

# Dwesa & Cwebe Nature Reserves 1E

**T**he gentle hills and forest-fringed shorelines of the Dwesa/Cwebe nature reserves reveal nothing of the complex and emotive land struggle that took place in this region of the Wild Coast during the 1990s. But the continued existence of the reserves bears testimony to the fact that, in South Africa today, it is possible to reconcile the needs of rural people with a desire to conserve our country's rich biodiversity.

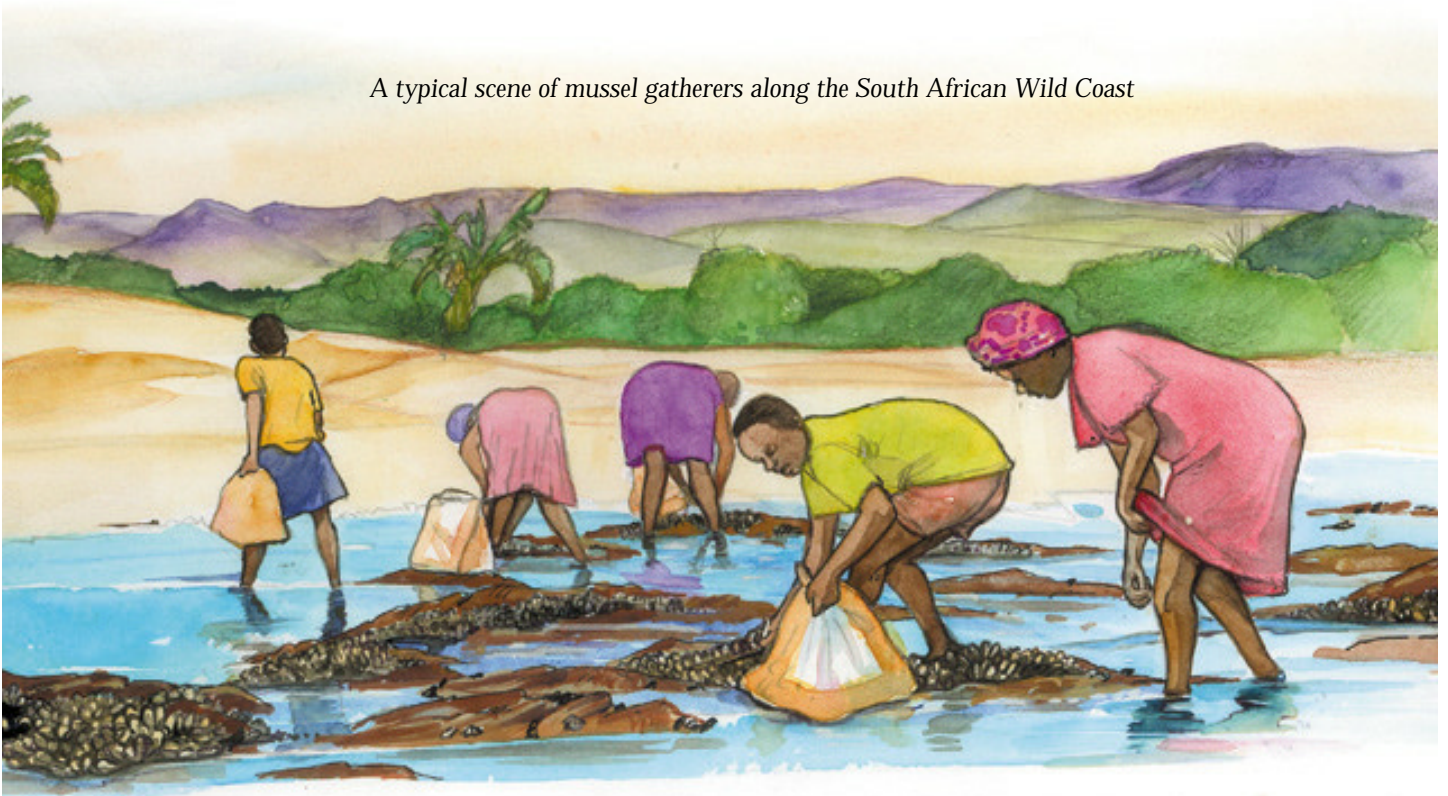
Dwesa Nature Reserve and its sister reserve, Cwebe, are situated on opposite banks of the Mbashe River. Together the reserves conserve the largest tract of indigenous coastal forest in the Eastern Cape and a rich inter-tidal and marine environment. Ownership of the reserves is currently being transferred to a local community trust following a successful land claim by the people who live on the boundaries of Dwesa/Cwebe. In terms of a ruling by the Minister of Land Affairs, ownership of the reserves is being transferred on condition that the conservation objectives of the reserves are upheld. A management plan for Dwesa/Cwebe is being established through negotiation between the local communities and the Departments of Land Affairs, Water and Forestry, Environmental Affairs and Tourism and Eastern Cape Nature Conservation.

The Dwesa/Cwebe nature reserves occupy a narrow coastal strip which is approximately 14 km long; their combined area is a little under 6 000 ha. The reserves represent a tiny portion of the South African coast and their location on the remote Wild Coast means that they are a destination for only the most adventurous tourist – so why is it so important that the conservation objectives of the reserves are upheld? The answer is simply that the Dwesa/Cwebe reserves are a biodiversity hotspot. They are located in a transition zone between the temperate and sub-tropical biological zones and form the southern distribution limit for a number of plant and animal species. This is an area rich in biological diversity in all its facets and the conservation value of the reserves has never been in question.

## Indigenous forests

The indigenous forests at Dwesa/Cwebe have been protected since 1891 and 1893 respectively. The forests are predominantly evergreen, but there are also sensitive dune forests in the reserves. Although commercial exploitation of the forests was stopped in the previous century, subsistence utilization by local people has occurred on an ongoing basis. Forest resources are used for building huts and kraals, for firewood and traditional medicine. A recent study has indicated that current levels of utilization are not sustainable. In common with other parts of the country, exotic invasive plants, particularly guava trees, are a threat to the forests.

*A typical scene of mussel gatherers along the South African Wild Coast*



## Conflicting interests

In 1994 local residents began to protest against their exclusion from the inter-tidal zone and started to remove large quantities of protected shellfish from the rocks in defiance of the law. Negotiations with local communities resulted in a moratorium being placed on further harvesting, but this agreement has not been adhered to.

