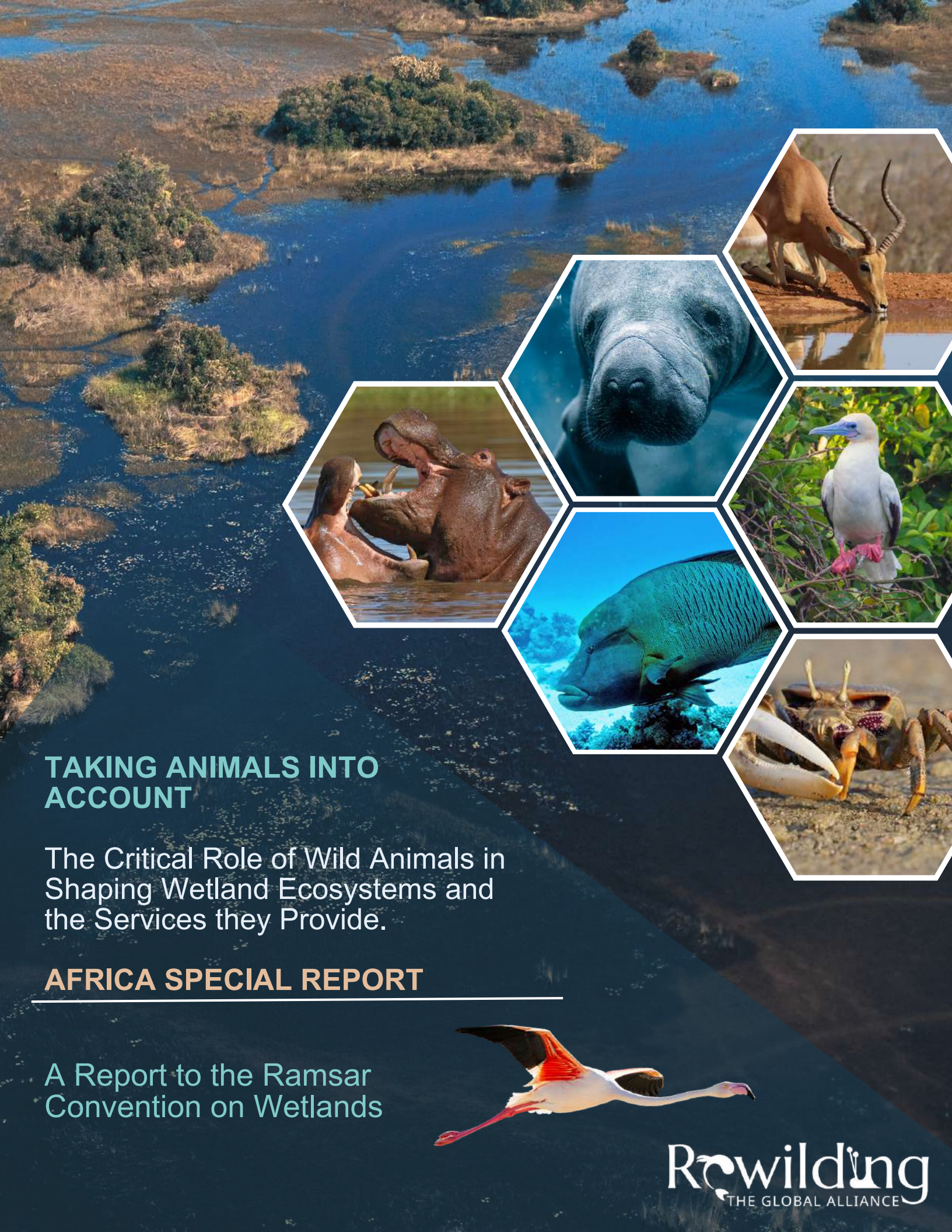




TAKING ANIMALS INTO ACCOUNT

The Critical Role of Wild Animals in Shaping Wetland Ecosystems and the Services they Provide.

AFRICA SPECIAL REPORT

A Report to the Ramsar Convention on Wetlands



Rewilding
THE GLOBAL ALLIANCE

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The Critical Role of Wild Animals in Shaping Wetland Ecosystems and the Services they Provide

AFRICA SPECIAL REPORT

Victoria Falls, Zimbabwe, July 2025

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Executive summary

As part of efforts to mainstream a rewilding¹ perspective in science, policy and practice, the Global Rewilding Alliance, with the support of eleven organisations in Asia, Europe, and Latin America published a report “[Taking Animals into Account](#)”. The report evaluates how wild mammals, birds, fish, reptiles and amphibians, macro-crustaceans (especially crabs and crayfish), and molluscs shape lakes, rivers and streams, as well as saltmarshes, seagrass meadows, estuaries, coastal lagoons, deltas and mudflats, mangroves, coral reefs, and kelp forests – all wetland types recognized by the Ramsar Convention on Wetlands.

This is a special follow-up report of “Taking Animals into Account”, featuring the African continent, based on a literature review and a set of case studies.

Africa consists of ten principal basins, fifty-two larger river systems, and sixteen main wetland areas. A special feature of the continent is its inland deltas, with three of the largest being the Sudd in the upper Nile catchment, Niger Inland Delta, and the Okavango Delta. The Great Lakes of East Africa are globally significant in terms of volume, surface area and depth. Shallow lakes are numerous and vary greatly in size, with Lake Chad being the largest. Mangroves in Africa account for 21% of global coverage, while the continent hosts only 4-5% of the world’s tropical coral reefs. Kelp forests are limited to West Africa, Namibia, and South Africa, whilst mudflats are distributed all around the African coasts.

To recognise the global importance of Africa’s inland and coastal wetlands, 51 countries have designated 431 areas covering 1.11 million square kilometres as Ramsar Sites of International Importance under the Convention on Wetlands. Fifteen percent consist of coastal wetlands and the rest inland. The network includes some of the world’s largest and most ecologically significant wetlands, such as the Tumba-Nigri-Mai Ndombe (DRC), Sudd (South Sudan), Okavango Delta (Botswana), Inner Niger Delta (Mali), Parc National du Banc d’Arguin (Mauritania), and Rufiji-Mafia-Kilwa (Tanzania).

Africa hosts the Planet’s most intact assemblages of terrestrial and aquatic mammals, fishes and reptiles megafauna species. Unfortunately, many of the populations are in steep decline, including species that are directly utilised by humans, both in the terrestrial and freshwater environments as well as in marine systems.

The report highlights the ecological and functional importance of a wide spectrum of species, some strongly associated with inland and coastal wetlands such as hippos, Nile crocodiles, dugongs, Mediterranean monk seals, otters, sharks, and many fishes and waterbirds; and others with a more indirect connection, such as the African buffalo, elephant, and the Striped and Spotted hyenas.

¹ **Rewilding**, as defined by the [Global Charter for Rewilding the Earth](#), is an ecological restoration strategy focused on restoring nature by returning wildlife so they can play their critical role in shaping their natural habitats on land and in the seas, always with a human co-existence perspective. This process allows natural dynamics to foster vibrant and self-sustaining ecosystems put into a wider societal perspective. This paper supports the Charter’s twelve guiding principles by illustrating the vital roles wild animals play in wetland ecosystems.

To help translate the science-based information on the relationships between wild animals and the functions of various inland and coastal wetland types, the report identifies key species for nine ecosystems. This information can serve as a first step in assessing the ecological functionality of a wetland and determining the extent to which restoration efforts may be needed. However, sound ecological knowledge is required for site-specific assessments and for more precise conservation recommendations.

*The report also provides an overview of how different individual species or species groups contribute to supporting and regulating ecosystem services. It places particular emphasis on the “Supporting Services”, which provide the ecological foundation for the other three services: regulating, provisioning, and cultural services. This type of information is essential for analysing and guiding practical actions aimed at maintaining the **ecological character** of wetlands as a fundamental concept of the Wise Use of Wetlands. It also directly supports the goal “to stem the progressive encroachment on and loss of wetlands now and in the future”.*

Eleven case studies from across the continent bring examples of how wild animals shape coastal and inland wetlands framed within a human context. The stories come from ten individual countries: Botswana, Kenya, Liberia, Mauritania, Mozambique, Sierra Leone, South Africa, Tanzania, Uganda, and Zambia as well as two broader regions: the West African coast and inland areas featuring the African manatee, and the Red Sea and East African coast, focusing on the Dugong. This journey will feature both well-known sites (e.g., Okavango Delta in Botswana, Murchison Falls in Uganda, Banc d’Arguin in Mauritania, False Bay in South Africa, and Gorongosa National Park in Mozambique) as well as more hidden places (e.g., Chumbe Island Coral Park in Tanzania, Banhine and Maputo National Parks in Mozambique, the Grand Mano landscape in Sierra Leone and Liberia, and the Tondwa plains, rivers, lakes and wetlands in Zambia).

The five key messages from the case studies are:

- ❖ *Rewilding works!*
- ❖ *Combat unsustainable use of key wetland species,*
- ❖ *Establish effective no-take fishing zones in inland and coastal waters,*
- ❖ *Intact ecosystems with megaherbivores are more resilient against alien invasive plant species than degraded,*
- ❖ *Ensure the ‘flow’ of water and wildlife in large-scale Landscapes, “Wetlandscapes” & Seascapes*

Since “other taxa” than waterbirds and fish were rarely referred to in the Site Designations of the Ramsar Sites in Africa (only in one percent of the cases), there is an urgent need to rectify this omission. This confirms the conclusion in the global “Taking Animals into Account” report that there is “general lack of recognition regarding the critical role some animal species play in shaping the composition and functionality of various wetland categories and associated ecosystem services”. Some recommendations are provided to rectify this gap when it comes to the existing criteria.

Based on the information in this report, four areas with very high ecological and conservation values are highlighted for nomination as Ramsar Sites of International Importance, namely the Banhine, Maputo and Gorongosa National Parks in Mozambique. They are showcases for applying the “ecological character” in practice and the findings of this report.



Banhine National Park. [Image Source](#)



Gorongosa National Park. [Image Source](#)

Table of Contents

1. Introduction.....	6
2. Functional aspects of animals in wetlands.....	7
3. The aquatic environment of Africa.....	8
4. Ramsar Convention on Wetlands implementation in Africa.....	10
5. Africa – Planet Earth’s most intact megafauna, but in steep decline.....	14
6. Ecosystems and places.....	18
7. Species groups.....	31
8. Practical conservation aspects.....	50
8.1 Ecosystem specific key species.....	51
8.2 Species specific ecosystem services.....	51
8.3 Five key messages from the case studies.....	53
8.4 Consequences for Ramsar Site designations.....	60
9. Conclusions.....	61
10. References.....	61
11. Acknowledgement.....	61
<u>Case Study #1:</u> The Okavango Delta – A Living System Engineered by Animals.....	63
<u>Case Study #2 :</u> West African Manatees and Dugongs - Ecological Roles of African Sirenians.....	68
<u>Case Study #3:</u> Fish - Urchin Imbalance and Seagrass Decline in Coastal Kenya.....	72
<u>Case Study #4:</u> Banc d'Arguin National Park in Mauritania.....	74
<u>Case Study #5:</u> The return of biodiversity and resilience to Chumbe Island.....	80
<u>Case Study #6:</u> Ecological Impacts of Great White Shark Decline in False Bay, South Africa.....	87
<u>Case Study #7:</u> The Banhine and Maputo National Parks in Mozambique – Rebuilding the Ecological Functionality of Two Key Wetland Areas in Southern Africa.....	91
<u>Case Study #8:</u> Rewilding Case Study: The Urema floodplain - Gorongosa National Park, Mozambique.....	107
<u>Case Study #9:</u> Restoring the Hippo in Uganda’s Murchison Falls National Park and Conservation Area.....	112
<u>Case Study #10:</u> Yawri Bay, Sherbro River Estuary and Lake Piso - Grand Mano Landscape, Sierra Leone & Liberia.....	118
<u>Case Study #11:</u> Wildlife, Wetlands & a New Way Forward – How Conserve is Rewriting the Rules of African Conservation in Zambia’s Forgotten Wilderness.....	131

1. Introduction

In February 2025, the Global Rewilding Alliance launched a report “Taking Animals into Account” ([ref](#)), evaluating how wild animals shape the functions of inland and coastal wetlands, including the ecosystem services they provide. The work consisted of an extensive literature review combined with the compilation of eleven case studies to illustrate and contextualise the findings of the review. It was a joint effort by eleven organisations from Asia, Europe, and Latin America.

Written feedback on the content of the draft report was provided by five individual members of the Ramsar Scientific and Technical Review Panel (STRP), and two of them submitted the following supportive statements:

“This report will be of significant value for those implementing the Ramsar Convention, summarising very many scientific studies that demonstrate the multiple ways in which large animal species not only depend on wetlands, but also contribute to the maintenance of wetland ecological character through a wide range of different ecological roles and interactions. It demonstrates that maintaining species diversity should be central in the mission to sustain and conserve wetlands across the world.”

David Stroud, Emeritus Senior Advisor Scientist, JNCC, UK; Honorary Patron of the AEWA (Agreement on the Conservation of African-Eurasian Migratory Waterbirds), Warmington, UK and Chair of Ramsar STRP 2019-2021

“Overall, the report is a compelling reminder of the need to consider ecosystem services in the context of the whole ecosystem including the full complement of species, the interactions of animals, and feedback loops, of which animal populations are important drivers. Given the alarming loss of large animals in many wetland types, this report is also valuable in thinking about restoration practices, and planning to enhance/restore ecosystem services and biodiversity in restoration programs. I see real value here in setting restoration projects in the river basin and landscape context.”

Siobhan Fennessy, Philip and Sheila Jordan Professor of Environmental Studies and Professor of Biology, Kenyon College, Ohio, USA & Vice-Chair of Ramsar, STRP, 2022-2024

Following the launch of the report on World Wetlands Day, 2 February 2025, it was officially handed over to the Secretariat of the Convention on Wetlands on [March the 6th](#).

In preparation for the 15th meeting of the Conference of the Contracting Parties (COP15) of the Convention on 23-31 July 2025 in Victoria Falls, Zimbabwe, it was decided to prepare a Special Report on Africa. This report serves as a regional follow-up to the global report released in February, introducing a new set of case studies featuring both the science and practical aspects of enhancing the ecological functions of wetlands in Africa through wild animals. The report offers a snapshot of current knowledge and experiences, with the aim of stimulating new approaches in securing the future of inland and coastal wetlands of Africa. These ecosystems host an extraordinary richness of biodiversity, including mammals, birds, fishes, reptiles, amphibians and other animal species vital to ecological health and human wellbeing.

We respectfully invite the Ramsar Convention on Wetlands to consider the findings of this report in support of its important mission supporting *“the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world”*.

This report represents our collective contribution to “Taking Animals into Account” in an African context - a tribute to the animals that shape Africa’s wetlands and a call to honour their ecological roles through science, policy and practice.

2. Functional aspects of animals in wetlands

Ecosystem services are the benefits that society receives from nature ([ref](#)). They are broadly classified in four different categories: provisioning, regulating, cultural, and supporting ([Figure 1](#)). Provisioning ecosystem services include the contribution of essential goods such as food, fiber, and medicinal. Regulating ecosystem services include carbon sequestration, prevention of soil erosion, and natural flood control. Cultural ecosystem services include intellectual, inspirational, and recreational activities. The fourth category is supporting ecosystem services, which include services that depend on ecological processes such as primary production and nutrient cycling, and that are intimately related to biological diversity. Supporting services provide the foundation for the other three ecosystem services: regulating, provisioning, and cultural services ([Figure 1](#)).

