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ASSESSMENT OF TRANSBOUNDARY ENVIRONMENTAL ISSUES AFFECTING BIODIVERSITY IN SHARED MARINE ECOSYSTEMS TOWARDS FORMULATING HARMONIZED REGIONAL FRAMEWORK FOR CONSERVATION OF AQUATIC BIODIVERSITY AND JOINT ACTION PLAN

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Executive Summary

The African Continent is encompassed by some highly productive large marine ecosystems endowed with rich and abundant biodiversity and unrivalled natural beauty (AU BES, 2020; AUC, NPCA 2014, 2014; IPBES 2018). Marine and coastal environments are of significant ecological and socio-economic importance to the African Continent and are under immense threat from human activities. In some coastal states, biodiversity-derived services contribute more than 50% of the gross domestic product (IPBES, 2019). The decline and loss of biodiversity are reducing nature's contributions to people in Africa, affecting daily lives and hampering the sustainable social and economic development targeted by African Countries (IPBES, 2019). Many African countries have developed their national biodiversity strategies and action plans in conformity with the Strategic Plan for Biodiversity 2011–2020 and its Aichi Biodiversity Targets. However, implementation has lagged due to various constraints such as finance and capacity (IPBES, 2018). In addition to climate change, several human-induced factors are negatively impacting African marine ecosystems and posing serious threats to biodiversity and extensive damage to key ecosystems and these include unsustainable exploitation of living marine resources, pollution (land-based and seas-based sources), habitat degradation / modification, water quality deterioration, alien invasive species, depletion of natural resources due to the rising population pressure, expansion in human activities and uncontrolled expansion of urbanisation and ineffective governance (IPBES, 2018; AUC, NPCA 2014; IPBES, 2018; UNEP, 2016; Diop *et al.*, 2011). These threats, if not arrested, may have significant and lasting negative ecological, environmental, and social-economic impacts and result in a loss of natural capital and related ecosystem services, which will ultimately lead to increasing poverty, especially in local communities, tension over scarce resources, instability, insecurity and migration and economic crisis (IPBES 2018).

High ocean temperatures will have tremendous impacts on biodiversity such as fish stocks' abundance, composition, distribution and availability in ways that are not yet fully understood and could result in major ecosystem changes and the collapse of the resources. The projected sea level rise will inundate low-lying coastal urban centres and ports, and densely populated low-lying coastal and estuarine zones, including small islands, will be most affected. Ocean acidification will increase with increasing CO_2 in the ocean, and coupled with increased temperature, will have profound impacts, especially on corals biodiversity in ASCLME region, causing bleaching (Hoegh-Guldberg *et al.*, 2007) and the de-calcification of shells of molluscs (Parker *et al.*, 2013).

There are 18 species of true mangal and 16 species of seagrass found around Africa (Failler *et al.*, 2017). The African coastal areas are significant for both resident and migratory bird species. Whales and dolphins are found throughout African waters. Five species out of the seven species of sea turtles are known to forage and nest around Africa, hawksbill turtle green turtle, olive ridley, leatherback and loggerhead turtle. All of them are listed as threatened on the IUCN Red List and in CITES Appendix. Mammals are incidentally killed through bycatch and vessel strikes, pollution, noise, loss or degradation of breeding habitat, disturbance, blasting, infectious diseases and climate change (Wilson and Mittermeier, 2014). Pelagic shark populations are vulnerable to overfishing due to their slow growth rate, low fecundity, late maturity and longevity.

Weak governance at all levels, often characterised by overlapping jurisdictions, institutional failures, and lack of transparency, undermines biodiversity conservation and sustainable use (Biggs *et al*., 2018). All African coastal States have national biodiversity strategies and action plans and provide regular reports on implementation to the CBD. Nonetheless, the effective national-scale implementation of MEAs is highly challenging (Stringer *et al*., 2018), and parties to the CBD have largely failed to meet targets agreed upon in 2010. Area-based techniques such as MPAs are adopted in all coastal states with varying degrees of success.

The paucity of data is a severe constraint in assessments, protection and conservation of biodiversity (AU BES 2020). Improved coordination between National institutions responsible for various multilateral environmental agreements and relevant ministerial departments and agencies is critical to synergising biodiversity and ecosystem services management strategies within a multi-layer governance system (Stringer *et al*., 2018). Collaborative management of transboundary biodiversity is imperative (Okafor-Yarwood *et al*., 2020; Adewumi, 2020 and 2021). Africa can move towards achieving its development aspirations, while at the same time improving the conservation of its valuable natural assets and meetings its biodiversity commitments and targets through multi-stakeholder and multilevel adaptive governance, as well as improved integration of indigenous and local knowledge through recognition of traditional institutions (IPBES 2019).

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Acronyms

ABES	Africa Blue Economy Strategy
AfDB	African Development Bank
AIMS	African Integrated Maritime Strategy, 2050
ASCLME	Agulhas and Somali Coastal Current Large Marine Ecosystem
AU	African Union
AU-IBAR	African Union Inter African Bureau for Animal Resources
BCLME	Benguela Current Large Marine Ecosystem
BES	Blue Economy Strategy
CBD	Convention on Biological Diversity
CCLME	Canary Current Large Marine Ecosystem
COMESA	Common Market for Eastern and Southern Africa
CR	Critically Endangered
DD	Data Deficiency
EAC	East African Community
EN	Endangered
EX	Extinct
EW	Extinct in the wild
FAO	Food and Agriculture Organisation of the United Nations
GCLME	Guinea Current Large Marine Ecosystem
IAS	Invasive Alien Species
ICCAT	International Convention for the Conservation of the Atlantic Tunas
IOC	Indian Ocean Commission
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
IUU	Illegal Unreported and Unregulated Fishing
LME	Large Marine Ecosystem
LC	Least concern
MedLME	Mediterranean Large Marine Ecosystem
MS	Member State
NGO	Non-Governmental Organisation
NT	Near Threatened
PERSGA	Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment
PFRS	Policy Framework and Reform Strategy for African Fisheries and Aquaculture
REC	Regional Economic Community
RSGA	Red Sea and Gulf of Aden
SADC	Southern Africa Development Community
SDGs	Sustainable Development Goals
TDA	Transboundary Diagnostic Analysis
UNECA	United Nations Economic Commission for Africa

UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
VU	Vulnerable
WIO	Western Indian Ocean

1. Introduction and background

1.1 Context

The Global environment has been significantly altered by multiple stressors, most of which are human-induced, with the great majority of indicators of ecosystems and biodiversity (Box 1) showing rapid decline (IPBES 2019). About 75% of the ocean area is experiencing increasing cumulative impacts, and over 85% of wetlands (areas) have been lost (IPBES 2019). Approximately 50% of the live coral cover on coral reefs has been lost since the 1870s, with accelerating losses in recent decades due to climate change exacerbating other drivers (IPBES 2019). Consequently, the compounding effects of drivers such as climate change, habitat degradation, unsustainable use of resources, pollution, acidification, sea level rise and invasive alien species are likely to exacerbate the negative impacts on nature, as seen in different ecosystems, including shelf, open sea and deep Sea areas (IPBES 2018). In this section, the assessment of the status, trends and threats, as well as the identification and categorisation of biodiversity in shared African large marine ecosystems, is conducted per the method outlined in section 3.

Box 1. Convention on Biological Diversity (CBD)[1]
Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems.

[S**ource**: Convention on Biological Diversity, article 2].

The African continent is encompassed by some highly productive large marine ecosystems (LMEs), namely Canary Current (CCLME), Guinea Current (GCLME), Benguela Current (BCLME), Agulhas Current (ACLME), Somali Coastal Current (SCCLME), the Red Sea (RSLME), and the Mediterranean Sea (MedLME) (Sherman and Hamukuaya 2016; Satia, 2016, see Figure 1). Thirty-eight coastal states share these African LMEs with a population of about 945 million people[2], most of whom are assumed to live within 100 km from the coasts. These LMEs are endowed with rich biodiversity and unrivalled natural beauty (Africa BES 2020; AUC, NPCA 2014; IPBES 2018; UNEP 2016; Diop et al., 2011). Natural ecosystems provide many essential ecosystem services (Box 2), and countries' economies depend heavily on biodiversity.

Africa is bathed by three Oceans, namely the Atlantic, Mediterranean and Indian oceans, richly endowed with marine biodiversity and threatened by anthropogenic stressors and climate change. Africa contains 19% of mangrove cover; however, approximately 20–30% has been lost in the past 25 years (IPBES 2018). The African people depend highly on biodiversity and ecosystem services for their livelihoods. Maintaining the health and diversity of life is vital for human well-being and a sustainable economy and society. However, losing biodiversity depletes natural capital and reduces ecosystem services to society.

[1] *'Biological Diversity' is used throughout this assessment as defined by the CBD.*
[2] *https://www.worldometers.info/world-population/population-by-country/*

Box 2: Types of ecosystem services (Millennium Ecosystem Assessment, 2005).
A **provisioning service** *(food-fish, shellfish, oil, diamonds, fuel, recreational activities) is any benefit that can be extracted from nature, such as food, drinking water, wood fuel, natural gas, oils, and medicinal products.* **A regulating service** *(e.g., protection of shoreline from erosion and storm surges), regulates and moderates ecosystem processes to make life possible for the people and includes carbon storage and climate regulation, erosion and flood control, water purification and protection from extreme events such as storms and tidal surges.* **Cultural services** *are non-material benefits that contribute to the development and cultural advancement of people obtained from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences.* **Supporting services** *(such as habitats for fish and nesting for turtles and seabirds, transport of eggs/larvae, carbon sequestration, and coastal protection) are those that sustain fundamental natural processes to allow the Earth to sustain basic life forms, and these include primary production, nutrient cycling and the water cycle.*
*[***Source:** https://www.millenniumassessment.org*].*

Based on recent information (AU BES, 2020), African blue economy sectors and components generate today a value of USD 296 billion with 49 million jobs. It is projected that by 2030, figures will be USD 405 billion and 57 million jobs, respectively, while in 2063, the same estimates would be USD 576 billion of value created and 78 million jobs, respectively. The number of jobs would correspond to about 5% of the active population in 2063.

Africa's unique and abundant biodiversity is an asset for achieving Sustainable Development Goals and can be sustainably and equitably used to reduce inequality and poverty on the continent (AUC, NPCA 2014; IPBES 2018). Biodiversity underpins the fundamental elements for human well-being, including food security, health, and access to clean water. The value of biodiversity and ecosystem services is critical to achieving several Sustainable Development Goals, in particular, Goals 14 and 15, which are focused on conservation and the sustainable use of natural resources in the context of contributions to human well-being (e.g., Goals 1, 2, 3, 6 and 7, IPBES 2018). However, ecosystem valuation to factoring biodiversity and ecosystem services into national accounting systems is non-existing (except for Seychelles and Mauritius). The AU Agenda 2063 (Goal 7) prioritizes sustainable natural resource management and biodiversity conservation. The Lomé Charter (Article 26) enshrines that each state party shall preserve the marine environment and protect the biological species of marine fauna and flora in its environment and biodiversity development. The 2050 African Integrated Marine Strategy (AU 2050 AIMS) recognizes the vulnerability of Africa's coast to marine environmental degradation and climate change and dedicates one of its objectives to minimising environmental damage and expediting recovery from catastrophic events. In 2010, the Aichi Biodiversity Targets were adopted by world leaders to address the crisis of biodiversity loss.

Despite conservation efforts, none of the Aichi Targets has been fully met (Annex 1, IPBES 2018). Under the UN SDGs (Goal #14.2), countries are expected to sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience and taking action for their restoration to achieve healthy and productive oceans and conserve at least 10% of coastal and marine areas. Many initiatives (e.g., EBSAs and MPAs) aimed at biodiversity protection and conservation of coastal aquatic ecosystems are ongoing around Africa, including those undertaken at national levels and under the auspices of the regional Seas programmes (the Abidjan and the Nairobi conventions) and the LME projects/commissions. Many African Countries have developed their National biodiversity strategies and action plans in conformity with the Strategic Plan for Biodiversity 2011–2020 and its Aichi Biodiversity Targets. However, implementation lags due to financial and capacity constraints (ref to Annex 1, IPBES 2018).

The Africa Blue Economy Strategy (ABES) was developed following the Sustainable Blue Economy Conference in Nairobi, Kenya, in 2018. The ABES was endorsed by the 3rd session of the Specialized Technical Committee on Agriculture, Rural Development, Water and Environment (STC-ARDWE) in October 2019, and adopted by the side event of the 33rd Summit in February, 2020. It is composed of six thematic areas that are considered critical vectors for Africa's blue economy development, and these are:

a. Fisheries, aquaculture, conservation and sustainable aquatic ecosystems
b. Shipping, transportation, trade, ports, maritime security, safety and enforcement
c. Coastal and maritime tourism, climate change, resilience, environment, infrastructure
d. Sustainable energy, mineral resources and innovative industries
e. Polices, institutional and governance, employment, job creation and poverty eradication, innovative financing

The Strategy is in line with AU instruments, including the 2014 Africa's Integrated Maritime Strategy (AU 2050 AIMS), the 2014 Pan-African Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa (AUC, NPCA 2014), the 2016 African Charter on Maritime Security and Safety and Development in Africa (Lomé Charter) and the African Union Agenda 2063 and contributes to Africa's integrated, inclusive, secured, transformation and growth. Once implemented, it will contribute, in no small measure, to successfully attaining the 2015 UN Agenda 2030 for Sustainable Development Goals (SDGs). The Blue Economy focuses on the sustainable utilization of aquatic and marine resources (AU BES 2020) around all three pillars of sustainability (Purvis et al., 2019). The Blue Economy paradigm constitutes a sustainable development framework that is transformational and aims to achieve improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities (AU BES, 2020; UNECA, 2014), and realise social-economic development and a dynamic balance of resources and environment and finally achieve sustainable use of the resources (AU BES, UNECA, 2014). Africa can move towards achieving its development aspirations while at the same time improving the conservation of its valuable natural assets and meetings its biodiversity commitments and targets through multi-stakeholder and multilevel adaptive governance, as well as improved integration of indigenous and local knowledge through recognition of traditional institutions (IPBES 2018). Such a polycentric governance approach bridges sectors and operates at multiple levels and scales over different time frames and also offers an alternative to top-down approaches that are less sensitive to local constraints and to bottom-up approaches that are sometimes inadequate for dealing with issues at higher levels (IPBES 2018).

1.2 Rationale

Marine and coastal environments are of significant ecological and socio-economic importance to the African Continent and are under immense threat from human activities (IPBES 2018; AU BES 2020, UNECA, 2014; AUC, NPCA 2014). In some Countries, biodiversity contributes more than 50% of the gross domestic product (GDP). For example, in Tanzania, agriculture, livestock, forestry, and fisheries contribute over 65% of the GDP and account for over 80% of total employment and over 60% of the total export earnings (Tanzania NBSAP 2015-2020). Several human-induced factors are negatively impacting African marine ecosystems and posing serious threats to biodiversity and extensive damage to key ecosystems and these include climate change, unsustainable exploitation of living marine resources, pollution (land-based and

Sea-based sources), habitat degradation/modification, water quality deterioration, alien invasive species, expansion in human activities and ineffective governance (IPBES 2018, AUC, NPCA 2014). These threats, if not arrested, may have significant and lasting negative ecological, environmental, and social-economic impacts and result in the loss of biodiversity, a loss of natural capital and related ecosystem services, which will ultimately lead to increasing poverty, especially in local communities, tension over scarce resources, instability, insecurity and migration and economic crisis (IPBES 2018).

The large African marine ecosystems inhabit critically valuable diversity that are the primary sources of essential ecosystem services that steer the socio-economic growth of the coastal States. Urgent conservation and transformative actions are needed to protect and conserve aquatic biological diversity and reverse or halt biodiversity loss. To make informed management decisions, it is imperative to assess the biodiversity's status and the threats they face. It is in this light that the AU-IBAR, with support from the Swedish International Development Cooperation Agency (SIDA), has commissioned this study. The assessment will inform the development of a harmonized Regional Biodiversity Framework and Joint Action Plan that will help the RECs and their Member States to foster regional cooperation and strengthen mechanisms for joint actions in respect of biodiversity conservation in shared marine ecosystems.

2. Methodological approach

An in-depth desktop study was conducted where critical information on biodiversity in African marine ecosystems was collected and compiled from various sources. Primary sources of information include National biodiversity strategies/plans/programmes/reports, authoritative reports by, among others, IPBES, CBD, CITES, IUCN, RAMSAR convention, Regional Seas Programmes, UNEP, UNFCCC, LME projects/ commissions, WWF, AU-IBAR, RECs, RFMOs, RFBs, peer-reviewed scholarly articles, as well as prominent research entities and academic institutions. The consultant visited Tanzania in the eastern region (Agulhas and Somali Current LME), and Angola in the southern region (Benguela CLME/Guinea CLME) where consultations took place with key stakeholders representing the government responsible for the biodiversity, experts/academics and NGOs who provided valuable inputs necessary for ground-truthing.

The drivers of change regarding biodiversity have been identified based on the analysis of the recent national reports of 38 African coastal States submitted to the Secretariat of the Convention on Biological Diversity (CDB). In these reports, each State has published and described priority drivers of changes (see section 4 and Annex 2).

Figure 1. *Location of African LMEs: Mediterranean (26), Canary Current (27), Guinea Current (28), Benguela Current (29), Agulhas Current (30), Somali Coastal Current (31) and Red Sea (33). The circled number is as assigned in the World Map of Large Marine Ecosystems (Sherman and Hamukuaya, 2016), [Source: Satia, B. 2016].*

There is no agreed standard approach to assessing marine biodiversity. The IPBES methodological approach divides Africa into five regions, namely, Northern, Western, Central, Southern, Eastern, and surrounding islands. For each region, the biodiversity's status, trends and threats were assessed and described for the shelf, open sea and deep-sea areas. In analyzing the status of marine biodiversity in eastern central Atlantic (west and central Africa), Polidoro et al., 2017 used a taxonomical approach by categorizing the species into three classes, namely, vertebrate, invertebrate and marine plants, where vertebrates include marine mammals (sirenians, pinnipeds and cetaceans), marine turtles, seabirds, and marine fishes, invertebrates compose of sea cucumbers, cone snails, cephalopods, lobsters, reef□building corals and marine plants including mangroves, seagrasses, corals and sponges. Spalding et al., 2007; Annex 2) produced a biodiversity-derived map showing bio-regions of coasts and shelf areas of the world in which Sub-Saharan Africa borders four marine realms, namely, temperate Atlantic, tropical Atlantic, temperate Southern Africa, and western Indian Ocean, within which there are 9 separate provinces and 26 distinguishable ecoregions, which reflects the immense diversity of marine life hosted around the Africa continent.

The global marine ecosystems have been defined based on the concept of large marine ecosystems in which their boundaries are based on ecological criteria, including bathymetry, hydrography, productivity, and trophically linked populations (Sherman and Duda, 1999, Sherman and Hamukuaya, 2016). The large marine ecosystems (LMEs) of the world, 66 in total, are relatively large regions on the order of 200,000 km^2 or greater that occupy coastal ocean space around the margins of the continents. They produce 80% of the world's annual marine fish catch, are overfished, polluted, and subject to nutrient over-enrichment, acidification, accelerated warming from climate change, loss of biodiversity, and key habitats such as seagrasses, mangroves and coral reefs under severe stress (Sherman and Hamukuaya 2016). Employing the ecological criteria, Africa has seven distinct LMEs, (Figure 1).

This analysis, therefore, assesses the existing biodiversity information in the context of the large marine ecosystem but also considers the above-described methodological approaches (IPBES, 2019; Polidoro et al., 2017; Spalding et al., 2007). The use of IUCN Red List Categories is evident throughout the report. They consist of eight different levels of extinction risks, namely, Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC) and Data Deficient (DD). A species qualifies for one of the three threatened categories (CR, EN, or VU) by meeting the threshold for that category in one of the five different criteria (A–E). These different criteria are based on extinction risk theory (Mace et al., 2008) and form the real strength of the IUCN Red List as they provide a standardized methodology that is applied consistently to any species from any taxonomic group (Polidoro et al., 2010).

The draft Report was shared with resource persons at AU-IBAR, and their comments were incorporated. A stakeholders' consultative workshop (a hybrid of virtual and in-person) attended by representatives from coastal States, AU technical institutions, RECs representatives, experts and AU-IBAR senior officials was held on 28th February, 2023, where further inputs and comments on the document were received and incorporated. The workshop validated the document.

3. Assessments of priority environmental issues affecting biodiversity in African marine ecosystems

3.1 Introduction

This section assesses direct and indirect drivers affecting biodiversity in shared African marine ecosystems. It is subdivided into two parts, namely direct and indirect drivers. At the Global level, an analysis of the proportion of threatened species on the IUCN Red List (mammals, birds, amphibians) affected by each driver showed that more than 80% are under threat from habitat loss, 70% from overexploitation and unsustainable use, and almost 30% from invasive alien species. According to the most recent IPBES Report (2018 and 2019), the direct and indirect drivers of change in respect of global biodiversity have accelerated at an unprecedented pace during the past 50 years. The Report further described that the major threats to African biodiversity include habitat destruction, deforestation, habitat conversion and disturbances such as habitat fragmentation, overexploitation of some species, invasive alien species, pollution, and climate change and variability. Changes in land use and lack of appropriate land-use planning contribute to the loss of habitats and biodiversity. Agricultural expansion, the establishment of settlements in biodiversity-rich ecosystems and sensitive areas, excessive collection of firewood and construction materials, and illegal exploitation of wildlife also contribute to biodiversity loss. Invasive alien species of both plants and animals seriously threaten local biodiversity in the region. The results of the above analyses are consistent with the comprehensive assessment in 2003 (Millennium Ecosystem Assessment 2005; UNEP 2016).

In this assessment, National reports submitted to the CBD of 38 African coastal states (Annex 2) were reviewed, and priority issues of concern were deduced. The results are shown in Figure 2. Climate change (38), unsustainable use of living marine resources (31) and habitat destruction (28), rank 1st, 2nd and 3^{rd,} respectively. In descending other, others are invasive alien species (25), pollution (25), poorly planned or unplanned development (23), the impact of extractive activities (14), population pressure (14), coastal erosion (7), weak governance (7), poverty (7), IUU fishing (6), limited data (4), limited capacity (4) and lack of awareness (4). It was, therefore, based on the results of the reported and published priority issues by the parties to the CBD that the selection was based.

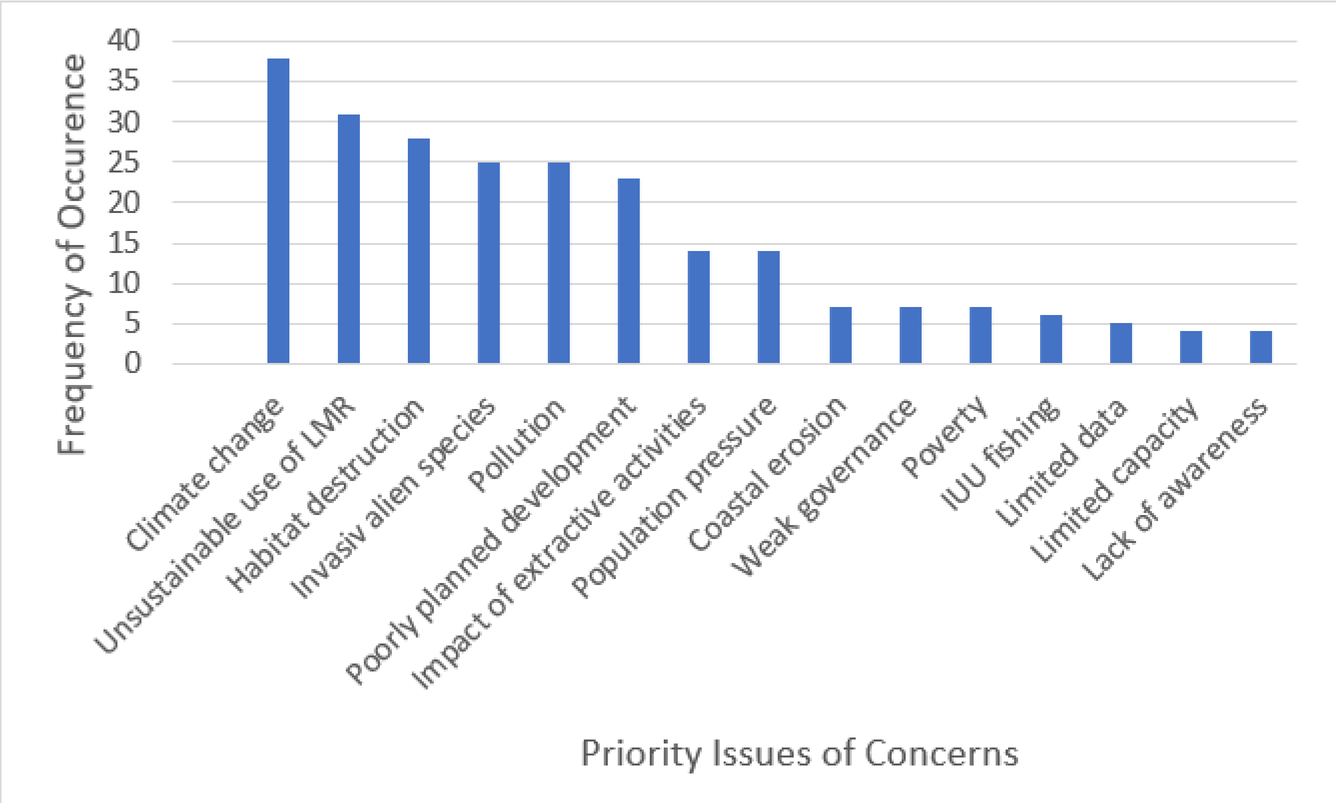

Figure 2. *Drivers of changes deduced from countries National Report to the CBD.*

3.2 Direct threats

3.2.1 Climate change and climate variability

Anthropogenic processes are altering the atmosphere and climate system, with forecasted increases in the global average temperature of around 1°C by 2050 and potentially 5°C by 2100 (IPBES 2019, IPCC, 2014) and are anticipated to have major impacts on species extinctions (Thomas et al., 2004; Jetz et al., 2007; Foden et al., 2013). Sea-level rise is occurring and is expected to increase by 20–40 cm by 2050 and 50–80 cm (or more) by 2100, approximately 10 per cent higher than the global mean (Schellnhuber et al., 2013). With a 1-metre sea level rise accompanied by 10 per cent intensification of storm surges, the mangrove areas of Gabon, Cameroon, Guinea, Guinea Bissau and Nigeria and the coastal lagoons of Angola and Ghana, in addition to low-lying coastal urban centres and ports, will be inundated (Dasgupta et al., 2011; Donkor and Abe 2012). The coastal wetlands of 38 countries will be vulnerable at various spatial and temporal scales. Densely populated low-lying coastal and estuarine zones, including small islands such as Seychelles, Comoros and Mauritius in the Western Indian Ocean, will be most affected.

