991).

Mahango Game Reserve and Kavango river

NA003

Admin region Caprivi

Coordinates 18°18'S 20°37'E

Area 24,462 ha Altitude 500–1,000 m

 A1, A3 (A10), A4i
Game Reserve

■ Site description

This IBA includes the portion of the Kavango river in north-eastern Namibia between Andara Mission and the Botswana border at the western end of the Caprivi Strip. The IBA includes the Mahango Game Reserve, which essentially consists of the vast flood-plain along the Kavango river (the start of the panhandle of the Okavango Swamps) and its associated riverine forests and woodlands. Once the Kavango river leaves Namibia it flows into and creates the Okavango Delta in Botswana. High water occurs in April from rains in the highlands of Angola, and floods usually reach heights of 3–4 m above the low-level water in November. This flooding is essential for the functioning of all aquatic systems along the river. The climate can be divided into two distinct seasons—a dry season between April and November, and a shorter wet season from the end of November to early April. The monthly average maximum temperature is 30°C and about 80% of the region's rain (550–600 mm per year) falls between October and April.

Vegetation along the river is extremely diverse with 869 species from 88 families so far recognized, about 25% more species-rich than the delta itself. The vegetated dunes that dominate the topography away from the river include extensive dry woodlands. Dominant trees of the riparian woodland include *Garcinia*, *Sclerocarya*, *Diospyros*, *Acacia* and *Grewia*. The vegetation of the dunes is dominated by mixed *Pterocarpus*, *Ricinodendron*, *Ziziphus* and dense stands of *Baikiaea* and *Baphia* shrubs. The riparian vegetation is of particular importance. In Namibia, riparian woodland is increasingly rare as it is mostly destroyed during human settlement. The flood-plain comprises reedbeds, swamps, open flooded grasslands and papyrus *Cyperus*. Two conspicuous species on the edge of the flood-plain are the palm *Phoenix* and baobab *Adansonia*.

■ Birds

See Box and Table 3 for key species. The reserve's most important feature is the flood-plain, which is critical habitat for breeding wetland bird species. About two-thirds of Namibia's bird species have been recorded in Mahango, and it boasts the highest species diversity in Namibia, the result of a diversity of both wetland and tropical terrestrial species. The flood-plain supports important populations of rare wetland birds including *Egretta vinaceigula*, *Grus carunculatus*, *Ardeola rufiventris*, *Pelecanus rufescens*, *Ephippiorhynchus senegalensis*, *Microparra capensis*, *Vanellus albiceps*, *V. crassirostris*, *Glareola pratincola*, *Macronyx ameliae* and *Circus pygargus*. The riverbanks and rocks hold *Glareola muchalis* and *Rynchops flavirostris*, while the fringing riparian vegetation supports *Scotopelia peli* and *Gorsachius leuconotus*. The surrounding grassveld also holds Palearctic migrants, including *Glareola nordmanni*.

Key species

A1	<i>Egretta vinaceigula</i> <i>Grus carunculatus</i>	<i>Glareola nordmanni</i>
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A3 (A10) Zambezi biome: 14 of the 16 species of this biome that occur in Namibia have been recorded at this site; see Table 3.

A4i	Breeding (pairs)	Non-breeding
<i>Egretta vinaceigula</i>	Breeds	15–100
<i>Glareola nordmanni</i>	—	200–300

Other threatened/endemic wildlife

This is the second most species-rich area for mammals in Namibia, with 99 species. Threatened mammals occurring in the reserve include *Lycan pictus* (EN), *Loxodonta africana* (EN), and *Lutra maculicollis* (VU), which requires pristine aquatic habitat. The frog *Phrynomantis affinis*, with only five specimens known, occurs here. About 71 species of fish occur in the Kavango river, including two threatened species.

Conservation issues

Declared a conservation area by the former Kavango Executive Committee in 1983, Mahango was opened to the public three years later in 1986. The reserve was officially proclaimed in 1989. After Namibian independence (1990), ownership of the reserve was transferred to the Ministry of Environment and Tourism. Mahango is part of a comprehensive planning programme in the Caprivi Strip called the North East Parks Project, largely funded by the German Development Bank (KfW). The area is soon to be part of the new Babwata National Park.

The management of the riparian strip and flood-plain is of utmost importance. Any dramatic alteration of the Namibian portion of this river will affect the Okavango Delta (BW003) in neighbouring Botswana. The entire portion of the river in Namibian territory needs careful management planning since 78% of the 120,000 people who live along the Kavango occur within 5 km of the river and the pressure for resources is intense. Measures to mitigate human impacts on the flood-plain and adjacent riparian strip and alternative options to slash-and-burn agriculture need to be sought. Education campaigns on sustainable utilization of the river's resources and its surrounding habitats are a priority.

Threatened mammals such as *Loxodonta africana* and *Kobus leche* migrate out of the park and are threatened by poachers in the neighbouring areas. Furthermore, uncontrolled growth in the elephant population is of some concern, as they modify habitat at a dramatic rate, especially in the highly sensitive riparian zone, which has suffered enormous impact from elephants in the last few years. Human disturbance to *Rynchops flavirostris* is caused by the wake generated by motorized boats destroying sandbank nesting sites. Disturbance by humans also causes adult birds to abandon their nests, exposing eggs and chicks to intense heat and additional predation pressure.

Uncontrolled fires in the Kavango region can also cause extensive damage to wildlife and reduce plant species diversity. Pesticides used annually to control malarial mosquitoes and tsetse fly *Glossina* (DDT and dieldrin) are found in the river and occur mainly from the astonishing practice of rinsing equipment and occasionally from the dumping of surplus supplies directly into the river. That this happens in the 'protected' Mahango Reserve is cause for great concern.

If future water abstraction occurs at Rundu to feed the growing population of Windhoek, off-take during flooding periods may reduce flooding levels below the critical threshold required for spawning fish. Non-selectivity of fishing gear has led to an almost total absence of larger fish. It has been suggested that fishing be restricted in some areas to allow fish stocks to recover.

Further reading

Curtis and Appleton (1987), Griffin and Channing (1991), Hines (1987), Merron and Bruton (1989), Skelton and Merron (1987).

Etosha National Park

Admin region Kunene

Coordinates 18°59'S 15°45'E

Area 2,291,200 ha Altitude 1,100–1,200 m National Park, Ramsar Site

NA004

A1, A3 (A11), A4i, A4iii

Site description

Etosha, 'the great white place', is enclosed within a National Park c.400 km north of Windhoek and 120 km south of the Angolan border. The primary feature within the park is the Etosha Pan, a saltpan some 4,760 km² in size, up to 129 km long and 72 km wide, covering almost

one-quarter of the park. Numerous smaller salt and clay pans exist to the west and north of the main pan, some of which lie just outside the park boundaries. The park comprises an area of closed drainage on the great African plateau. Most of the year the pan lies dry, appearing barren and desolate, but during the wet season it is inundated with water from the Ekuma and Oshigambo rivers, which drain catchments in former Ovamboland and southern Angola. Inflow from the east through the Omuramba Ovambo may also be important in flooding Fischer's Pan and the southern ancient river course on the pan. The extent of the flooding is dependent on the amount of rain that falls in the catchment area, and not on surface rainfall. In exceptionally rainy years the pan becomes a shallow lake a few centimetres deep.

Geologically the area comprises calcareous sand, gravel and limestone with dolomite outcrops in the west. Soils are shallow and alkaline. The temperature is one of extremes, ranging from below freezing on some winter nights to above 45°C during the day in midsummer. Pan surface temperatures can then reach 60°C. The vegetation is primarily arid savanna, shrub and thorn scrub in the west, tending towards tree-savanna and broadleaved woodland in the east. *Acacia* woodland is found throughout the region. Patches of mopane *Colophospermum* and *Combretum* woodland are also characteristic of the park, especially in the eastern broadleaved savanna belt.

Birds

See Box and Table 3 for key species. The park supports at least 340 bird species. The main pan is of particular importance as large numbers of both *Phoenicopterus ruber* and *P. minor* regularly breed here when rainfall exceeds 440 mm per year. Historically, up to 1.1 million flamingos have been recorded in years of exceptional rain. Etosha is one of only two regular breeding sites for these species in southern Africa, the other being Sua Pan in the Makgadikgadi Pans (BW005) in Botswana. Unfortunately, breeding success is very limited, and the pan cannot be considered to hold a viable breeding population. In recent years the pan has regularly held over 20,000 waterbirds during the wet season. Apart from flamingos, *Pelecanus onocrotalus* and *Charadrius pallidus* also breed here in large numbers in years of good rainfall. Rarities are also attracted at such times and *Egretta vinaceigula* and *Aenigmatolimnas marginalis* are unusual visitors. The pan and its surrounding grassveld are also good for Palearctic migrants, including important numbers of *Glareola nordmanni* and *Charadrius asiaticus*. Etosha also supports the only breeding population of *Grus paradisea* outside South Africa—a tiny population of about 60 birds, known to have declined in the last 10 years.

The park is particularly rich in raptors with 46 species recorded. It supports all vultures found in Namibia, including *Gyps coprotheres*, *Torgos tracheliotus* and the locally rare *Neophron percnopterus*. Scavengers such as *Aquila rapax* and *Terathopius ecaudatus* are particularly common, since they are unaffected by poisons here.

Key species

A1	<i>Phoenicopterus minor</i>	<i>Grus paradisea</i>
	<i>Circus macrourus</i>	<i>Glareola nordmanni</i>
A3 (A11)	Kalahari-Highveld biome: 11 of the 12 species of this biome that occur in Namibia have been recorded at this site; see Table 3.	
A4i	Breeding (pairs)	Non-breeding
	<i>Pelecanus onocrotalus</i>	Breeds 622–3,000
	<i>Phoenicopterus ruber</i>	Breeds 9,770–100,000
	<i>Phoenicopterus minor</i>	Breeds 1,594–1,000,000
	<i>Glareola nordmanni</i>	— 200–300
	<i>Charadrius pallidus</i>	Breeds 166–550
	<i>Charadrius asiaticus</i>	— 119–382
A4iii	More than 20,000 waterbirds occur at this site.	

Other threatened/endemic wildlife

Among mammals, threatened species include *Acinonyx jubatus* (VU), *Loxodonta africana* (EN), *Diceros bicornis bicornis* (CR) and *Equus zebra hartmannae* (EN), while *Aepyceros melampus petersi* is endemic and *Madoqua kirkii* is near-endemic to Namibia; efforts to reintroduce *Lycan pictus* (EN) have failed thus far. Reptiles include *Python sebae*, *P. anchietae*, *Psammobates oculiferus*, *Geochelone pardalis* and *Agama etoshae*.

Conservation issues

Originally established in 1907, Etosha Game Reserve covered 9,324,000 ha; it was gradually reduced to 2,314,000 ha in area between 1947 and 1953. In 1958, it was officially designated a National Park

under Section 37 of the Nature Conservation Ordinance 31, and on the recommendation of the Commission of inquiry into South West Africa's Affairs (Odendaal Commission), the size of the park was increased to include sections of the Skeleton Coast, enlarging the area to 9,952,600 ha. By 1970 the park's borders had once again been de-proclaimed to its current size to provide land to Herero-speaking tribes; the size has been reduced by 72% since 1907.

Etosha faces several persistent management challenges. It is surrounded on its southern and western borders by commercial farmland; double electric boundary fences, primarily designed to keep *Panthera leo* and *Loxodonta africana* in the park and poachers and domestic animals out, have been erected. This has resulted in serious disturbance to the migratory movements of ungulates. In particular, wildebeest migration was blocked by the northern fence, with a resultant decline from 25,000 to 2,300 animals in the space of 25 years. *Loxodonta africana*, however, still migrate out of the park in the wet season and may then create problems in adjacent commercial and communal farming areas. A disease, feline immune deficiency virus (FIV), affects wild cat species, particularly *Acinonyx jubatus*. Fire control in the past permitted the transition of the vegetation from open savanna to woodland, which allowed a concomitant increase in *Loxodonta africana* numbers from 100 in 1955 to 1,500 at present. Drought periods between 1979–1996 have further complicated issues, as ungulates have been unable to migrate away from drought-stricken areas.