Wild animals have been found to play an important role in shaping essential functions of inland and coastal wetlands ([ref](#)). A review of the literature ([ref](#)), mammals, birds, fish, reptiles and amphibians, macro-crustaceans (especially crabs and crayfish) and molluscs - through their interaction with lakes, rivers and streams, as well as saltmarshes, seagrass meadows, estuaries, coastal lagoons, deltas and mud flats, mangroves, coral reefs, and kelp forests - were found to influence the following functions:

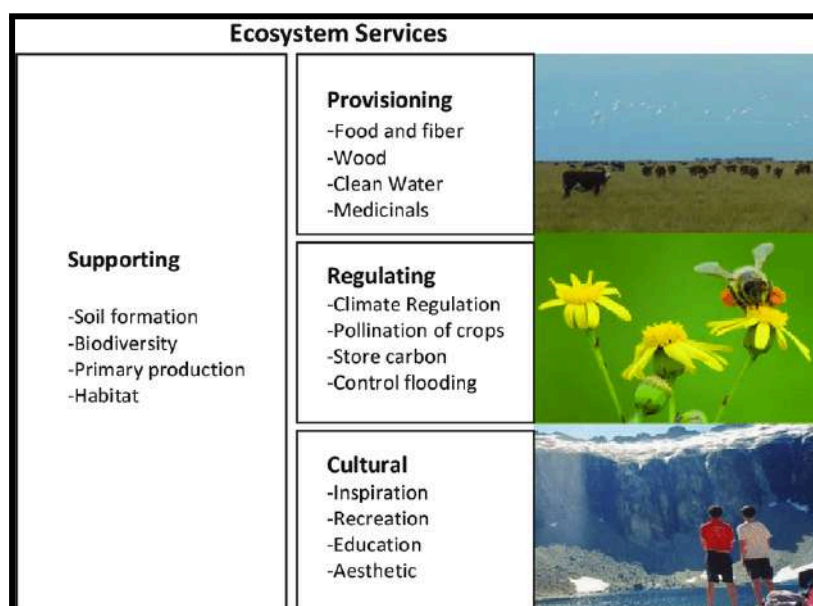


Figure 1: The four principal ecosystem services. [Image Source](#)

- *Ecosystem engineering & habitat modification for other organisms,*
- *Nutrient cycling & ecosystem productivity,*
- *Sediment/soil formation,*
- *Seed dispersal,*
- *Mediating cross-ecosystem linkages,*
- *Biodiversity enhancement,*
- *Food webs & trophic cascading,*
- *Water distribution & flow,*
- *Ecosystem heterogeneity.*

By influencing these “**supporting ecosystem services**” ([ref](#)), the animals shaped the following four “**regulating ecosystem services**”:

- *Carbon dynamics, climate regulation & adaptation,*
- *Flood regulation,*
- *Water purification,*
- *Invasive species control.*

The review provided numerous examples showing that the functioning of wetlands is often the result of interactions between the terrestrial and aquatic environment. Animals such as mammal herbivores (e.g., hippos and water buffalos) and birds spend time both on land and in the water, contributing to transfer of nutrients, energy, and seeds.

One important conclusion of the report “Taking Animals into Account” is the dramatic declines of wild animal populations and the widespread negative impacts of trophic downgrading of the Earth system, including the negative ecological impact of megafauna downsizing. The report also highlights the important role of predators in wetland systems, and the impact of their loss in wetland functioning. ([ref](#)).

3. The aquatic environment of Africa

The inland aquatic environments of Africa ([ref](#)) consist of ten principal basins ([Figure 2](#)), fifty two larger river systems - including the four largest: Congo, Nile, Zambezi and Niger and - 16 main wetland areas, such as floodplains and marshes ([Figure 3](#)). The continent also contains twenty-six shallow lakes (e.g., Chad and Mweru in the DRC), seven deep lakes (e.g., Victoria, Tanganyika and Malawi), and twenty one larger reservoirs for hydropower, irrigation and/or urban water supply (e.g., Lake Nasser on the Nile, Lake Volta in Ghana and Lake Kariba on the Zambezi).

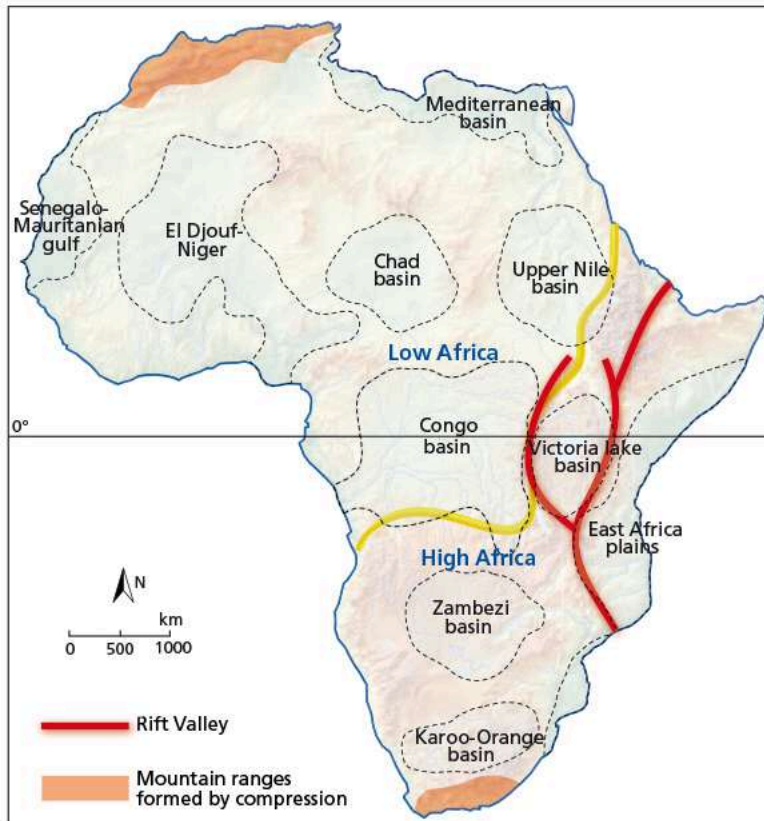


Figure 2: The ten main river basins of Africa. [Image Source](#)

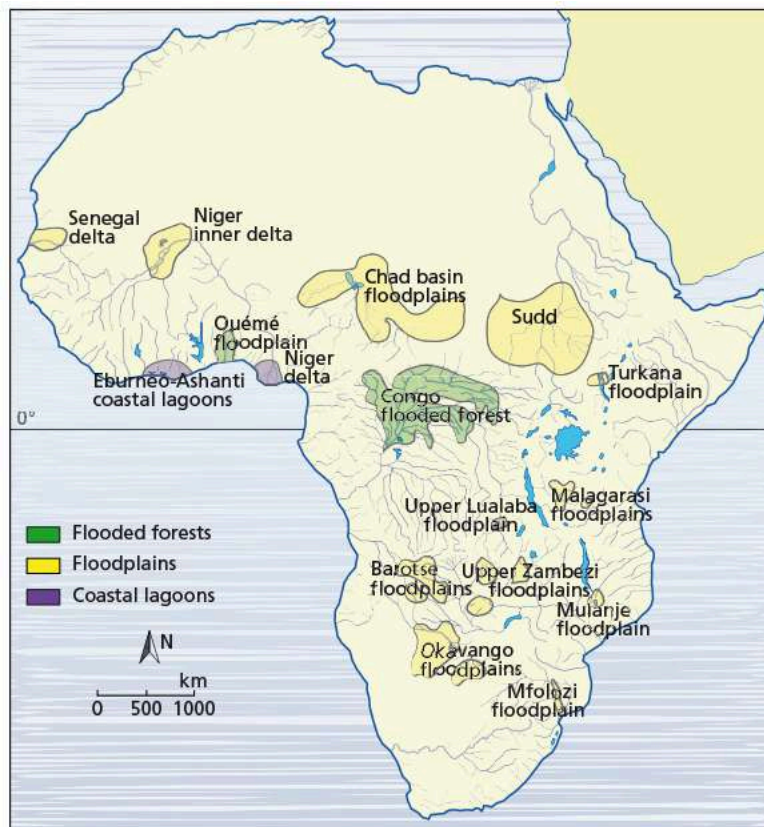


Figure 3: Location of the main wetlands areas of Africa. [Image Source](#)

Figure 3 corresponds, to a large extent, with the mapping of the world's inland and coastal wetlands (Figure 4), based on an upgrade of the Global Lakes and Wetlands Database (GLWD v2), published on 4 June 2025 ([ref](#)).

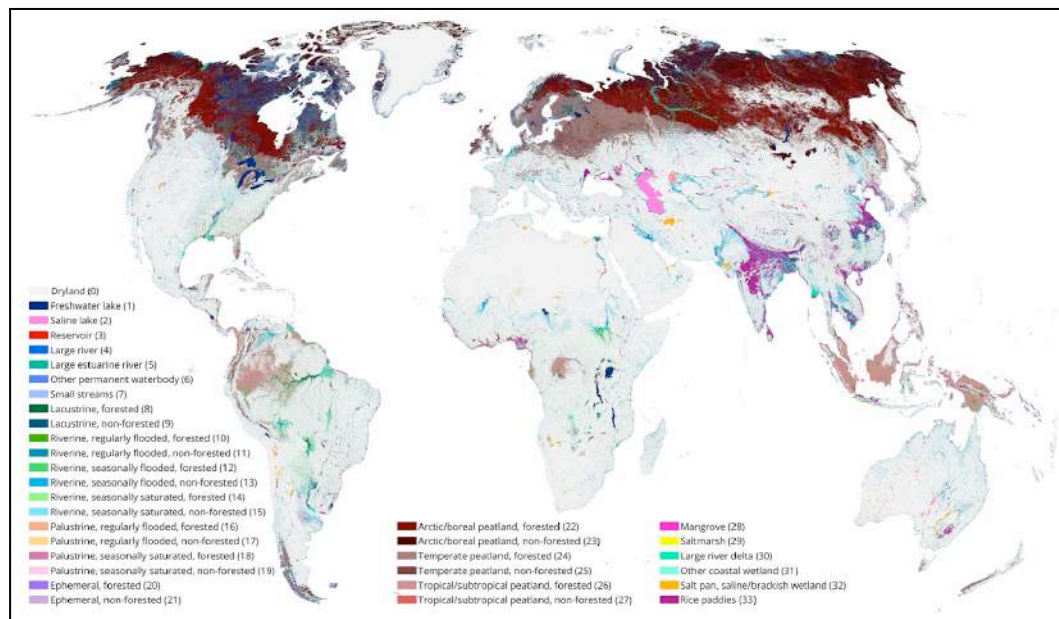


Figure 4: World distribution of 33 wetland types, including three coastal (mangroves, saltmarshes and “other coastal wetlands”). [Image Source](#)

Mapping the distribution of inland and coastal wetlands (excluding shallow marine waters) of Africa in 2019-2021 ([ref](#)) has shown a total extent of 1.31 million km², comprising 81% inland wetlands and 19% coastal wetland (see map). Marshes were found to be highly dynamic, expanding by 92% from the dry to the wet season.

4. Ramsar Convention on Wetlands implementation in Africa

The Ramsar Convention on Wetlands, established in 1971, is an international treaty aimed at conserving wetlands and promoting their “wise use” for both nature and people. [The Ramsar Sites Information Service](#) (accessed May 2025) provides data on the global spatial distribution and characteristics of Ramsar designated wetlands. In Africa, **431 Ramsar Sites** have been designated across 51 countries ([Figure 5](#)), covering approximately **1.11 million km²** of diverse wetland ecosystems. The top five countries in terms of the number of designated sites are:

- Algeria: 50
- Morocco: 38
- South Africa: 31
- Burkina Faso: 25
- Madagascar: 21

Of these, **366 sites (85%)** are inland wetlands, while **65 sites (15%)** are coastal wetlands.

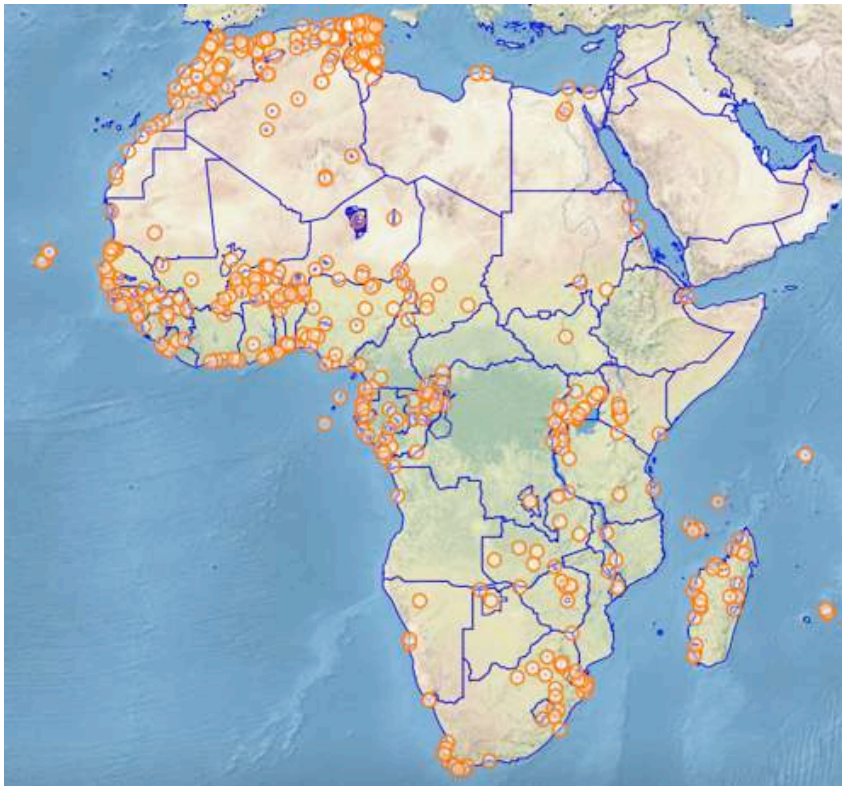


Figure 5: Distribution of designated Ramsar Sites in Africa as of May 2025. [Image Source](#)

The application of the nine criteria used for Site Designation in Africa (ref) is shown in [Figure 6](#). The four dominating criteria for the site designation were:

- **Criterion 1** (290 sites|16%): “A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.”
- **Criterion 2** (344 sites|19%): “A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.”
- **Criterion 3** (339 sites|19%) : “A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.”
- **Criterion 4** (285 sites|16%) - “A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions” -

The two waterbird related criteria account for a total of 14%:

- **Criterion 5** (89 sites|5%): “A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.”
- **Criterion 6** (167 sites|9%): “A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird”

For Fish a total of 15% was applied with the following breakdown:

- **Criterion 7** (126 sites|7%): “A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or value and thereby contributes to global biological diversity.”
- **Criterion 8** (157 sites|8%): “A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.”

Only a very small fraction of Other Taxa are considered:

- **Criterion 9** (13 sites|1%): “A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species.”

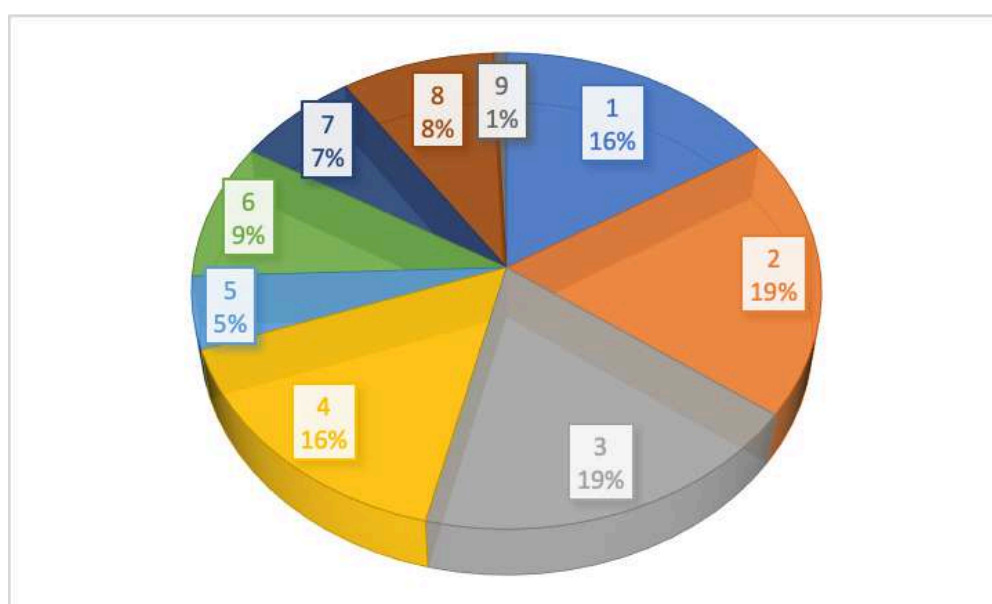


Figure 6: Application of the nine selection criteria for the designation of 431 Ramsar Sites in Africa.
[Data Source](#)

Africa’s Ramsar network includes some of the world’s largest and most ecologically significant wetlands. Notable **inland Ramsar Sites** include:

[Tumba-Nigiri-Mai Ndombe](#) in the Democratic Republic of the Congo (6,569,600 ha), a vast wetland within the Congo Basin. It contains the largest continental freshwater body in Africa, making it one of the most important wetlands on the continent and one of the largest freshwater bodies in the world. It hosts endemic species such as the Bonobo (*Pan paniscus*), Forest elephant (*Loxodonta cyclotis*), leopard (*Panthera pardus*), and African buffalo (*Syncerus caffer*), over 1,000 nesting pairs of Purple heron (*Ardea purpurea*), and extensive peatlands serving as a major carbon sink.