In coastal marine ecosystems, sea-level rise, higher Ocean temperatures, increasing acidification, and changes in the Ocean current patterns will have tremendous impacts on fish stocks' abundance, composition, distribution and availability in ways that are not yet fully understood and could result in major ecosystem changes, the collapse of key fish stocks, threats to biodiversity (AU BE Thematic on Fisheries), and the security of coastal communities. As the climate warms, temperate communities are declining, and tropical communities are increasing as these communities expand into areas formerly dominated by warm temperate species. On the eastern coast, (Lloyd et al., 2012) recorded a decline in temperate species and an increase in tropical species associated with warming sea temperatures. A rise in temperature, increased storm surge and sea level rise pose threats to coastal systems, with estuarine environments particularly vulnerable (Magadza, 2000). Seggel and De Young (2016), projected that warmer temperatures are expected to lead to a drop of 21% in the annual landed value of fish in West Africa and a fall of nearly 50% in fisheries-related employment by 2050. If overexploitation of fisheries in the region continues at their current rates, projections suggest marine-capture fisheries in Nigeria, Côte d'Ivoire, Ghana, Liberia, Sierra Leone, and Togo could halve by 2050 (World Bank, 2017).

Africa is highly vulnerable to the impacts of climate change, with temperatures in African countries rising faster than the global rate, and in some areas, at double the global rate of warming (IPBES 2018). Despite Africa's low contribution to greenhouse gas emissions, its biodiversity and ecosystems are amongst the most vulnerable and most severely impacted by climate change (IPCC 5th Assessment Report, AUC, NPCA 2014). This, in turn, is having a profound negative impact on Africa's ability to achieve sustainable development and will continue to do so unless adaptive measures are undertaken. Low adaptive capacity makes Africa highly vulnerable to the impacts of climate change (Engelbrecht et al. 2015; UNECA 2014; Niang et al., 2014; Boko et al., 2007). The African Region is warming faster than the global average, with projections of a rise of 3–4°C this century, which makes climate change a considerable health and economic challenge for the Continent. Adaptive capacity for the coastal communities that are overwhelmingly dependent on the ecosystem services to management intervention, such as closures to fishing, can have a positive impact on reef recovery, as observed in Tanzania (McClanahan et al., 2009)

Warmer temperatures are expected to lead to a decline of 21% in the annual landed value of fish in West Africa and a drop of nearly 50% in fisheries-related employment by 2050 (Seggel and De Young, 2016). Suppose the overexploitation of fisheries in the Region continues at current rates. In that case, projections suggest marine-capture fisheries in Nigeria, Côte d'Ivoire, Ghana, Liberia, Sierra Leone, and Togo could halve by 2050 (The World Bank, "New Hope for Sustainable Fishing and a Blue Economy for West Africa)[3]. Many studies (El-Nahry et al., 2011; Kilroy, 2015) concluded that along the Northern coast of Africa, changing climate conditions and accelerating sea level rise will intensify the stress on many coastal zones, coastal cities, lagoons, wetlands and deltas (IPBES 2018). Climate change and climate variability are already adversely impacting Africa's aquatic systems (Sumaila et al., 2020; Lam et al., 2020). In coastal marine ecosystems, Sea-level rise, higher Ocean temperatures, increasing acidification, and changes in the Ocean current patterns will have tremendous impacts on the abundance, composition, distribution (AUC, NPCA 2014) and availability of fish stocks in ways that are not yet fully understood (Ehler and Douvere, 2009), and these changes could result in significant ecosystem modification, the collapse of key fish stocks, and threats to biodiversity (Allison et al., 2009). Small-scale fishing communities, which make up a large percentage of Africa's fisheries, will disproportionately bear the impact of declining catches associated with climate change (AUC-NEPAD, 2014). The migration of fishers in search of livelihood and food security opportunities elsewhere is expected to increase. Policy and regulatory systems are required to manage the effects of climate change on fishing practices, and traditional fishing patterns must adjust to the variations in species productivity and distribution (AfDB 2022). With the anticipated increase in demand for fish products which will be required to meet the needs of the growing population, the projected declines in catch potential, particularly in the tropical to temperate regions within which all of Africa's fish supply originates, suggests a worrisome future (Cheung et al., 2010).

[3] *https://www.worldbank.org/en/news/feature/2017/06/07/new-hope-for-sustainable-fishing-and-a-blue-economy-for-west-africa.*

Ocean acidification will increase with increasing CO_2 in the Ocean. This, coupled with increased temperature will have profound impacts, especially on corals biodiversity in the Eastern Region as coral vulnerability is high in this Region Western Indian Ocean causing bleaching (Hoegh-Guldberg et al., 2007) and the de-calcification of shells of molluscs (Parker et al., 2013; IPCC 2014).

The adverse effects of climate change in Africa may include but are not limited to, reduced diversity, regime shifts and worsening of food insecurity and an increased risk of conflict over scarce land and water resources. Recent studies have shown that over the seven decades or so, thousands of species have shifted from equatorial latitudes attributed to climate warming (add more ref; Chaudhary et al., 2021). Based on large-scale models and scenarios assessments (Cheung et al., 2009; Kaimuddin et al., 2016), climate change has caused species and biomes to poleward/deepward range shifts. This trend is projected to persist throughout the 21st century (Loarie et al., 2009), with the extinction rates also expected to increase (Pimm et al., 2014). The model projection shows that the species turnover across Africa's important bird areas varies regionally and substantially at many sites. There are apparent shifts in the distribution of the entire avifauna (Hole et al., 2009).

Considering some of the climate change impacts currently experienced and projected to increase, Africa has the opportunity to manage its biodiversity to contribute to international efforts to mitigate observed and projected climate change impacts, including the frequency and intensity of extreme events, through improved efforts in, among others, restoration of degraded ecosystems and expansion and effective management of marine protected areas.

3.2.2 Unsustainable exploitation of living marine resources

Unsustainable use of natural resources is a direct result of population growth and is rampant in Africa (IPBES 2022, Arthurton et al., 2006; Diop et al., 2011), and in the absence of proper interventions, it can lead to, among others, loss of biodiversity, habitat degradation, increased vulnerability to climate change (IPBES 2018) and poverty (FAO SOFIA 2022). All seven large African marine ecosystems (see Figure 1) are richly endowed with living marine resources, including fishery resources. Three of the top four ranked globally productive LMEs are in Africa, namely Canary Current, the Benguela Current and the Somali Coastal current (Rosenberg et al., 2014).

Marine species diversity and average body size for many important commercial fishery species have markedly declined over the past few decades, and several reviews report that many artisanal and commercial fish stocks are now considered to be overexploited. These threats are compounded by the challenge of managing shared stocks across a culturally, politically and geographically diverse landscape. The status of fisheries in Africa's large marine ecosystems is a concern, particularly of overexploited resources in the CCLME, GCLME and MedLME (Figure 3). Various fisheries sub-sectors (e.g., artisanal, semi-industrial, industrial, longline, purse seine, traps) operating throughout Africa target an estimated 643 taxonomic groups, of which about 280 taxa are exploited in the Mediterranean coast of Africa alone, dominated by small pelagic species such as sardines (Sardina pilchardus), sardinellas (Sardinella spp.) and anchovies (Engraulis encrasicolus) (Belhabib et al., 2016). Substantial pressures threaten Africa's marine fisheries, and these include pollution, habitat destruction, unsustainable and destructive fishing practices (AfDB 2022), Illegal, Unreported and Unregulated (IUU) fishing (which was recently estimated at $10 billion annually (AU BES 2020), and negatively impacts the well-being and food security of people in coastal communities, particularly in developing States and small island developing States (SOFIA 2022). Coastal communities have open access to marine resources in Eastern Africa for survival, which often results in unsustainable fisheries in the interest of livelihoods (McClanaban, 1987). Most fish stocks in West African waters are overfished (Nguyen, 2012), which leads to conflicts between the artisanal and commercial fisheries due to the competition for the same fishing grounds (Djama, 1992; Bennett, 1998).

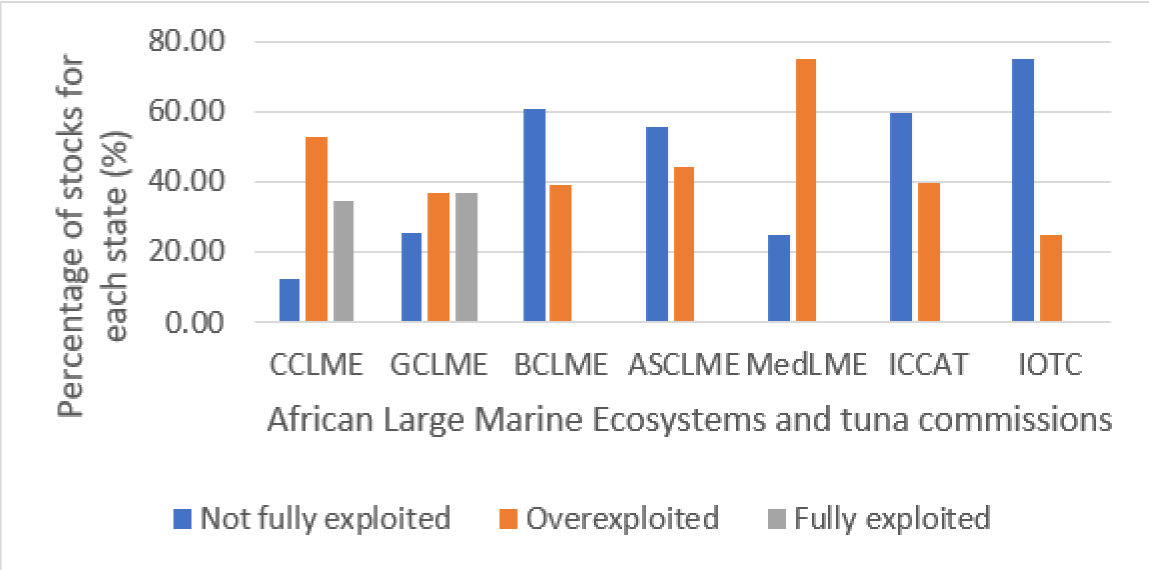

Figure 3. *Status of the African marine fisheries (Source: FAO; AfDB 2022).*

Marine turtles have cosmopolitan distribution along the entire coast of Africa. In the west, the beaches of Cape Verde, Gambia, Guinea, Guinea-Bissau, Mauritania and Senegal are important nesting sites for five marine turtle species: green, hawksbill, loggerhead, leatherback and olive ridley. The Gabonese waters are one of the hotspots for foraging and nesting marine turtles. Guinea-Bissau hosts the largest green turtle (Chelonia mydas) breeding population in Africa. The Cape Verde Islands harbours the 2nd largest breeding population in the Atlantic and the 3rd largest population in the world after that of the United States of loggerhead turtle (Caretta caretta). The olive ridley turtle (Lepidochelys olivacea) is regionally significant in Guinea-Bissau. In general, turtles around Africa face threats that include traditional consumption of meat and eggs, ornamental products, accidental mortality in fishing operations, habitat degradation or modification (WWF)[4], marine litter (notably plastics ingestion and entanglement and coastal development. In Gabon, the total annual number of turtle captures by the fisheries was estimated as ranging between 1,026 and 2,581 olive ridley turtles, with a mortality ranging from 63 to 794 turtles per year which is a severe concern for the local breeding population of olive ridley turtles (Casale et al., 2017). Gabon has already declared 23.8% of its exclusive economic zone, as a MPA and sea turtles are protected by law (Casale et al., 2017).

Long-lived top predators with low reproductive rates, including marine mammals, Sea birds, Sea turtles, sharks, and their prey removed from the ecosystem by the fisheries threaten biodiversity (Hall 1996). Unselective and damaging fishing methods, such as in shrimp fisheries, bycatch of commercial and non-commercial species often significantly outweigh the catches of target species (Banks and Macfadyen, 2011;

[4] *https://wwf.panda.org/discover/knowledge_hub/where_we_work/west_africa_marine/project/turtles/*

Hall, 1996). The ratio of shrimp to other species in landed catch weight ranges from 1:8 in West Africa (Banks and Macfadyen, 2011) to 1:1 in some fisheries with effective selectivity devices, such as Madagascar (Banks and Macfadyen, 2011). Unsustainable practices such as by-catch discarding are responsible for around 20% of catch loss. The incidental catch of non-target species by fishing gear has become a severe conservation challenge for marine fauna (Lewison et al., 2014; Zollett and Swimmer 2019), despite available technical mitigation measures, such as those recommended in the FAO Code (FAO, 1995) and the International Plan of Action for Conservation and Management of Sharks and the International Plan of Action to Reduce Incidental Catch Seabirds in Longline Fisheries and the International Plan of Action to reduce Incidental Catch of Turtles.

Pelagic shark populations are vulnerable to overfishing due to their slow growth rate, low fecundity, late maturity and longevity (Gilmman et al., 2008). Blue sharks (Prionace glauca), shortfin makos (Isurus oxyrinchus) and porbeagle sharks (Lamna nasus) are vulnerable to both high-Seas fishing fleets and local fleets (Gareth et al., 2020). They are the most important bycatch species caught by pelagic longline and gillnet fisheries, which mainly target swordfish and tuna in the Atlantic Ocean (Santos et al., 2021) and are considered to be at the most significant risk of overexploitation. Mammals are incidentally killed through bycatch and vessel strikes, pollution, noise, loss or degradation of breeding habitat, disturbance, blasting, infectious diseases and climate change (Wilson and Mittermeier, 2014).

3.2.3 Habitat degradation/modification

Healthy coastal and marine ecosystems are essential for ecosystem services and critically important to African biodiversity (Senelwa et al., 2012). Therefore, habitat destruction and alteration in African pose severe threats to marine biodiversity, as anthropogenic activities modify or and alter essential coastal and marine habitats and negatively impact marine biodiversity through, among others, seabed extraction (e.g. offshore oil exploration and exploitation), poorly planned coastal urban infrastructural development, unsustainable exploitation of mangroves, destructive fishing methods such as smaller mesh sizes, bottom trawling, and poison fishing (Lee et al., 2011; AfDB 2022), population pressure, industrial and agricultural development and a changing climate (Hamerlynck and Duvail, 2003), conversion to land for other uses including agriculture, aquaculture, infrastructure development, tourism and salt production, cutting of the trees for fuelwood and poles for housing construction and firewood and charcoal, urbanisation and industrialisation, canalisation, discharge of sewage and other pollutants, siltation, sand mining, erosion, construction of embankments, increased sedimentation, and changing hydrology (IPBES 2018/2019). Destructive fishing practices include intensive inshore and offshore trawling with associated consequences of unwanted by□catch, the use of explosives and chemicals in inshore areas, and the use of the small mesh□sized beach and purse seine nets in both nearshore and offshore regions (GCLME TDA 2006) and juvenile nursery habitats.

3.2.4 Invasive alien species (IAS)

Alien species have been identified as one of the significant threats to the maintenance of biodiversity and ecosystem functioning in marine systems (Branch and Steffan, 2004) and the conservation of biodiversity and ecosystem services in Africa (IPBES 2018). They occur in all major taxonomic groups, including viruses, fungi, algae, plants, fish, amphibians, reptiles, birds and mammals (Tassin et al., 2007). Once an unwanted alien species has naturalized in the new environment, it is nearly impossible to eradicate it (Pyšek and Richardson, 2010; Punt and Post 2003). A large number of introductions of IAS can be attributed to intensified global trade and shipping (Hulme et al., 2008).

Globally alien species have increased by 40% since 1980, and nearly one-fifth of the earth's surface is at risk of plant and animal invasions, impacting native species, ecosystem functions and nature's contributions to people as economies and human health (IPBES 2019). IAS can exert a heavy economic toll on National governments, industries, and the private sector, and illustrate, the estimated damage from invasive species worldwide totals more than $1.4 trillion or 5% of the Global economy (Pimentel, et al., 2001), and could even be higher in Africa where data/information on the financial costs of conservation is lacking or limited (Frazee et al., 2003).

In Africa, the status of invasive alien species (IAS) remains poorly documented in the African continent, except to a certain extent, in East Africa, South Africa, Mauritius, Seychelles, and Reunion Island. However, the primary vector of introducing IAS is shipping through the ballast water, followed by aquaculture and canal construction (Figure 4). Increased marine transport could introduce many more invasive species into African ecosystems. Coastal shipping ports are IAS hotspots due to shipping ballast water. The Mediterranean Sea has a sizeable known amount of IAS around Africa due to its massive shipping ports connecting to Suez Canal, which is home to over 500 invasive species (Figure 5, Molnar et al., 2008). A mussel species, Brachidontes pharaonis was first recorded in 1876 through the Suez Canal and gradually outcompeted a native mussel, Mytilaster minimus, which consequently altered the feeding patterns of predators. In the same area, the green algae, Caulerpa taxifolia was introduced in 1984 due to the aquarium trade, and eventually replaced the natural algae, C. taxifolia. As a defence mechanism, it releases a toxin that prevents other marine species from feeding on it, which can eventually result in a significant decrease in biodiversity (Molnar et al., 2008). It is believed that many invasive species affect the keystone species causing major shifts in the food web and biodiversity.

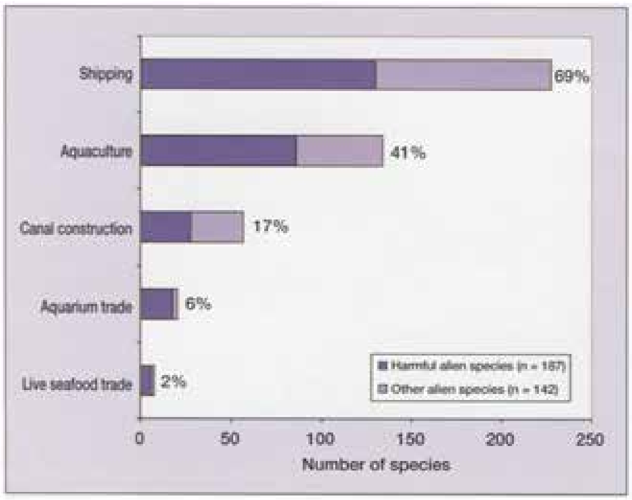

Figure 4. *Percentage of marine invasive species using human-assisted pathways. Darker proportions are labelled as having high ecological impacts (Molnar 2008).*

One of the most successful IAS in Southern Africa is the Mediterranean mussel Mytilus galloprovincialis that invaded the shores of South Africa in about the mid-1970s, first detected at Saldanha Bay on the West coast, and now occupies the whole of the West coast of South Africa and the Southern half of Namibia (Branch and Steffan 2004). It was deliberately introduced from the west coast to the South coast for mariculture. It competitively displaces several species because of its physiological performance. It also serves as an additional food source for higher predators, including the rare and endangered African Black Oystercatcher (Haematopus moquini) (Branch and Steffan, 2004). Another IAS found in Southern Africa and northwest of Africa is oyster Crassostrea giga, which originated from Japanese waters and is commercially farmed in many parts of the World where environmental and ecological damages caused by them can be much worse.

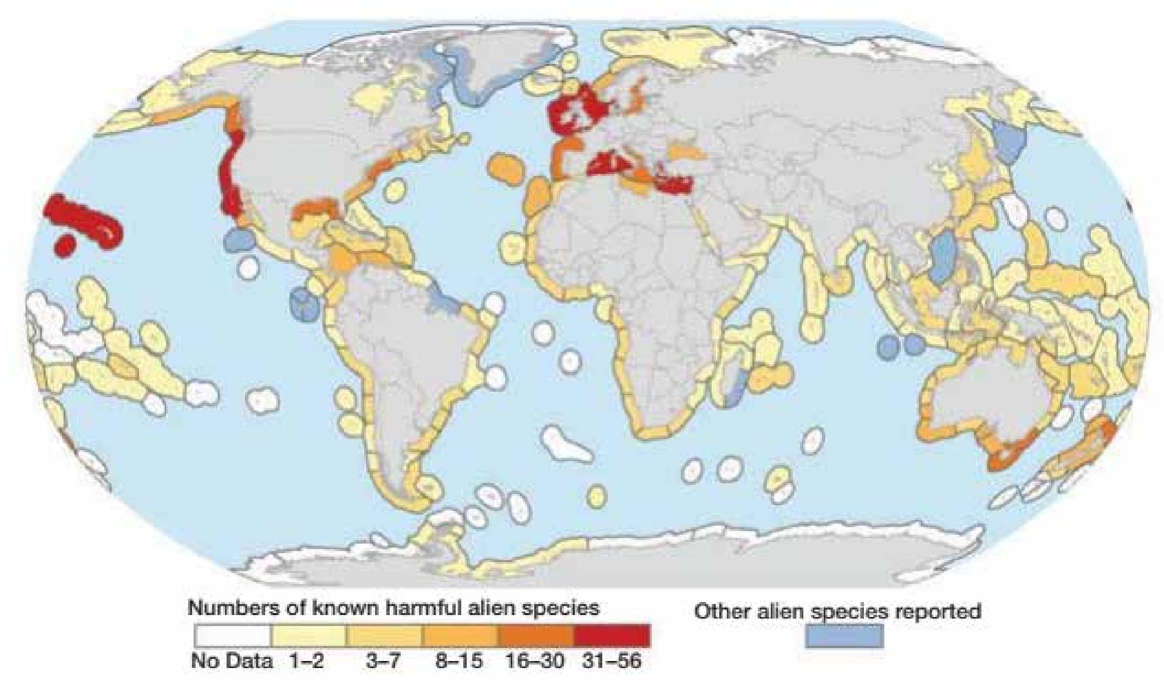

Figure 5. *Map of the number of harmful alien species by coastal ecoregion, with darker shades indicating a more significant number of species (Molnar et al., 2008).*

The AU coastal Member States have recognised the importance of controlling the introduction of damaging invasive alien species through several agreements and protocols. In its Framework Action Plan for the Environment, the AU-NEDAP identifies Invasive Alien Species (IAS) as one of its core program areas. The RECs (e.g., COMESA, SADC, EAC) embodied IAS in their treaties. The African Convention on the Conservation of Nature and Natural Resources required parties to strictly control the intentional and accidental introduction of invasive alien species, including modified organisms and to endeavour to eradicate those already introduced where their consequences are detrimental to native species or the environment in general.

3.2.5 Pollution

Marine pollution severely impacts the ecosystem and biodiversity, as it damages spawning, nursery and feeding grounds essential to the biological diversity of living marine resources (AfDB 2022). Globally, land-based activities are considered to contribute between 80 – 90% of the chronic pollution load to the marine environment (ASCLME/SWIOFP 2012). Coastal nutrient enrichment from agricultural run-off and atmospheric deposition of nitrogen from fossil fuel combustion are significant causes of coastal eutrophication and so-called dead zones (Diaz & Rosenberg, 2008; Doney, 2010) with adverse effects on coastal ecosystems like salt marshes (Deegan et al., 2012) and coral reefs (Altieri et al., 2017).

Oil pollution, sewage outfalls, heavy metals from industrial processes and biological waste cause deterioration in coastal water quality (AfDB 2022). Fertilisers, pesticides and agrochemicals lead to nutrient enrichment of coastal ecosystems, posing a significant threat, where harmful algal blooms and microbial contamination has been shown to cause major changes in species composition, structure, and function of marine communities (Islam and Tanaka, 2004).

According to IPBES 2019, marine plastic pollution has increased tenfold globally since 1980, affecting at least 267 species, including 86% of marine turtles, 44% of seabirds and 43% of marine mammals. Based on a recent estimate, 192 coastal countries have generated 275 million metric tonnes of plastic waste, 4.8–12.7 million of which have entered the ocean (Jambeck et al., 2015). Major factors that affect how much plastic waste enters the sea include population size and the quality of waste management systems. SDG Target 14.1 calls for preventing and significantly reducing marine pollution, but it is yet to be fully implemented. Inevitably, humans are affected by food chains. Plastic debris has become rampant with visible impacts on marine species through ingestion, suffocation and entanglement. Fish and other marine living resources mistake plastic waste for prey and most then die of starvation as their stomachs become filled with plastic. Floating plastics also help transport invasive marine species, threatening marine biodiversity (AfDB 2022).

