TEETERING ON THE brink

Following the collapse of pelagic fish populations off Namibia in the 1970s, South Africa became the main stronghold for the African Penguin. However, penguin numbers off South Africa's west coast have halved since 2004, apparently as a result of a lack of food. With co-operation from the purse-seine fishing industry, South Africa's Marine and Coastal Management has halted fishing around two breeding islands to test whether this measure improves matters for penguins. **Lorien Pichegru** and **Peter Ryan** describe this unique experiment. ▸

CHRIS VAN ROOYEN

SEINE language

ALBERT FRONEMAN (2)

The African Penguin *Spheniscus demersus* is one of seven seabird species confined to the Benguela upwelling region off the coast of southern Africa. Like penguins worldwide, this species has broad public appeal, and its accessible breeding colonies at Boulders Beach and Stony Point contribute significantly to the tourism value of the Western Cape. But all is not well in penguin land. At the start of the 19th century there were about a million African Penguins on Dassen Island alone; currently there are fewer than 30 000 pairs worldwide.

Coupled with the disturbance caused by people scraping for guano, the African Penguin's initial decrease resulted from egg collecting, with as many as 600 000 eggs being taken from Dassen Island each year. But penguin numbers have continued to decrease after these activities ceased. Loss of guano from the breeding islands has made it more difficult for the birds to find suitable nests, thus reducing breeding success, and oil pollution is an ongoing problem. But the main reason for the species' decreases in recent decades has been a shortage of food. Like many other predators in the Benguela region, adult African Penguins rely on sardines and anchovies for the bulk of their diet. As these pelagic schooling fish also form the basis of a valuable purse-seine fishery, penguins compete with humans for food.

Off Namibia, there was a dramatic collapse in sardine landings during the early 1970s. Pelagic fish were replaced by jellyfish and salps, which consumed most of the eggs and larvae produced by the dwindling fish populations. This has switched the system to a new stable state dominated by these gelatinous zooplankton. The bad news for penguins is that jellyfish and salps are a poor substitute for pelagic fish and cannot sustain significant seabird populations. As a result, populations of seabirds breeding at the Namibian guano islands have decreased dramatically. Over the past five decades, African Penguin numbers in Namibia have decreased by more than 90 per cent, from some 50 000 pairs in the 1950s to only 5 000 pairs in the 2000s.

ABOVE
Porpoising is a fast but energetically expensive way for African Penguins to travel at sea. Most commuting is done at a more sedate three to six kilometres an hour, which saves energy but constrains the area they can search for food when breeding.

OPPOSITE
African Penguins can suffer from heat stress ashore, especially when breeding in exposed sites. Exceptionally hot days can cause parents to desert their nests, leaving their eggs and chicks exposed to predation.

The southern Benguela off South Africa also saw a crash in sardine landings following over-exploitation in the 1960s, but much of the slack in the system was taken up by anchovies. Careful management of the fishery during the 1970s and 1980s saw the slow recovery of sardines, and by the 1990s seabird populations were increasing, linked to a few bumper years of anchovy recruitment. Unfortunately, the good times haven't lasted. During the past decade, pelagic fish stocks have dwindled off the west coast, where most penguins traditionally have bred, forcing predators – and the fishery – to travel farther and farther south and east in pursuit of prey. The south-eastward movement of prey is thought to result from a combination of environmental factors favouring populations breeding on the south coast rather than the west coast, coupled with greater fishing pressure along the west coast, where fleets and processing plants are concentrated.

A shift in penguin prey isn't too serious when the birds are free to follow it. But, while breeding, adult penguins depend on a reliable source of food for themselves and their chicks close to the breeding island, and most African Penguins remain within 20 to 30 kilometres of their breeding islands at this time. Birds forced to travel further than this spend so long commuting that they struggle to raise a brood of healthy chicks. To make matters worse, adult African Penguins are creatures of habit and return to breed at the same site each year. As a result of the lack of food, penguin numbers off South Africa's west coast fell from almost 40 000 pairs in 2004 to barely 12 000 pairs in 2008. This calamitous decrease has led for calls to upgrade the species from globally Vulnerable to Endangered.

