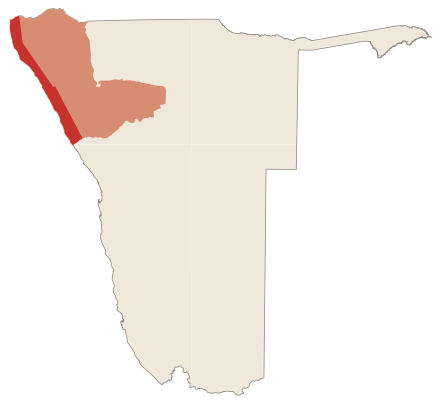
The coast of Kunene and the Skeleton Coast Park

Namibia's Coast

Introduction



Namibia's coastline falls within four political regions: Kunene, Erongo, Hardap and Karas. This booklet covers the coastal area of the Kunene Region which also comprises all of the Skeleton Coast Park.

Few areas in Namibia are as bleak, forbidding and thinly populated as coastal Kunene. But not many other places also offer an environment that is so pristine and spectacular. This is a harsh, but magnificent part of Namibia.

The Kunene coast has undoubtedly been occupied sporadically by humans in various places for a very long time, perhaps hundreds of thousands of years. People were attracted to the rich supplies of food from the sea and the ephemeral rivers. The dry conditions meant that the human population was always small. Fresh water for both people and livestock was hard to find, grazing usually in short supply and crops difficult to grow. These conditions made the coast inhospitable to most people, leaving its environment largely unspoilt. However, the threat of environmental impacts is growing as people increasingly seek mineral wealth along the coast.

Coastlines are the narrow interface between the Earth's three great realms – the land, the atmosphere and the oceans. This is the zone where diversity of life is often concentrated, with some organisms from the sea, other species from the land, and those that occur only in the thin inter-tidal strip itself. Processes operating in one domain affect the other. For example, the ocean temperature affects that on land, while the land provides nutrients to the oceans. Conditions along coasts are also influenced by tidal changes and particularly by weather, such as the wind, waves and currents driven by atmospheric circulation.

The Skeleton Coast Park occupies the entire coastal portion of the Kunene Region, stretching some 500 kilometres and covering 17,450 square kilometres between the ephemeral Ugab River in the south and the perennial Kunene River in the north. The Park is characterised by extreme aridity, frequent fog and southerly winds. Offshore, the cold Benguela Current and its associated upwelling system is rich in nutrients and makes for cool conditions on the coast. Most of the coastline consists of sandy beaches and rocky headlands with salt pans and gravel plains inshore. Several ephemeral rivers cut across the desert, sometimes bringing life-giving fresh water to the coast. The mouth of the Kunene River is an important habitat for a wide variety of birds, fish, turtles and other wildlife.

The area between the Hoanib River and the Kunene River was first established as the Skeleton Coast Park in 1971, and then expanded to its present size when the stretch between the Hoanib River and the Ugab River was added in 1973. The entire eastern