Damage to coral reef systems, primarily due to pollution and climate change, has far-reaching implications for fisheries, food security, tourism and overall marine biodiversity. Coral reefs, in particular, seem very vulnerable to plastic debris, with one study estimating that contact with plastic results in a 4–89% increase in the likelihood of coral disease (Lamb et al., 2018). Contaminants like metals, hydrocarbons, nutrients, herbicides and sewage have been shown to reduce species richness and abundance across marine ecosystems (Johnston and Roberts, 2009) with particular impacts on coral reefs (McKinley & Johnston, 2010) and seabird species (Croxall et al., 2012) and mortalities from ingestion have been reported in some species (Baulch & Perry, 2014).

In the CCLME, wastewater from domestic, urban and industrial sources and ports is the primary source of pollution of the coastal and marine aquatic environment (CCLME TDA 2014). These discharges have increased significantly in recent decades owing to the high concentration of people and industries along the coast, poor wastewater management (absence and/or lack of control and treatment facilities) and the increased demand for water in urban areas. Inadequate or lack of adequate sanitation is observed in all CCLME Project countries.

Persistent organic pollutants with harmful effects on the environment and human health, mainly used in agriculture, have been reported in Morocco, Senegal, the Gambia and Guinea and have accumulated in living organisms and natural habitats (CCLME TDA, 2014). Hydrocarbon pollution is generally a problem around ports owing to port traffic, boat maintenance, discharges, the emptying of ballast tanks of ships, and oil spills during oil exploration and exploitation offshore, which are incredibly harmful to marine and coastal wildlife.

Land and marine-based activities have contributed significantly to the deterioration of water quality in the GCLME. The primary sources are domestic and industrial pollutants associated with the large cosmopolitan areas of Abidjan, Accra, Port Harcourt, Lagos, Douala and Luanda (GCLME TDA 2006). Untreated effluents discharged directly into sewers, canals, streams, and rivers end up in the ocean, causing widespread deterioration of the water quality in the GCLME region (GCLME TDA 2006).

In the BCLME region, main pollution areas are primarily located around the major coastal cities (including Cape Town, Walvis Bay, and Luanda) and in areas with mining and petroleum activities and other industries. The primary sources in this Region include Sea and land-based activities, the latter due to run-off from agricultural activities and Rivers and effluent outfalls as well as atmospheric deposition (BCLME TDA, 2022). The sources of pollution in this Region include land-based and maritime-related activities that include dumping, shipping, ports, and oil and gas activities (ASCLME/SWIOFP 2012; AfDB 2022). In ASCLME, the deteriorating quality of the coastal waters poses a significant threat to public health and the health of its living marine resources and ecosystems.

Most of the African coastal countries are party to relevant international pollution instruments including the Abidjan Convention, Nairobi Convention and the Barcelona Convention. Marine plastic pollution continues to present serious challenges to the integrity of coastal livelihoods and marine biodiversity in Eastern and Southern Africa (Pucino et al., 2020). The effective management of marine pollution requires a strong legal regime covering National, Regional and International levels and stakeholders consultation (AfDB 2022; Adam et al., 2020).

3.3 Indirect threats

3.3.1 Impact of extraction activities

In most countries within the GCLME Region, including Nigeria, Liberia, Gabon, Ghana, Benin, Cameroon, Angola, Sierra Leone, and Togo, unregulated sand mining has contributed to the degradation of coastal areas. In most cases, the mined sand is used for construction, beach replenishments and reclamation purposes. Other impacts would include increased current wave activities and change in the hydrodynamics of the area, particularly in the marine environment and aggravating coastal erosion. Also, the increasing depletion of the sandy bottom can adversely affect living resources, especially the benthic organisms, which require sandy bottom and shallow depths for spawning (GCLME TDA 2006).

3.3.2 Population explosion/pressure and uncontrolled expansion of urbanization

The population growth in Africa is at the rate of 2.5% per annum (Boke-Olén et al., 2017), or more than three times the global average of 0.8 per cent per year (UN DESA, 2022). The African population is expected to reach 1.7 billion in 2030 (AfDB 2022) and 2.5 billion in 2050, putting severe pressure on the Continent's biodiversity and the ability to provide nature's contribution to people (IPBES 2018). Feeding the population at today's level of per capita consumption (7.5 kg/capita/year from marine fisheries[5]) will require 13 million tonnes of marine fish in 2030 and almost 19 million tonnes in 2050 (AfDB 2022), and thus the demand for marine food products will consequently increase (Garcia et al., 2010, Nguyen, 2012).

[5] Per capita consumption of (total) aquatic food is estimated at 9.9 kg in 2020 (FAO SOFIA 2022).

Africa is also one of the most rapidly urbanizing Continents, as most people live in towns and cities (Figure 6). Based on current estimates, Gabon is the most urbanised Country in Africa, with 90% of its citizens living in cities. Libya ranks second at 81%, and Djibouti occupies the third position at 78%. Other highly urbanised Countries are Sao Tome and Principe at 75%, Algeria at 74%, Tunisia at 70%, Congo Republic at 68%, South Africa at 67%, and Angola at 67%. In terms of the region, southern Africa is the most urbanised at 61% followed by North Africa at 51%. Many coastal towns have become megacities (Lagos 15 million, Cairo 7.8 million, Alexandria 3.8 million, Abidjan 3.7 million, Cape Town 3.4 million, Casablanca 3.2 million, Durban 3.1 million and Luanda 2.8 million. Rapid and often poorly or unplanned urbanization puts immense pressure on coastal habitats, adversely impacting biodiversity.

The impacts of population growth on biodiversity and ecosystems present one of the primary drivers of environmental change (Millennium Ecosystem Assessment, 2005; IPCC, 2007; WWF-AfDB, 2015; UNEP, 2016). In the GCLME Region, about 47% of the 248 million people live within 200 km of the coast and are dependent on the goods and services the ecosystem provides (Adewumi 2020 and 2021; Okafor-Yarwood et al., 2020). The coastal population is projected to increase in share to 52% in 2100 (Barbier, 2015). However, intense competition and unsustainable use of resources by di□erent sectors, coupled with climate change, negatively a□ect the ecosystem and people who depend on them (Okafor-Yarwood, 2018). Urban population produces large quantities of solid and other wastes that lead to environmental pollution, negatively affecting the coastal and marine biodiversity.

The rapid expansion of coastal populations has resulted in high population growth rates (4.49%) and urban immigration (GCLME TDA 2006). The highest population density centres are located in some of the cities along the coast, including Accra-Tema (Ghana), Abidjan (Cote d' Ivoire), Douala (Cameroon), Lagos and Port-Harcourt (Nigeria) and Luanda (Angola). Lagos is currently a megacity of over 10 million inhabitants.

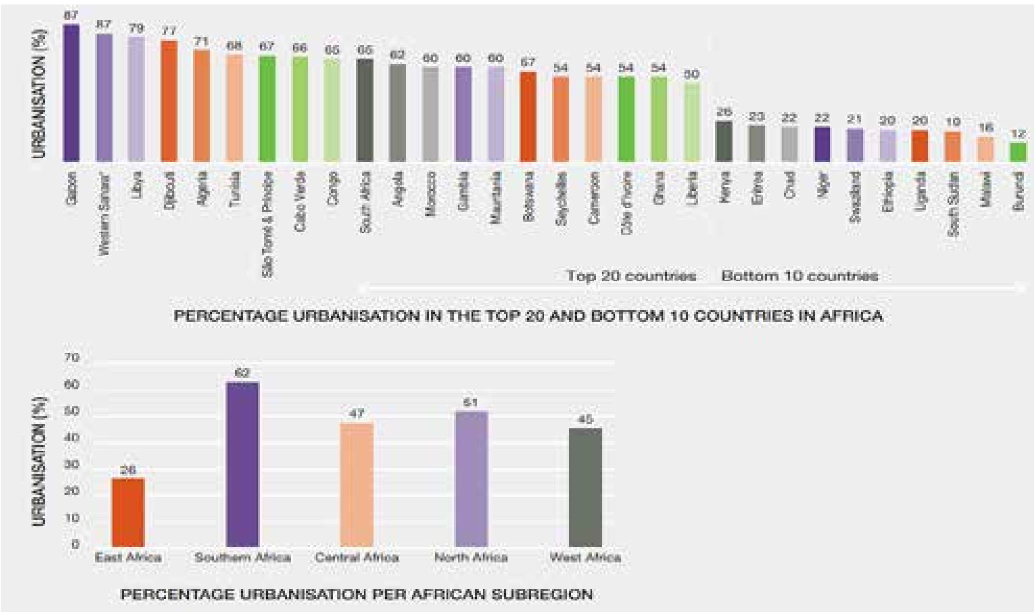

Figure 6. *Top Figure: Percentage urbanization in the top 20 and bottom 10 countries in Africa; Bottom Figure: Percentage urbanization per African subregion (IPBES 2018).*

A rapidly growing population stresses ecosystems by accelerating environmental degradation through, among others, biodiversity loss (World Bank 2008). Extreme competition over scarce resources leads to conflict (IPBES 2018).

3.3.3 Coastal erosion

The problems caused by erosion are increasingly becoming a concern in the CCLME Region (CCLME TDA 2014). This phenomenon is observed in Morocco, Senegal, Mauritania and the Gambia. A large part of the acceleration of coastal erosion is due to the hydrodynamic and morpho-sedimentary effects of anthropogenic activities. Examples include the construction of a breakwater at the port of Conakry, dredging of access channels, extraction of coastal and marine sand, uncontrolled construction in coastal areas and excessive cutting of mangroves. These natural and anthropogenic environmental changes can, if they persist, lead to loss of biodiversity and sometimes complete degradation of the ecosystem (CCLME TDA 2014). Sand mining is the most significant cause of coastal erosion and is mainly a result of the increasing demand for construction materials, primarily sand, for the building industry. This demand, estimated at nearly 13 million tonnes in Morocco and expected to more than double in 2015, is often met by illegal and inexpensive mining of beaches and coastal dunes. Rapid unplanned coastal development in some coastal areas, such as the Petite Côte in Senegal, frequently causes an accentuation of coastal erosion either by inadequate construction and facilities or by the increasing extraction of sand for construction purposes (Cesaraccio et al., 2004; Sakho et al., 2011; Balde, 2003; Ackerman et al., 2003)). Both these practices can lead to catastrophic results, as is currently feared in the Langue de Barbarie, St Louis. Cape Verde and Guinea-Bissau sand extraction is also taking place (CCLME TDA 2014).

Coastal erosion constitutes a severe problem in many Countries in the GCLME (GCLME TDA 2006). The rate of the coastal retreat can average several meters per year (for example, erosion rates caused by port structures in Liberia, Togo, Benin and Nigeria sometimes reach a staggering 15-25 m per year). Although the coastline is highly subject to natural erosion and sedimentation processes due to high wave energy, and strong littoral transport, amongst others, erosion has been intensified mainly by human activities, notably through sand mining and exploitation, disturbance of the hydrographical cycles, River damming, port construction, dredging, and mangrove deforestation. Harbour construction activities have altered the current longshore transport of sediment and, in many cases, have led to significant erosion and siltation problems. Actions to control erosion around these ports are critical to maintaining their vitality as sites for growing touristic, recreational, commercial and defence needs. These aspects described above are particularly relevant to the Western part of GCLME and particularly for the countries Benin, Côte d'Ivoire, Ghana, Nigeria and Togo.

3.3.3 Ineffective governance

In Africa, there is limited information about ecosystem status and health, which grossly hinders their effective management at the National, transboundary, and Regional levels. Overlapping jurisdictions and institutional failures often characterize weak governance at all levels. Inadequate transparency undermines biodiversity conservation and sustainable use (Biggs et al., 2018). It exacerbates the already complex issues of conservation and sustainable use and management of shared biodiversity resulting in the unsustainability of the resources (AfDB 2022) and is among the main drivers of biodiversity loss and ecosystem degradation

(Biggs et al., 2018). Assessment by Belhabib et al., (2015) found that the monitoring of fisheries catch and efforts in many African coastal countries vary from reasonable to non-existent. IUU fishing and under-reporting (that often exceed 50% of the total catch) are exacerbated by the lack or weak governance, corruption, and limited transparency (AUC-NPCA 2014; Standing, 2011; AfDB 2022) on licensing and fishing agreements and lack of Policy coherence in fisheries management combined with Policies that are poorly implemented, and rarely coordinated for shared stocks (AUC-NPCA, 2014, AfDB 2022). These challenges contribute, among others, increased intensity of fishing pressure, open access regimes, overfished stocks and illegal, unreported and unregulated (IUU) fishing (Sumaila et al., 2006; Agnew et al., 2009; Failler and El Ayoubi, 2015).

Regional biodiversity conservation policies and strategies are extremely important considering the shared resources and the transboundary nature of Africa's marine ecosystems. Specific policy instruments that target the conservation of unique and Globally important biodiversity hotspots are required. It is imperative to mainstream biodiversity conservation across all management, leveraging wide institutional cooperation where possible (e.g. Nationally/interministerially, between Regional Seas Conventions, Regional fishery bodies and Large Marine Ecosystem projects (FAO-SOFIA 2022) and the RECs need to be considered. All African coastal States have National biodiversity strategies and action plans and provide regular reports on implementation to the CBD. However, the implementation is weak (Annex 1). Restoring degraded coastal and marine ecosystems requires adequate governance and support to incorporate conservation and sustainable production actions by multiple actors, sectors and jurisdictions (SOFIA). Placing environmental justice and blue fairness at the centre of the continent's governance priorities can help improve both the environment and human well-being while achieving key international biodiversity and development targets (Biggs et al., 2018).

3.3.4 Illegal, Unreported and Unregulated (IUU) fishing

IUU fishing is a severe challenge in the marine waters of Africa (AfDB 2022): It was conservatively estimated to have cost Africa $10 billion annually (AU-IBAR, 2016). The practice threatens resource conservation, the sustainability of fisheries and the livelihoods of fishers and other stakeholders in the sector and exacerbates unemployment, malnutrition, poverty and food insecurity (AU BES 2020; AU-IBAR 2016; World Bank 2017). Target 14.7 of SDG calls for ending IUU fishing by 2020. One factor that makes Africa particularly vulnerable to IUU is the lack of transparency and data sharing around foreign fishing arrangements (AU-IBAR, 2016).

The various forms of illegal fishing render the issue very complex: drivers are very different between large and small-scale sectors, and lack of resources means low deterrence rates. Forms of illegal fishing include fishing by unlicensed foreign vessels; fishing in prohibited areas, including inshore waters; fishing with illegal nets and without a turtle-excluding device for shrimping vessels; illegal fishing by small-scale fishers, including fishing in restricted areas or with illegal nets or explosives; and illegal transshipment at sea by large-scale industrial vessels (Okafor-Yarwood and Pigeon, 2020). While all forms of IUU fishing are harmful to the marine environment, fishing without a license by foreign vessels and fishing in prohibited areas are most responsible for accelerating overexploitation and, as such, do the most damage to fisheries' health. Estimates suggest that 40–65% of fish caught in West African waters are caught illegally (Agnew et al., 2009; Doumbouya et al., 2017). It threatens resource conservation, the sustainability of fisheries and the livelihoods of fishers and other stakeholders in the sector and exacerbates unemployment, malnutrition, poverty and food insecurity. This practice allows for the introduction on the market of fishery products which are less expensive than those derived from responsible fishing. Target 14.7 of the SDG calls for ending IUU fishing by 2020. Action is needed now by all Member States to eliminate IUU fishing by, inter alia, strengthening national fisheries laws and regulations, taking punitive action against perpetrators, establishing mechanisms that encourage compliance, implementing the provision of the Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (PSMA), adoption and implementation of National Plan of Action, introduce Catch Documentation Scheme for traceability of fish, and ensure that subsidies or any other benefits that they grant to their fishing sectors do not nurture IUU fishing. The RFMOs and Regional Fisheries Bodies are uniquely and strategically positioned to take a leading role in Regional and Global efforts in the fight against IUU. These entities can compile an IUU Fishing Vessels List as a tool to combat illegal fishing and broader fisheries crime.

3.3.5 Limited data and information

A major barrier to the assessment of biodiversity is incomplete or lack of information about the status and the levels of threats within the ecosystems. Most countries cannot assess biodiversity due to inadequate capacity. Existing knowledge is not sufficiently comprehensive, and data aggregation for regional assessment is limited. Additionally, a limited institutional and human capacity and poor regional collaboration prevent wise management of marine biological resources, especially transboundary species and stocks. There is also an unequal human and infrastructure capacity distribution between and among the coastal states. Lack of Regional coordination in studies of biodiversity, habitats, and ecotones hinders effective management on a national and regional level (AU BES 2021).

3.3.6 Limited capacity

The African coastal states have a series of National priorities: developing Countries to meet the basic living needs of their peoples. Resources for marine monitoring and assessment of biodiversity are very limited, and Policymakers are not always fully aware of the importance of transboundary environmental variability/change in ocean management applications. The example from GCLME below is a reflection in other parts of Sub-Sahara Africa (GCLME TDA 2006):

a. The lower priority placed on environmental issues by Policymakers
b. Limited inter-Country exchange of personnel for liaison, experience sharing and training
c. Degrading and downsizing of research institutions
d. Limited training/skill development programmes
e. Limited funds to meet day-to-day running expenses, let alone to invest in hardware and capital items.
f. Limited skills in maintaining equipment.
g. Limited availability of equipment and supplies
h. Severely limited numbers of trained personnel and an unequal distribution of skills between countries.
i. Inadequate remuneration for Regional researchers
j. Brain drain; loss of personnel to the private sector and overseas

Capacity gaps lead to uneven research monitoring efforts in the system as a whole with consequences for resource management, e.g. possible bias in information and advice leading to inappropriate decision-making.

3.3.7 Limited awareness of ecosystem values

There exists a large amount of uncertainty over the current ecosystem status. Information about ecosystem integrity, visible in changes in community composition, vulnerable species and biodiversity, the introduction of alien species and changing yields in a highly variable environment which now includes the unpredictable effects of global climate change, is limited. The inadequacy of knowledge of the ecosystem's status and the lack of regional coordination in studies of biodiversity, habitats, and ecotones (transition areas) hinders effective national and regional management. The root cause of the lack of information derives from the absence of national or regional valuation of ecosystem services (AfDB 2022).

In most African coastal states, there is relatively limited public awareness about the value of the ecosystem and the human impacts.

4. Regional biodiversity assessments: status, trends and threats

4.1 Mediterranean LME (MedLME)

The Mediterranean Sea is connected to the Atlantic Ocean through the Strait of Gibraltar and the Red Sea via Suez Canal. Thus, the African coastal Countries bordering the MedLME are Morocco (which is also part of the Canary Current LME), Algeria, Libya, Tunisia and Egypt. It is considered to be a low-productivity ecosystem (NOAA, 2003) and relatively reduced species richness, except around the Nile Delta, where high nutrient outflows increase productivity (Zenetos, A., et al., 2001). Approximately 17,000 marine species occur in the Mediterranean Sea, with 20.2% endemic (MedLME TDA 2005; Zenetos, A., et al., 2001).

The Mediterranean, accounting for only 1.5% of the earth's surface, hosts approximately 7% of the known world marine fauna and 18% of the World marine flora, of which 28% are endemic to the Mediterranean Sea (Fredj. et al., 1992). Ten thousand to twelve thousand marine species have been recorded, and new species are regularly discovered and described. Biomass in the Mediterranean is low, however (MedLME TDA 2005). The distribution of species throughout the Mediterranean Sea is not homogeneous: it is greater in the western than in the eastern part. In addition, the distribution of both fauna and flora varies with depth. Compared to the Atlantic, the Mediterranean marine communities are rich in species with smaller individuals and have a shorter life cycle (MedLME TDA 2005).

4.1.1 Vertebrates

More than 600 fish species have been recorded, including 81 cartilaginous fish, such as sharks and 532 bony fish (Zenetos, A., et al., 2001). The distribution of fish species is not homogeneous, as there is double the number of species in the western basin than in the eastern (Zenetos, A., et al., 2001). Total fish landings in the Mediterranean have increased steadily largely due to fishing pressure. Artisanal fisheries are important in the Mediterranean, but industrial fishing, including foreign fleets is also prevalent. It is the main spawning ground of the eastern Atlantic bluefin tuna (Thunnus thynnus, Endangered). Most of the fish species, such as Tuna, are ranked from fully exploited to overexploited and are at risk of falling into the category of depleted (FAO, 2016, Figure 3).

Based on the FAO data as referenced in the African Development Bank Report (2022), 75% of the validated assessment stocks in the MedLME are fished outside biologically sustainable limits. However, there has been an improvement since 2014, when the percentage of overexploitation was 88%. The assessment indicates that fishing mortality for all species and management units combined is around 2.5 times higher than the reference point. The European hake (Merluccius merluccius), blue and red shrimp (Aristeus antennatus) and Norway lobster (Nephrops norvegicus), have the highest maximum values of exploitation ratios. Stocks fished within biologically sustainable limits include anchovy (Engraulis encrasicolus), common cuttlefish (Sepia officinalis), Norway lobster and red mullet (Mullus barbatus), as well as deep-water rose shrimp (Parapenaeus longirostris) (AfDB 2022, FAO, 2020).

Based on the ICCAT data, the Mediterranean swordfish is overexploited; as such, the catches are recommended to be reduced to rebuild the population to a biomass level that can produce maximum sustainable yield (MSY) by the end of the projected period in 2028. The bluefin tuna in the Mediterranean Sea, which is commercially important, especially to Morocco, Tunisia, Algeria and Libya, has no scope to increase the current catches without jeopardising the health of the species[6].

Sea turtles in the Mediterranean are of conservation concern. Three turtle species, the leatherback (Dermochelys coriacea), the green (Chelonia mydas) and the loggerhead turtle (Caretta caretta), are present in the Mediterranean. Because these turtle populations appear to be genetically isolated from turtle populations in the Atlantic Ocean, the unnaturally high mortality rates resulting from fishing cannot be counterbalanced by immigration (MedLME TDA 2005).

Over 150 wetland sites have been recognized as being of International importance, and thousands of islands are used by marine and migrating birds. There are 33 breeding colonial waterbird species along the Mediterranean coastline. However, wetland loss and habitat degradation are recognised as serious threats for nine of these species (MedLME TDA 2005).

Twenty-two species of whales have been sighted in the Mediterranean, but only 12 of these species occur regularly. The other 10 are probably not true inhabitants. Nineteen of the cetaceans and seals are listed in Annex II (List of endangered or threatened marine species in the Mediterranean) of the Barcelona Protocol concerning Specially Protected Areas and Biological Diversity (MedLME TDA 2005). The status of the Mediterranean monk seal (Monachus monachus) is of conservation concern is it is Critically Endangered, with a total population not exceeding 500 specimens. Dolphin species (Delphinus delphis, Tursiops truncatus, Stenella coeruleoalba), sperm whales (Physeter macrocephalus) and freshwater and marine turtles (Chelonia mydas, Trionyx triunguis, Caretta caretta) are among the most endangered Annex II contains a list of threatened species in the Mediterranean LME (MedLME TDA 2005).

4.1.2 Marine plants

The status of the main coastal habitats (mangroves, seagrass, corals) is provided in Annex 3. There are several unique and endangered habitats, including the seagrass meadows of the endemic Posidonia oceanica (Least Concern) that develops as extended meadows in the infra-littoral zone (to a depth of 25–40 m) in the whole Mediterranean basin. Seagrass covers 5,065 km^2 of the Mediterranean LME (Tregarot et al., 2020).

There are some other important coastal ecosystems like the calcareous algal rims formed by Lithophyllum lichenoides in the medio-littoral zone; the sea caves, which support several rare and endemic species (e.g., sponges and red coral) which are also found in the bathyal zone where the light condition is similar; and the coralligenous communities (circalittoral zone) which constitute the most spectacular underwater scenery in the Mediterranean LME (MedLME TDA 2005).

The Mediterranean LME is characterized by the presence of marine bioconstructions or bioherms (Schuhmacher and Zibrowius, 1985), which are elevated biogenic structures found from the sea surface to the deep sea, resulting from centuries or even millennia of biological activity (Picone et al., 2022), built by organisms such as the endemic gastropod/molluscs Dendropoma petraeum (Gabrié et al., 2012), calcareous algae, sponges, corals, red coralline algae, vermetids, oysters, mussels, polychaetes (serpulids and

[6] *https://www.ccsbt.org/en/content/total-allowable-catch*

sabellariids), barnacles, and bryozoans can modify the geological substrate by creating a new one through diverse building processes including skeleton production, sand-binding and cementing activities, or the consolidation of calcareous sediments originated from shells or other skeletal debris (Ingrosso et al., 2018). The Scleractinian corals Astroides calycularis and Cladocora caespitosa are two endemic corals that are both included in the International Union for Conservation of Nature (IUCN) Red List of Threatened Species, and are critically importance in forming reefs in the shallow infralittoral waters (Casado de Amezua et al., 2015; Ocaña et al., 2015) of the Mediterranean Sea. The resulting bioconstructions increase the spatial complexity of the marine environment, providing settlement opportunities and habitats for many species. As a result, bioconstructions host a great diversity of marine life, playing a crucial role in supporting the biodiversity of the Earth's oceans and seas (Picone et al., 2022).

Noting that the Mediterranean LME is subjected to high levels of anthropogenic pressure, these reef-forming organisms are at risk, including climate change.

4.2 Canary Current Large Marine Ecosystem (CCLME)

The African coastal countries within the limits of the CCLME are Morocco (also part of the MedLME), Mauritania, Senegal, The Gambia, Cape Verde, Guinea Bissau and Guinea, in addition to the Spanish Canary Islands (Figure 1). The CCLME is one of the world's most highly productive eastern boundary upwelling systems. The upwelling of deeper nutrient-rich cold water to the surface contributes to the high average primary productivity of 392 gCm^2/year which causes a high biological activity, resulting in the important global reservoir of marine biological diversity (GCLME, 2006). The coastal ecosystems support highly diverse faunal communities, with the total biological diversity estimated at 12,500 species (CCLME TDA 2014), primarily dominated by arthropods, molluscs and chordates. The numbers of phyla and species vary depending on the country.

