

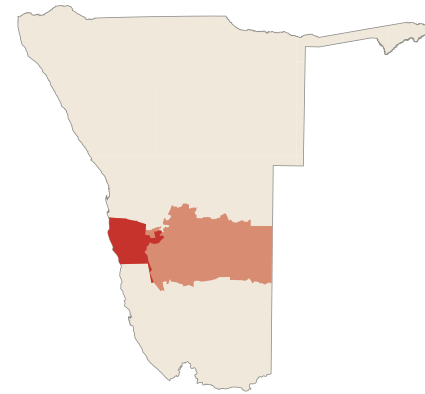


The coast of the Hardap Region

Namibia's Coast



Introduction



Namibia's coastline falls within four political regions: Kunene, Erongo, Hardap and Karas. This booklet is about the coastal area within Hardap Region which comprises the central area of the Namib Naukluft Park.

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, bringing together 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 wind and the waves and currents driven by atmospheric circulation.

The coastal area of the Hardap Region 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 brings cool conditions to the coast. The coastline consists largely of sandy beaches with salt pans and gravel plains inshore.

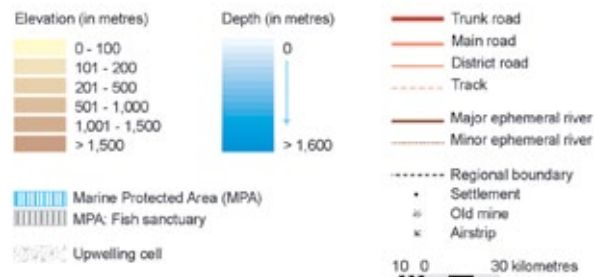
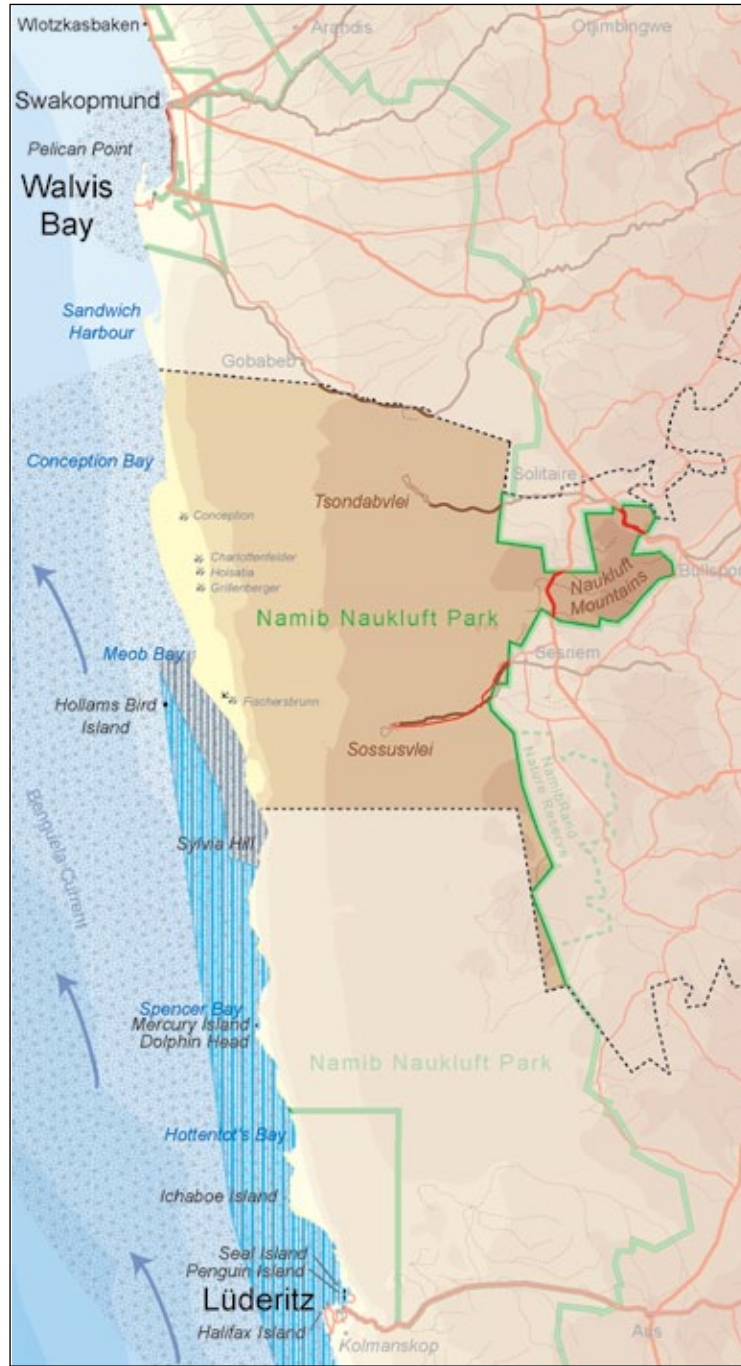
The Hardap coastal area falls within the Namib Naukluft Park. It is scenically dramatic and economically important, a combination which is well illustrated by Sossusvlei – one of Namibia's top tourist attractions that attracts huge numbers of tourists every year.

The area comprises some of the harshest parts of the Namib Desert, almost exclusively dominated by the dune sea which consists of shifting sands dropping straight into the sea. There is no significant rocky shore and little fresh water. Although the sand sea is an inhospitable, highly mobile environment it supports a number of highly specialised plants and animals. Further to the east, the Naukluft Mountains also fall within the Hardap section of the Namib Naukluft Park. Here, there is much more variety, both in terms of habitats and in terms of the plants and animals which live there.