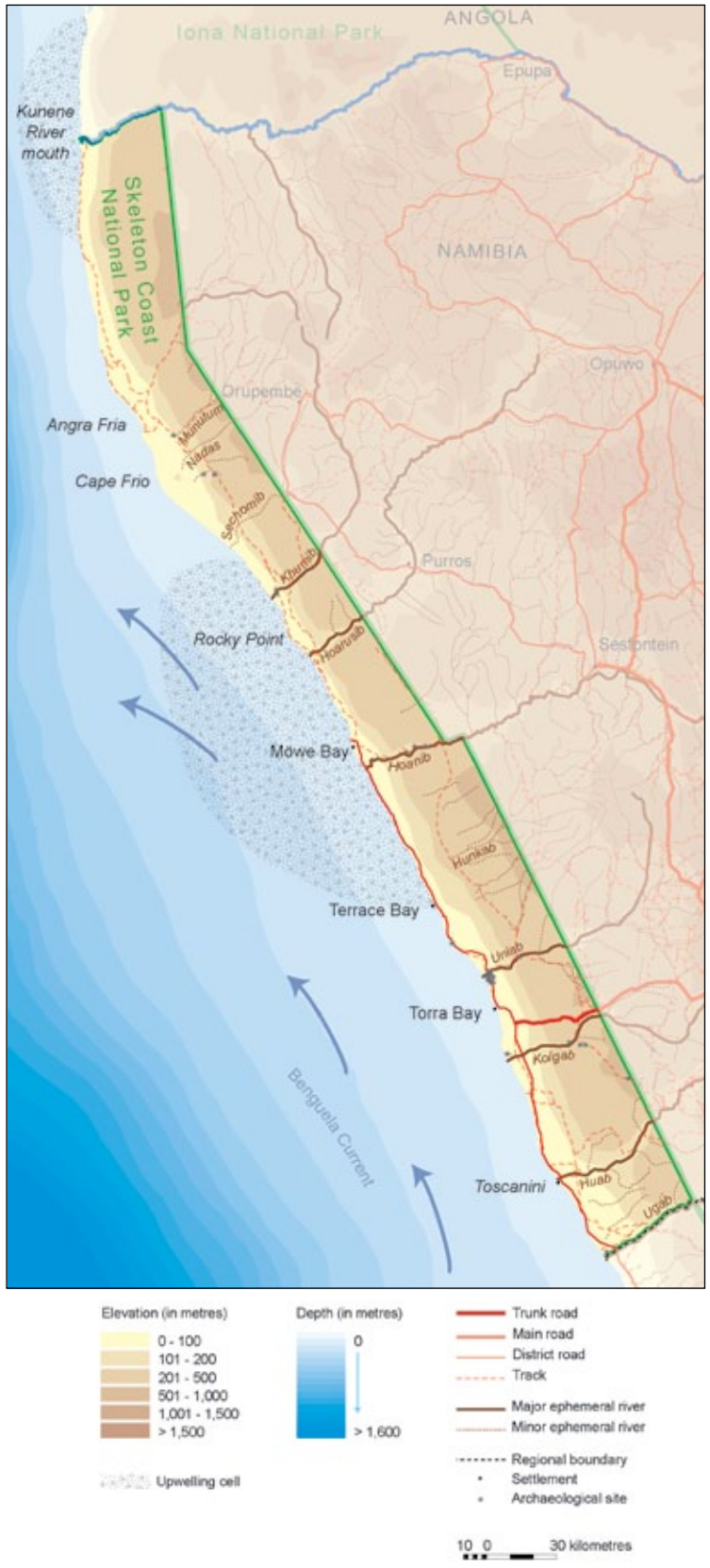


Figure 1. The coastal zone of Kunene Region. The arrows show the direction of flow of the Benguela Current.

border of the Park, which is between 25 and 50 kilometres from the coast, now adjoins eight communal conservancies and one tourism concession area. The Park also lies adjacent to the Iona National Park in Angola and the newly-proclaimed Dorob National Park to the south. Only a few hundred people live in the Skeleton Coast Park as well as in the very arid areas immediately to its east.

The Climate

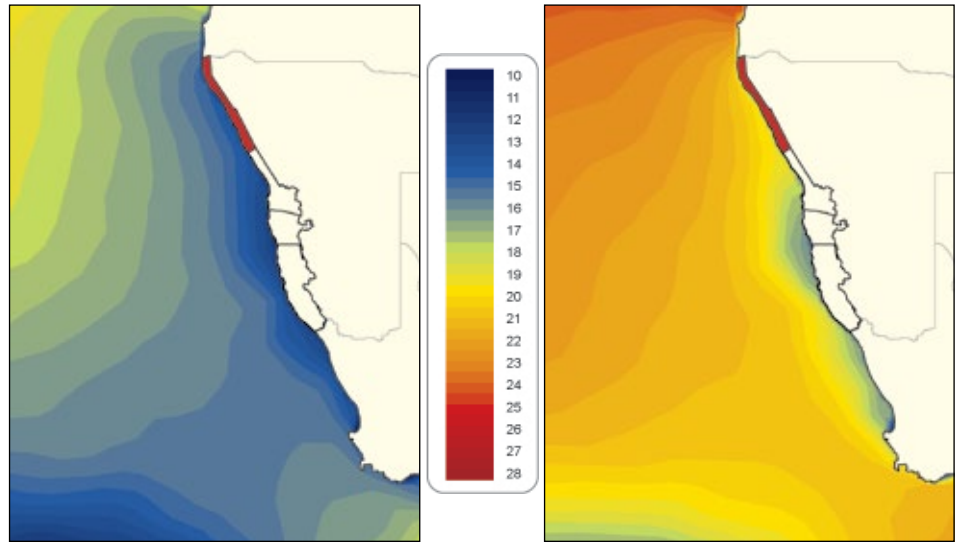


Figure 2. Average temperatures (ºCelsius) of the sea surface over the past 20 years in August (left) and February (right). The upwelling of deeper colder water is evident from the low temperatures close to the coast.

The climate of Kunene's coast is strongly influenced by the Benguela Current which carries cold water from the Southern Ocean all the way up to near the Kunene River mouth. Here the cold current meets the warm waters of the southerly Angola Current forming what is known as the Angola-Benguela Front.

Low sea surface temperatures – ranging from monthly averages of 13 to 18ºCelsius – keep the air above the sea cool and dense (Figure 2). Winds along the coast are predominantly from the south, having been generated by the South Atlantic high pressure cell far to the south-west of Namibia. The cool, relatively dry air usually cannot rise high enough over the coast to form proper rain clouds, and so moisture normally condenses only into fog and low clouds. Fog occurs between 75 and 100 days each year (Figure 3), and is most prevalent during mornings and evenings. The Kunene coast receives an average of some 5 to 6 hours of sun per day.

The strong prevailing southerly winds (Figure 3) combined with the effects of the Coriolis Force cause surface waters to be deflected away from the shore. Cold water from deeper layers then moves upwards to replace the surface water. These circular upward