The productivity of the Wild Coast coastline is very low and the impact of uncontrolled harvesting in the Dwesa/Cwebe MPA is noticeable. Just as the local community are adamant that their access to the inter-tidal resources must be restored, so too is the Department of Environmental Affairs and Tourism adamant that the

Dwesa/Cwebe MPA represents a last line of defence for the conservation of the inter-tidal resources of the Wild Coast region. A potential, but controversial, solution to this quandary is to institute a system of rotational harvesting whereby different parts of the inter-tidal zone are opened and closed to harvesting on a rotational basis. If this system is instituted, the quantities harvested would need to be limited and trained observers would have to control operations and record data. Part of the reserve would have to be totally protected to provide a control base. The zoology department at the University of the Transkei has a long-term research project monitoring the marine ecosystem at Dwesa/Cwebe, so the effects of harvesting can be assessed against this base-line study.

## Grasslands

The grasslands of Dwesa/Cwebe have high plant biodiversity. They are also relatively underutilized when compared to neighbouring lands which are heavily grazed by domestic cattle and goats.

Small patches of wetland vegetation occur in both reserves and the mangrove community on the banks of the Nqabara River, although it is located outside the boundaries of the reserves, is considered to have a high conservation value. Mangroves are among the most threatened plant communities in South Africa.

## Marine Protected Area

The inter-tidal zone, estuaries and marine environment at Dwesa/Cwebe comprise a Marine Protected Area (MPA) of approximately 18 000 ha. Fishing is prohibited for six nautical miles seawards of the terrestrial reserves. This stipulation has allowed visitors to the reserves to catch fish, while local inhabitants are prohibited from doing so.

Between 1978 and 1994 the MPA was totally protected through rigorous law enforcement and this caused much resentment. Local people had utilized inter-tidal resources, specifically brown mussels *Perna perna*, for centuries and depended on these food organisms for their nutritional needs. (Eight villages, with a total population of approximately 15 000 people share a border with the Dwesa/Cwebe reserves. A large proportion of the population is under 18 and poverty levels are high. More than 600 households have no income at all and depend on agriculture and natural resources for their survival).

People have probably lived in and around the Dwesa and Cwebe forests for many centuries and there is evidence to suggest that forest and inter-tidal resources were once used sustainably and wisely. But today the pressure on resources is far greater than in the past and, as neighbouring communities prepare to take ownership of the reserves once again, innovative strategies, like the one outlined above, will have to be devised to ensure that this treasure chest of biodiversity is protected for the benefit of generations to come.

*Author: Claire Attwood September 2000*

### FURTHER INFORMATION:

- Department of Environmental Affairs and Tourism: Marine and Coastal Management, Private Bag X2, Roggebaai, 8012. Tel: (021) 402 3911 or 402 3043. Fax: (021) 425 2920.
- University of Transkei, Zoology Department, Private Bag X1, Unitra 5117, Tel: (047) 502 2111

### RELATED FACTSHEETS:

- Garden Route • Wild Coast • West Coast • Coastal Forests • Mussel Harvesting • Marine Protected Areas



## Kosi Bay 1E

The Kosi Bay system is one of the largest and best preserved estuarine systems along the east coast of South Africa. It is renowned for its clear water and biodiversity. Located near the border with Mozambique, it consists of a series of circular, semi-saline and saline lakes. The four lakes Amanzimnyama, Nhlange, Mpungwini and Makhawulani on the mouth, are joined by narrow, shallow channels. The largest lake is Lake Nhlange, which covers about 30 km<sup>2</sup>. The lake system empties into the Indian Ocean via a shallow channel and estuary, just south of the border with Mozambique. Very little siltation has occurred in the system and the lakes are considerably deeper than other estuarine systems along the KwaZulu-Natal coast.

The Kosi Bay Nature Reserve was proclaimed in 1987 and is managed by KwaZulu-Natal Wildlife. In 1991 the area was declared a Wetland of International Importance under the Ramsar Convention. The surface area of the reserve is about 11 000 ha, about half of which is water.

### Biodiversity

Kosi Bay supports a great variety of fish and other aquatic fauna, in addition to the wide diversity of terrestrial fauna and flora. The system includes the largest swamp forests in South Africa and the southern most grove of the giant palm, *Raphia australis*.

The palmnut vulture is dependent on the raphia palm. This is the only area in South Africa where all five species of mangrove trees are found. The mangroves dominate the shores in the northern saline areas, while phragmites reed beds surround the southern lakes. The northern part of the system is characterised by wide areas of tidally inundated sand flats surrounded by beds of the sedge *Juncus kraussii*. At spring tides, the tidal influence can reach the southern-most large lakes. Although the numbers of wetland birds is not exceptionally high, the system is important for migratory birds. Greater Flamingos, Lesser Flamingos and Ospreys are often seen. In addition to these, water associated species such as the Flufftails, White-backed Night Heron and the Crab Plover are encountered. Hippopotamus are common in the lakes and crocodiles breed there in small numbers.

Over 163 fish species have been recorded in Kosi Bay and the system is considered to fulfil an important nursery function for numerous marine species. Marine fish are common in the mouth area, while estuarine species are found throughout the system. About nine freshwater fish species are found in the lakes. The fish diversity in the Kosi lakes is the highest recorded in any South African estuary. The system supports some of the largest populations of eight fish species that are listed in the Red Data book for threatened or vulnerable species.

The mouth of the magnificent Kosi System is the northern-most feature of the Maputaland coastline and protected as a no-take zone. Over 200 species of fish have been recorded in the Kosi mouth and this makes snorkelling in this crystal clear area better than being in an aquarium.



PHOTO: JEAN HAREIS

## Local people

People have lived around the shores of the Kosi Bay system, in considerable densities, for hundreds of years. The baTonga people have, for centuries, relied on fish and invertebrates from the lakes and estuary, as well as wild fruits and crops for their subsistence. Natural resources also provide these members of the Zulu nation with shelter, bedding and medicines.

Lake Makhawulani is renowned for its extensive network of palisade fish kraals. These kraals, which have remained relatively unchanged in living memory, are used to trap fish in the shallow, clear waters of the lake. Each kraal consists of a guide fence that curves towards a fish trap that allows the fish easy entry but no escape. Fish moving through the channel are guided into the traps where they are caught and speared by the trap owner. Ownership of the kraals is usually handed down through the generations. Local people also use traditional spearing, rod and line fishing and gill netting in the lakes. These harvests have been carefully monitored by management staff since 1985, and most are considered to be sustainable. However, the use of illegal gill nets and other more modern techniques to harvest fish in an uncontrolled manner has led to over-exploitation and these have, therefore, been discouraged.