Hardap's coastal region extends some 130-170 kilometres from north to south and roughly 120 kilometres inland. The area has enjoyed a long history of protection. In 1939 Diamond Area 2 was proclaimed covering the entire sand sea area within Hardap. In 1968 the Naukluft Mountain Zebra Park was proclaimed, which at the time covered only 200 square kilometres and did not adjoin Diamond Area 2. Further changes in 1979 and 1986 resulted in the creation of the Namib Naukluft Park as it is today. About one third of the marine environment of the Hardap coast is now included in the Marine Protected Area, which was proclaimed in 2009 and extends southwards from Meob Bay.

The south-eastern section is bordered by NamibRand (Figure 1), one of Namibia's largest private nature reserves, while the north-east borders farms which are now largely used for tourism, an industry which is much more viable than farming in this dry climate.

Figure 1.
The coastal zone of the Hardap Region outlined by a dotted line. The arrows show the direction of flow of the Benguela Current.



Almost the whole area is uninhabited with no permanent settlements except for infrastructure of the Ministry of Environment & Tourism. In fact, the whole area is near pristine due to its inaccessibility. Access to the coast itself is only possible via off-road vehicle concession routes which run between Lüderitz, Sandwich Harbour, Walvis Bay and some inland entry points. In the south-eastern section there is a tourism concession used for commercial ballooning trips.

The Climate

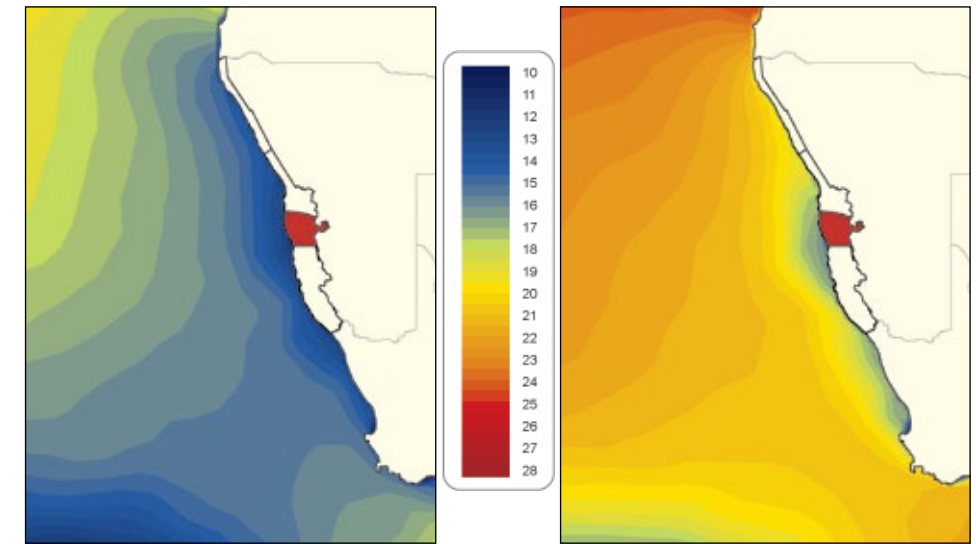


Figure 2. Sea surface temperatures in the coolest month (August - left) and in the warmest month (February - right). Upwelling of deeper colder water is evident close to the coast.

The climate of the Hardap Region'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 in northern Namibia. The low sea surface temperatures – ranging from monthly averages of 13 to 18°C – keep the air above the sea cool (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 rain clouds, and so moisture normally only condenses into fog or low clouds. Along the Hardap coast, fog occurs on between 120 and 140 days each year (Figure 3), and is most prevalent during mornings and evenings. The coast itself receives an average of about 5 to 6 hours of sun per day but this increases to 10 hours around 50 kilometres inland.

The strong prevailing southerly winds (Figure 3) cause surface waters to be deflected away from the shore. Cold nutrient-rich water from deeper layers then moves upwards to replace the surface water. These upward movements are known as upwellings (see Figure 1) and are the key to the coastal waters' high productivity. The entire Hardap

