

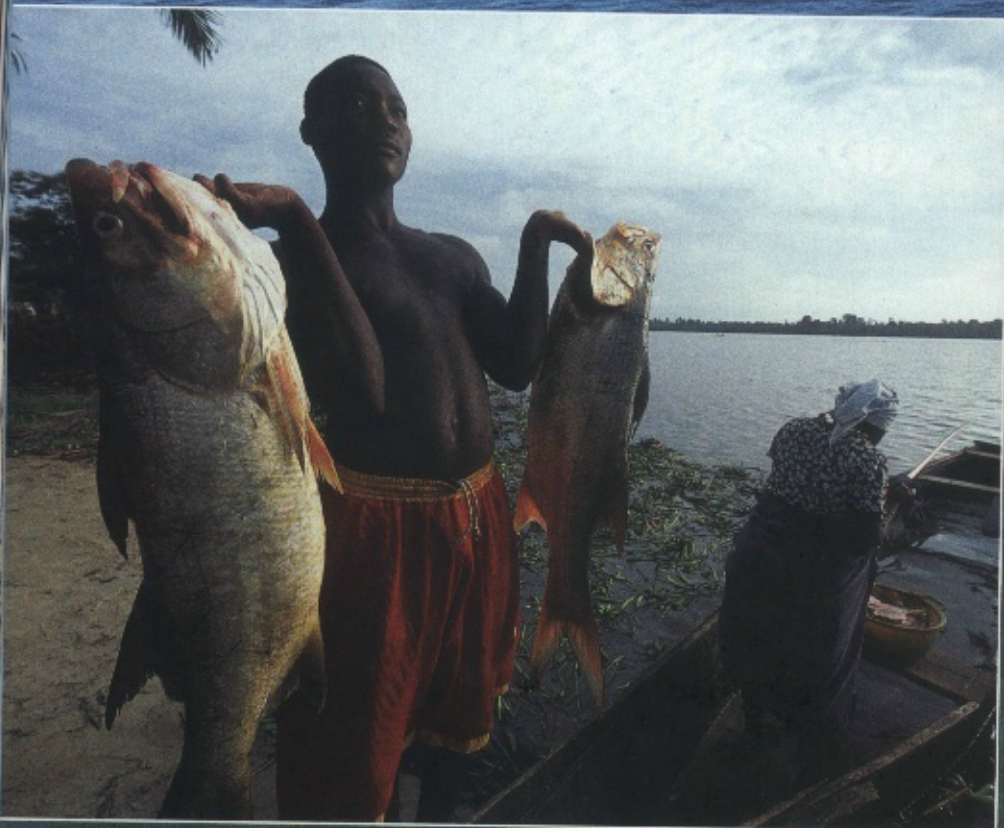
TEXT BY CLAIRE ATTWOOD & MICK O'TOOLE • PHOTOGRAPHS BY CLAUDIO VELÁSQUEZ ROJAS

# a coldwater lifeline

The tiny flotilla of rowing boats that sets out with gillnets from the beaches of Ambriz, south of Angola's capital, Luanda, bears little resemblance to the highly sophisticated trawlers that fish for hake in deep water off Namibia and South Africa. Yet the fortunes of fishermen in all three countries are linked by the Benguela Current, a narrow, ribbon-like system that extends from east of Port Elizabeth to Angola's oil-rich province of Cabinda. Today, Angola, Namibia and South Africa are working together to manage the Benguela, one of the most productive ecosystems on earth. ▶



# Why the fuss?



Saharan Africa. Both South Africa and Namibia are actively developing their own oil and gas industries.

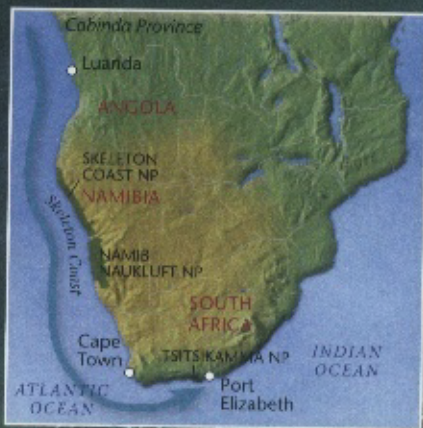
While the integrity of the Benguela Current is still largely intact, the ecosystem faces accelerating threats which, if left unchecked, would damage vital economic and ecological resources. Primary threats include habitat loss and pollution – particularly in areas adjacent to urban centres – and the increasing exploitation of fish stocks, such as hake and horse mackerel, which straddle national boundaries. Oil and gas exploration and production, as well as marine mining, are also all potentially polluting activities.