The [Sudd in South Sudan](#) (5,700,000 ha), one of the largest tropical wetlands in the world, contains diverse habitats supporting endemic fish, birds, mammals, and plants. It supports the largest

population in the world of the Shoebill (*Balaeniceps rex*) and provides crucial refuge for the Great white pelican (*Pelecanus onocrotalus*), Black crowned crane (*Balearica pavonina*), White stork (*Ciconia ciconia*), and numerous other birds, while acting as a natural water filter and flow stabilizer.

The [Okavango Delta](#) in Botswana (5,537,400 ha) encompasses the Okavango River and surrounding floodplains. This vast inland delta sustains over 1,060 plant species, 32 large mammals, 650 bird species, 68 fish species, and diverse insects, with floodplain habitats that support recreation, tourism, fishing, and subsistence farming.

Another vital inland site, the [Inner Niger Delta](#) in Mali (4,119,500 ha), stretching from Ké Macina to Timbuktu across Ségou, Mopti, and Timbuktu regions. It supports vulnerable species such as the hippopotamus and West African manatee (*Trichechus senegalensis*), diverse fish like Tigerfish (*Hydrocynus vittatus*), Elongate tigerfish (*Hydrocynus forskahlii*), and Victoria perch (*Lates niloticus*), and threatened waterbirds like the Black crowned crane. The delta plays a crucial role in flood regulation, water filtration, and local livelihoods through agriculture, fisheries, and grazing. However, it faces significant threats from climate change, upstream water mismanagement, overfishing, agricultural expansion, deforestation, and resource conflicts.

Prominent **coastal Ramsar Sites** include:

[Parc National du Banc d'Arguin](#) in Mauritania (1,200,000 ha), one of the world's richest fishing grounds thanks to nutrient-rich upwelling waters, with vast seagrass beds supporting rich invertebrate life and providing nursery grounds for deep-sea fish. The park hosts over two million shorebirds, alongside marine mammals and turtles. The endangered Mediterranean monk seal (*Monachus monachus*) currently breeds only on the Cap Blanc peninsula in Moroccan territory. Although not found within the park itself, efforts are underway to support its reintroduction in the region.

[Rufiji-Mafia-Kilwa](#) Ramsar Site in Tanzania (596,908 ha) includes Tanzania's largest mangrove forest, coral reefs, and seagrass beds, providing habitat for marine turtles, Dugongs (*Dugong dugon*), Whale sharks (*Rhincodon typus*), and migratory birds, while sustaining fisheries supporting over 100,000 coastal residents.

Ramsar Sites across Africa are vital refuges for birds, fish, amphibians, reptiles, and large mammals that depend on wetlands for breeding, feeding, and shelter. Many lie along major migratory flyways, providing critical stopover, feeding and resting grounds for millions of waterbirds traveling between continents outside the breeding season. Through protection of both inland and coastal wetlands, the Ramsar Convention supports biodiversity conservation and promotes sustainable livelihoods for communities that depend on these ecosystems.

An important aspect of the Ramsar Convention on Wetlands is the protection of migrating birds. A study on the African winter population trends of European waterbirds ([ref](#)) analysed the situation for 17 species in West Africa using data from the [African-Eurasian Waterbird Census](#), one of the largest and longest running citizen-based global waterbird counts in the world. Out of 6,326 count plots, 252 were located within Ramsar designated sites. The study found only "limited positive effects of

Ramsar designation.... on migratory waterbird numbers in their wintering habitats in Africa". However, the lack of data "made it impossible to interpret the observed trends and effects of conservation initiatives", with a plea of "improving the monitoring efforts on the African continent".

5. Africa – Planet Earth's most intact megafauna, but in steep decline

One of humankind's most pervasive effects on ecosystem functioning has been changes to biodiversity at higher trophic levels ([ref](#)), particularly among species categorised as "megafauna", with only 11 out of 57 species of megaherbivores (mean body mass $\geq 1,000$ kg) surviving through to 1,000 AD ([ref](#)). This has led to profound changes in ecosystem structure and function. Beyond their trophic roles, the decline of megafauna has diminished their ecological functions as physical ecosystem engineers and as agents of energy and nutrient transport across landscapes and water systems ([ref](#)). Due to the onset of intensive commercial harvesting and large-scale habitat modifications, aquatic ecosystems – both freshwater and marine – experience the same negative developments as terrestrial ([ref](#)).

When it comes to **mammal megafauna** species richness, Africa is by far the most intact continent on the planet ([Figure 7](#)). The losses of mammal herbivore megafauna species richness since Late Pleistocene (50,000 -10,000 BP) are as follows: Australia 100%, South America and North America 89%, Europe 53%, Asia 41%, and Africa 27% ([ref](#)).

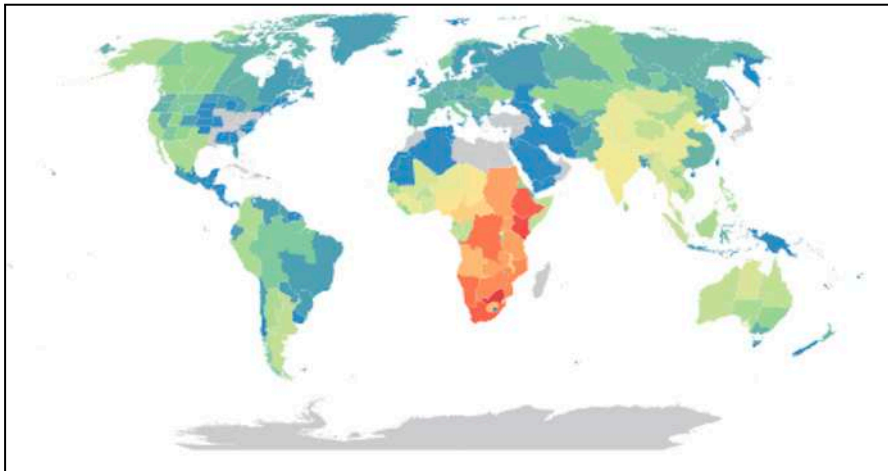


Figure 7: Current native megafauna species richness of herbivores (body mass: minimum least 100 kg) in the world, with a minimum of 1 (dark blue) to a maximum 20 species (dark red), based on country data from the Taxonomic Databases Working Group level 3 countries (TDWG). [Image source](#)

Freshwater megafauna (minimum 30 kg) inhabit every continent except Antarctica ([ref](#)). The 132 megafauna species consists of 73 fishes, 36 reptiles, and 23 mammals. As expected, they mostly occur in large rivers (e.g., Amazon, [Congo](#), Ganges, Mekong, and Mississippi) and lakes (e.g., [Lake Tanganyika](#), Tonlé Sap Lake, and the Caspian Sea), which also harbor a major share of the total freshwater fauna. Geographically, South America, [Central Africa](#), and South and Southeast Asia are notably rich in freshwater megafauna.

Ninety-three percent of all assessed freshwater biodiversity co-occurs with freshwater megafauna species ([ref](#)). Africa hosts 22 megafauna species: 11 fish, 6 mammals, and 5 reptiles ([Table 1](#)). One species, the African Slender-snouted Crocodile ([Figure 8](#)), is Critically Endangered (CR), four are Endangered (EN) - two fish species (Madagascar kob and Tanganyika lates) and two mammals (Pygmy hippo and Nile lechwe), four are Vulnerable (VU) – one fish species (Atlantic tarpon), two mammals (Common hippo and West African manatee), and one reptile (West African dwarf crocodile), two species are Near Threatened (NT) – the Giant sea catfish and the Bull shark, eight species are categorised as Least Concern (LC) – four fish species (Kokuni, African catfish, Catfish, Giant tigerfish and Nile perch), two mammals (Southern lechwe and Sitatunga), and one reptile (Nile crocodile), and three species are Not Evaluated (NT) – one fish (Grand threadfin) and two reptiles (Osborn's dwarf crocodile and African softshell turtle) ([Table 1](#)).

Table 1: List of 22 freshwater megafauna species (minimum 30 kg) in Africa and their conservation status: CR= Critically Endangered, EN=Endangered, NT=Near Threatened, VU=Vulnerable, LC=Least Concern, and NT=Not Evaluated. [Source](#)

Animal group	Common name	Scientific name	Red list category
Fishes	Madagascar Kob	<i>Argyrosomus hololepidotus</i>	EN
	Tanganyika Lates	<i>Lates angustifrons</i>	EN
	Atlantic Tarpon	<i>Megalops atlanticus</i>	VU
	Giant Sea Catfish	<i>Arius gigas</i>	NT
	Bull Shark	<i>Carcharhinus leucas</i>	NT
	Kokuni, Kokuni, Manora	<i>Chrysichthys cranchii</i>	LC
	African Catfish	<i>Clarias gariepinus</i>	LC
	Catfish, Sampa, Vundu, Vundu	<i>Heterobranchus longifilis</i>	LC
	Giant Tigerfish	<i>Hydrocynus goliath</i>	LC
	Nile Perch	<i>Lates niloticus</i>	LC
	Grand Threadfin	<i>Polydactylus macrochir</i>	NE
Mammals	Pygmy Hippopotamus	<i>Choeropsis liberiensis</i>	EN
	Nile Lechwe	<i>Kobus megaceros</i>	EN
	Common Hippopotamus	<i>Hippopotamus amphibius</i>	VU
	West African Manatee	<i>Trichechus senegalensis</i>	VU
	Southern Lechwe	<i>Kobus leche</i>	LC
	Sitatunga, Marshbuck	<i>Tragelaphus spekii</i>	LC
Reptiles	African Slender-snouted Crocodile	<i>Mecistops cataphractus</i>	CR
	West African Dwarf Crocodile	<i>Osteolaemus tetraspis</i>	VU
	Nile Crocodile	<i>Crocodylus niloticus</i>	LC
	Osborn's Dwarf Crocodile	<i>Osteolaemus osborni</i>	NE
	African Softshell Turtle	<i>Trionyx triunguis</i>	NE

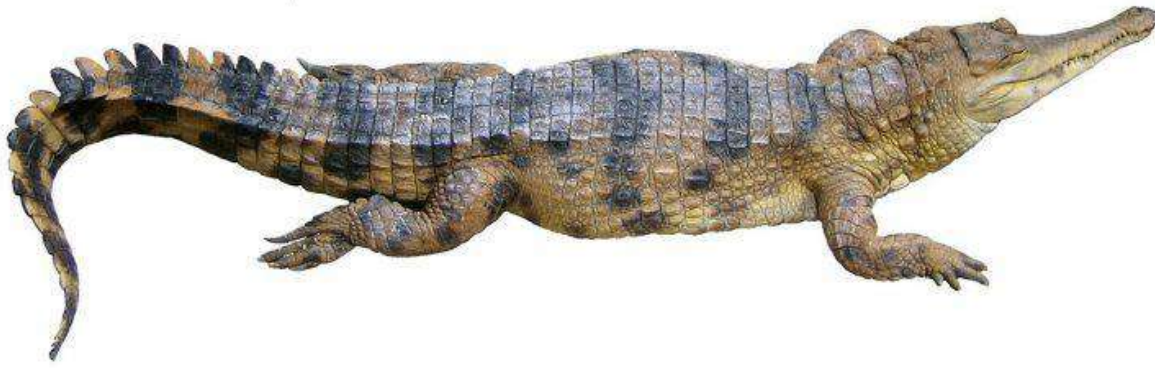


Figure 8: The African slender-snouted crocodile (*Mecistops cataphractus*) is the only critically endangered freshwater megafauna species in Africa. It occurs sparsely in West Africa (Benin, Burkina Faso, southern Senegal, Gambia, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Liberia, southern Mali, Nigeria, Sierra Leone, and Togo) and extends into Cameroon in Central Africa ([ref](#)). The African slender-snouted crocodile prefers to live in dense, vegetated bodies of water that are away from human settlements. [Image Source](#)

The recent population development of megafauna in freshwater is less well documented than those of terrestrial species ([ref](#)). However, based on a 2019 assessment, global freshwater megafauna populations declined by 88% between 1970 and 2012. Among them, mega-fishes exhibited the largest decline (94%) followed by mega-reptiles (72%).

The Living Planet Index (LPI) for Africa shows a 76% decline in monitored vertebrate populations, equivalent to 2.8% per year ([Figure 9](#)). The index includes mammals, reptiles, birds, fish and amphibians in terrestrial, freshwater, and marine habitats. This is the second-largest regional decline globally, following Latin America and the Caribbean, which shows a 95% decline ([ref](#)).

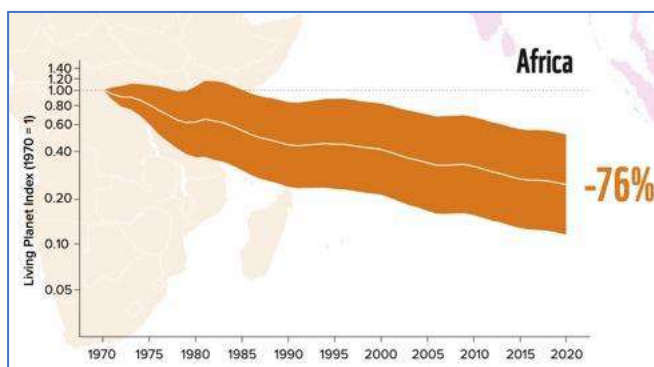


Figure 9: Graph illustrating the dramatic decline of mammals, birds, reptiles, and fish populations in Africa 1970 to 2020. [Image Source](#).

Habitat loss followed by overexploitation are the two dominant threats to the wild animals of Africa ([Figure 10](#)) ([ref](#)).

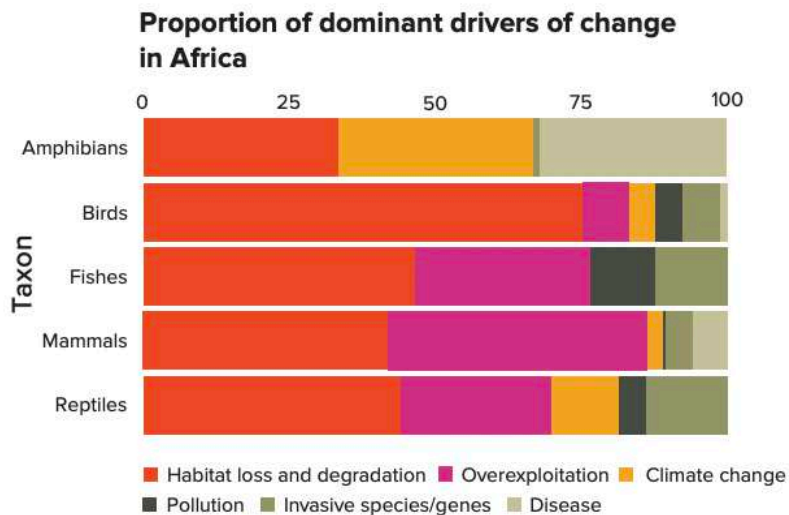


Figure 10: The proportion of the decline in vertebrate populations (amphibians, birds, fish, mammals and reptiles) in Africa due to the dominant drivers of change (habitat loss/degradation, overexploitation, invasive species/genes, pollution, disease, and climate change). [Image source](#)

The use of wildlife supports many people for their food, medicine, and livelihoods. Ensuring that this use is sustainable is central to conservation, enabling the persistence of species while allowing continued human utilization. A global analysis published in 2022 examined over 11,000 wildlife population trends to better understand how local populations respond to utilisation ([ref](#)). It was found that utilized populations declined on average by 50% between 1970 and 2016 and showed steeper negative trends than populations that were not utilized (−3%). Africa showed the greatest decline since 1970 in the terrestrial/freshwater and marine subsets ([Figure 11](#)); both indices show steeper decline than the global average for utilized species ([ref](#)).