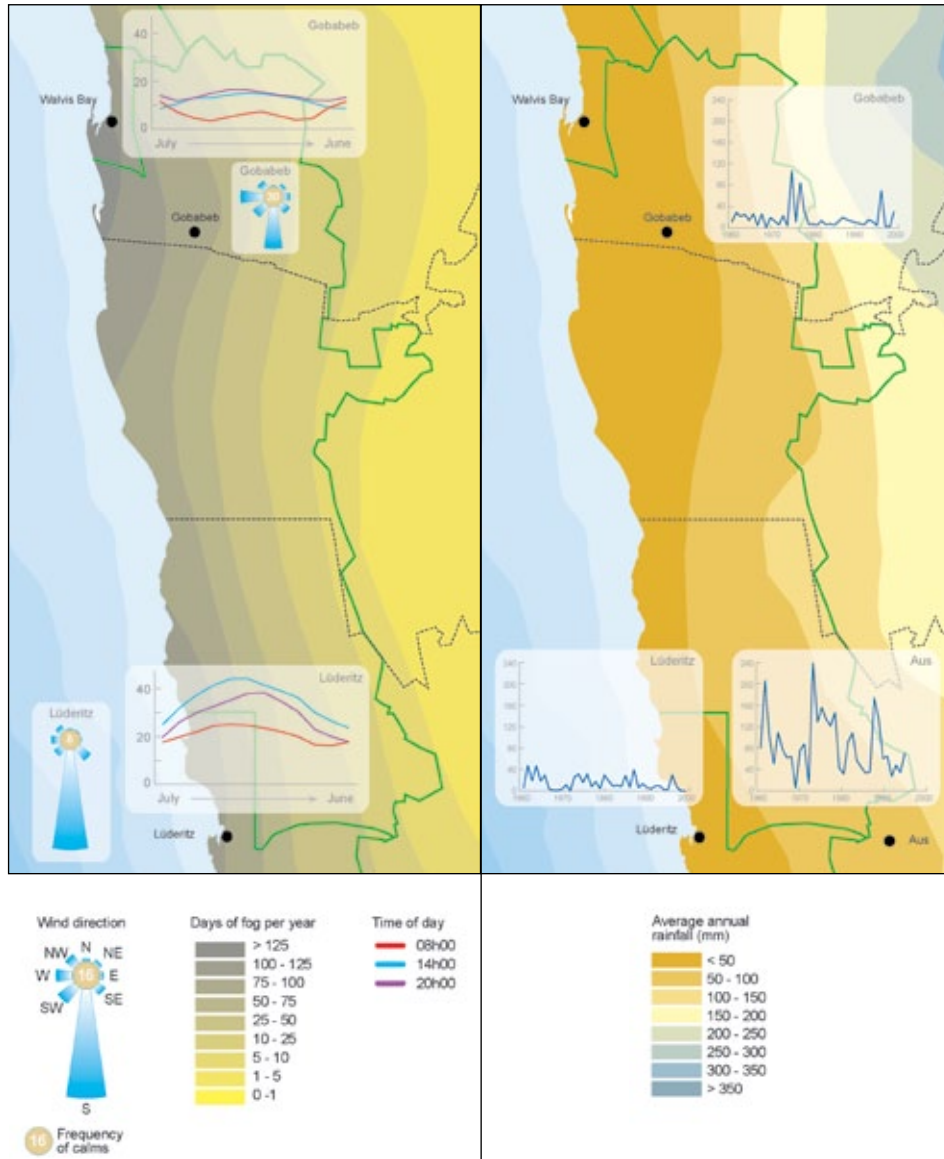


Figure 3. The map shows the average number of days on which fog occurs, while the graphs show average wind speed at different times during the year. The wind roses show wind direction and frequency at Gobabeb and Lüderitz, the closest weather stations since there are no stations in the Hardap coastal region itself.

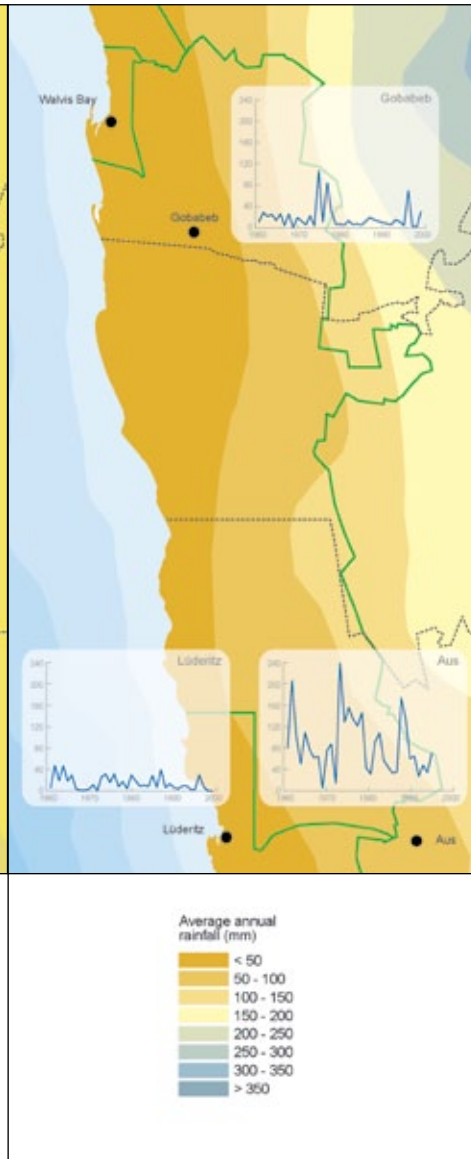


Figure 4. Average annual rainfall and the total recorded each season at three places in the vicinity of the Hardap coast. Note how greatly the totals vary from year to year. There are no data available from within the Hardap coastal region itself.



Fog over the Namib sandsea

coast falls within the Lüderitz upwelling cell, which is the largest such cell along the whole south-west African coast. The influence of tides on the Hardap coast is small since the tidal range is a modest 1.4 metres between its lowest and highest levels.

Cool dry air from the South Atlantic anti-cyclone prevails over the Hardap 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. The coast gets an average of less than 20 millimetres of rain each year. While precipitation generally increases to the east (Figure 4), rainfall in the Hardap Region is generally rare and highly variable locally and annually.



East winds are common at the coast during the winter months and sometimes carry vast quantities of sand.

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 can then go up to 44°C. The winds are driven by the Botswana anti-cyclone 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.