The region's marine trophic index has declined since the mid-1970s. It falls in the highest risk group, scoring a low 58 out of 100 on its Ocean health index, compared to other large marine ecosystems (Kershaw et al., 2016). However, there has been an 18% increase in the coverage of marine protected areas between 1983 and 2014, from 829 km^2 to 16,216 km^2 (Robin et al., 2015).

All countries in the CCLME have established MPAs and have succeeded in obtaining International recognition for one or more of these areas. There are over 580 terrestrial and MPAs within the CCLME Countries. There are 15 MPAs with international status, including two UNESCO World Heritage Sites, Banc D'Arguin National Park (Box 3) in Mauritania and Djoudj National Bird Sanctuary in Senegal. In addition, there are two UNESCO Man and Biosphere Reserves, namely, Saloum Delta in Senegal and Bijagos Archipelago in Guinea-Bissau. Furthermore, 13 RAMSAR wetlands of international importance are declared in the Region. Senegal has designated the largest number of protected areas, totalling 19, covering an area of 2,062 km^2. Guinea-Bissau has designated fewer MPAs in total 15, but has the largest area, amounting to 20,874 km^2, mainly owing to the large area covered by the Bijagos Archipelago Biosphere Reserve. Morocco recently created three MPAs for fishing purposes – one in the Mediterranean and two on the Atlantic side, namely, Complex Sidi Moussa and Dakhla Bay; and the wetland in Oued El Maleh) (CCLME TDA 2014).

Box 3. Banc d'Arguin National Park (PNBA) source

The Banc d'Arguin National Park (PNBA) in Mauritania is an essential supplier of fishery resources to the nation's fishery sector. Fish stocks in the once highly productive EEZ of the country are overfished with little sign of recovery (Failler *et al.,* 2005; Tregarot *et al.,* 2020), making the fishery extremely dependent on the good functioning of the PNBA for their resilience. Currently, the PNBA makes up 15% of fishery contributions to the country, generating up to $90 million per year (Tregarot *et al*., 2020), a very high return from a single MPA. The PNBA is a focus point for several restoration and carbon sequestration activities associated with biodiversity conservation and climate change mitigation. Research confirms that fish stocks in the EEZ of Mauritania benefit from the PNBA, as the largest MPA of West Africa. This highlights the learning that increasing attention to the restoration of coastal and associated marine ecosystems through endeavours to increase biodiversity and mitigate climate change provides positive opportunities for Africa's fisheries, given the critical dependency of fish abundance and biomass on healthy functioning ecosystems. The Banc d'Arguin National Park in Mauritania has the world's largest concentration of wintering shorebirds, numbering over two million.

[**Source**: AfDB 2022, Trégarot *et al*., 2020].

4.2.1 Vertebrate

Fish comprise 1,344 known species in the region, of which 6 to 8% are in a status ranging from "vulnerable" to "Endangered" (CCLME TDA, 2014). Low growth rates species of commercial importance, such as alfonsino (Beryx splendens and B. decadactylus) have also been reported in the area. The fisheries in the region are subjected to the most significant exploitation, with catches in 2014 of around 2.7 million tonnes of which artisanal fisherfolks harvested 1 million tonnes are dominated by the small pelagics, especially sardine (Sardina pilchardus), sardinellas (Sardinella aurita and S. maderensis) and horse mackerel (Trachurus trachurus and T. trecae) (CCLME TDA 2014).

Morocco is by far the largest fish producer in the region. In 2001, its total marine fish production was 933,197 tons–a six-fold increase since 1961. In 2015, its production reached 1,355,393 tons (Arneri et al., 2011). Among the pelagic fish, Sardina pilchardus (Least Concern) is the species most fished and Merluccidae for white fish (Arneri et al., 2011).

As deduced from the AfDB Report 2022, in 2019, a total of 27 demersal stocks were assessed (FAO/CECAF WG., 2019; Figure 3) in the CCLME (Morocco, Mauritania, Senegal, the Gambia and Canary) of which 13 species were Overexploited, six Fully Exploited, and three Not Fully Exploited. The Overexploited species are the grouper (Epinephelus aeneus) in Mauritania-Senegal-Gambia, the blue-spotted seabream (Pagrus caeruleostictus) in Mauritania-Senegal, the axillary seabream (Pagellus acarne) in Morocco, the rubber-lip grunt (Plechtorynchus mediterraneus) in Morocco-Mauritania, deepwater pink shrimp (Parapenaeus longirostris) in Senegal-Gambia and in Morocco, octopus (Octopus vulgaris) in Dakhla and Cap Blanc, cuttlefish (Sepia officinalis) in Dakhla and Senegal-Gambia, white hake (Merluccius merluccius) in Morocco and black hake in Morocco-Mauritania-Senegal-Gambia. Six fully exploited stocks are the red pandora (Pagellus bellottii) in Mauritania-Senegal-Gambia, the southern pink shrimp (Penaeus notialis) in Mauritania, the southern pink shrimp (Penaeus notialis) in Senegal-Gambia, the deepwater pink shrimp (Parapenaeus longirostris) in Mauritania, striped red shrimp (Aristeus veridens) from Mauritania, and octopus (Octopus vulgaris) in Senegal-Gambia. Three stocks are Not Fully Exploited, including the squid (Loligo vulgaris) from Mauritania, cuttlefish (Sepia officinalis) at Cap Blanc, and the large-eyed dentex (Dentex macrophthalmus) in Morocco-Mauritania-Senegal. The catch of overexploited stocks should be reduced to halt overfishing and commence with the rebuilding plans. A paucity of reliable biological and fisheries data diminishes the power of stock assessments and threatens the resources' sustainability (FAO/CECAF. WG., 2019).

The results of the assessments indicate that some pelagic resources, such as the round sardinella (Sardinella aurita) between Morocco and the southern part of Senegal and the Cunene horse mackerel (Trachurus trecae) both in the northern and southern part of the CCLME, overexploited (CCLME TDA 2014, Figure 3). Historical catches are provided in Figure 7.

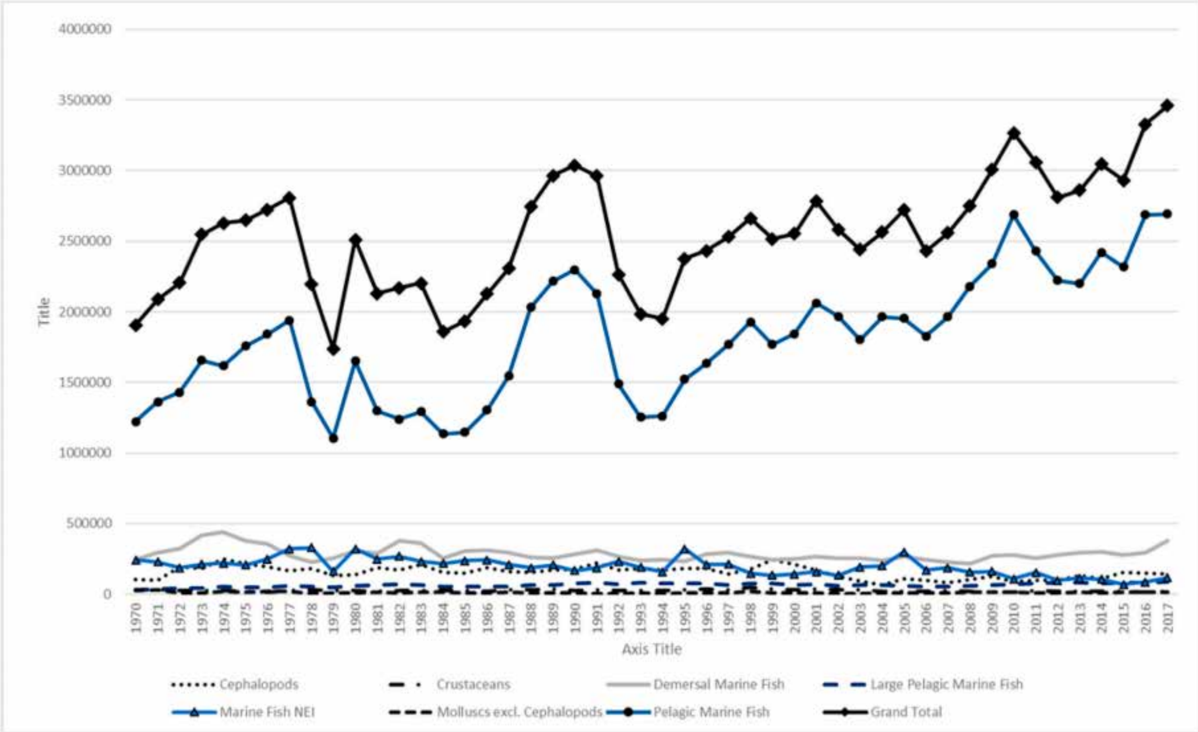

Figure 7. *Catches per species in CCLME 1970–2017. Source: FAO FISHSTAT (2020), cited from Failler 2020.*

The CCLME supports a significant number of elasmobranchs, including 43 species of sharks, 24 species of rays, three species of angel sharks, five species of guitarfish and three species of sawfish. The coastal species found on the shallow continental shelf (Carcharhinidae, Sphyrnidae, Triakidae, Ginglymostomatidae, Hemigaleidae, Leptochariidae, Rhinobatidae, Dasyatidae, Myliobatidae, Gymnuridae, and Pristidae) are more accessible to artisanal fishers. Species living at greater depths on the slope (Squalidae, Rajidae, Squatinidae, Echinorhinidae, Oxynotidae, Torpedinidae and Scyliorhinidae) are often caught by demersal trawlers. In contrast, pelagic species (Alopiidae, Lamnidae, Carcharhinus longimanus, Prionace glauca and Mobulidae) are more common in the catches of the pelagic trawlers and surface longliners (CCLME TDA 2014).

In the CCLME, as in many seas of the world, the vulnerable species, including elasmobranchs (sharks and rays), deserve special attention because the introduction of conventional resource management systems will not be enough to save them from the threat of extinction and protective management is therefore necessary. The elasmobranchs are large cartilaginous fishes with low rates of reproduction. They are targeted for their fins (used for soup in Asia) and meat (driven by local demand for protein). They are large and easy to catch. Local stocks are rapidly depleted, after which fishers migrate to new grounds to exploit new stocks (CCLME TDA 2014). The shark fishery has a transboundary dimension involving different nationalities in the region (mainly Senegalese and Ghanaian), the processors for salted meat (Senegalese and Ghanaian) and the processors for smoked shark (Guinean and Burkinabe). The fin trade is dominated by the Guineans, while salted fish is under the control of the Ghanaians. The demand for shark products and the high price they attract pose a real threat of overexploitation of these scarce species. One coastal country alone cannot ensure effective management of the sharks, and thus, LME management is required.

Similar to all other African LMEs, marine turtles are at risk of threat of extinction in the CCLME unless strict conservation and management measures are adopted and their implementation enforced (CCLME TDA 2014). Even though they are protected, marine turtles constitute the bycatch of longliners tuna fleets and are thus threatened with extinction.

The CCLME is home to approximately 148 species of seabirds and marine seabirds, mainly migratory species and mostly observed between November and March (CEPF, 2015). Coastal ecosystems are internationally important for migratory waterfowl (for example, Senegal Delta is home to over 3 million wintering shorebirds; at least 108 bird species of nesting piscivorous birds and is one of the 3 transfrontier Biosphere Reserves of Africa (Bouamrane et al., 2016). All countries in the region are signatories to the Ramsar Convention and have designated sites within the coastal marine zone (Annex 4). The estuaries in the CCLME contain high biodiversity, contributing to the richness as well as serving as sites of international importance for migratory seabirds. Some of the major estuaries are (Loukkos, Sebou, Bouregreg – Wadi Sala, Nefifikh, Mellah, Oum Errabia, Tessaout, Lakhdar, Tensift, Ksob, Tamri, Souss, Massa, Noun, Drâa, Seguia Al Hamra, in Morocco; Senegal, Saloum, Gambia, Geba and Casamance in Senegal; The Gambia River in The Gambia; Farim, Cacheu, Mansôa, Gêba, Corubal, Cacine and Rio Grande in Guinea-Bissau (CCLME TDA 2014). Seabirds also constitute the bycatch of longliners in the tuna fisheries (CCLME TDA 2014).

Seabirds in the Northwest Atlantic region are mainly migratory species and are mostly observed between November and March. During ecosystem surveys in the CCLME conducted onboard the R/V Dr Fridtjof Nansen in 2011, a total of 1,049 birds were recorded from 480 observations between the Cape Verde Islands and Dakar. Among the 11 species, nine reproduce in the Cape Verde Islands, whereas the common tern (Sterna hirundo) and the great skua (Stercorarius skua) are classified as rare visitors. Two of the most abundant seabirds in the Cape Verde Islands, Cape Verde shearwater (Calonectris edwardsii), which is endemic and the white-faced storm petrel (Pelagodroma marina) were often seen around small fishing boats. From Morocco to Guinea, there were significant changes in the abundance and species composition of seabirds, e.g. the pomarine skua (Stercorarius pomarinus) was replaced by the great skua (S. skua) as the top predator and the northern gannet (Morus bassanus) was less abundant in the south, although the species remained dominant. The presence of hundreds of sooty shearwaters was a surprise, and the winter behaviour of the Mediterranean gull (Larus melanocephalus) is not well known. However, many individuals were observed feeding around the trawl on the continental shelf. The Balearic shearwater (Puffinus mauretanicus) is the most threatened seabird species in the CCLME area, classified as "Critically Endangered" on the IUCN Red List, and its presence is of particular interest. Time-stamped seabird photographs were provided for analysis at the University of Dakar during the May 2013 CCLME reproduction study survey of pelagic fish (CCLME TDA 2014).

Four species of marine mammal classified as either "Endangered" or "Critically Endangered" on the IUCN Red List, found within the waters of the CCLME and they are sei whale (Balaenoptera borealis), blue whale (B. musculus), fin whale (B. physalus) and the Mediterranean monk seal. The countries with the most information are the Canary Islands, Cape Verde and Morocco, where specific studies have been conducted since the beginning of the twentieth century. Cape Blanc hosts the largest surviving population of monk seals. Fewer than 600 individuals of the Mediterranean monk seal remain throughout the species distribution range, from the Black Sea, Mediterranean and North East Atlantic. The species is listed as "Critically Endangered" on the IUCN Red List and is included in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The surveys in the CCLME conducted onboard the R/V Dr Fridtjof Nansen in 2011, and 2012 provided valuable information on the status of sea mammals in the area. Between the Cape Verde Islands and Dakar, Senegal a humpback whale (Megaptera novaeangliae), a rough-toothed dolphin (Steno bredanensis) and a killer whale (Orcinus orca), a striped dolphin (Stenella coeruleoalba), groups of small unidentified delphinidae, probably belonging to the genera Delphinus, Stenella and Tursiops were sighted. From Morocco to Guinea, the following were observed/sighted: short-beaked common dolphin (Delphinus delphis) was by the far most commonly encountered, followed by unidentified delphinids and balaenopterids, including Bryde's whales (Balaenoptera edeni) and sei whales (B. borealis), common bottlenose dolphin (Tursiops truncatus), the short-finned pilot whale (Globicephala macrorhynchus), the Atlantic spotted dolphin (Stenella frontalis), the pan-tropical spotted dolphin (S. attenuata) and the rough-toothed dolphin (S. bredanensis), unidentified beaked whale (Ziphiidae), humpback whales, of which at least two were new-borns, (indicates a wintering and breeding location).

The African manatee (T. senegalensis) is found in West Africa from Senegal to Angola in marine, brackish and freshwater habitats, from the open ocean to coastal lagoons, estuaries, rivers and lakes. Guinea-Bissau is the country with the largest population of manatees within the CCLME. It is classified as "Vulnerable" on the IUCN Red List and listed in Appendix II of CITES. This species was hunted in the CCLME countries for meat, hide, oil and bones and is now also targeted deliberately by fishers because it is perceived to be a threat, especially when damaging fishing nets. The common hippopotamus (Hippopotamus amphibius), typically found near large rivers and estuarine habitats, has the largest populations in Guinea, Guinea-Bissau and Senegal, with a total number of individuals in a few thousand (Lewison and Oliver, 2008). The primary threats to the hippopotamus are IUU hunting for meat and ivory (found in the canine teeth) and habitat loss.

Generally, mammals in the CCLME are at risk including habitat loss or disturbance because of the expansion of urban and agricultural areas, damming and increased use of hydroelectric power, boat strikes, accidental catch by fishing trawls and shark nets, hunting, loss of prey species due to fisheries, disorientating effects of marine noise from shipping and bathymetric surveys, and seismic surveys (by the oil and gas industry), noting that data on the status and biology of these mammals is limited. (CCLME TDA 2014).

Fourteen species of shark and ray found within the waters of the CCLME are classified as either "Endangered" or "Critically Endangered" on the IUCN Red List. This includes two of the three species of sawfish (Pristis pectinata and P. perotteti). The smalltooth sawfish (P. pectinata) was historically found along the coast of western Africa from Angola to Mauritania. The principal threat to this species is fishing. Although it is no longer targeted, it is caught accidentally in various fisheries, particularly artisanal gillnet fisheries. Three species of guitarfish are listed as "Endangered"; these species are targeted throughout their range by artisanal fisheries and are also caught as bycatch by bottom trawlers (CCLME TDA 2014).

Five species of sea turtles have been reported from within the CCLME region: green (Chelonia mydas), loggerhead (Caretta caretta), Olive Ridley (Lepidochelys olivacea), hawksbill (Eretmochelys imbricata) and leatherback turtles (Dermochelys cariacea). The green turtle and loggerhead are listed as "Endangered" on the IUCN Red List, while the leatherback and hawksbill turtles are both listed as "Critically Endangered" and the olive ridley as "Vulnerable"15. Green turtles are known to nest on the beaches in the Gambia, whilst Cape Verde is the second most important site in the North Atlantic for breeding loggerhead turtles. Of three sea turtles seen during the May 2013 CCLME reproduction study survey of pelagic fish, at least two were loggerheads.

Turtles are threatened by direct hunting, bycatch, nest raiding and loss of beach habitat suitable for nesting, hunting, bycatch (in both industrial and artisanal fisheries), pollution (particularly from plastic bags, which can be ingested, and abandoned fishing gear, which can entangle the animals), the extraction of beach sand and beach construction (which degrade nesting habitat), nest raiding and the destruction of nests, climate change and changes in marine currents. The underlying causes include increased beach construction, tourism development, lack of scientific information, beliefs and traditions, poverty, the lack of alternatives and a lack of enforcement of regulations. The root causes are coastal development (owing to population growth), tourism-related construction, and coastal erosion. Impacts on the ecosystem include loss of biodiversity and destabilizing effects due to their decline. Socio-economic consequences include cultural impoverishment and loss of tourism revenues (CCLME TDA 2014).

The Mediterranean monk seal (Monachus monachus) is currently among the world's most endangered marine mammals (Karamanlids and Dendrinos 2015). The species was previously listed as 'Critically Endangered' and included in Appendix I of the CITES. Conservation measures introduced over the last 30 years have started to stem the decline, and there is no evidence of recent small increases in all known subpopulations. Hence the species has been re-classed as 'Endangered' on the IUCN Red List. One of the largest surviving colonies is found around Cabo Blanco (also known as Cap Blanc) at the northern border of Mauritania, where there are estimated to be 220 individuals (Martínez-Jauregui et al. 2012; Mo et al. 2011; Failler et al. 2017).

4.2.2 Invertebrate

The coastal ecosystems support highly diverse faunal communities, including invertebrate fauna, many of which are important commercial species. Shrimps and, to a lesser extent lobsters, spiny lobsters, and crabs mainly represent crustaceans. Based on information from the CCLME TDA 2014, catches of crustaceans represent, on average, 6% of catches of demersal species in the CCLME region. Two main groups of shrimps are important in the region: the coastal shrimps, represented principally by the southern pink shrimp, Penaeus notialis, and the deepwater shrimps, represented mainly by the deepwater rose shrimp Parapenaeus longirostris. Other less abundant shrimp species are also caught in the area: Penaeus kerathurus, Aristeus antennatus, Holthuispemaeopsis atlantica, Aristeus varidens, Plesionika heterocarpus, Aristaeopsis edwardsiana and Aristaeomorpha spp. (FAO, 2015a and 2015b). Four species of lobster are caught on the continental shelf of Cape Verde: the Cape Verde spiny lobster (Palinurus charlestoni) the green spiny lobster (Panulirus regius), brown spiny lobster (Panulirus echinatus) and the pink spiny lobster (Palinurus mauritanicus). Species of crab found include Sanquerus validus which are found along the coast, Callinectes Amnicola which is abundant in estuaries and lagoons and Liocarcinus corrugates and Chaceon maritae which tend to be found offshore (CCLME TDA 2014). Stock status is provided in Table 1.

***Table 1:** Stock status of shrimp resources (Source: CCLME TDA 2014).*

Stock	Species	Assessment
Shrimps	*Parapeneus longirostris*	Overexploited (2010, Morocco)
		Not fully exploited (2010, Mauritania, Senegal and the Gambia) Not fully exploited (2013, Mauritania) Not fully exploited (2013, Senegal and the Gambia)
		Fully exploited (2011, Guinea-Bissau)
	Penaeus notialis	Overexploited (2010, Mauritania, Senegal and the Gambia) Overexploited (2013, Mauritania) Overexploited (2013, Senegal and the Gambia)
		Overexploited (2008, Guinea) No conclusive results (2011, Guinea) No conclusive results (2011, Guinea-Bissau)

The TDA further illustrates that the main target species in the cephalopod fisheries are octopus (Octopus vulgaris), cuttlefish (Sepia spp., of which most are Sepia hierredda and a Southwards decreasing proportion of Sepia officinalis) and squid (Loligo vulgaris). These species make up an average of 35% of landings of demersal resources. The common octopus (O. vulgaris) can be found from Guinea in the South to Morocco in the North and is typically found in coastal waters at depths ranging from 0 to 400 m (CCLME TDA 2014). The cuttlefish (S. officinalis, S. hierredda and S. bertheloti) are found on sandy and muddy seabeds from the coast to about 200 m depth. Loligo vulgaris is the most common species of squid in coastal waters from the North Sea to the West coast of Africa and lives at depths of 500 m. Its abundance is often sporadic in the CCLME area and catches are relatively low (CCLME TDA 2014). Stock status is provided in Table 2.

Table 2: *Stock status cephalopod resources (Source: CCLME TDA 2014; FAO, 2015a; FAO 2015b).*

Stock	Species	Assessment
Cephalopods	*Octopus vulgaris*	Overexploited (2010, Dakhla from Cape Bojador to Lagouira 26°N–20°50'N; Cape Blanc 20°N–16°N; Senegal and the Gambia) Not fully exploited (2011, Guinea-Bissau)
		Overexploited (2013, Dakhla) Overexploited (2013, Cape Blanc) Not fully exploited (2013, Senegal and the Gambia)
	Sepia spp.	Overexploited (2010, Dakhla from Cape Bojador to Lagouira 26°N–20°50'N; Cape Blanc 20°N–16°N (uncertainty in the assessments); survey indices in Mauritania show a decrease; 2008, overexploited in Senegal and the Gambia) Not fully exploited (2013, Dakhla) Not fully exploited (2013, Cape Blanc) Not fully exploited (2013, Senegal and the Gambia)
		Not fully exploited (2008, Guinea-Bissau) No conclusive results (2011, Guinea- Bissau)
	Loligo vulgaris	Results of the model are not conclusive (2010, Dakhla from Cape Bojador to Lagouira 26°N–20°50'N) Not fully exploited (2013, Cape Blanc) No conclusive assessments in the other areas (subgroup north) (2013)

4.2.3 Marine plants

The wide continental shelf along the CCLME, mangrove forests provide diverse habitats that support high levels of biodiversity of fish and invertebrate species (IPBES 2018; Table 3). The mangrove forests cover 3,212 km^2 in the CCLME (Tregarot et al., 2020), repressing about 48% of the area in the CCLME (Diop et al., 2014). There are 18 species of true mangal and 16 species of seagrass found around Africa (Failler et al., 2017), while 8 species of mangroves are found in the CCLME. They are: Acrostrichum aureum, Avicennia germinans, Conocarpus erectus, Laguncularia racemosa, Nypa fructicans, Rhizophora harisonii, R. mangle, R. racemose, and countries with the highest number of species of mangrove include Senegal (Failler et al., 2017). In west Africa, mangroves provide many important ecological functions including sequestering up to 1,000 tons of carbon per year which is three times more than tropical rainforests (Rotich et al., 2016). The largest mangrove forests are in Guinea-Bissau with its Bijagos Archipelago (2,999 km^2 (CCLME TDA 2014), representing 2.5% of the total global areas of mangroves, and in Guinea. However, trends from 1975 to 2013 show a drastic decline in mangrove areas and their associated biodiversity and ecosystem services (Conchedda et al., 2011; Temudo, 2012; Carney et al., 2014; Cormier-Salem et al., 2016; Temudo et al., 2017). Other important areas for mangroves include the Sine-Saloum Delta, the Casamance River in Senegal, and the Gambia River. In many of these areas, regional conditions enable mangroves to grow as far as 100 km inland. Mangrove forests are rich in biodiversity, providing habitats for a host of animal species, from endangered mammals to reptiles, amphibians and birds, and spawning grounds for a variety of fish and shellfish, including several commercial species. Mangrove forests also provide nutrients to coastal marine waters, often resulting in high fishery yields in waters adjacent to them (Trégarot et al., 2020). Birds use the mangrove forests for feeding, reproduction and shelter (CCLME TDA 2014).