Recent research has shown that while flamingos occur in spectacular numbers, they rarely breed successfully (one in nine years) because the water rapidly evaporates, exposing chicks and fledglings to predators and eliminating food sources adjacent to the colony. The low breeding success in the last four decades has shown that the pan does not support a self-sustaining population. Scientific research to find solutions to management problems is conducted through the Etosha Ecological Institute, which is located at Okaukeujo.

Further reading

Archibald (1991), Archibald and Nott (1987), Aves (1992), Berry (1972, 1997), Berry *et al.* (1973, 1987), Brown (1992), Brown *et al.* (1987), Clinning and Jensen (1976), Fox *et al.* (1997), Gasaway *et al.* (1996), Jensen and Clinning (1976), Lindeque and Lindeque (1997), le Roux *et al.* (1988), Simmons (1996a), Simmons *et al.* (1996).

Hobaterre

Admin region Kunene

Coordinates 19°15'S 14°00'E

Area 222,000 ha Altitude 1,200 m

NA005

A2 (s045), A3 (A11)

Unprotected

Site description

This site is one of the best areas for bird species that are endemic or near-endemic to the Namibian escarpment. Its identification as an IBA arose directly from research coordinated by the Ministry of Environment's Ornithology Section, aimed at identifying the most important areas for Namibia's near-endemic birds. The Namibian escarpment forms the interface between the interior plateau and the coastal plain, varying in altitude from 400 to 2,500 m. The most important node within this broad zone is the area surrounding Hobaterre tourist lodge, immediately west of the western boundary of Etosha National Park. This east–west oriented block falls in communal farmland, just to the west of commercial farmland in the Sesfontein-Kamanjab area. The IBA is part of the western catchment of the Ombonde/Hoanib river, one of the largest ephemeral rivers in north-western Namibia.

Birds

See Box and Tables 2 and 3 for key species. Although the area holds only one restricted-range species, *Namibornis herero*, it also hosts a plethora of species with global ranges slightly larger than the restricted-range species cut-off of 50,000 km². All of these species are endemic to the Namibian escarpment and Namib desert, which stretch into neighbouring Angola.

Included are the 10 'inland' endemics, excluding the three desert larks and *Sterna balaenarum*. These taxa are, in decreasing order of estimated population size within the IBA, *Lanioturdus torquatus* (11,900 birds), *Parus c. carpi* (5,800 birds) and *Tockus monteiri* (2,360 birds), each found in dry woodland where large trees are

common. The shrike is the commonest of this trio, while the main centre of distribution for the hornbill and tit occurs somewhat east (higher rainfall) of this IBA. *Namibornis herero* and *Achaetops pycnopygius*, common within the IBA, occur predominantly on rocky hillsides. Populations for both species in Namibia are estimated at about 100,000 birds, and more than 1% of *Namibornis herero* occur in this IBA. *Eupodotis rueppellii* (580 birds) is found on open plains mainly in the western portion of the IBA.

The river valleys running through this area enhance diversity, as several endemics exhibit particularly high abundances in riverine woodland, and collect there in winter periods. *Turdoides gymnogenys* (335 birds) is a bird of mopane woodland, which favours riverbeds, where it occurs in groups averaging six birds. *Poicephalus rueppellii* (450 birds) occur at good densities in the river valleys, but this bird is nowhere common, with a Namibian population estimate of only 29,000 birds. One of the rarest of the endemics is *Francolinus hartlaubi* (450 birds), a bird found on inselbergs and koppies throughout this region. The rarest and most enigmatic endemic taxon is *Phoeniculus d. damarensis* (35–70 birds), a species difficult to distinguish from the morphologically similar *P. purpureus*, with which it hybridizes. It is only found close to large rivers with large trees, and the Namibian population is predicted to be a mere 1,800 birds.

A total of 215 species occur in this region, about half the number recorded in the most species-rich areas of north-eastern Namibia.

Key species

A2 (s045) Namibian escarpment Secondary Area: *Namibornis herero* has been recorded at this site.

A3 (A11) Kalahari-Highveld biome: 10 of the 12 species of this biome that occur in Namibia have been recorded at this site; see Table 3.

Other threatened/endemic wildlife

Threatened mammals include *Diceros bicornis* (CR), *Loxodonta africana* (EN) and *Panthera leo* (VU), the latter two being common in this region and possibly coming into conflict with commercial farmers. The area is extremely rich in endemic species of frog, reptile, mammal and plant.

Conservation issues

The main concern is that the rich Namibian escarpment vein of bird, mammal, frog, reptile and plant endemism falls squarely between Namibia's main protected areas—the Etosha National Park (NA004) in the east and the Skeleton Coast Park in the west. It has been suggested that a park joining the two would be ideally situated to protect many of these endemic taxa, as well as to act as a corridor for large mammals that regularly move between Etosha and the Skeleton Coast Park. Conservancies at Sesfontein and Bergsig will improve the situation.

Farming practices are of relatively low intensity, but on communal lands overstocking may occur where goats congregate around waterholes. The dry river-courses to the coast are inhabited by pastoralists who regularly shoot *Panthera leo* (and other large mammals) that threaten their livestock. A protected area may prevent this, and effectively help fill the Skeleton Coast Park with mammals that once naturally occurred there. Among the bird endemics, only *Poicephalus rueppellii* is under direct threat, since it is illegally trapped for the wild bird trade. Hundreds of birds are taken from the population each year, but recent breakthroughs in catching bird-trappers may help reduce this problem.

Further reading

Clinning and Tarboton (1972), du Plessis (1997), Jarvis and Robertson (1999), Jensen and Jensen (1971), Robertson (1993), Robertson *et al.* (1995, 1998), Selman (1998), Simmons *et al.* (1998).

Bushmanland (Tsumkwe) Pan system

NA006

Admin region Otjozondjupa

Coordinates 19°37'S 20°37'E

Area 120,000 ha Altitude 1,100–1,300 m

A1, A3 (A10), A4i

Unprotected

Site description

Widely known as Bushmanland after the inhabitants of this region, the new name is the Tsumkwe District. The original name has been retained because of its widespread acceptance. This very extensive wetland system in north-eastern Namibia has developed on a broad, flat watershed, on

the eastern edge of the Kalahari Basin, situated between the Nhoma and Daneib drainage systems. Here, the geology restricts drainage and, as there are no major drainage lines out of the area, these pans, flooded grasslands and *Acacia* woodlands can remain wet throughout the dry season in years of above-average rainfall. The town of Tsumkwe lies in the centre of the area, which is inhabited by the Ju/'hoan Khoi. Livestock, so common in other parts of Namibia, are largely absent from the area, since a hunter-gathering lifestyle was until recently practised by all the inhabitants. However, cattle-farming has been introduced, and will, in time, replace the traditional nomadic lifestyle.

The Bushmanland Pans system is centred on the Nyae-Nyae wetlands, which run in a broad arc south-east of Tsumkwe. The Nyae-Nyae Pan itself consists of a large deflation basin comprising both grassland and open wetlands. Also included are the Pannetjies Veld wetlands 25 km east of Tsumkwe, comprising mainly flooded woodland, the Klein Dobe wetlands (two pans of 30 and 50 ha) 15 km north of Tsumkwe and the CinQo wetlands 40 km north-east of Tsumkwe. The wetland system as a whole is both extensive and variable.

The wetlands are widely interconnected and many wetland-types intergrade into one another, including: (1) Unvegetated open-water pans with highly alkaline evaporite basins; these pans are the last to dry up and can be up to 1.5 m deep. (2) Doline pans appear to be sinkholes formed in areas underlain by calcrete. When full, these are more than 2 m deep and unvegetated. (3) Open-water pans form where the underlying soils are not very alkaline. Vegetation is dominated by floating and submerged macrophytes such as *Persicaria*, *Scirpus*, *Nymphaea*, *Aponogeton*, *Elytrophorus*, *Eragrostis* and species of algae (Characeae). The pans are of medium size and the water in them can persist for three months. A second type of open-water pan develops where shallow calcareous sands make the pans more alkaline. In these, the vegetation is dominated by sedges (Cyperaceae) and floating mats of *Persicaria* which form in the deeper parts of the system. (4) Grass pans are small pans where organic clays have impeded the drainage; these are dominated by *Echinochloa* or *Diplachne*; the latter are the commonest pans in the system. (5) Wet grasslands develop on calcareous sands where the period of inundation is short. (6) During periods of extreme inundation on clay soils, flooded woodland develops. Occasionally scrubby areas of *Grewia* and *Croton* become periodically flooded in years of very high rainfall. The high-lying areas surrounding the pans hold palms such as *Hyphaene*.

■ Birds

See Box and Table 3 for key species. The variety of wetland habitats, ranging from unvegetated open-water systems to wet grasslands, supports a diverse assemblage of flora and fauna. This area holds important numbers of rare and threatened bird species; it regularly holds more than 10,000 waterbirds of 84 species when wet. The most important species include breeding *Egretta vinaceigula*, and non-breeding *Grus carunculatus* and *Gallinago media*; the cranes occur in larger numbers than anywhere else in Namibia. These wetlands are also known to be important for rails (Rallidae), especially migratory Palearctic and intra-African crakes. The pans occasionally support thousands of both *Phoenicopterus ruber* and *P. minor* (probably on passage between Etosha and Makgadikgadi Pans in Botswana), as well as thousands of *Himantopus himantopus*. *Tringa glareola* and *Philomachus pugnax* may be particularly numerous, with over 1,000 birds present.

The surrounding grassveld holds Palearctic migrants, including large numbers of *Glareola nordmanni* and *Charadrius asiaticus*. Large mixed breeding colonies of *Podiceps nigricollis*, *Chlidonias hybridus*, *Fulica cristata*, *Porphyrio porphyrio*, *Gallinula angulata*, *Himantopus himantopus* and a handful of *Porzana pusilla* form in flooded grasslands around Nyae-Nyae. It is in the top 20 atlas squares for overall avian species richness in Namibia.

Key species

A1	<i>Egretta vinaceigula</i>	<i>Grus carunculatus</i>
	<i>Phoenicopterus minor</i>	<i>Glareola nordmanni</i>
	<i>Circus macrourus</i>	<i>Gallinago media</i>
A3 (A10)	Zambezian biome: Five of the 16 species of this biome that occur in Namibia have been recorded at this site; see Table 3.	
A4i	Breeding (pairs)	Non-breeding
	<i>Egretta vinaceigula</i>	Breeds 15–200
	<i>Phoenicopterus ruber</i>	— 740–3,950
	<i>Himantopus himantopus</i>	— 391–1,140
	<i>Charadrius asiaticus</i>	— 50–200

■ Other threatened/endemic wildlife

Among mammals, the temporary wetland system supports the near-endemic *Mastomys shorridgei*, and threatened species include *Acinonyx jubatus* (VU), *Lycaon pictus* (EN) and *Loxodonta africana* (EN).

■ Conservation issues

Overall threats to temporary wetlands in the area are low since it is used mainly by traditional hunter-gathering Khoi or Ju/'hoan. Developments in the tourism industry and recently introduced subsistence livestock-farming may have negative impacts if they are not adequately controlled. Tourism is on the increase in eastern Bushmanland, and the pans of the Nyae-Nyae area may be heavily utilized. The area was gazetted as a conservancy on 16 February 1998 and land-use plan policies have been initiated. Threats to birds come largely from disturbance of breeding waterfowl, and off-road vehicles driving through the wetland areas. Livestock-farming in the Gautcha area has already led to overgrazing of upland sites which may change drainage patterns, groundwater percolation and vegetation development. Continued monitoring of these wetlands over a long period of time, encompassing both wet and dry phases, could give important insights into arid-zone wetland functioning. Careful assessment of the threats to this system, particularly tourism, is required.