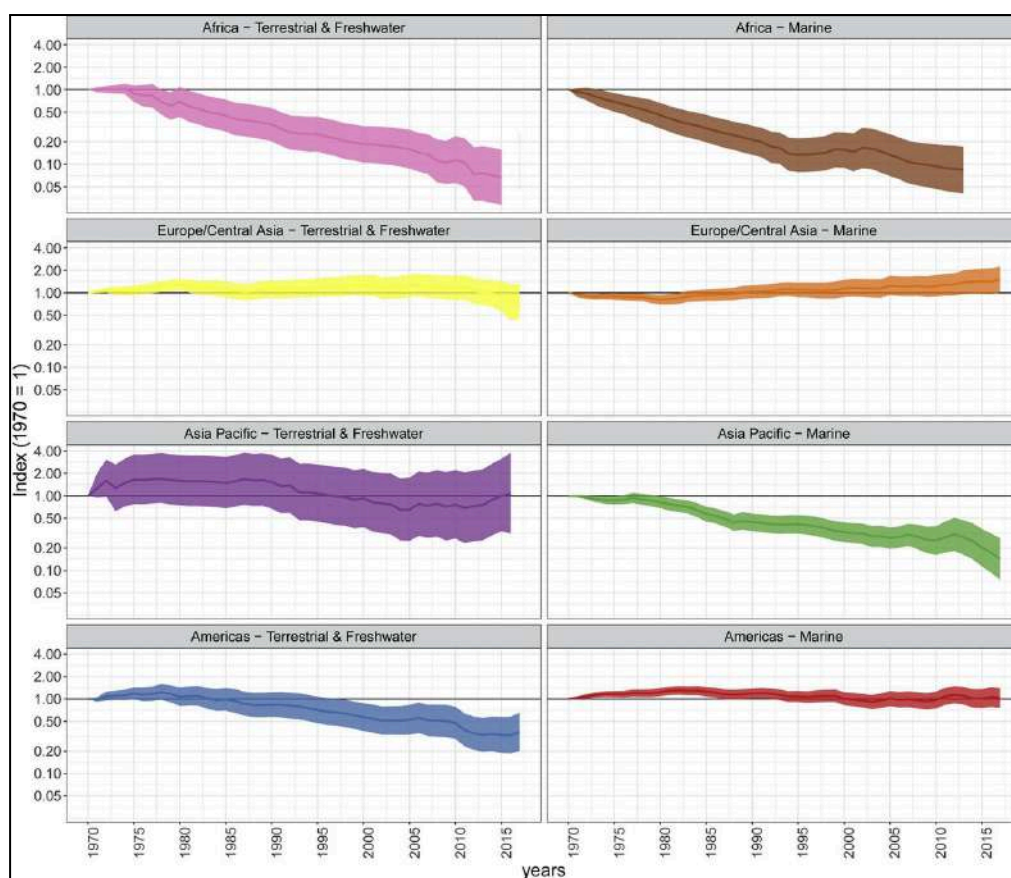


Figure 11: During the period 1970 to 2016, Africa showed the largest population decline in terrestrial, freshwater, and marine species utilised by man. [Image Source](#)

6. Ecosystems and places

Africa's **lakes** are broadly categorized into two main categories: 26 main shallow lakes (e.g., Chad and Mweru in the DRC), and seven main deep lakes (e.g., Victoria, Tanganyika and Malawi) ([ref](#)).

The shallow lakes are numerous and vary greatly in size, from small pools to bodies such as Lake Chad, which once spanned approximately 22,000 km² in the 1960s but has now shrunk to less than 1,500 km² ([ref](#)). Some lakes such as Chad and Chilwa are endorheic (with no surface outlet) and all the water input from the rain and tributaries is lost through evaporation and seepage to the underground water table. In shallow lakes, the coastal zones and bankside vegetation play a significant role in ecosystem functioning, in contrast to deep lakes where the pelagic zone is particularly well-developed. These shallow lakes generally occupy depressions in areas with moderate reliefs.

Lake Chad is a typical example of a shallow lake. Some fish species, like the Pebbly fish or Silversides (*Alestos baremoze*) and the Upside-down catfish (*Synodontis batensoda*) ([Figure 12](#)), impact differently on the zooplankton through their gill structures, the first capturing larger species and the latter smaller – both through their prey selection creating a top-down control of the zooplankton community and the entire ecosystem ([ref](#)). A similar top-down control of the benthic community by a different set of fish species, such as the Red tailed synodontis (*Synodontis clarias*), the

Wahrindi (*S. schall*), and the Bebe morymid (*Hyperopisus bebe*), have also been reported from Lake Chad ([ref](#)).

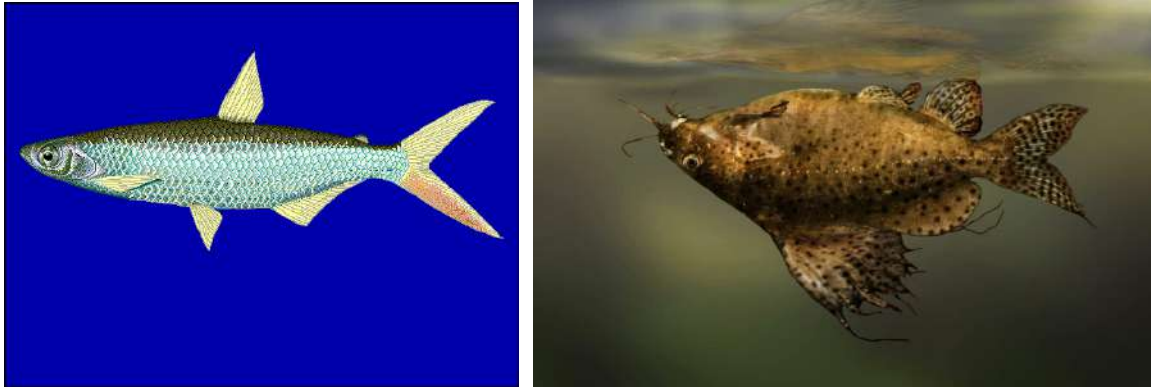


Figure 12: Pebbly fish, [Image Source](#), and the Upside-down catfish, [Image Source](#)

An example of a trophic cascade occurred in Lake Nakuru, Kenya, following the introduction of Graham's cichlid (*Alcolapia graham*) ([Figure 13](#)), a species endemic to Lake Magadi, Kenya, in the late 1950's to control mosquito larvae ([ref](#)). Originally devoid of fish, this saline (soda) lake experienced a rapid proliferation of cichlids, which fed primarily on the abundant populations of the cyanobacterium *Spirulina platensis*. Just a few years after the introduction in 1963, fish-eating birds began invading Lake Nakuru with white pelicans becoming especially dominant. By the late 1970s, they accounted for approximately 85% of the lake's fish-eating bird population. Prior to the introduction of cichlids, the bird community at Lake Nakuru was essentially composed of Greater and Lesser flamingos (*Phoenicopterus roseus* and *Phoeniconaias minor*). Following the introduction, the community diversified, and now includes over 50 aquatic bird species ([Figure 14](#)).



Figure 13: Graham's cichlid was successfully introduced in the late 1950s to fight the mosquito larvae in Lake Nakuru, Kenya. [Image Source](#)



Figure 14: Today the aquatic bird fauna of Lake Nakuru has increased to about 50 species from essentially the lesser and greater flamingo (*Phoeniconaias minor* and *Phoenicopiterus roseus*) prior to the introduction of Graham's cichlid. [Image Source](#)

The great lakes of East Africa are characterized by unusual dimensions in terms of volume (Tanganyika, 18,900 km³), surface area (Victoria, 68,800 km²; Tanganyika, 32,900 km²; Malawi, 30,800 km²) or depth (Tanganyika, 1,435 m max; Malawi, 758 m max.). Pelagic processes are dominant in the Rift Valley lakes owing to the reduced littoral zone and immense depth linked with the high local relief. Deep lakes, large or moderate in size, are generally characterized by seasonal or permanent stratification. The water of the upper layers is warmer and less dense than in the deeper layers. Deep stratified Rift Valley lakes, such as Lake Tanganyika and Lake Malawi, are typically structured with two distinct layers that mix only minimally. The upper layer is well illuminated and oxygenated, supporting most fish life, which feed and breed there. In contrast, the deeper layer is poorly oxygenated and dominated by decomposition processes. In such systems, shoreline areas become especially important for species that are not strictly pelagic.

The introduction of a top fish predator can dramatically change the whole ecology of such lakes. An example ([ref](#)) is when the Nile perch (*Lates niloticus*) – one of Africa's freshwater megafauna fish species (see Table 1) - was released in Lake Victoria, which led to the simplification of the trophic chains in the sub-littoral areas (6-20 m deep) between the 1970s and 1989 ([Figure 15](#)). This also led to the loss of several top fish predators, like the African sharptooth catfish (*Clarias gariepinus*) and the Silver butter catfish (*Schilbe intermedius*) ([ref](#)), and reduction of the insectivorous cichlid species, generating a significant increase in the larvae of aquatic insects whose adults form enormous swarms above the lake, benefitting the sand martin (*Riparia riparia*), which spends the northern winter in Africa and whose population massively increased ([ref](#)). The trophic changes of the lake also resulted in frequent, intense algal blooms ([ref](#)).

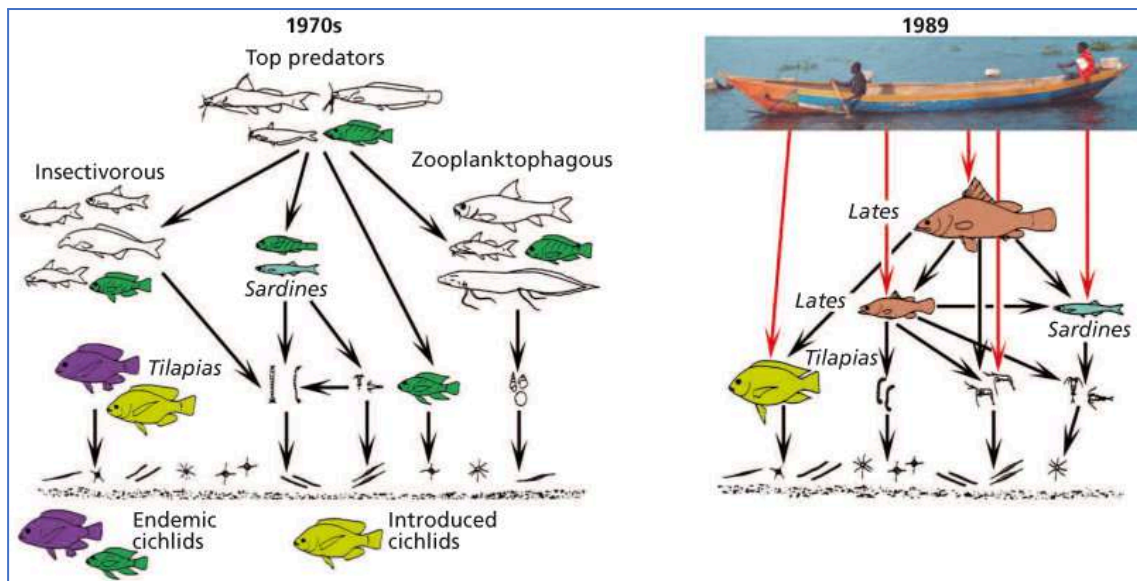


Figure 15: The complete change of the food web in the sub-littoral zones of Lake Victoria following the introduction of the top predator Nile perch in the 1970s. [Image Source](#)

Inland Deltas are a very special feature of Africa ([ref](#)). The three largest are:

The Sudd in the upper Nile catchment area in South Sudan ([Figure 16 and 17](#)), consisting of some 16,600 km² of permanent swamps flanked by 14,000 km² of seasonally flooded grassland.



Figure 16 and 17: The Sudd wetlands. [Image links](#)

The Inner Niger Delta at the confluence of the Niger and Bani rivers in Mali ([Figure 18 and 19](#)), consisting of 4,000 km² of permanent wetlands and 26,000 km² seasonally inundated areas.



Figure 18 and 19: Niger Inland Delta, [Image Sources](#)

The Okavango Delta is found in northern Botswana along the Okavango River ([Figure 20 and 21](#)), consisting of 6,000 km² of permanent wetlands surrounded by 7,000-12,000 km² of seasonally inundated wetlands ([ref](#)), sometimes reaching out to 28,000 km² during particularly wet years ([ref](#)).

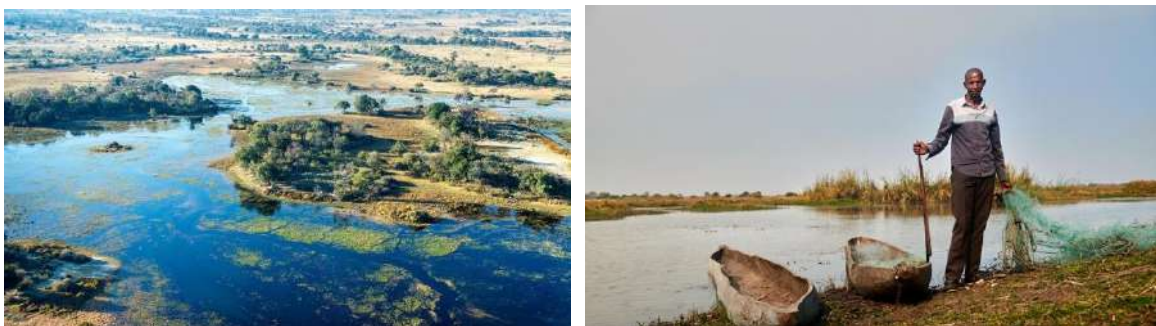


Figure 20 and 21: Okavango Delta. [Left Image Source](#) and [Right Image Source](#)

Common features for the three inland deltas include the semi-arid settings in which evaporation transpiration greatly exceeds rainfall and the extensive seasonal wetlands are largely fed by inflow derived from outside, in higher rainfall sub-tropical areas.

[Case Study #1](#) gives a more detailed description of how mammals, reptiles, birds and termites shape the Okavango Delta in Botswana.

Coastal lagoons and estuaries, including seagrass meadows and mudflats: Fishes in these ecosystems play an important role in the flow of energy and nutrients ([ref](#)). Through their migrations, they facilitate nutrient and energy exchanges with coastal marine systems. Estuaries in particular serve as critical nursery habitats for the post-larval and juvenile stages of numerous fishes and other species. The favourable conditions for the nutrition and survival of juvenile forms, combined with the relatively high temperatures often found in estuaries and lagoons, encourage rapid growth.

Among the megafauna tied to these coastal and riverine systems are the dugongs and manatees, large herbivores dependent on tropical and subtropical shallow-water habitats rich in plant resources. Africa is home to two of these iconic species: the Dugong, found along the eastern African coastline, and the West African manatee see ([Case Study #2](#)).