Few mangroves forests are found in the South of Mauritania, in the Senegal Delta along the estuary of Ntiallakh with Avicennia germinans (Least Concern) which has remarkable vitality according to its biogeographical limit (Dahdouh-Guebas et al., 2001) is the dominant species found in this region (Mauritania/Senegal). Mangrove lagoons and channels are occupied by numerous fish species, including many commercially important species (such as Acanthopagrusberda, Chanoschanos, Crenidenscrenidens, and some mugilid species). The Diama and Manantali dams, built along the Senegal River, negatively impacted the mangroves, although they are recovering partly due to the protected status accorded by the government as part of the Diawling National parks (Hamerlynck and Duvail, 2003) and partly due to the intrusion of salty water as a result of the breach across the Barbarie Tongue opened in 2003.

Table 3: *Mangrove forests coverage in each country of the CCLME country (FAO, 2007).*

Country	Area of mangroves (km^2)	Number of species
Morocco	0	0
Mauritania	2	3
Senegal	1 287	7
The Gambia	581	7
Cape Verde	0	0
Guinea-Bissau	2 999	6
Guinea	2 039	7

Mangroves and associated ecosystems (coastal lagoons, tidal estuaries, and deltas) face severe threats as they are being rapidly degraded due to anthropogenic stressors and climate change (Hamerlynck and Duvail, 2003; CCLME TDA 2014). Human activities impacting the mangroves include unsustainable use of the mangroves, pollution (from agricultural activities, sewage discharge, industrial waste and oil and mineral exploration and extraction, conversion of land for agriculture, fuelwood and land reclamation and freshwater diversion and population pressure cutting of the trees for fuelwood and poles for housing construction; construction of dams, coastal erosion, urbanisation and industrialisation; siltation, sand mining, erosion, construction of embankments canalisation, the steady decrease in freshwater inputs from rivers impounded upstream (Church et al., 2010, CCLME TDA 2014, Hamerlynck and Duvail, 2003). The single root cause identified for mangrove loss is poverty (CCLME TDA 2014).

There has been limited work on corals in CCLME, and there are still new discoveries, with three new species of azooxanthellate (non-photosynthetic) coral species having recently been described (Ocaña et al., 2015), including Thalamophyllia wirtzi, Tubastraea caboverdiana, and Africana wirtzi, which is an entirely new genus. In the slope area off Mauritania, carbonate mounds composed of large areas of coral rubble with some live hard coral polyps have also been found, including Lophelia pertusa, Madrepora oculata, Solenosmilia variabilis and Desmophyllum sp. (Failler et al., 2017). Formations of corals are occurring around the Cape Verde Islands, in Guinea around the Loose Islands, especially the islands of Corail, Blanche and Cabris (Failler et al., 2017).

The seagrasses cover an area of 6,195 km^2 in the CCLME (Tregarot et al., 2020). Large seagrass beds exist in Mauritania in the Banc d'Arguin National Park area and cover more than 500 km^2, representing one of the rare positive examples worldwide of seagrass beds avoiding the otherwise strong tendency towards habitat loss (CCLME TDA 2014). Species of seagrass commonly found in the CCLME region are Cymodocea nodosa, Zostera noltei, Halodule wrightii, Halophila decipiens, Ruppia maritima, dwarf eelgrass and Nanozostera noltii (Fabbri F., et al., 2015; Pavón-Salas N., et al., 2000). All these species are listed on the IUCN Red List as being of "Least Concern".

Threats to the seagrass communities include mechanical damage caused by trawling and anchoring from boats, dredging, coastal development activities, eutrophication and habitat loss from industrialization and agriculture. Seagrasses' environmental tolerance range with respect to light, temperature, salinity, sedimentation and pollution varies between species (CCLME TDA 2014).

4.3 Guinea Current Large Marine Ecosystem (CGLME)

The coasts of West Africa are among the world's most productive marine areas and are rich in fishery resources, oil and gas reserves, and precious minerals, and are an important global reservoir of marine biological diversity (GCLME TDA 2006). GCLME comprises 14 countries: Guinea Bissau, Guinea, Sierra Leone, Cote D'Ivoire, Ghana, Togo, Benin, Nigeria, Cameroon, and Equatorial Guinea. DR Congo, Gabon, Sao Tome and Principe and Angola (Figure 1; Satia, 2016). Although variable, the continental shelf is generally narrow, extending just 15–90 km offshore, and breaking at depths of approximately 100–120 m, making it the smallest tropical shelf area of the world's four main tropical regions. The status of the main taxa in the GCLME region is provided in Annex 5.

Ocean Health Index (OHI) data shows that the Gulf of Guinea region is generally performing at below-optimal ocean health levels. Most countries perform lowest on environmental quality measures like biodiversity and coastal protection; the region is on the highest risk level in the Ocean Health Index Large Marine Ecosystems classification (http://onesharedocean.org/).

4.3.1 Vertebrates

The GCLME is among the world's most productive marine areas, rich in fishery resources, and an important global reservoir of marine biological diversity (GCLME, TDA 2006; GEF, UNDP, UNEP, UNIDO, US-NOAA and NEPAD, 2011). The Niger Delta is one of the vital spawning and nursery grounds for many fish stocks in the Gulf of Guinea, and the pelagic fish community has a high diversity with 48 species in 38 families. The fisheries are exploited at artisanal and industrial scales. Coastal communities across the region are overwhelmingly dependent on these resources for their livelihoods and food security as the main source of animal protein in coastal communities (Okafor-Yarwood and Pigeon, 2020, AfDB 2022).

The main small pelagics families in the GCLME are clupeidae, Carangidae, Scombridae and Engraulidae. The Sardinella aurita, round sardinella; Sardinella maderensis, flat sardinella, and Ilisha Africana, West African Ilisha, Ethmalosa fimbriata, bonga shad dominate clupeidae. The most important carangidae stocks are Caranx rhoncus, yellow horse mackerel; Trachurus trachurus, horse mackerel; Canranx hippos and crevalle jack, while the Scombridae include Scomber japonicus, Spanish mackerel; Scomberomorus tritor, West African Spanish mackerel; Euthynnus alletteratus, common tuna. Engraulis encrasicolus Guinean anchovy is the main stock from Engraulidae family (GCLME TDA 2006). The tuna fish species are represented mainly by Katsuwonus pelamis, skipjack Thunnus albacares, yellowfin tuna, and tuna-like fishes. Istiophoridae is represented mainly by Istiophorus albicans and Atlantic sailfish (GCLME TDA 2006).

The status of the main small pelagic fish resources based on the assessments by the FAO/CECAF Working Group (2019) shows the following: the round sardinella (Sardinella aurita), the flat sardinella (Sardinella maderensis), bonga (Ethmalosa fimbriata), anchovy (Engraulis encrasicolus) and horse mackerel and other carangidae. In total, sixteen stocks were assessed (seven species/species groups) and the results show that four stocks are Overexploited, namely, S. aurita, Western stock; S. maderensis, Western stock; and Trachurus trecae for the Northern and Southern stocks. Two stocks are Fully Exploited, and they are: Sardinella spp., Southern; and Decapterus spp. Northern stock; four stocks are Not Fully Exploited, namely, sardinella spp. Northern and Southern stocks; bonga, Southern stock; and anchovy for the Western and Southern stocks. Six stocks were not assessed or had inconclusive results and these are: S. aurita, central stock; S. maderensis central stock; bonga, Northern, Central, and Western stocks; and Trachurus trecae, Western stock. Some Countries did not provide the required data, while in other cases, the integrity of the data supplied is questionable, compromising the model output and management advice. Reduction of catches are recommended for Overexploited stocks (AfDB 2022, FAO/CECAF WG., 2019). To halt overfishing, catches of overexploited stocks should reduce to the level commensurate with the biologicsl productivity of the stocks concerned (AfDB 2022; FAO/CECAF WG., 2019).

The Sciaenidae family dominates the demersal finfishes and includes Pseudotolithus elongatus, Bobo croaker; Pseudotolithus senegalensis, Cassava croaker; Pseudotolithus typus, longneck croaker. The Lutjanidae family include Lutjanus goreensis, Gorean snapper; Lutjanus agennes, African red snapper and Lutjanus dentatus, African brown snapper. Pomadasys jubilini, Sompat grunt represent the Pomadasyidae family; Pomadasys peroteti, Parrot, grunt; Pomadasys rogerii, Pigsnout Parrot, grunt. The Polynemidae include Polydactylus quadrifilis, Giant African threadfin; Galeoides decadactylus, Lasser African threadfin; Pentanemus quinquarius, Royal threadfin. Sparidae is a deeper water component of demersal finfishes and is represented by Dentex angolensis, Angola dentex; Dentex congoensis, Congo dentex and Dentex macrophtalmus, Large-eye dentex, Pagellus species and Seabreams (GCLME TDA 2006).

The status of the 53 most important demersal fish stocks as assessed by the FEA/CECAF Working Group (2019) yield the following: Nine stocks were found to be Overexploited: the grey grunt (Pomadasys spp.) in Guinea-Bissau; lesser African threadfin (Galeoides decadactylus) in Guinea-Bissau, the stock in Côte d'Ivoire, Ghana, Togo, and Benin, and the stock in Gabon, Congo, and Angola; the bigeye grunt (Brachydeuterus auritus) in Côte d'Ivoire, Ghana, Togo, and Benin; deepwater rose shrimps (Parapenaeus longirostris) in Congo and the stock in Angola; southern pink shrimp (Penaeus notialis) in Congo; and pink lobster

(Palinurus charlestoni) in Cabo Verde. Eleven stocks are Fully Exploited: moreias (Muraenidae) in Cabo Verde; croakers (Pseudotolithus spp.) in Côte d'Ivoire, Ghana, Togo, and Benin, and the stock in Nigeria and Cameroon; lesser African threadfin (Galeoides decadactylus) in Nigeria, Cameroon, and Equatorial Guinea; Sole (Cynoglossus spp.) in Nigeria, Cameroon, and Equatorial Guinea, and the stock in Gabon, Congo, and Angola; bigeye grunt (Brachydeuterus auritus) in Nigeria, Cameroon, and Equatorial Guinea; marine catfish (Arius spp.) in Nigeria, Cameroon, and Equatorial Guinea; southern pink shrimp (Penaeus notialis) in Guinea-Bissau; coastal shrimps in Cameroon; and cuttlefish (Sepia spp.) in Guinea-Bissau. Five stocks are Not Fully Exploited: red pandora (Pagellus bellottii) in Côte d'Ivoire, Ghana, Togo, and Benin); marine catfish (Arius spp.) in Gabon and Congo; deepwater rose shrimp (Parapenaeus longirostris) in Guinea-Bissau; southern pink shrimp (Penaeus notialis) in Gabon; and cuttlefish (Sepia spp.) in Ghana (AfDB 2022).

Three factors undermine the health of fisheries in the GCLME include unsustainable use of the fisheries resources, the effects of climate change, marine pollution, IUU fishing, human population growth and limited reliable data and information (Okafor-Yarwood and Pigeon 2020). The range of estimates suggests that between 40 and 65% of fish caught in the region are caught illegally (Okafor-Yarwood and Pigeon, 2020; Agnew et al., 2009).

Box 4. Conservation of sea turtles in Gabon

Olive ridley turtle, leatherback turtle, green turtle and hawksbill turtle forage and have nesting grounds in Gabonese waters (Casale *et al.*, 2017). The Government has declared 23.8% of its EEZ as a MPA and sea turtles are protected by law despite that they are caught incidentally in trawl and longline fisheries and sometimes are targeted for their meat, eggs and shells. Aside from accidental or purposeful fishing they also die due to marine litter, including plastic ingestion and in addition, are threatened by global warming and habitat loss. The use of Turtle Excluder Devices (TEDs) has proven an effective solution to the problem of turtle bycatch in the shrimp fisheries and also in tuna fisheries (both in WIO and the eastern Atlantic). Similarly, public outreach information and education campaigns targeting fishers, with a specific focus on best practices to reduce post-release mortality of captured turtles, have led to positive results in Gabon – a lesson and best practices that can be replicated in other African LMEs.

[**Source**: AfDB, 2022].

Five species of marine turtles leatherback (Dermochelys coricea, Endangered), loggerhead (Caretta caretta, Endangered), olive ridley (Lepidochelys olivacea, Vulnerable), hawksbill (Eretomychelys imbricata, Critically Endangered), and green turtles (Chelonia mydas, Endangered) are found along the beaches of the entire GCLME region, where they lay their eggs at selected places along the shores, and they are globally threatened (GCLME TDA 2006). Sandy beaches, particularly along the Gabonese and Angolan coasts, are considered important nesting grounds for sea turtles. Turtles are often subject to marine debris and detritus accumulation. Gabonese beaches are also among the world's most important for nesting marine turtles, particularly leatherbacks (Box 4, Mayaux et al., 2013). Despite International initiatives to protect these endangered species, marine turtles are still secretly hunted for food throughout the Gulf of Guinea. Their eggs are also collected by humans and destroyed by dogs and pigs on the beaches. In some shrimp fisheries in the sub-region (e.g. in Nigeria and Cameroon), the introduction of the turtle excluder device (TED) is being considered. This device allows turtles to escape from shrimp nets when caught (GCLME TDA 2006).

The Gulf of Guinea is included in the West African flyway, which is the major annual bird migration route between breeding and wintering areas, including stop-over areas in between. Most of the coastal wetlands in the region provide unique ecological conditions and habitats for migratory birds, many of which come from Europe. Among the marine and seashore birds found in the Gulf of Guinea are: Common Ringed Plover (Charadrius hiaticula), Knot (Calidris canutus), Curlew Sandpiper (Calidris ferruginea), Bar-tailed God wit (Limosa lapponica), attle Egret (Bubulcus ibis) and the white-winged Tern (Chlidonias leucopterus). Also, a number of seabirds breed in the area between Guinea Bissau and Angola. This includes the gull-billed Tern (Gelochelidon nilotica), the Royal Tern (Sterna maxima albididorsalis), the white-tailed tropic bird (Phaeton lepturus) and the brown Booby (Sula leucogaster). It is estimated that the area between Sierra Leone and Ghana holds about 700,000 waders in winter. A conservative estimate puts the corresponding number between Ghana and Angola at about 300,000 birds (GCLME TDA 2006).

The main threats to the survival of both endemic and migrant birds in the Gulf of Guinea include habitat loss due to urbanization and agricultural activities and pollution from activities connected with the oil industry. All countries in the GCLME are parties to the Ramsar Convention and have delineated Ramsar sites for conservation and protection (GCLME TDA 2006, Annex 4).

A recent review of Cetaceans species in the GCLME reported the occurrence of 28 species, with the highest number of species recorded in Angola (Weir 2010). The manatee is found in marine, coastal brackish and freshwater habitats, from the open Ocean to coastal lagoons, estuaries, Rivers and Lakes in 21 Countries[7] spanning from Southern Mauritania to Angola and is now classified as 'Vulnerable' on the IUCN Red List and listed on Appendix II of CITES. The greatest populations of manatee are found in Guinea-Bissau, and coastal lagoons of Gabon, the lagoons of Cote d'Ivoire, the Niger River in Nigeria, the Sanaga River and coastal Cameroon, and the lower reaches of the Congo River (Trimble and Van Aarde 2010, Failler et al. 2017).

Marine mammals that inhabit the waters of the Gulf of Guinea are mainly Cetaceans (whales and dolphins) and sirenians (manatees). The Atlantic Humpbacked dolphin (Sousa teuszii) and the African manatee (Trichecus senegalensis) are of particular importance. Both species appear on the IUCN Red List of endangered species, whereas the African manatee is classified as vulnerable and the humpbacked dolphin as highly endangered under CITES. It is reported that whales especially toothed, fin and humpback whales, migrate to the waters of the Gulf of Guinea from Antarctica at the end of summer. The most important aquatic mammals in Congo are Lamantins (Trichechus senegalensis), while the Hippopotamus (Hippopotamus amphibius) seems to have disappeared. In general, marine biodiversity in the GCLME region is very rich and diverse. The total number of species is not yet well known; already, one can expect more than 480 species. Using a classification based on the important commercially exploited finfish and shell fish provides another magnitude of the importance and diversity of the biodiversity in the GCLME ecosystem (GCLME TDA 2006).

Of the 87 species of sharks and rays assessed in the GCLME region, 54% were found to be threatened (CEPF, 2015). Incidental catches in the fisheries and shark fining are of concern.

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[7] Angola, Benin, Cameroon, Chad, Republic of the Congo, Democratic Republic of the Congo, Côte d'Ivoire, Equatorial Guinea, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone and Togo

4.3.2 *Invertebrates*

Molluscs found in this habitat include Crassostrea gasar (clams), Arca senilis (volutes), Cymbium pepo, cones, cowries and conches. These molluscs form an important basis for fish and bird food chains as well as being a major food source for humans (GCLME TDA 2006). The shrimp fisheries in the GCLME exploit both inshore and offshore penaeids. Penaeuss notialis, pink shrimp and Parapeneopsis atlantica, brown shrimp, represents the inshore shrimps. Whereas the offshore penaeids consist mostly of Parapenaeus longirostris, deep water rose shrimp. Molluscs consist of squids, cuttlefish and octopus. Their exploitation is emerging and still highly localised (GCLME TDA 2006).

4.3.3 *Marine plants*

There is coverage of 16,195 km^2 of mangroves in the GCLME region (Tregarot et al., 2020). GCLME mangrove forests are among the most carbon-rich ecosystems in the world, with estimates that 1,299 tonnes of carbon dioxide would be released per hectare of pristine mangrove if cleared (Ajonina et al., 2014). There are 8 species in GCLME region (Acrostrichum aureum Least Concern, Avicennia germinans, Conocarpus erectus, Laguncularia racemosa, Nypa fructicans, Rhizophora harisonii, R. mangle, R. racemosa – all of which are of Least Concern) and countries with the highest number of mangrove species include Nigeria and Gabon (GCLME TDA 2006, Failler et al., 2017). They occupy close to close to 25,000 km^2 from Guinea Bissau to Angola, with the highest concentration located along the coasts of Guinea and Guinea Bissau, Sierra Leone and in the Niger delta of Nigeria, which has Africa's largest and the World's third-largest mangrove forests, at approximately 7,415 km^2 (Failler et al., 2017). The delta of the Ogooué River in Gabon is Africa's second largest delta after the Niger, covering over 5,000 km^2 of flooded forests, swamps, lagoons, Lakes and mangroves, it is one of the World's most important sites for nesting marine turtles, particularly leatherbacks (Mayaux et al., 2013). Other rich mangrove areas include to the east of the mouth of the Cross River in Nigeria and Cameroon, in the vicinity of Doula in Cameroon, and the Muni Estuary and Como River in Gabon, with smaller areas, also found in Ghana, in Conkouati lagoons of Congo, and in Angola. Although GCLME mangrove forests are less diverse in terms of species than those found in ASCLME, they are the best-developed and most extensive in Africa; they provide unique ecological conditions and habitats for migratory birds. In addition, they serve as spawning and nursery grounds for valuable fish, many of which are transboundary and shellfish and harbour endangered West African manatee Trichechus senegalensis (GCLME TDA 2006).

Climate change is projected to impact mangrove and wetland ecosystems significantly, with changes in temperatures, as well as coastal sea level rise and saline intrusion dynamics (Niang et al., 2014), compounded by other stressors, including unsustainable utilisation, urbanisation, pollution, increases in extractive industries, wood, charcoal and poles (Mallon et al., 2015). Currently, the GCLME region's mangrove forests are at risk of natural and anthropogenic influences. Results obtained during the pilot phase Gulf of Guinea LME project showed that in Ghana, 55% of the mangroves and significant wetlands around the greater Accra area had been decimated through pollution and overcutting. In Benin, the figure is 45% in the Lake Nokoué area and 33% in the Niger Delta of Nigeria. In Cameroon, 28% of the Wouri Estuary has been destroyed; in Côte d'Ivoire, more than 95% of the mangroves in the Bay of Cocody have been cut (GCLME TDA, 2006).

There are 4 species of seagrass in west Africa within three families, with two species of Cymodoceaceae (Cymodocea nodosa, Halodule wrightii), and one species of Hydrocheritaceae (Halophila decipiens) and Zosteraceae (Nanozostera noltii) (Failler et al., 2017 and references contained therein). The seagrass coverage in the GCLME is 43,582 km^2 (Tregarot et al., 2020). Sea-grass beds are not well developed in the region due to the intrusion of cool waters of the Benguela and Canary currents and the high turbidity of the waters. However, there are indications of isolated patches in some estuaries and delta mouths (GCLME TDA 2006).

No true coral reefs exist in GCLME, although there are formations in the waters of Sierra Leone, Liberia, Côte d'Ivoire, Ghana, and around the islands of São Tomé, Príncipe and Bioko, and Gabon. Given the environmental conditions in the region, areas with significant coral growth are only found in shallow protected bays, outside which the number of species and size of coral colonies rapidly decrease. In open waters, hermatypic corals are generally limited to depths shallower than 20 m with some exceptions (Spalding et al., 2001 as referenced in Failler et al., 2017). There are no true corals along the continental margin in the GCLME region, mainly due to the cool waters of the Benguela and Canary currents. However, there have been new observations of deep-water coral reefs Lopheliapertusa in the Angolan waters that are generally associated with cold seep environments (Le Guillox et al., 2009).

4.4 Benguela Current Large Marine Ecosystem (BCLME)

The ecosystem encompasses one of the world's four major coastal upwelling ecosystems, which lie at the Eastern boundaries of the Oceans, the others being the Humboldt (West coast of South America), California, and the Canary. These systems are important centres of marine biodiversity and high marine productivity and support major fisheries (BCLME TDA 2022). Coastal Countries in the region in collaboration with development partners have invested hugely in the assessment of marine biodiversity specifically the identification of EBSAs (Box 5; Annex 6).

4.4.1 Vertebrates

The marine resources of the BCLME are rich and diverse, with commercial catches of about 1.5 million tonnes (Kainge et al., 2021). The BCLME region has shown a decreasing trend in catches since the early 1970s, from a total production of 3.3 million tons to 1.5 million tons in 2018 (FAO, 2016, Kainge 2021, BCLME TDA 2022). Horse mackerel, anchovy, sardine and round herring are the dominant species in pelagic fisheries (IPBES 2018, Kainge et al., 2021). Horse mackerel and hake represent the most important species in terms of landings, with 25% and 22%, respectively.

Box 5. A Network of representative MPAs: a South African experience

In the Southern African region, South Africa is leading the way in respect of proclaiming and managing a network of marine protected areas. By 2011, the National Biodiversity Assessment noted that offshore ecosystems were poorly protected. A total of 22 new MPAs were gazetted for comment in 2016 as part of a lengthy consultation process. The South African Cabinet granted permission to declare a revised network of 20 new MPAs in October, 2018 which culminated in the gazetting of 20 new MPAs on 23rd May, 2019 that expanded the protection of South Africa's mainland Ocean territory to 5%. New research and planning work is underway to identify further priority areas for protection to support the longer-term goal of 10% Ocean protection.

[**source**: https://www.sanbi.org].

The BCLME is rich in small pelagic fish species, most of which are of commercial importance and contribute significantly to the socioeconomic well-being of the people in the region. For Angola, in 2017, the status of the sardinellas (mainly round sardinella S. aurita) and Cape horse mackerel T. capensis was assessed to be optimal or biologically sustainable, while the status of Cunene horse mackerel T. trecae was assessed as overexploited (Kainge et al., 2020). In Namibia, the pilchard (Sardinops sagax) is depleted, largely due to overfishing (Boyer and Hampton 2001). As for the hake stocks, despite the efforts at rebuilding them, the resources have still not recovered and were assessed to be about 20% of its pre-exploitation level (Kirchner et al., 2012), and therefore overfished. It is worth noting that the M. paradoxus stock has been confirmed as shared between Namibia and South Africa (Strømme et al., 2016; Henriques et al., 2016). The sardine population in South African waters is depleted following more than a decade of low recruitment levels (DAFF Department of Agriculture, Forestry and Fisheries, 2016) and is considered by some to be due to overfishing (Coetzee et al., 2017).

The most important nearshore linefish species are snoek and silver kob (Argyrosomus inodorus) caught mainly in Namibia and South Africa, and dusky kob (A. coronus) which occurs off Northern Namibia and in Angolan waters. Other angling fish include West coast steenbras (Lithognathus aureti), blacktail (Diplodus sargus) and galjoen (Coracinus capensis), hottentot seabream (Pachymetopon blochii), snoek (Thyrsites atun), carpenter (Argyrozona argyrozona), santer (Cheimerius nufar), slinger (Chrysoblephus puniceus), Roman (Chrysoblephus laticeps) and yellowtail (Seriola lalandi)) are considered Not Overexploited, while silver kob (Argyrosomus inodorus), geelbeck (Atractoscion aequidens) and white stumpnose are considered depleted/Overexploited (AfDB 2022; DAFF, 2014; Kainge et al., 2021; BCLME TDA 2022).

Other demersal stocks, notably, the Cape monkfish Lophius vomerinus, kingklip (Genypterus capensis west coast sole Austroglossus microlepis and deep-Sea red crab Chaceon maritae are Not overexploited. The status of other demersal fish are unknown and they include large–eye dentex Dentex macrophthalmus, Angola dentex Dentex angolensis, red pandora Pagellus bellottii, Umbrina canariensis, Atractoscion aequidens, and Argyrosomus hololepidothus (BCLME TDA 2022). The long-lived, slow-growing, late-maturing, a low fecundity orange roughy (Hoplostethus spp.) concentrations found in three seamounts in Namibian water in 1990's were heavily fished and Depleted, resulted in a moratorium in early 2009 (Boyer, et al., 2001), and the fishery remained closed (Kainge et al., 2020), while and West Coast rock lobster (Jasus lalandii) are Overexploited in Namibia and South Africa (Kainge et al., 2020; BCLME TDA 2022).