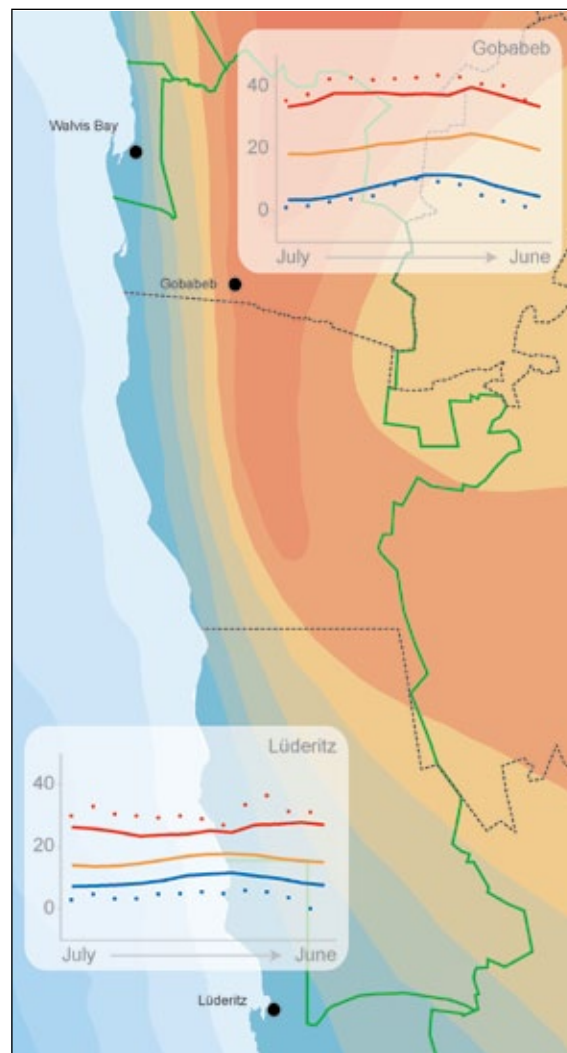


Figure 5. Average daily temperatures range between 14°C in the coolest month (August) and 19°C in the warmest month (February).

Landscapes and shapes of the Hardap Coast

The north-south orientation of the Hardap 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, marine and terrestrial processes have shaped the details of the shoreline we see today.

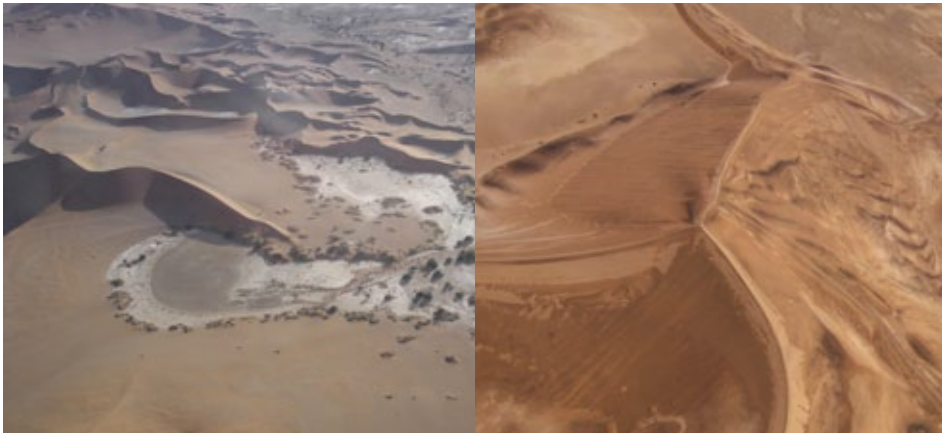
However, shorelines shift as sea levels rise and fall, and the present coastline has actually only been in place for a relatively short period. For example, sea levels were about 120 metres lower as recently as about 12,000 years ago. This was towards the end of the last ice age when large amounts of 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 land probably then extended another 30 – 50 kilometres westwards. 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.



Even today, the coast continues to change, both in a northerly and westerly direction. The Eduard Bohlen was shipwrecked in 1909. She ran aground just offshore in thick fog, but lay some 370 metres inland of the shore in 2007. Today retreat of the shoreline is occurring and at the end of 2009 the wreck was situated only 247 metres from the sea.

The entire shore consists of sandy beaches, some of which have sheltered bays on their northern side, such as Conception Bay and Meob Bay (Figure 6). Inland of the beaches are salt pans and extensive dune fields and the Namib Sand Sea is at its widest (125 kilometres) in this region. On the coast the dunes often form an imposing buttress bordering the marine environment, in particular along the so-called Lange Wand, or long wall. There are no perennial rivers and only two ephemeral rivers – the Tsauchab and Tsondab – which disappear into vleis in between the dunes and thus never reach the coast. Sporadic flows along these rivers usually occur during the late summer months of February and March. However, underground reservoirs fed by water seeping along ancient channels from these rivers emerge in three springs close to Conception and Meob Bay. These are very important to wildlife and have historically been valuable for humans.

Sediments are transported up along the coast by the north-flowing currents. Strong winds drive the waves (and sand and pebbles) obliquely on to 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.



Dunes are moulded into a variety of shapes depending on wind speed, changes in wind direction and the supply of sand.



It is often said that the dunes at Sossusvlei are the highest in the world. However, while the highest dune here is some 105 metres high, there are many higher dunes elsewhere. For example, Dune 7 outside Walvis Bay has a height of 377 metres. Nevertheless Sossusvlei remains one of the most attractive places in the world for tourists to visit and climb high dunes.