Global estimates of **seagrass** cover remain highly uncertain with significant regional data gaps, especially in the African continent ([ref](#)). Much of Africa's coastline has yet to be mapped in detail using either field-based surveys or remote sensing technologies. Based on a global mapping ([Figure 22](#)), the areas with the largest seagrass meadows are in the northwest (Western Sahara and Morocco), the Mediterranean, and the Red Sea. Other areas include Guinea-Bissau-Guinea-Sierra Leone, Ghana-Togo-Benin-Nigeria, East Africa, Mozambique, and South Africa. Among these, East Africa stands out as particularly species-rich with 14 seagrass species documented ([ref](#)). Seagrass meadows are among the most threatened of all marine ecosystems ([ref](#)). Among the primary drivers of their decline, fishing activities account for 29% of documented loss. Biological factors also play a significant role, with overgrazing by sea urchins (*Tripneustes gratilla*) and green turtles (*Chelonia mydas*), contributing to substantial reductions in seagrass cover in places ([ref](#)).

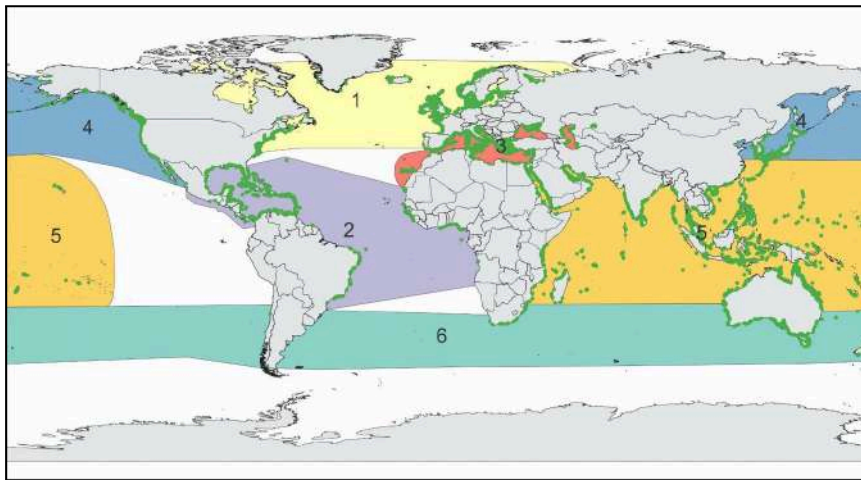


Figure 22: Global distribution of seagrass and geographic bioregions based on data from UNEP-WCMC and Short ([2021](#)) and Short et al. ([2007](#)). [Image Source](#)

Sea urchins are one of the main invertebrate grazers in tropical seagrass meadows, which play a fundamental role in shaping the structure and abundance of macroalgae and seagrasses ([ref](#)). In tropical seagrass ecosystems, 24% of seagrass production is consumed by sea urchin grazing, which shows that the accumulation of plant biomass in these ecosystems is heavily controlled by consumers ([ref](#)). An increase in abundance of sea urchin populations, generally due to the absence of top-down control, can lead to increased grazing pressure and, consequently, overgrazing of seagrass meadows. This has been reported in several cases in East Africa where populations of *Tripneustes gratilla* have been observed to be 127 times greater in areas that are devoid of top predators (generally due to fishing activities) than in marine protected areas ([ref](#)). Population outbreaks of *T. gratilla* can lead to serious consequences in the ecosystem structure and functioning, like a change in the dominant primary producers from foliose algae to crustose coralline algae or a severe reduction in seagrass densities. The main fish predators of *T. gratilla* in this region in the Western Indian Ocean are the Orange-lined triggerfish (*Balistapus undulatus*) ([Figure 23](#)) and the Humphead wrasse (*Cheilinus undulatus*) ([Figure 24](#)). Both of the species are commercially fished. For a description of the situation in Kenya, please see [Case Study #3](#).



Figure 23: Humphead wrasse. [Image source](#)



Figure 24: Orange-lined triggerfish. [Image source](#)

Mudflats: Mudflats—unvegetated, soft-sediment, intertidal habitats—support macrofaunal assemblages that contribute to a number of important ecosystem functions, including providing food for fish and birds, nutrients, and carbon cycling ([ref](#)). They are primarily found all around the African coasts ([ref](#)). The fauna consists of worms, gastropods, clams, snails, mussels, crabs, and zooplankton. The prevalence of crustaceans, such as fiddler crabs, in tropical mudflats can provide functional equivalence to the burrowing worms of temperate regions. Fiddler crabs (family *Ocypodidae*), with hundreds of species, are particularly abundant in tropical mudflats ([ref](#)). Fiddler crabs (Figure 25) are thought to potentially act as ecosystem engineers within their habitat due to the way they rework the sediment during feeding ([ref](#)).



Figure 25: West African Fiddler crab (*Afruca tongeri*). [Image Source](#)

Mudflat macrofauna are a major source of food for fish, crabs and birds and so support commercial fisheries and large populations of birds ([ref](#)).

The Banc d'Arguin coastal system in Mauritania supports the largest concentrations of migratory waterbirds along Africa's coastline ([Figure 26](#)), including intertidal waders and fish-eating coastal birds². A special [Case Study #4](#) on the Banc d'Arguin is included with this report. In general, sites harboring large numbers of wintering and migratory shorebirds correspond with regions of high coastal productivity ([ref](#)). Shorebirds play a central role in mudflat trophic webs and exert major predatory, physical, and chemical impacts on mudflats ([ref](#)). During peak overwintering and start of the migratory periods they have also been found to have positive impacts on ecosystem functions in intertidal mudflats ([ref](#)), reducing erosion, controlling and engineering nutrient fluxes between the sediment and water column, and increasing carbon sequestration (uptake of dissolved organic carbon, DOC).



Figure 26: During the northern winter months, the Banc d'Arguin welcomes more than two million migratory birds, some from as far afield as Siberia, Greenland and Canada. They play an important ecological role in the functions of the mudflats. [Image Source](#)

Mangroves: Africa accounts for 21 % of global mangroves, covering a total area of 30,555 km² in 2020. Roughly 75 % are found on the west coast, and 25 % along the east coast ([ref](#)). spanning 19 countries on the west coast and 15 on the east coast ([ref](#)). The most important remaining blocks of mangroves on the Atlantic coast are located in the Niger River Delta in Nigeria, around Douala in Cameroon, within the Muni Estuary and Como River region in Gabon and in protected areas and Ramsar sites in Ghana and Guinea Bissau ([ref](#)).

Bivalves (aquatic molluscs) and gastropods (slugs and snails), as primary consumers and detritivores play a foundational role in mangrove ecosystems. By directly releasing faecal matter enriching the sediment, they ensure other animal forms gradually congregate and form complex food webs (Sevvandi Jayakody, *pers.com.*). In mature mangrove forests, large quantities of dead wood in the intertidal zone are tunnelled by teredinid bivalves also known as “shipworms”. These bivalves function as ecosystem engineers, transforming wood into intricate habitats which serve as refuges for a large number of animals, ranging from centipedes, crickets and spiders, and those found in subtidal marine ecosystems such as fish, octopods and polychaetes ([ref](#)). Shore crabs (*Carcinus spp.*), especially sesarmid crabs

² El-Hacen Mohammed El-Hacen in Prokosch, P. (ed.) (2024): The East Atlantic Flyway of Coastal Birds: 50 Years of Exciting Moments in Nature Conservation and Research. Lynx Nature Books, Barcelona, Chapter 14: A journey through the natural world of Parc National du Banc d'Arguin, Mauritania (p. 165-176)

(*Neosarmatium smithi*) and fiddler crabs (family *Ocypodidae*) ([ref](#)), appear to be a major driver of recruitment, tree density and distribution, and size structure in mangrove and other coastal tropical forests. They also serve as a primary food source for stingrays, shorebirds/waders, and fish ([ref](#)). However, mangrove ecosystems with large crab populations have lower carbon sequestration rates than those with no or fewer crabs. Small-bodied predators, such as predatory ants and birds, can directly and indirectly protect mangroves from insect and crab herbivory, which would negatively affect the photosynthesis of mangroves ([ref](#)). Under certain circumstances, predatory fish seem to have a positive impact on carbon sequestration through the decline of bioturbators, such as crabs.

Mangroves are often referred to as nursery grounds for coral reef fishes, but this only holds true when coral reefs are located near the mangrove forests and under low amplitude tidal conditions ([ref](#)). Nonetheless, mangrove habitats appear to provide important habitat for coastal and estuary fish across tidal ranges and regions ([ref](#)).

Through their roosting or nesting in mangroves, seabirds have been found to play an important role in mangrove ecosystems ([ref](#)). Nutrients from seabird guano enrich mangrove plants, reduce nutrient limitations, enhance mangrove invertebrate food webs, and are exported to nearby coastal habitats through the tidal flow ([Figure 27](#)). Conserving seabird populations is therefore vital to preserve and enhance their role in mangrove productivity, resilience, and provision of diverse functions and services. These findings are based on research collected in the mangrove habitats on Aldabra Atoll, in the Southern Seychelles. Aldabra Atoll supports the most extensive mangrove forests in the Seychelles archipelago and harbours one of the Indian Ocean's most important mangrove nesting seabird colonies. It hosts the region's largest breeding populations of frigatebirds (*Fregata minor* and *F. ariel*), and Red-footed boobies (*Sula sula*), providing habitat for some of the region's highest known concentrations of these species.

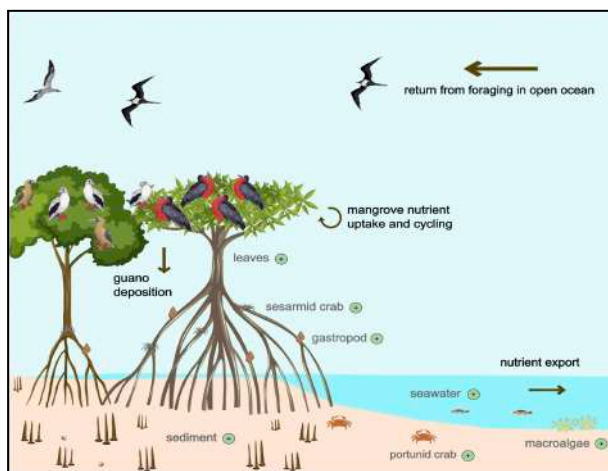


Figure 27: Seabirds forage at sea and deposit nutrient-rich guano in their mangrove breeding colonies, which enrich mangroves and their associated invertebrate fauna, and are exported to adjacent habitats by tidal flow. [Image source](#)

Tropical coral reefs: The total area of shallow coral reefs³ globally amounts to 348,361 km² of which 4-5% is found in Africa ([ref](#)), most of it in the Red Sea and Western Indian Ocean ([Figure 28](#)). Only a few areas of coral reefs exist in West Africa ([Figure 28](#)). Of 20 “major coral reef jurisdictions”, four are found in Africa:

- Eritrea: 4,451 km²,
- Mozambique: 4,027 km²,
- Madagascar: 3,949 km²,
- Tanzania: 3,387 km²,

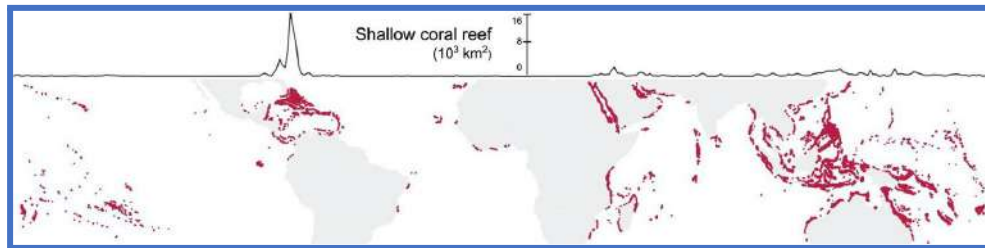


Figure 28: World distribution of shallow coral reefs. [Image Source](#)

Fish are the dominant consumers within coral-reef systems ([ref](#)). Much of the energy transferred between trophic groups passes through fish, and collectively, they influence the biomass, productivity, and composition of algal communities, as well as the composition and morphology of coral assemblages. Fish also facilitate the settlement of benthic organisms by clearing patches of substratum and are major agents of bioerosion and the production, reworking, and transport of sediments on coral reefs. Parrotfishes, more than any group of fishes, are key contributors to all these processes on coral reefs ([ref](#)). The five principal ways in which parrotfish impact tropical coral reefs are shown in [Figure 29](#).

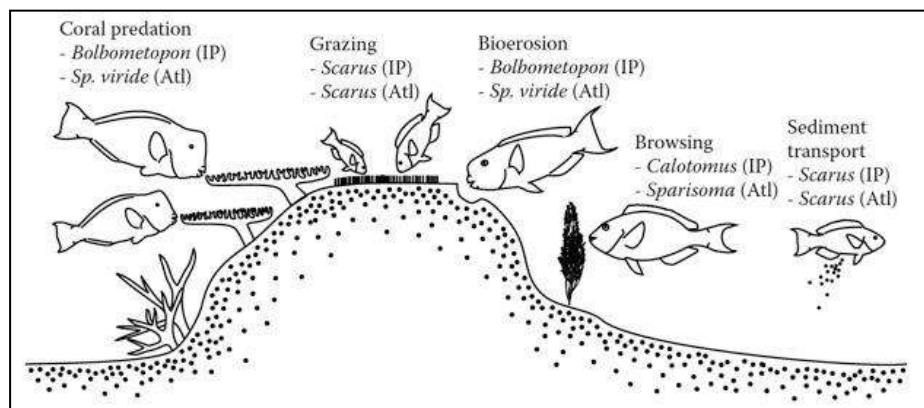


Figure 29: Primary functional roles of parrotfishes on tropical coral reefs: predation, grazing, bioerosion, browsing and sediment transport. The dominant groups of parrotfish for each function in the Atlantic (Atl) and in the Indo-Pacific (IP) are indicated. [Image Source](#)

³ “Shallow coral reefs” consist of the amalgamation of all classes from the geomorphic zones map, which are mapped down to about 15 m water depth globally; this equates to any hard (coral, rock) or soft (sand, rubble, mud, seagrass) bottom substrate in the tropics able to be assigned a reef geomorphic zone.

The following species of parrotfishes have been identified as important when it comes to the health and functioning of tropical coral reefs in the Western Indian Ocean and the Red Sea (G = grazing, P = predation, B = bioerosion) ([Figure 30](#)):

- Spectacled parrotfish, *Chlorurus perspicillatus* (G)
- Steephead parrotfish, *C. strongylocephalus* (G, P)
- Heavybeak parrotfish, *C. gibbus* (P, B)
- Daisy parrotfish, *C. sordidus* (B)
- Rusty parrotfish, *Scarus ferrugineus* (G, B)
- Swarthy parrotfish, *S. niger* (G, P, B)
- Bridled parrotfish, *S. frenatus* (P, B)
- Blue-barred parrotfish, *S. ghobban* (P, B)
- Bicolour parrotfish, *Cetoscarus bicolor* (P)



Figure 30: Four examples of ecologically important parrotfish from the Red Sea and East Africa coast: Steephead parrotfish (top left), Heavybeak parrotfish (top right), Rusty parrotfish (bottom left), and Swarthy parrotfish (bottom right). Various image sources.

The grey reef shark (*Carcharhinus amblyrhynchos*) ([Figure 31](#)), is one of the most common reef shark species in the Indo-Pacific region and is found all along the East African coast ([ref](#)). In the Central Pacific Ocean, populations of this species are estimated to deposit an estimated 95 kg of nitrogen daily into the nutrient-limited reef ecosystem, thereby supporting coral health within the 15,000-acre (6,070 hectare) Altyra Atoll US National Wildlife Refuge ([ref](#)). It is estimated that roughly 86% of this nitrogen originates from pelagic resources. These results suggest that sharks may contribute substantially to nutrient transfer from offshore waters to near-shore reefs, providing subsidies that

are important for coral reef health ([ref](#)). However, overfishing has reduced storage and resupply of fish-derived nutrients on coral reefs by nearly 50%, resulting in diminished coral growth and primary productivity ([ref](#)). Further information on the interactions between sharks and coral reef ecosystems are found in the “Taking Animals into Account” report ([ref](#)).