■ Further reading

Bieseles and Weinberg (1990), Hines (1989, 1993, 1996), Jones (1988), Mendelsohn and Ward (1989), Olivier and Olivier (1993), Robertson *et al.* (1998), Simmons *et al.* (1998).

Waterberg Plateau Park

NA007

Admin region Otjozondjupa

Coordinates 20°25'S 17°13'E

A1, A3 (A11)

Area 40,500 ha Altitude 1,600–1,800 m

Park

■ Site description

Waterberg Plateau Park is located some 30 km east of Otjiwarongo. The primary feature within the park is the Waterberg Plateau, which rises to 1,800 m on the western and southern sides. The major part of this differentially weathered sandstone plateau is at 1,600 m, some 150–200 m above the surrounding plain. The plateau consists mostly of near-vertical cliffs on the east and west, up to 140 m high. In the north the plateau gradually widens and dips to join the plain. Below the cliffs the ground slopes steeply but evenly away from the base of the mountain; the slopes are covered by sandstone scree weathered from the summit. The plateau comprises an undulating landscape with deep sand and scattered granite koppies. It is an erosional relict of a hard Etjo sandstone casing that covered large parts of Namibia millions of years ago. Most of the ancient plateau was carved up over aeons, but the resistant Etjo sandstone prevented the erosion of the Waterberg. To the south of the main plateau lies the Klein Waterberg, an inselberg rising to 1,930 m, which is now part of a large conservancy surrounding the park.

On the plateau summit thick broadleaved woodland occurs right to the edge of the escarpment. The broadleaved tree and shrub savanna is dominated by *Terminalia*, *Burkea*, *Combretum* and *Peltophorum*. There are isolated grass savanna valleys. Below this, and surrounding the plateau for thousands of square kilometres, lies a sea of dense scrub, dominated by *Acacia* and *Dichrostachys*.

■ Birds

See Box and Table 3 for key species. This park supports over 200 bird species, including Namibia's only surviving colony of *Gyps coprotheres*, which used to breed on the cliffs of Okarukuwisa mountain (1,884 m) in the Waterberg range. Due to poisoning and bush encroachment these birds no longer breed. It is the only area in Namibia where *Hieraetus pennatus minisculus* are known to breed. Other cliff-nesting raptors breeding on the Waterberg include *Falco peregrinus* and *Aquila verreauxii*. Vultures include *Torgos tracheliotus*, *Trigonoceps occipitalis* and *Gyps africanus*. Other raptors include *Sagittarius serpentarius*, *Terathopius ecaudatus*, *Polemaetus bellicosus* and *Aquila rapax*. The park lies close to the boundary of near-endemic Namibian species such as *Parus carpi* and their northern cousins (e.g. *P. niger*).

Key species

- A1 *Gyps coprotheres*
 A3 (A11) Kalahari–Highveld biome: Nine of the 12 species of this biome that occur in Namibia have been recorded at this site; see Table 3.

Other threatened/endemic wildlife

Among mammals, threatened species include *Acinonyx jubatus* (VU), *Ceratotherium simum* (LR/cd) and *Diceros bicornis* (CR), while *Madoqua kirkii* is near-endemic to Namibia and common here.

Conservation issues

Originally established as the Eland Game Reserve in 1965, the Waterberg Plateau Park was declared in 1972. The colony of *Gyps coprotheres* numbered over 500 in the 1950s, but this crashed to 20 birds by 1980 and an all-time low of 14 birds in 1987, with only three pairs breeding in 1996. Vultures have declined as a result of indiscriminate use of poisons by farmers to control vermin and severe bush encroachment at the base of the mountain preventing efficient foraging. These birds are now exceptionally vulnerable, and a single irresponsible poisoning event could result in this species becoming extinct in Namibia. This may have happened in 1995 when breeding suddenly stopped and the population dropped from 25 to five birds. In an attempt to prevent the extinction of this colony a vulture restaurant was established in 1984, to supplement the birds' diet. A simultaneous farmer-awareness programme was initiated.

Other conservation problems include severe bush encroachment around the plateau and on adjoining farmland. In 1997 a private conservancy was established completely surrounding the plateau. The plateau features a core (18,600 ha) wilderness area where human activities are kept to a minimum. The park was originally established to resettle and breed rare and endangered large mammal species. To date *Hippotragus equinus*, *H. niger*, *Taurotragus oryx*, *Giraffa camelopardalis*, *Connochaetes taurinus*, *Ceratotherium simum*, *Diceros bicornis* and *Syncerus caffer* have been reintroduced. The park is rich in cultural heritage, with many rock engravings by Stone Age inhabitants, as well as dinosaur footprints.

Further reading

Brown (1985a,b), Brown and Cooper (1987), Jankowitz and Venter (1987), Olivier and Olivier (1993).

Brandberg mountain
NA008

Admin region Erongo

Coordinates 21°08'S 14°35'E

A2 (s045), A3 (A11)

Area 50,000 ha Altitude 480–2,606 m

Unprotected

Site description

Brandberg is Namibia's highest mountain. Massive and conical, it is of ancient volcanic origin, situated in the central section of the Namib desert. Rainfall averages 100 mm per year. Basalt plains envelop the northern slopes, supporting slightly different vegetation assemblages to elsewhere. The mountain is uninhabited, but the ephemeral Ugab river flows past its northern extremities and supports traditional pastoralists. Owing to higher cloud cover, and accumulations of water on top of the mountain, relative to the surrounding area, many of the grasses on the mountain's plateau-like summit are perennial, replacing the annuals common on the plains below. Grass composition may, however, change in decades with poor rainfall when both plants and some vertebrates disappear. The western side of the mountain receives coastal fog and supports higher vegetation biomass than other slopes. The valleys and gorges also differ in plant community composition because of the higher run-off in these areas.

Birds

See Box and Tables 2 and 3 for key species. The mountain is rich in raptors (18 species). *Torgos tracheliotus*, *Aquila verreauxii*, *A. rapax* and *Polemaetus bellicosus* are uncommon breeding residents, while *Melierax canorus* and *Falco tinnunculus* are abundant. The Brandberg inselberg and the Ugab river to the north hold many typical Namib species. The flat plains below the inselberg are home to *Ardeotis kori*, *Neotis ludwigii*, *Eupodotis rueppellii*, *Rhinoptilus africanus*, *Ammomanes grayi*, *Eremalauda starki* and *Cercomela tractrac*. Typical Namibian near-

endemic species which occur in the gorges and valleys around the mountain include *Francolinus hartlaubi*, *Agapornis roseicollis*, *Poicephalus rueppellii*, *Tockus monteiri*, *Turdoides gymnogenys*, *Phoeniculus d. damarensis*, *Namibornis herero*, *Achaetops pycnopygius*, *Monticola brevipes* and *Lanioturdus torquatus*. In total, about 150 species have been recorded on this mountain, twice as many as found on the surrounding gravel-plains.

Key species

A2 (s045) Namibian escarpment Secondary Area: *Namibornis herero* has been recorded at this site.

A3 (A11) Kalahari–Highveld biome: Eight of the 12 species of this biome that occur in Namibia have been recorded at this site; see Table 3.

Other threatened/endemic wildlife

Recent analyses show that Brandberg is at the centre of a rich vein of endemic mammals, reptiles, amphibians and plants that runs north–south through western Namibia from the Sperrgebiet (NA019) in the south to the Otjihipa mountains in the north. No other area in the country is as rich in endemics as the Brandberg Massif; among the 90 plants endemic to Namibia, eight are found nowhere else, three of the country's six near-endemic frogs, eight of 14 near-endemic mammals, 49 of 59 near-endemic reptiles, and 11 of 14 near-endemic birds occur on, or around, this outstanding inselberg. Brandberg supports a greater combination of endemic plants, reptiles, amphibians, birds and mammals than any other place in Namibia. As such, it is a critical conservation area in the country.

Conservation issues

Brandberg is famous for its prodigious quantities of rock art left by nomadic people who inhabited the mountain from about 4,000 to 500 years before present. The enigmatic 'white lady' painting is visited by thousands of tourists each year. Thus this mountain is of particular importance within Namibia, ecologically, culturally and historically, and for these reasons it has been proposed as Namibia's first World Heritage Site. The local community experiences problems with visitors as it derives no benefits from tourism. Community programmes similar to that at nearby Spitzkoppe may alleviate these problems, providing custodianship and some protection to the species and rock art unique to the mountain.

Further reading

Brown (1991), Craven (1989, 1997), Griffin (1998), Kinahan (1986, 1991), Kirk-Spriggs and Marais (2000), Maggs *et al.* (1998), Nordenstam (1974), Robertson *et al.* (1998), Simmons *et al.* (1998).

Cape Cross lagoon
NA009

Admin region Erongo

Coordinates 21°45'S 13°59'E

A1, A4i, A4iii

Area 500 ha Altitude 0 m

Private Nature Reserve

Site description

Longshore drift of sediments from south to north along the coast, driven by the Benguela Current, has led to the formation of a sandbar across what was formerly a coastal embayment just south of the rocky promontory of Cape Cross. The inner part of the embayment remains a series of saline lagoons. These receive oceanic water from seepage through the sandbar and, during extreme high tides or storms, by water washed over the sandbar. The lagoons vary in size and number depending on water-level, and are controlled by two main factors: evaporation and seawater input. Desiccation of the eastern borders of the embayment has produced sterile salt pans and flats. These salt deposits are worked commercially on a small scale. Three wooden platforms with a total area of 68,000 m² have been erected in some of the lagoons to provide roosting and breeding places for seabirds, as their guano is commercially harvested. Guano from these platforms probably serves to enrich the micro-flora and fauna of the lagoons. There is an irregular fringe of saltmarsh vegetation along the coastal edge of the lagoons. Inland of this region are the rocky gravel-plains of the Namib desert.

Birds

See Box for key species. The lagoons, and their platforms, have been known to support up to 14% of the global population of *Phalacrocorax*

capensis (30,600 pairs), but estimates as high as 900,000 cormorants were made from aerial counts in 1974. Regular wetland counts indicate that, in addition to cormorants, these lagoons regularly support up to 11,000 other birds. In total, the lagoons and platforms regularly support over 20,000 birds, including up to 16% of the southern-African-endemic subspecies *Podiceps nigricollis gurneyi* and large numbers of *Phoenicopterus ruber* and *P. minor*, *Charadrius pallidus*, *Calidris ferruginea*, *C. minuta*, *Larus dominicanus*, *L. hartlaubii*, *Sterna balaenarum*, *S. bergii* and large flocks of *S. hirundo*.

Key species		
A1	<i>Phoenicopterus minor</i>	<i>Sterna balaenarum</i>
A4i		Breeding (pairs) Non-breeding
	<i>Podiceps nigricollis</i>	Breeds 120–2,187
	<i>Phalacrocorax capensis</i>	Breeds 2,420–60,000
	<i>Phoenicopterus ruber</i>	— 1,354–1,961
	<i>Larus dominicanus</i>	Breeds 126–300
	<i>Sterna bergii</i>	— 265–500
A4iii	More than 20,000 waterbirds occur at this site.	

Other threatened/endemic wildlife

A massive mainland breeding colony of the Namibian near-endemic seal *Arctocephalus pusillus*, numbering 156,000 adults and subadults, occurs here. This is one of two populations in Namibia that are harvested commercially, mainly for pelts.