The concept of wise sustainable utilisation is central to the management of the Kosi Bay system. Traditional harvesting methods have been investigated in detail and have been found to be generally sustainable. However, the area has a high population growth rate and this, combined with high levels of unemployment, has led to progressively increasing demands being placed on the natural resources of the system.

## Tourism

Kosi is a favourite tourist destination and is particularly popular among the angling fraternity. Recreational angling began towards the end of the 1940s and grew with the establishment of a camping facility in 1950. Kosi Bay has a reputation for good fishing, particularly using small powered boats. Catches are controlled by comprehensive regulations and are monitored by voluntary catch cards. The high bio-diversity in the area is now attracting an increasing number of birdwatchers and other



*Curved fences guide fish into one-way traps*

nature enthusiasts. A KwaZulu-Natal Wildlife campsite at Lake Nhlange caters for tourists who are prepared to bring their own supplies, while more upmarket facilities are available outside the reserve.

## Why conserve Kosi Bay?

Kosi Bay might easily have been another harbour, serving as Swaziland's trade outlet to the rest of the world. It may also have been a site for massive tourism development, complete with five-star hotels. However, the value of its pristine, unspoiled natural environment, with its rich complement of biodiversity, long recognised by conservationists, is slowly being appreciated by others.

In an effort to provide much needed income to this poor area, it will be important to develop it with sensitivity, so as to preserve the natural features that make Kosi Bay so attractive.

*Author: Judy Mann-Lang September 2000*

### FURTHER INFORMATION:

- Bruton, M.N. & Cooper, K.H. 1980. *Studies on the Ecology of Maputaland*. Wildlife Society Publication
- Mountain, A. 1990. *Paradise under Pressure*. Southern Book Publishers, Johannesburg.
- KwaZulu-Natal Wildlife (formerly KZN Nature Conservation Service) P.O. Box 13053, Cascades, Pietermaritzburg 3200. Tel: (0331) 845 1999

### RELATED FACTSHEETS:

- Maputaland Coast • St. Lucia • Marine Reserves • Traditional Fishing Methods • Coastal Forests



# St Lucia 1E

**L**ake St Lucia, on the northern KwaZulu-Natal (KZN) coast, is the largest estuarine system in Africa, covering an area of 35 000 ha. In fact, Lake St Lucia makes up about 80% of the estuarine area in KZN. The lake lies behind a system of dunes with steep seaward slopes, and the area around the lake is sandy and flat to gently undulating. The lake is generally very shallow, with a mean depth of 1m and is separated from the sea by a strip of land between 2 km and 11 km wide. The lake is subject to long-term salinity variations because it is shallow and the flow of fresh water into the lake is irregular. Five rivers feed Lake St. Lucia and extensive fresh water swamp systems are associated with it.

Throughout the ages, sea levels have risen and fallen in the St Lucia area. This has had the effect of producing some interesting fossils. About 150 000 years ago the sea level was much higher than at present and, what is now the western

shore of the lake was then the marine shoreline. False Bay (within St Lucia) was once the site of a thriving coral colony and evidence of this remains to this day.

## Management

The natural beauty and biotic diversity of Lake St Lucia led to the area being proclaimed a game reserve in 1895, making it one of the oldest reserves in South Africa. Today the lake forms part of the Greater St Lucia Wetland Park, which has been recognised as a World Heritage Site. The area is managed by KwaZulu-Natal Wildlife. Management of the area includes research to assist in the understanding of how natural systems function, the identification of ecologically sensitive areas, the drafting and implementation of management plans, the monitoring of key aspects of ecosystems, the impact of developments and public use on the natural environment and the effectiveness of management actions.

## Biodiversity

Lake St. Lucia is considered to be one of the most outstanding wildlife areas on the African continent. It is extremely productive and regarded as an excellent area for viewing wildlife. The Greater St Lucia Wetland Park is made up of five discrete

*A large fossil ammonite on the shore of Lake St Lucia – a world heritage site*



ecosystems, each with its own characteristic features. The marine ecosystem is characterised by warm water, coral reefs and long sandy beaches. Lush dune forests, grassy plains and a variety of wetlands dominate the eastern shores of the lake. The area includes some of the highest forested dunes in South Africa. The swamps to the north of the lake are dominated by reeds and papyrus, while the western shores of the lake are drier, dominated by savanna and thornveld. "The narrows" – a 21 km long connection between the main lake and the sea – is tidal and, in many places, lined by mangroves.

Lake St Lucia forms a critical habitat for a large number of species and several communities. It contains the largest hippopotamus, crocodile and white pelican populations in South Africa. Over 340 species of bird have been recorded including about 15 species of herons and egrets and some 20 species of ducks and geese. The wetland is of high value as a breeding site for threatened or endangered species such as the White Pelican, Goliath Heron, Yellowbilled Stork, African Fish Eagle, Red-winged Pratincole and Caspian Tern. It is possible to have up to 40 000 flamingos utilising the lake at the same time and thousands of pairs have been known to nest on islands in the lake. Surveys have recorded about 108 species of fish in Lake St. Lucia and it is an extremely important nursery area for numerous species of marine fish such as grunter, kob and stumpnose.

### Local People

Lake St. Lucia has been subjected to interference by humans for many years. As early as 1927, the Umfolozi swamps were canalized to drain the once extensive swamps and reedbeds of the Umfolozi flats to grow sugar cane. This canalization resulted in the destruction of the natural filter processes and the silting up of the Umfolozi River mouth and the St Lucia mouth. Since then, new channels have been dredged and many changes to the natural water flow have been made. In order to maintain the delicate ecological balance of the area, constant dredging is now required to keep the mouth of Lake St Lucia open. The reduced water flow in the system is no

longer able to force a natural opening. Vast plantations in the area have replaced the natural vegetation and soak up valuable fresh water, while large sugar cane farms cover huge tracts of land in the vicinity of the lake.

People are an integral part of the St Lucia area and have lived in the immediate vicinity of the lake for many years. The Zulu speaking people in the area are primarily subsistence farmers and are allowed access to some of the natural resources in the area. For instance, the harvesting of fish using gill nets and the cutting of ncema grass for sleeping mats is allowed.

