6

Ecologically or Biologically Significant Marine Areas (EBSAs)

Special places in the world's oceans

SOUTH-EASTERN ATLANTIC OCEAN

Areas described as meeting the EBSA criteria at the CBD South-Eastern Atlantic Regional Workshop, in Swakopmund, Namibia, 8 to 12 April 2013

UN environment programme

Convention on Biological Diversity

Published by the Secretariat of the Convention on Biological Diversity.
ISBN: 9789292257071

Citation: Secretariat of the Convention on Biological Diversity (2020). Ecologically or Biologically Significant Marine Areas (EBSAs). Special places in the world's oceans. Volume 6: South-Eastern Atlantic Ocean. Montreal: 108 pages.

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Layout and design: Em Dash Design, https://emdashdesign.ca/
Cover photo: Southern right whale mother with her calf, South Africa. Photo courtesy of Peter Chadwick www.peterchadwick.co.za

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Cape fur seals, Pelican Point, Namib Flyway. Photo courtesy of Rodney Braby

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** Note that at its twelfth meeting, in decision XII/22, the Conference of the Parties to the CBD requested the Executive Secretary to include in the EBSA repository (at www.cbd.int/ebsa) 44 of the 45 areas described during the workshop. As such, there is no EBSA number 14 in this booklet.*

Heaviside's dolphins. Photo courtesy of Simon Elwen

Olive ridley baby turtles, Parc Marin des Mangroves, Democratic Republic of the Congo. Photo courtesy of Catherine Trautes

ACKNOWLEDGEMENTS

The Secretariat of the Convention on Biological Diversity acknowledges, with thanks, the workshop participants from the following countries and organizations, who contributed their time and scientific knowledge to the description of the areas meeting the EBSA criteria presented in this booklet:

Angola, Benin, Cameroon, Congo, Côte d'Ivoire, Democratic Republic of Congo, Gabon, Liberia, Mauritania, Morocco, Namibia, Norway, Sao Tome and Principe, Senegal, Sierra Leone, South Africa, and Togo as well as the Abidjan Convention Secretariat, the United Nations Environment Programme Food and Agriculture Organization of the United Nations, Ocean Biodiversity Information System of the Intergovernmental Oceanographic Commission of UNESCO, South East Atlantic Fisheries

Organisation, Benguela Current Large Marine Ecosystem Project, Canary Current Large Marine Ecosystem Project, Fisheries Expert Group of the Commission on Ecosystem Management of the International Union for Conservation of Nature, Global Ocean Biodiversity Initiative, International Collective in Support of Fishworkers, BirdLife International, Centre de Suivi Ecologique de Dakar, Fondation Internationale du Banc d'Arguin–FIBA, Programme Gestion de Ressources Naturelles in Mauritania, Réseau Régional d'Aires Marines Protégées en Afrique de l'Ouest,WWF West Africa Marine Ecoregion Office, and the Commonwealth Scientific and Industrial Research Organisation.

The Secretariat would like to thank the governments of Norway, Japan (through the Japan Biodiversity Fund) and the United Kingdom of Great Britain and Northern Ireland for providing financial support to convene the workshop, and the Abidjan Convention Secretariat, the Food and Agriculture Organization of the United Nations and the South East Atlantic Fisheries Organisation for their collaboration on the organization of the workshop.

The Secretariat wishes to express its profound appreciation to the team from the Commonwealth Scientific and Industrial Research Organisation, Mr. Nic Bax, Mr. Piers Dunstan and Mr. Michael Fuller, for their outstanding scientific and technical support.

The Secretariat appreciates the generous financial assistance of the European Union, which has made this publication possible.

The Secretariat acknowledges with appreciation the author, Mr. Christopher Barrio Froján, who wrote the area descriptions, as well as staff members Joseph Appiott and Jacqueline Grekin, who edited and coordinated the production of the booklet, and Marketa Zackova, who compiled the images from various contributors. The Secretariat also thanks the Secretariat of the Global Ocean Biodiversity Initiative for facilitating the preparation of this booklet.

Grateful thanks are extended to those who kindly allowed the Secretariat to use their photographs in this booklet; photo credits are provided for each photograph. The Secretariat would also like to thank the following for their assistance: Peter Chadwick, Rémi Bigonneau, Simon Elwen, Rodney Braby, Robyn Adams, Catherine Trautes, Caroline Weir, Inna Moody, Tomas Kotouc, Derek Keats, Alicja Grabowska and Shannon Sutherland.

FOREWORD

Since 2011, the Secretariat of the Convention on Biological Diversity has embarked on an incredible journey around the world. Working in close collaboration with governments, United Nations agencies, international and regional organizations, and scientists, we have been on a quest to find and describe the "special places" of the ocean and seas—places that are crucial to the healthy functioning of the global marine ecosystem. Known as "ecologically or biologically significant marine areas", or EBSAs, they are defined by a set of seven criteria that were adopted at the ninth meeting of the Conference of the Parties to the Convention, in 2008.

Over the years, our collective work on EBSAs has helped to identify the areas that are most in need of enhanced management and further research. It has significantly advanced our understanding of these "special places" in the ocean and has provided a sound basis for actions by governments and competent authorities on where to focus their efforts to better conserve and sustainably use marine and coastal biodiversity.

In addition to describing these special places, the EBSA process has also provided many tangible co-benefits; it has facilitated regional-scale collaboration and information sharing, and catalysed new partnerships and research initiatives. It has been instrumental in coalescing various sources of information as well as identifying knowledge gaps, yielding important insights about the state of our knowledge of marine ecosystems and biodiversity.

The fruits of our efforts thus far can be seen on the EBSA website (www.cbd.int/ebsa). Yet, EBSAs are more than just shapes on a map; they are reflections of living, breathing ecosystems, the loss and degradation of which would undermine the functioning of the Earth's life-support system and compromise the ability of marine and coastal ecosystems to support sustainable economic growth and human well-being.

This booklet, which was produced with the kind support of the European Union, aims to paint portraits of the EBSAs described in this region, giving tangible character to the vast amounts of scientific data made available for describing these precious ecosystems. It aims, in short texts and evocative photographs, to capture the significance of these unique and complex systems.

The South-Eastern Atlantic Ocean region is home to three of the world's large marine ecosystems: the Benguela, Canary and Guinea currents. Where these mighty currents converge are vast, highly productive feeding grounds for creatures great and small. Also in this region are two of the four main areas of upwelling in the world—the Canary and Benguela upwelling systems—where cold, deep nutrient-rich water is forced to the surface, supporting the growth of phytoplankton and consequently very rich fisheries. Several UNESCO World Heritage Sites are to be found in this region, including the only waterfall in the world that cascades directly into the sea. Other notable areas include submarine canyons that connect the biodiversity of coastal and deepwater species, seamount chains to the north and south, highly productive river deltas and estuaries, and even a fossilized forest dating millions of years that provides a footing for cold-water corals. And there is plenty more where these came from!

I encourage you to read this booklet and gain a greater appreciation of the breadth, depth and complexity of the unique features of marine and coastal ecosystems in this region and their important roles in a healthy functioning planet.

Elizabeth Maruma Mrema
Executive Secretary, Convention on Biological Diversity

EBSAs: AN INTRODUCTION

The ocean encompasses 71 per cent of the planet's surface and a large portion of its habitable space. Whereas life on land is almost exclusively contained within a thin strip of breathable atmosphere overhead, in the ocean it is found from the waves that wash against the shore to the deepest canyons that plunge thousands of metres beneath the sea floor.

Life is found throughout the ocean, from coastal zones to the open sea, from coral reefs to kelp beds, in forms as varied as algae that cling to the underside of polar ice floes, humpback whales that migrate from the Antarctic to the equator and back.

The distribution of life in the ocean, however, is varied. Whether caressed by currents, sheltered by the shore, nurtured by nutrients, or heated by hydrothermal vents on the sea floor, some areas boast life that is more plentiful, diverse or unique than others.

The top 100 metres of the open ocean hosts the great majority of the sea life with which we are more familiar—turtles, fish and marine mammals—as well as the microscopic plankton that form an integral part of the ocean food web and provide so much of the oxygen that we breathe. Far below the surface, in the dark depths, seamounts—underwater mountains that rise 1,000 m or more from the ocean floor—provide habitat for rich and diverse communities. Hydrothermal vents and cold-water seeps form the basis of unique ecosystems and species that might seem to belong more comfortably in a science fiction movie than the real world.

Much of this unique and special biodiversity is facing major threats, however, such as habitat destruction, overfishing, pollution and climate change. The global community has recognized the need to address these threats and to take measures to support the health and well-being of marine and coastal biodiversity.

Walvis Bay lagoon, Namibia. Photo courtesy of Skyhawk Photography

In order to protect and preserve marine biodiversity effectively, we need to know where to focus and prioritize conservation and management. We must have a good understanding of the many different types of marine ecosystems in different regions, including which areas are the richest in life, which boast the greatest diversity and abundance of species, and which possess the rarest species and the most unique communities of marine flora and fauna.

It is in this respect that the work of the CBD on ecologically or biologically significant marine areas (EBSAs) plays a key role. In 2008, the Parties to the CBD adopted a set of seven scientific criteria to be used in identifying EBSAs. The EBSA criteria are as follows:

1	Uniqueness or rarity
2	Special importance for life history stages of species
3	Importance for threatened, endangered or declining species and/or habitats
4	Vulnerability, fragility, sensitivity, or slow recovery
5	Biological productivity
6	Biological diversity
7	Naturalness

These criteria provide guidance on the key types of features to be considered when identifying areas that are critically important to the functioning of marine ecosystems.

In 2010, the Parties to the CBD requested the CBD Secretariat to collaborate with Parties, other Governments and a range of partners in different regions in convening regional workshops to facilitate the description of EBSAs using the EBSA criteria. Through an inclusive and science-driven process involving experts from all over the world and an enormous amount of scientific data, these regional EBSA workshops have described the areas of the oceans that are the most crucial to the healthy functioning of the global marine ecosystem.

Fishing boat, Senegal. Photo courtesy of David Johnson

EBSAs can be as varied as the life within them. They can address large ocean areas or individual features. They can be static or move with seasonal variations in certain oceanographic features. But they all, in one way or another, have been described as important in the context of one or more of the seven EBSA criteria.

Furthermore, there are many different types of measures that can be used in regard to the EBSAs. These include, but are not limited to, marine protected areas and other area-based management tools, impact assessments and fisheries management measures.

The description of an area as meeting the EBSA criteria is a scientific exercise aimed at supporting the prioritization of management efforts of governments and relevant authorities. It does not necessarily mean that new management measures will be put in place, and it does not prescribe what types of management measures should be used.

This booklet is the sixth in a series (available at **www.cbd.int/marine**) intended to capture the essence of oceanic areas that are the most ecologically or biologically significant around the world, distilling hundreds of pages of data compiled by experts into an easily accessible and

informative format. It provides summaries of the areas described during the South-Eastern Atlantic Regional Workshop to Facilitate the Description of Ecologically or Biologically Significant Marine Areas, which took place in Swakopmund, Namibia, from 8 to 12 April 2013.

The workshop was organized in collaboration with the Abidjan Convention Secretariat, the Food and Agriculture Organization of the United Nations (FAO) and the South East Atlantic Fisheries Organisation (SEAFO), and hosted by the Government of Namibia, with the financial support of the Governments of Norway, Japan (through the Japan Biodiversity Fund), and the United Kingdom of Great Britain and Northern Ireland. Scientific and technical support was provided by a team from the Commonwealth Scientific and Industrial Research Organisation. The workshop was co-chaired by Ms. Charlotte Karibuhoye (Fondation internationale du Banc d'Arguin – FIBA) and Mr. Abou Bamba (Abidjan Convention Secretariat) and attended by experts from Angola, Benin, Cameroon, Congo, Côte d'Ivoire, Democratic Republic of Congo, Gabon, Liberia, Mauritania, Morocco, Namibia, Norway, Sao Tome and Principe, Senegal, Sierra Leone, South Africa, and Togo as well as the Abidjan Convention Secretariat, the United Nations Environment Programme (UNEP), Food and Agriculture Organization of the United Nations (FAO), OBIS-UNESCO/IOC, South East Atlantic Fisheries Organisation (SEAFO), Benguela Current Large Marine Ecosystem Project (BCLME), Canary Current Large Marine Ecosystem Project, Fisheries Expert Group of the Commission on Ecosystem Management of the International Union for Conservation of Nature (IUCN-CEM-FEG), Global Ocean Biodiversity Initiative (GOBI), International Collective in Support of Fishworkers, BirdLife International, Centre de Suivi Ecologique de Dakar, Fondation Internationale du Banc d'Arguin–FIBA, Programme Gestion de Ressources Naturelles (ProGRN) in Mauritania, Réseau Régional d'Aires Marines Protégées en Afrique de l'Ouest (RAMPAO) and WWF West Africa Marine Ecoregion Office (WAMER). The full report of this workshop is available at: **www.cbd.int/doc/meetings/mar/ebsa-sea-01/official/ebsa-sea-01-04-en.pdf**.