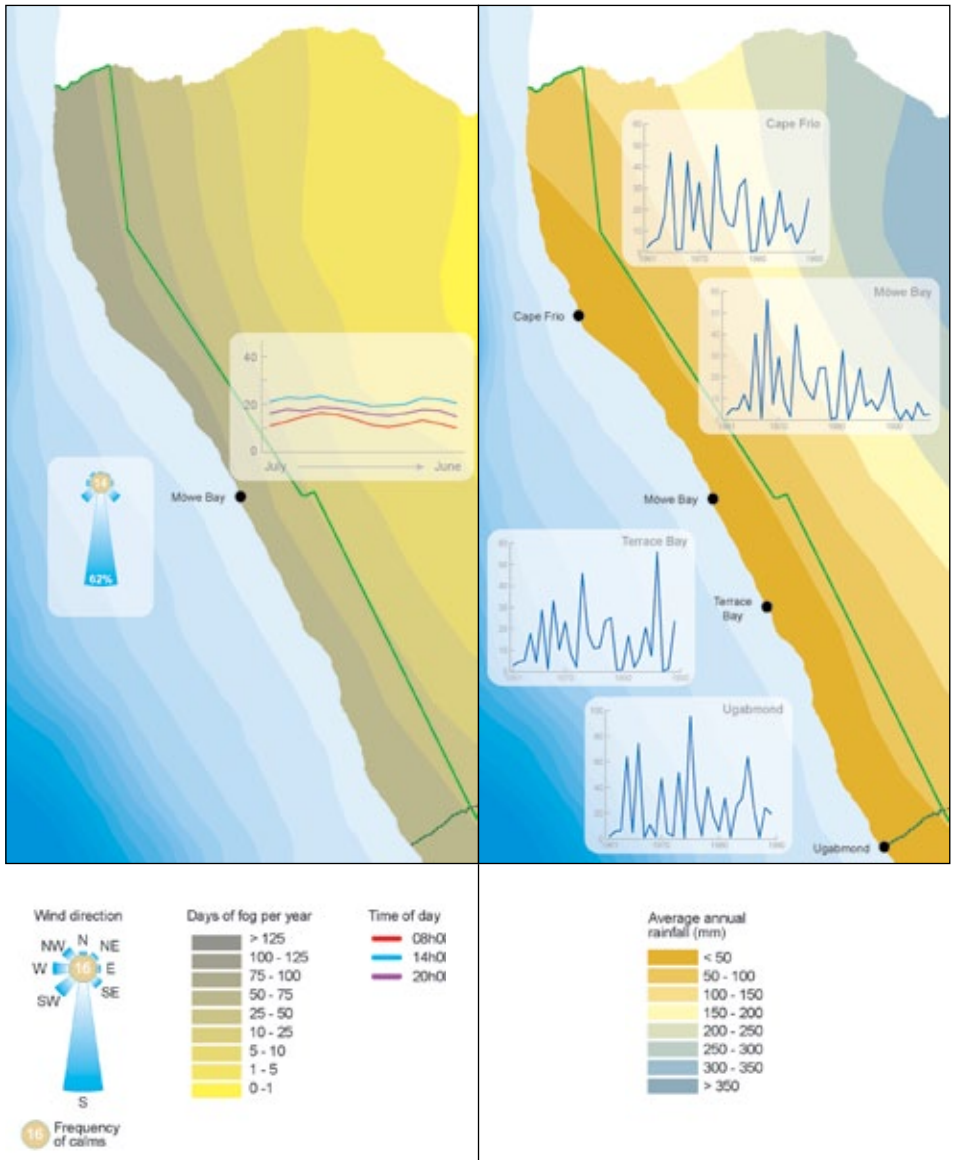


Figure 3. The map shows the average number of days on which fog occurs, while the graph is of average wind speed throughout the year. At Möwe Bay almost two-thirds (62.5%) of all wind is from the south, and calms are recorded only 14% of the time.

Figure 4. Average annual rainfall and the total recorded each season at four places along the Kunene coast. Note how greatly the totals vary from year to year.

movements are known as upwellings which draw nutrient-rich water from the depths of the ocean up to the sunlit surface. There are two major upwelling cells along the Kunene coast, one near the Kunene River mouth and another in the area off Möwe Bay (see Figure 1). These cells and others further south along the Namibian coast are key to the high productivity of Namibia's coastal waters.

Cool dry air from the South Atlantic anti-cyclone prevails over the Kunene coast for much of the year. However, the dominating effects of the anti-cyclonic cell weaken when it shifts south during summer, and tropical moist air from the east and north may then reach down to the coast, bringing rare showers of rain which are usually light. The coastline gets an average of less than 20 millimetres of rain each year. While precipitation generally increases to the east, rainfall in Kunene is highly variable everywhere (Figure 4).

Temperatures along the coast are lower and less variable than those inland (Figure 5). Interestingly, the highest maximum temperatures are measured in winter when berg or east winds blow. Temperatures then can reach 44ºCelsius. The winds are driven by the Botswana anti-cyclone which is situated over the interior of southern Africa in winter. The dry air heats up as it drops down from the higher interior and moves out over the coastal plains, and sometimes blows great quantities of sand into the Atlantic, as shown in the image above right.

Figure 5. Average daily temperatures range between 14ºCelsius in the coolest month (August) and 19ºCelsius in the warmest month (February). The graph shows maximum (red line), average (orange) and minimum (blue line) temperatures recorded each month at the Möwe Bay weather station.

Landscapes and shapes of the Kunene Coast

The north-south orientation of the Kunene coastline has its origins in the break-up of the Gondwana continent around 132 million years ago when part of this ancient landmass divided along a north-south line into what became Africa and South America. Since then, oceanographic and terrestrial processes have shaped the details of the shoreline we see today.

However, shorelines shift as sea levels rise and fall, and the present coastline has been in place only for a relatively short period. For example, sea levels were about 120 metres lower as recently as about 12,000 years ago. This was towards the end of the last ice age when large amounts of sea water were stored in polar ice caps, and the land area of what was to become Namibia was consequently much larger. In fact, the coastline probably extended another 30 – 50 kilometres westward. The most recent episode of sea level rise occurred about 2,000 years ago when the beach was about 5 – 6 metres higher than it is now.