### Tourism

The high biodiversity, wide range of ecosystems and the incredible beauty of St Lucia make it a very popular tourism destination. Bird watchers, anglers, nature lovers and those who just want to escape from the world are all catered for in St Lucia. The village of St Lucia provides a wide range of accommodation options, while KwaZulu-Natal Wildlife offers rustic accommodation at a number of sites around the lake, including Charters Creek, Fannies Island, False Bay Park and in the St Lucia village.

### Why conserve St Lucia?

St Lucia has been in the world spotlight because of a proposal to mine the dunes between St Lucia village and Cape Vidal in order to extract titanium from rich deposits. The wide-ranging public outcry that greeted this proposal led to a detailed investigation into the impact that mining the dunes would have on both the natural environment and the future of the area as a tourist destination. The Environmental Impact Assessment (EIA), one of the most detailed ever undertaken in South Africa, came to the conclusion that no mining should take place in St Lucia, as mining would cause unacceptable and irreversible damage. The panel also recommended that the area be developed for tourism. KwaZulu-Natal Wildlife and other stakeholders are currently working towards this goal.

Author: Judy Mann-Lang 2000

#### FURTHER INFORMATION:

- KwaZulu-Natal Wildlife (formerly KZN Nature Conservation Service) P.O. Box 13053, Cascades, Pietermaritzburg 3200. Tel: (0331) 845 1999
- Bruton, M.N. & Cooper, K.H. 1980. *Studies on the Ecology of Maputaland*. Wildlife Society Publication
- Mountain, A. 1990. *Paradise under Pressure*. Southern Book Publishers, Johannesburg.

#### RELATED FACTSHEETS:

- Marine Reserves • Maputaland Coastline • Sustainable Use of our Coastal Resources



# Langebaan Lagoon 1E

Unlike most lagoons, Langebaan does not owe its existence to a river flowing into the sea. Rather, it is the result of huge fluctuations in sea level over millions of years. When the sea retreated after covering large areas of low-lying land it left behind vast quantities of marine sands, which the wind shaped into dunes along the coast. During the most recent advance of the sea, about 6 500 years ago, the sea broke through the rocky headlands at the mouth of Saldanha Bay and flooded the area behind the massive dune which today comprises the Langebaan peninsula. Since about 200 AD, when the sea receded for the last time, this barrier has separated the calm waters of Langebaan Lagoon from the rough open sea.

Nevertheless, it is the sea that controls the environment of the 16-km lagoon, through the daily ebb and flow of the tides. At the northern end of the lagoon, tidal currents as strong as 1 m/sec flow in and out of Saldanha Bay, cutting deep channels and forming sub-tidal sandbars. Further south, narrow tidal channels and broad intertidal flats predominate, while at its extremity the lagoon peters out into salt marshes and a cluster of small pans.

## Ecology

It is the saltmarshes that make Langebaan Lagoon such a productive environment, as their plants represent the main primary producers of the system. Fed by nutrients imported into the lagoon from the west coast upwelling areas with each tide, they flourish, forming zonation patterns typical of saltmarshes everywhere. At Langebaan the eel grass *Zostera capensis* inhabits the fine substrates at the lowest levels, but is gradually replaced further up the shore by the cord grass *Spartina marina*. At the top of this zone, the glass wort *Sarcocornia perennis* co-occurs with the arrow grass *Triglochin bulbosa*. Above the high water mark is a mixed community of taller, shrubbier plants known as salt bushes.

Few animals feed on the saltmarsh plants directly. Instead, particles of dead plant matter and the bacteria responsible for its decomposition form a nutrient-rich "detrital soup" which is consumed by worms, snails, prawns, clams and a host of other invertebrates inhabiting the lagoon. In fact, more than 500 species of invertebrates occur in the lagoon and the adjacent Saldanha Bay, almost double the number found in any other lagoon in South Africa. This high diversity can be attributed to the absence of riverine inflow of freshwater, which means its organisms do not need to be adapted to the harsh conditions of widely fluctuating salinity that is typical of estuaries.

The lagoon does not support a diversity of fish species, possibly because the clear waters offer little protection from predators,



although gobies, klipfish, pipefish, skates, rays and small sharks are common. Sandsharks, which feed on small snails and crabs on the lagoon floor, are particularly abundant.

### Rich Birdlife

The lagoon's birdlife is richer than any other wetland in South Africa, with more than 200 species recorded from the area. Each summer about 30 000 waders, such as Curlew Sandpipers, Sanderlings and Knots, migrate here from their breeding grounds in Siberia and Greenland to feed on the small invertebrates of the mudflats. Flamingos are winter visitors to the lagoon, and can be seen in large flocks in the southern reaches. In addition, Saldanha Bay has four small rocky islands – Schaapen, Marcus, Malgas and Jutten – that provide roosting and nesting grounds for Black-backed gulls, African Black Oystercatchers, African Penguins, Cape Gannets, Crowned Cormorants and Swift Terns.

### Conservation

Due to its large colonies of migrating waders, Langebaan Lagoon has been classified as a wetland of international importance in terms of the Ramsar Convention. It is also the focal point of the West Coast National Park, which conserves the lagoon's sensitive ecosystems as well as the surrounding land. The park in turn forms the core area for the proposed West Coast Biosphere Reserve.

Exploitation of the lagoon's resources and recreational activity is controlled to allow various levels of use. The lagoon is divided into three management zones:

- Zone A: Multi-purpose recreational area (most watersports allowed and controlled exploitation of marine resources)
- Zone B: Limited recreational area (no power-boats or exploitation of marine resources allowed)
- Zone C: Wilderness area (closed to the public).

Recreational angling (boat and shore), shellfish-collecting (mussels) and bait-collecting (sandprawns) are the major types of exploitation, although there is also a licensed trek-net fishery in zone A.

The park's strandveld vegetation is characterised by low bushes, sedges and succulents, with many flowering annuals in spring. European Bee-eaters, Cape Weaver, Pied and Wattled Starlings, and Black Harriers are among the many birds that can be seen hunting amongst this vegetation, while reptiles such as snakes and tortoises are abundant. Steenbok are the most common naturally occurring antelope in the area, but there are also smaller numbers of grysbok and duiker, as well as mammalian predators such as mongoose, genet, lynx, jackals and bat-eared fox. The park offers environmental education courses for both scholars and adults at the historic Geelbek homestead.