Environmental problems such as these are compounded by the fact that the legacies of colonialism, apartheid and civil war persist in the Benguela region, primarily in the form of depleted resources, poor infrastructure and, above all, limited human capacity to cope with the complexity and variability that characterises the system.

Yet, in spite of these difficulties, the governments of Angola, Namibia and South Africa are working together to deal with environmental problems that occur across national boundaries so that the Benguela ecosystem can be managed as a whole. Their efforts are being supported by the Global Environment Facility (GEF), which has invested in a five-year Benguela Current Large Marine Ecosystem (BCLME) programme, through the United Nations Development Programme (UNDP).

It all started in 1995, when Namibia and South Africa were new democracies and Angola was still embroiled in a brutal civil war. Fisheries scientists from the three countries met for the first time in Swakopmund, Namibia, to share knowledge and understanding of the Benguela Current ecosystem. It was this meeting that led to talk of managing the system cooperatively through a Large Marine Ecosystem (LME) programme.

'It was really surprising to see how much goodwill there was, both within governments and the scientific institutes,' remembers German biologist, Gotthilf Hempel, reflecting that not long before,



**PREVIOUS PAGE** Endemic to the Benguela Current, a Heaviside's dolphin leaps out of the water near Lüderitz on the Namibian coast.

**T**he Benguela Current occupies a crucial position in the world's oceans. Not only is it richly endowed with both living and non-living resources, but its location at the south-western corner of the African continent means that it is a critical crossroads for environmental variability, ocean circulation and international shipping. The ecosystem supports a number of commercially important fish stocks such as hake, anchovy, sardine, horse mackerel and tuna. Rock lobsters are harvested in the southern Benguela, while shrimps and deep-sea crabs provide small-scale fishers in the north with an important source of food and work.

Fisheries are an economic mainstay in the Benguela region, but they are not the only resource to attract attention: there are also rich reserves of oil, gas and minerals, particularly diamonds, within the sediments of the Benguela. The marine diamond-mining industry in Namibia and South Africa yields close to a million carats each year, and Angola is the second largest producer of oil in sub-



the three countries had been bitterly divided by the aggression of South Africa's apartheid government.

The BCLME programme is now in its fifth year and in that time has allocated more than US\$10-million in support of 75 scientific and economic research projects. All of these focus on gaining a better understanding of the BCLME so that the transboundary management problems associated with fishing, mining, oil exploration, coastal development, biodiversity and pollution can be addressed.

One cluster of projects, for example, is designed to test the cumulative environmental impact of offshore marine diamond mining, with a view to making clear recommendations to the governments of South Africa and Namibia. Another set of projects is assessing and mapping the biodiversity of the Benguela's estuarine, coastal, nearshore and offshore environments to identify suitable sites for aquaculture.

The BCLME programme is moving towards the establishment of a Benguela Current Commission, a formal framework that will enable the three countries to engage constructively in resolving any issues that threaten the integrity of this vital ecosystem. ▶

**ABOVE** Poised to strike in an upright position, an Argenville's limpet waits for kelp fronds to be washed within reach of its serrated shell.

**TOP** The sand anemone aggregates in sandy gullies or on the margins of rock pools to feed on dislodged mussels or other animals tumbled by the waves.

**OPPOSITE** A proud fisherman displays his early morning catch. In contrast to Namibia and South Africa, artisanal fishing is an important economic mainstay in Angola.

**MAIN PICTURE** Over the aeons, rivers such as the Gariiep (Orange) have deposited diamonds along the Benguela coast. Sophisticated mining vessels are able to mine them at depths of more than 100 metres.



# Shifting seas

**ABOVE** The world's largest concentration of Cape gannets occurs within the Benguela ecosystem. The populations of some seabirds, fish and crustaceans, however, appear to be shifting eastwards.

**OPPOSITE, ABOVE** Offshore islands provide vital refuge for breeding marine birds, such as the endemic crowned cormorant.

**OPPOSITE, BELOW** West Coast rock lobsters caught at Port Nolloth, South Africa. The distribution of these lobsters also seems to be shifting to the east, a phenomenon that has serious economic implications for West Coast fishing communities.

**T**he bustling fishing harbour at Mossel Bay on South Africa's southern coast provides a picturesque home base for a fleet of inshore trawlers and a large number of longline fishing boats. The inshore trawlers catch Agulhas sole in the sheltered bays between Mossel Bay and Cape Agulhas, and shallow-water hake further offshore. The longline fleet casts its lines in deeper water, mainly over the Agulhas Bank, one of the most productive fishing grounds off the South African coast.