There are no major indentations along the Kunene coast. Much of the shore consists of sand, gravel and pebble beaches with rocky headlands, some of which have small, sheltered bays on their northern side (Figure 6). Inland of the beaches are salt pans, dune fields and rocky surfaces from which sand has been scoured away by wind. The only perennial river is the Kunene. Several ephemeral rivers occasionally bring water, sediment and nutrients to the coast. This is usually during the late summer months of February and March after very heavy falls of rain in the inland catchments of the rivers. Underground reservoirs in these rivers are important sources of water for wildlife along the coast. The lower reaches of these rivers are remarkably straight, the only exception being the Uniab where the lower river splits into at least nine distributary channels to form a small delta just inland of the shore.

Sediments are transported up along the coast by the north-flowing currents. Strong winds drive the waves (and sand and pebbles) obliquely onto the shore, and in that way sediment carried down the rivers during floods is later driven back onshore north of the river mouths. Once onshore, the sand is shaped into dunes. Crescent-shaped barchan dunes are the first to develop when the supply of sand is limited, while transverse dunes form where there is more sand. Hummock dunes develop around obstacles such as vegetation or rocks. The influence of tides on the Kunene coast is small since the tidal range is a modest 1.4 metres between its lowest and highest levels.

The bedrock along most of the shoreline alternates between metamorphosed sediments and granites that have intruded into the sediments. Some glacial valleys are present, for example the Engo Valley, and were formed during an ice age some 300 million years ago (Figure 6). Extensive layers of volcanic basalts were deposited during eruptions that accompanied the break up of Gondwana; these are the Rocky Basaltic Areas in Figure 6. Remnants of marine sediments from times when sea levels were higher occur as terraces which form low sea cliffs in some places.

Several springs bring life-giving water to the coastal regions and allow large mammals to move further west than they otherwise could. Most springs are from seepage in the ephemeral rivers, but there are some springs formed by water being forced to the surface along faults in the underlying rock formations.

An exceptional geomorphological event occurred in 1995 after a large storm dumped at least 60 millimetres of rain on the catchment of the Hunkab River on the 2nd of April. This downpour followed several weeks of rain which had helped saturate the ground. People driving from Möwe Bay the following morning discovered that the road along the coast had been washed away by the Hunkab. Flowing rivers are not uncommon after heavy rain in the Namib but what made this so unusual is that this river had to breach 15 kilometres of dunes to reach the sea. The river soon formed a small delta, but this was removed by wave action and wind within a week. Subsequent floods, such as the one in 2000, have had an easier route through to the sea. With time the dunes will probably block the river course again.

The relatively few small ephemeral fountains and springs along the coast are critically important for species of wildlife that depend on water. Each source of water thus sustains wildlife that live in a large surrounding area. Over-use for farming or other purposes can cause the water sources to dry up.