Tuna and tuna-like species are caught in the BCLME, and they include southern albacore or longfin tuna Thunnus alalunga caught in Namibia and South Africa by pole and line vessels, big eye tuna Thunnus obesus caught off the Angolan coast, swordfish Xiphias gladius, southern blue tuna Thunnus maccoyii caught along the edge of the shelf as well as the yellowfin tuna (Thunnus albacares). Smaller tuna species like skipjack (Katsuwonus pelamis) and bonitos (Sarda sarda) are also widely distributed along the Angolan coast and are caught by small fishing vessels (artisanal and semi-industrial fishing fleet) (BCLME TDA 2022).

The BCLME is home to a wide diversity of shark families and species. Over fifty species of sharks have been recorded in the region. The most common family include squalidae (Squalus megalops, Deania calcea, Centrophorus squamosus), Scyliorhinidae (Galeus poli), Hexanchidae (Hexanchus griseus), Lamnidae (Isurus oxyrinchus), Triakidae (Mustelus palumbes) and Carcharhinidae (Prionace glauca). Although there are no directed shark fisheries in the BCLME, these species are incidentally caught during fishing operations (trawl, purse seine, longline, pole and line) (BCLME TDA 2022).

Of the 8 species of Sea turtles worldwide, 5 occur in the BCLME: Loggerhead turtle (Caretta caret), Green Sea turtle (Chelonia mydas), Hawksbill Sea turtle (Eretmochelys imbricata), Olive ridley turtle (Lepidochelys olivacea), and - Leatherback turtle (Dermochelys coriacea). They are caught incidentally in some fisheries (longlines, gill-nets, traps and trawls), and in former years, they were poached for ornamental crafts, their skins and meat (BCC Thematic Report on LMR, 2020). They have been of economic value as a tourist attraction, but they are also preyed upon by sharks (Box 6).

Box 6. Angola case study: Sea Turtle Conservation Program

Five turtles species, namely, olive, leatherback, green, loggerhead turtle and hawksbill turtle and recorded in Angolan waters. Three turtles spawn on the beaches of Angola are: green, olive and leatherback. The Kitabanga project started in 2006, aims to contribute to the knowledge and protection of sea turtles in six out of seven provinces along the coast of Angola. It was initiated by an oil and gas company (ALNG), managed by an NGO (Wildlife Conservation Society) in collaboration with Agostinho Neto University, and fully supported by the Government, local fisherfolks and community members. The project raised awareness amongst the communities on the importance of conserving and protecting the turtles as well as promoting general environmental education. It conducted training and capacity building for a selected technician within the communities to oversee the conservation efforts in their areas, resulting in over 70 job opportunities. The project supports local communities in promoting alternate livelihoods such as crafts with crafts, sports and education. A bachelor's degree thesis has been produced under this project. Regular surveys are conducted to determine and assess the status and threats of the turtles and contribute information to the decision-making authority to promote the conservation and protection of these Globally threatened species. Data on local turtle populations are collected, and risks to nesting turtles from human activities are mitigated. In addition, nests are monitored and sometimes relocated to a safer protected hatchery. By the end of 2020, more than 105,000 turtle hatchlings had been released from the hatcheries. In 2021, ALNG signed a memorandum of understanding with the Kitabanga Project that included a commitment to fund and monitor the ongoing conservation program.

This success story involving the private sector, the Government, NGOs, academia, and the local community in conserving and protecting threatened biodiversity can be replicated in other parts of the Continent.

Sources: https://angolafieldgroup.com/2013/05/24/turtle-facts-from-projecto-kitabanga/
https://www-kitabanga-org
Personnel communication: Vladimir Russo, Director of Holisticos (an NGO).

The BCLME supports important communities of seabirds, both residents and migrants, the latter migrating along the African coasts and occasionally crossing the Atlantic and Indian Oceans. Notable endemic species include the Great White Pelican Pelecanus onocrotalus, White-breasted Cormorant Phalacrocorax carbo, Grey-headed Gull L. cirrocephalus, and Caspian Tern. Piscivores seabirds, for example, Roseate Tern (Sterna dougallii), African Penguin Spheniscus demersus, Cape Gannet Morus capensis, Cape Cormorant Phalacrocorax capensis, Kelp Gull Larus dominicanus, and Greater Crested Tern, follow the availability of pelagic fish; and Leach's Storm Petrel Hydobates leucorous, many of which migrate south from the northern hemisphere in the austral summer. There have been large declines in populations of African Penguin S. demersus, Cape Gannet M. capensis, and Cape and Bank Cormorants P. neglectus in the central BCLME (Lüderitz to Cape Point) but increases of some of these species farther north and southeast (Benguela Current Commission, 2000). Cape Cormorants initiated breeding at Ilha dos Tigres, Angola around the recent turn of the Century (2002; BCLME TDA 2022). Seabirds that migrate into the BCLME include some that breed in the Northern hemisphere cold region, in the tropics and in the Southern hemisphere cold region (Failler et al., 2017). Commercial fisheries (through competition for food and mortality on fishing gear) and pollution at Sea pose principal threats to seabirds. On land, they are attacked by alien invasive predatory species and face habitat degradation and other human disturbance. Direct exploitation remains a problem for some species both at sea and ashore. Availability of prey, which is thought to have been driven by environmental change as well as fishing, caused large recent diseases of several of the system's endemic seabirds (BCLME TDA, 2022). Displacement of seabirds from breeding sites by larger animals (BCLME TDA 2022), unsustainable natural predation at certain localities and disease are other threats (BCLME TDA 2022).

The primary stressors affecting biodiversity in the BCLME include harmful fishing practices, pollution, climate change, habitat loss and disturbance, accidental capture in fishing nets and trawls, and competition with fisheries for food, inadequate food, ecosystem changes, predation (BCLME TDA 2022).

Whaling was a profitable fishery developed during the second half of the 18th Century, initially targeting Southern right whales and throughout the 19th Century, hunting humpback whales, sperm whales, humpback whales, fin whales, and blue whales until they were virtually driven to extinction. The BCLME has a high diversity of marine mammals. Several of the larger whales visiting the BCLME are cosmopolitan in their distribution, while some smaller species, e.g. Killer Whale and Risso's Dolphin, also are wide-ranging. BCLME is home to two seals species: Cape Fur Seal Arctocephalus pusillus and A. tropicalis. Cape fur seal (Arctocephalus pusillus pusillus) is found on the mainland or small rocky islands, from southern Angola to Port Elizabeth in South Africa, and more than 60% of the population is located along the Namibian coast. Sealing stopped in South Africa in 1990 while harvesting continues in Namibia (BCLME TDA 2022).

According to IUCN, most species are vulnerable or endangered, despite all cetaceans being fully protected in the area. Mammals are incidentally killed through bycatch and vessel strikes. Pollution, including noxious chemical substances, oil spills, marine debris (that can cause entanglement) and noise (causing disturbance and disrupting communication and self-locating abilities), affects 60% of marine mammal species. Other threats to marine mammals include loss or degradation of breeding habitat, disturbance, blasting, infectious diseases, harmful algal blooms, severe storms and climate change (Wilson and Mittermeier, 2014, BCLME TDA 2022). Mammals are also harvested for their skins, oil, meat, male genitalia (as an aphrodisiac in the Far East) (Griffiths, 2004).

4.4.2 Invertebrates

The most important crustaceans in the BCLME are the deep-Sea crab Chaceon maritae, which is caught in Angola and Namibia. Off the Angolan coast, the Southern pink shrimp (Penaeus notialis) is the most important shallow-water shrimp species while rose shrimp Parapenaeus longirostris and striped shrimp Aristeus varidens are caught in deep waters. There are also many species of lobsters of which the West Coast rock lobster has been commercially harvested with traps in Namibia and South Africa, and they are in depleted stage. Molluscs are widely distributed in the BCLME, and include squids species (Todarodes sagittatus and T. angolensis), chokka squid (Loligo vulgaris reynaudi), perlemoen abalone (Haliotis midae in South Africa only), and cuttlefish (Sepia officinalis and S. orbignyana), which are caught as bycatch in the trawl fisheries or in directed fisheries. The sedentary bivalve species such as black mussels (Choromytilus meridionalis) and brown mussels (Perna perna) are harvested for food and for bait. West coast rock lobster populations have also declined dramatically due to overfishing and low-oxygen water. The species is now severely overfished in South Africa (DAFF, 2014) and Namibia (Kainge et al., 2021). The condition of the perlemoen/abalone stock in South Africa, targeted heavily by illegal fishing, has deteriorated and remains overfished (BCLME TDA 2022).

4.4.3 Marine plants

There are 617 km^2 of mangroves in the BCLME region (Tregarot et al., 2020). The services provided by the mangroves cannot be underestimated (Lewis et al., 2013). In Angola, mangrove communities occur at the mouths of the Cuvo, Longa, Cuanza, Dande, and M'Bridge Rivers (Huntley et al., 1994), though they are not as extensive as the vast mangrove swamps at the mouth of the Congo River. Namibia has no mangrove plants. In South Africa, the distribution of mangrove forests (temperate and subtropical) is patchy, and the drivers of the mangrove's distribution are still poorly understood. A changing climate that results in increased temperature may favour the expansion Southward of mangrove forests in South Africa's estuaries (Hoppe-Speer et al., 2013; Kairo et al., 2016). Along the Eastern coast of South Africa, six species of mangroves are found. They are: Avicennia marina (Least Concern), Bruguiera gymnorrhiza, Rhizophora mucronata (Least Concern), Ceriops tagal (Least Concern), Lumnitzera racemosa (Least Concern) and Xylocarpus granatum (Least Concern) and three in Nahoon (Avicennia marina, Least Concern, Bruguiera gymnorrhiza and Rhizophora mucronata, Least Concern) (Hoppe-Speer et al., 2013). About 75% of mangroves are found at Kosi, St. Lucia, Mfolozi and Mhlathuze estuaries; except Mfozoli, they are protected (Obura et al., 2004).

Similar to other regions, the threats to mangroves include unsustainable use (for charcoal, firewood, building material, fences and fish traps, and medicine.

4.5 Agulhas and Somali coastal Current LME and adjacent islands

The marine environment of the ASCLME region is characterized by a mosaic of mangroves, coral reefs, seagrass beds, major estuaries, sandy beaches, cliffs, and muddy tidal flats. These coastal ecosystems are highly productive and provide important biological and economic resources, and critical sources of livelihood for local communities (Francis et al., 2002; Wells et al., 2007). The ecosystem supports rich species composition, exceeding 11,000 species of plants and animals (WWF, 2017; Tear et al., 2014). Across taxa, high levels of endemism have been recorded in the waters of South Africa, Mauritius, La Reunion, Seychelles (Obura, 2012; Briggs & Bowen, 2012). However, the coastal and marine environment is increasingly subjected to a wide range of natural and anthropogenic disturbances, exacerbated by widespread poverty and rapidly increasing coastal populations. Countries in the region recognize the urgent need for better and more effective management of the coastal and marine resources to improve the quality of life of the people, sustain National economies, and maintain the productivity and diversity of these valuable ecosystems for the future (Francis et al., 2002).

Bullock et al., (2021) found that more than 90% of the threatened and Near Threatened species are impacted by biological resource use through direct, targeted fisheries, Illegal, Unreported and Unregulated fishing or indirectly through bycatch or habitat degradation. Specifically, overexploitation is a driver for all threatened and Near Threatened cartilaginous fishes, mammals and Sea turtles, and these long-lived, late-maturing species may be particularly susceptible to declines. The threatened and near Threatened reef-building corals are impacted by the same suite of threats, including fisheries-related habitat degradation; climate change and severe weather; human intrusions and disturbance; invasive and other problematic species, genes and diseases; pollution; residential and commercial development; and transportation and service corridors (Bullock et al., 2021). Habitat degradation and destruction through pollution, coastal development and other habitat modifications emerged as a major threat across the species groups assessed. These anthropogenic activities can lead to physical damage, changes in chemical water quality (eutrophication), sedimentation, the introduction of pollutants, and microbial contamination (Bullock et al., 2021). Ultimately, habitat loss can lead to ecosystem phase shifts in which the dominant structuring species (i.e., corals, seagrasses, and/or mangroves) are replaced (McManus and Polsenberg, 2004). Phase shifts ripple through the ecosystem many causing a net loss of biodiversity as habitat quality declines (McManus and Polsenberg, 2004).

4.5.1 Vertebrates

Coastal fish diversity is relatively high in East Africa and adjacent islands, with approximately 1,000 – 1,500 species identified and 142 endemics (Briggs et al., 2012). Major species in this region are small pelagic, caught almost everywhere along the coast and demersal fish, caught by artisanal fishermen. Most of the coastal stocks are fully exploited or overexploited (FAO, 2016). The studies of fish biological diversity in the WIO are biased towards coral reef areas (Failler et al., 2017). About 3,200 species or about 20% of the world's marine fish fauna, occurred in the WIO, with at least 1000 coastal species (Failler et al., 2017). The region from southern Kenya to northern Mozambique and northern-eastern Madagascar, including the Mascarene Islands and the Mozambique-South Africa border, are areas with moderate to high fish diversity (Failler et al., 2017). The famous coelacanth (Latimeria chalumnae (Box 7), Critically Endangered), is an endangered 'living fossil' that was discovered in waters surrounding Comoros in 1938 and the population is now estimated to be 200-300 individuals (Failler et al., 2017), remains the most threatened fish species in the ASCLME (Wells et al., 2007).

Box 7. MARINE PARK THAT WORKS: A CASE STUDY OF TANGA COELACANTH MARINE PARK (TCMP), TANZANIA

The coelacanths were believed to have become extinct about 66 million years ago. However, in 1938, a living member (Latimeria chalumnae) was netted in the Indian Ocean near the southern coast of Africa. In 1952, a second specimen (named Malania anjouanae but not separable from Latimeria) was caught near the Comoros Islands. The Coelacanth by-catch was observed at the small island of Songo Mnara, off Kilwa Masoko in the South of Tanzania, where fishermen landed the first specimen of coelacanth in 2003. Another by-catch was witnessed in the Tanga region, in the North of the Country, which recorded the highest number of accidental catches, with 39 individuals captured between 2003 and 2007 at relatively shallow depths (40 to 70 m) being caught by bottom-set shark nets (Sasaki et al., 2007; Nikaido et al., 2011). The extent of the coelacanth by-catch prompted the Government to create the Tanga Coelacanth Marine Park, which covers 467 km^2 to protect and conserve this 'living fossil' ([MPRU, 2011). Since the park's establishment, some regulations have been imposed on the protection of Coelacanth; hence the number of reported by-catch incidences drastically went down. Indeed, fishing activities in the park are restricted to local artisanal fisheries, using small vessels and gears that are set in relatively shallow waters (e.g. handline, spearfishing, traps). There are no local trawlers in the Tanga area, and trawling is banned within the boundary of the TACMP. The bottom areas of the canyon are presumed to be a refugia for the coelacanths species. This remarkable conservation effort can be replicated elsewhere in the African LMEs.

[**Source**: Information provided by the Marine Parks and Reserves, Republic of Tanzania].

Based on the report of the 9th session of the SWIOFC Scientific Committee (SWIOFC SC, 2019), 86 groups were assessed, of which 48 were Not Overexploited, while 38 were Overexploited and 21 unknown[8]. Fifty-six percent of the assessed stocks can be considered sustainably exploited, while 44 were unsustainably harvested (AfDB 2022). Most of the stocks reported as assessed by Comoros were considered Overexploited. France reported 31 stocks in total, which included 14 that were Not Overexploited. More than half of the stocks reported by Kenya show the status Unknown, with the others classified both as Not Overexploited and Overexploited. Mauritius presented an equal number of Overexploited and Not Overexploited stocks. Mozambique reported eight stocks, of which four were classified as Not Overexploited and the other four as Overexploited. Seychelles reported 15 stocks, of which more than 50% are assessed as Overexploited. South Africa provided information on eight stocks, with 56% Not Overexploited. The proportion of Not Overexploited stocks from the United Republic of Tanzania was 73% out of 15 (SWIOFC SC, 2019 as cited in AfDB 2022). The deeper waters (>400 m) of Walter's Shoal - a group of submerged mountains south of Madagascar, host over 50 species of fish, of which several are endemic (Shotton, 2006). The long-lived, slow growth and low fecund orange roughy (Hoplostethus sp.) concentrations found in the South-Eest Indian Ocean seamounts in 1999 were heavily fished (www.siodfa.org) and now depleted together with other deep-Sea fisheries of commercial interests such as alfonsino (Beryx splendens) and red snapper (Etelis coruscans) (Bensch et al., 2008).

The fisheries of the Indian Ocean are subject to multiple stressors including fishing, Ocean acidification, changing Sea temperatures, salinity and dissolved oxygen, pollution, and destructive fishing, including blast fishing. The continuation of some of these activities, coupled with temperature-induced coral bleaching is likely to result in a complete loss of biological diversity in the region. Of particular concern, is the loss of coralline algae, which is essential for cementing coral rubble into a solid reef–a critical habitat for many organisms (Veron et al., 2009).

Artisanal fisheries in the Indian Ocean are critical for the livelihoods and food security of coastal

[8] It must be noted that the percentages of Overexploited or Not Overexploited stocks refer to the stocks whose status could be estimated by the countries, not to the total number of stocks that exist in each country.

States' populations, particularly island Nations such as Seychelles (IPBES 2018). The offshore fisheries of the Western Indian Ocean are rich, but countries within the region have been unable to develop the infrastructure to exploit these fisheries. As a result, they have allowed the distant-water fishing fleets of developed Countries to access fish resources through multilateral or Bilateral Agreements (AfDB 2022).

Sharks in WIO include regionally endemic species, the Bluespotted bambooshark (Chiloscyllium caerulopunctatum), Harlequin catshark (Ctenacis fehlmanni) and Short-tail nurse shark (Ginglymostoma brevicaudatum) (Failler et al., 2017). In Madagascar, 83 species of shark have been identified in coastal and offshore waters, including six endemic species. The most threatened species include the largetooth sawfish (Pristis pristis) and greentooth sawfish (P. zjisron), the hammerhead sharks (Sphyrna lewini and S. mokarran) (Failler et al., 2017).

Five species of marine turtles occur in east Africa: green, hawksbill, loggerhead, olive ridley and leatherback. The first two are known to nest in the region. Important hotspots for nesting and feeding grounds of Sea turtles are along the coasts of Kenya, Tanzania (Misali Island, off Pemba, and Mafia Island), Seychelles, Comoros, Mayotte, Europa Island, Mozambique and South Africa. The Pemba Bay – Mtwara (Mozambique/ Tanzania) transboundary EBSA provides nesting and feeding grounds for olive ridley, green and hawksbill. The main threats to turtles are a disturbance of nesting and foraging habitats, incidental net captures (gillnets and trawlers), poaching of meat and eggs, lack of adequate protection and enforcement, limited awareness and land-based development and pollution. Threats to turtles include habitat destruction and alteration, overexploitation for meat and eggs, and incidental capture in gillnets and trawlers.

Lagoons and estuaries provide feeding and breeding areas for a high diversity of resident and migratory seabirds and marine turtles, such as the olive ridley (Lepidochelys olivacea, Vulnerable), green turtle (Chelonia mydas, Endangered) and hawksbill (Eretmochelys imbricate) (Wells et al., 2007), all of which are CITES listed. In the WIO some of the most threatened species of seabird include the regionally endemic 'Critically Endangered' Mascarene Petrel (Pseudobulweria aterrima), and Madagascar fish-eagle (Haliaeetus vociferoides) and 'Endangered' Barau's petrel (Pterodroma baraui). Indian yellow-nosed albatross (Thalassarche carteri), Madagascar Sacred Ibis (Threskiornis bernieri), Madagascar Pond-heron (Ardeola idea), Madagascar Heron (Ardea humbloti) and Madagascar Teal (Anas bernieri), as well as other species of cape cormorant and African penguin, and Atlantic yellow nosed albatross, which feed in the WIO as well as the EAR (Failler et al., 2017).

There are also 37 Cetacean species reported from East Africa, and among these the most threatened species are the baleen whales, which are classified as 'Endangered' on the IUCN Red List such as the sei whale (Balaenoptera borealis), blue whale (B. musculus), fin whale (B. physalus), the minke whale (B. bonaerensis) and brydes whale (B. endeni). There are one species classified as 'Near-threatened', the Indo-pacific beaked whale (Indopacetus pacificus) and three species classified as 'Vulnerable' including the Sperm Whale (Physeter macrocephalus), armoux's beaked whale (Berardius arnuxii), and dusky dolphin (Lagenorhyncus obscurus), and the heavyside's dolphin (Cephalorhyncus heavisidii) (Reeves et al., 2013), found in west Africa, is of conservation concern in this region as an endemic species. However, it is classified as 'Data Deficient' on the IUCN Red List.

In the ASCLME, dugong (Dugong dugong) (Marsh and Sobtzick, 2015) are usually found in shallow tropical coastal waters in proximity to seagrass beds, between East Africa and the Pacific within the latitudes of 27° North and South of Equator. Several dugongs were sighted in the seagrass beds next to the Rufiji Delta (Sea Sense, 2011). Dugong populations have dwindled around Africa. The only recent sightings in the WIO have been from Madagascar, Seychelles, Comoros and Mozambique, and the population in the Bazaruto Archipelago in Mozambique is believed to be the largest remaining viable population in the WIO region. Regional assessments classified dugong populations in the WIO as 'Endangered' and RSGA as 'Data deficient'. They are classified as 'Vulnerable' on the IUCN Red List and listed on Appendix I of CITES (Failler et al., 2017).

4.5.2 Invertebrates

Comprehensive conservation assessments of invertebrates are limited in the ASCLME, with assessments completed only for the cone snails (Gastropoda: Conidae), Sea cucumbers (Holothuroidea), and reef-building corals (Anthozoa: Scleractinia). In general, few cone snails were threatened, while 22% of Sea cucumbers and 24% of reef-building corals were threatened (Bullock et al., 2021).

Marine Crustacean biodiversity is poorly documented in this region (Rogers, 2012), however, a total of 165 species of shrimp have been identified in Seychellois waters, many of which are endemic. There are also several regionally endemic Crustacean species associated with coral habitats (Briggs et al., 2012). More studies have been undertaken on Walter's Shoal (Rogers, 2012) and found at shallow waters species such as Comanthus wahlbergi tenuibrachia (Collette et al., 1991) and an endemic species of rock lobster (Palinurus barbarae) (Groeneveld et al., 2006), and several Crustaceans including an endemic species of aphid shrimp (Alpheus waltervadi) and endemic isopod (Jaeropsis waltervadi).

4.5.3 Marine plants

The total mangroves coverage in the ASCLME region is 7,355 km^2 (Agulhas Current LME 5,792 and Somali Coastal Current LME 1,555 km^2 plus African Islands of the Indian Ocean 8 km^2) (Tregarot et al., (2020). Mangrove forests inhabit many of the saline and brackish coastal and marine areas and estuaries (including the estuaries of the Limpopo, Zambezi, Rufiji, and Tana Rivers) of the East African Region, stretching from the coastal cities of Kismayu in Somalia to Maputo in Mozambique. Large stands of mangroves are found at the mouths of the Zambezi, Save, Pungue, and Limpopo rivers along the coastline of Mozambique. The dominant trees are Rhizophora racemosa (Least Concern), R. mangle (Least Concern), R. harrisonii and, Avicennia Africana. The largest mangrove areas are in one of the Global biodiversity hotspots along the Madagascar coast (2,991 km^2) and Mozambique (2,909 km^2) (Chapman et al., 2001; Samoilys et al., 2015). The Rufiji Delta contains the largest continuous block of estuarine mangrove forest in East Africa and adjacent islands. Mangroves in East Africa are home of 10 species, the most common species being Avicennia marina (Least Concern), Rhizophora mucronata (Least Concern), and Ceriops tagal (Least Concern). The only endemic mangrove is C. somaliensis, found only in Somalia. Salt Avicennia and Sonneratia leaves from mangroves are important sources of food feed for the Zebu cattle (Cormier-Salem, 2007).

Concerns have been raised over the increasing erosion of wetlands, mangrove forest fauna, and flora due to water and soil pollution (Beuel et al., 2016). Recent studies have revealed severe degradation of crabs and molluscs due to polluted waters and soils of the wetlands and mangrove forests. Mangroves in the Kilifi area in Kenya only make up a small proportion of the total area but have seen the highest rate of loss, estimated at 18% between 1985 and 2010 (Kirui et al., 2013).

In east Africa, there are nine species of mangal (Avicennia marina, Bruguiera gymnorrhiza, Ceriops tagal, Heritiera littoralis, Lumnitzera racemosa, Rhizophora mucronata, Sonneratia alba, Pemphis acidula, Xylocarpus granatum and X. molucensis) the most common of which are A. marina, R. mucronata, and C. tagal. Diversity is highest along the mainland countries and lowest on the islands (e.g. Mauritius and Rodrigues, where only two species are found) (Failler et al., 2017). In Madagascar, the loss of mangroves was found to be 7% of mangrove forests from 1975 to 2005 (Giri et al., 2008). Since 2011, nongovernmental organisations have been involved in projects (in Madagascar) to assess the feasibility of using payments for blue carbon as a long-term financial mechanism for community-based mangrove management (Leach et al., 2013; Cormier-Salem et al., 2016). Mangroves are particularly overexploited in the areas surrounding major cities on the East African coast, such as Mombasa, Dar-es-Salaam and Maputo, becoming heavily degraded or destroyed by multiple pressures on resources and pollution. They are also threatened by erosion and direct harvesting/cutting and population pressure (Spalding et al., 1997).