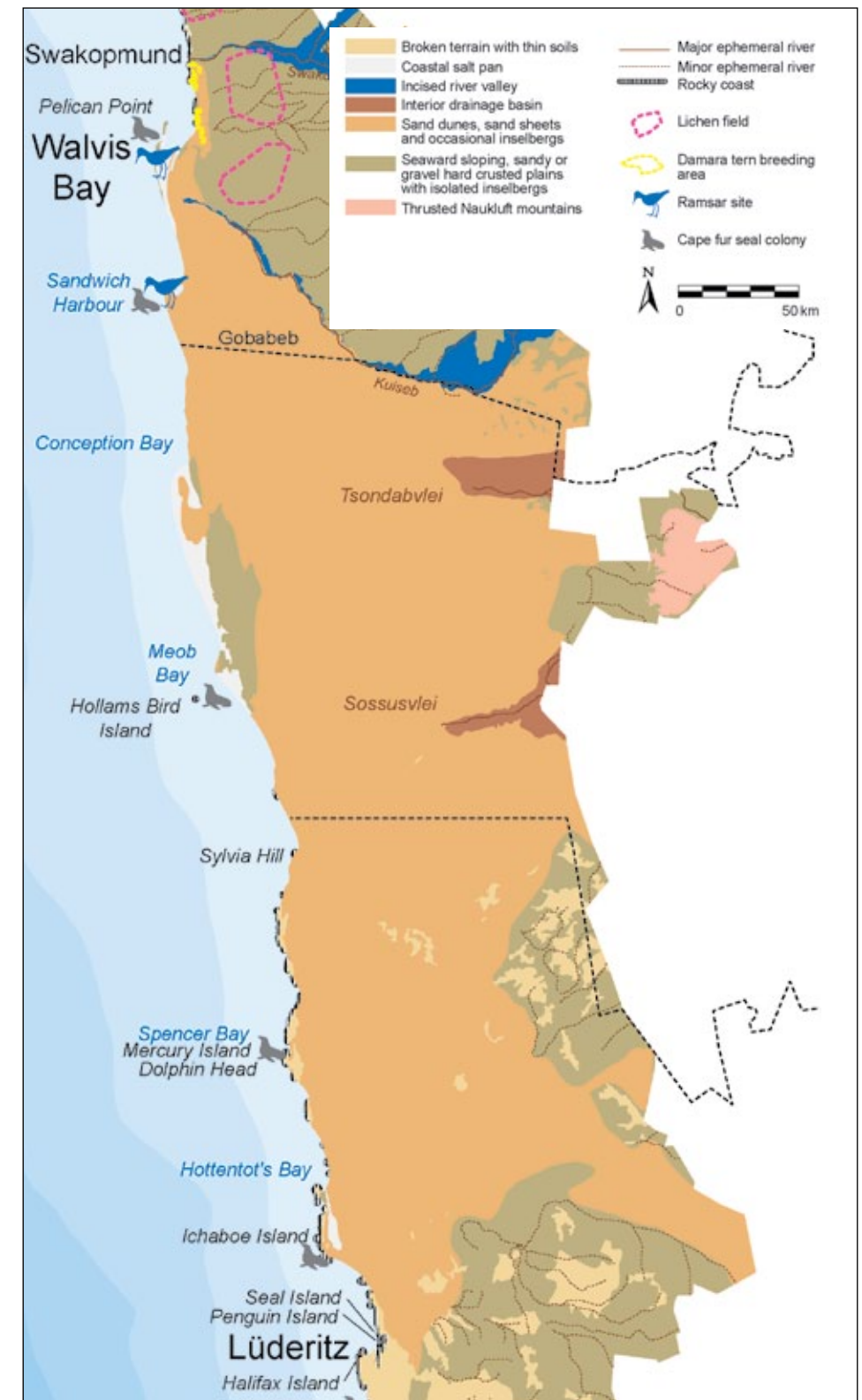


Figure 6. Important habitats, geomorphological features and sites of special interest along the Hardap coast.

Life on the coast

Since the Hardap coastal area is dominated by the Namib Sand Sea only a small number of specialised plants and animals occur there. The major habitats that support living organisms are shown in Figure 6 and described below in two categories: terrestrial and marine.

Terrestrial habitats

The coast falls entirely within the Namib Desert biome. There is very little vegetation on the dunes and almost none on the salt flats. However, the dune fields are the major habitat of a wide range of invertebrate and vertebrate species. Some of these animals are found only in the central coastal area whilst others are endemic to the Namib. The gravel plains, such as those between Conception Bay and Meob Bay, are fragile habitats that are easily damaged by vehicle tracks and other disturbances. Plants on these plains are strongly dependent on fog. Dune hummocks support a variety of salt-tolerant woody shrubs, such as *Salsola* and *Zygophyllum*. The shrubs grow along the coastline and provide an important habitat for many species of wildlife including gemsbok, brown hyaena and black-backed jackal. Brown hyaena and black-backed jackal feed on young seals, dead seals that wash up along the beach and other small animals.

The extensive salt pans in the Meob-Conception Bay area provide a valuable summer stopover for migrating birds. Bird counts in the Conception Bay area typically record about 17,000 birds of 25 species. There are often large numbers of terns here, with 13,000 common terns having been recorded in one July count. Other species recorded in significant numbers include Sandwich tern, Cape cormorant, kelp gull and greater flamingo. Damara terns breed in the salt flats. These small, elegant terns are endemic to the south-western coast of Africa, and are listed as a Red Data species, which means that their conservation is a national priority.

Lichens are important pioneer plants that colonise bare desert habitats. They grow extremely slowly and depend on moisture from coastal fog. The lichens provide ecological niches for other flora and fauna and are an important food source for beetles and a range of larger animals from gerbils to springbok. Lichens also prevent wind and water erosion by stabilising the soil. They are highly vulnerable to the impacts of off-road driving and mining.

Marine environment

Namibia's marine environment supports one of the greatest concentrations of marine life in the world. This includes vast populations of commercially valuable fish which are one of Namibia's most important renewable natural resources. The wealth of life results from extremely high rates of primary production as a consequence of upwelling caused by the Benguela Current. Water in the upwelling cells moves up to the surface, and in doing so transports nutrients from the depths of the ocean to the surface.