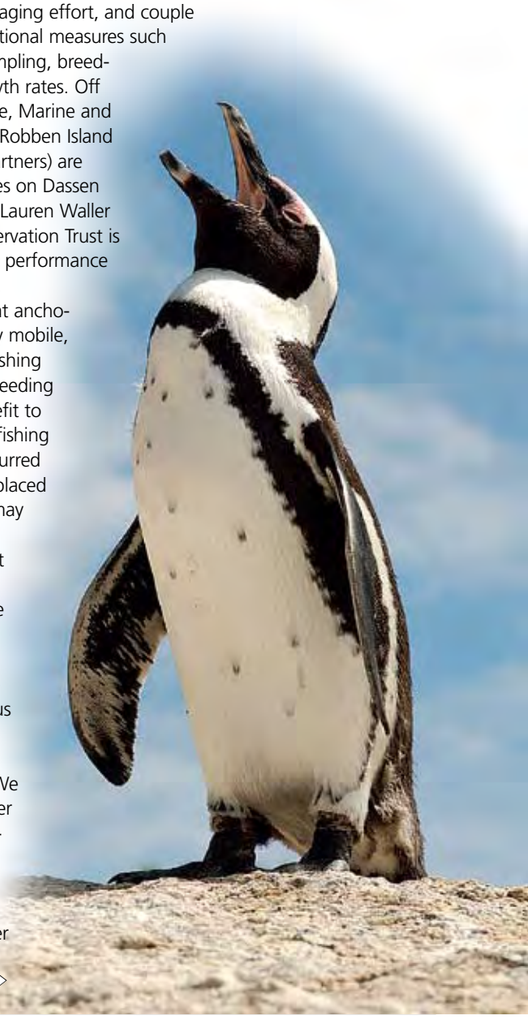
The fishing industry faces a similar challenge from the shift in fish stocks. Longer commuting distances between fishing areas and processing plants, coupled with sharp increases in fuel prices, have forced some companies to make the costly decision to relocate their plants to Mossel Bay on the south coast. Sadly, this option isn't open to penguins, as there are no suitable breeding islands between Dyer Island, just east of Hermanus, and Port Elizabeth. A few pairs have tried to breed along the remote De Hoop coastline, but they are vulnerable to terrestrial predators.

Although climate change might be the ultimate factor driving the shift in fish populations, competition with purse-seine fisheries around breeding colonies almost certainly exacerbates the situation for penguins. As a result, Marine and Coastal Management, the government agency responsible for managing South Africa's fisheries and marine resources, has devised an ambitious plan to try to improve conditions for breeding penguins. With the cooperation of the purse-seine industry, fishing has been stopped for an initial two-year period within 20 kilometres of two key breeding sites: Dassen Island on the west coast and St Croix Island off Port Elizabeth. Teams of scientists will monitor whether this improves the lot of penguins breeding there compared with birds breeding on nearby islands that have not been afforded any protection, namely Robben and Bird islands.

Lorien Pichegru, a post-doctoral fellow at UCT's FitzPatrick Institute, has been tasked with monitoring the performance of penguins breeding at St Croix and Bird islands in Nelson Mandela Bay. Typically, fishing pressure is far greater around St Croix, which lies close to Port Elizabeth. Perhaps as a result of this, African Penguins breeding on St Croix in 2008 had to work much harder than those breeding on Bird Island to find food for their chicks, travelling on average almost twice as far. From the start of 2009, fishing has ceased within 20 kilometres of St Croix and within a five-kilometre radius of the Riy Bank, a key area for fish south of St Croix.

Pichegru and a team of students will test what effect this has on the islands' penguins over the next two years. She will use GPS-loggers to track foraging birds and thus estimate their foraging effort, and couple these data with more traditional measures such as population size, diet sampling, breeding success and chick growth rates. Off the west coast, CapeNature, Marine and Coastal Management and Robben Island Museum (together with partners) are running similar programmes on Dassen and Robben islands, while Lauren Waller from the Dyer Island Conservation Trust is keeping a close eye on the performance of penguins at Dyer Island.