Conservation issues

This wetland is currently registered as a Private Nature Reserve. The purpose of this registration was to restrict access to the public who might disturb birds on the guano platforms. It is also a seal reserve, Cape Cross Seal Reserve, visited by 40,000 tourists per year. The area qualifies for registration as a Wetland of International Importance under the Ramsar Convention. The large number of seals may potentially threaten the seabirds which feed in the area, since a small fraction of seals are known to take young birds at sea. The Ministries of Environment and Tourism and of Fisheries and Marine Resources have joint jurisdiction over the area.

Further reading

Berry (1976b), Cooper *et al.* (1982), Noli-Peard and Williams (1991), Olivier and Olivier (1993), Simmons (1991, 1992), Tarr (1996), Williams (1991).

Namib-Naukluft Park

Admin region Hardap

Coordinates 24°37'S 15°23'E A1, A2 (s045, s046), A3 (A11, A12), A4i
Area 4,976,800 ha Altitude 0–2,000 m National Park

NA010

Site description

This massive conservation area, one of the largest in Africa, incorporates a large portion of the Namib desert, which some authorities consider the oldest desert in the world. The park comprises gravel-plains of intensely weathered rock, with some gypsum crusts, calcrete and desert pavement. River canyons are intermittent and sand-filled. Extensive sand-dunes, which form a dune sea, run parallel to the coastline for up to 120 km inland. The Naukluft mountains are part of the high-rising escarpment that marks the western edge of the interior highlands of Namibia. The flat, plateau-like summit of the mountain complex is separated from the adjacent highland plateau to the south by impressive near-vertical cliffs, while in the north-west and west its highest peaks loom almost 1,000 m above the plains of the Namib desert.

The Naukluft forms part of a large triangular plateau, which is higher than the main Namibian Plateau and separated from it by almost unbroken cliffs, 500 m high. The plateau consists mainly of dolomite and limestone formations. Dissolution of the dolomite and limestone by waters over many millennia has given rise to karstification of the plateau and an extensive underground drainage system. In some of the deeply incised kloofs, discharge from this underground reservoir occurs as crystal-clear springs and streams. Soils are shallow except on the less pronounced slopes. The southern portion of these mountains holds the Sesriem Canyon, where the Tsauchab river has carved a spectacular gorge into the gravels deposited some 15–18 million years ago. It is thought that the Tsauchab once flowed to the Atlantic Ocean, but that it was blocked by encroaching sand-dunes some 70 km inland

approximately 60,000 years ago. Over thousands of years the Tsauchab river has, nevertheless, managed to keep open parts of its course, ending at Sossusvlei, a clay pan 65 km south-west of Sesriem.

The sand-dune desert has its origin at the mouth of the Orange river, eventually coalescing into a vast sea of dunes north of Lüderitz. The sand sea is abruptly halted by the Kuiseb river, which forms an impenetrable barrier, 400 km to the north.

Vegetation is extremely sparse on the shifting dunes of the sand-sea; occasionally grassy pockets of dune grass *Stipagrostis* develop in more stable slacks. Following good rainfall, grasses also develop on the gravel-plains, which are otherwise mostly devoid of cover. Plants that can tolerate the extreme aridity on a permanent basis include the lichens and succulents that dominate on inselbergs and pegmatite dykes, making use of moisture in the fog and dew. The plains hold the bizarre *Welwitschia mirabilis*, the only species of its family.

The riverbeds near the coast are colonized by *Tamarix*, *Lycium* and *Salsola* and inland by a denser growth of *Acacia* and *Faidherbia*. The fruit of the !Nara *Acanthosicyos horridus*, which occurs in the Kuiseb river valley, is a valuable source of water and nutrition in the desert. The vegetation of the Naukluft mountains is complex and relatively diverse, owing to the wide variation in aspect and soil.

Birds

See Box and Tables 2 and 3 for key species. The park is rich in raptors, and *Sagittarius serpentarius*, *Gyps africanus*, *Torgos tracheliotus*, *Aquila rapax*, *Polemaetus bellicosus* and *Falco rupicoloides* are very common. *Trigonoceps occipitalis*, *Circus macrourus*, *C. maurus* and *Falco naumanni* are less common. In the east, the Naukluft mountains hold breeding *Aquila verreauxii*, *Ciconia nigra* and probably a few pairs of *Bubo capensis*. Several characteristic species of the Namib–Karoo biome reach the northern limit of the distributions in the southern portion of the park, including *Eupodotis vigorsii*, *Sylvia layardi*, *Eremomela gregalis*, *Euryptila subcinnamomea*, *Serinus alario* and *Eremopterix australis*.

Other species more typical of northern Namibia penetrate the northern section of the park around the Naukluft mountains, including *Francoelinus hartlaubii*, *Poicephalus rueppellii*, *Tockus monteiri*, *Namibornis herero*, *Achaetops pycnopygius*, *Monticola brevipes* and *Lanioturdus torquatus*. Typical desert-dune and gravel-plain species include *Ardeotis kori*, *Neotis ludwigii*, *Eupodotis rueppellii*, *Cursorius rufus*, *C. temminckii*, *Rhinoptilus africanus*, *Certhilauda erythrochlamys*, *Ammomanes grayi*, *Eremalauda starki*, *Cercomela schlegelii*, *C. tractrac* and *Malcorus pectoralis*.

The coastline holds roosting and foraging areas for *Haematopus moquini*, *Sterna balaenarum*, *Phalacrocorax neglectus*, *P. coronatus*, and large numbers of *Sterna hirundo*. The coastline also holds the only mainland breeding colony of *Spheniscus demersus* in Namibia. When wet, Sossusvlei holds several waterbird species, including flamingos.

Key species

A1	<i>Spheniscus demersus</i>	<i>Phoenicopterus minor</i>
	<i>Phalacrocorax neglectus</i>	<i>Haematopus moquini</i>
	<i>Phalacrocorax coronatus</i>	<i>Sterna balaenarum</i>
A2 (s045)	Namibian escarpment Secondary Area: <i>Namibornis herero</i> has been recorded at this site.	
A2 (s046)	Namib desert Secondary Area: <i>Certhilauda erythrochlamys</i> has been recorded at this site.	
A3 (A11)	Kalahari–Highveld biome: Eight of the 12 species of this biome that occur in Namibia have been recorded at this site; see Table 3.	
A3 (A12)	Namib–Karoo biome: 15 of the 19 species of this biome that occur in Namibia have been recorded at this site; see Table 3.	
A4i	Breeding (pairs)	Non-breeding
	<i>Phalacrocorax neglectus</i>	— 100–200
	<i>Phalacrocorax coronatus</i>	— 50–150
	<i>Haematopus moquini</i>	Breeds 30–50
	<i>Larus dominicanus</i>	Breeds 250–350
	<i>Sterna hirundo</i>	— 10,000
	<i>Sterna balaenarum</i>	220 560

Other threatened/endemic wildlife

This park supports many species that are endemic to Namibia and to the small portion of Angola into which the Namib desert extends. Unique threatened or endemic plants include *Aloe namibensis*, *A. sladeniana*, *A. karasbergensis*, *Welwitschia mirabilis*, *Lithops schwantesii*, *Trichocaulon* spp. and *Myrothamnus flabellifolius*. Interesting endemic invertebrates include *Onymacris unguicularis* and

Lepidochora spp. Reptiles include *Palmatogecko rangei*, *Aporosaura anchietae* and *Bitis peringueyi*. Endemic and/or threatened mammals include *Eremitalpa granti* (VU), *Gerbillurus tytonis*, *Acinonyx jubatus* (VU) and *Equus zebra hartmannae* (EN).

■ Conservation issues

The Namib Desert National Park was first established as a game reserve in 1907. The Sandwich Harbour area (NA014) was incorporated into the game reserve in 1941. In 1956, the name was changed to the Namib Desert Park, and the reserve was enlarged to include the Kuiseb Canyon, Swakop river valley, and the Welwitschia Plains. In 1966, the Naukluft farm was purchased and two years later the Naukluft Mountain Zebra Park was established. The parks were amalgamated in 1979 by a 30-km-wide corridor; the size increased from 2,244,150 ha to its present size in 1984. The area was officially proclaimed as a National Park in 1986 when the remainder of Diamond Area II was added under Nature Conservation Ordinance No. 31.

The Topnaar Hottentots have lived in the Kuiseb river valley for many generations. They farm goats and cattle and are permanently resident in the park. Illegal nomadic farming on the Kuiseb flood-plain is a conservation concern and is being stopped. Three large inactive mining concessions remain in the park. Prospecting in the region prior to park establishment has left visible scars in several areas. Natural migration patterns of *Oryx gazella* may be forced to change because the numerous springs of the escarpment are being utilized too intensively. The area has been well studied, particularly through the endeavours of the Desert Ecological Research Institute, which was established in 1963 and is located at Gobabeb on the banks of the Kuiseb river. Studies have concentrated on the physiological and behavioural adaptations of beetles, ants and lizards to extreme desert conditions.

■ Further reading

Boyer and Bridgeford (1988), Brown (1987), Jarvis and Robertson (1997), Olivier and Olivier (1993), Simmons *et al.* (1998).

Mile 4 saltworks

Admin region Erongo

Coordinates 22°39'S 14°33'E

Area 3,400 ha Altitude 0 m

NA011

A1, A4i, A4iii

Private Nature Reserve

■ Site description

This coastal area comprises a private nature reserve of 400 ha and a saltworks. It lies adjacent to the sea on the central Namib desert coast and has been extensively altered to create numerous evaporation ponds. Immediately inland lie the gravel-plains of the Namib desert. The saltworks are situated about 7 km (4 miles) north of Swakopmund, off Route 76 to Terrace Bay. Production of the concentrated brine at the saltpan, known as Panther Beacon, began in 1933, but by 1952 the salt source was exhausted. Seawater has since been pumped into open evaporation and concentration ponds from which crystallized salt is removed with mechanical scrapers. The pans are shallow and of varying salinity. A large wooden commercial guano platform covering 31,000 m² has been built in one of the northern pans. Apart from a few halophytes, the saltworks are devoid of vegetation.

■ Birds

See Box for key species. Mile 4 occasionally supports massive numbers of waterbirds. The guano platform has supported up to 700,000 *Phalacrocorax capensis* in the past, and an average of 45,000 birds has been supported in recent years. Cormorants aside, the area may support more than 50,000 other waterbirds, including large numbers of *Phoenicopter ruber* and *P. minor*, *Haematopus moquini*, and up to 100,000 *Sterna hirundo*. Breeding species include *Sterna balaenarum* and *Charadrius pallidus*.

Key species

A1	<i>Phoenicopter minor</i>	<i>Sterna balaenarum</i>	
	<i>Haematopus moquini</i>		
A4i		Breeding (pairs)	Non-breeding
	<i>Phalacrocorax capensis</i>	Breeds	45,400–700,000
	<i>Phoenicopter ruber</i>	64 (once)	1,306–2,688
	<i>Larus dominicanus</i>	120	372–706
A4iii	More than 20,000 waterbirds occur at this site.		

■ Other threatened/endemic wildlife

Brown hyena *Hyaena brunnea* (LR/nt) occurs at the nearby Swakopmund dump and scavenges along the beaches in this area.

■ Conservation issues

The proprietors of the saltworks have registered the aquatic portion of this wetland, which encompasses 400 ha, as a private nature reserve. The Richwater Oyster Company has been cultivating oysters on the pan since 1985. Oyster production and guano scraping appear to be compatible with maintaining good populations of wetland birds, judging by the large numbers present, and the breeding of terns, cormorants and plovers in and around the saltworks. The value of these commercial salt pans as habitat for waders and other birds is obvious from biannual wetland counts (up to 93,000 birds of c.35 species at any one time). Management options that enhance the value of these systems, for breeding flamingos for example, should be sought; although the owners are not keen on attracting large numbers of visitors who may disturb the breeding cormorants. Substantial quantities of guano fall into the pans. The effect of this guano-enrichment on productivity of microorganisms in the pan has not been directly assessed, but oysters are grown commercially here and nutrient pollution has not been reported. The site can be considered secure as long as guano harvesting remains commercially viable.