The Postberg Nature Reserve is privately owned land that is included in the West Coast National Park on a contractual basis. It is only open to the public for a few months during spring, when spectacular flower displays

as well as re-introduced game species such as black wildebeest, bontebok and eland can be seen.

### Threats

The proximity of Saldanha Bay, a growing node of urban and industrial development, is a potential threat to the lagoon's sensitive ecosystems. Pollution sources include outfalls for stormwater discharge, sewage overflows and fish-factory effluent, while accidental oil spills have occasionally occurred during off-loading of imported crude oil supplies. There are fears that atmospheric fallout from air pollution caused by heavy industry would also contaminate the lagoon. Furthermore, Saldanha Bay has been earmarked as an Industrial Development Zone, which will result in more pollution sources and necessitate expansion of the port in the long term, increasing the risk of oil spills or other industrial accidents, making it essential to follow the Integrated Environmental Management (IEM) process for any potential new development in the area.



Curlew sandpiper

Author: Sue Matthews September 2000

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  - Siegfried, R. Ed. Saldanha Bay – Langebaan. Caltex
- Wannenburg, A 1984. *The Natural Wonder of Southern Africa*. C. Struik, Cape Town.
  - West Coast National Park, Tel: (02287) 2-2144/5 Fax: (02287) 2-2607

#### RELATED FACTSHEETS:

- Estuaries and Lagoons • Wetlands • Marine Protected Areas • Saltmarshes • Marine Fossils



# Orange/Gariep River Mouth 1E

**O**ne of the most unusual places in the whole of southern Africa is where the Orange River pours its muddy plume into the cold Atlantic Ocean. This mighty river mouth is an oasis on a desert coastline and its riverine reeds and trees contrast with the cryptic, desert plants that nestle in crevices, gleaning drops of moisture from the fogs. At this remote river mouth there are not one but two towns; Alexander Bay on the southern bank reflects its rugged history, while Oranjemund, to the north, is a young mining town built in 1936 and privately owned by the Consolidated Diamond Mining company. The narrow Oppenheimer bridge provides a tenuous link between these two towns, but freedom of movement is restricted because the Orange River is the international border between South Africa and Namibia and there is also strict security associated with their diamond mining activities.

## One of the world's major rivers

The Orange, recently renamed the Gariep, is one of the world's major rivers. It snakes its way across South Africa for 2173 km from its spring near Mont-aux-Sources in the Drakensberg on the eastern side of the continent to its mouth on the west coast at Alexander Bay. The vast catchment of the Gariep River drainage basin amounts to 891 780 km<sup>2</sup> and includes the Gariep, Vaal, Molopo and Fish River systems. It drains 45% of the total surface area of South Africa – from which most of the water comes. The Fish River in Namibia is essentially dry in its upper reaches but delivers vast quantities of sediment into the Gariep during rare flash floods. The Gariep River can be divided into the Upper Gariep above its confluence with the Vaal, the Middle Gariep between this confluence and the Augrabies Falls situated about 100 km downstream from Upington, and the Lower Gariep from the Falls to the ocean. The Lower Gariep is a popular haunt for river rafters where the river has carved a spectacular gorge through the Richtersveld. This wilderness experience includes dramatic arid landscapes of pink, granite mountains and dolomite hills which contrast with the riverine vegetation, sand spits and rippling water that polishes semi-precious pebbles.

Although the Gariep is the fourth largest river in Africa its mean annual runoff (MAR) of 11 km<sup>3</sup> per year is puny, when compared with other major rivers of the world. The Zambezi has three times, the Ziare 10 times and the mighty Amazon 600 times the MAR of the Gariep. The sediment discharge of the

Gariep River is high. Its turbidity ratio (obtained by dividing the mean annual sediment by the MAR) used to be second in the world after the Whang Ho in China. However, since 1884 twenty one major dams have been constructed in the catchment of the Gariep and have dramatically altered the flow of the river and reduced the turbidity ratio from 10 to 1.5.

## Spectacular Floods

The oldest record of an Gariep River flood is a vivid account by Burchell in 1882. He described the confluence of the Vaal and Gariep as 'a rapid and agitated tide of muddy water, swelled to a terrific height, overwhelming the trees on its bank, and thrown into waves by the force of its own impetuous current'. In 1840 according to Hottentot legend the river was in flood for 5 months. Big floods have occurred at about 10-15 year intervals and interspersed with these there have been years when the river has stopped flowing completely.

In March 1988 the Gariep River experienced a 1 in 100 to 200-year flood, which is the best-studied flood to date. This dramatic event was heralded by heavy rain in the upper catchment. Flooding occurred progressively along the Middle Gariep inundating many towns but, due to the gentle river gradient (apart from the Augrabies Falls), it took several days to reach the mouth. Residents at Alexander Bay, therefore, had time to use heavy earth moving machinery from the mines to implement emergency measures. The southern bank was reinforced and the sand spit across part of the mouth was weakened, assisting it to break through, thus preventing the water backing up behind it. Nevertheless a major channel was scoured beside the southern bank beneath the bridge and approximately 1 million tons of sediment was eroded from the right bank of the estuary. A muddy suspended load of an estimated 3.6 million tons of sand was deposited in a flood delta up to 1.2 km offshore and will probably take several years to be redistributed by the sea swell. Large tracts of wetland vegetation were destroyed either by erosion or the deposition of coarse sediment. Birds were the most severely affected component of the fauna. Many were unable to locate fish in the turbid waters and wading species were deprived of suitable foraging areas. The recovery of the river after floods is good because the biota of this river evolved under a regime of alternate flood and drought and the plants are able to slowly recolonize the banks and islands after a flood. The Orange does not have true estuarine communities as the sea hardly enters the river and there are few salt tolerant plants, sand prawns or bivalves that would normally be expected to dwell in the mud flats of estuaries.

The flow of the warm Gariep River into the cold Atlantic Ocean increased dramatically during the 1988 flood and its path in the ocean could be followed by satellite imagery.

Initially the fresh water flowed southwards in a narrow inshore plume for some 120 km. This resulted in mass mortalities of intertidal and shallow-water marine organisms such as limpets, mussels, urchins, red bait, rock lobsters and kelp. Later, when the south-easterly winds increased, the plume of fresh water flowed northwards up the coast.

