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**Economic and Ecosystem Benefits of Some Marine Top Predators for Parties to the Benguela Current Convention**

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This synopsis briefly overviews the economic and ecosystem benefits of some marine top predators for states that are party to the Benguela Current Convention.

**Economic benefits**

***Turtles***

In former years, turtles in southern Africa were exploited for their meat, shells and eggs and in many instances fell to low levels of abundance. More recently, they have been of economic value as a tourist attraction (Hughes 1989). In 2013, it was estimated that marine turtle tourism contributed ZAR 15 million to the South African economy annually (Crawford et al. 2015).

***Seabirds***

Historically, harvests of penguin eggs and seabird guano were important industries in the BCLME (e.g. Shelton et al. 1984, van Sittert and Crawford 2003). However, following the collapse of the African Penguin, its eggs are no longer collected. Similarly, decreases of the main guano producers (Cape Gannet and Cape Cormorant) and, in the case of Namibia, the proclamation of the Namibian Islands' Marine Protected Area, have resulted in cessation of guano collections at islands, although guano is still harvested at platforms in Namibia that were especially constructed for this purpose (Figure 1). It is a sought-after natural fertilizer.



**Figure 1.** Seabird guano collected at the Swakopmund guano platforms (photo RJM Crawford).

Seabird tourism is a rapidly expanding industry in the Benguela Current Large Marine Ecosystem. In South Africa, Simon's Town (Boulders), Betty's Bay (Stony Point) and Robben Island provide opportunities for the public to observe African Penguins in their natural habitat and have become popular tourist destinations that generate socio-economic benefits through gate fees, provision of jobs at the colonies and associated tourism profits in surrounding areas (Lewis et al. 2012). For example, the colony at Simon's Town provided 885 jobs directly associated with the colony and expenditure related to the colony was approximately ZAR 311 million p. a., with a cumulative value of R 6.87 billion forecast over the next 30 years (van Zyl 2018). Other benefits of this colony include its contribution to the overall branding of Cape Town, enhanced property values in Simon's Town and the fostering of social-cultural values associated with this penguin colony (van Zyl 2018). In 2016, Boulders became the world's most-visited penguin colony.

The Stony Point penguin colony is also a popular tourist destination receiving on average 77,500 visitors per year (2010–2019, CapeNature, unpub. data). The restaurant associated with that colony is operated by the Mooiuitsig community and provides job opportunities where few alternatives exist. A planned upgrade to the facilities by CapeNature is likely to increase visitor numbers substantially, which will have various positive economic spin-offs for the communities in the Overstrand.

The Cape Gannet colony at Lambert's Bay is an important source of revenue for that community (Saul and Fortuin 2015). Boat-based seabird viewing operates out of several Namibian and South African ports, including Algoa Bay which provides dedicated trips around the largest African Penguin colony at St Croix Island. In 2013, it was estimated that seabird tourism contributed ZAR 125 million to the South African economy annually (Crawford et al. 2015) but given the subsequent figures obtained for Boulders this is more likely to be c. ZAR 500 million.

### ***Mammals***

Cape Fur Seals were one of the earliest marine mammals to be harvested in the BCLME. About 45,000 were killed by Dutch sealers near the Cape of Good Hope in 1610 (David 1989). Early sealing was unregulated and by the end of the 19<sup>th</sup> century Cape Fur Seals had probably been reduced to < 100,000 individuals and at least 23 island colonies had become extinct (Shaughnessy 1984, 1987). The first legal controls of sealing were implemented in South Africa in 1893 and in Namibia in 1922. The Sea Birds and Seals Protection Act of 1973 prohibited landing on islands and capture or killing of seals (and seabirds) without a permit. It enabled government to prescribe the age, size and sex of seals killed, as well as the season and localities where sealing may take place. Until 1965 most sealing was carried out by government, which then began to hand over concessions to private enterprise. By 1979 all concessions were in private hands. At that time the most valuable product was the skins of pups aged 7–10 months old. By the 1970s the seal population had recovered to allow annual harvests 62,000–81,000 pups. In addition to pups some bulls were taken. Besides skins the most important product of the industry was oil obtained by rendering down blubber. Meat-meal and bone-meal were produced and meat was used in pet food and sold as bait to fishers. Male genitalia were dried and sold in the Far East as a supposed aphrodisiac (David 1989). Based on pup counts there were approximately two million Cape Fur Seals in both 1993 and 2004, despite unfavourable feeding conditions in the northern Benguela during 1994–1995 and 2000–2001 that reduced birth rates and caused starvation of tens of thousands of seals, both pups and older individuals (Kirkman et al. 2007). Commercial harvesting ended in South Africa in 1999 but continues in Namibia (Wilson and Mittermeier 2014). The Cape Cross Seal Reserve in Namibia is a popular tourist attraction, while boat tours to watch seals and other wildlife, including dolphins, run from several harbours in Namibia and western South Africa (Figure 2). In 2013, it was estimated that seal tourism contributed ZAR 25 million to the South African economy annually (Crawford et al. 2015).