The Chumbe Island Coral Park ([Case Study #5](#)) in Tanzania, is an excellent example of how the eradication of rats on the land allowed the comeback of birds, reptiles and the Coconut crab (*Birgus latro*), the world’s largest terrestrial arthropod. This boosted the productivity on land with positive impacts filtering down to surrounding reefs, enhancing their productivity as well. (For more information, please see section 9.3 “Key Messages” and Annex 1. [Case Study #5](#)).



Figure 31: The Grey reef shark plays an important ecological role in tropical coral reefs. [Image Source](#)

Kelp forests: Kelp forests are vital ecosystems which play a crucial role in maintaining biodiversity and supporting marine life ([ref](#)). They provide habitat and food for a diverse array of species, including fish, invertebrates, and marine mammals, thus contributing to the overall health of ocean ecosystems. From a climate perspective, kelp forests are significant carbon sinks, absorbing carbon dioxide from the atmosphere and helping to mitigate the effects of climate change. For local communities and coastal populations, kelp forests support centuries-old kelp harvesting practices and livelihoods, as well as fisheries, and aquaculture, while providing income and food security.

In Africa ([Figure 32](#)) kelp forests are found in West Africa, Namibia, and South Africa ([ref](#)). The kelp forests along the southwestern and west coasts of South Africa, dominated by the species *Ecklonia maxima* and *Laminaria pallida*, are locally termed ‘the Great African Seaforest’ ([ref](#)). These kelp forests also extend into Namibia ([ref](#)). In West Africa, *Ecklonia* species similarly form the kelp forest habitats.

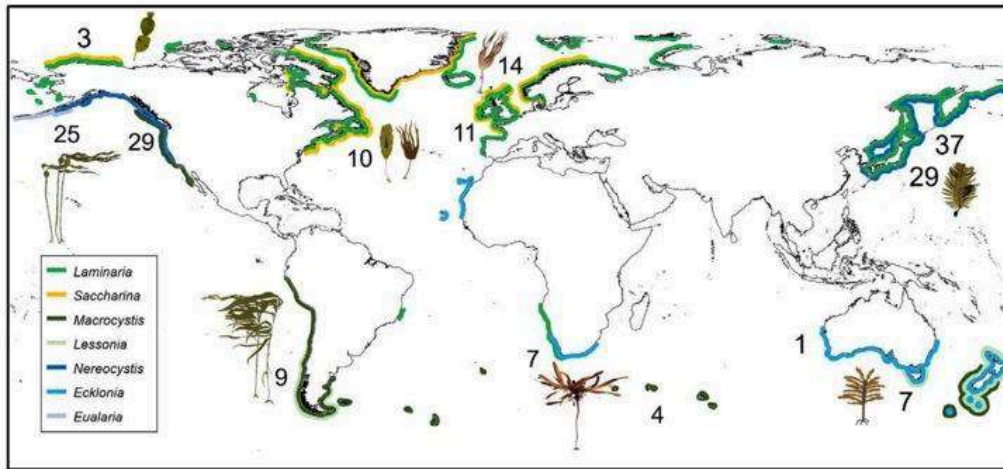


Figure 32: Global distribution of laminarian kelp forests. [Image Source](#)

These ecosystems provide complex, three-dimensional habitats with modified sub-canopy conditions. The effect of this supports a trophic foundation of coastal food-webs by providing food for a suite of grazers, carnivores, detritivores, and microbes. Kelp forests play an important role as nurseries for juvenile fish ([ref](#)). These effects can reach adjacent reef, seagrass, and sediment communities as well as to deep sea waters beyond the continental shelf ([ref](#)).

The West Coast rock lobster (*Jasus lalandii*) ([Figure 33](#)) is a significant and voracious predator within kelp forest ecosystems along the coast of South Africa ([Figure 34](#)), feeding on sea urchins and mussels - species that can have detrimental effects on kelp populations ([ref](#)). The overfishing of this lobster species has disrupted these ecological dynamics, resulting in negative impacts on the health and extent of these kelp forests.



Figure 33: Overfishing of the West Coast lobster has negatively impacted the kelp forests along the coast of South Africa. [Image source](#)

Trophic cascades play a critical role in kelp conservation. The loss of predators such as sea otters, sea stars, lobsters, and predatory fish often results in the expansion of sea urchin populations, commonly associated with the loss of the kelp habitat ([ref](#)). The [Case Study #6](#) describes the ecological impacts resulting from the decline of White sharks in the kelp forests of False Bay, South Africa.



Figure 34: Kelp forest in South Africa. [Image Source](#)

7. Species groups

Freshwater fish: Currently, nearly 11,000 freshwater and brackish water fish species have been described worldwide, of which approximately 3,360 species are found in Africa, representing 95 families ([ref](#)). The Cichlidae family are by far the most abundant with around 1,150 species (and an estimated total exceeding 2,000) about 143 genera recorded, most of them endemic to East African lakes where many species remain to be described. The main feature of African fish fauna is the existence of a high proportion of endemic families. They are likely among the most ancient families of fish, given that the African continent has remained above sea level since the Precambrian, more than 600 million years ago. This long period of exundation may explain why Africa has a far more diverse fish fauna than South America (there are no Cyprinidae in the South American fauna which mostly consists of Siluriformes and Characiformes), although the number of inland waters fish species of Africa is slightly lower than the number estimated for South America.

The pelagic fish communities of East African lakes consist of “relatively simple trophic webs” compared to the “more complex food webs” of the shallow lakes ([ref](#)).

[Figure 35](#) illustrates an example of convergent evolution across continents, where African species occupy ecological niches similar to those of species in Europe, South America, and North America ([ref](#)). Since the functional roles of many fish species are better understood and documented in Europe, South and North America than in Africa, this could be helpful to categorise their African equivalents. [Figure 36](#) shows two endemic species that are “ecologically equivalent” yet “phylogenetically distant”: the fish-eating cichlid *Bathybates ferox* in Lake Tanganyika and *Rhamphochromis macrophthalmus* in Lake Malawi ([ref](#)).

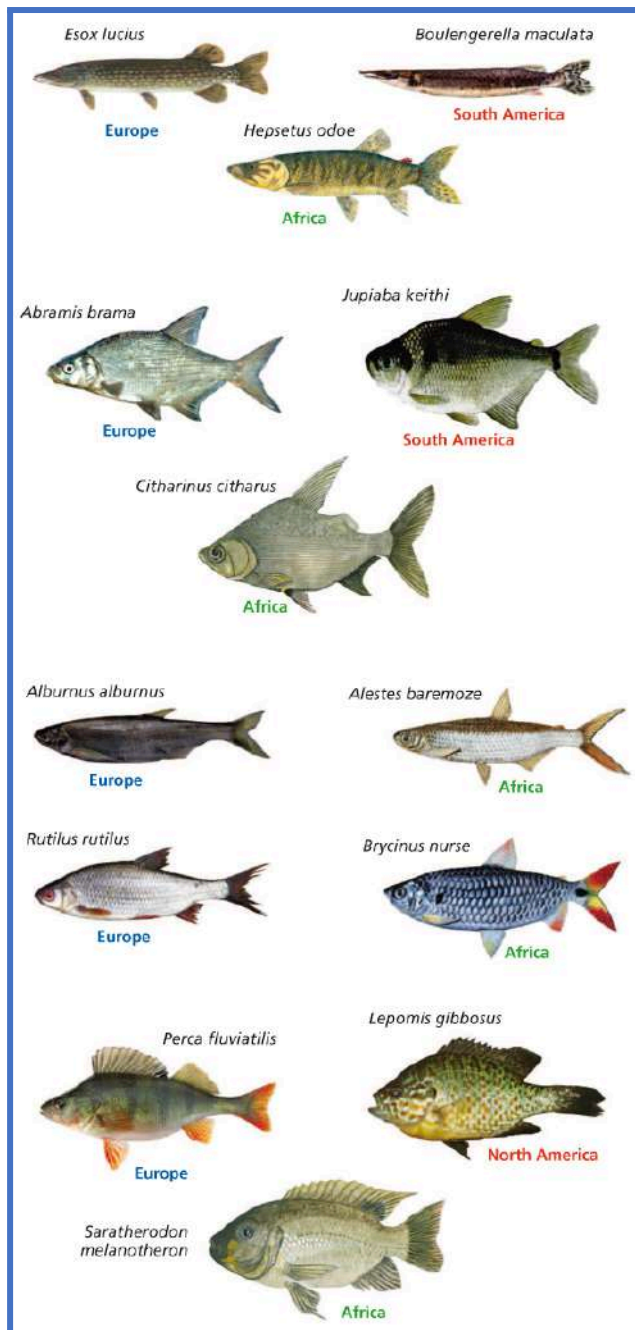


Figure 35: Examples of five African fish species that occupy similar ecological niches as other fish species in Europe, South America, and North America. [Image Source](#)



Figure 36: Two endemic cichlid fish species that are “phylogenetically distant” but share the same ecology in their respective lakes. [Image Source](#)

Animal-mediated **seed dispersal** is a critical ecological process, shaping plant demography, diversity, and distribution ([ref](#)). It is estimated that 52% of plant species rely on animals for seed dispersal. Among these interactions, fruit eating by fishes, represents an ancient interaction increasingly regarded as important for seed dispersal (“ichthyochory”) in tropical and temperate ecosystems ([ref](#)). Most of the more than 275 known frugivorous species belong to the Neotropical region. Ichthyochory in Africa has not yet been evaluated, although fruit and seed consumption has been documented in natural history studies on multiple species across the continent ([ref](#)). Reports on fruit-eating fishes are limited, despite the considerable expanse of forested floodplains throughout western Africa (i.e., coastal portions of Liberia, Côte d’Ivoire, Ghana, Nigeria and Cameroon) and the Congo Basin. It is in these areas where the largest potential for ichthyochory would be expected. In the extensive swamp forests in the lower Niger basin and the seasonally flooded forests in the Congo River basin, which hold the largest fish diversity on the continent, fewer than ten frugivorous or granivorous species have been reported. Across Africa as a whole, only 12 frugivorous species ([Figure 37](#)) have been identified, while the majority – 41 species – are granivorous ([Figure 38](#)). This may be influenced by the extensive savannas and grasslands that cover the floodplains of some of the major rivers ([ref](#)). The potential for effective seed dispersal by catfishes (*Siluriformes*) is higher than for some of the other species, because they swallow entire seeds and have benthic habits ([ref](#)).



Figure 37: African sharptooth catfish – partly frugivorous species widely distributed through Africa. [Image Source](#)



Figure 38: Silver catfish – widespread species of an African granivorous fish. [Image Source](#)

Marine fish: The giant trevally (*Caranx ignobilis*) ([Figure 39](#)) is top predator fish inhabiting tropical and sub-tropical marine waters throughout the Indian and Pacific Oceans ([ref](#)). It is associated with coral and rocky reefs but also frequently uses estuaries and coral atolls as both juvenile and adult

stages. An assessment of its trophic position in the Western Indian Ocean (Mozambique and Seychelles) found that the giant trevally occupies a similar position to many predator sharks, and that it plays a critical functional role in many marine ecosystems ([ref](#)). The Ponta do Ouro Partial Marine Reserve in southern Mozambique hosts the largest recorded aggregation of this species, with up to 2,413 individuals representing an estimated biomass of approximately 30 tonnes ([ref](#)). This unique site is included in Mozambique's Maputo National Park, which is co-managed by the Peace Parks Foundation and further described in [Case Study #7](#) ([ref](#)).

Other examples of the ecological role of marine fish are provided under “tropical coral reefs” (section 6, above) and sharks (below).



Figure 39: The predatory Giant trevally is an important apex fish species in coastal reefs, coral atolls, and granitic islands in western Indian Ocean. [Image Source](#)

Sharks: Historically, sharks have performed roles as predators, competitors, facilitators, and nutrient transporters. However, overfishing and other anthropogenic threats have greatly reduced shark populations globally and altered their roles and ecosystem importance. A recent review ([ref](#)) summarises the extensive historical and ongoing global shark depletions, describes the diverse ecological roles of sharks, and highlights the value of understanding their past, present, and future roles. The “[Taking Animals into Account](#)” report provides some examples of the role of sharks in coral reefs (cascading interactions between reef sharks and herbivorous fish, nutrient contributions by grey reef sharks) and seagrass meadows (impact of tiger sharks on the foraging behaviour of dugongs and green turtles).

With nearly 200 species recorded, the East African region is a major hotspot for sharks and rays in the world ([ref](#)). However, very few studies of the ecological role of sharks in African waters seem to be available ([Figure 40](#)). A [Case Study #6](#) describing the ecological impacts of the decline of white sharks in False Bay, South Africa, is provided. This study documents the cascading ecosystem effects following the near-total disappearance of this apex predator, highlighting the resulting shifts in mesopredator dynamics, prey species abundance, and kelp forest ecology.

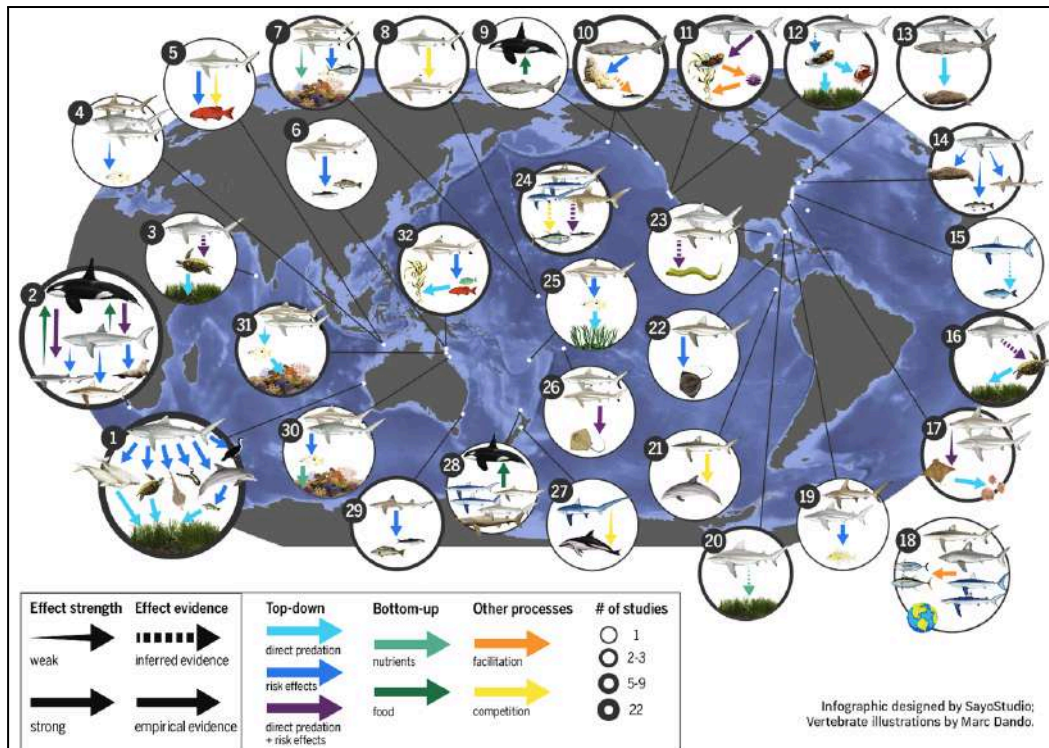


Figure 40: In a [review](#) of the empirical studies of ecosystem effects of sharks, only one study (#2) was included from Africa. [Image Source](#)

Reptiles: In Africa, **crocodilian** systematics has been hampered by complex regional biogeography and a confounded taxonomic history. A recent evaluation ([ref](#)) has identified seven species in Africa:

- Nile crocodile (*Crocodylus niloticus*),
- West African crocodile (*C. suchus*),
- West African slender-snouted crocodile (*Mecistops cataphractus*),
- Central African slender-snouted crocodile (*M. leptorhynchus*),
- Osborn's dwarf crocodile (*Osteolaemus orborni*),
- Dwarf crocodile (*O. tetraspis*),
- New species of dwarf crocodile (*O.sp.nov.*).

The two species of dwarf crocodiles both live in West Africa ([ref](#)).