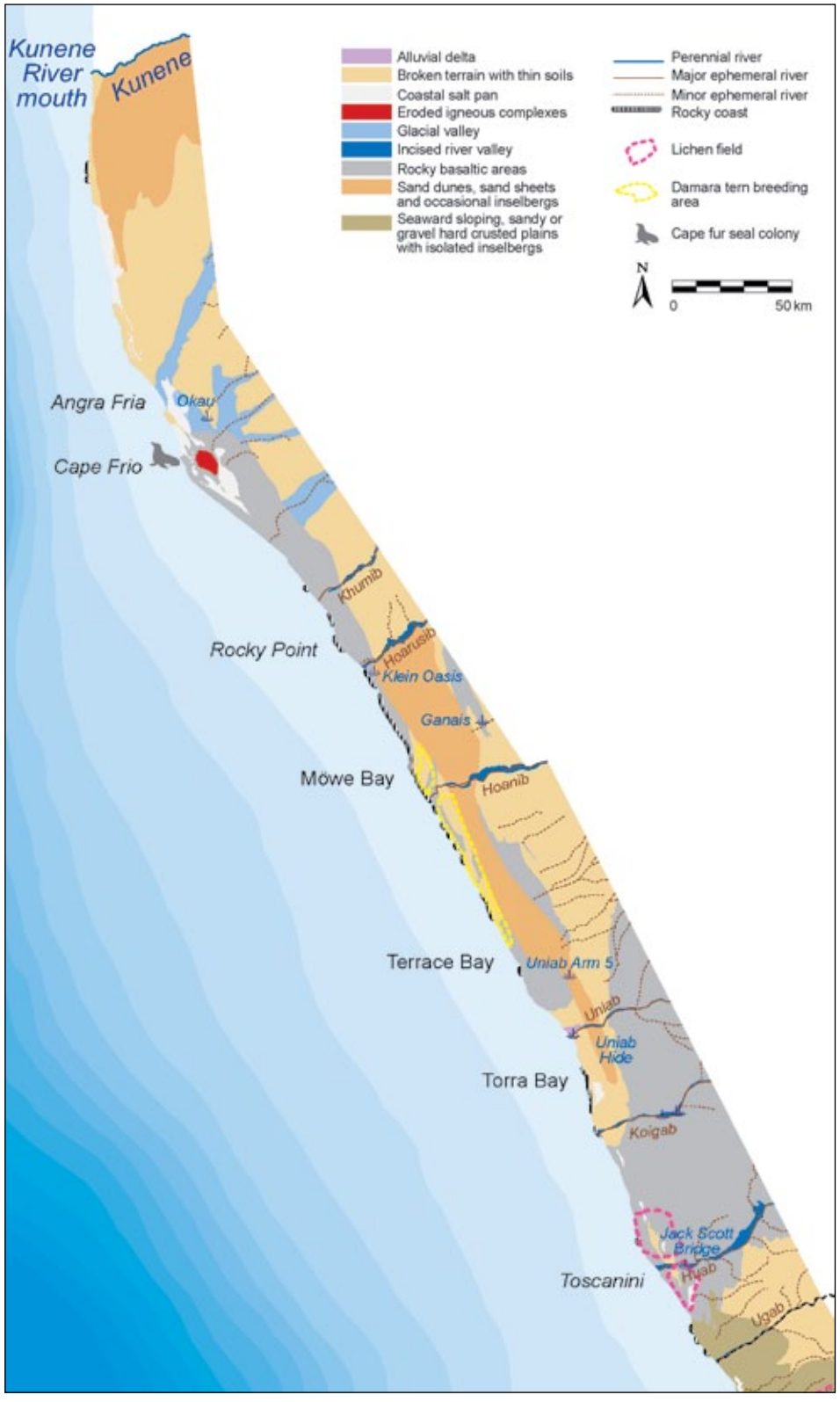


Figure 6. Important habitats, geomorphological features and sites of special interest along the Kunene coast and in the Skeleton Coast Park.

Life on the coast

Many of the plants and animals found along the Kunene coast are unusual, and some of them are rare or endangered. Certain species are endemic to the area, occurring only or predominantly here and not in other parts of the world. High concentrations of migratory shorebirds and seabirds congregate in some places along the coast. The Kunene coast is therefore an important refuge for all these species. The major habitats that support living organisms are shown in Figure 6 and described below in three categories: terrestrial, riverine and marine.

Terrestrial habitats

Kunene's coast falls entirely within the Namib Desert Biome where very sparse grasslands predominate. The following areas deserve special attention for their conservation value:

- Breeding areas for Damara terns. These small, elegant terns are endemic to the south-western and south coast of Africa, and are listed as a Red Data species, which means that their conservation is a national priority.

- The dunefields are the major habitat of a wide range of invertebrate and vertebrate species. Some of these are found only in the Skeleton Coast Park whilst others are endemic to the Namib.

- The gravel plains are fragile habitats that are easily damaged by vehicle and other surface disturbances. Their functioning is strongly influenced by fog.

- Dune hummocks support a variety of salt-tolerant plants such as *Salsola* and *Zygophyllum*. They extend along the coastline and provide an important habitat for many species of wildlife.

- Lichens are important pioneers that colonise bare desert habitats. These composite organisms, consisting of both fungus and algae, grow extremely slowly and depend on moisture from coastal fog. About 100 species occur in the Skeleton Coast Park, most of which are endemic. They form tiny habitats for other flora and fauna and are an important food source for beetles and a range of animals from gerbils to springbok. Lichens also stabilise the soil, this reducing wind and water erosion. They are highly vulnerable to damage from off-road driving and mining.

Other features having high conservation value are scattered along the coast. These include rare mammals such as Lions and Brown Hyaenas and various endemic birds. A few endemic Red Data plant species occur in the Park, including *Aloe dewinteri*, typically found on dolomite and granite koppies and cliffs; *Lithops ruschiorum*, a dwarf succulent occurring in shallow soil, sand, gravel and pebbles in rock desert; and *Adenia pechuelii*, a woody perennial plant that grows on rocky slopes and gorges.

Riverine habitats

Most of the rivers that cut down towards the coast are ephemeral (see Figure 1). Their occasional flows are usually short-lived, lasting a day or less, but rare, lasting flows over several weeks can follow repeated rainfall events in their catchments. Many of the smaller ephemeral rivers seldom, if ever reach the coast.

Environmentally, the ephemeral rivers are of very high value in creating linear oases in this arid landscape. Trees along the rivers provide shade, forage and places to rest, nest and hide. Water for drinking, bathing and cooling is available in pools that are scattered along the lengths of the rivers, allowing animals to live in areas that would otherwise be completely inhospitable to them. For example, Elephants, Kudu and Lions can extend their ranges down into the Skeleton Coast Park and to the coast. Many of these animals traverse the coastal zone seasonally, their movements taking them up and down the river courses.

left: The Uniab River and its small delta just inland of the shore.

below: Elephants spend much of their time in riverine woodland, but also trek from one river to the next.

Covering some 500 hectares, the Kunene River mouth is of great significance for its wilderness and conservation value. Sandbars to the north and south of the mouth create a small lagoon where the water can be up to 10ºCelsius warmer than the sea. The Kunene River Mouth has been proposed as a Ramsar Site, which is a wetland area recognised to be of international importance. This recognition should be accorded when Angola becomes a signatory to the Ramsar Convention. On average, some 5.5 cubic kilometres of water flow down the Kunene each year. Reductions in flow, for example caused by damming, irrigation and bulk water abstraction, may change the ecological nature and value of the river mouth.