■ Further reading

Berry (1976a,b), Cooper *et al.* (1982), Crawford and Dyer (1995), Noli-Peard and Williams (1991), Simmons (1992), Tarr (1996).

30-Kilometre Beach: Walvis–Swakopmund

Admin region Erongo

Coordinates 22°48'S 14°31'E

Area 2,100 ha Altitude 0 m

NA012

A1, A4i

Partly protected

■ Site description

This coastal IBA is situated in central Namibia, on the border of the Namib desert, between the harbour town of Walvis Bay and Swakopmund. It is essentially a 30 km by 0.7 km stretch of beach comprising mainly sand, with isolated rocky outcrops forming less than 5% of its length. Two small resorts occur in an otherwise uninhabited section of coast, namely Langstrand and Dolphin Strand. Rainfall here is highly variable, averaging about 15 mm per year, but precipitation from coastal fog occurs during one out of every 3 days on average. Line fishing is common along the northern sections, while swimmers and surfers are concentrated around the two resorts. The area is the focus of an intense oceanic upwelling system that begins in Lüderitz, where nutrients are brought to the surface, and algal and zooplankton blooms form as the water is swept north by the Benguela Current. Between Walvis Bay and Henties Bay inshore winds push large quantities of nutrients inland, supporting an abundance of invertebrates on the sandy and rocky shores. Invertebrate densities on both shore-types are higher than any other beach in southern Africa. Furthermore, the effect of the Pelican Point sand-spit is to refract waves around and into the bay, concentrating the nutrients still further on these shores. Little vegetation occurs, although washed-up kelp is seen on some sections and there provides a rich microhabitat for kelp flies and associated shorebirds. Associated with this beach is the only bulge along an otherwise straight beach, known as Caution Reef (or Patrysburg). This is an area of sandflats immediately behind a shingle beach, rising to a raised plateau overlooking the shore about 600 m inland. The road between Swakopmund and Walvis Bay acts as a boundary to the area c.1 km inland.

■ Birds

See Box for key species. This site is not only the richest shoreline in terms of shorebird density anywhere in southern Africa, but it supports the densest colony of breeding *Sterna balaenarum* known. Surveys 20 years ago showed the beach to hold peak shorebird numbers of 448 birds/km. Similar densities were recorded in 1996 (451 birds/km). Individual 10-km sections, including the rocky shores between Caution Reef and Swakopmund, peak even higher at 770 birds/km. Totals for this 30-km stretch of beach therefore exceed 13,000 shorebirds of c.31 species, most of which are Palearctic migrants. The most abundant

waders (Charadrii) are *Arenaria interpres*, *Calidris ferruginea*, *Pluvialis squatarola* and *Numenius phaeopus*. Breeding *Sterna balaenarum* occur mainly at Caution Reef and breed from October through February. Densities within a 2 km² study area have exceeded 120 nesting pairs or 60 pairs/km². This is considerably higher than the modal density in Namibia of about 1 pair/km². Other birds breed further inland at lower densities. Breeding and ringing studies have continued since 1995. Large numbers of *Sterna hirundo*/*S. paradisaea* flock here, and large numbers of cormorants, which use the artificial guano platform at the southern end of this IBA, sometimes roost on the beach.

Key species			
A1	<i>Sterna balaenarum</i>		
A4i		Breeding (pairs)	Non-breeding
	<i>Arenaria interpres</i>	—	5,211
	<i>Larus dominicanus</i>	—	1,688
	<i>Sterna balaenarum</i>	120	250

Other threatened/endemic wildlife

In recent years the rare cetacean *Caperea marginata* (five records) has occurred or been stranded on these beaches, while *Lagenorhynchus obscurus* (DD), *Tursiops truncatus* (DD) and *Cephalorhynchus heavisidii* (DD) are frequent visitors.

Conservation issues

As of 2001, breeding *Sterna balaenarum* are protected on their Caution Reef breeding site, and losses due to non-hatching have dropped by about 30%, due to a barrier preventing off-road vehicles from driving over the colony and new interpretation signs for visitors. *Larus dominicanus* and *Canis mesomelas*, attracted to fishermen and their bait, have also decreased due to the protective measures, thus decreasing predation on eggs.

Fishermen regularly use the same beaches as the shorebirds, but space competition is not severe. What is more important is the possibility of major developments, including casinos and hotels, proposed for the Caution Reef plains. A building on the site, or close to it, is likely to drive birds away, even though the terns tolerate a certain degree of visitor traffic. Dogs and visitors to the two resorts also disturb feeding birds in some sections of this productive beach, but the impact is relatively minor. Pollution is relatively rare away from the Walvis Bay harbour, but tankers anchored in the bay opposite Pelican Point clean their bilges, and scum from this uncontrolled source may be problematic.

Further reading

Braby (1995), Braby *et al.* (in press), Summers *et al.* (1987), Simmons *et al.* (1998), Wearne (1997), Whitelaw *et al.* (1978).

Walvis Bay

Admin region Erongo

Coordinates 22°59'S 14°31'E

Area 4,000 ha

Altitude 0 m

NA013

A1, A4i, A4iii

Municipal Nature Reserve,
Ramsar Site, Unprotected

Site description

Once famous for its whales, hence the name, Walvis Bay is a large modern town and Namibia's only port. It is one of the country's four Ramsar Sites and is located on the Kuiseb river delta, approximately halfway down the Namib desert coast, some 55 km north of Sandwich Harbour (NA014). The Kuiseb river no longer flows into its own delta, having been dammed off in 1962 to prevent flooding of the town. The wetlands south and west of the town make up the natural areas of Walvis Bay lagoon, and include intertidal mudflats and the eastern half of a 10-km-long north-south sand-spit called Pelican Point; this spit provides protection for the bay from Atlantic swells. A lagoon lies at the southern end of the open water. A salt-works was built at the southern end of this lagoon; it reduces the tidal sweep and possibly adds to increased siltation. Included in this IBA are the artificially flooded evaporation ponds of the saltworks, as well as the occasionally flooded areas to the south of the saltworks. The only terrestrial plants occur in the extensive riverine vegetation of the delta and the ephemeral river. The bay is a tourist attraction because of the proximity of 100,000 birds, mainly flamingos, to public areas. Rainfall is sporadic and averages about 15 mm per year, while precipitation in the form of coastal fog is common.

Birds

See Box for key species. In terms of numbers and species of birds, this is the most important coastal wetland in southern Africa, and is probably one of the three most important coastal wetlands in Africa. This area regularly supports over 100,000 birds in summer (maximum 162,000) and 50,000 in winter. Most birds (c.90% by number) which use the wetland in summer are non-breeding intra-African and Palearctic migrants. The area is vitally important for Palearctic waders and flamingos, which make up the majority of the numbers. Between 80–90% of the subregion's flamingos winter here, utilizing especially the evaporation ponds of the saltworks, or at Sandwich Harbour (NA014). As many as 16 species occur in numbers exceeding 1% of the relevant biogeographical population.

Several species number in their thousands, including *Phoenicopus ruber* and *P. minor*, *Calidris ferruginea*, *C. minuta*, *Sterna hirundo* and *S. paradisaea*, and significant numbers of the global populations of *Charadrius pallidus* (60% of the world population) and *Podiceps nigricollis* occur. Other common species include *Haematopus moquini*, breeding *Sterna balaenarum*, *Pluvialis squatarola*, *Charadrius marginatus*, *Arenaria interpres*, *Calidris alba*, *Recurvirostra avosetta*, breeding *Sterna caspia*, *S. bergii*, *S. sandvicensis* and most of southern Africa's *Chlidonias niger*. The site also holds large proportions of the southern African populations of *Calidris canutus*, *Limosa lapponica*, *Numenius arquata* and *N. phaeopus*. Smaller numbers of *Pelecanus onocrotalus*, *Anas capensis* and *Charadrius hiaticula* occur. This very high species richness and abundance is probably due to nutrients from the highly productive Lüderitz upwelling cell being brought north by the cold Benguela Current and being blown inshore by year-round winds.

Key species

A1	<i>Phoenicopus minor</i>	<i>Sterna balaenarum</i>
	<i>Haematopus moquini</i>	
A4i		Breeding (pairs)
	<i>Podiceps nigricollis</i>	—
	<i>Phoenicopus ruber</i>	2,050–4,030
	<i>Phoenicopus minor</i>	11,350–31,800
	<i>Recurvirostra avosetta</i>	14,200–33,060
	<i>Haematopus moquini</i>	818–2,340
	<i>Pluvialis squatarola</i>	110–204
	<i>Charadrius pallidus</i>	816–3,360
	<i>Charadrius marginatus</i>	Breeds 1,810–6,040
	<i>Arenaria interpres</i>	Breeds 1,010–1,610
	<i>Calidris alba</i>	—
	<i>Calidris ferruginea</i>	2,110–4,420
	<i>Larus dominicanus</i>	—
	<i>Sterna caspia</i>	2,110–7,360
	<i>Sterna bergii</i>	—
	<i>Sterna bergii</i>	11,180–22,700
	<i>Sterna bergii</i>	Breeds 1,710–5,170
	<i>Sterna bergii</i>	Breeds 70–230
	<i>Sterna bergii</i>	—
	<i>Sterna bergii</i>	350–1,660
	<i>Sterna bergii</i>	—
	<i>Sterna bergii</i>	5,410–23,610
	<i>Sterna bergii</i>	—
	<i>Sterna bergii</i>	Breeds 60–265
A4iii	More than 20,000 waterbirds occur at this site.	

Other threatened/endemic wildlife

Whales, including *Megaptera novaeangliae* (VU) and *Eubalaena australis* (LR/cd), which once brought their calves into the sheltered waters, and were exterminated by early whalers, are still sometimes seen at sea. In recent years the rare cetacean *Caperea marginata* has occurred, while *Lagenorhynchus obscurus* (DD), *Tursiops truncatus* (DD) and the poorly known Benguela endemic *Cephalorhynchus heavisidii* (DD) are frequent visitors.

Conservation issues

Once an enclave of South Africa, Walvis Bay was ceded to Namibia in March 1994. However, the legislation in the Walvis Bay and Offshore Islands Act of 1994 made no provision for the gazetted Cape Nature Reserve to be re-promulgated, and other than its Ramsar status, it is not formally protected. However, moves by the recently formed Coastal Environmental Trust of Namibia, the Municipality and the Ministry of Environment and Tourism are making rapid progress towards improving the situation.

Although the saltworks at Walvis Bay destroyed large areas of naturally flooded saltpan, it does provide large areas of permanently flooded shallow water with a range of salinities not naturally occurring in this environment. The artificial section of the wetland regularly supports more than half the birds in the wetland. Natural threats to the system include transport of wind-driven sand from the Kuiseb

Delta into the lagoon, and the large silt load present in the ocean in and around the mouth of the lagoon, which may lead to the eventual siltation of part of the system. The growth of the Pelican Point sand-spit at 22 m per year decreases the tidal sweep during spring tides that once helped to scour the bay of wind-transported sand.

Fish oils, fish-processing wastes and ship-borne pollution from the harbour have affected an already hyper-rich system, but most marine die-offs are associated with natural build-ups of sulphur dioxide precipitated by the high nutrient load of the waters. Oil spills from the natural gas fields off Lüderitz have the potential to be blown inland to Walvis Bay, but oil-spill contingency plans are in place.

Light aircraft, prohibited from flying low over the lagoon and mudflats, regularly violate the height restrictions and disturb feeding birds, particularly flamingos. Implementing strictly enforced regulations, including the suspension of flying licences, may help curb this problem.