**Figure 2.** Cape Fur Seals at Lambert's Bay are best viewed by boat.

Whalers were hunting off Angola and Namibia before 1770 and off South Africa by 1771. Open-boat whaling stations operated around South Africa from 1792 to 1910, their principal target being Southern Right Whales, whose inshore population was quickly depleted. Land-based whaling stations became operative in the BCLME from 1909 and some functioned until 1975, when whaling in South Africa ceased. Inshore Humpback Whales were early targets, followed by rorquals (especially in the Western Cape and Namibia) and Sperm Whales (especially in Kwa-Zulu Natal) that were found farther out to sea. In the late 1920s South Africa commenced pelagic whaling from factory vessels in the Antarctic. However, both South African factory ships were requisitioned by the United Kingdom in World War II, one being sunk in 1941 and the other in 1944 (Best and Ross 1989). After cessation of whaling in the 1970s, whale watching became a multi-billion dollar global enterprise (Wilson and Mittermeier 2014). In the BCLME, operators run tours from several harbours and land-based whale watching benefits local economies, as in Hermanus, South Africa. In 2013, it was estimated that cetacean tourism contributed ZAR 505 million to the South African economy annually (Crawford et al. 2015). Boat-based dolphin watching has also increased in popularity in recent years in Algoa Bay, the so-called 'dolphin watching capital of the world' where up to 4 operators conduct tours in the bay to view mostly Common, Bottle-nosed and Humpback dolphins (Pichegru pers. comm).

### **Ecosystem benefits**

When breeding, seabirds and seals are central-place foragers that bring large quantities of nutrients from the ocean to their colonies. This influences the functioning of island and headland ecosystems and adjacent marine areas, e.g. through increasing algal growth and changing the structure of intertidal communities, which in turn increases the population sizes of some shorebird species (Bosman and Hockey 1988). Inputs by seabirds of nitrogen (N) and phosphorus (P) are substantial, with concentrations per unit of surface area among the highest measured on the Earth's surface. Furthermore, an important fraction of the total excreted N and P is readily soluble increasing the short-term bioavailability of these nutrients in coastal waters (Otero et al. 2018). Not only do seabirds have such beneficial bottom-up impacts but they also exert valuable top-down control. For example, they may select prey that are small or in poor body condition and by removing substandard individuals may ensure the long-term survival of prey populations (Tucker et al. 2016). Seabirds and marine mammals facilitate feeding by other species; e.g. African Penguins herd prey shoals upwards making them available to birds restricted to feeding near the surface (McInnes et al. 2019). Accordingly, large decreases in numbers of top predators, as have been observed for some species in the BCLME, will have detrimental consequences for ecosystem functioning.

Marine top predators are a potentially useful source of information for management of marine ecosystems, *inter alia* through informing marine spatial planning and ecosystem thresholds (e.g. Cury et al. 2011, Hindell et al. 2020). They are sensitive to ecosystem change and consequently have ability to provide indices of change and health of and marine ecosystems (e.g. Underhill and Crawford 2005, Durant et al. 2009). It is thought that monitoring appropriate top-predator indices will improve ability to monitor and predict environmental change and to manage changing ecosystems (Hazen et al. 2019). Moreover, data from land-breeding top predators are relatively inexpensive, easily obtained and often able to be collected more frequently and at a broader spatial scale than using ship-based surveys (e.g. Tavares et al. 2020).

Interactions between seabirds and their prey have generated interest in validating the use of seabirds as indicators of prey supplies (see reviews by Einoder, 2009; Montevecchi, 1993). The capacity for a seabird species to reflect variation in prey abundance depends on its degree of dietary specialization (Cairns, 1992), its foraging mode in relation to prey accessibility (Montevecchi, 1993) and the relative dominance of targeted prey species in the ecosystem (Reid, Croxall, Briggs, & Murphy, 2005).

Small pelagic fish in the Benguela Upwelling System are important prey for several linefish species which are of economic value to commercial, recreational, and small-scale fisheries. Significant effects of anchovy and sardine biomass on important linefish species have been demonstrated for silver kob, yellowtail and geelbeck (Parker et al. 2020).

Overharvesting of small pelagic fish can have detrimental effects on upwelling ecosystems as occurred in the northern Benguela following overfishing of small pelagics in Namibia during the 1960s and 70s. This led to a regime shift associated with an abundance of jellyfish which largely replaced the mid-trophic small pelagics, such as sardine (Roux et al. 2013). This had a significant effect on marine top predator populations, especially piscivorous seabirds such as African penguins and Cape Gannets, whose populations remain a fraction of what they were before overharvesting occurred in this region (Roux et al. 2013).

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