The total seagrass coverage in the ASCLME region is 10,008km^2 (Agulhas Current LME 9,714 km^2 + Somali Coastal Current LME 160 km^2+ African Islands of the Indian Ocean 134 km^2) (Tregarot et al., 2020). There are 12 different seagrass species in the WIO region within three families, with 5 species of Cymodoceaceae (Cymodocea rotundata, C. serrulata, Halodule uninervis, Syringodium isoetifolium, Thalassodendron ciliatum), 6 species of Hydrocheritaceae (Enhalus acoroides, Halophila ovalis, H. stipulacea, H. decipiens, H. beaudettei, Thalassia hemprichii) and one species of Zosteraceae (Nanozostera capensis) (Failler et al., 2017 and the reference therein). Of the 50 Globally described seagrass species, 13 are found in the Mascarene Plateau area15. Preliminary data from the Shoals of Capricorn Marine Programme indicate very large, previously uncharted, seagrass beds in the Mascarene Plateau (Burnett et al., 2001; Payet, 2004). Overall, the risk of Global extinction to these marine plants remains low in the WIO, with only two species of seagrasses listed as VU and one as DD (Bullock et al., 2021).

The total corals' coverage in the ASCLME region is 11,571km^2 (Agulhas Current LME 6,442 and Somali Coastal Current LME 2,844 km^2+ African Islands of the Indian Ocean 2,285 km^2) (Tregarot et al., 2020). The region is characterized by high endemism amongst the coral fauna. All species of corals are listed on the IUCN Red List. In the WIO, there are 478 species of corals listed on the IUCN Red List. However, a recent paper identified 413 distinct species from the WIO, including several unidentified records, which resulted in 369 species being identified, with the highest diversity being reported from the northern Mozambique channel (as cited in Failler et al., 2017). The WIO is also known for soft corals such as Dendronephthya and Xenia, as well as a host of other cnidarians, including black corals, sea anemones, and sea fans. Regional endemic species (e.g. Parasimplastrea sheppardil), listed as 'Endangered' on the IUCN Red List, are considered more threatened (as cited in Failler et al., 2017). Kenya, Tanzania, and Mozambique have lost significant portions of their mangrove shoreline, and coral reefs have declined due to major bleaching events (Obura et al., 2017).

Coral communities occur in shallow waters of Mozambique, Tanzania. There is a rich coastal and marine biodiversity associated with the fringing and patching coral reefs and mangrove forests on the Maputoland Reef in KwaZulu-Natal, South Africa extends into Mozambique and then into Tanzania (Obura et al., 2004).

4.6 Red Sea Large Marine Ecosystem

According to PERSGA GEF (2003), as cited in the fifth National Report of Eritrea (de Grissac and Negussie 2007), the Red Sea represents a complex and unique tropical marine ecosystem with extraordinarily rich biodiversity and a remarkably high degree of endemism. It is one of the most important repositories of marine biodiversity on a global scale and features a range of significant coastal habitats, including the diversity of coral reef habitats in the Central Red Sea; distinct zoogeography and number of endemic species; the unique coral reefs around the Sinai; the atoll-like formation of Sanganeb Atoll in Sudan; extensive stands of mangroves and populations of dugong and turtle in the southern Red Sea. (https://persga.org/programs).

Threats include rapid development and population growth along the coastal zones, increased international dive tourism causing the destruction of coral reefs in heavily visited reefs, habitat destruction and modification and the release of pollutants, and over-fishing. The social and economic structure and the livelihoods of coastal communities are threatened by the accumulated impacts occurring within the marine and coastal environments.

4.6.1 Vertebrate

More than 1,300 fish species and hundreds of marine invertebrates and marine mammals call the Red Sea and the Gulf of Aden their home. Species endemism in the Red Sea is extremely high, particularly among some groups of reef fishes and reef–associated invertebrates. In the Red Sea, the total fish landings amount to about 22,800 tons/year with 44% of the landings being coral reef-based (PERSGA/GEF, 2003).

All species of Sea turtles, namely, hawksbill turtle (Eretmochelys imbricata), green turtle (Chelonia mydas), olive ridley (Lepidochelys olivacea), leatherback (Dermochelys coriacea) and loggerhead turtle (Caretta caretta) are listed as threatened on the IUCN Red List and are included in CITES Appendix 1. The hawksbill turtle (E. imbricata) and green turtle (C. mydas) are the most threatened species. The island Countries and nearshore islands and islets are particularly important for nesting activities. Previously only the first two species (green turtles and hawksbill turtles) were thought to nest in the Red Sea and Somalia (Failler et al., 2017 and the references therein). Surveys have since found evidence to support the other species forage and nest in the region.

Coastal wetlands, the shallow waters adjacent to reefs and islands, and the numerous islands throughout the Region provide ideal habitats for many seabirds. Some of the important resident species include the Lesser Flamingoes (Phoenicopterus minor) and the Yellow–vented Bulbul (Pycnonotus xanthopygos), while the important wintering species include the Greater Spotted Eagle (Aquila clanga), White–eyed Gull (Larus leucophthalmus) and the Greater and Lesser Sand Plover (Charadrius leschenault, C. mongolus). The Red Sea is a flyway for many species of birds that seasonally migrate between Europe and Africa. The Southern Red Sea islands, in particular the Farasan Islands, are utilized by hundreds of thousands of birds in the spring and autumn migrations. Here there are Internationally important populations of Saunders' Little Tern (Sterna saundersi), Bridled Tern (S. anaethetus) and the resident Egyptian Vulture (Neophron percnopterus) (PERSGA SAP, 2014).The RSGA region also hosts many residents and migratory bird species (Evans and Fishpool 2001), including endemic resident taxa such as the 'Near-threatened' white-eyed gull (Larus leucophthalmus) and sooty falcon (Falco concolor). Some species and sub-species are endemic to the northwest Indian Ocean that also breed within the RSGA region e.g. 'Vulnerable' Socotra cormorant (Phalacrocorax nigrogularis) and 'Near-threatened' Jouanin's petrel (Bulweria fallax) (Failler et al., 2017).

There are significant island groups, such as the islands and islets around Mukkawar, the Suakin Archipelago in Sudan, the Dhalak Archipelago in Eritrea, and the Sept Freres in Djibouti and the Sa'ad el Din islands along the North coast of Somalia. These islands and islets are usually uninhabited and important for seabirds and sea turtles (as cited in Failler et al., 2017).

Marine mammals in the Region are represented by cetaceans such as dolphins, whales, and dugongs (PERSGA/GEF, 2003). Although dugongs were hunted in the past by artisanal fishermen, this is no longer the case, and where surveys of their populations have been done, such as in Saudi Arabian waters, the populations are healthy. In the absence of major human impacts, the conservation of dugongs is directed towards the conservation of feeding habitats, the seagrass beds. Sea turtles feed and nest in the Region and at least three species—green, hawksbill and loggerhead—have been observed. They rely on seagrass, algae, and invertebrates for their food. Information on their status is generally lacking and hunting by humans continues in some parts of the Region. There are 13 species reported in the RSGA region. Among these the most threatened species are the baleen whales, which are classified as 'Endangered' on the IUCN Red List such as the sei whale (Balaenoptera borealis), blue whale (B. musculus), fin whale (B. physalus), the minke whale (B. bonaerensis) and brydes whale (B. endeni). There is one species classified as 'Near-threatened', the Indo-pacific beaked whale (Indopacetus pacificus) and three species classified as 'Vulnerable' including the Sperm Whale (Physeter macrocephalus), armoux's beaked whale (Berardius arnuxii), and dusky dolphin (Lagenorhyncus obscurus), and. The heavyside's dolphin (Cephalorhyncus heavisidii) (Reeves et al., 2013), which is found in West Africa, is of conservation concern in this region as an endemic species. However, it is classified as 'Data Deficient' on the IUCN Red List (Failler et al., 2017). There are also recent reports of dugongs from Egypt and Sudan in the RSGA (Failler et al., 2017).

4.6.2 Marine plants

Mangroves are an extremely important form of coastal vegetation: their extensive root systems stabilize sediments and protect the coastline; they provide shelter for an array of marine animals, birds — enhancing overall biodiversity—and the juveniles of commercially important fish and Crustaceans. The total mangrove coverage in the Red Sea LME region is 76 km^2 (Tregarot et al., 2020). There are extensive mangrove stands in the Red Sea LME, especially in the Southern areas. The dead leaves and branches of mangroves are a source of food within the mangrove ecosystem and offshore, such as in shrimp communities. However, environmental conditions in the Region, such as temperature and salinity, are near the upper limits for mangrove existence, which makes them very sensitive to disturbance and probably limits their ability to recover (PERSGA SAP, 2014). There are four species found, which are a subset of those found in the wider Indian Ocean (A. marina, R. mucronata, B. gymnorhiza and C. tagal) (PERSGA/GEF, 2004). The stands in RSGA are typically smaller and narrower than elsewhere around the continent, except in areas where there are seasonal freshwater inputs (surface and groundwater), and composed of A. marina, with R. mucronata. All of the species are listed a 'Least Concern' on the IUCN Red List.

Along the Sudanese coast, the mangroves stretched from Mohammed Qol north of Port Sudan to Shabarango-Gafud South of Suakin and are dominated by Avicennia marina (Least Concern). Mangrove lagoons and channels are occupied by numerous fish species, including many commercially important species (e.g., Acanthopagrus berda (Least Concern), Chanos chanos (Least Concern), Crenidens crenidens (Least Concern), Hypoatherina temminckii, Leiognathus equulus (Least Concern), Terapon jarbua (Least Concern), Pomadasys commersonni and some mugilid species). Most of the Sudan Mangroves are included in the national parks of the Red Sea and could be stable (PERSGA SAP, 2014).

The Red Sea LME has a high degree of endemism and is an important repository of marine biodiversity including 12 of the world's 60 seagrasses, and 38 coral reef genera with 220 species. The 12-seagrass species are: Cymodoceacea (C. rotundata, C. serrulata, Halodule uninervis, H. pinifolia, S. isoetifolium, T. ciliatum) and 6 species of Hydrocharitacea (Enhalus acoroides, Halophila ovalis, H. stipulacea, H. decipiens, H. ovata, and T. hemprichii) (Grissac and Negussie 2007, Failler et al., 2017). Seagrasses inhabit shallow and sheltered waters throughout much of the Region. The total seagrass coverage in the Red Sea LME region is 6,963 km^2 (Tregarot et al., 2020). The productivity of seagrass beds is greater than comparable areas of coral reefs and mangroves. Seagrass roots stabilize sediments and protect the coastline in conjunction with nearby mangroves. Water currents are reduced in the vicinity of seagrass beds leading to the deposition of fine sediments and the clarifying of surrounding waters. Many marine animals rely upon seagrass beds for shelter and food, including water birds, fish and crustaceans, and the Internationally important dugong and green turtles. Commercially important fish and crustaceans use seagrass beds as nursery grounds. There are strong connections between seagrass beds and nearby coral reefs: nocturnally active fish migrate at night from the reefs to the seagrass beds to feed; dead seagrass leaves carried offshore in currents become food for animals inhabiting deeper marine habitats (PERSGA SAP, 2014).

The Eritrean coast along the Red Sea is rich in marine plants, especially seagrasses, the only group of higher plants (flowering plants) adapted to life submerged under the Sea.

The Red Sea has a high degree of endemism and is an important repository of marine biodiversity. The IUCN Red List includes 382 corals, with the highest diversity found within the Red Sea's central region (Failler et al., 2017). Some prominent species include soft corals Dendronephthya and Xenia and other cnidarians, including black corals, Sea anemones, and Sea fans. Regional endemic species (e.g. Parasimplastrea sheppardiI), listed as 'Endangered' on the IUCN Red List, are considered more threatened. The Eritrean coast is also known for diverse coral reefs, with about 38 coral reef genera and 220 species recorded in the area (Failler et al., 2017).

The warm water and absence of freshwater input provide suitable conditions for coral reef formation adjacent to the coastline. In the Northern Red Sea, the coast is fringed by an almost continuous band of coral reef, which physically protects the nearby shoreline. This beautiful environment is extremely attractive as a tourist resource and is currently visited by hundreds of thousands of people each year, who dive, walk, and swim in the waters adjacent to the reefs. Further South, the coastal shelf becomes much broader and shallower, and the fringing reefs gradually disappear to be replaced by shallow, sandy shorelines and mangroves. Coral reefs have become more numerous offshore in this part of the Region.

The important coastal and marine environments and resources of the Red Sea and Gulf of Aden are subject to a series of individual and cumulative threats which have significant short– and long–term consequences for the sustainable development of the Region. The threats include habitat destruction, overexploitation of living marine resources, environmental degradation from petroleum development, significant risks from marine transportation, pollution from industrial activities, and diverse environmental impacts from urban and tourism development (PERSGA SAP, 2014).

5. Assessments of the multilateral environmental agreements (MEAs) on biodiversity

Annex 7 lists multilateral agreements on biodiversity to which the 38 coastal states are parties. These Instruments can help to align policies to achieve desired outcomes for biodiversity and climate change within the broader context of sustainable development. The African Union Member States have committed to fully implementing key multilateral environmental agreements. Harnessing synergies in these multilateral environmental Agreements with Sustainable Development Goals and other related regional and National initiatives can foster the effective implementation of policies and strategies at different levels and scales, helping to ensure resource efficiency (IPBES 2019). All 38 African coastal States have National Biodiversity Strategies and Action Plans, some of which are under revision, and have reported their revised 5th National reports to the Convention on Biological Diversity (with National targets for the period 2010–2020). Through the preparation of National Biodiversity Strategies and Action Plans, National and sectoral policies have responded to International Agreements such as the CBD, the United Nations Framework Convention on Climate Change's National Adaptation Plans, and Intended Nationally Determined Contributions (Stringer et al., 2018). National Biodiversity Strategies and Action Plans act as National Instruments to incorporate biodiversity strategy into development planning. Aichi Biodiversity Target 17 stipulates that each party to the CBD is expected to have developed, adopted or started the implementation of National Biodiversity Strategies and Action Plans by 2015. National Instruments, together with a range of regional treaties addressing and related to the environment, are among the tools for the implementation of multilateral environmental agreements (IPBES 2019). Nevertheless, moving towards effective National-scale implementation of Global Multilateral Agreements is highly challenging (Annex 7, Stringer et al., 2018). Parties to the CBD have largely failed to meet targets agreed upon in 2010.

Highlighting just a few Global Instruments, the CBD is the primary authority with a mandate on all aspects of biodiversity. Its objectives include the conservation of biodiversity and sustainable use of its components, and the equitable sharing of benefits from using genetic resources. The Convention stresses the need to promote Regional and Global cooperation for effective implementation and requires parties to cooperate on matters of "mutual interest" related to biodiversity conservation and its sustainable use. It was signed in June 1992 and has since been ratified or acceded to by 188 countries and the European Union, and all African coastal states are Parties to the Convention. The Convention requires that the parties a) inventorise National biodiversity b) mainstream biodiversity protection into relevant Policies, strategies and programmes c) identify and monitor activities that harm biodiversity, and protect biodiversity through a range of measures that include the creation of protected areas and the implementation of regulations and incentives aimed at ensuring its sustainable use, and d) develop National Biodiversity Strategies and Action Plans (NBSAPs) which presents the status of biodiversity, evaluates the importance of biodiversity to the national economy and highlights the various threats to biodiversity and their significance. Since its inception in 1992, the CBD has had an excellent track record of coordinating roles among multilateral environmental Agreements (MEAs) to support parties in understanding and attempting to reverse declines in biodiversity through, among others, promoting the uptake and implementation of relevant Policy and legislative Instruments (FAO SOFIA 2022).

Another key Instrument on biodiversity is the Ramsar Convention on Wetlands of International Importance (Annex 4). The Convention requires that parties designate at least one National wetland for inclusion in the List of Wetlands of International Importance. All coastal African Countries are Parties to the RAMSAR Convention (Annex 4). As climate change has a devastating impact on biodiversity, and according to 5th IPCC Report, for Africa, Global warming could translate into an increase in temperature by as much as 6°C in some areas, with sub-Saharan Africa a region identified as being the most vulnerable to drought and climate change-induced impacts. Thus, the United Nations Framework Convention on Climate Change (UNFCCC) is of high priority in Africa. The Convention on International Trade in Endangered Species of Wild Fauna and Flora has seen the development of National programs in much of Africa to help in the sustainable utilization and trade of wildlife.

The new set of CBD goals and targets (the Post-2020 Global Biodiversity Framework) for 2030 have been agreed upon at COP15 in December, 2022. Using existing opportunities, such as regional economic communities, National, Bilateral and International funding Instruments such as the Global Environment Facility, the Green Climate Fund and other environment finance initiatives, to leverage synergies can be particularly effective for policy implementation at the Regional and National levels. Member States may take advantage of opportunities presented by RECs, technical Agencies, and Bilateral and International funding sources to include support for implementing the Instruments.

6. Coordination mechanisms for the conservation of aquatic biodiversity

Marine biodiversity is both a National and a transboundary issue. Thus, improved coordination between National institutions responsible for various multilateral environmental Agreements and relevant Ministerial Departments and Agencies is critical to synergising biodiversity and ecosystem services management strategies within a multi-layer governance system (UNEP 2015). Synergy can be harnessed between multilateral environmental agreements through mainstreaming National strategies into National and Regional development plans and projects for sustainable development (Stringer et al., 2018). It requires coordinated efforts from many stakeholders (public and private), including intergovernmental and governmental institutions, NGOs, the private sector and local communities, to identify solutions to interlinked problems. Such an approach can also help to integrate decision-making across scales from the local to the International. In many Countries, sectors have specific legislation, action plans and programmes developed with various stakeholders. Mainstreaming biodiversity and ecosystem services into sectoral legislation and plans not only benefits biodiversity but also benefits other sectors because they reinforce the sustainability impacts of legislated activities (Stringer et al., 2018).

Transboundary biodiversity has many facets, and its management presents particular challenges. To illustrate, different communities value and utilise biodiversity (plant and animal species) differently, which could create challenges in conservation and management between two or more communities. Likewise, there are differences in livelihood strategies that could influence the way biodiversity is utilised and managed across country boundaries. High-level maritime disputes presented additional challenges (Temu et al., 2017; Bryant, 2021). Transboundary, collaborative management is imperative to protect biodiversity and secure livelihoods (Adewumi 2020 and 2021). Weak governance in some coastal States of Africa impedes stakeholders from managing the Ocean cohesively, minimising conflict, and maintaining a long-term flow of ecosystem goods and services, just as biodiversity loss becomes increasingly evident (Okafor-Yarwood et al., 2020).

7. Conclusion

This assessment of the status, trends and threats of the biodiversity in African LMEs shows that much of Africa's marine and coastal biodiversity is under threat. The main environmental stressors are human-induced and include unsustainable exploitation of living marine resources, pollution (land-based and seas-based sources), habitat degradation/modification, water quality deterioration, alien invasive species, depletion of natural resources due to the rising population pressure, expansion in human activities and uncontrolled expansion of urbanisation and ineffective governance and poverty. Important fish stocks are unsustainably harvested, and bycatches are high; marine mammals are caught incidentally or illegally for their products (meat, eggs); habitats for spawning and nurseries and nesting are altered or destroyed. Mangrove forests that provide diverse habitats that support high levels of biodiversity of fish and invertebrate species are being cut down for wood or / and construction. Biodiversity is coping with the menace of immense pollution from various sources, as Ocean acidification increases with increasing CO_2. With the Sea level rising, ecosystem services are being threatened. Shipping remains a primary source of spreading invasive alien species. Thus, the current losses of genetic biodiversity due to climate changes and unsustainable resource exploitation in Africa are restricting future management and development options and threatening many African coastal communities' livelihoods. (IPBES 2018).

The role of area-based conservation strategies and tools such as MPAs are increasingly useful in managing current unprecedented rates of biodiversity loss. The extent of marine protected areas in Africa has almost doubled in the last decades, covering 2.5% of marine realms. The effectiveness of protected areas varies due to a combination of factors, such as climate change, overexploitation and encroachment from local populations to sustain their livelihoods, and inadequate marine park design and administration (IPBES 2018). Transformative outcomes for achieving the African Union's vision of an integrated, prosperous and peaceful Africa by 2063 and associated Sustainable Development Goals and the recently adopted Biodiversity Targets are challenged in the absence of effective conservation and protection of marine biodiversity. All efforts must aim at ensuring the protection and integrity of biological diversity, which are critically important for life-support systems for the sustained human well-being of the African people (UNEP 2016). Effective conservation and protection of marine biodiversity in the African LMEs is critical and should include strong governance, multilateral collaboration, regional collaboration, capacity training and development and improved data sharing.

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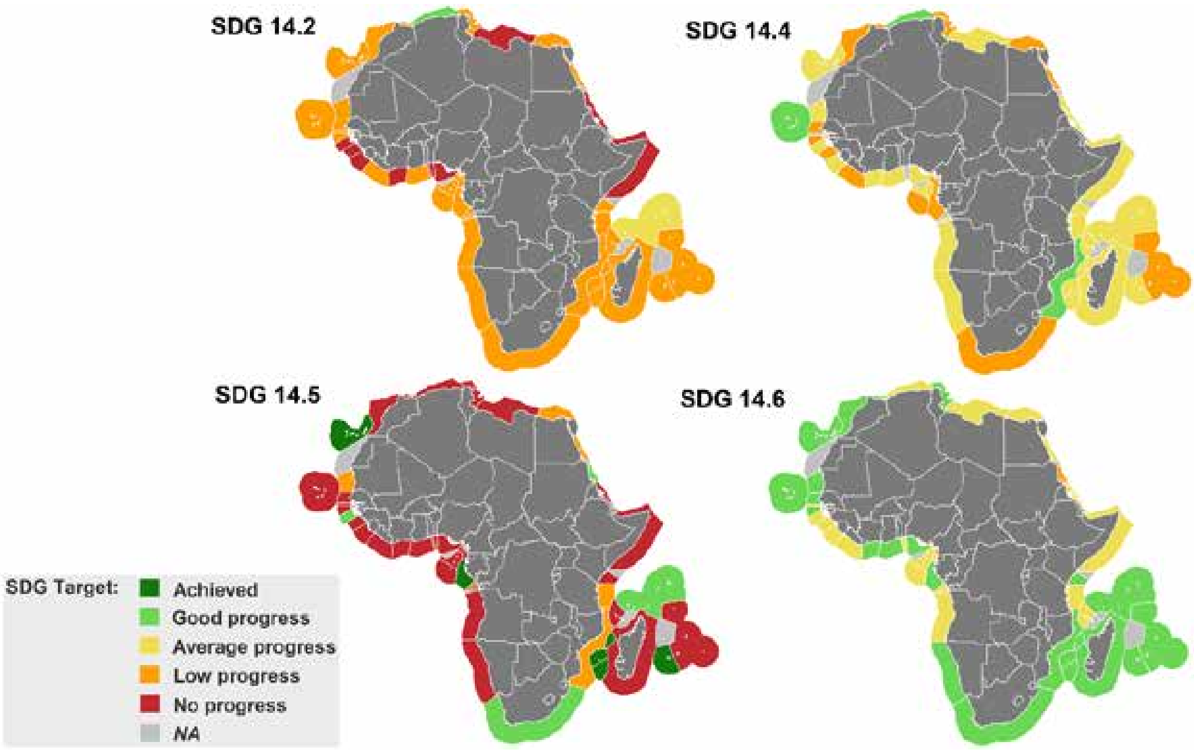
Annexes

Annex 1: Achievement Of The Four SDG 14 Targets By Each Coastal State



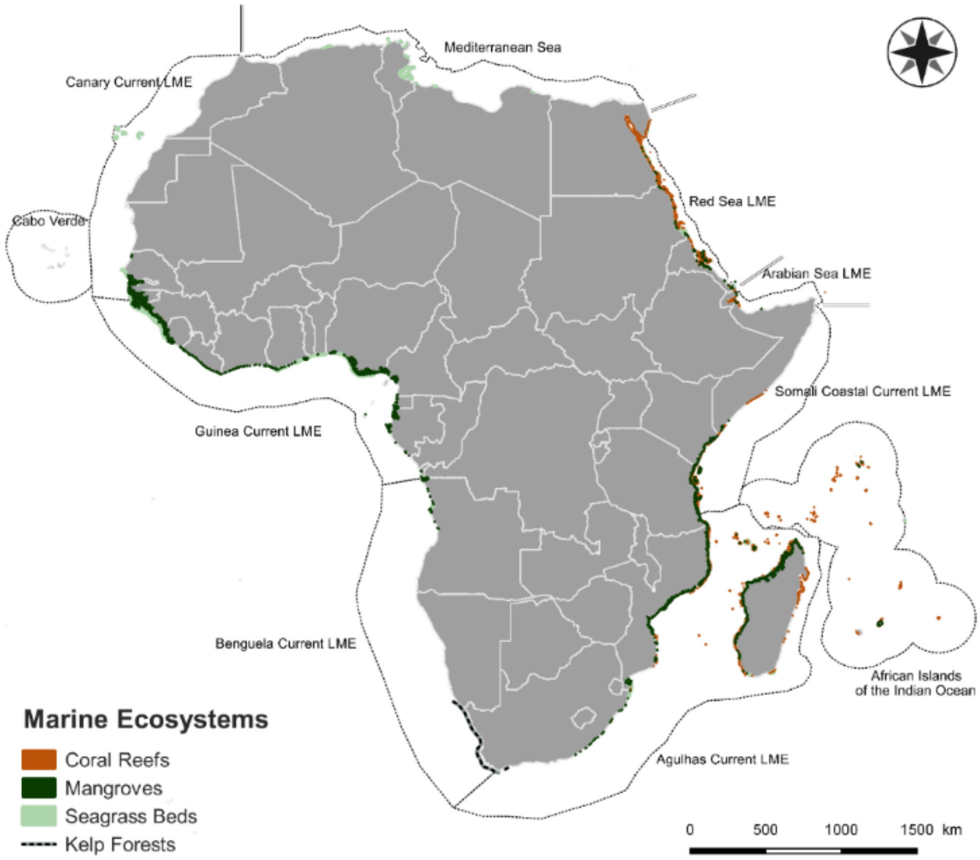
Source: *Andriamahefazafy et al. 2022.*

The analysis shows that achieving these four targets in African coastal states (of which there are 38) has been meagre with most countries not achieving any of the four targets, and no country achieving more than one. Furthermore, when analysed globally, Africa has the highest number of non-achieving countries of all continents for reaching targets of SDG 14.