Further reading

Berry (1976a), Boyer (1988), Curry (1997), Hockey *et al.* (1992), Jacobson *et al.* (1995), Noli-Peard and Williams (1991), Simmons (1991, 1992, 1996a, 1997), Ward (1997), Wearne (1997), Whitelaw *et al.* (1978), Williams (1987, 1988).

Sandwich Harbour

Admin region Erongo
Coordinates 23°20'S 14°30'E
Area 8,500 ha Altitude 0 m

NA014

A1, A4i, A4iii
Park, Ramsar Site

Site description

Sandwich Harbour is a natural lagoon which lies on the Namib desert coast, c.55 km south of Walvis Bay. One of Namibia's four Ramsar Sites, and the country's only marine reserve, Sandwich was once a natural harbour for whalers and fish processors who could gain access to fresh water here. Owing to dynamic geomorphological change, its sandbars and lagoons shift constantly with winter storms and longshore currents.

Two main sections of this wetland are recognized: the northern freshwater wetland, much reduced in size since the early 1970s when it covered c.2 km², and the southern mudflats, a 20 km² area of sand and mudflats inundated daily by the tides. The northern wetland is now a thin sliver, mainly of reedbed *Phragmites*, fed by a massive freshwater aquifer beneath the high dunes of the Namib sand-sea. This potable water slowly seeps through the wetland and there supports lush but dwindling stands of emergent and marginal vegetation. The wetland is protected from the Atlantic Ocean swells by a barrier beach which has moved from 1 km to within 100 m of the dunes. The southern lagoon, which leads into mudflats, is a relatively shallow water-body some 5 km long by 3 km wide. It is protected from the ocean by a western sand-spit that once reached the northern wetland but now joins the mainland some 3 km south of it.

Sandwich Harbour is one of the most geomorphologically active areas along the entire Namib coast. In the late 1800s there was no barrier beach and therefore no protected wetland and an otherwise open harbour. The system continues to evolve rapidly and contrary to popular belief it is far from dead.

Birds

See Box for key species. This is the most important wetland for waterbirds in southern Africa, with counts exceeding 300,000 birds in some years. Sandwich Harbour regularly supports over 50,000 birds in summer and over 20,000 in winter. Traditionally, the northern wetland holds the highest species diversity (up to 51 species of wetland bird), while the southern mudflats hold by far the largest number of birds, dominated by terns, sandpipers, flamingos and cormorants. Shorebirds occur here at densities exceeding 7,000 birds/km², amongst the highest recorded in the world. The largest total counts at Sandwich Harbour have been 238,000 birds in January 1998 and 316,000 in January 2001.

The area is vitally important for Palearctic waders and flamingos, which comprise the majority of the numbers. The area supports massive numbers of several species, including *Phalacrocorax capensis*, *Phoenicopterus ruber* and *P. minor*, *Sterna hirundo*, up to 40% of the world population of *Charadrius pallidus*, and tens of thousands of *Calidris ferruginea* and *C. minuta*. At times, the combined total of birds in Sandwich Harbour and Walvis Bay is so large that it

constitutes half of all birds counted in southern Africa during African waterfowl counts.

Key species			
A1	<i>Phoenicopterus minor</i>	<i>Sterna balaenarum</i>	
	<i>Haematopus moquini</i>		
A4i		Breeding (pairs)	Non-breeding
	<i>Phalacrocorax capensis</i>	—	4,230–25,300
	<i>Phoenicopterus ruber</i>	—	2,480–11,900
	<i>Recurvirostra avosetta</i>	—	120–940
	<i>Haematopus moquini</i>	—	20–90
	<i>Charadrius pallidus</i>	Breeds	170–5,590
	<i>Charadrius marginatus</i>	10	440–2,540
	<i>Arenaria interpres</i>	—	402–2,260
	<i>Calidris alba</i>	—	1,630–14,160
	<i>Calidris minuta</i>	—	3,590–30,480
	<i>Calidris ferruginea</i>	—	3,580–43,680
	<i>Larus dominicanus</i>	—	280–3,200
	<i>Sterna caspia</i>	—	30–168
	<i>Sterna bergii</i>	—	80–820
	<i>Sterna sandvicensis</i>	—	200–3,660
	<i>Sterna hirundo</i>	—	4,610–42,000
	<i>Sterna balaenarum</i>	20	50–300
A4iii	More than 20,000 waterbirds occur at this site.		

Other threatened/endemic wildlife

The dolphin *Tursiops truncatus* (DD) is seen in the lagoons, with pods of 10–20 animals not uncommon, while a non-breeding colony of c.10,000 *Arctocephalus pusillus* occupies the beach west of the mudflats. *Hyaena brunnea* (LR/nt) is a frequent visitor to the wetland.

Conservation issues

There have been no permanent human inhabitants at Sandwich Harbour since 1969, although remnants of a whaling station exist at the foot of the dunes and several wooden buildings belonging to earlier guano collectors and fishermen still stand. The entire area was a marine reserve, but that status was lost in 1994 through a legal oversight. Sandwich lies within the boundaries of the Namib-Naukluft Park (NA010), managed by the Ministry of Environment and Tourism. Owing to its discrete and dynamic nature it is treated as a separate IBA from the Namib-Naukluft system. Should current geomorphic processes eradicate the northern wetland, most of the freshwater vegetation would be lost and species richness would probably decrease. Any plans for the area should recognize that the southern end of the harbour supports the greatest abundance of birds, and this situation will remain, irrespective of the fate of the northern wetland. It is one of the best studied and most fascinating wetlands in Namibia, with bird counts spanning a period of 27 years and further research planned on the invertebrate fauna that presumably accounts for the high densities of waders found here.

The one conservation problem is the constant illegal low flying undertaken by tour companies, which 'buzz' the flamingos and cormorants 5–6 times daily in order to show visitors the sights of Sandwich Harbour, particularly flushed flamingos. Height restrictions are now set at 1,000 m and more regularly enforced. The area's history is well known and numerous artefacts, grave sites, shipwrecks and large shell middens litter this fascinating site.

Further reading

Berry and Berry (1975), Gebhardt (1973), Glassom and Branch (1997), Hellwig (1968), Kensley (1978), Kensley and Penrith (1977), Kinahan (1991), Lenssen *et al.* (1991), Noli-Peard and Williams (1991), Prozesky (1963), Simmons (1991, 1996b, 1999), Ward and Seely (1990), Whitelaw *et al.* (1978), Wilkinson *et al.* (1989).

Mercury Island

Admin region Karas
Coordinates 25°43'S 14°50'E
Area 3 ha Altitude 0–40 m

NA015

A1, A4i, A4ii, A4iii
Protected by Ministry of Fisheries

Site description

Located 800 m offshore, the precipitous Mercury Island lies within Spencer Bay, about 110 km north of Lüderitz. The island is within a

zone of intense oceanic upwelling that is responsible for the elevated nutrient levels and high fish biomass around these near-shore islands. Somewhat elongate, this steep-sided island reaches 40 m, is 500 m long and 100 m wide. It is the smallest of the three guano islands at 3 ha. Known as the island that shakes (hence the name Mercury), the interior of the island is hollow, and large swells, common in this region, thunder inside the coves under the island, causing it to reverberate ominously. The island is unvegetated and was first exploited for guano in the 1840s when thousands of tons of ‘white gold’ were stripped from its flanks. It is the northernmost of the 18 near-shore islands of the Diamond Coast used by breeding seabirds.

■ Birds

See Box for key species. Mercury Island is one of three very important coastal seabird-breeding islands along the Diamond Coast of south-western Namibia; the other two are Ichaboe (IBA NA016) and Possession (NA018). Mercury regularly supports over 15,000 seabirds, including *Spheniscus demersus*, *Morus capensis*, *Phalacrocorax neglectus*, and small numbers of *P. coronatus*. The island’s breeding population of *Phalacrocorax neglectus* has decreased by about 50% in the last 15 years. The seabirds cover virtually the entire surface area of the island, leaving no space for other species.

Key species			
A1	<i>Spheniscus demersus</i>	<i>Phalacrocorax neglectus</i>	
	<i>Morus capensis</i>	<i>Haematopus moquini</i>	
A4i		Breeding (pairs)	Non-breeding
	<i>Phalacrocorax neglectus</i>	679	2,000
A4ii	<i>Spheniscus demersus</i>	1,000–3,000	4,000–10,000
	<i>Morus capensis</i>	1,300	10,000
A4iii	More than 20,000 waterbirds occur at this site.		

■ Other threatened/endemic wildlife

Several whale species migrate through these waters, including *Megaptera novaeangliae* (VU) and *Eubalaena australis* (LR/cd). The cetaceans *Cephalorhynchus heavisidii* (DD), *Lagenorhynchus obscurus* (DD) and *Tursiops truncatus* (DD) occur in these waters.

■ Conservation issues

The island has one stone building for permanent staff, whose job is to prevent seals *Arctocephalus pusillus* from settling on the island’s shores. The staff also undertake regular counts of breeding birds and monitor their success. All of the near-shore islands on the Namibian coast were managed by Cape Nature Conservation as nature reserves when they were under South African rule. Now under Namibian law, they are not reserves but are protected by staff of the Ministry of Fisheries and Marine Resources. Three seabird species, *Spheniscus demersus*, *Morus capensis* and *Phalacrocorax capensis*, have suffered serious population declines in the last 30 years, mostly because of overfishing of surface-shoaling fish, such as *Sardinops sagax*, their main food source. From an already reduced population of 70,000 *Spheniscus demersus* in the 1950s, only 5,300 pairs remained 30 years later. However, since humans displaced seals from the island in 1986, penguin numbers have increased.

Penguins and cormorants are renowned for their guano, which has been harvested for hundreds of years for the fertilizer trade, resulting in disturbance during breeding, which compounds their population declines. This has affected *Spheniscus demersus* most severely, as it prefers to burrow in the guano. Large-scale guano harvesting removed the penguins’ cover and forced them to breed in the open, exposing their chicks and eggs to increased predation by gulls and seals, and excessive daytime heat and storms. Conservation measures currently ensure that these coastal seabirds are not disturbed during breeding and no guano is harvested.

Potential threats to the seabirds include the steadily increasing population of *Arctocephalus pusillus* along the Namib coast. Seals compete for space on some islands and eat young birds as they leave the islands. A programme has been initiated in which seals are discouraged from breeding where they dramatically affect sensitive seabird species. Furthermore, stocks of the fish *Sufflogobius bibarbatu*s have declined and those of *Jasus lalandi* have been severely over-exploited in the last 30 years. *Phalacrocorax neglectus*, which forage primarily on gobies and lobster, are particularly numerous on this island because the rocky nature of both the island and the adjacent shoreline is favoured by their prey-species. *Phalacrocorax neglectus* has declined

since 1956 on this island, possibly because of a reduction of food stocks. Appropriate management, permitting stocks of *Sufflogobius bibarbatu*s and *Jasus lalandi* to recover, may lead to a concurrent improvement in population levels of *Phalacrocorax neglectus*. Offshore diamond mining, in which sections of the seabed are vacuumed up and then re-deposited from small vessels, may disturb prime lobster habitat.

■ Further reading

Cooper *et al.* (1980), Crawford *et al.* (1982, 1989), Hockey (1982), Kemper *et al.* (in press), Pallet (1995), Rand (1963), Swart (1987, 1988), Williams (1993).