During the past five years, Mossel Bay's fishing fleet has had to contend with an invasion of purse-seiners, West Coast fishing boats that have been moving further away from their traditional fishing grounds as they follow the sardines that form the bulk of their catch. Since 2001, fisheries scientists

have documented a pronounced eastward shift in sardine catches – the Mossel Bay catch mushroomed from 2 110 tons in 2000 to 121 536 tons in 2005 – but they're reluctant to predict whether the shift should be considered a permanent trend or not.

This leaves the fishing industry in a rather tight spot. The big sardine canneries are all located on the West Coast and fishing companies have been transporting their catches by truck to the canneries – a messy, time-consuming and costly operation. The million-dollar question is whether they should continue to view the eastward shift in sardine populations as a temporary anomaly or start building new canneries in Mossel Bay.

The quandary facing the sardine fishing industry illustrates the economic reality of environmental change,

a subject that is beginning to receive increased attention among scholars and researchers of the Benguela. Environmental monitoring in Angola, Namibia and South Africa, coupled with recent outputs from the BCLME programme, provides a growing body of evidence to show that significant changes have taken place in the ecosystem over the past 50 years.

Environmental parameters, such as sea surface temperature, indicate a pronounced warming trend in the northern Benguela, a cooling inshore in the south and a warming offshore near the ecosystem's southern boundary. There has also been an increased frequency of warm events, including 'Benguela Niños' in the northern Benguela, which are characterised by large swathes of warm, highly saline water moving south from Angola. In addition, the occurrence of low-oxygen water over the continental shelf and increasingly frequent eruptions of sulphur from the seabed have had a severe impact on the fishing industry in Namibia.

Scientists are beginning to talk about a 'regime shift' in the Benguela. They are tentatively suggesting that environmental change in the ecosystem could be associated with global climate change and may be behind the eastward movement of sardines and other species, such as the Cape gannet.

In 1956, only seven per cent of southern Africa's gannet population occurred in the Eastern Cape; now it's closer to 67 per cent and the number of gannets breeding on Namibia's offshore islands has plummeted. They aren't the only eastward immigrants. The endemic crowned cormorant now breeds at Tsitsikamma National Park, 355 kilometres east of its traditional nesting sites, and the Hartlaub's gull is breeding 550 kilometres further east than it did 10 years ago. Scientists are also puzzled by an apparent eastward shift in the distribution of West Coast rock lobster, a species that is an economic mainstay for West Coast fishing communities.

If recent oceanographic and ecosystem studies are correct, an eastward and poleward shift in the Benguela ecosystem may be taking place. This would signal serious consequences for an ecosystem that has, until recently, sustained large-scale fisheries, which support thousands of jobs and earn valuable foreign currency. ▶



# A holistic approach

The BCLME programme is part of a wider global effort to halt and reverse the spiralling degradation of the world's marine and coastal areas. It is a classic example of the LME concept, a radical shift in thinking that calls for a more holistic approach to ocean governance and managing marine ecosystems. This new 'ecosystem approach' aims to balance human needs with conservation issues by focusing on five basic tenets – productivity, fish and fisheries, ecosystem health and pollution, socio-economics and governance.

To date, 64 LMEs have been described. Each one consists of a large chunk of ocean – usually about 200 000 square kilometres – and includes coastal areas from river basins and estuaries to the seaward boundaries of continental shelves. These 64 ecosystems produce 95 per cent of the world's annual marine fish catches and almost all marine pollution problems and coastal habitat alterations occur within their boundaries. Today, 121 developing countries are working together through programmes such as these in an attempt to reduce coastal pollution, restore damaged habitats and recover depleted fishery stocks.

Funding for LME programmes is provided by the GEF, which was established by the World Bank, UNDP

and UNEP during the lead-up to the 1992 UN Conference on Environment and Development. The LME concept provides the GEF with a vehicle to promote a science- and ecosystem-based approach to managing coastal and marine ecosystems, and enables developing countries that show a commitment to tackling the causes of transboundary environmental problems to access financial support. This science-based approach also helps countries to share information and resources, thereby building trust between them.

The BCLME programme is one of the most successful LME programmes. It has captured the interest of the international scientific community and is regarded as a 'model' demonstration of LME project development and implementation, both within sub-Saharan Africa and the GEF. ■



**MAIN PICTURE** On a foggy morning, a researcher prepares exclusion cages for white mussels on beaches in the Sperrgebiet. His research will help to assess the impact of siltation by diamond mining on the Namibian coast.

**LEFT** After decades of war, Angolans are moving back to the coast and its resources. These children were pictured at the fishing village of Buraco.

**OPPOSITE, ABOVE** Longfin tuna are brought aboard a pole-fishing boat. Tuna pole-fishing was introduced to the region by Portuguese colonists and has almost no by-catch.

**OPPOSITE, BELOW** The desolate, rocky coasts of the Benguela host large populations of South African fur seals.