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

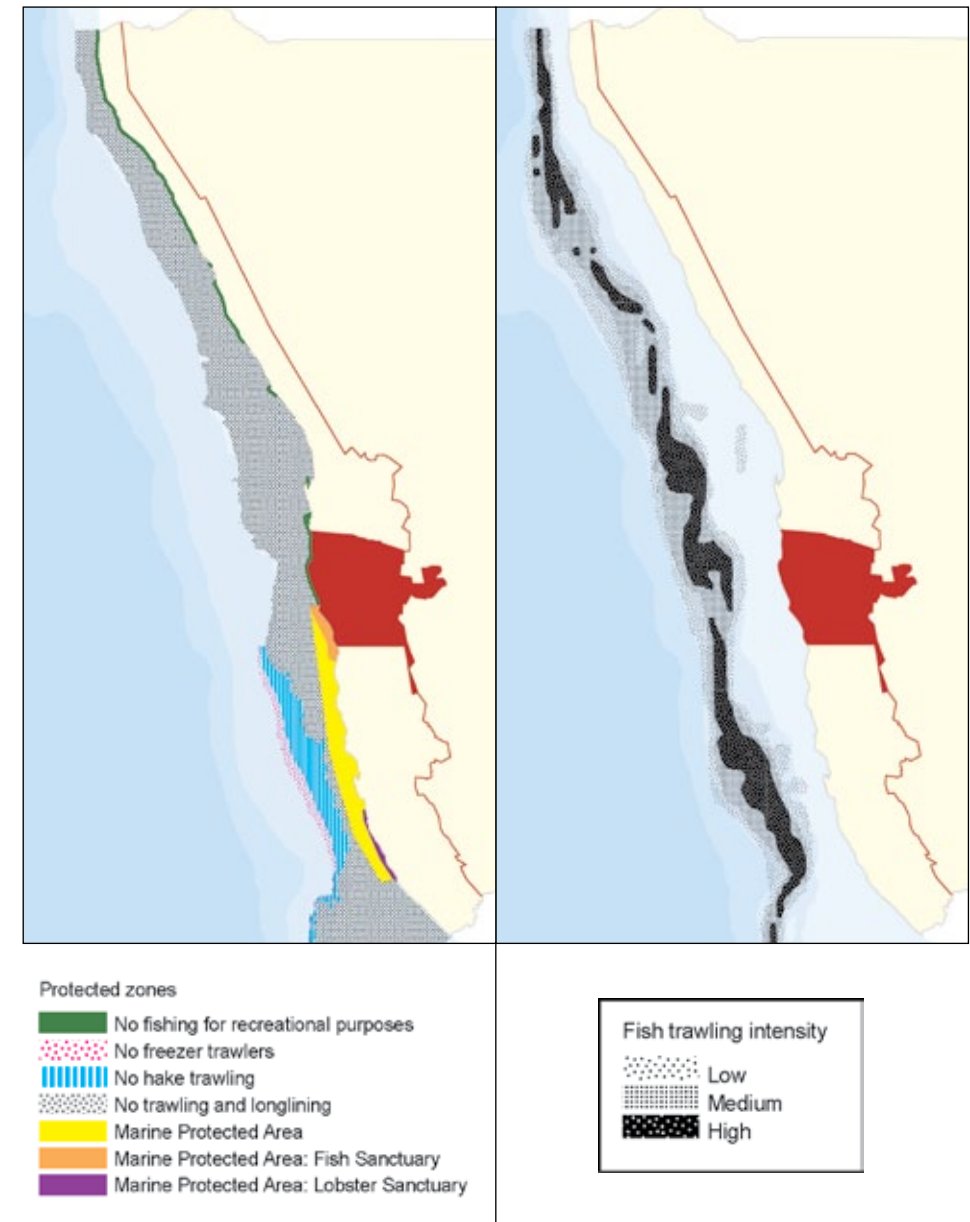


Figure 7: Fishing areas and protected zones off the Namibian coast

bouts of production and reproduction occur as the zooplankton provide vast 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.

The most intense upwelling and nutrient supply occurs where the continental shelf is narrowest and the wind strongest. The biggest and most productive cell along the entire west coast of southern Africa is the Lüderitz upwelling cell. This is in the Hardap Region, the northern edge of the cell being adjacent to Meob Bay (Figure 1).

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

The coast of the Hardap Region supports a range of cold-water species similar to those found along the southern coast and South African coast. However, the sandy beaches support relatively few invertebrate species. Of about 20 species found on the sandy shores, most are insects and arachnids associated with washed up kelp. Other animals include nematodes, flat worms (platyhelminths), amphipod crustaceans and ghost crabs.



The only island in the area is Hollams Bird Island, where Namibia's northernmost breeding colony of bank cormorants occurs, as well as breeding colonies of Cape cormorant and Cape fur seals.

Twenty-three species of dolphins and toothed whales have been recorded along Namibia's coast in addition to eight of the world's eleven species of baleen whales. While some are resident, most are seasonal migrants that spend summer in the Antarctic and winter in West African waters. For example, humpback whales have their breeding/calving grounds in the tropics north of Angola. Small numbers of southern right whales have been recorded breeding since 1996, and females with new-born calves have been seen within two kilometres of the Conception Bay shore. Heaviside's dolphins, also known as Benguela dolphins – found only in Namibia – also occur in this area.

The section of coast between Meob Bay and Sylvania Hill (which is just south of the Hardap-Karas regional boundary) falls within the Fish sanctuary of the Marine Protected Area within which no commercial or recreational fishing for line fish species (except snoek) may take place. The area has been identified as important for fish such as silver kob which spawn there, steenbras and galjoen as well as surf zone sharks.

Meob Bay has a different marine habitat compared with the rest of the Namibian coast. For example, the offshore water is relatively warm and the shore is home to an isolated population of a large bivalve mollusc (*Panopea glycymeris*), a species which is found further north in Angola and northwards into West Africa but not anywhere else on Namibia's coast.



Dunes drop precipitously down to the shore along the Langewand.