Ichaboe Island

Admin region Karas

Coordinates 26°17'S 14°56'E

Area 7 ha Altitude 0–7 m

NA016

A1, A4i, A4ii, A4iii

Protected by Ministry of Fisheries

■ Site description

This small (6.5 ha) coastal island lies 1.4 km from Namibia’s Diamond Coast, c.50 km north of Lüderitz. The island is circular, mostly flat and unvegetated, and since rocky outcrops reach only 7 m, sea spray covers much of the island during storms. It is now completely surrounded by a sea wall to prevent seals from hauling out and disturbing the birds. Repeated guano scraping since the 1840s, when guano deposits were over 20 m thick, has left the rocky island-floor entirely exposed. Sandy stretches exist on the eastern side of the island. Ichaboe lies in the heart of the one of the strongest upwelling systems in the world, caused by the consistently strong longshore winds. The upwellings bring nutrients to the surface where they enhance phyto- and zooplankton blooms that are the basis for the rich abundance of fish on which the birds thrive. Rainfall is minimal (less than 10 mm per year), but coastal fog and storms often envelop the island.

■ Birds

See Box for key species. Ichaboe Island is one of the most important and densely packed coastal seabird breeding islands in the world. It regularly supports over 50,000 seabirds of at least eight species, including large numbers of *Spheniscus demersus*, *Morus capensis*, *Phalacrocorax capensis*, *P. neglectus* and *P. coronatus*. Smaller numbers of *Larus dominicanus* and *Haematopus moquini* also breed. This island is the most important location for *Phalacrocorax neglectus* in the world, holding a massive 65% of this globally near-threatened species’s population. During the last 20 years the global population has declined from 9,000 pairs to less than 5,000 pairs, of which total Namibia holds c.4,000 pairs. Ichaboe also holds about 4% of the world breeding population of *Phalacrocorax coronatus*. The island may also harbour thousands of roosting terns, particularly *Sterna hirundo* and *Chlidonias niger*.

Key species

A1	<i>Spheniscus demersus</i>	<i>Phalacrocorax neglectus</i>	
	<i>Morus capensis</i>	<i>Phalacrocorax coronatus</i>	
A4i		Breeding (pairs)	Non-breeding
	<i>Phalacrocorax capensis</i>	8,000	19,960–36,544
	<i>Phalacrocorax neglectus</i>	2,625	10,000–12,000
	<i>Phalacrocorax coronatus</i>	143	190
A4ii	<i>Spheniscus demersus</i>	2,000–3,400	5,000–10,000
	<i>Morus capensis</i>	11,000	25,000–40,000
A4iii	More than 20,000 waterbirds occur at this site.		

■ Other threatened/endemic wildlife

Whales sighted here include *Megaptera novaeangliae* (VU) and *Eubalaena australis* (LR/cd). The cetaceans *Lagenorhynchus obscurus* (DD), *Tursiops truncatus* (DD) and the endemic *Cephalorhynchus heavisidii* (DD) are visitors to the island’s waters.

■ Conservation issues

All the near-shore islands of Namibia’s Diamond Coast were managed by Cape Nature Conservation as nature reserves when they were under South African rule. Now under Namibian law, they no longer carry the same status, but fall under the jurisdiction of the Ministry of Fisheries and Marine Resources. Three seabird species, *Spheniscus*

demersus, *Morus capensis* and *Phalacrocorax capensis*, have suffered serious population declines during the last 30 years, mostly because of overfishing of surface-shoaling fish, such as *Sardinops sagax*, their main food source. These seabird species are also renowned for their guano, which has been harvested for many years for the fertilizer trade, resulting in disturbance to breeding seabirds and compounding their population declines. This has affected *Spheniscus demersus* most severely, as it prefers to burrow in the guano. The guano on Ichaboe Island was 22 m deep when exploitation began in the 1840s; it was completely cleared of guano in three years. Large-scale guano harvesting removed the penguins' cover and forced them to breed in the open, exposing their chicks and eggs to increased predation by gulls and seals, excessive heat during the day, and storm conditions. Conservation measures ensure that sensitive coastal seabirds are not disturbed during their critical breeding season. This does not preclude harvesting of guano, which is presently carried out less than once every two years. Only decisive conservation actions on Ichaboe Island, involving limitations on guano collection at certain times of the year, and active prevention of seals landing to breed, have begun to restore the penguin population.

Further conservation problems for coastal seabirds include a population of the seal *Arctocephalus pusilla* which has been steadily increasing in number along the Namib coast after being severely depleted by hunting in the 1800s. Seals occasionally disrupt and displace sensitive breeding seabirds on islands, competing for space and occupying areas originally used for breeding by the birds. This has led to the decline in several of these species' populations, including *Spheniscus demersus* which has decreased from 8,000 to 3,400 individuals since 1956. *Arctocephalus pusilla* are actively discouraged from breeding in areas where they dramatically affect sensitive seabird species. *Phalacrocorax neglectus*, which forage primarily on the fish *Sufflogobius bibarbatatus* and *Jasusalandi*, have recently suffered a global decline of 34%. The decline has been attributed to a reduction in food abundance and displacement by seals.

Further reading

Crawford *et al.* (1982, 1999), Kemper *et al.* (in press), Pallet (1995), Rand (1963), Swart (1987, 1988).

Lüderitz Bay islands

Admin region Karas

Coordinates 26°37'S 15°07'E

Area 80 ha Altitude 0 m

NA017

A1, A4i, A4iii
Unprotected

Site description

The Lüderitz Bay island complex consists of four coastal islands, all situated within one kilometre of the shore. The rocky shoreline, including Lüderitz fishing harbour, is included within the IBA. Halifax Island (3 ha) is located at the south end of Guano Bay near Diaz Point, a promontory at the western entrance of Lüderitz Bay, and one of the first landfalls of Portuguese explorers in the 1400s. The whole area lies within the intense upwelling cell off the Lüderitz coastline, creating a node of high marine productivity resulting in large congregations of seabirds. The other three islands, Penguin (36 ha), Seal (44 ha) and Flamingo, lie to the east of Halifax, within Lüderitz Bay. The islands hold some abandoned guano-scrappers' buildings. They support no vegetation other than subtidal kelp and other seaweed on their shores.

Birds

See Box for key species. The island complex regularly supports over 10,000 seabirds. Halifax Island is an important coastal seabird breeding island; it supports over 2,000 breeding seabirds, including important numbers of breeding *Spheniscus demersus* (c.400 pairs), *Sterna bergii* and *Phalacrocorax coronatus*. Penguin and Seal islands are utilized mostly for roosting, but *Phalacrocorax coronatus*, *P. neglectus*, *P. capensis* (2,000 pairs) and *P. carbo* (20 pairs) all breed on Penguin Island. The latter also holds large numbers of *Haematopus moquini* (possibly 20% of the world population), which probably breed, and roosting *Sterna balaenarum*. Seal Island is important for *Phalacrocorax coronatus*, as it holds some 3% of the world population. It also holds many pairs of *Larus dominicanus*, which occasionally depredate cormorant eggs when the latter are disturbed.

On the adjacent mainland, the harbour supports dense nesting populations of *Larus hartlaubii* and *Sterna bergii*. In 1994, at least 2,470 pairs of *S. bergii* (40% of the southern African population) nested successfully there and on the rocky promontory called Shark Island. The shoreline is completely rocky and the Lüderitz peninsula, excluding the islands, holds about 14,000 shorebirds. At 30 birds/km it is locally dense, but supports a lower linear density than shores farther north in central Namibia.

Key species

A1	<i>Spheniscus demersus</i> <i>Phalacrocorax coronatus</i>	<i>Phalacrocorax neglectus</i> <i>Haematopus moquini</i>	
A4i		Breeding (pairs)	Non-breeding
	<i>Phalacrocorax coronatus</i>	50–160	160–350
	<i>Phalacrocorax neglectus</i>	60	200
	<i>Haematopus moquini</i>	5–10	200–400
	<i>Larus dominicanus</i>	500–800	1,200–2,000
	<i>Larus hartlaubii</i>	200–400	1,500
	<i>Sterna bergii</i>	800–2,470	6,000
A4iii	More than 20,000 waterbirds occur at this site.		

Other threatened/endemic wildlife

Among the cetaceans that occur, *Cephalorhynchus heavisidii* (DD), *Lagenorhynchus obscurus* (DD) and *Turstopus truncatus* (DD) are frequently seen, while *Megaptera novaeangliae* (VU) and *Eubalaena australis* (LR/cd) are rarer.

Conservation issues

All of the near-shore islands on the Namibian coast were managed by Cape Nature Conservation as nature reserves when they were under South African rule. Now, under Namibian law, they no longer carry the same status, but fall under the jurisdiction of the Ministry of Fisheries and Marine Resources who man three of them. Previously, all the islands held more breeding birds than at present; their proximity to the mainland, and Namibia's only other fishing port, resulted in intense exploitation by humans, probably even before the precipitous decline of *Spheniscus demersus* in the 19th and 20th centuries. Three seabird species, *Spheniscus demersus*, *Morus capensis* and *Phalacrocorax capensis*, have suffered serious population declines in the last 30 years, mostly because of overfishing of surface-shoaling fish, such as *Sardinops sagax*, their main food source. These birds are also renowned for their guano, which has been harvested for over 100 years for fertilizer, resulting in disturbance during breeding, which compounds their population declines. This has affected *Spheniscus demersus* most severely, as it prefers to burrow into the guano. Large-scale guano harvesting removed the penguins' cover and forced them to breed in the open, exposing their chicks and eggs to increased predation by gulls and seals, excessive heat during the day and other hazards.

Conservation measures, including reduced guano-scraping, currently ensure that these birds are not disturbed during the main breeding season, but some disturbance always occurs as the birds breed all year-round. Egg-collecting persisted well into the 1970s on some of these islands, and may still occur at low levels. Further conservation problems for coastal seabirds include a growing population of seals *Arctocephalus pusilla*, which has been steadily increasing in number along the Namibian coast after a period of severe exploitation during the 1800s. *Arctocephalus pusilla* often disrupt and displace breeding seabirds on islands. They are physically discouraged from hauling out on the three manned islands further south. *Phalacrocorax neglectus*, which forage primarily on *Sufflogobius bibarbatatus* and *Jasusalandi*, have recently suffered a global decline of 34%. The decline has been attributed to a reduction in food abundance and displacement by seals. Appropriate management, permitting stock recovery of their primary prey-species, may lead to an improvement in population levels of *Phalacrocorax neglectus*.

Onshore, harbour pollution appears minimal but disturbance to breeding gulls and terns in the harbour itself by humans and dogs and cats has been severe. Attempts to control it have met with some success, but disturbance will increase as the harbour is renovated.

Further reading

Berry *et al.* (1974), Cooper *et al.* (1990), Crawford *et al.* (1989, 1999), Hockey (1982), Noli-Peard and Williams (1991), Pallet (1995), Simmons and Roux (in press), Swart (1988).

Possession Island

Admin region Karas

Coordinates 27°01'S 15°12'E

Area 80 ha Altitude 0 m

NA018

A1, A4i, A4ii, A4iii

Unprotected

Site description

Possession Island is located 1.6 km from the Diamond Coast of south-western Namibia, just south of Elizabeth Bay, c.40 km south of Lüderitz. This rectangular island is the largest of Namibia's guano islands. It extends 4 km from north to south and is at most 1 km wide. Low rainfall (less than 10 mm per year) and frequent storms inhibit vegetation growth, and isolated bushes are scattered around otherwise barren and somewhat sandy ground. Old diamond diggings have broken much of the sandy surface. The island still holds a main jetty and the remains of a small village. Like the other guano islands it was stripped of its guano cap in the 1840s and has never regained it. It is permanently manned to keep seals from settling on the island.