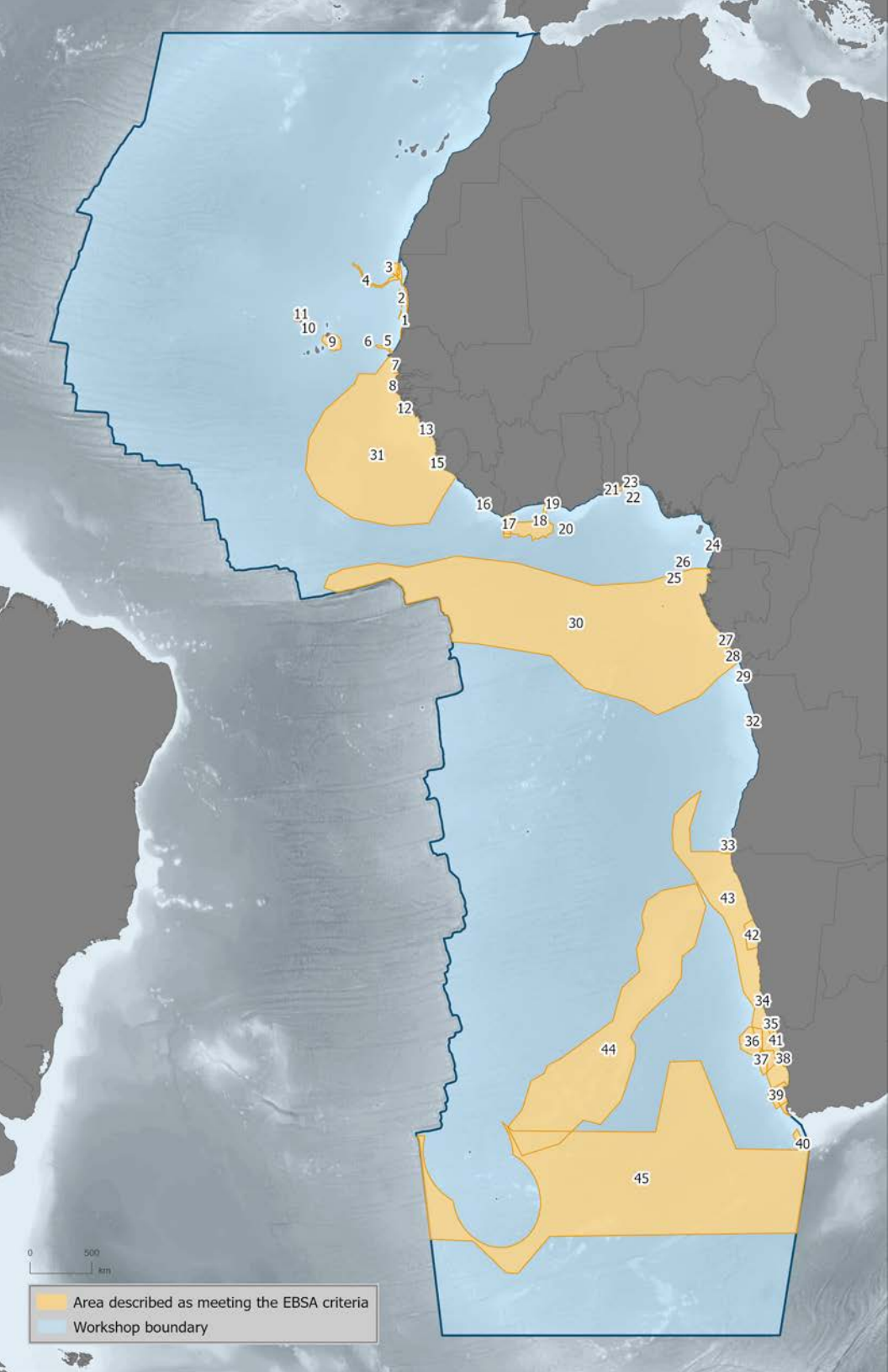
To find out more about this and other work on EBSAs under the Convention on Biological Diversity, see **www.cbd.int/ebsa**.

THE SOUTH-EASTERN ATLANTIC OCEAN

Over the centuries, the waters off the western coast of Africa have witnessed their fair share of human endeavour. However, despite the turmoil and strife brought about by past European exploration and expansion efforts, the natural world has stood steadfast in stoic endurance.

It is easy to imagine the iconic African wildlife roaming the parched grassy plains or lazing around lush steamy jungles, but they are no match for the multitude of charismatic species and habitats lurking beneath the surf. So forget the lion, the gorilla and the elephant; never mind the Sahara and Serengeti; this is the realm of the crocodile, the manatee and the humpback whale; let the Gulf of Guinea into the limelight, this is the age of the Benguela Current!

All along the West African shore, baby sharks and forage fish, protected from predators in shallow estuaries and lagoons, fatten up before facing their adult lives in the open ocean. In deeper, mangrove-lined channels, hippos with a taste for saltwater come face-to-face with manatees, while watchful crocodiles skulk on the banks. The mangrove forest canopy is a cacophony of roosting seabirds, while its mangled roots act as a living maze for crabs and molluscs. Sun-kissed beaches up and down the continent conceal the next generation of marine turtles as their buried eggs are incubated in the sand. Offshore, dense schools of plankton-gulping fish follow their food as it blooms in swirls of fertilizing nutrients surging from the depths. Dolphins, sea lions and tuna fish are never far behind, corralling their prey into ever-shrinking bait-balls. Canyons and seamounts slash and dot the continental shelf, entraining currents, snaring nutrients and providing a wormhole between otherwise disconnected habitats. Corals and sponges cling to the cliffs of these underwater structures, trapping any passing particle. The big blue ocean beyond the continental margin is far from barren and is on the migratory circuit for many oceanic wanderers, including—unsurprisingly—wandering albatross, as well as humpback whales and leatherback turtles.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Workshop boundary

MAP OF WORKSHOP BOUNDARY AND AREAS MEETING THE EBSA CRITERIA IN THE SOUTH-EASTERN ATLANTIC OCEAN

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1. Coastal Habitats of the Neritic Zone of Mauritania and the Far North of Senegal
2. Cold-Water Coral Reefs off Nouakchott
3. Permanent Upwelling Cell in Northern Mauritania
4. Timiris Canyon System
5. Cayar Seamount
6. Cayar Canyon
7. Saloum Delta
8. Mouth of the Casamance River
9. Island of Boavista
10. Santa Luzia, Raso and Branco Complex
11. Santo Antão, North-West Region
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16. Rivercess-Greenville Turtle-breeding Ground
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18. Abidjan Canyon and Bottomless Pit
19. Shrimp and Sardine Route from Tabou to Assinie
20. The EEZ off the Coast of Côte d'Ivoire
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22. Bouche du Roi – Togbin
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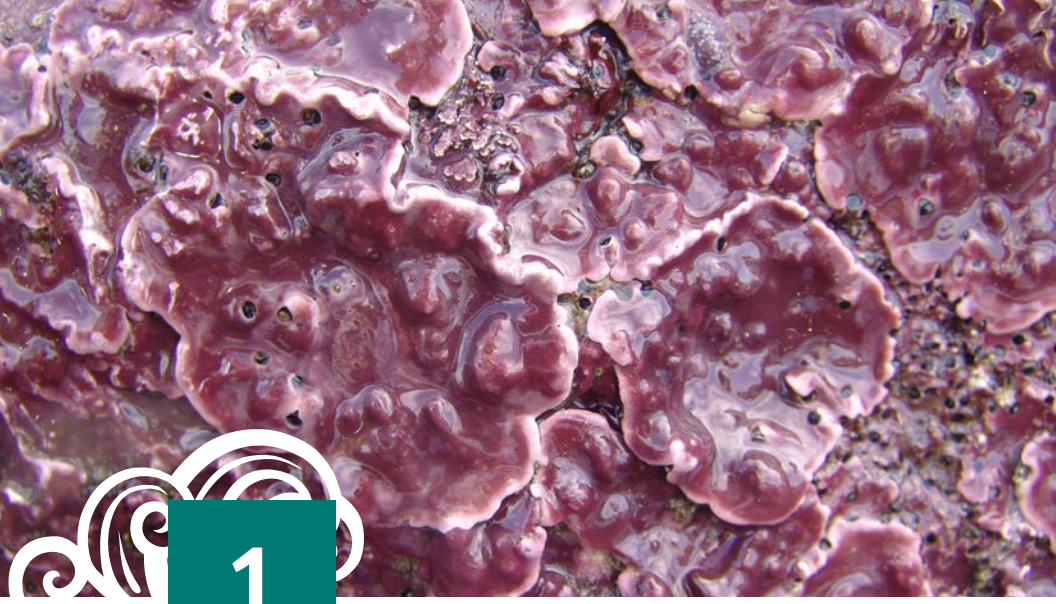
32. Ramiros-Palmeirinhas Coastal Area
33. Kunene-Tigres
34. Namibian Islands
35. Orange Cone
36. Orange Shelf Edge
37. Childs Bank
38. Namaqua Coastal Area
39. Cape Canyon and Surrounds
40. Browns Bank
41. Namaqua Fossil Forest
42. Namib Flyway
43. Benguela Upwelling System
44. Walvis Ridge
45. Subtropical Convergence Zone

** Note that at its twelfth meeting, in decision XII/22, the Conference of the Parties to the CBD requested the Executive Secretary to include in the EBSA repository (at www.cbd.int/ebsa) 44 of the 45 areas described during the workshop. As such, there is no EBSA number 14 in this booklet.*

Map courtesy of Marine Geospatial Ecology Lab, Duke University



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Coralline red algae. Photo courtesy of Dr. Gavin W. Maneveldt, University of the Western Cape

COASTAL HABITATS OF THE NERITIC ZONE OF MAURITANIA AND THE FAR NORTH OF SENEGAL

The extensive shallow-water platform off the coast of Mauritania in northwest Africa has long been recognized as a priceless jewel in the continent's crown of spectacular wildlife habitats. Part of this natural wonder has already been designated a UNESCO World Heritage Site and a national park. Describing the area as an EBSA imbues this jewel with extra sparkle.

Over thousands of years, the shelly remains of countless generations of molluscs and barnacles have been shuffled along the north-west African coast by waves and currents, only to settle layer on layer in vast undulating deposits off Mauritania. This submerged chalky platform is known as the "Banc d'Arguin", and it provides shallow, stable substrate for meadows of seagrass and maerl (a coralline red algae), and plentiful feeding grounds for shrimp, fish, guitar fish, sharks, rays, turtles and seabirds. Atlantic humpback dolphins (*Sousa teuszii*) frequent the area, and there is even a self-sustaining population of Mediterranean monk seals (*Monachus monachus*), the world's rarest seal species. Both these species and several others that have been observed there are at high risk of extinction, and are therefore included on the IUCN's Red List of Threatened Species.

Wintering and migratory birds flock to feed in the shallows in their millions, while many, such as the Caspian tern (*Hydroprogne caspia*), royal tern (*Sterna maxima*) and the grey-headed gull (*Chroicocephalus cirrocephalus*), also use the adjacent land to nest and rear their young. Coastal human settlements also take advantage of the area's high productivity, with a well-established artisanal octopus fishery. Other low-impact maritime activities are present, although it is the threat of degradation by indirect means, such as oil spills from passing tankers and marine litter, that poses the greatest risk to the easily damaged and slow-to-recover ecosystem.

This EBSA stretches from Cap Blanc, off the coast of northern Mauritania, southwards all the way to the mouth of the Senegal River in northern Senegal. Its seaward boundary follows the contour of the edge of the Banc d'Arguin.

Mediterranean monk seal. Photo courtesy of P. Dendrinos/Mom, licensed under CC BY-NC-SA 4.0, World Register of Marine Species

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Deep-sea crab. Oceana Ranger 2012: Expedition to the deep-sea. Photo courtesy of OCEANA

COLD-WATER CORAL REEFS OFF NOUAKCHOTT

As the steep-sided flanks of the west African continental slope deflect deep ocean currents upwards towards the sunlit surface, the nutrients in the water fertilize a bloom of algal growth that kick-starts a cascade of productivity down the food chain. The favour is returned to the flanks by the gentle sinking of detritus from above—often referred to as "marine snow"—which sustains banks of filter-feeding corals that grow in pitch darkness into massive deep-sea fringing reefs.

Deep-water coral. Photo courtesy of Bioluminescence 2009 Expedition, NOAA/OER, NOAA Photo Library, licensed under CC BY 2.0

The living reef is located at a depth of 600 m and grows atop the fossilized remains of previous generations dating back at least to the last ice age. Amongst the coral, primarily the reef-building, deep-water coral (*Lophelia pertusa)* and zigzag coral *(Madrepora oculata)*, nestle long-lived, giant deep-sea oysters (*Neopycnodonte zibrowii*) and leggy deep-sea crabs (*Paramola cuvieri*). Deep-sea sharks and other fishy denizens of the deep also use the reef for protection and shelter. Above them, migrating whales and sea turtles add to the marine snow that sustains the corals, while shoals of sardines scurry along the coast in their thousands.

The coral structures are fragile and can be vulnerable to disturbance from deep-sea fishing activities like bottom trawling, which are in their infancy in the region. Also on the continental slope are oil and gas operations, which could be a cause for concern. Any physical or chemical damage to the reef community takes several decades to remedy, as many of the species are slow-growing and reproduce at a relatively old age. Because of this, some of these species are included on the IUCN Red List of Threatened Species.

This EBSA comprises several long, thin segments encapsulating the main isolated coral-reef outcrops along the continental slope. The EBSA also includes the Banda and Timiris seamounts. Altogether, the EBSA segments stretch over a distance of 400 km.

3

Horse mackerel. Photo courtesy of Dennis King

PERMANENT UPWELLING CELL IN NORTHERN MAURITANIA

The area of permanent upwelling off the coast of Cap Blanc in northern Mauritania is commonly known as the Canary Upwelling System, and it is one of only four permanent upwelling areas in the world (the others being the California, Humboldt and Benguela Upwelling systems). It is named after the Canary Islands, which disrupt the southward flow of the prevailing Canary Current.