Based on a 2020 global review of crocodilian ecology ([ref](#)), the following conclusions highlight their potential functional roles in wetlands, with examples of African crocodiles when available:

- ◇ **Ecosystem engineers:** The Nile crocodile is known for mound nesting in close proximity to other nests, which can modify the environment benefitting other species as well ([Figure 41](#)). Burrows ([Figure 42](#)) dug by the Nile and West African crocodiles are often seasonally co-inhabited by insects, arachnids, amphibians, reptiles, and even bats. In forested habitats, burrows created and maintained by the dwarf crocodile provide the only access to surface water during the dry season.



Figure 41: The Nile crocodile mound nesting can benefit other species as well. [Image Source](#)



Figure 42: Burrowing by the Nile crocodile also generates habitats for other animal species associated with wetlands. [Image Source](#)

- ◇ Apex predator: Large herbivores can comprise a substantial portion of the diet of large Nile crocodiles during the peak dry season, when terrestrial herbivores attracted to dwindling water sources provide seasonal predation and scavenging opportunities. Crocodylians have been categorised as opportunistic, generalist predators. A significant portion of their diet comprises invertebrates and smaller-bodied vertebrates, many residing in low trophic levels. As ectothermic predators, many crocodiles in the wild can go without food for extended periods during extreme dry seasons, and the feeding frequency and growth rate generally declines with increasing body size. Empirical assessment of trophic position, like those for other predators, is unavailable for crocodylians. Despite concentrated feeding events, crocodylians generally feed infrequently, consume small amounts of food on average relative to body size, and have periods during the year when feeding may cease altogether. Taken together, available evidence suggests that crocodylians do not appear to conform to the traditional concept of an apex predator!
- ◇ Keystone species: The literature often cites crocodylians as keystone species, generating cascading effects if they are removed. Particularly through their potential impact on fish as part of aquatic food webs. However, this argument is not yet supported by empirical data. For instance, dietary data on Nile crocodiles in the Okavango Delta show that the proportion

of fish in the diet increases with age, with the largest size class (subadults) consuming primarily fish ([ref](#)). Here, in contrast to some other wetland areas in Africa, land-living vertebrates do not appear to play a significant role as a food source. Additionally, during the winter months, many crocodiles eat very little.

- ◇ Mediating cross-ecosystem linkages and nutrient fluxes: Throughout all life stages, most crocodylians consume both terrestrial and aquatic prey, thus transferring energy and nutrients between land and aquatic systems. A study from the Northern Territory of Australia ([ref](#)) may offer insights relevant to Africa. Following the 1971 hunting ban on saltwater crocodiles (*Crocodylus porosus*), the population increased from fewer than 3,000 to more than 100,000 animals today. The increase coincided with a shift from predominantly aquatic prey to mostly land animals now, such as feral pigs, young cattle and Asian water buffalo making up 70% of the diet. Over the past five decades, the amount of prey consumed per square kilometre of wetlands increased from less than 20 kg to about 180 kg. Correspondingly, the amount of nitrogen and phosphorus that the crocodiles excreted in the waterways increased 186-fold and 56-fold, likely boosting phytoplankton and zooplankton productivity, which serve as the building blocks of the food chain. No similar study exists from Africa, but it's not impossible that the Nile crocodile, which is of similar size as the saltwater crocodile and shows a similar ecology and diet, also transfers energy and nutrients from land to the water systems ([Figure 43](#)).



Figure 43: Large ungulates provide a seasonal source of food for the Nile crocodile, which could generate an additional source of nutrients for rivers and other wetlands. [Image Source](#)

In summary, crocodiles in Africa may have positive impacts on their environment by creating physical structures like burrows and nest mounds to be used by other wetlands-associated species. Through feeding seasonally on large ungulates, crocodiles also contribute to an increased flow of nutrients from land to the aquatic ecosystems. It is however less likely they also play an important role as apex predators and keystone species.



Figure 44: Through its predatory behaviour, the Nile monitor lizard is affecting the ecological functions of wetlands. [Image Source](#)

The Nile monitor (*Varanus niloticus*) ([Figure 44](#)) is the largest lizard in Africa, reaching up to 242 cm in total length ([ref](#)). It has a wide distribution covering most of the African continent ([ref](#)). In the Niger Delta, adults have been observed preying on a wide variety of organisms, with crabs representing the most important prey types in terms of frequency of occurrence (56% of the whole dietary spectrum) ([ref](#)). Vertebrates were rarely preyed on, but these monitor lizards proved to feed on both smaller conspecifics as well as newly-born dwarf crocodiles. As an apex species, the Nile monitor could play an important role in the ecosystems where it lives. It has also been suggested that an interspecific competition exists between the Nile monitor and the dwarf crocodile ([ref](#)).

Birds: As referred to in the global study “Taking Animals into Account” ([ref](#)) waterbirds play a vital role in maintaining connectivity among communities in isolated aquatic systems and, thus, maintaining species and genetic diversity ([ref](#)). By acting as passive dispersal agents, waterbirds are known to be vectors of a whole range of aquatic invertebrates including crustaceans, bryozoans, dipterans, molluscs, rotifers, and annelids as well as aquatic and terrestrial plants, and fish eggs ([ref](#)). Many of these organisms are incapable of moving between lakes or river catchments on their own, making waterbirds crucial for facilitating gene flow between communities ([ref](#)). These findings most likely also apply to Africa.

It has also been proposed that waterfowl are the principal vectors for marshland plants, a function originally dispersed by large, migratory mammals that are now extinct ([ref](#)), but the conclusion that waterbirds “probably offer only a pale shadow of what once had been a massive seed flow by large herbivores” probably applies less to Africa with still quite abundant populations of large herbivores of many species (see section 6 of this report).

The study on the positive impact of colony breeding seabirds on mangroves was based on information collected for the Great frigatebird (*Fregata minor*), Lesser frigatebird (*F. ariel*), ([Figure 45](#)) and the Red-footed booby (*Sula sula*) ([Figure 46](#)) in the Western Indian Ocean (Seychelles). The Europa Island ([Figure 47](#)) between Mozambique and Madagascar is a breeding hotspot for all three species: Red-footed booby (2,800-3,800 pairs), Greater frigatebird (700-1,100 pairs), and Lesser frigatebird (1,000-1,200 pairs), making this island, together with the Aldabra Atoll in the Southern Seychelles, two of the best preserved and most functional mangrove sites in the Western Indian Ocean.



Figure 45: Lesser frigatebird. [Image Source](#) **Figure 46:** Red-footed booby. [Image Source](#)



Figure 47: Europa Island (Île Europa) in the Mozambique Channel between Madagascar and Africa mainland with large breeding colonies of frigatebirds and red-footed boobies hosts one of the two best preserved and most functional mangrove sites in the Western Indian Ocean. [Image Source](#)

In February 2012, the French Government designated Europa Island (Île Europa) as a Wetland of International Importance under the Ramsar Convention. In addition to its biodiversity significance for Green sea turtle, several rare sea birds species, the Madagascar pond heron (*Ardeola idea*), Fin whale (*Balaenoptera physalus*), and Hammerhead shark (*Sphyrna lewini*), the island is largely undisturbed, is home to coral reefs, mangroves and sea grass beds and is of "great scientific significance, constituting an open-air laboratory for the study of the natural evolution of island ecosystems and global change" ([ref](#)).

Breeding colonies of waterbirds generate a lot of nutrients (nitrogen and phosphorus) in wetlands around the world ([ref](#)). A 2014-2016 assessment of breeding mixed species⁴ heronries in Africa ([ref](#)) gives a good indication where we could expect the biggest, positive impacts on wetland systems ([Figure 48](#)). The inventory identified 336 heronry sites of 31 species, hosting a total number of at least 35,000 breeding pairs. The countries with the largest numbers of documented heronries were Botswana (14,000 pairs), South Africa (8,000 pairs), and Mauritania (6,000 pairs). One of the top sites is the Kanana Heronry in the Okavango Delta, Botswana ([Figure 49](#)).

⁴ Cormorants, egrets/herons, bitterns, ibises, spoonbills & storks

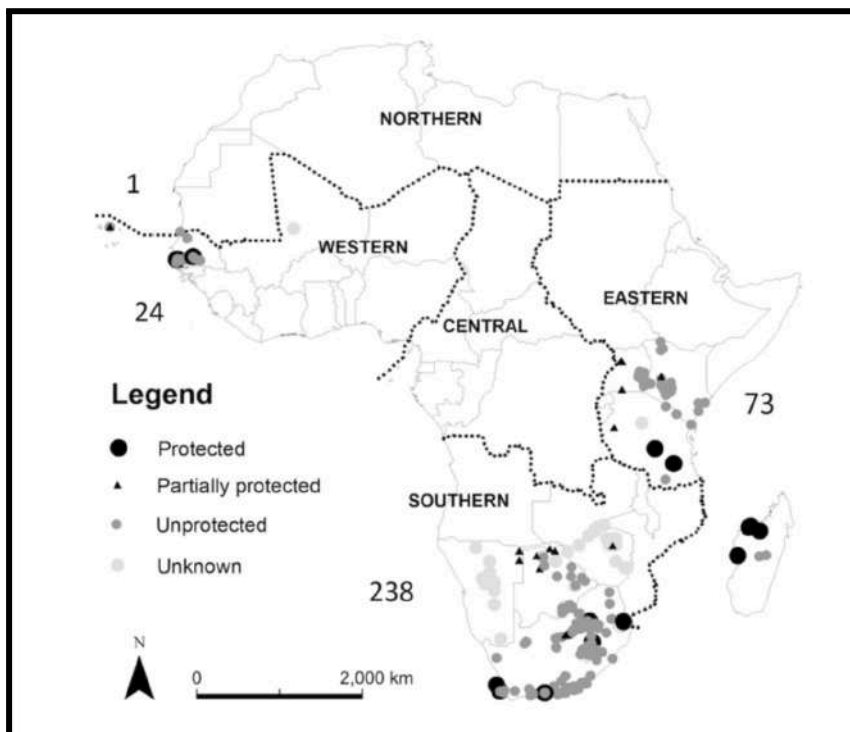


Figure 48: Spatial distribution and protective status of 336 heronry sites throughout Africa based on Heronry MAP:Africa data. [Image Source](#)



Figure 49: The Kanana Heronry in the Okavango Delta, Botswana, is one of the most important breeding sites for herons, storks, and other tree nesting waterbirds in Southern Africa. [Image Source](#)

There are four main bird global flyways, one of which is the African-Eurasian Flyway ([Figure 50](#)), covering Africa, Europe, Greenland/northern Canada, and parts of Asia along with billions of birds that migrate annually ([ref](#)).

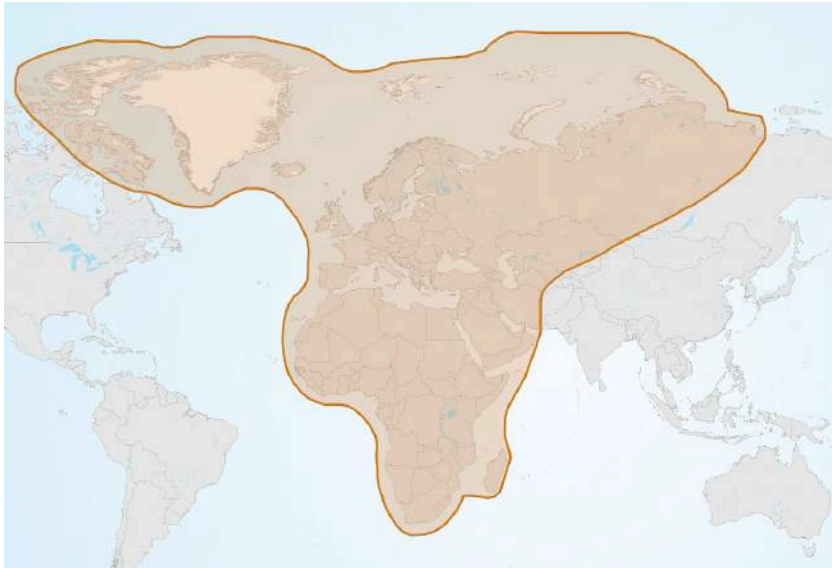


Figure 50: The African Eurasian Flyway according to the Arctic Migratory Birds Initiative. [Image Source](#)

Among the 10 most important sites for non-breeding migratory waterbirds in Africa in terms of numbers are provided in [Table 2](#), with a total of 5-6 million birds.

Table 2: Some key non-breeding sites for migratory waterbirds in Africa, with information on key species, estimated numbers, and some additional information provided by [AfWC Reports & Wader Atlas](#). (Source: Tim Dodman, Associate Expert, Wetlands International).

Site	Country/Region	Key Species	Estimated Population	Notes
Banc d'Arguin	Mauritania	Red Knot (<i>Calidris canutus</i>), Bar-tailed Godwit (<i>Limosa lapponica</i>), Grey Plover (<i>Pluvialis squatarola</i>), Eurasian Curlew (<i>Numenius arquata</i>)	Up to 2 million shorebirds	Critical intertidal zone; significant declines in some species over recent decades
Bijagós Archipelago	Guinea-Bissau	Whimbrel (<i>Numenius phaeopus</i>), Sanderling (<i>Calidris alba</i>), Ruddy Turnstone (<i>Arenaria interpres</i>)	Up to 700,000 shorebirds	UNESCO Biosphere Reserve; vital for migratory shorebirds
Lower Senegal Delta (Djoudj, Diawling, Ndiaël)	Senegal/Mauritania	Garganey (<i>Spatula querquedula</i>), Northern Pintail (<i>Anas acuta</i>), Ruff (<i>Calidris pugnax</i>), White-faced Whistling	Approximately 500,000 individuals of top species	Transboundary Biosphere Reserve, with Ramsar sites; significant for

		Duck (<i>Dendrocygna viduata</i>)		migratory waterbirds
Inner Niger Delta	Mali	Black-tailed Godwit (<i>Limosa limosa</i>), Ruff (<i>Calidris pugnax</i>), Garganey (<i>Spatula querquedula</i>), Northern Pintail (<i>Anas acuta</i>)	Over 1 million waterbirds in wet years	Major floodplain; crucial for both Palearctic and Afrotropical species
Lake Victoria	Uganda/Kenya/Tanzania	African Openbill (<i>Anastomus lamelligerus</i>), White-winged Tern (<i>Chlidonias leucopterus</i>), various herons and egrets	Significant numbers: exact figures vary	Largest freshwater lake in Africa; supports diverse waterbird populations
The Sudd	South Sudan	White-faced Whistling Duck (<i>Dendrocygna viduata</i>), Shoebill (<i>Balaeniceps rex</i>), Black Crowned Crane (<i>Balearica pavonina</i>), various herons	Notably large populations: exact figures limited	One of the world's largest wetlands; essential for numerous species
Lake Chad Basin	Chad/Cameroon/Niger/Nigeria	Ruff (<i>Calidris pugnax</i>), Black-tailed Godwit (<i>Limosa limosa</i>), Spur-winged Goose (<i>Plectropterus gambensis</i>)	Hundreds of thousands; variable due to water levels	Dynamic wetland system; supports a range of migratory species
Nile Wetlands	Sudan	Eurasian Teal (<i>Anas crecca</i>), Northern Shoveler (<i>Spatula clypeata</i>), Garganey (<i>Spatula querquedula</i>)	Significant numbers: specific data varies	Series of wetlands along the Nile; important stopover and wintering sites
Walvis Bay – Sandwich Harbour	Namibia	Curlew Sandpiper (<i>Calidris ferruginea</i>), Sanderling (<i>Calidris alba</i>), Little Stint (<i>Calidris minuta</i>)	Around 450,000 migratory birds	Key coastal wetland; vital for Palearctic migrants
Merja Zerga	Morocco	Eurasian Wigeon (<i>Mareca penelope</i>), Common Teal (<i>Anas crecca</i>), Greater Flamingo (<i>Phoenicopterus roseus</i>), various waders	Up to 200,000 waterbirds	Premier Moroccan wetland; crucial for migratory waterbirds

As has been demonstrated for migratory and wintering shorebirds in other parts of the world (see “mudflats” in section 6), large concentrations of waterbirds can be expected to have positive impacts

on ecosystem functions in coastal and inland wetlands ([ref](#)). These effects include reducing erosion, controlling and engineering nutrient fluxes between the sediment and water column, and increasing carbon sequestration. Shorebirds could also restore wetland multifunctionality by controlling crab populations, thereby enabling vegetation recovery and improved sediment accretion.