Meob Bay

People and land uses

The relatively few archaeological sites found in the Namib dunes show that the area has a long history of human occupation. Evidence indicates that people used areas in the vicinity of Sossusvlei and the Naukluft Mountains during the Early and Middle Stone Ages (1.8 million – 10,000 years ago). These people were most likely nomadic, moving from one water source or good hunting area to another. People were also hunting and gathering in the Sossusvlei area between 10,000 and 2,000 years ago. And the presence of nomadic pastoral sites suggest that within the last 2,000 years people were moving through the area with herds of domestic stock.

More recently, the coast served as a contact point with the rest of the world when early explorers made their first contact with coastal inhabitants. However, many seafarers met their untimely end when their ships were wrecked, giving the Skeleton Coast its name. In the 1800s, guano was mined from many islands along Namibia's coast including Hollams Bird Island.

There are no towns or ports within the Hardap coastal area and no inhabitants within the Namib Naukluft park. However, there are a few small settlements to the east including Solitaire, Büllsport and Sesriem. Roads within the area are limited to the access road from Sesriem into Sossusvlei and the north-south road crossing the eastern section of the park. Several off-road vehicle routes pass through the area close to the coastline, from Walvis Bay, Solitaire and Lüderitz. These are operated on a concession basis with each route being allocated to a specific concessionaire. Typically a guide takes a few vehicles at a time and each trip takes several days. There is also a fishing concession at Meob Bay.

The main economic sector in the area is tourism which revolves mainly around Sossusvlei. A large number of lodges offer accommodation and tourism facilities in the area. Sesriem, at the entrance to Sossusvlei, has infrastructure including Ministry of Environment & Tourism (MET) offices, tourist accommodation, a petrol station and shop. The MET has a station and some campsites at Naukluft, in the easternmost section of the Park.



Several historical sites remain as remnants of mining, such as the ghost towns of Grillenberger, Charlottenfelder, Holsatia, Fischersbrunn and the Conception Bay Police Station. There are currently no active mines in the area, but their historical remains present an attraction for tourism activities, as does the wreck of the Eduard Bohlen.

The whole area has been licensed for mining exploration at one time or another and there is a long history of diamond mining in the Meob-Conception Bay area. Diamond mining took place between Meob and Conception Bay from 1909 to 1914, and then again from 1920 until its closure in 1930. Limited exploration took place even after that. There are several dilapidated settlements associated with mining and the infrastructure includes railways, a hospital, a police station, a water pipeline and a telephone line.

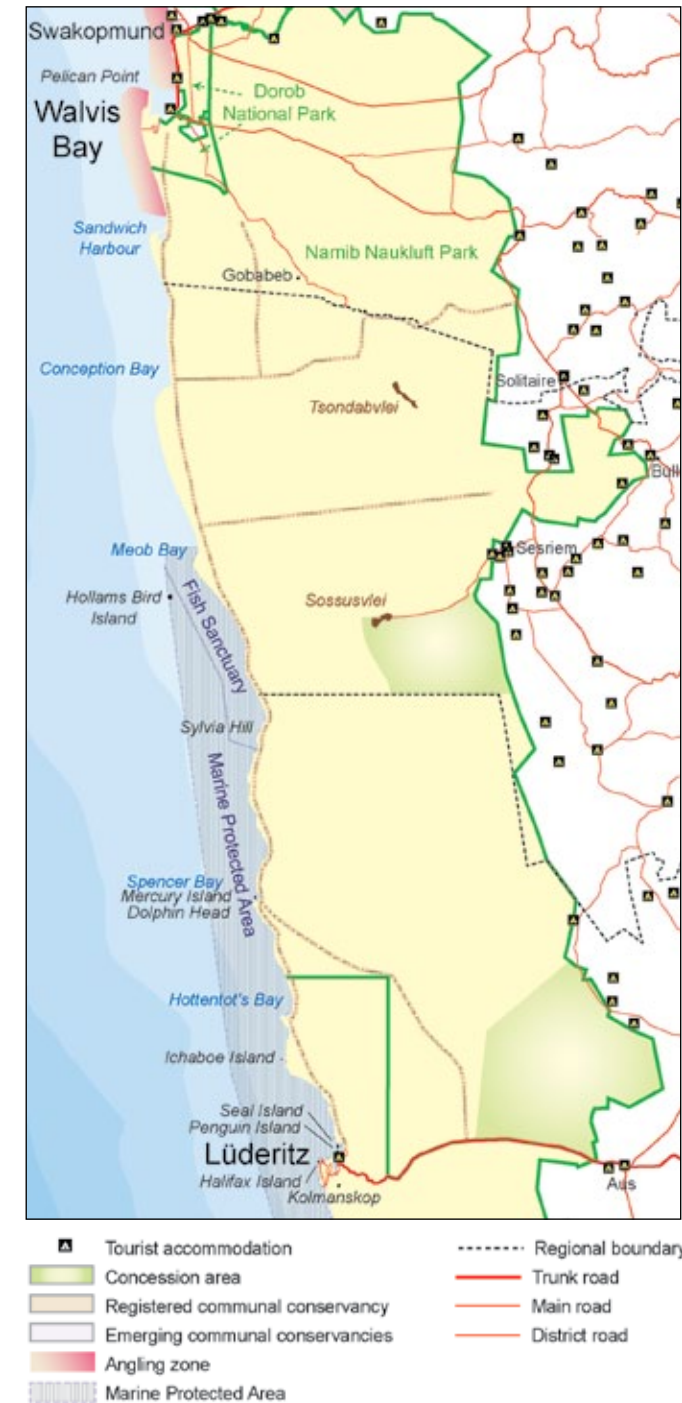


Figure 8. Conservation areas and tourism facilities in and around the Hardap coast.