Upwelling occurs when trade winds and water currents conspire to force surface layers of sea water away from land, only for these layers to be replaced by cooler water drawn up from the deep. The upwelled water is rich in dissolved nutrients, which planktonic algae at the surface are keen to exploit for their own rapid growth and reproduction. The increased primary production of algae attracts grazers and, in turn, their predators, including the largest animals in the ocean. In this regard, the Canary Upwelling System does not disappoint, being host to forage fish (sardine, sardinella, anchovy and mackerel), tuna, swordfish, sailfish, sunfish, sharks, rays, dolphins, beaked whales, sperm whales and blue whales, as well as sea turtles, seals and seabirds. Due to their scarcity, many of these emblematic species are listed on the IUCN's Red List of Threatened Species.

The area encompassed by this EBSA is traversed by busy shipping routes to and from Europe. This intensity of maritime traffic poses an elevated risk of pollution by accidental discharge of fuel, cargo or ballast water. There is also industrial fishing in the area by vessels keen to take a share of the bounty.

Manta ray. Photo courtesy of Derek Keats, licensed under CC BY 2.0, Flickr

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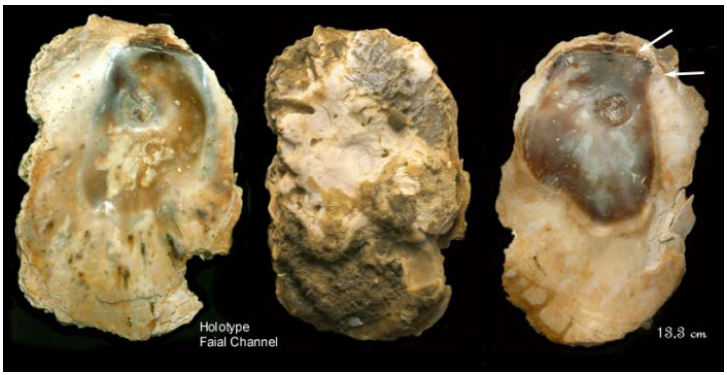
Zigzag coral. Photo courtesy of NOAA

TIMIRIS CANYON SYSTEM

The recent discovery of a spectacular 450 km long submarine canyon off the coast of Mauritania has spurred scientists to question how it may have formed; indications suggest that there was once a mighty river system draining the western Sahara Desert and flowing into the Atlantic Ocean. The ancient river has long since run dry, but the underwater canyon itself still allows water, animals and sediments to flow between the coastal shallows and the ocean abyss.

The Cap Timiris Canyon runs jaggedly from west to east cutting a deep gash into the west African continental shelf and slope. Its steep flanks, up to 250-300 m tall and between 2 and 7 km apart, are encrusted with cold-water coral reefs, formed mostly of reef-building, deep-water coral (*Lophelia pertusa)* and zigzag coral *(Madrepora oculata)*. Living within this thicket of coral is one of the longest-lived animals in the world, the giant deep-sea oyster (*Neopycnodonte zibrowii*), which can live up to 500 years. Deep-sea crabs (*Paramola cuvieri*), spiny lobsters (*Palinurus mauritanicus*) and the coral-associated clam *Acesta excavata* also thrive amongst the coral branches and canyon crevices. The entire coral assemblage benefits from the nearby areas of upwelling that deliver nutrients to the surface, where productivity booms and its detritus sinks to sustain the corals. The canyon itself also channels the upwelling currents and their life-giving nutrients far closer to shore that they would otherwise reach, in turn attracting shoals of sardines, tunas, seabirds, whales and dolphins.

Given the area's natural ability to concentrate productivity by channelling upwelling currents, its function as a highway between the deep-sea and shallow coastal habitats, and considering the fragility and longevity of the coral reef structures that cling onto the canyon flanks, the habitats and fauna within this EBSA are particularly vulnerable to the damaging effects of trawling and of chemical pollution from nearby oil and gas extraction. So far, however, such activities are fairly limited.



Giant deep-sea oyster. Collected by submersible "Lula" in 2006. Photo courtesy of World Register of Marine Species, licensed under CC BY-NC-SA 4.0

5

CAYAR SEAMOUNT

Not far off the coast of Senegal, just as the base of the steep continental slope starts levelling out towards the abyss, the seabed juts skywards to create three distinct seamounts. In their splendid isolation, this towering trinity provides an irresistible pit-stop for many a passing predator.

Seamounts are renowned for interfering with water currents, forming obstacles that force water to swirl and mix around them, and in the process creating ideal conditions for filter-feeding animals like corals that thrive in the steady supply of nutrients in the current. Where there are corals there are reef fish and countless other critters enjoying the high-rise life, and where there are fish there are predators. Tuna, sailfish (*Istiophorus platypterus*) and swordfish (*Xiphias gladius*) chase schools of silvery forage fish such as sardines, sardinella and mackerel. On the steep-sided seabed, octopus, shrimp, crabs and spiny lobsters scurry around the crevices, ever watchful of passing grouper (*Epinephelus aeneus*), grunts (*Pomadasys* spp) and gulper sharks (*Centrophorus granulosus*). Wandering oceanic sharks, whales and sea turtles are also regular visitors, keen to recharge their energy reserves. Like many isolated seamounts around the world, the Cayar seamounts are likely to host a higher-than-average number of species that are found nowhere else in the world (endemic).

Atlantic mackerel, Cayar, Senegal. Photo courtesy of Jacqueline Grekin

Some of the charismatic visitors to this EBSA are globally rare and are therefore listed on the IUCN Red List of Threatened Species. All species that inhabit the area, especially the long-lived and slow-growing ones, are vulnerable to the effects of the growing commercial trawl fishery operating out of Senegal. Detrimental effects of the less intense sport and artisanal fisheries are less of a threat at present.

Marbled electric ray. Photo courtesy of Andrew Levin

6

CAYAR CANYON

The narrow continental shelf and slope off the coast of northern Senegal is notably featureless, except for a formidable canyon that brings the deep sea almost right up to the beach of Cayar Town.

Step into the water at Cayar beach and within 10 m from the shoreline the water is already 50 m deep. This astonishing drop-off marks the head of the canyon that stretches more than 200 km out to sea, with a maximum gradient of 100 m drop for every 1 km travelled. At its furthest end the water depth is 4,500 m. Along its length, cold, nutrient-laden waters from the abyss are funnelled upslope, fertilizing planktonic blooms that sustain an entire food chain, from tiny sprat to mighty whales. Many fish species, such as sardines, seabream, mackerel and white grouper, use the relative safety of the canyon to spawn and as a nursery for their young. Other species, such as whales and sea turtles, use the landmark as a staging post, to rest and replenish on their long trans-oceanic migrations. Lurking in the murky depths are rare, deep-sea sharks and rays, which are seldom seen so close to shore.

All along the beach at Cayar there is a line-up of multi-coloured artisanal fishing boats, attesting to the productivity of the waters offshore. This EBSA is also frequented by industrial fishing boats, increasing the vulnerability of fish stocks to overexploitation. Lamentably, the same canyon that brings the deep ocean so close inshore also fast-tracks anthropogenic waste and pollution to the deep ocean; however, the canyon feature as a whole is reputed to be relatively pristine.

Fishing boats on a beach in Senegal. Photo courtesy of Jacqueline Grekin

Grey-headed gull. Photo courtesy of Rémi Bigonneau

7

SALOUM DELTA

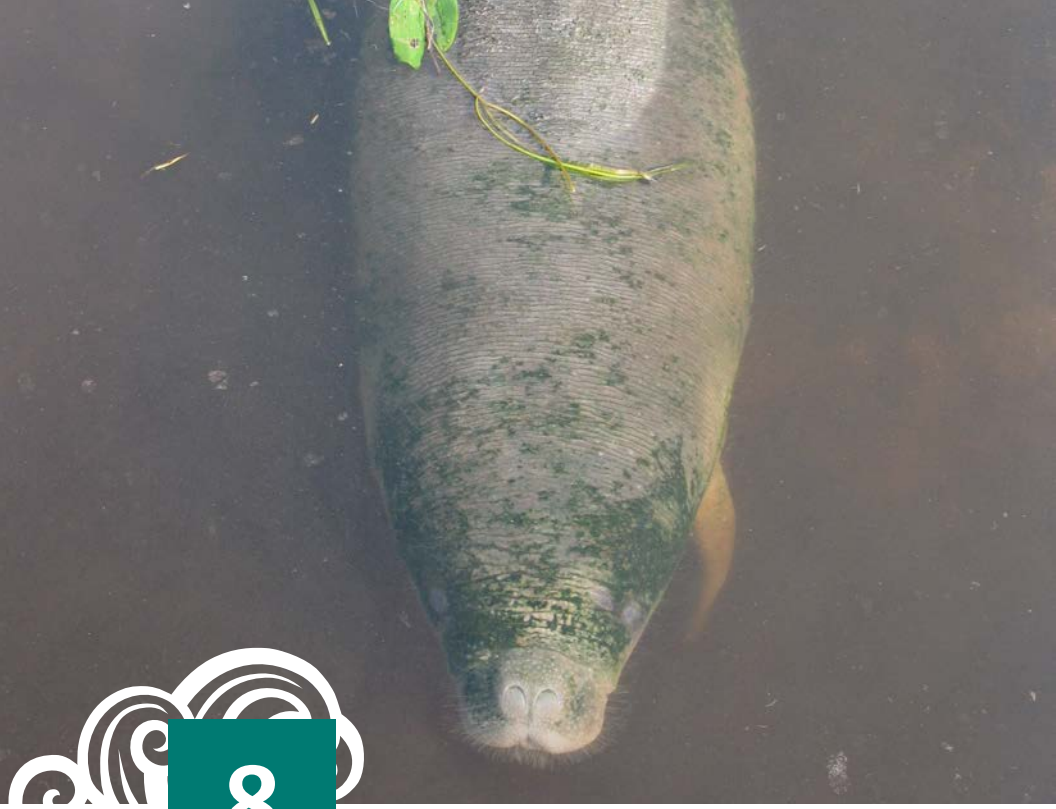
The interface between sea and land has never been fuzzier than in coastal wetlands, where the boundary shifts with every tide. Such dynamic conditions offer ample opportunity for animals and plants to specialize in all manner of niches. The islands, mudflats, mangroves, sandbars, tidal channels and brackish backwaters of the Saloum Delta in Senegal are no exception.

Mangroves offer some stability to the shifting landscape, trapping sediment and nutrients as they grow. Their tangled roots provide a substrate and act as a protective cage for countless molluscs, crabs and small fish eager to escape predation; several oceanic fish species, such as sharks, seek out submerged mangrove root habitats to use as nurseries. The mangrove canopy at Saloum also provides nesting sites for migratory seabirds such as Caspian and royal terns

(*Hydroprogne caspia*, *Thalasseus maximus*), and grey-headed and slender-billed gulls (*Chroicocephalus cirrocephalus*, *C. ganei*). Below the water, seagrass beds also stabilize the seabed and sustain their own cast of residents, from shrimp and crabs to sea snails and cuttlefish. Six species of sea turtle are known to visit the area to graze on seagrass, joining the resident African manatees (*Trichechus senegalensis*). These larger animals are included on the IUCN's Red List of Threatened Species due to their rarity and vulnerability to certain human activities.

Human activities within this EBSA, such as fishing and harvesting of eggs and wood, are intense, although are not practiced on an industrial scale. The natural complexity and cultural significance of the delta have also been recognized by UNESCO, which has declared it a World Heritage Site; Senegal has also designated it a national park.

Aerial view of the mangroves in Saloum Delta, Senegal. Photo courtesy of Jean Goepp - Nébéday



West African manatee. Photo courtesy of Lucy Keith-Diagne

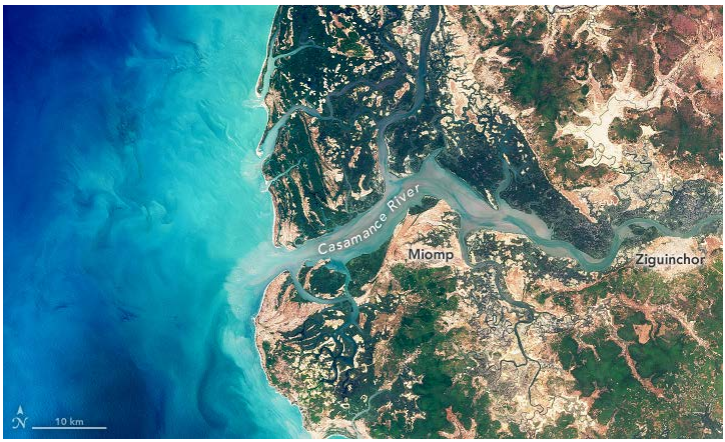
8

MOUTH OF THE CASAMANCE RIVER

The mouth and estuary of the Casamance River in southern Senegal provide an ideal nursery ground for a number of fish species that form a major food resource for offshore seabirds, tuna, dolphins and whales. The provision of sustenance and protection by the estuary to growing hordes of hungry juveniles is an important function not to be underestimated.

As well as providing food, shelter, egg-laying sites and juvenile habitat for countless forage fish, such as sardines, mackerel and false scad (*Sardinella aurita*, *Sardinella maderensis*, *Trachurus trecae*, *Decapterus rhonchus*), this EBSA also attracts and supports numerous species of breeding sea and water birds that nest in the mangrove-lined shores; of particular note is the ground-nesting great white pelican (*Pelecanus onocrotalus*). Green sea turtles (*Chelonia mydas*) travelling up the African coast also nest on the soft sandy banks and beaches of the estuary, while African manatees (*Trichechus senegalensis*) lurk in slow-motion in the shallows. The juveniles of predators like white grouper (*Epinephelus aeneus*) sharks and rays also thrive on their bountiful prey. The transfer of energy and nutrients embodied by the feeding and growth of millions of juvenile fish in the estuary and their eventual journey offshore to form part of the oceanic food web is one of the most remarkable natural phenomena on the coast of West Africa. Many of the species that use this area as a nursery are listed on the IUCN's Red List of Threatened Species.