Annex 2: Priority Stressors Impact Biodiversity

	Countries	Unsustainable use of LMR	Impact of extractive activities	IUU fishing	Pollution	Habitat destruction	Invasive Alien Species	Population pressure	Poorly planned infrastructure dev.	Coastal erosion	Climate change	Weak governance	Poverty	Lack of awareness of ecosys-tem value	Limited capacity	Limited data and info	Socio-econ & cultural issues
1	Algeria	x	x	x	x	x	x	x	x		x						
2	Angola	x	x		x	x			x	x	x						
3	Benin	x	x		x	x		x	x		x						
4	Cape Verde			x	x				x	x	x		x				
5	Cameroon	x				x		x	x		x	x	x				x
6	Comoros	x	x		x	x			x	x	x						
7	Congo	x		x		x	x		x	x	x					x	
8	Cote divore	x			x	x	x		x		x		x	x			
9	DRC	x	x		x		x				x	x			x	x	
10	Djibouti	x			x	x	x		x		x			x	x		
11	Egypty	x		x	x	x	x	x	x		x						
12	Equatorial Guinea	x		x	x	x			x		x						
13	Eriteria	x			x	x			x	x	x						
14	Gabon	x				x	x				x						
15	Gambia	x			x	x	x	x	x		x	x					
16	Ghana	x			x	x	x			x	x						
17	Guinea	x						x			x		x				
18	Guinea Bissau	x					x	x			x						
19	Kenya						x				x		x	x			
20	Liberia	x	x	x	x	x		x	x	x	x						
21	Libya	x			x	x	x				x						
22	Madagascar										x	x	x			x	
23	Mauritania	x	x		x	x	x	x	x		x				x		
24	Mauritius				x	x	x				x						
25	Moroc	x	x		x	x	x	x			x						
26	Mozambique	x				x		x	x		x	x					
27	Namibia		x		x		x	x			x	x	x				
28	Nigeria				x	x	x		x		x						
29	Sao Tome and Principe	x			x	x	x		x		x					x	
30	Senegal	x	x		x		x		x		x	x		x		x	
31	Seychelles	x	x				x		x		x						
32	Sierra Leone	x	x			x		x			x						
33	Somalia	x				x	x		x		x						
34	South Africa	x	x		x		x		x		x						
35	Sudan	x				x		x	x		x						x
36	Togo					x	x				x				x		
37	Tunisia	x	x		x	x	x				x						x
38	Tanzania	x			x	x	x				x						
	Total	31	14	6	25	28	25	14	23	7	38	7	7	4	4	5	3

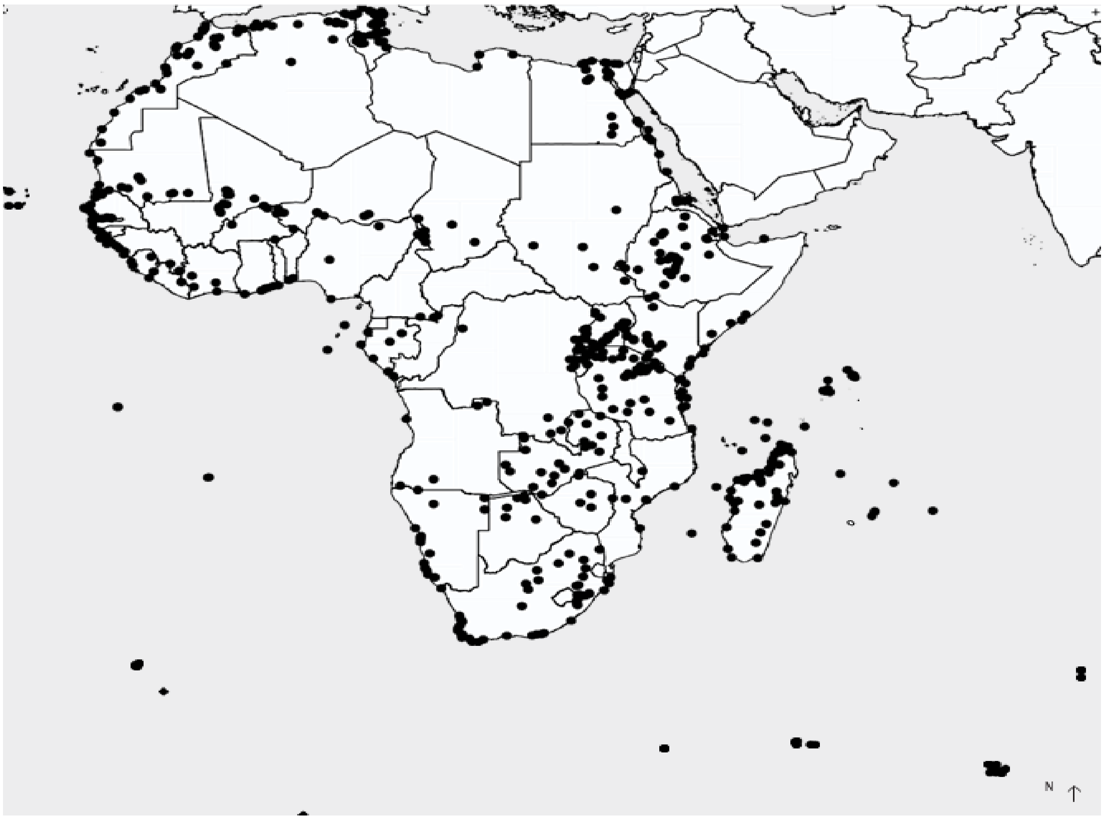
Annex 3: Distribution of the Main Coastal Marine Habitats



Coastal marine habitats around Africa. The surveyed coastal habitats cover about 117,000 km^2, with seagrass beds being by far the most extensive habitat. Present all along the coasts of Africa, their surface area represents about 62% of surveyed coastal habitats, followed by the mangroves (23%), and coral reefs (15%). Kelp forests are only present in the southern Benguela Current LME. The estimated annual value of the LME's coastal ecosystem services is 814 billion USD. Coral reefs have the highest value (588 billion USD/year), followed by seagrass beds (135 billion USD/year), mangroves (91 billion USD/year), and kelp forests (0.4 billion USD/year). The Agulhas Current LME has the highest value, representing 38 % of the total value, followed by the Red Sea LME (28 %) and the Somali Coastal Current LME (10 %). The three LMEs on the Atlantic coast represent 15 % of the total estimated value (Tregarot et al., 2020).

Annex 4: RAMSAR Sites

Over 1,250 sites have been identified as Important Bird Areas (IBAs) in Africa for the conservation of birds, other biodiversity and wider ecosystems and their services. IBAs have in many countries formed the basis of the designation of wetlands of international importance, under the Ramsar convention in recognition of the presence of significant numbers of waterbirds (BirdLife International, 2002, IPBES 20-18).

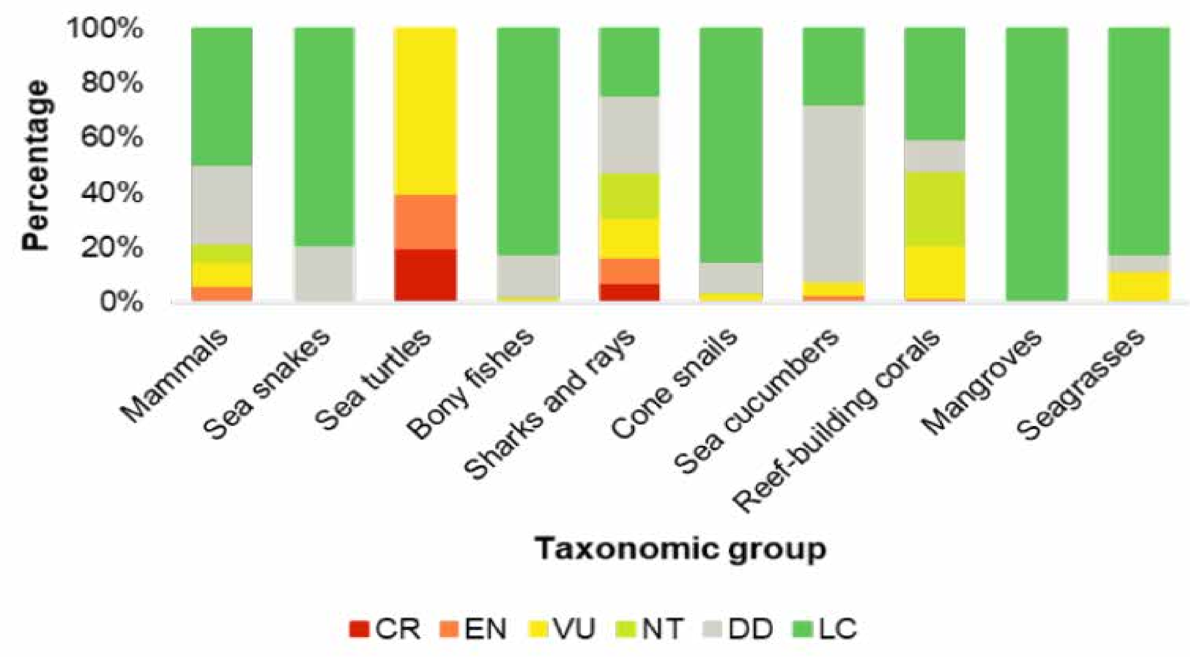


Source: *IPBES, 2018.*

Africa boasts 369 wetlands of international importance (Ramsar sites), 142 UNESCO World Heritage Sites, 1,255 important bird and biodiversity areas and 158 Alliance for Zero Extinction sites where endangered or critically endangered species occur. The continent hosts eight of the world's 36 biodiversity hotspots. These hotspots are the Earth's most biologically rich and threatened areas, with large numbers of endemic or threatened species. Many areas also serve as important components of the flyways for migratory species recognized in the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (IPBES 2018).

1. ANNEX 5: THE STATUS OF MAIN TAXA IN THE ASCLME

The estimates of the percentage threatened varied widely by taxonomic group. All five of the sea turtles that occur within the WIO were considered threatened, while none of the 19 species of sea snakes was considered threatened. Seven of the 46 marine mammals, including cetaceans, pinnipeds and sirenians, were listed as threatened; however, a high percentage of these species were listed as DD (28%).



Percentage of species listed in each of the IUCN Red List categories by taxonomic group. CR – Critically Endangered; EN – Endangered; VU – Vulnerable; NT – Near Threatened; LC – Least Concern; DD – Data Deficient. [source Bullock et el. 2021].

The number of species and estimates of the percentage of threatened species for each taxonomic group are shown in the Table below. The best estimate is the midpoint, which assumes the Data Deficient species are as threatened as non-Data Deficient species, while the lower and upper bounds assume that none, and all, of the Data Deficient species, are threatened, respectively (Bullock et al., 2021).

Taxon	Species	Lower	Midpoint	Upper
Mammals	46	15%	21%	43%
Sea snakes	19	0%	0%	21%
Sea turtles	5	100%	100%	100%
Bony fishes	2990	2%	2%	18%
Sharks and rays	264	31%	43%	59%
Cone snails	183	3%	4%	15%
Sea cucumbers	125	8%	22%	72%
Reef-building corals	492	21%	24%	33%
Mangroves	26	0%	0%	0%
Seagrasses	17	12%	13%	18%

Annex 6: Transboundary EBSAs In BCLME and ASCLME

Several Ecologically and/or Biologically Sensitive Areas (EBSA) in the BCLME region have been identified, and there are three transboundary EBSAs[9] and several in the ASCLME region Namibe (Angola/Namibia; Orange Seamount and Canyon Complex (Nam/SA) and Orange Cone (Nam/SA); Delagoa Shelf edge, canyons and slope (SA/Mozambique); Agulhas Front (Mozambique/Amsterdam and Saint Paul – French territories); Tanga Coelacanth Marine Park (Mozambique and Tanzania); Pemba Bay – Mtwara (Mozambique / Tanzania; Walters Shoals (SA/Mozambique); Northern Mozambique Channel (Mozambique / Tanzania). These transboundary EBSA are briefly described below. The primary source of information for the BCLME EBSA is the Transboundary Diagnostic Analysis (BCLME TDA of 2022), while information for those in the ASCLME region is summarised from "Ecologically or Biologically Significant Marine Areas (EBSAs), Special places in the world's oceans. Vol. 3: Southern Indian Ocean". The references cited are therefore contained in the above-mentioned two sources.

The Namibe EBSA (Angola / Namibia) is a transboundary EBSA between Angola and Namibia and centred around the Cunene River mouth. Several seabirds, including globally threatened Cape Cormorants and Damara Terns and locally threatened Great White Pelicans and Caspian Terns, breed there, and it is a resting area for Palearctic migrant bird species (Simmons et al., 1993; Simmons et al., 2006; Simmons 2010), so as the Cape fur seals. At least 119 bird species have been recorded at the Cunene River mouth (Paterson, 2007). There are records of 381 species in the EBSA area, of which two are Critically Endangered, three are Endangered, and nine are Vulnerable (OBIS, 2017). Furthermore, the Cunene-Namib area is known to support the largest density of green turtles in Namibia (Griffin & Channing 1991; Simmons et al., 2006), with olive ridleys also present. In addition, there are many species of fish, sharks and cetaceans in the area, some of which are threatened, that breed and/or forage in this EBSA (BCLME TDA 2022; Hay et al., 1997).

Orange Seamount and Canyon Complex (Namibia / South Africa): Located at the outer shelf and shelf edge of the western continental margin of South Africa and Namibia and spanning the border between the two countries, it is a transboundary EBSA. Offshore, the EBSA is characterised by seamounts (it includes Tripp seamount on the Namibian side), submarine canyons and the shelf break, all of which occur in the area, which is all vulnerable and sensitive ecosystems. Seamount communities are particularly vulnerable to human activities (e.g. trawling) due to intrinsic biological factors that are characteristic of seamount-associated species (e.g. slow growth rate, late maturation), with the likelihood of very long time scales of recovery if damaged (Gjerde and Breide, 2003; Clark et al., 2006). Based on spatial modelling of nearly 30 years of distribution and abundance data from trawl surveys, Kirkman et al., 2013) identified a persistent hotspot of species richness for demersal fish species that coincides with part of the area. This may be related to the local habitat heterogeneity, including the presence of a shelf-indenting submarine canyon and the proximity of a seamount. Generally, however, seamounts and canyons in the region have been poorly studied (Sink et al., 2011).

Orange Cone Transboundary EBSA (Namibia and South Africa): The Orange River estuary is located at 29°S and forms the boundary between South Africa and Namibia. The northern and southern boundaries

[9] *https://cmr.mandela.ac.za/Research-Projects/EBSA-Portal/Project-Reports*

of the Orange Cone EBSA are located 50 km north and south of the Orange River, respectively, with the eastern border extending 30 – 45 km offshore and including the full extent of the estuary. The estuary is a Ramsar site and an Important Bird and Biodiversity Area (BirdLife International 2013). Altogether, 206 species have been recorded in the EBSA, including four threatened fish and chondrichthyan species (OBIS 2017). The marine area served as the conduit supporting the estuary's biodiversity for migratory marine and estuary-independent species, as well as marine pelagic and demersal species, including their juvenile stages. The estuary and nearshore are impacted by, among others, the invasion of alien plants, and there are significant impacts from coastal diamond mining in Namibia and, to a lesser extent, in South Africa (Sink et al., 2012; Holness et al., 2014), and fish catches have been declined over the years (Sink et al., 2012; Holness et al., 2014). The estuary provides many ecological services such as recruitment and nursery ground. It is a nursery ground for coastal fish species, such as kob (van Niekerk and Turpie 2012), which are overexploited (Mann 2000), and important breeding habitat for Endangered Cape Cormorants (BCLME TDA2022), and also contains Endangered Ludwig's bustard and Vulnerable Damara Terns (Birdlife International, 2018). Four fish and chondrichthyan species recorded in the EBSA are threatened, including the Endangered Rostroraja albai and Mustelus mustelus, and the Vulnerable Galeorhinus galeus and Squalus acanthias

Delagoa ShelF Edge Canyon and Slope (South Africa/Mozambique). It covers the critical offshore habitats of endangered leatherback turtles. Potential vulnerable marine ecosystems include numerous submarine canyons, palaeo-shorelines and deep reefs, and hard shelf edges with reef-building cold-water corals at depths of more than 900 m. The 'living fossil' coelacanth fish believed to be extinct for 70 million years, is also found here. The deep-sea environment in this area is especially conducive to coelacanths, nocturnal benthic feeders that spend the daytime in caves several hundred metres deep. They are found primarily in a series of submarine canyons in this area. Submarine canyons are frequently hot spots of biodiversity. This area has a high level of richness of some sponge communities in the submarine canyons. This includes a key migratory route for humpback whales, a nursery area for bull sharks, spawning areas for fish (especially endemic sparids) and sharks, and the habitat of other threatened species, including marine mammals and sharks. Whale sharks feed in this area in summer.

The Agulhas Front EBSA (Mozambique/Amsterdam and Saint Paul – French territories) is the eastward extension of the Agulhas Current, which connects water from south-western Africa to the subtropical and sub-Antarctic waters as far east as the French overseas territories of Amsterdam and Saint Paul Islands. With high productivity, the area supports many seabird species, pinnipeds, southern bluefin tuna and southern right whales. Amsterdam Island is home to the endemic and critically endangered Amsterdam albatross. Large numbers of the endangered northern rockhopper penguin breed in Amsterdam and Saint-Paul. Also found breeding there are the flesh-footed shearwater, Indian yellow-nosed albatross and soft-plumaged petrel, among various others. Agulhas Front region is also a "globally significant feeding area" for the endangered Barau's petrel, endangered Indian yellow-nosed albatross, endangered sooty albatross, and the vulnerable wandering albatross. Antarctic terns, white-chinned petrels, white-bellied storm-petrels and both northern and southern giant petrels also forage here, and as tracking studies continue it is likely that the region's importance for other seabirds will be revealed. Other species that make use of this region are: critically endangered southern bluefin tuna, southern elephant seals, and southern right whales.

Tanga Coelacanth Marine Park (Mozambique and Tanzania): It covers the northern and southern boundaries of the Zambezi River delta down to the coastal shelf of the Sofala Bank. About 13 submerged and tidal reef formations, including stretches of intertidal fringing reef, are also located within the park. It has a high number of coelacanths recorded in this area in recent years, living in caves at depths between 150 and 200 metres. Fishing has impacted the coelacanths but is currently regulated. This area's extent of mangrove forest cover is the third largest in Tanzania. The Tanga region features 407 km of coastline, along which are found a total of 376 km of reef edge: fringing reefs occur along the coast, shallow patch reefs are located in the inshore waters, and offshore there are deeper reefs near the drop-offs, containing a total of 47 coral genera. There are three species of marine turtles, occasional sightings of dugongs and 380 recorded marine fish species. The catches have also led to increased attention being paid to the coelacanth population in the region, which has led to several unexpected discoveries.

Pemba Bay – Mtwara (Mozambique/Tanzania): The Quirimbas Archipelago that extends from Pemba Bay in northern Mozambique to the Ruvuma estuary and the Mtwara-Mnazi Bay reef system in southern Tanzania comprises 28 islands and the offshore Lazarus Bank, have the highest diversity of corals recorded in the Western Indian Ocean with almost 300 species in 60 genera. Gray reef sharks (Carcharhinus amblyrhyncos) and many species of grouper, snapper and emporer (angelfish) are present. Trevallies and other top predators, such as dogtooth tuna (Gymnosarda unicolour) are found here. The Lazurus Bank is a shallow seamount overgrown with corals on its surface. Its steep topography serves as a retention of pelagic eggs and larvae, making it a biodiversity hotspot and a paradise for both the organisms living there—three species of marine turtles — olive ridley, green and hawksbill feed and nest in the region. The green turtles of Vamizi Island are the most critical nesting population in Mozambique, and the density of hawksbill nests on the island is the highest known in the country. Dugongs are known to reside in the Quirimbas National Park area but are scarce, and their actual numbers are unknown. Dolphins, whales (namely the humpback whale), bull sharks, white tip sharks, whale sharks and large populations of manta rays are known to frequent the islands.

Walters Shoals Walters (SA/Mozambique): Shoals are an isolated series of seamounts reaching within 18 m of the surface, located about 400 nautical miles south of Madagascar and 600 nautical miles east of South Africa. The shoals are covered by coral reefs of broken and jagged relief. They are the only known habitat of the recently described giant species of spiny lobster, Palinurus barbarae. Some 30 to 40 per cent of the shallow water fish fauna of Walters Shoals is endemic to some part of the local West Wind chain of islands and seamounts. Other species found here are various species of grenadiers, snapping shrimp, a variety of mysids (shrimp-like crustaceans), euphausiids (krill), decapod crustaceans, and cephalopod. The seamounts are essential feeding and staging areas for numerous migratory species, including the red-tailed tropicbird and the endangered Barau's petrel, while humpback whales from the southwest Indian Ocean have been tracked passing through this area on their way to Antarctic waters.

Northern Mozambique Channel (Mozambique / Tanzania): The Northern Mozambique Channel has the highest concentration of biodiversity in this portion of the Western Indian Ocean. This area includes the southern part of Tanzania, from Mtwara southwards; northern Mozambique; the northwest and northeast part of Madagascar; the Comoros archipelago; south of Seychelles, including the Aldabra group; Providence plateau and Farquhar; and the French overseas territories Mayotte and Glorieuses. Coelacanths are found in this area, too, particularly in the waters of Comoros. The waters of the Comoros archipelago are important for many cetacean species, including spinner dolphins, humpback whales, and Omura's whales. Comoros archipelago is an important nursery area for the species. The Northern Mozambique Channel contains a variety of seascapes and environments, ranging, for example, from the world's second-largest raised coralline atoll by land area in Aldabra in Seychelles to the mangrove-lined embayments and offshore reefs of northwestern Madagascar. There are, for example, 11 species of seagrass, 39 species of sharks and rays, and some 390 fish species off the island of Mayotte alone. Aldabra is home to between 3,000 and 5,225 nesting green turtles annually, while more than 5,000 greens nest on just five beaches on Moheli Island in Comoros; the total nesting population on this island is the largest in the Western Indian Ocean. Aldabra is home to the largest breeding population of frigatebirds in the Indian Ocean. The Seychelles atoll of Cosmoledo alone is home to 20 per cent of sooty terns, 25 per cent of red-footed boobies, and more than half the masked boobies in the world.

Annex 7: Status of African Coastal States in Respect Of Multilateral Environmental Agreements (MEAS)

[r=ratified; a= accession; ac= accepted].

#	Country	CBD	CARTAGENA	ITPGRFA	RAMSAR	KYOTO	WHC	UNFCCC	CITES
1	Algeria	r	R	a	a	ac	r	r	a
2	Angola	r	a	r	s	a	r	r	a
3	Benin	r	r	a	a	a	r	r	a
4	Cameroon	r	r	r	a	a	r	r	a
5	Cape Verde	r	a	-	a	a	ac	r	a
6	Comoros	r	ac	-	ac	a	r	r	a
7	Congo-Brazzaville	r	r	a	a	a	r	r	re
8	Cote d'Ivoire	r	a	r	a	a	r	r	a
9	Djibouti	r	a	a	a	a	r	r	a
10	DRC	r	a	r	r	ac	r	r	r
11	Egypt	r	r	r	p	r	r	r	a
12	Equatorial Guinea	a	r	ac	a	a	r	a	a
13	Eritrea	a	a	r	-	a	ac	a	a
14	Gabon	r	a	r	s	a	r	r	a
15	Ghana	r	a	r	a	a	r	r	r
16	Guinea	r	r	ac	a	a	r	r	a
17	Kenya	r	r	a	a	a	ac	r	r
18	Liberia	r	a	a	a	a	ac	r	a
19	Libya	r	a	a	a	a	r	r	a
20	Madagascar	r	r	r	r	ac	r	r	r
21	Mauritania	r	a	a	a	a	r	r	a
22	Mauritius	r	a	r	r	ac	r	r	r
23	Morocco	r	r	r	s	a	r	r	r
24	Mozambique	r	r	-	r	ac	r	r	r
25	Namibia	r	r	r	r	ac	ac	r	r
26	Nigeria	r	r	-	a	a	r	r	r
27	São Tomé and Príncipe	r	-	a	a	a	r	r	a
28	Senegal	r	r	r	a	a	r	r	a
29	Seychelles	r	r	r	r	r	ac	r	r
30	Sierra Leone	a	a	a	a	a	r	r	a
31	Somalia	a	a	-	-	a	r	a	a
32	South Africa	r	a	-	r	ac	r	r	r
33	Sudan	a	a	r	a	a	r	a	r
34	Tanzania	r	a	r	r	ac	r	r	r
35	The Gambia	r	r	-	r	a	r	r	a
36	Togo	ac	r	r	a	a	ac	ac	r
37	Tunisia	r	r	r	a	a	r	r	r

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