Challenges for the future

The overarching challenge facing development of the Hardap coast lies in finding a balance between sustainability and adding value to the coast. So what economic development is possible or desirable? Agriculture is not viable due to the obvious constraints of water and poor soil fertility (although there was a tiny vegetable garden which used water from the Fischersbrunn spring at Meob during the mining era). Due to the high-energy nature of the coast, there is relatively low potential for aquaculture or inshore fishing. Moreover, an expansion of recreational line fishing would not be desirable because these coastal waters are breeding grounds for many species.

The constraints of access, lack of services and infrastructure and the high costs of providing these mean that the area is not suitable for permanent human settlement or urban development.

Whilst bringing possible economic benefits, mining has significant environmental costs including the loss of potential for tourism that would result from consequent environmental degradation. Many of the impacts are especially harmful in the fragile arid environments found along the coast, and mining in national parks – if it is to be allowed at all – needs particularly careful management. Certainly, speculative exploration and mining ventures must be prohibited.

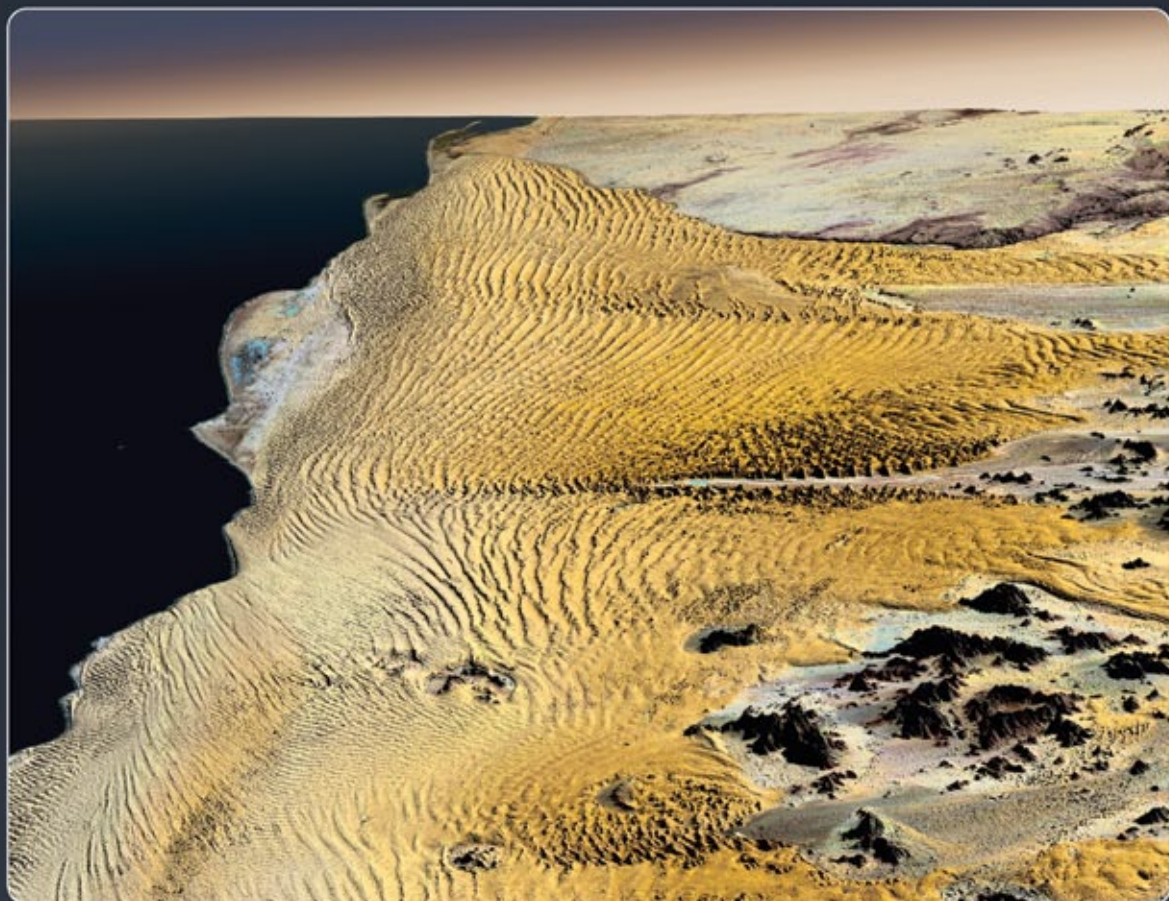
The most obvious opportunity for developing the value of the coast lies in tourism. Considerable opportunities for high value eco-tourism based on wildlife and adventure tourism are available. Visitors can thus be drawn to a variety of activities, sights and routes within this area. Tourism now generates a large proportion of Namibia's GDP (gross domestic product), being second only to mining in terms of economic value.

Tourism is already a key activity in this area, although the great majority of activities are focused on one attraction, namely Sossusvlei. People visit Sossusvlei and the adjacent dunes because of their scenic and wilderness value, and the reputation of being amongst the highest dunes in the world. Additional high-value activities include scenic flights or ballooning trips.

Utilising the coastal areas near Meob and Conception for additional ecotourism ventures such as photography or nature tours based on the wilderness value of the area could result in high-value products. Previous proposals for development in this area have included the construction of a lodge at Meob Bay, partly due to the availability of groundwater.

Overall, Hardap's coastal zone has high potential for ecotourism, given the desert landscape, wildlife, wrecks, whalebones and old mining camps. Heaviside's dolphins, hump-back whales and southern right whales occur in the marine environment. These and other species could potentially be a significant source of income and jobs if a whale-watching tourism industry was developed, similar to the substantial whale-watching enterprises in South Africa.

Any new developments in this sensitive area must be tightly monitored and controlled so as to minimise environmental impacts, and to ensure that the developments generate real value for the Hardap region in a sustainable way.



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Authors: Roger Swart, Tony Robertson, John Mendelsohn & Alice Jarvis

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