The following noteworthy species and groups of species occur at the Kunene River mouth:

Birds	At least 81 species of wetland birds including: African Black Oystercatcher, Lesser Flamingo, Damara Tern, White Pelican, Greater Flamingo, Chestnut-banded Plover, Swift Tern and Caspian Tern
Reptiles	Nile Soft-shelled Terrapin, Green Turtle, Nile Crocodile and Nile Monitor
Fish	69 freshwater fish species occur in the lower Kunene, including five that are endemic to the river
Crustaceans	Nine species including a large freshwater prawn
Mammals	Brown Hyaena, Oryx and Springbok
Molluscs	15 species, including an edible freshwater mollusc found nowhere else in Namibia
Amphibians	11 species, two of which are endemic to the river

Marine environment

Namibia's oceanic environment supports one of the greatest concentrations of marine life in the world. This includes large populations of commercially valuable fish which are one of Namibia's most important renewable natural resources. The wealth of life is due to extremely high rates of primary production as a consequence of upwelling caused by the Benguela Current (see Figure 1).

Great numbers of tiny plants known as phytoplankton use the nutrients to grow and multiply, and they, in turn, provide food for small animals called zooplankton. Further bouts of production occur as the zooplankton provide enormous supplies of food for other, larger consumers up the food chain, such as fish, whales and dolphins, seabirds, seals and, of course, humans by way of the commercial fishing industry.

Much of the production and wealth of life is far offshore where fishing boats ply the waters to catch hundreds of tonnes of fish each year (Figure 7). However, the inshore marine environment, which includes the inter-tidal and sub-tidal zones, is crucial to fish breeding and shellfish populations.

While maritime conditions along Namibia's northern coast are usually dominated by the cold, north-flowing Benguela Current, there are frequent influxes of warm tropical water from the Angola Current. Much of the coast of the Kunene Region is therefore a transition zone which supports a mix of cold water species from the south and tropical species from the north.

The rocky shores and sandy beaches support relatively few animal species. For example, the rocky shores at Rocky Point are home to 85 species of invertebrates, plus six species of intertidal fish. Sandy beaches such as those at Bosluisbaai, Hoarusib and Toscanini support only about 30 species, which are predominantly insects and arachnids associated with washed up kelp. Other animals include nematodes, flat worms, amphipod crustaceans and ghost crabs on the sandy beaches.

Seals are important marine predators. A sizeable mainland colony of up to 100,000 seals is found at Cape Frio. There are colonies at Palgrave Point, Möwe Bay and in several other locations along the Kunene coast. Hyaenas and jackals are important coastal scavengers and are often seen scavenging at the seal colonies.

Of eleven species in the world, eight species of baleen whales occur along Namibia's coast. While some are resident, most are seasonal migrants that spend summer in the Antarctic and winter in West African waters. Twenty-three species of dolphins and toothed whales have been recorded along the coast. Five of the eight species of marine turtles in the world occur here, though they do not come ashore to lay eggs.