The mangroves, beaches and shallows of the Casamance River mouth and estuary are used and exploited by the local human population, although not at an industrial level. Offshore artisanal fishing is a common and productive enterprise, however activities by the oil and gas industry along the coast are of concern.



Casamance river. NASA Earth Observatory images by Joshua Stevens, using data courtesy of David Lagomasino/NASA Goddard Space Flight Center, and Landsat data from the U.S. Geological Survey.

9

Boa Vista Island, Cape Verde. Photo courtesy of Sabino Parente

ISLAND OF BOAVISTA

Boavista Island is the most easterly island of the Cape Verde archipelago, situated off the coast of Senegal. Its golden sandy beaches are a magnet for savvy sun-worshipers, but their true golden treasure lies beneath the surface: millions of buried sea-turtle eggs.

The sandy beaches along the southern coast of the Island of Boavista are the prime nesting ground for the loggerhead sea turtle (*Caretta caretta*) in the whole of western Africa, which also makes it a site of global significance for the species. Between bouts of egg-laying, the turtles enjoy another significant feature: the most extensive tropical shallow coral reef in the eastern Atlantic Ocean, where they can feed, rest and mate. The reef, with its diverse assemblage of colourful corals and reef fish, covers the clear coastal shallows and seamount tops, attracting countless shark

and fish species from the surrounding ocean, as well as breeding and calving humpback whales (*Megaptera novaeangliae*). The skies above are no less spectacular, with magnificent frigate birds (*Fregata magnificens*) harassing other seabirds on the wing for their catch. The endemic Cape Verde shearwater (*Calonectris edwardsii*) breeds exclusively on the archipelago, only to disperse throughout the southern Atlantic Ocean during the non-breeding season.

Both the beaches and the coral reefs within this EBSA are vulnerable to the effects of the growing tourism industry on the islands — recreational fishing and disturbance of turtle-nesting sites being the prime detrimental human activities.

Top: Cape Verde shearwater. Photo courtesy of Rémi Bigonneau
Bottom: Loggerhead sea turtle, Cape Verde. Photo courtesy of Project Biodiversity

10

Hawksbill sea turtle, São Vicente, Cape Verde. Photo courtesy of Susana Martins

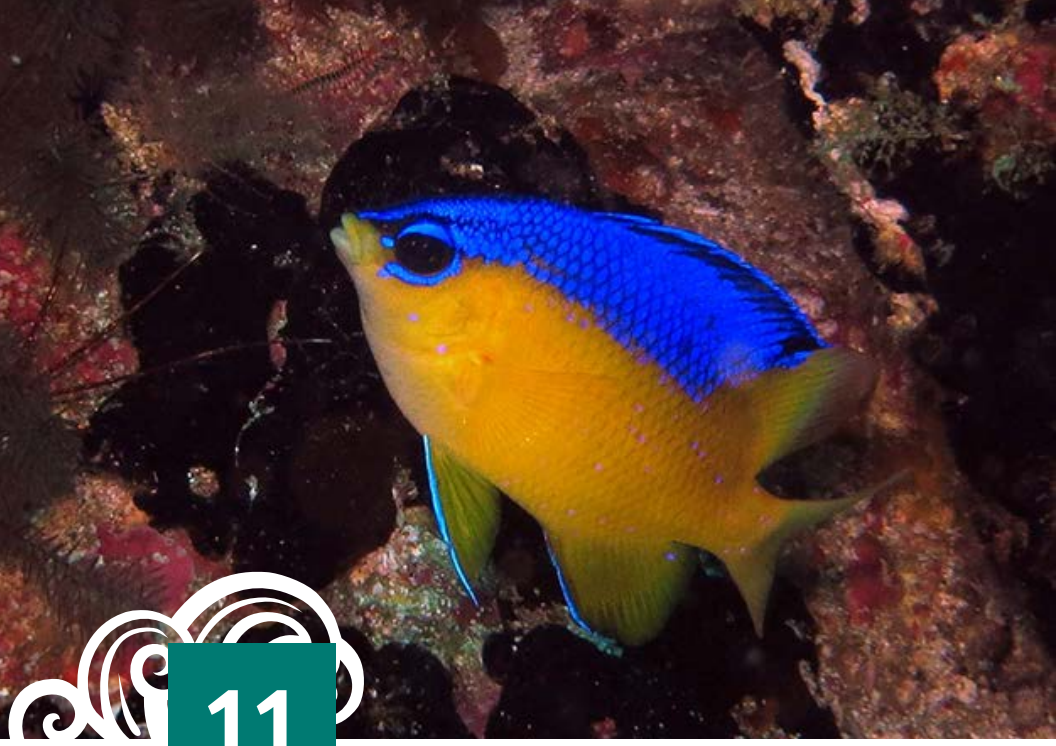
SANTA LUZIA, RASO AND BRANCO COMPLEX

Three tiny uninhabited volcanic islands in the north-eastern extent of the Cape Verde archipelago, off Senegal, have been set aside for the protection of the diverse and pristine natural ecosystem they represent.

Brown booby. Photo courtesy of Ray Pierce

Devoid of fresh water and dense plant cover, the islands of Santa Luzia, Raso and Branco are of little interest to the Cape Verdean human population, leaving the islands free for wildlife to flourish. Endemic songbirds and lizards flit and scurry over the rocks, while seabirds, such as the Cape Verde shearwater (*Calonectris edwardsii*) and the brown booby (*Sula leucogaster*), rear their young on the island's ledges and forage over the bountiful sea. Beneath the waves, five species of sea turtle have been observed, including the green and loggerhead species. The coral reefs and sandy beaches on nearby islands provide them with ample opportunity to feed, rest and lay their eggs. Dolphins and whales are also known to frequent the area.

The undisturbed natural beauty of this EBSA has been recognized by the Government of Cape Verde, which has declared the area around all three islands as an Integral Nature Reserve. The area is also being considered for inclusion in UNESCO's network of World Heritage Sties.



11

Cape damsel, São Vicente Island, Cape Verde. Photo courtesy of Dr. Peter Wirtz

SANTO ANTÃO, NORTH-WEST REGION

Santo Antão is the westernmost island of the Cape Verde archipelago, situated off the coast of Senegal. Jutting into the Atlantic Ocean, its underwater westward extension is peppered with seamounts and gouged by canyons.

Lubbock's chromis, Cape Verde. Photo courtesy of Dr. Peter Wirtz

The complexity of the underwater landscape as it slopes down towards the mid-Atlantic abyss creates obstacles that deflect oceanic currents, which in turn promotes the mixing of water masses and provides fertilizing nutrients to blooming clouds of plankton at the sea surface. Thriving plankton is grazed upon by schools of forage fish that are themselves food for tuna, dolphins and seabirds; sharks and whales are never far from any feeding frenzy. With all this activity in the water, there is plenty of nourishment that reaches the sea floor, where deep-sea corals and other filter-feeding animals stick their proverbial tongues out into the "snow". Deep-sea coral reefs attract their own cast of residents and visitors seeking food, shelter or company, some of which occur nowhere else on Earth – the Cape damsel fish (*Similiparma hermani*), for example. The availability of food for all-comers, including five species of sea turtle and 30 species of whales and dolphins, is the area's main attraction. Many of the species that frequent the area appear on the IUCN Red List of Threatened Species.

There is considerable fishing effort in the area from the fishers of Cape Verde, with resultant concern over the potential damage to the shallow, and therefore vulnerable, coral-encrusted tops of seamounts.

12

Royal terns, Sandwich terns and Caspian terns, Bissagos Archipelago. Photo courtesy of Rémi Bigonneau

BISSAGOS ARCHIPELAGO

The last emergent remnants of a vast ancient river delta, the Bissagos Islands, located off the coast of Guinea-Bissau, are truly remarkable for the number and variety of coastal habitats they contain. The animals that make this kaleidoscopic archipelago their home are no less diverse and unique.

Mangrove forests, palm forests, dry forests, coastal savanna, sand banks, beaches, mudflats, brackish streams and tidal channels all merge seamlessly into one another to create a patchwork of productivity for all who live in it. In the trees and on the shoreline, thousands of overwintering birds, such as terns, curlews and sandpipers, gorge

themselves on worms, shrimp and clams in readiness for their return to the Siberian summer. Juvenile forage fish dart through the maze of tidal channels before embarking on their adult lives out at sea, while juvenile sharks and rays perfect their predatory pounces. The extensive, undisturbed mudflats and shallows are amongst the last sanctuaries along the west African coast for the smalltooth sawfish (*Pristis pectinata*). African manatees (*Trichechus senegalensis*) meander amongst the mangrove-lined waterways, ever mindful of meeting the uncommonly marine population of common hippopotamus (*Hippopotamus amphibius*). Five species of marine turtles, including green, olive ridley *(Lepidochelys olivacea)*, hawksbill (*Eretmochelys imbricate),* leatherback and loggerhead (*Caretta caretta)*, are known to lay their eggs on the numerous beaches and sandbanks. The shy Atlantic humpback dolphin is perfectly at home in the calm and plentiful shallows.

Almost all of the large charismatic and migratory species that inhabit this EBSA are classed as globally threatened on the IUCN's Red List of Threatened Species. Artisanal and industrial fishing efforts, together with natural coastal erosion, are some of the few threats that affect the area. The archipelago has been declared a UNESCO Biosphere Reserve.

Bissagos islands and Guinea-Bissau. Photo courtesy of USGS/ESA, licensed under CC BY-SA 3.0 IGO

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Goliath heron. Photo courtesy of Derek Keats, licensed under CC BY 2.0, Flickr

RIO PONGO

The mangrove forest lining the estuary of the Pongo River in Guinea is considered a rare remnant of a near pristine ecosystem, providing sanctuary and sustenance for both residents and visitors alike.

Despite the growing pressures on coastal ecosystems from the ever-expanding human population, there remain a few pockets of almost pristine paradise where nature still reigns supreme. The mangrove forest at the mouth of the Pongo River has evaded major disturbance by humans and continues to attract significant numbers of migratory birds, such as the overwintering slender-billed gull (*Goeland railleur*) and royal

tern (*Sterne royale*). Local birds also making the most of the coastal wetlands include the Goliath heron (*Ardea goliath*), the yellow-billed stork (*Mycteria ibis*) and the African fish eagle (*Haliaeetus vocifer*). All of these bird species benefit from the highly productive estuary, which acts as a spawning site, hatchery and nursery ground for several oceanic fish species. In the deeper creeks, African manatees (*Trichechus senegalensis*) graze on vegetation, while West African crocodiles (*Crocodylus suchus*) skulk on the banks nearby. Several of the species that occur in the area are listed on the IUCN's Red List of Threatened Species.

Although presently pristine, mangrove forests are at risk of overexploitation by hunters, wood harvesters and even by the expansion of human settlements upstream of the river that sustains them. So far, however, just a low level of artisanal fishing appears to encroach on the otherwise intact Rio Pongo EBSA.

African fish eagle. Photo courtesy of Derek Keats, licensed under CC BY 2.0, Flickr

15

YAWRI COMPLEX

Coastal wetlands, as well as harbouring their own uniquely diverse cast of plants and animals, play an important role in the lives of countless oceanic species. Many fish species that live in the boundless blue ocean take their first fin-strokes in the sheltered shallows near land.

The islet-speckled shallows and mudflats of Yawri Bay in Sierra Leone are the ideal setting for many fish species to spawn, as the hatchlings are surrounded with plenty of food and shelter. Mangrove-lined creeks keep larger predators out, while also offering a perch for

Royal tern. Photo courtesy of Rémi Bigonneau

barnacles, oysters, crabs and nesting birds. African manatees (*Trichechus senegalensis*) keep sentry in the deeper channels while grazing on any overhanging branches. The extensive mudflats are teaming with worms and molluscs, filtering and scavenging whatever the tide brings in, as well as being fodder for entire colonies of overwintering migratory seabirds, such as the royal tern (*Sterna maxima*). The soft sandy beaches are the ideal nesting ground for green, loggerhead and olive ridley sea turtle species. Several fish species are caught in the bay and form an important food resource for the local human population. Pink shrimp (*Penaeus notialis*), tiger shrimp (*P. kerathurus*) and spiny lobsters (*Panulirus* species) are also a valuable catch.

Many of the resident and visiting species are listed on the IUCN Red List of Threatened Species. Human encroachment on mangrove habitat is also a concern. Part of this EBSA is designated as a marine protected area in recognition of its biological diversity and ecological importance.

16

RIVERCESS-GREENVILLE TURTLE-BREEDING GROUND

The long southwest-facing beaches of the Liberian coast offer the perfect conditions for sea turtles to lay their eggs, and they flock there from far and wide.

The gently sloping Liberian coast is composed of sandy beaches interspersed with mangrove forest around river mouths and a few rocky outcrops. Together, these habitats offer ample food and shelter to spawning and juvenile fish, overwintering migratory seabirds and particularly sea turtles seeking a safe place to lay their eggs. Five sea turtle species are known to nest there, including the leatherback, loggerhead, olive ridley, hawksbill and green sea turtle, especially on a relatively undisturbed stretch of coastline between the towns of River Cess and Greenville, in the south-eastern extent of the country. All five marine turtle species are included on the IUCN Red List of Threatened Species, together with several of the overwintering migratory bird species.