### River of Diamonds

Over a 100 million years ago, when the Gariep River flooded, it carried more than water and sand. It transported a treasure trove of diamonds gathered by the ancient river network and eroded from volcanic pipes in areas such as Kimberley, Botswana and Lesotho. At one time the river ended in a great pan, but about 70 million years ago the Gariep burst through its banks, eroded a channel to the Atlantic Ocean and carried a great load of diamonds to be deposited in a huge submarine delta. Two million years ago the sea level dropped so that this ancient bed now lies buried several kilometres inland. At about this time a second pulse of diamonds reached the new delta of the Gariep. The diamonds were distributed northwards up the coast by long-shore currents and today form an ancient, fossilised beach-terrace along the coast.

The discovery of diamonds at Luderitz in 1908 triggered a diamond rush in this region, and very soon a spectacular concentration of gems had been found lying in the windswept valleys parallel to the sea. Twenty years later the first diamond was found at Alexander Bay and the raised beach deposits of the Gariep River region were to prove richer still. At present along the diamond coast the biggest fleet of privately-owned earth-moving equipment in the southern hemisphere works night and day to remove the sands that overlie the diamond-rich gravels. The process is simple, but involves moving 50 million tons of overburden a year to reveal the raised fossil beach deposits in which the gems lie. Along the shoreline massive sea-walls of sand are built to keep out the sea so that the enclosed paddocks can be pumped dry and the wealth of diamonds extracted from the more recent beds below sea level. Diamonds are also

sucked from the underwater seabed by divers operating near the shore, or from large boats off shore.

These gemstones from an ancient world have created enormous wealth, provided jobs and led to the establishment of the towns at the mouth of the Gariep. But one day, not too far in the future, they will be used up and the area will have to find other ways of providing income or these towns will become ghost towns like Kolmanskop near Luderitz.

### An unique succulent desert

When the diamonds are gone and humans step back to view the devastated landscape, perhaps we will learn to appreciate the burning desert, transformed by winter rains into an ephemeral carpet of flowers. For this Namaqualand hosts a living treasure of succulent plants and bulbs that seasonally burst into bloom. Desert geckos alternately lift their feet from the hot sand in a stylised dance. Beetles gather drops of moisture from the fogs. Elegant gemsbok can survive without drinking and have special blood circulation to keep the brain cool in high temperatures. This desert is an ancient one, which was dry, millions of years ago, when most of the world was covered with lush rainforests. It will continue long after the diamonds run out, and perhaps we will learn to use it for a different form of wealth-creation: ecotourism. Meanwhile the Gariep River will continue its cycle of flood and drought.

Author: Margo Branch 2000



#### FURTHER INFORMATION:

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#### RELATED FACTSHEETS:

- Estuaries and Lagoons • Wetlands • Salt Marshes • Management of Estuaries • Diamond Mining on the West Coast • Erosion and Siltation



# Islands around South Africa 1E

*There are only a few islands off the shore of South Africa. Of these Robben Island is the most accessible and well known and has been declared a World Heritage Site. Most of the other islands are protected as sanctuaries under the control of Cape Nature Conservation or the South African National Parks, and provide safe breeding sites for large colonies of birds as well as seals.*

## White Gold

Guano is the accumulated droppings of seabirds. Over thousands of years massive amounts of guano were deposited on islands off the coast of South Africa and Namibia: in some cases it was up to 15 m thick. Guano is highly prized as a fertilizer and in the 1840's hundreds of boats descended on the islands to scrape up the 'white gold'. At the peak of the guano rush some 600 ships anchored offshore while 4000 men excavated Ichaboe and the adjacent islands. In 18 months these islands were scraped bare; what had taken thousands of years to produce was gone in one mad rush with devastating effects on the birds due to disturbance, egg collection and loss of safe breeding sites. In 1867 the thirteen islands between Walvis Bay and the Orange River mouth were annexed to the Cape of Good Hope and later the Republic of South Africa. They were ceded to Namibia after independence.

## Robben Island

Robben Island, which lies about 11 km north of Cape Town, has become synonymous with the anti-apartheid struggle in South Africa. It was here that people like Nelson Mandela, Walter Sisulu, Govan Mbeki, Ahmed Kathrada, Robert Sobukwe and Neville Alexander, among many others, were imprisoned because of their opposition to apartheid. Although best known for its role as a political prison, the 574-ha island has, during the course of history, been used as a pantry, hospital and mental asylum. Today Robben Island is a national museum, cultural heritage site and a World Heritage Site, hosting over 250 000 visitors annually. The boat trip to the island affords unforgettable views of Cape Town with the backdrop of Table Mountain.

The natural vegetation on Robben Island is Strandveld, much of which has been disturbed by buildings and extensive plantations of shrubs and exotic trees that were originally planted to give shade to the lepers who were banished to the island in the late 1800s. Spectacular displays of wild flowers, typical of the west coast, can be seen on Robben Island. Two species of amphibians, eight lizards and geckos, three types of

snakes and one species of tortoise occur on the island. Small herds of bontebok, springbok, fallow deer and eland, as well as increasing numbers of ostriches live on Robben Island. The inter-tidal zone is typical of the south-western Cape region. A one-mile exclusion zone around the island protects species like abalone and rock lobster.

A total of 74 bird species has been recorded on the island. Of these 14 species are seabirds, 24 are waders or waterbirds and 36 are terrestrial birds. At least six exotic species, including Chukar Partridge, were introduced to the island. The African Penguin was abundant on the island in the 17th century but was eventually eliminated by human activities such as egg collecting. In 1983, after an absence of some 200 years, a pair of penguins bred on the island. Today this colony has grown to approximately 4 000 pairs and is the third largest African Penguin colony in South Africa. Robben Island is also an important breeding site for Crowned Cormorants, Hartlaub's Gulls and Swift Terns.



Hartlaub's gull

## Bird Island, Lambert's Bay

Bird Island is linked to the mainland by a causeway. The causeway forms part of the existing harbour wall and was originally constructed to assist with the collection of guano. Today Bird Island is a popular destination for birdwatchers and other ecotourists who visit the island to enjoy the antics of a large breeding colony of Cape Gannets. A fibreglass bird hide, which is equipped with one-way glass, allows visitors to observe the birds from close quarters. Bird Island is managed as a nature reserve by Cape Nature Conservation who have turned some of the derelict buildings on the harbour side of the island into a museum focusing on the fascinating history of guano collection.