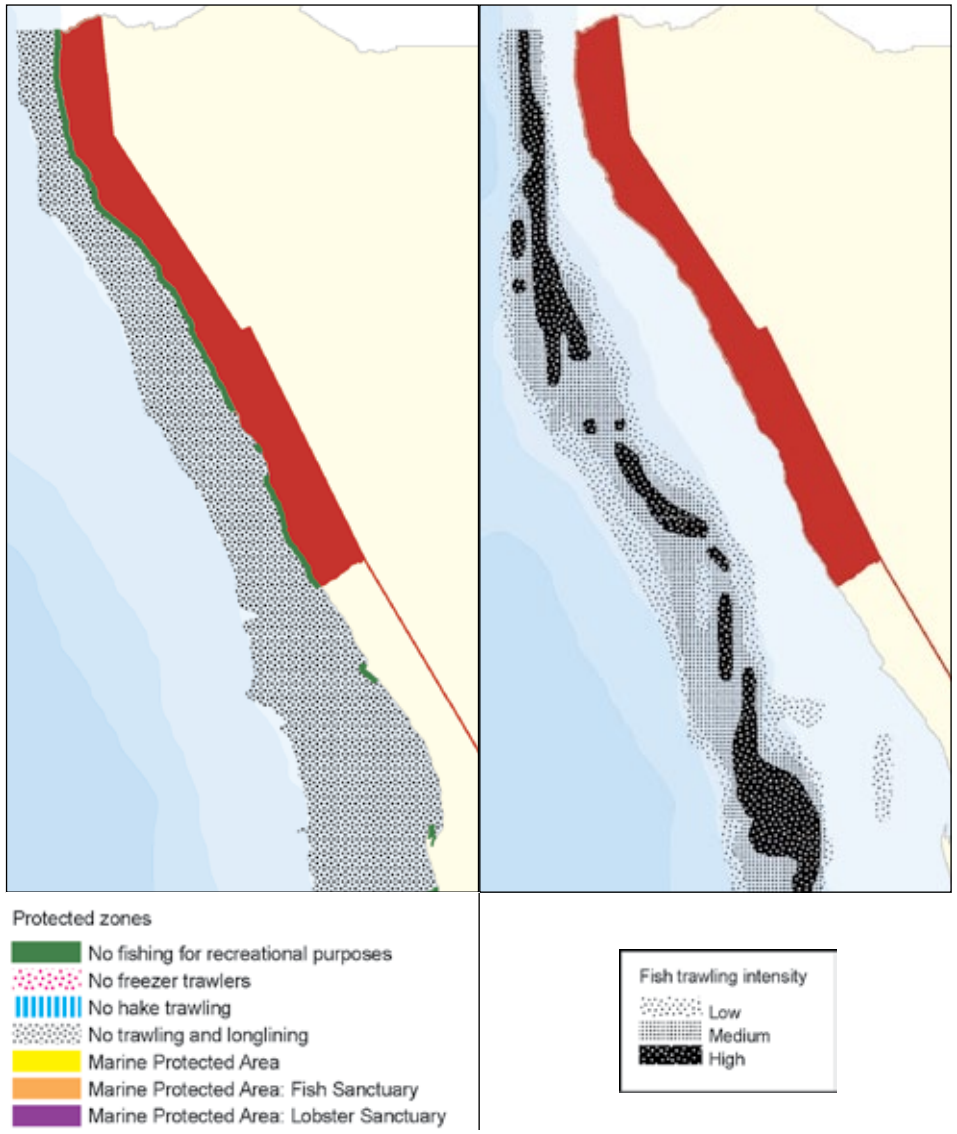


Figure 7: Fishing areas and protected zones off the Namibian coast.

People and land uses

The presence of archaeological sites scattered along the coast shows that the Kunene coast has a long history of human occupation. Particularly noteworthy sites are the whalebone houses at Ugab Mouth (the only Namibian example of these) and the stone circles at Cape Frio. Stone circles are found along the coast and there are undoubtedly many more archaeological sites still to be discovered

Evidence found at certain sites indicates that people used the eastern area of the Park between the Hoarusib and Khumib rivers during the Early Stone Age (1.8 million – 75,000 years ago). Artefacts found at other sites show the area in the east between the Nadas and Sechomib rivers to have been used during the Middle Stone Age (75,000 to 10,000 years ago). Stone Age people are most likely to have been nomadic, moving from one water source or good hunting area to another. Although evidence of nomadic pastoralism has not been found, this kind of livestock farming was widespread over hundreds of years in the central Namib and must have been an important economic activity in the Skeleton Coast Park.

More recently, the Namibian coast served as a contact point with the rest of world when early explorers first encountered coastal inhabitants at Walvis Bay and Lüderitz. However, many seafarers met their untimely end when their ships were wrecked, giving the Skeleton Coast its name. The Kunene coast has also seen successions of diamond and other mineral prospectors come and go.

Infrastructure: There is currently little development in the Park, which is managed by the Ministry of Environment & Tourism. Some infrastructure to support management and limited tourism is at Möwe Bay, Ugabmund, Torra Bay and Terrace Bay. Buildings and equipment from mining ventures, many of them abandoned, are to be found at various places, especially in and around Toscanini. Typically, fewer than several hundred people live in the Park. The main gravel roads link Ugabmund with Terrace Bay, and Torra Bay to the Springbokwasser gate inland and on to Khorixas (see Figure 8).

Mining: A wide range of minerals have been found at varying levels of commercial viability along the coast, and, despite being a protected park, the entire area has been licensed for exploration. Currently the only active mine is the Sarusas amethyst mine; most other mining activities have not lasted or have proved to be not economically viable. However, many of the operations have left scars since they were undertaken without environmental safeguards or consideration of the sensitive desert landscapes.

Tourism: The only tourism facilities open to the general public are located at Terrace Bay and Torra Bay where there is a substantial influx of people every December and January. About 530 people can be accommodated at the two facilities. The great majority of people who use these facilities go there to fish. Limited off-road driving to the dune fields is permitted at Terrace Bay and Torra Bay on demarcated routes. The section of the park to the north of Terrace Bay is closed to tourists except through a tourism concession where a small number of tourists are accommodated in a luxury tented camp. This was Namibia's first tourism concession in a national park, awarded in 1994.

In addition, the Skeleton Coast National Park attracts visitors who drive through the Park without staying overnight. In total, some 15,000 visitors entered the Skeleton Coast Park through Ugabmund or Springbokwasser in 2006/7. They paid a total of about N$900,000 in entry and other fees. About two-thirds (66%) were Namibian visitors, while 27% were from southern Africa and 7% from overseas.

Figure 8. Conservation areas and tourism facilities in and around the Kunene coast.