This EBSA stretches 1.5 km into the sea from the coastline, encompassing the areas to which marine turtles retire between bouts of egg-laying. Despite the relatively undisturbed natural habitat, harvesting of turtle eggs and capturing of adults for human consumption do occur, although at a scale so far that is not considered detrimental to the overall turtle population.

Rescued leatherback turtle making its way back to the sea. Photo courtesy of Environmental Justice Foundation (EJF)

17

Slate pencil urchin. Photo courtesy of Nick Hobgood, licensed under CC BY-SA 3.0, Wikimedia Commons

TABOU CANYON AND SEAMOUNT

At the point along the African coastline where Liberia meets the Ivory Coast, a rare canyon and seamount lie submerged beneath the waves. Their influence on the local wildlife makes the area unique.

The unusual rocky seabed off the coast of Tabou, on the Liberia-Ivory Coast border, occurs in a predominantly sandy coastline, allowing for the attachment of seaweed and animals that would not otherwise live there. The seaweed (mostly *Ulva* and *Sargassum* species) sway in the swell, providing shelter and food for an army of urchins, starfish, molluscs, crustaceans and fish that lurk in the rock crevices. While the

submerged canyon and seamount promote a weak upwelling of nutrients from the deep sea, the prolific growth of algae is sustained by nutrients delivered in abundance each rainy season by the Cavalla River; this makes up for the generally low productivity of plankton in the area as a whole. Along the adjacent sandy shores, at least four species of sea turtle lay their eggs (leatherback, olive ridley, green and hawksbill), benefitting from the cliffs and rocky outcrops that make human access more difficult. Along the shore and upriver, African manatees (*Trichechus senegalensis*) graze on the surrounding greenery. Several species of forage fish, such as sardines and anchovies, shoal along the shore, attracting artisanal fishers eager to net their share.

This EBSA is relatively pristine, despite low-level human activities along the coast and in the water. Some of the larger species that frequent the area, however, are included on the IUCN's Red List of Threatened Species.

Seaweeds: Gigartina radula, Codium, Ulva, Aeodes. South Africa. Photo courtesy of Derek Keats, licensed under CC BY 2.0, Flickr

18

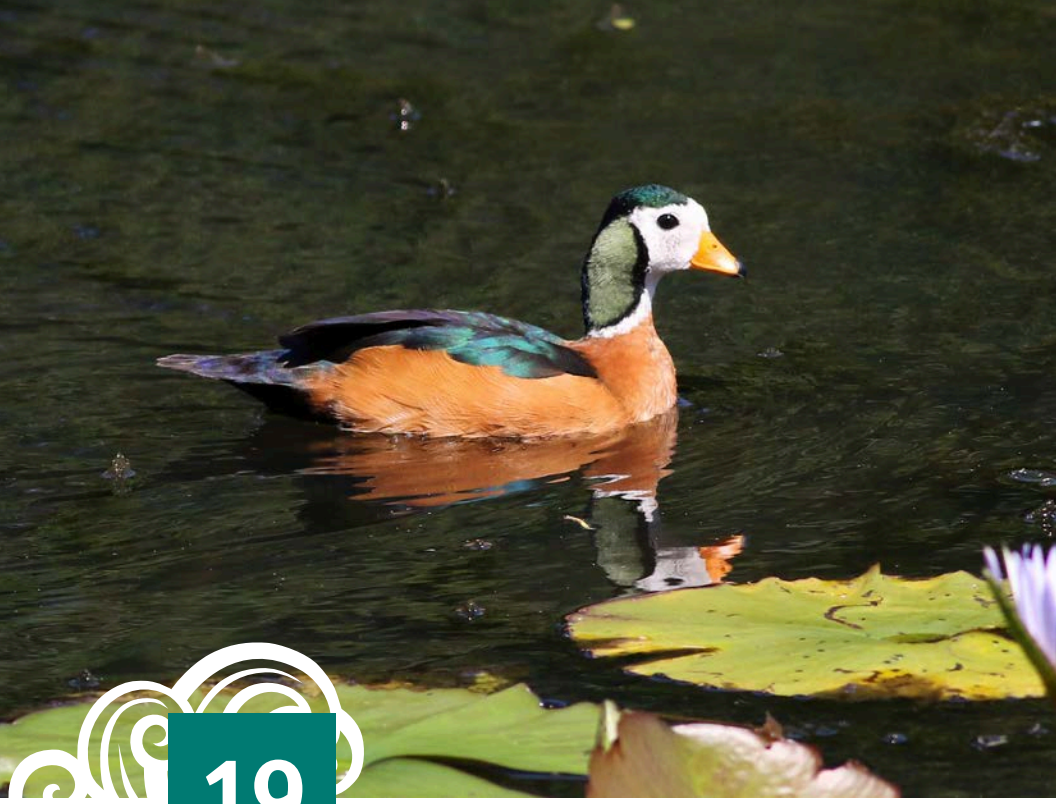
ABIDJAN CANYON AND BOTTOMLESS PIT

The name of this feature may not conjure up images of benign natural wonder, but this striking breach of the continental shelf in the Gulf of Guinea is a true underwater monument.

The canyon, running from the city of Abidjan in Ivory Coast to the depths of the Gulf of Guinea, rips through the continental shelf, creating two distinct environments on either side. To the west, the continental shelf is narrower and slightly rockier, allowing for the attachment of seaweeds and sedentary animals, whereas to the east the wider continental shelf is predominantly sedimentary and more dynamic. The canyon itself offers rocky, sandy and muddy substrates reaching to a depth of 3,000 m, which attract a multitude of different species, each with its own particular preference. Notable species include the West African geryon crab (*Chaceon maritae*), the Guinean barracuda (*Sphyraena afra*), African moonfish (*Selene dorsalis*), white mullet (*Mugil curema*) and the white grouper (*Epinephelus aenus*). Several species alternate between the canyon depths and the coastal shallow lagoons at times of spawning. There is evidence of upwelling of nutrient-rich water from the depths of the Gulf of Guinea, which supports algal and plankton growth at the sea surface.

One of the greatest threats to the long-term ecological integrity of this EBSA is the practice of dumping much of the waste from the city of Abidjan and its busy container port deep in the canyon. A small artisanal fishery also takes place in the area.

African moonfish. Photo courtesy of Aquarium Poema del Mar, Las Palmas de Gran Canaria



19

African pygmy goose. Photo courtesy of Derek Keats, licensed under CC BY 2.0, Flickr

SHRIMP AND SARDINE ROUTE FROM TABOU TO ASSINIE

Extensive brackish-water lagoons just behind the shoreline of the Ivory Coast are the ideal spawning and nursery ground of shrimp and small fish, such as sardines. Once grown, they join their brethren offshore as they feed *en masse* on the plentiful plankton blooms along the coast.

The Ivory Coast shoreline and continental shelf offers multiple habitats, such as sandy beaches, rocky outcrops, muddy bottoms and mangrove-fringed lagoons. Each is inhabited and frequented by its own set of species, like seabirds, sea turtles, seaweeds, crabs, lobsters and manatees, each species finding its own preference for food and sanctuary. The seasonal regime of water currents and upwelling from the deep deliver nutrients to the shallow coastal waters, which in turn support the growth of plankton, the staple diet for thousands of filter-feeding forage fish like sardines. The combination of conditions present in the area means that many usually oceanic species can complete their entire life-cycle without ever having to leave.

Parts of the coastline can be heavily impacted by human activities, such as around the larger settlements and the busy container port of Abidjan. In other areas, however, cliffs and mangroves make human access difficult, and wildlife can flourish. Several sea turtle species take full advantage of the inaccessibility of some beaches to lay their eggs. Sea turtles and larger animals like the African manatee are included on the IUCN's Red List of Threatened Species. This EBSA spans the entire coastline of the Ivory Coast, from the border with Liberia to the border with Ghana; it extends offshore to the continental shelf break.

Southern pink shrimp. Photo courtesy of Zacharie Sohou

20

Long-beaked common dolphins. Photo courtesy of Tanja Heinz

THE EEZ OFF THE COAST OF CÔTE D'IVOIRE

Beyond the narrow continental shelf and slope of Ivory Coast, the deep waters of the Gulf of Guinea are teeming with tuna and other oceanic superstars.

Upwelling of nutrient-rich water from the depths of the Gulf of Guinea towards the sea surface nourishes planktonic blooms that are feasted upon by swarms of sardines all moving in unison with mouths agape. The sardines themselves are the staple diet of various species of tuna, sharks, dolphins, sailfish and swordfish, which herd them

Sperm whale. Photo courtesy of Caroline Weir / Ketos Ecology

into frantically revolving and ever-diminishing bait-balls. Larger ocean dwellers, like sperm and fin whales (*Physeter catodon*, *Balaenoptera physalus*), time their migration to coincide with seasons of higher productivity, to claim their share of the spoils. Sea turtles criss-cross the area, avoiding the mayhem on their way to their nesting beaches. All this activity at the surface means there is plenty of leftover detritus sinking to the seafloor, where West African greyon (*Chaceon maritae*)—a deep-sea red crab—and other denizens of the deep make the most of every scrap.

This EBSA is heavily fished for tuna and deep-sea crab. It also overlaps with busy shipping routes along the West African coast, and historically the area has witnessed its share of shipping accidents with environmentally damaging consequences. However, the complex pattern of currents and counter-currents in the Gulf of Guinea has ensured that biological productivity has not yet been radically and permanently affected.

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Common cuttlefish. Photo courtesy of Amada44, licensed under CC BY-SA 3.0, Wikimedia Commons

AGBODRAFO COASTAL AND MARINE HABITAT

Despite a considerable human presence on the Togolese coast, the diversity of wildlife in its inshore waters is worthy of note.

This EBSA spans almost the entire length of Togo's 50 km long coastline and extends 23 km out to sea, right to the edge of the continental shelf. The seabed slopes very gently, only reaching a depth of 100 m before plunging down the continental slope. On the shoreline, natural concretion of the sediment forms solid slabs that stabilize the seabed and allow for the establishment of animals and seaweeds associated with rocky

Pantropical spotted dolphin, near Cape Verde. Photo courtesy of Graham Ekins

shores. Anthropogenic structures, such as an oil pipeline and three shipwrecks, also provide attachment sites for seaweeds, sponges and corals, which in turn attract reef fish, lobster, octopus and a great many grazers and predators. Four species of sea turtle are known to frequent the area, although only the olive ridley and leatherback nest in the area. All four turtle species are listed on the IUCN's Red List of Threatened Species. Several marine mammal species have also been observed, including the Atlantic humpback dolphin, which is critically endangered.

Oil production, phosphate mining, container port activities and intensive artisanal fishing all take place in and around the Togo coast, making the area far from pristine. Despite this, the wildlife contained within the described EBSA forms an integral part of the marine ecosystem of the Gulf of Guinea.

22

Humpback whale. Photo courtesy of Simon Elwen

BOUCHE DU ROI—TOGBIN

The EBSA described for the westernmost half of the coast of Benin and its territorial waters contains almost every conceivable marine habitat, from brackish water lagoons to abyssal plains and everything in between.

Brackish water lagoons behind Bouche du Roi beach in Benin are the ideal habitat for shrimp and prawn species, as well as for juvenile forage fish, like sardine, herring and anchovy, that migrate offshore in adulthood. The beach itself is also an important nesting ground for sea turtle species, such as the olive ridley, leatherback, green and hawksbill. In slightly deeper water offshore, scattered rocky outcrops provide hard substrate for the attachment of seaweeds like *Sargassum*, which can become detached and foul the shoreline in great decomposing clumps. A fringing coral reef at 50-70 m depth, combined with an area of weak seasonal upwelling of nutrients from deeper waters that fuels planktonic blooms, attracts plenty of fish from the ocean at large, as well as their predators. Humpback and Cuvier's beaked whales (*Megaptera novaeangliae*, *Ziphius cavirostris*) pass through the area on their annual migrations across the Gulf of Guinea.

Artisanal fishing and harvesting of sea turtle eggs represent the biggest threats to the ecological integrity of this EBSA. Occasionally, the channel between the lagoon and the open sea can close temporarily, as a result of natural fluctuations in water currents and transport of sediment along the coast. Such closures can affect the survival rate of shrimp and prawns, which are an important source of income to the local human population. The area is being explored for its oil and gas resources.

Bouche du Roi beach, Benin. Photo courtesy of Zacharie Sohou

Short-finned pilot whale. Photo courtesy of Caroline Weir / Ketos Ecology

23

TOGO-BENIN CROSS-BORDER MARINE AREA

As this EBSA clearly demonstrates, biodiversity is not confined by national boundaries; instead, it spans the stretch of coastline between two river mouths—one in Togo, the other in Benin.

The flow of river-borne nutrients into the shallow coastal waters of the Gulf of Guinea supports the growth of plankton, which forms the base of a productive marine food chain. Marine fish species that

Atlantic spotted dolphin, near Mauritanian coast. Photo courtesy of Graham Ekins

spawn and hatch in estuarine and coastal waters, such as sardines and herring, can complete their entire life cycle in these waters, migrating to plankton-rich feeding grounds offshore as they mature. Abundant fish also attract their predators, such as tuna and dolphins; the Atlantic humpback dolphin is a common visitor to the area. Humpback whales pass through during their annual migration across the Gulf of Guinea. The sandy beaches along the coast offer ideal nesting sites for sea turtles, including the olive ridley, leatherback and green, while within the estuaries, West African manatees graze on any greenery within their reach. Almost all of these larger species appear on the IUCN's Red List of Threatened Species.

Construction of hydroelectric dams upstream of the rivers has altered the natural flow of sediments and nutrients to the coastal wetlands and the sea beyond, with some repercussions to wildlife, especially mangroves. Other human activities, such as artisanal fishing and coastal management practices, also have an impact on the area.