## Dassen Island

The Portuguese named Dassen Island *Ilha Blanco* (white island) because of the thick layer of guano that once covered it. Later the island's name changed several times, but around 1656, one of Jan van Riebeeck's men, Syman Turvey, named it Dassen after the large populations of rock hyrax (dassies) which occurred there. Dassen Island is located 9 km offshore from Yzerfontein and is 222 ha in size.

About two-and-a-half million penguins are estimated to have inhabited Dassen Island at the time that Portuguese navigators first described it early in the 17th century. By 1930 this number had been reduced to approximately one million and today there are estimated to be 35 000-40 000 penguins on the island. Despite this dramatic drop in numbers, largely brought about by guano scraping, egg collecting, competition for food with the pelagic fishery and, latterly, oil pollution, Dassen Island remains

the principle home of the African Penguin. Dassen Island is also one of only two South African breeding sites for white pelicans. (The other is at Lake St Lucia in northern KwaZulu-Natal.)

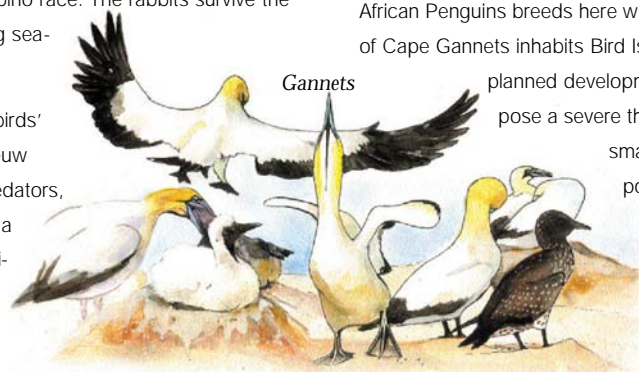
### The Saldanha Bay group

South African National Parks is responsible for the management of four islands in Saldanha Bay. These are Marcus Islands (17 ha), which is joined to the mainland by a causeway, Malgas (18 ha), Jutten (43 ha) and Schaapen Island (29 ha). Meeuw Island also forms part of this group but is managed by the South African National Defence Force because it falls within a military area.

Like most South African islands, this group provides an important home for Cape Gannets and other seabirds, many of which are endemic to the nearshore regions of South Africa and Namibia. For instance, approximately 30 percent of the world population of African Black Oystercatchers breed on these islands. The endangered Bank Cormorant – whose numbers have plummeted from 8 700 breeding pairs in 1980 to a current level of 4 900 pairs – also breed on these islands and the largest known colony of Kelp Gulls in southern Africa is found on Schaapen Island. Populations of African Penguins and Bank Cormorants have dropped dramatically on Malgas Island; it is believed that predation by a small number of seals may be the cause of this alarming decline.

Although historical records show that Cape fur seals once colonised the Saldanha Bay islands, they were eventually slaughtered or driven away. Today no indigenous mammals live on the islands, but European rabbits, which are thought to have been introduced in the days of Jan van Riebeeck, still abound on Schaapen and Jutten islands. Interestingly the rabbit population on Schaapen Island is an albino race. The rabbits survive the hot, dry summers by grazing seaweeds on the seashore.

Egg-eating snakes prey on birds' eggs on Schaapen and Meeuw islands. With few natural predators, these snakes grow to up to a metre long but have a significant impact on the breeding success of the seabirds.



Gannets

### Vondeling Island

Vondeling Island (9 ha) is situated on the seaward side of Langebaan Lagoon. The stone wall which surrounds Vondeling is characteristic of many South African islands. These walls were originally built to confine African Penguins to the coastal regions of the islands, which made egg collecting easier and assisted guano scrapers. Today a series of steps have been built into the walls to allow penguins access to the centre of the island.

Brown seal



### Dyer and Geyser Islands

These islands, situated near the small coastal town of Gans Bay, are notorious for the numbers of great white sharks that are attracted by the Cape Fur Seals that inhabit Geyser Island. In recent years the narrow channel that separates the islands has become something of a mecca for ecotourists who pay a premium to view the sharks underwater, from the safety of a steel cage.

The waters around the islands are a marine protected area, although commercial abalone divers are allowed to harvest a small quantity of abalone each year. Penguins and cormorants nest on the islands, as do endangered Roseate Terns. Dyer Island is the only known breeding site for Leach's Storm Petrel in the Southern Hemisphere.

### The Algoa Bay group

St Croix (16 ha) and Bird Island (11 ha) make up the Algoa Bay islands. St Croix is situated opposite the Coega River mouth, close to the city of Port Elizabeth and Bird Island is located on the east side of Algoa Bay. Both islands are important breeding sites for seabirds: sixty percent of the world population of African Penguins breeds here while the world's largest colony of Cape Gannets inhabits Bird Island. Some of the currently

planned development on the mainland may pose a severe threat to the islands: even a small oil spill in Algoa Bay has the potential to devastate these seabird colonies.

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• Cape Nature Conservation, Private Bag X9086, Cape Town 8000. Tel: 483-3911 Fax: (021) 483-3500

**RELATED FACTSHEETS:** • Guano • Penguins • Gannets • Birds and Oil Spills • Cormorants • Gulls • Islands of the Subantarctic • Coega Industrial Development.



# Islands of the Sub-Antarctic 1E

**M**arion Island and Prince Edward Island are small, remote and inaccessible islands located approximately 2000 km south of Cape Town, halfway to Antarctica and in the middle of the Southern Ocean. They were annexed by South Africa in 1947. Both islands are volcanic in origin and rise sharply from the sea; essentially they are pinnacles of volcanoes of the undersea Atlantic-Indian Ridge where the seafloor is spreading. The islands are managed by the Department of Environmental Affairs and Tourism and the preservation of their biological diversity is given high priority. A research and weather station is maintained on Marion Island. Together the islands offer a rare opportunity for studying ecological processes and monitoring bio-diversity. Gough Island is another remote weather station on the Atlantic-Indian ridge but lies north of the sub-Antarctic zone.

## MARION ISLAND AND THE PRINCE EDWARD ISLANDS (46° 38'S and 37° 59'E)

Marion Island is 24 km long and the larger of the two islands. It rises 1 186 m above sea level and, like Prince Edward Island, has a rugged and uneven coastline. The foothills of both islands are covered by soft, spongy vegetation, which, together with the high rainfall, creates swampy conditions. The weather is generally cold, cloudy and windy. The average annual temperature is about 5°C but temperatures as low as -6°C occur frequently and there is only about 29% sunshine per year. The annual rainfall is 2 500 mm spread fairly evenly throughout the year. There are frequent gales on Marion



Elephant seal

Skua

Island, which lies in the 'roaring forties' latitudes. The mean wind speed is about 60% higher than that of Cape Town.