Challenges for the future

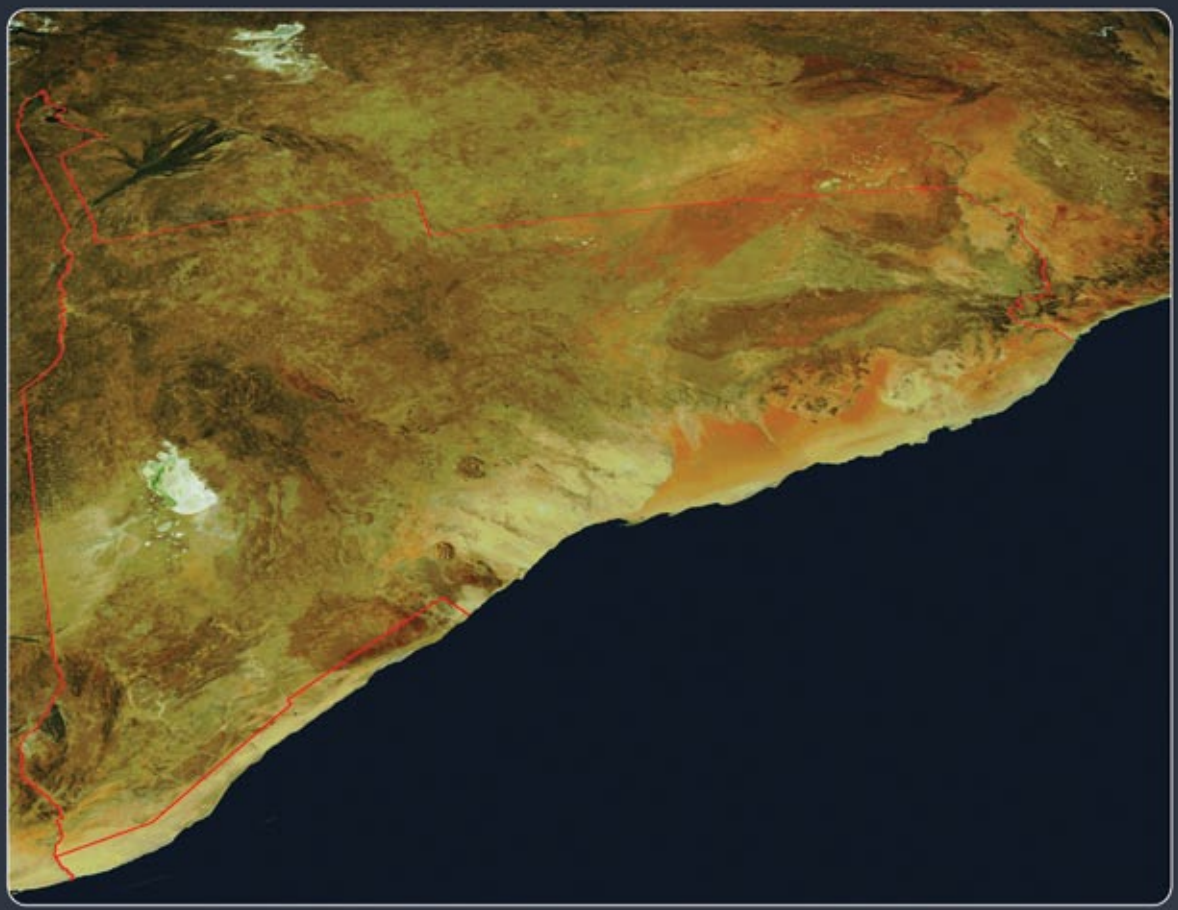
The overarching challenge facing the management of the Kunene coast lies in finding a balance between environmental conservation and adding value to the area. As a result of protection provided by its remoteness and conservation status, the coast is currently remarkably unspoiled, at least compared to most other areas in Namibia. However, the protection provided to the coast has disadvantages, most notably because its economic and aesthetic value has never been developed. In a sense - and provocatively - the coast can be said to have very little value: most people in Kunene have no access to the Park, commercial fishing happens to the west off the coast, and a small number of people drive through the Park and/or do some fishing at one or two places. Of course, the coast and Park has immense value for conservation and biodiversity but these values are of little relevance or value to most people. Given the low economic, aesthetic and use value of the coast and Park, it is not surprising that people are easily convinced that it can be put to 'better' use for mining and harbour development.

So what economic development is possible or desirable? Agriculture is not viable because of the poor water supplies and soil fertility. Due to the high-energy nature of the coast, there is relatively low potential for aquaculture, and significant expansion of recreational line fishing would not be sustainable because these coastal waters are breeding grounds for many species that then migrate as adults to other areas of the Namibian coast.

What of harbours and mining? Although the building of a harbour along this coast is often proposed, such a massive development is unlikely to be economically viable and would incur substantial environmental costs. Despite decades of prospecting and the development of small, short-lived mines, no economically viable mineral deposits have been found. Moreover, the economic benefits of mining would have to outweigh the environmental costs that mining is likely to generate and the consequent loss of potential for tourism that would result from the environmental degradation.

The most obvious opportunity for developing the value of the coast and Park lies in tourism. The Kunene coast's unspoiled, wild and scenic environment is its singular competitive advantage, and it is one that offers considerable opportunities for eco-tourism based on wildlife and adventure. Few other places in the world are so remote and impressive in their own right. Moreover, the tourism potential of the Kunene coast gains in scale because its attractions are immediately adjacent to those offered by tourism concessions and conservancies to the east and the Iona National Park in Angola. Visitors can thus be drawn to a variety of activities, sights and routes within this large spectacular area of wilderness. Other tourism attractions are available to the south of the Kunene coast, and the possibility has been suggested of creating a corridor managed for conservation between the coast and Etosha National Park.

Eco-tourism now generates a sizeable proportion of Namibia's GDP, and tourism is second only to mining in terms of economic value. But relativly little income from tourism is earned along the Kunene coast. With appropriate, bold planning, coastal Kunene could certainly earn much more to enhance the livelihoods of people in the region while at the same maintaining the coast's spectacular and unspoiled environment.



Produced by
Research and Information Services of Namibia (RAISON)

Published: 2012

Published by Namibian Coast Conservation and Management (NACOMA) project,
Ministry of Environment & Tourism

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People who assisted in the compilation of this booklet as well as sources of technical and other information are acknowledged and listed in the major publication entitled ***Namibia's coast:*** *Ocean riches and desert treasures* written by Tony Robertson, Alice Jarvis, John Mendelsohn and Roger Swart, and published in 2012 by the Ministry of Environment & Tourism, Windhoek.

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Back cover: RAISON

ISBN 978-99945-0-020-8

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