24

KRIBI-CAMPO

The southern coast of Cameroon, along the west-facing shores of the Gulf of Guinea, offers a truly remarkable sight—the only waterfall in the world that cascades directly into the sea.

The Lobé Waterfall is a natural wonder that lends charisma and focus to the importance of the area as a whole; the falls have been recognized by UNESCO as a World Heritage Site. In addition, however,

Lobé waterfalls, Cameroon. Photo courtesy of Christoph Pauwels, licensed under CC BY-NC-SA 2.0, Flickr

the area boasts a mosaic of sediments and rocky outcrops that support a wide variety of species, from seaweeds in need of attachment sites to sea turtles looking to lay their eggs. Five species of sea turtle are known to feed and nest in the area, including the green, olive ridley, leatherback, loggerhead and hawksbill (*Eretmochelys imbricata*) species. Mangrove forests line the coastline, offering an ideal habitat for juvenile fish and shrimp. The combination of rocky shores, fringing mangrove forests and long sandy beaches captures a variety of habitats to support a diverse assemblage of species.

Activities surrounding a recently constructed container port built at Kribi in the northern part of this EBSA are likely to have some effect on the wildlife of the surrounding area, although it is too early to determine.

25

Lagoa Azul, São Tomé, São Tomé and Príncipe. Photo courtesy of mp3ief, licensed under CC BY-NC-SA 2.0, Flickr

LAGOA AZUL AND PRAIA DAS CONCHAS

If prizes were awarded for the most evocative place-names, the Blue Lagoon and Seashell Beach in northern São Tomé would be sure winners. Their natural assets appear equally prize-worthy.

São Tomé is the largest of the islands in two archipelagos that form the state of São Tomé and Príncipe in the Gulf of Guinea. On its northern coast, the bay, between the headlands of Lagoa Azul

Little egret. Photo courtesy of Derek Keats, licensed under CC BY 2.0, Flickr

and Praia das Conchas, is recognized for its unspoiled natural beauty. The beaches offer ample nesting sites amongst the boulders for sea turtles like the leatherback, hawksbill, olive ridley, green and loggerhead species. All of these species are included in the IUCN's Red List of Threatened Species. Also nesting, though on the island's trees, are significant colonies of little egrets (*Egretta garzetta*). Just offshore and within the boundaries of this EBSA, corals cling to the steep seabed as it plunges into the abyss, making the most of the nutrients carried by the currents. Being in the middle of the ocean, the islands as a whole are surrounded by numerous oceanic fish species, like sardine, mackerel, tuna, flying fish, grouper and several species of shark.

Harvesting of sea turtles, sand extraction and destructive dynamite fishing have been reported in the area, although these practices have stopped. The site's remoteness counteracts the allure of its evocative name.

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Great star coral. Photo courtesy of NOAA, Biogeography Team, Center for Coastal Monitoring and Assessment

ILHAS TINHOSAS

The two tiny Tinhosa Islands form part of the Príncipe archipelago, which, together with the São Tomé archipelago to the south, form the state of São Tomé and Príncipe, right in the middle of the Gulf of Guinea.

Being in such a central position in the Gulf of Guinea, the waters around São Tomé and Príncipe are bathed by two dynamic ocean currents—the warm eastwards Guinea current and the cold westwards Benguela current—that wax and wane in strength and influence

White-tailed tropic bird. Photo courtesy of Ross Wanless

with the passing of the seasons. As these water masses mix, blooms of plankton swirl in the eddies, tracked closely by filter-feeding forage fish and their predators. On the Tinhosa Islands themselves, sandy beaches offer nesting sites for five species of sea turtle, including the leatherback, hawksbill, olive ridley, green and loggerhead species, all of which are listed on the IUCN's Red List of Threatened Species. The brushwood forest beyond the beaches provides roosting and nesting sites for seabirds, such as the white-tailed tropicbird (*Phaethon lepturus*), the sooty tern (*Onychoprion fuscatus*) and the black noddy (*Anous minutus*). Beneath the waves, coral reefs, with their varying cast of residents, cling to the plunging seabed.

The seas surrounding this EBSA are subjected to wider regional-scale pressures like over-harvesting of fish, sea turtles and seabirds. Locally, highly destructive artisanal fishing practices have also been reported. Nonetheless, Príncipe and its surrounding islets have been declared a UNESCO Biosphere Reserve.

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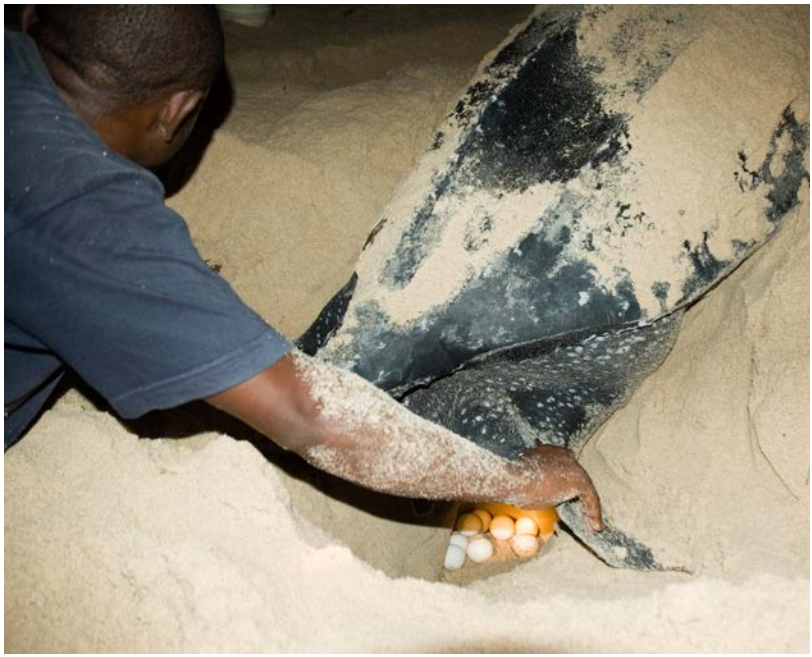
Atlantic humpback dolphins. Photo courtesy of Tanja Heinz

MAYUMBA MARINE AND COASTAL AREA

Along the southernmost shores of Gabon, coastal lagoons and sandy beaches attract wildlife from land and sea, and are the perfect setting for the country's only national marine park.

This EBSA spans about 65 km of coastline, taking in numerous brackish lagoons behind a seemingly endless sandy beach, and stretching seawards for another 60 km. The area's claim to fame is that it hosts the largest nesting population of leatherback turtles on the African continent and possibly worldwide, with nearly 30,000 turtles visiting its beaches each year between October and April. Other species of sea turtle have also been observed, including the olive ridley, hawksbill, green, loggerhead and Atlantic ridley (*Lepidochelys kempii*). All of the sea turtle species observed are listed on the IUCN's Red List of Threatened Species. Out to sea, migrating humpback whales and marauding Atlantic humpback dolphins are a common sight. The seabed, a mixture of sedimented plains and rocky outcrops, provides a mosaic of substrates on which a diverse set of animals can settle and thrive.

Intrusion or exploitation of natural resources by humans is minimal, as the coastal population of the area is low, therefore the area ranks highly against the "naturalness" EBSA criterion, which is unusual for the inshore waters of any nation.



Leatherback sea turtle, nesting with eggs, Point Denis, Gabon. Photo courtesy of Inna Moody

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Blacktip shark. Photo courtesy of Tomas Kotouc

NORTH-WEST CONTINENTAL SHELF

Congo has a narrow, relatively flat continental shelf, but it is teaming with life, thanks to the influx of nutrients from the deep ocean and the mighty Congo River to the south.

While the mouth of the Congo River is located in the Democratic Republic of the Congo further south, the influence of the sediment and nutrients flowing out of the river can be felt as far as the currents can carry them. The predominant Benguela Current, running northwards along the southwestern African coast, ensures that nutrients from the deep ocean are mixed with those flowing out from the river, ready to be exploited by the awaiting plankton. Productivity from plankton blooms at the sea surface eventually reaches the seabed, where countless organisms benefit from the bounty. In this EBSA, the seabed is teeming with deep-water rose shrimp (*Parapenaeus longistris*), striped red shrimp (*Aristeus varidens*), scarlet shrimp (*Aristaeopsis edwardsiana*) and the Atlantic deep-sea red crab (*Geryon quinquedens*). Many of these species are targeted by international commercial fisheries that often impact the seabed and its integrity. Other species caught by fishers in the area include Benguela hake (*Merlusccius polli*), Angolan dentex (*Dentex angolensis*) and various species of cuttlefish (*Loligo* species and *Sepia officinalis*).

The boundary of this EBSA covers the area between the 120 m depth contour and the 450 m depth contour, a distance of about 20 km.

Deep-water rose shrimp. Photo courtesy of Luis Sanchez Tocino, Universidad de Granada, https://litoraldegranada.ugr.es/

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Great hammerhead shark. Photo courtesy of Tomas Kotouc

MUANDA COASTAL AND MARINE AREA

The second-largest country in Africa, the Democratic Republic of the Congo has a surprisingly small coastline, merely 40 km long. However, what it lacks in coastal extent it makes up for in diversity of habitats and organisms.

The outflow of the Congo River delivers sediment and nutrients to the Atlantic Ocean, but not before passing through extensive mangrove forests and a network of creeks on the banks of the river estuary. The mangroves host their usual array of marine species, including juvenile

Olive ridley sea turtle hatchling, near Muanda, Parc Marin des Mangroves, Democratic Republic of the Congo. Photo courtesy of Catherine Trautes

oceanic fish such as sardines that benefit from the protection afforded by the tangle of mangrove roots. In deeper creeks, West African manatees (*Trichechus senegalensis*) munch on any vegetation within their reach. Further from the river mouth, sea turtles lay their eggs on the soft sandy beaches, while adult sardines school offshore in their thousands to feed on the abundant plankton that is nourished not only by river nutrients, but also by the upwelling of nutrients from the Benguela current. Such a high level of productivity attracts larger fish, some of commercial importance, as well as dolphins and whales as they follow their annual migration routes. Most of the larger animals that frequent the area are included on the IUCN's Red List of Threatened Species.

Artisanal fishing practices, exploitation of mangroves and river-borne pollution are known to have an impact on the coastal ecosystem within this EBSA. The extent of the EBSA itself covers a narrow band of coastal waters above the narrow Congolese continental shelf.

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Skipjack tuna. Photo courtesy of Steven Trainoff Ph.D.

EQUATORIAL TUNA PRODUCTION AREA

Spanning half the width of the Atlantic Ocean at the Equator, this EBSA is one of the largest on record.

This vast area of ocean in the Equatorial Atlantic Ocean owes its significance to the convergence of several oceanic currents and river flows that deliver a constant supply of nutrients to sustain a conveyor belt of productivity like no other. The warm eastbound Guinea current to the north of the Equator and the cool northbound Benguela current running up the African coast are both forced westward by the South Equatorial current, which carries the outflow of the Congo River, creating a tongue of mixing

Yellowfin tuna. Photo courtesy of Steven Trainoff Ph.D.

eddies all the way out to the mid-Atlantic Ocean. As the different water masses mix, their nutrients are exploited by billions of planktonic algae, which thrive in the strong equatorial sunlight. Where there is plankton, its grazers and their predators follow. The most conspicuous organisms in such a vast area of ocean are those that are exploited by commercial fisheries, which include up to ten species of tuna, such as yellowfin (*Thunnus albacares*), skipjack (*Katsuwonus pelamis*), bigeye (*Thunnus obesus*), albacore (*Thunnus alalunga*), little tunny (*Euthynnus alletteratus*) and frigate tuna (*Auxis thazard*), as well as sail fish (*Istiophorus albicans*) and sword fish (*Xiphias gladius*). Dolphins, fin whales, sperm whales, sharks, rays and several species of sea turtles are also present, all of which are included on the IUCN's Red List of Threatened Species.

Several international and industrial fishing operations take place in the area. Closer to shore, numerous land-based human activities also impinge on the natural character of the area.

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Hamerkop. Photo courtesy of Charles J Sharp, Sharp Photography, licensed under CC BY-SA 4.0, Wikimedia Commons

AREA OF CONVERGENCE OF THE CANARY AND GUINEA CURRENTS

Just above the Equator in the eastern Atlantic Ocean, the southbound Canary current and the eastbound North Equatorial counter-current converge with varying intensity throughout the year to form the Guinea Current flowing eastwards. This EBSA captures the transition over a vast area of ocean.

In eastern ocean boundary currents, characteristic areas of upwelling deliver cool water from the ocean depths to the surface, where the dissolved nutrients fuel a frenzy of productivity that benefits all ocean life, from miniscule plankton to mighty ocean migrants. This particular current also encompasses every type of tropical marine and coastal habitat imaginable, including mangrove-fringed coastal lagoons brimming with manatees, long sandy beaches laden with sea turtles, coral reefs, both deep and shallow, teaming with life, oceanic fronts and eddies boiling with biomass, and dark ocean trenches, continental slopes and towering seamounts still to be explored. Just about every habitat in the area is exemplary of its kind, and such a diversity of habitats is accompanied by an eye-popping diversity of organisms. Some of the larger and more charismatic species that occur there, however, are listed on the IUCN's Red List of Threatened Species, so conditions are not as pristine as they might be.

Human activities affect the area at every scale, from localized artisanal fishing near the coast to industrial fishing by the international fleet on the high seas. Chronic and sporadic pollution from land and ships is also a concern.