## Mammals and birds

In spring breeding elephant seals flop onto the beaches of Marion Island. The bulls, three tonne monsters full of fat, roar challenges through their bulbous noses. The cows gather in crowded harems where the pups are born amid the bedlam and are added to the pile of bloated, snuffling bodies. In summer the seals return to the islands to moult but from May to August they feed at sea. Elephant seal cows mate at an early age and reproduce at the maximum rate and yet the population at Marion Island is declining at about 4% per annum because the life-span is too short to maintain the population. Studies on the local and long-range movements of the seals and their behaviour at sea together with knowledge of their prey movements may provide answers to this decline. Cows fitted with time-depth recorders have been shown to dive as deep as 1 444 m and stay down for 113 min but the average is about 500 m for 20-30 min and depends on the locality and prey.

Sub-Antarctic fur seals are smaller and more agile. They haul out on the rugged, exposed west coast of the islands where, cooled by the chilling gales, they pup in caves and crevasses. These fur seals have a pale golden chest and the male has a crest of long hairs on top of the head. In the 1840's fur seals were slaughtered in their thousands for their pelts while elephant seals were rendered down for their oil.

Killer whales patrol around the islands where they prey on seals, penguins and fish.

Hundreds of thousands of penguins, including King, Rock-hopper, Macaroni and Gentoo Penguins, breed in colonies at various sites on the island. Albatrosses circle the globe on the west winds and only touch down on these tiny islands to breed. During summer Yellow-nosed, Wandering, Sooty and Grey-headed Albatrosses may be seen nesting on Marion Island and other seabirds, such as Kelp Gulls and Sub-Antarctic Skuas frequent the islands. Thirteen species of seabirds that nest in burrows return to the islands during darkness to avoid



King Penguin

predation from Skuas and Gulls. Most of these burrowers are sooty-grey and blend with the black, volcanic terrain. The most common are Salvin's Prion, which lays eggs in late November, and the Grey-winged Petrel, an autumn-winter breeder.

### Introduced cats and mice

The house mouse, *Mus musculus*, has been present at Marion Island since the early 19th century. Four kittens, introduced in 1949 to control the mice, bred rapidly to generate a population of 2 000 by 1980. These feral cats wreaked havoc on the birds which nest on the ground, killing an estimated 600 000 birds per year. In a concerted drive during the 1980's hunters, working at night over very difficult terrain, eventually eliminated these wily cats. This highlights the enormous problems caused when predators are introduced to islands.

### Marine research

A number of offshore scientific expeditions have recorded the marine life around Marion and Prince Edward Islands, these included the British *Challenger* Expedition of 1873, the *Discovery* Expedition of 1935 and the French *Marion-Dufresne* voyage in 1976. South African research began with land-based intertidal and shallow water surveys in 1967 and 1976. During the 1980's the University of Cape Town extended the research offshore with a quantitative SCUBA-diving survey and a grid of dredging and photographic surveys carried out from the *SA Agulhas* between 30 and 700 m depths. Divers were amazed at the richness of the underwater life, and recorded over 200 species. Mauve sponges, pink anemones, crustaceans, molluscs, marine worms and starfish provide food for fish, birds and mammals at the fringe the rocky island, amid the swirling fronds of large brown seaweeds which subdue the surf. The kelp *Macrocystis laevis* forms dense beds below 5 m depths and *Durvillei antarctica* and *Desmarestia rossi* dominate at 3-6 m depths. Understorey red algae decrease with depth and coralline algae encrust shallow areas.

The dredging surveys recorded over 540 macrofaunal species, a diverse colonisation for such geologically young and isolated islands. Deep, rocky substrata were dominated by sponges, bryozoans and octocorals while the soft substrata were dominated by polychaetes, bivalves and brachiopods. Mobile crustaceans and echinoderms were important in shallower

habitats. There were many large and interesting starfish while the molluscs were predominantly white and quite small. Filter-feeders dominated in all habitats. The material from these surveys provides a valuable reference collection that is housed in the South African Museum in Cape Town. The results are reported in the South African Journal of Antarctic Research.

### Plankton Research

Several studies around Marion Island have focussed on the richness of plankton and nutrients in the water. Birds transport nutrients from sea to land and ultimately back again. At the end of summer the surface nesting birds have contributed 32 000 tons of guano and about 1 000 tons of feathers, dead birds and eggs, and these figures do not include the burrowing, night-flying birds. Guano fertilises the land plants and after rain the runoff returns minerals to the sea, enriching inshore waters.

### Patagonian toothfish

The management of the longline fishery for Patagonian toothfish, *Dissostichus eleginoides*, is particularly important in the vicinity of the Marion and Prince Edward Islands. Data collection, by integrated monitoring using scientific observers and satellite tracking, is used by the Commission of Conservation of Antarctic Marine Living Resources (CCAMLR) for setting catch-limits for this large and valuable fish in the Southern Ocean region as a whole. However, both the national and CCAMLR toothfish fisheries continue to suffer from high levels of illegal, unregulated and unreported fishing and the catch per unit effort around the Prince Edwards Islands has dropped dramatically since 1997.

### Gough Island – A South African weather station

Gough Island (40° 21'S and 09° 53'W) lies 2 600 km south-west of Cape Town. It is a British possession, forming part of the Dependency of Tristan da Cunha. It is uninhabited, save for a meteorological station that is operated by six South Africans. The site of the meteorological station, at Transvaal Bay on the southeastern tip of the island, is leased as part of an agreement between South Africa and the United Kingdom. Gough Island was granted World Heritage Site status in 1996.

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- FURTHER INFORMATION:** • South African National Antarctic Programme (SANAP), Directorate: Antarctica and Islands, Department of Environment Affairs and Tourism, Private Bag X447, Pretoria 0001.  
• South African Journal of Antarctic Research, Department of Environment Affairs and Tourism, Private bag X447, Pretoria.  
• South African Museum, P.O. Box 61, Cape Town 8000, Tel. (021) 243 330.

**RELATED FACTSHEETS:** • Guano • Gulls • Islands off South Africa • Albatrosses • Seals • Ocean Currents • Weather and the Ocean