Birds

See Box for key species. As Possession Island is the largest of the Namibian coastal islands, it has the potential to hold the most seabirds. This honour, however, goes to Ichaboe (IBA NA016) which is 14 times smaller than Possession. Despite the relatively low seabird densities, Possession Island is a vitally important coastal seabird breeding island, supporting over 20,000 seabirds in total. Important species include decreasing numbers of *Spheniscus demersus*, *Morus capensis*, *Phalacrocorax capensis*, *P. coronatus* and *P. neglectus* (10 pairs). Some of these breeding seabirds have been in decline since the island was first surveyed in 1956. Numbers of *Spheniscus demersus* decreased by 92% and numbers of *Morus capensis* by 68% over the next 40 years. While some colonies have disappeared altogether, others remain at much-reduced densities. Single pairs are unusual, scattered haphazardly over barren portions of the island. Large areas which were once occupied by breeding birds, now stand unused. This is the only island breeding site of the normally mainland-breeding *Sterna balaenarum*. Small colonies of *Sterna balaenarum*, that once bred between dunes on the adjacent mainland, have largely disappeared since the early 1970s. *Sterna bergii* are said to have nested on the island, but now no longer do. *Haematopus moquini* are common on the island.

Key species

A1	<i>Spheniscus demersus</i>	<i>Phalacrocorax neglectus</i>	
	<i>Morus capensis</i>	<i>Haematopus moquini</i>	
	<i>Phalacrocorax coronatus</i>		
A4i		Breeding (pairs)	Non-breeding
	<i>Phalacrocorax capensis</i>	2,000–4,000	5,704
	<i>Phalacrocorax coronatus</i>	20–280	50–500
	<i>Haematopus moquini</i>	66	200–300
	<i>Larus dominicanus</i>	—	2,864
A4ii	<i>Spheniscus demersus</i>	300–900	700–2,700
	<i>Morus capensis</i>	800–3,000	2,000–10,000
A4iii	More than 20,000 waterbirds occur at this site.		

Other threatened/endemic wildlife

Of great significance was the birth of a calf of *Eubalaena australis* (LR/cd) in Elizabeth Bay in 1996, the first breeding record of this whale on the Namibian coast for over 100 years.

Conservation issues

Like the other 18 islands off Namibia's desolate Diamond Coast, the 1994 Walvis Bay and Offshore Islands Act brought Possession Island back from South African to Namibian jurisdiction. It now falls under the auspices of the Ministry of Fisheries and Marine Resources, who have a post (unfilled) for a full-time marine ornithologist and have permanent staff on the island. The main purpose is to prevent seals from invading the island and displacing the seabirds, with a view to re-exploiting the guano deposits that may then accumulate. Onshore disturbance is higher than on other islands, as a large diamond mine was established in Elizabeth Bay in 1991. The most important seabird species on this island are *Spheniscus demersus*, *Morus capensis* and *Phalacrocorax capensis*, all of which have suffered serious population declines in the last 100 years, mostly because of overfishing of their main food source. This island has suffered particularly from guano-scraping, as it is relatively featureless and guano was easy to remove.

The lack of guano has reduced penguin-nesting habitat to a few peripheral shoreline areas. *Spheniscus demersus* populations plummeted from 35,000 birds in 1956 to less than 3,000 birds in 1997. Little guano is currently harvested owing to the severely reduced numbers of birds on the island. Research conducted by the Ministry of Fisheries and Marine Resources includes assessing breeding success of colonial and solitary penguins, and the effect of the numerous parasites on brood-size and growth-rates. Whether guano harvesting will prove viable remains to be seen. Unauthorized landing by fishermen still occurs on the island but disturbance is minimized by Fisheries personnel.

Further reading

Cooper *et al.* (1980), Cordes *et al.* (1999), Crawford *et al.* (1982, 1989), Hockey (1982), Noli-Peard and Williams (1991), Pallet (1995), Rand (1963), Swart (1987, 1988), Williams (1993).

Sperrgebiet

Admin region Karas

Coordinates 27°20'S 15°52'E

A1, A2 (s046), A3 (A12), A4i

Area 2,600,000 ha Altitude 0–1,488 m Ramsar Site (Unprotected)

NA019

Site description

The Sperrgebiet, or forbidden territory, lies in the south-western corner of Namibia. Famous for its diamonds, the area is bordered by the Orange river in the south and the Atlantic Ocean to the west. The northern boundary was established at the 26°S line of latitude, whereas the eastern boundary parallels the coast c.100 km inland. The IBA includes the Namibian side of the Orange river mouth (adjacent to IBA ZA030). Largely uninhabited, the only towns in the Sperrgebiet are Oranjemund on the southern coast and Lüderitz on the northern coast. The Sperrgebiet is an extremely arid zone, encompassing the northern extremity of the winter-rainfall portion of the Namib desert. It is the windiest region in southern Africa. The only permanent water in the area is the perennial Orange river. The northern coastal plain is rocky and holds various sandy bays; the southern shores, intensively mined for diamonds, are reconstituted sandy beaches. The major part of the remaining area comprises sand and gravel-plains with low isolated hills. In the centre and north of the park, dune sand and sand-sheets predominate, the most prominent area being Obib dune-field which rises to 500 m. Several rocky ranges, low mountains and inselbergs are found scattered throughout the park.

Various vegetation-types are found, including coastal zone vegetation, which consists of hummocks in sandy areas, which stabilize dunes and form barriers to sand movement. Lichens, such as *Xanthoria*, are found on the numerous rocky outcrops and on dead *Salsola* plants. The central sand-plains lie between 300 and 600 m and are covered by dune fields and coarse sands that are driven inland by southerly prevailing winds, which are a dominant feature of this region. The more elevated eastern sand-plains consist predominantly of gravel-plains with one permanent dune system north-east of the Klinghardtberg. The rocky outcrops and inselbergs receive higher precipitation and more fog moisture and have a more diverse flora than the surrounding areas. The Aurusberg supports the highest diversity and density of plants in the Sperrgebiet. The linear Orange river in the south supports dense riverine woodland.

Birds

See Box and Tables 2 and 3 for key species. This extremely arid area holds a depauperate avifauna of only some 110 bird species, many of which are restricted to the Namib-Karoo biome. However, the inclusion of the Orange river mouth boosts the species total to 251 bird species. The recently recognized *Certhilauda barlowi* is virtually restricted to the Sperrgebiet, which holds over 80% of its tiny 18,000 km² range. The newly recognized *Certhilauda curvirostris* just occurs in this region, in low numbers. *Haliaeetus vocifer* is common along the Orange river, where *Phragmacia substriata* and *Francolinus capensis* reach the northern limit of their distributions. The Orange river mouth is particularly species-rich (64 wetland species) and in the past has been the sixth most important wetland (for total abundance: 26,000 birds) in southern Africa. It is one of Namibia's four Ramsar Sites. Bird numbers and species richness increase along its length from east to west, and the mouth alone holds four times as many birds as the total river along the Namibian border.

Several characteristic species of the Namib–Karoo biome occur in the Sperrgebiet, including *Eupodotis vigorsii*, *Eremopterix australis*, *Cercomela schlegelii*, *C. sinuata*, *Euryptila subcinnamomea* and *Sylvia layardi*. Other arid-zone species which are found within the area include *Neotis ludwigii*, *Certhilauda erythrochlamys*, *Ammomanes grayi*, *Eremalauda starki*, *Cercomela tractrac* and *Serinus alario*.

Key species

A1	<i>Phoenicopterus minor</i> <i>Haematopus moquini</i>	<i>Sterna balaenarum</i>
A2 (s046)	Namib desert Secondary Area: <i>Certhilauda erythrochlamys</i> has been recorded at this site.	
A3 (A12)	Namib–Karoo biome: 15 of the 19 species of this biome that occur in Namibia have been recorded at this site; see Table 3.	
A4i	Breeding (pairs)	Non-breeding
	<i>Podiceps nigricollis</i>	— 250–300
	<i>Phalacrocorax capensis</i>	— 1,228–6,000
	<i>Haematopus moquini</i>	20–50 78–296
	<i>Larus dominicanus</i>	Breeds 354–1,433
	<i>Sterna bergii</i>	— 869–4,941

Other threatened/endemic wildlife

The Sperrgebiet is characterized by high levels of endemism in various taxa. At least 45 plant species are endemic to the Sperrgebiet and thus Namibia, but many more are endemic to the Sperrgebiet and Richtersveld of South Africa. The coastal zone holds the spectacular endemic plant *Sarcocaulon patersonii*. Aurusberg holds several endemic plants that are exclusive to this peak. In the Orange river valley, the inselbergs Skilpadberg and Swartkop hold several plants endemic to the lower Orange river, including *Aloe ramosissima* (VU) and *A. garipeensis*. Endemic and near-endemic amphibians include *Breviceps macrops*, *B. namaquensis*, *Strongylopus springbokensis* and a recently discovered, and as yet undescribed, toad *Bufo*. Endemic and near-endemic reptiles include *Homopus* sp., *Bitis schneideri*, *B. xeropaga* and two legless burrowing skinks. The Sperrgebiet comprises about 40% of the global range of the small mammal *Bathyergus janetta*. *Cephalorhynchus heavisidii* (DD), endemic to the south-west coast of Africa and probably one of the world's rarest dolphins, is fairly common off the Sperrgebiet coast.

Conservation issues

Wildlife in the Sperrgebiet is unofficially protected by virtue of the high security surrounding the diamonds mined there. The area is earmarked to become a protected area under the auspices of the Ministry of Environment and Tourism. It is adjacent to the large Namib-Naukluft Park, which lies to the north, and it is also narrowly linked to the recently proclaimed Huns-Ai-Ais Game Reserve in the east at Sendelingsdrift. To the south-east, across the Orange river, is

the Richtersveld National Park in South Africa. This park shares the lower Orange river as a common boundary for several kilometres. The scenic value of this area has the potential to make an important contribution to the local and national economy. The only permanent water supply in the area is the Orange river, but flow rates have dwindled and will do so in future as the Lesotho Highlands Scheme takes more from the headwaters in Lesotho for water-supply to South Africa's Gauteng District. Agricultural potential along the lower Orange river is minimal, and difficult to realize because of the great distance from suitable markets and the anticipated reduction of available water in the river. Nevertheless, organophosphates constantly filter into the river from lucerne farming on the river's banks and may be detrimental to the associated flora and fauna.

The area is largely used for diamond prospecting and mining by NAMDEB; the remainder of the area falls under the jurisdiction of the Ministry of Mines and Energy, which intends to maintain the high security of the entire Sperrgebiet by restricting access to the area and thereby limiting human impacts in the region. All mining activities should be undertaken in conjunction with Environmental Impact Assessment procedures. Mining activities should be restricted because mined areas require rehabilitation, and the massive quantities of waste generated by mining should be appropriately managed. The Ministry of Environment and Tourism has proposed that the area be converted into a park, to create a continuous strip of protected land between the Cunene and Orange rivers, under its jurisdiction. The Ministry of Mines and Energy has recently opened up 46 concessions along a 3-km-wide strip of the Orange river.

The vegetation of the Sperrgebiet is for the most part pristine. The main terrestrial impacts on this area occur for 100 km along the coast and about 3 km inland from the town of Oranjemund. The intensity of the mining appears to have affected both shorebird numbers using the beaches and the number of breeding *Sterna balaenarum* on the coastal plains. Older mining concessions occur around Lüderitz, and along the eastern margin of the area where emergency grazing has been permitted since the 1950s.

The Sperrgebiet has the distinction of supporting more non-native mammals than any other area of Namibia. Feral donkeys, European rabbits *Oryctolagus cuniculus* and house mice *Mus musculus* are among the aliens here, but ranges are restricted by the severe environment outside the winter-rainfall area. Offshore stocks of the fish *Jasus lalandi* have been severely over-exploited in the last 30 years and may be affected by the suction-dredging techniques of marine diamond-mining currently being employed.

Further reading

Cooper *et al.* (1980), Hockey (1982), Maggs *et al.* (1998), Pallet (1995), Robertson *et al.* (1998), Ryan and Bloomer (1999), Ryan *et al.* (1996, 1998), Simmons and Allan (in press), Simmons *et al.* (1998), Williams (1986, 1993).

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