Woolly-necked stork. Photo courtesy of Derek Keats, licensed under CC BY 2.0, Flickr

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An Angolan beach. Photo courtesy of Rodney Braby

RAMIROS-PALMEIRINHAS COASTAL AREA

A narrow stretch of coastline to the south of Luanda captures a unique combination of habitats that occur nowhere else along the Angolan coast.

Marginal mangroves (*Rhizophora mangle*, *Laguncularia racemosa*, *Avicenna germinans*) and saltmarsh species (*Sesuvium portulacastrum*, *S. mesembritemoides* and *Salicornia*) bind the sands and mudflats that make up the coast along the Ramiros and Palmerinhas districts. Their submerged aerial root systems and canopy offer substrate and protection for countless juvenile fish, crabs and roosting birds, such as the Cape gannet (*Morus capensis*) and the Damara tern (*Sterna balaenarum*). Sea turtles, including the green, leatherback (*Dermochelys cariacea*) and olive ridley species, lay their eggs on the sandy beaches within the area, while West African manatee (*Trichechus senegalensis*)

lurk in the shallows. Many of the species that frequent the area, especially those that are slow-growing and late to mature, are included on the IUCN's Red List of Threatened Species.

The coastal zone covered by this area is relatively pristine, although increased coastal traffic and footfall following ongoing coastal developments are likely to have an impact on the natural environment eventually.

Top: Mangrove restoration programme, Angola. Photo courtesy of Rodney Braby
Bottom: Red mangrove roots. Photo courtesy of Stefan Porembski, African Plants – A Photo Guide. www.africanplants.senckenberg.de

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African black oystercatcher. Photo courtesy of Peter Chadwick www.peterchadwick.co.za

KUNENE-TIGRES

The relationship between river run-off and offshore sandbank is captured perfectly in this Kunene River and Tigres Island system, each element on opposite sides of the Angola-Namibia border.

Tigres Island, in southern Angola, is what remains of a sand spit connected to the mainland, fed and maintained by the sediments pouring out of the Kunene River in northern Namibia. Since the 1970s, the wind and the waves have eroded away the sands connecting Tigres and Angola, creating an offshore island and sandy shallow sea that is ideal for resident and migratory wading birds. Suspended sediment and organic matter from the Kunene River further south continue to nourish the coastline between both features. Some of the bird species noted in the area include the great white pelican (*Pelicanus ornocrotalus*), the Cape cormorant (*Phalacrocorax capensis*), the African black

oystercatcher (*Haematopus moquini*), Hartluab's gull (*Chroicocephalus hartlaubii*) and the Damara tern (*Sterna balaenarum*). Green turtles are known to nest on the sheltered sandy beaches in their thousands, and a large colony of Cape fur seals (*Arctocephalus pusillus pusillus*) takes a rest from frolicking in the frigid waters offshore. Heaviside's dolphins, which are endemic to the Benguela current, the Atlantic humpback dolphin, and the bottlenose dolphin (*Tursiops truncates*) are frequent visitors. All of these species appear on the IUCN's Red List of Threatened Species.

The remoteness of Tigres Island and its position along such an arid and inhospitable coastline has ensured that the area around the Kunene-Tigres EBSA has remained pristine. However, growing tourism and planned hydroelectric dams upstream on the Kunene River are a potential threat to the ecosystem as a whole.

Great white pelican, Walvis Bay, Namibia. Photo courtesy of Olga Ernst, licensed under CC BY-SA 4.0, Wikimedia Commons

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African penguins. Photo courtesy of Harry Cunningham, pexels.com

NAMIBIAN ISLANDS

Four jewels on the Diamond Coast, the Namibian islands of Mercury, Halifax, Ichaboe and Possession, offer important yet vulnerable nesting sites for several species of endangered seabirds.

The four islands off the coast of central Namibia are surrounded by an intensive area of upwelling, which plays a key role in supporting the production of biomass close to the southern African shores. Cold water from the deep ocean, rich in dissolved nutrients, surges to the ocean surface, where it fuels a plankton bloom grazed upon by millions of anchovy and sardines, themselves the prey for hungry seabirds rearing their young on land. African penguin (*Spheniscus demersus*), bank cormorant (*Phalacrocorax neglectus*), Cape cormorant (*P. coronatus*) and Cape gannet (*Morus capensis*) all maintain significant breeding colonies on the islands, with little interference from their natural predators. The birds also use the islands as a safe place to moult. All of the species that occur on the islands are listed on the IUCN's Red List of Threatened Species. While

little human activity occurs on the islands now, harvesting of guano in the past has decreased the area's attractiveness for nesting seabird species that seek out areas of previous occupation on which to nest. The indirect effects of excessive fishing and depletion of forage fish are also of concern, along with the potential for the expansion of diamond mining operations.

The Namibian Islands EBSA is unusual in that it is formed of multiple spatially distinct elements—the boundary of each element delineated by a 5 km buffer zone around each of the four islands. Evidence suggests that nesting birds on the islands do most of their foraging within this area.

Top: The "long wall", south of Meob Bay, north of St. Francis Bay, Namibia. Photo courtesy of Skyhawk Photography
Bottom: Aerial view of Mercury Island, Namibia. Photo courtesy of Rodney Braby

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ORANGE CONE

Not to be confused with the orange cones used to direct road traffic, the Orange Cone EBSA captures a rare estuarine ecosystem on the southwestern African coast.

The lower reaches of the Orange River mark the border between Namibia to the north and South Africa to the south. At the river mouth, the expansive estuary—made up of shifting sandbanks, salt marshes, mud flats, gravel beds and shallow streams—offers the ideal conditions for spawning of riverine, coastal and pelagic fish, such as the Angolan dusky kob (*Argyrosomus coronus*) and the west coast Steenbras (*Lithognathus aureti*), both endemic to the southwestern African coast. Several species of water birds flock to the estuary, including the Cape cormorant (*Phalacrocorax capensis*), Hartlaub's gull (*Chroicocephalus hartlaubii*) and the Damara tern (*Sternula balaenarum*). Many of the fish and bird species that reside in or frequent the area are listed on the IUCN's Red List of Threatened Species. The estuary is the only one for several hundreds of kilometres both to the north and to the south, therefore the species that are dependent on estuarine conditions are very much restricted to the limited extent of its influence. The influence of the river offshore can fluctuate, depending on the amount of seasonal rainfall inland and on the volume of water diverted for irrigation upstream.

A local artisanal fishery is evident in the area, as well as a growing interest from tourism, but perhaps the biggest threat to the area as a whole is an expansion of the diamond dredging industry.

Hartlaub's gull. Photo courtesy of Dick Daniels, licensed under CC BY-SA 3.0, Wikimedia Commons

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Blue shark, Orange Shelf Edge. Photo courtesy of Steve Benjamin

ORANGE SHELF EDGE

The Orange River lends its name to an area offshore, just beyond the river mouth, where the west African continental shelf breaks and plunges into the Atlantic abyss.

Away from the frantic and turbulent coastlines of South Africa and Namibia, where animals have to contend with the wanton ways of weather and waves, the tranquil depths on the continental shelf break offer respite to any visitor that ventures there. Still benefiting from

the increased planktonic productivity associated with the eastern edge of the Benguela Current upwelling, the waters attract large, hungry oceanic fish, including migratory species. On the seabed, a shelf-edge canyon and the nearby Tripp Seamount add to the variety of rocky and sedimentary habitats that can be colonized by diverse bottom-dwellers. This diversity of seabed habitats, coupled with the elevated productivity in the waters above, is likely the reason why the area is a persistent hotspot of fish species diversity. Relative to other locations along the South African continental shelf, where similar habitats occur, the habitats within this area remain relatively pristine, as they are far from known sources of pollution and have not received excessive attention from bottom-contact fishing fleets.

The area is particularly vulnerable to trawling activities—mining and fishing—as the organisms that live on the seabed, such as cold-water corals and sponges, tend to be long-lived, fragile and slow to recover from disturbance.

Hake, Orange Shelf Edge. Photo courtesy of ACEP (African Coelacanth ecosystem programme)

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Seafloor habitat, filled with sensitive cold-water corals, sponges and tubeworms, Childs Bank. Photo courtesy of SAEON

CHILDS BANK

The Southern Benguela Submarine Bank, also known as Childs Bank, rises to 200 m below the surface from a base 400 m deep.

Childs Bank offers a variety of seabed habitats that are ideal for the growth of cold-water corals and sponges, with all their associated residents, like worms, molluscs, brittle stars, shrimp and fish. Most of these coral and sponge clusters occur around the steep and rugged edge of the bank, where stable attachment sites are cleared of sediment by strong upwelling currents that also deliver the nutrients on which the reefs thrive. Some of the most common reef-forming species include the sea-fan *Acabaria rubra*, the glass sponge *Rosella antarctica* and hard coral *Stylaster* species. All sponge and cold-water coral species are slow-growing and fragile, which makes them vulnerable to disturbance by bottom-contact fishing gear; there is a trawl fishery that targets the top of the bank and surrounding continental shelf. The waters above the bank are a popular feeding area for tuna and long-lived species of shark, such

Basket star, Childs Bank. Photo courtesy of SAEON

as the blue shark (*Prionace glauca*) and the shortfin mako shark (*Isurus oxyrinchus*), which are listed on the IUCN Red List of Threatened Species.

This area is subjected to a lower fishing intensity than elsewhere on South Africa's western continental shelf because the vessels trawling in the vicinity tend to avoid areas of coral and hard substrate, as these damage their nets.

Venus flytrap sea anemone, Childs Bank. Photo courtesy of SAEON

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NAMAQUA COASTAL AREA

The seabed habitats of the coastal waters of the Northern Cape province in South Africa have remained relatively unspoiled, making them ideal candidates for safekeeping.

Decades of fishing and mining activities around the western coast of South Africa have left their mark on the marine environment, with few places left where their influence cannot be detected. The

Cape fur seals, Namaqua National Park coastline. Photo courtesy of Peter Chadwick www.peterchadwick.co.za

shallow coastal waters of Namaqua district, bordering Namibia, have not been exploited as intensively as other areas around the coast, making some of the seabed habitats that occur there among the best examples of those pristine habitat types. Such habitats include inshore reefs and hard, sandy and muddy inshore substrates—each plays host to a distinct assemblage of different species, which in turn attract their own type of predator, from seabirds to oceanic fish. In addition, there are three estuaries along the coast, delivering river-borne nutrients to the shallow and productive waters. Many oceanic fish depend on shallow coastal seas and estuaries to spawn, feed and protect their young.

An analysis of threats to the integrity of coastal habitats in South Africa has recognized that the habitats within the Namaqua Coastal Area EBSA are at a lower risk of damage from human activities than those same habitats elsewhere on the coast. However, such habitats are not immune to damage should existing human activities along the coast expand in the future.

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Humpback whale swimming alongside Cape fur seal, Cape Canyon. Photo courtesy of Steve Benjamin

CAPE CANYON AND SURROUNDS

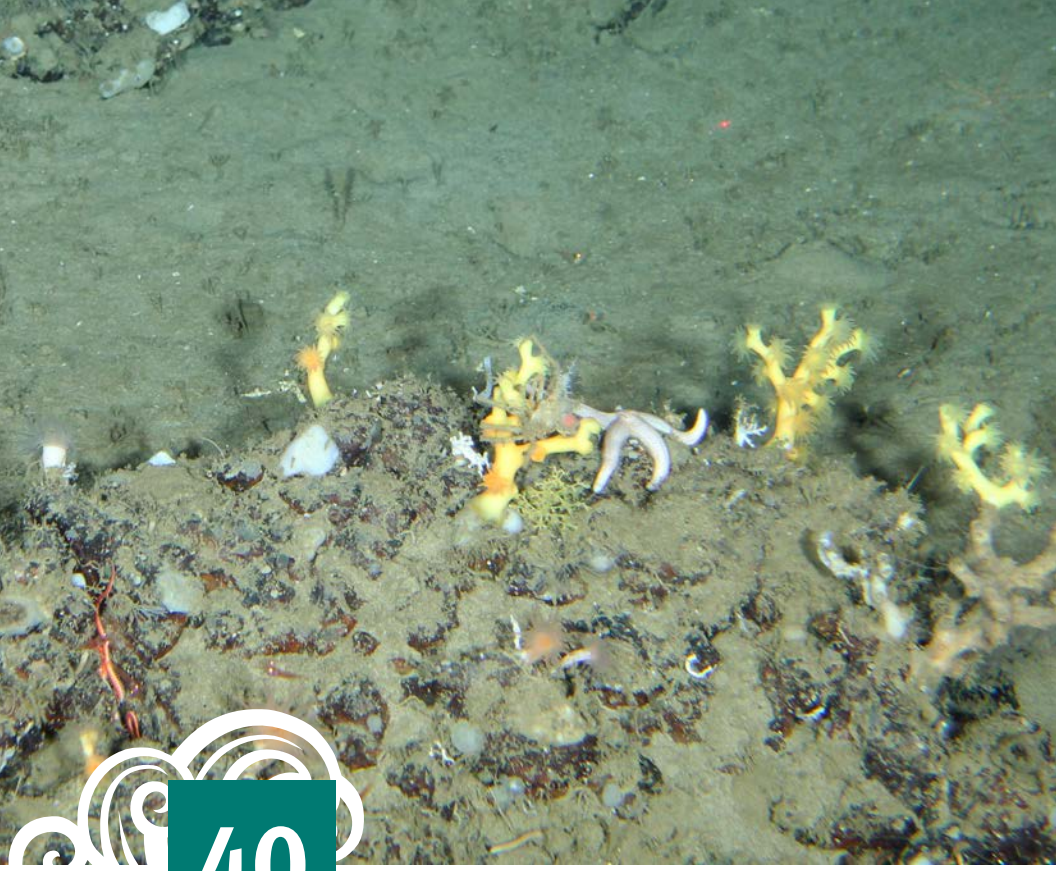
Canyons are always special places in the ocean, as they entrain water currents and sediment flows, providing a highway of material exchange between deep and shallow habitats.