Sceptics might argue that anchovies and sardines are highly mobile, and that closing areas to fishing immediately adjacent to breeding islands will be of little benefit to penguins, especially if the fishing effort that traditionally occurred in these areas is simply displaced a few kilometres away. It may require a marked reduction in catches off the west coast or even a cut in the total fishing quota to make a significant difference for penguins and other predators. However, such interventions would have serious economic implications and thus face stiff opposition from the fishing industry. We don't know whether smaller no-take areas will be effective until they are tested. If they do work, the benefits will extend beyond African Penguins to the many other predators that depend on pelagic fish for food.



MARINE PROTECTED AREAS FOR SEABIRDS

The 1992 Rio Convention on Biodiversity called for 10 per cent of the sea to be protected, to match the target for terrestrial environments. However, despite many new Marine Protected Areas (MPAs) being proclaimed, only 0.6 per cent of the world's seas are currently protected. South Africa is doing better than most countries, with 1.6 per cent of its Economic Exclusive Zone set aside as reserves, but this is still well short of the target level. Coastal waters are well represented, with 20 per cent of the South African coast protected. But most MPAs extend only a few kilometres offshore, offering little benefit to pelagic species, including many seabirds.

The preponderance of coastal MPAs is largely pragmatic: they are easiest to manage and inshore waters typically face the greatest human impacts. Coastal MPAs provide arguably the most practical way to protect sedentary, near-shore species from over-exploitation, given the easy access to them by large human populations. Pioneering work in South Africa has demonstrated the benefits of coastal MPAs for heavily exploited reef fish. Populations of these largely sedentary fish recover quite quickly even in fairly small protected areas, and ultimately benefit commercial and recreational anglers by exporting recruits to adjacent areas.

But can MPAs be used to protect wide-ranging pelagic species such as seabirds and other top predators? This is a question which is currently challenging conservationists and fishery managers worldwide. Unlike benthic species that are tied to fixed features on the sea floor, the distributions of pelagic species tend to follow more ephemeral oceanographic features, such as fronts and eddies, where vertical mixing brings nutrient-rich waters to the surface, promoting production by phytoplankton. It's analagous to protecting nomadic birds in the Karoo, whose movements follow rainfall events. Conserving such dynamic systems is likely to require much larger protected areas – demanding a change in the mindset of fisheries and their managers. African Penguins provide an exciting test case, as they fall midway in the spectrum between inshore and pelagic species. It will be fascinating to see whether protecting the waters close to their colonies enhances the availability of their wide-ranging prey.

CHRIS VAN ROOYEN

GROWING pains

ALBERT FRONEMAN

...while breeding, adult penguins depend on a reliable source of food for themselves and their chicks close to the breeding island

ABOVE
Counts of moulting penguins provide a better index of population trends than breeding numbers, because all penguins moult each year, whereas some adults may not breed if conditions are unfavourable.

RIGHT
An immature African Penguin is harassed by an adult. Young penguins are often the target of adult aggression on land, probably an extension of their exclusion from adult feeding flocks at sea. Immatures lack the bold plumage and requisite skills to join adult feeding groups (see *Africa – Birds & Birding* 1(3): 44–50).

PREVIOUS SPREAD
After some initial setbacks, the mainland colony on the south coast at Stony Point, Betty's Bay, has seen rapid growth in recent years. In addition to providing nesting sites for more than 300 pairs of penguins, it is an extremely important moulting location for penguins that have built up their fat reserves on the abundant pelagic fish in the area. ▷

CHRIS VAN ROOYEN

ALBERT FRONEMAN

ALBERT FRONEMAN (2)

LIFE ON THE edge

As a result of the lack of food, penguin numbers off South Africa's west coast fell from almost 40 000 pairs in 2004 to barely 12 000 pairs in 2008. This calamitous decrease has led for calls to upgrade the species from globally Vulnerable to Endangered

ABOVE
An adult penguin appears to ponder its precarious future.

RIGHT
Penguins are pugnacious birds, often picking fights for little apparent reason (above). Hopefully this fighting spirit will see them through their current crisis. But despite the gloomy outlook, pairs still find time to relax on the beach (below).

PREVIOUS SPREAD
After a hard day's foraging, an adult African Penguin struggles erect, its belly bulging with food. Sadly for penguins breeding off the west coast of southern Africa, many adults battle to find sufficient fish, returning late in the evening with too little food for their chicks. □

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