Cape Canyon is one of two canyons off the west coast of South Africa. The conditions created by the canyon, together with the muddy habitat around its top edge are unique and of limited extent along the broader continental shelf. The mud is likely the result of centuries of deposition of organic detritus form the water above; the remnants from a cascade of productivity that is nourished by the constant upwelling of

Black-browed albatross, Cape Canyon. Photo courtesy of Peter Chadwick www.peterchadwick.co.za

mineral-rich water channelled by the canyon from the deep. Where biological productivity and organic input are high, consumption of oxygen by microbes is increased, leading to a localized reduction in the concentration of ambient oxygen. This in itself leads to the establishment of organisms that can tolerate low oxygen concentrations, making the community different to that found elsewhere. Cold-water corals and sponges also cling to rare outcrops of stable rocky substrate, attracting their own retinue of seabed species. The rich waters within the Cape Canyon and Surrounds EBSA are the ideal spawning and nursery ground for hake, anchovy and sardine, which in turn attract a multitude of seabirds eager to feast on the bounty; they include African penguins (*Spheniscus demersus*), bank cormorants (*Phalacrocorax neglectus*), and black-browed and Atlantic yellow-nosed albatrosses (*Thalassarche melanophris* and *T. chlororhynchos*). Large oceanic sharks, whales and seals are common. Many of the species that frequent the area are listed on the IUCN's Red List of Threatened Species.

Bottom-contact fishing activities are the biggest threat to the integrity of the ecosystem in this area. However, there are some areas along the edge of the canyon and continental shelf that remain relatively pristine.



Cold water corals, Browns Bank. Photo courtesy of ACEP Deep Secrets

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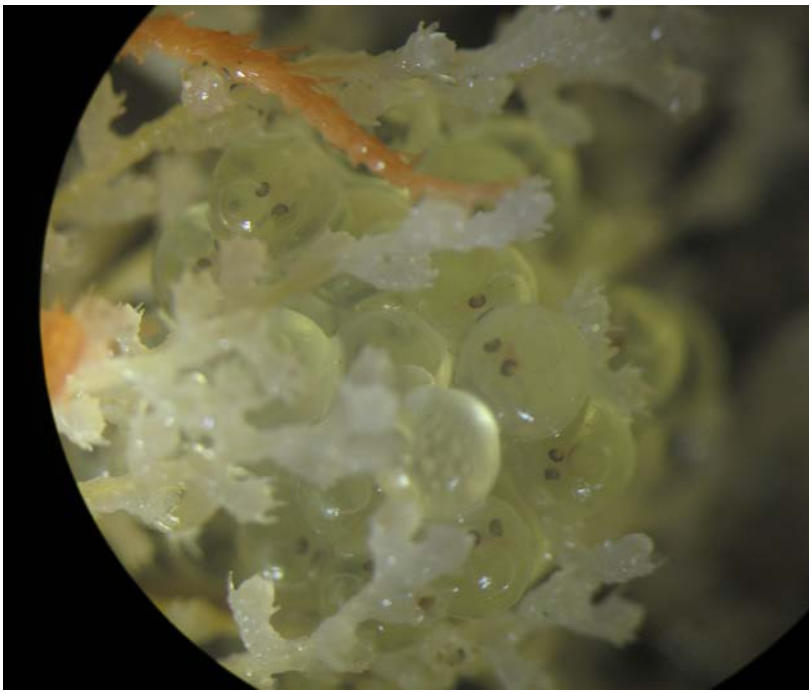
BROWNS BANK

On the southern cusp of South Africa, where the Atlantic Ocean meets the Indian Ocean, Browns Bank stands proud as a beacon for biodiversity.

While the ocean surface might appear calm to an airborne observer, powerful oceanic currents are doing battle beneath the waves, tearing eddies off each other as oceans collide. The periodic creation of wandering water whirls is exploited by fish like the Cape hakes (*Merluccius capensis* and *M. paradoxus*), the snoek (*Thyrsites*

atun) and the round herring (*Etremeus whiteheadi*), as currents carry their young from their offshore spawning sites to their inshore nursery areas to the north. On the gravelly seabed of the bank, the buffeting of currents and their dissolved nutrients is exploited by reef-building cold-water corals, which in turn attract all manner of other sea creatures like brittle-stars and colourful worms. An area of upwelling along the bank's outer edge also delivers nutrients to the ocean surface, where they fertilize blooms of plankton that attract grazers and their predators, including Cory's shearwater (*Calonectris borealis*) and Atlantic yellow-nosed albatross (*Thalassarche chlororhynchos*) sweeping in from above. Many of the species that are characteristic of the area are included on the IUCN's Red List of Threatened Species.

While there has been some bottom-trawling activity within this EBSA, some patches of seabed remain untouched and pristine. However, the few types of seabed habitat occurring on the bank are relatively rare elsewhere, so any damage is potentially significant.



Fish eggs, Browns Bank. Photo courtesy of ACEP Deep Secrets

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NAMAQUA FOSSIL FOREST

The western coast of southern Africa is famous as a source of precious stones presented in small packages—the Namaqua Fossil Forest EBSA fits the brief to perfection, albeit in a slightly unusual way.

Only 2 km² in area, the seabed outcrop of fossilized yellowwood trees located at a depth of 140 m, 30 km from the South African coast, is a unique gem along Africa's southwestern continental

Like these yellowwood giants of South Africa's temperate south coast, other (now extinct) species in the family Podocarpaceae covered the now arid west coast of South Africa 100 million years ago. Now, such trees only exist as fossilized trunks on the seafloor at a depth of more than 100 metres. Photo courtesy of Otto Whitehead

shelf. The exposed and petrified tree trunks, most of which lie in segments where they fell millions of years ago, are encrusted with cold-water corals, giving the surreal illusion that the forest is still living. The corals, however, obtain no benefit from the fossilized trees other than a stable substrate elevated from the surrounding seabed. Instead, the corals are sustained by nutrients delivered by the southern Benguela upwelling system, which nourish other life forms in the water, like plankton and its grazers, whose detritus eventually sinks and is captured by the coral polyps. In an area otherwise devoid of protruding hard substrates, the stony tree trunks and coralline canopy offer shelter and a gathering place for passing fish.

Offshore diamond mining operations along the western coast of southern Africa have occasionally yielded fragments of fossilized trees, although never in such high concentrations. Future mining operations may pose a threat to the integrity of this rare and fragile feature.

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Walvis Bay Ramsar site, Namibia. Photo courtesy of Skyhawk Photography

NAMIB FLYWAY

The sheltered bays and lagoons along the otherwise wild coast of central Namibia offer rare and sought-after habitats for seabirds and waterbirds from all over Africa and the rest of the world.

The productive waters of the Namibian coast are a well-known destination for lots of hungry ocean dwellers. However, it is rare that such elevated productivity in the water should also coincide with sheltered sandy bays and lagoons along the coast, where terrestrial animals—mostly overwintering migratory water-birds—can also benefit from the rich oceanic resources. Leatherback turtles travel from afar to forage in the offshore waters off Walvis Bay and Sandwich Harbour, where certain jellyfish species occur in great numbers. Other species, like Damara terns (*Sternula balaenarum*), lesser flamingos (*Phoenicoparrus minor*), southern right whales (*Eubalaena australis*), humpback whales, crowned cormorants (*Microcarbo coronatus*), Heaviside's dolphins (*Cephalorhynchus*

heavisidii) and bottlenose dolphins (*Tursiops* species), are attracted to the area to forage or to breed. A permanent colony of Cape fur seals is one of the largest on the African mainland. All of these species appear on the IUCN's Red List of Threatened Species.

The area has been highly fished over past decades, by both artisanal and industrial fishers, although a trawling ban is in place above the 200 m depth contour. While most of the adjacent land is under some form of conservation management, the potential for port expansion and offshore mining are of concern.

Top: Common bottlenose dolphin, Walvis Bay, Namibia. Photo courtesy of Simon Elwen
Bottom: Lesser flamingos in the air, greater flamingos on the ground, Walvis Bay, Namibia. Photo courtesy of Yathin S Krishnappa, licensed under CC BY-SA 3.0, Wikimedia Commons

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Brine pans north of Swakopmund, Namibia.
Photo courtesy of Skyhawk Photography

BENGUELA UPWELLING SYSTEM

The Benguela upwelling system is one of the four major eastern-boundary upwelling systems and includes the most intensive wind-induced upwelling cell in the world, at Lüderitz in southern Namibia.

Upwelling systems are characterized by their high levels of productivity, as strong trade winds push surface waters westwards, drawing up cold, nutrient-rich water from the deep ocean to replace them. The cold water from the ocean depths is laden with dissolved minerals that fertilize the growth and reproduction of plankton in the sunlit surface

Left: Cape cormorants feeding, Hottentots Bay, southern Namibia. Photo courtesy of Dr. Jessica Kemper
Right: Cape gannets. Photo courtesy of Lucy Kemp/Marine Photobank

layers. The resulting green soup is enriched by grazing zooplankton, all of which is filtered out by swarming schools of wide-mouthed forage fish (sardine, anchovy and horse mackerel) that complete their entire life-cycle in the area. These in turn attract the attention of their predators, including countless species of tuna, dolphins, whales, seals, sharks and seabirds like penguins and gannets. Many of these charismatic ocean-faring species are included on the IUCN's Red List of Threatened Species. The intense Lüderitz upwelling cell can act as a barrier to several species, effectively dividing the system into northern and southern components. In the north, a seasonal cycle of low oxygen concentration in the water has resulted in the establishment of a unique seabed community that depends on sulphide-oxidizing bacteria.

Stretching from Cape Point in South Africa to the Angola-Namibia border and up to 300 km offshore, the Benguela Upwelling System EBSA is one of the largest EBSAs in the region. Consequently, it is subject to a multitude of human pressures, from localized and widespread intensive industrial fishing, to harmful inputs from land and disruption by mining for minerals and diamonds, and drilling for oil.

Heaviside's dolphins. Photo courtesy of Simon Elwen

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WALVIS RIDGE

The Walvis Ridge is a unique chain of seamounts connecting the southern African continental margin to the Mid-Atlantic Ridge.

The ridge was created over millions of years by a volcanic hotspot deep beneath the Earth's crust, with each seamount resulting from a prolonged underwater eruption during the slow widening of the Atlantic Ocean. The relative proximity of each seamount to the next suggests that some sedentary animals, like corals and sponges, might use them as stepping stones, enabling species to disperse over a vast distance by small stepwise increments with each generation whose planktonic larvae manage to drift to the nearest seamount. Other species, in

Spectacled petrel, endemic. Photo courtesy of Rémi Bigonneau

their isolation, have become restricted and endemic to their own particular seamount. The seamounts influence local water circulation, which results in an increase in productivity that in turn supports large populations of resident fish and attracts hungry oceanic wanderers from far and wide. These oceanic grandees include Atlantic bluefin (*Thunnus thynnus*) and big-eye tuna (*Thunnus obesus*), southern right whales, sperm whales (*Physeter macrocephalus*) and several other species of marine mammal. Seabirds, keen not to miss out on the maelstrom, include two endemic species—the spectacled petrel (*Procellaria conspicillata*) and the Tristan albatross (*Diomedea dabbenena*)—as well as the wandering albatross (*Diomedea exulans*) and the Atlantic yellow-nosed albatross. Many of these species appear on the IUCN's Red List of Threatened Species.

The increased biological productivity along the ridge has been exploited by industrial fishing efforts over the decades, with some damage inflicted to coral reefs on the summits of some seamounts. The long-term effects of historic whaling activities are also still evident within the Walvis Ridge EBSA and the wider South Atlantic waters.

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SUBTROPICAL CONVERGENCE ZONE

Sandwiched between subtropical gyres to the north and the Antarctic Circumpolar Current to the south, the Subtropical Convergence Zone EBSA captures an area of intense oceanic turbulence and mixing.

As vast oceanic currents brush past one another, the turbulence generated as they mix sets up strong, swirling gradients in salinity, temperature and nutrients. The resulting fluid mosaic of water pockets of ever-shifting conditions at all depths allows creatures of all kinds

Southern right whale breaching. Photo courtesy of Harold Moses

to wallow and thrive in their preferred oceanic cocktail. Over the entire area, the collective biological productivity of the mixing zone is higher than in both currents on either side. This enhanced productivity supports a higher diversity of species, both in the water and on the seabed, especially on the summits of seamounts that reach into the sunlit waters nearer the surface. Noteworthy larger animals that thrive in the area include the Atlantic bluefin tuna, leatherback sea turtles and the Tristan albatross. Historic records also show how the area was a haven for southern right whales, a species that is still recovering from its past misfortunes. These and several other seabird and whale species known to frequent the area are included on the IUCN's Red List of Threatened Species and are vulnerable to declines in population because of human activities.

The Subtropical Convergence Zone EBSA has an extensive history of whaling, and in recent decades intensive industrial fishing has taken place. However, the area remains naturally highly productive, and this productivity continues westwards into the southwestern Atlantic Ocean, beyond the boundary of the EBSA itself.

Walvis Bay lagoon, Namibia. Photo courtesy of Skyhawk Photography

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The full report of this workshop is available at **www.cbd.int/doc/meetings/mar/ebsa-sea-01/official/ebsa-sea-01-04-en.pdf**

For further information on the work of the CBD on ecologically or biologically significant marine areas (EBSAs), please see **www.cbd.int/ebsa**

This booklet is available online at:
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