Mammals: The Mediterranean monk seal (*Monachus monachus*) ([Figure 51](#)) is one of the most threatened mammals in the world ([ref](#)). The largest remaining population, approximately 350 animals, live at the Cap Blanc peninsula on the border between northern Mauritania and southern Morocco. The area includes a satellite reserve of the Banc d'Arguin National Park, which is described more in detail in [Case Study #4](#). The coast is considered one of the most productive fishing grounds in the world ([ref](#)). This is the only remaining population of the Mediterranean monk seal along the African coast. Historically, the range of the Mediterranean monk seal extended throughout the coast of the Mediterranean and Black Sea, including the eastern Atlantic along the African coast from the strait of Gibraltar to Mauritania, and in the oceanic islands of Macaronesia (Madeira, Azores, Canaries and Cabo Verde archipelagos) ([ref](#)). Until at least the 15th century, the Mediterranean monk seal was abundant enough to justify hunting expeditions for seal oil and pelts. Historical accounts report as many as 5,000 animals in Dakhla Bay, Morocco. However, overexploitation led to their decline and eventual extermination from most of their range. In recent centuries, the number of seals continued to decrease due to commercial fishing in Mauritania and Morocco in the middle of the 20th century, which led to persecution and habitat disturbance ([ref](#)).



Figure 51: Mediterranean monk seal. [Image Source](#)

Information on the diet of the monk seals from the Cap Blanc Peninsula indicates that squid, octopus and cuttlefish constitute 58% of their diet followed by fish (33%), and crustaceans (9%) ([ref](#)).

Although the Mediterranean monk seal is considered an apex species located near or at the top of marine food webs, and is anticipated to have considerable impact on the structure of pelagic ecosystems ([ref](#)), no information actually exists on the role it plays - or has played - in the coastal systems of north-western Africa.

However, information on the ecological role of the extinct Caribbean monk seal (*Monachus tropicalis*) provides an interesting perspective ([ref](#)). Like the Mediterranean monk seal, the Caribbean monk seal fed on a variety of fishes and invertebrates. An estimated 233,000 to 338,000 monk seals

relied heavily on the coral reef systems for their subsistence. Through its role within the food webs of the tropical marine ecosystems, the monk seals played a critical role in maintaining highly productive coral reefs. Once it was discovered that seal oil could be used to grease the machinery of sugar plantations, its fate was determined, and the species went extinct in 1952.

With help of a food web model ([ref](#)), containing 15 functional groups (monk seals, tiger and reef sharks, birds, turtles, fishes, crabs, zooplankton, phytoplankton, etc.) it was shown that monk seals positively influenced both their prey groups and the entire system. When seals were abundant, coral reef productivity was very high – exceeding that of any Caribbean reef today and is comparable with those measured in remote Pacific reefs. It remains to be seen if the same holds true for the Mediterranean monk seal and its interaction with the coastal ecosystems in Mauritania and Morocco in the past, but a large-scale comeback of the species will most likely benefit the entire marine environment in northern Mauritania and southern Morocco.

Megaherbivores: The seasonal rain patterns, with dry and wet periods, shape how herbivores use and influence the landscapes in Africa ([ref](#)). They generally move to wetlands over the dry season when grasses have dried out and forage is depleted in the favoured wet-season ranges. It has been argued ([ref](#)) that wetlands play a major role in maintaining herbivore population size and density in savanna ecosystems through their ability to provide critical resources during potential population bottleneck periods. Only a few species, like the hippo, the lechwes and sitatunga, live more permanently in wetlands. A good overview of how different herbivores are distributed across Africa's main wetlands is provided by Fynn, et al ([ref](#)). Rivers, floodplains, and wetlands associated with megafauna typically exhibit more heterogeneous geomorphological and vegetation characteristics than those where megafauna have been extirpated ([ref](#)).

The most extreme wetland megaherbivore is the **Common hippopotamus** (Hippo) (*Hippopotamus amphibius*). Historically, it was widely distributed with scattered populations along the Mediterranean coast and Morocco, extending to an almost continuous distribution throughout Sub-Saharan Africa. Today, the species has been classified by IUCN as Vulnerable, having experienced considerable population declines in the mid 1990s and early 2000s ([ref](#)). The hippo uses the water only as a retreat and typically does not eat aquatic vegetation, rather, they forage on grass at varying distances from a water source ([ref](#)). The species relies on a range of water sources – rivers, lakes, and wetlands although seasonally the animal can survive in muddy wallows.

Hippos have been named “*the nutrient kingpins of Africa’s waterways*” ([ref](#)). They change the savanna and its waterways in many ways ([Figure 52](#)). Their impact has been summarised as follows ([ref](#)):

- ◇ Vegetation structure and composition: Hippo grazing near water bodies transforms tall grasslands into grazing lawns.
- ◇ Terrestrial biodiversity: These grazing lawns attract other ungulates, which benefit from the nutritious forage and safety from the openness of the lawns.
- ◇ Biochemistry: Hippos move nutrients, such as silicon, nitrogen, phosphorus and carbon, from their night-time feeding grounds into their daytime resting habitat in rivers and ponds.

- ◇ **Hydrology:** They defecate in the water releases large amounts of dung and nutrients, increasing the water nutrient content and turbidity.
- ◇ **Aquatic biodiversity:** Hippo effects on biochemistry and hydrology have cascading impacts for primary as well as aquatic biodiversity.

Hippo dung is an important source of food for other aquatic creatures including tilapia, a fish widely consumed in Africa ([ref](#)). The hippo population of Lake Edward on the border of the DRC and Uganda was so severely depleted by poachers that the tilapia fishery collapsed – taking local fishing livelihoods and a key nutrient source for the local people with it.

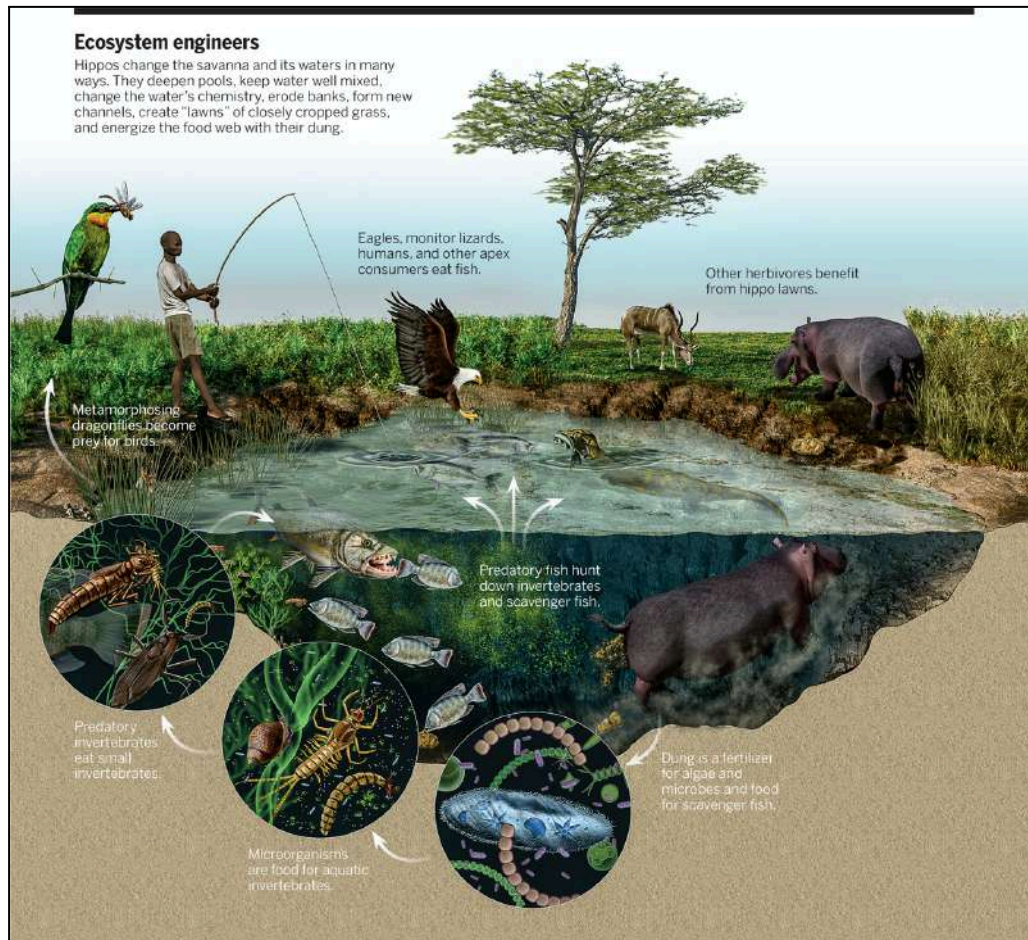


Figure 52: Through influencing vegetation structure and composition, biodiversity in water and on land, biochemistry, and hydrology, the hippo is a true keystone species in African rivers and wetlands.

[Image Source](#)

The hippo has a fascinating impact on the silicon cycle ([ref](#)). Silicon plays a major physiological and structural role in certain organisms, including diatoms, sponges, and many higher plants ([ref](#)). It has been demonstrated ([ref](#)) that the hippo is a key actor in the savanna biogeochemical silicon cycle and helps increase the transport of silicon to the streams by up to 76%. This can have large impacts on downstream lake ecosystems, where silicon availability directly affects primary production in the diatom-dominated phytoplankton communities ([Figure 53](#)).

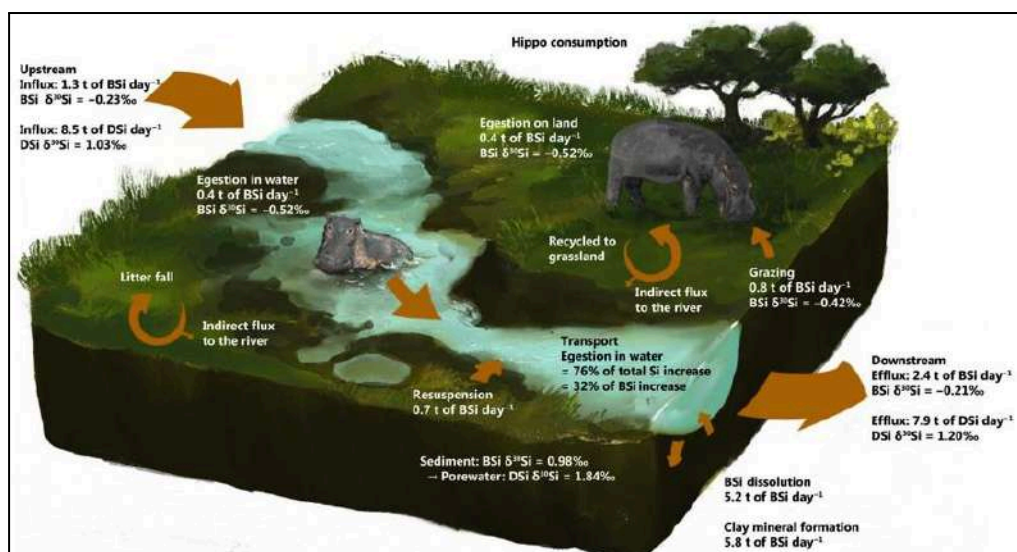


Figure 53: The complex animal silicon pump, as documented in the Mara River in Kenya, highlights the critical role of hippos in facilitating the transport of silicon - favourable for phytoplankton growth in downstream lakes. [Image Source](#)

Wetlands specialist antelopes: The wetlands-specialized **lechwes** consists of two species – the Southern lechwe (*Kobus leche*) (Figure 54) and the Nile lechwe (*Kobus megaceros*) (Figure 56). Southern lechwe has a discontinuous distribution in major wetlands in Botswana, Namibia, Angola and Zambia, and south-east DR Congo (Figure 55). Its present distribution closely resembles the historical range, although there has been notable contraction over the last century (ref). The five subspecies occupy separate ranges:

- ◇ Kafue lechwe (*K. l. kafuensis*) occurs in the Kafue Flats, central Zambia.
- ◇ Black lechwe (*K. l. smithemani*) is distributed in the southern half of the Bangweulu Swamps of northern Zambia. Formerly also on the Chambeshi floodplains along the upper Luapula floodplain between Zambia and south-eastern DRC, but it is unlikely to survive there.
- ◇ Red lechwe (*K. l. leche*) is found in the Okavango Delta, and the Kwando/Linyanti/Chobe system of northern Botswana; the Okavango, Kwando/Linyanti/Chobe, Mashu, and Zambezi River systems of north-east Namibia; and the upper Zambezi and middle Kafue of Zambia; the Cuando system of SE Angola and the Cuanza and Luando Rivers of Central Angola.
- ◇ Upemba lechwe (*K. l. anselii*) is restricted to the Upemba wetlands, Kamalondo depression, in Katanga Province of south-eastern Democratic Republic of Congo.



Figure 54: A group of Southern/Red lechwe antelopes running through shallow water in the Chobe National Park in Botswana. [Image Source](#)

Southern lechwe are associated with wetlands, preferring the shallow water margins of floodplains and swamps (less than 1 m deep), although they may occasionally swim across deep-water areas ([ref](#)). They typically frequent light woodlands and termitaria grasslands on the periphery of seasonally inundated floodplains, floodplain grasslands and water-meadows, shallow water meadows around permanently inundated swamps and lagoons, and occasionally papyrus and reed beds of deep-water swamps. Southern lechwe are grazers, feeding mainly on floodplain and aquatic grasses ([ref](#)).

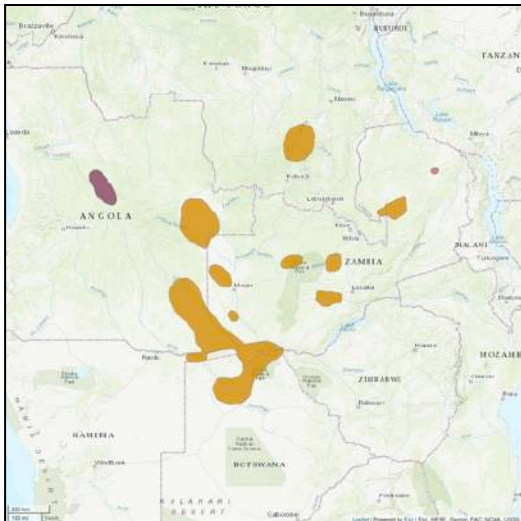


Figure 55: The discontinuous distribution of the Southern lechwe in major wetlands in Botswana, Namibia, Angola and Zambia, and south-east DR Congo. [Image Source](#)

The Nile lechwe is found only in South Sudan and Ethiopia. The largest part of its range occurs in the Sudd swamps along the Bahr-el-Ghazal (White Nile) and Sobat rivers ([ref](#)). There is a smaller population in the Machar marshes near the Ethiopian border, extending marginally into Gambella National Park (NP) in south-west Ethiopia, where its survival is highly precarious because of expanding human activities. The Nile lechwe is confined to seasonally flooded swamps and

grasslands and it is almost always on the edge of deeper swamps where the water is shallow (between 10 and 40 cm deep) ([ref](#)).



Figure 56 Male Nile lechwe. [Image Source](#)

The **sitatunga** (*Tragelaphus speki*) ([Figure 57](#)) is an antelope species heavily associated with wetlands. It lives in the upper Nile Watershed, the Congo Basin, and southern Africa ([Figure 58](#)). Due to its adaptation to dense vegetation in swamps and papyrus marshes, very little is known about its ecology ([ref](#)). A study in the Mayanja River in Uganda ([ref](#)) has confirmed its dependence on the wetlands in the river zone. It has been concluded ([ref](#)) that the sitatunga avoid disturbed habitats and confirmed the prediction of more intense use of undisturbed than disturbed wetland areas.



Figure 57: African sitatunga antelope in wetland habitat with lush vegetation during daylight. [Image Source](#)

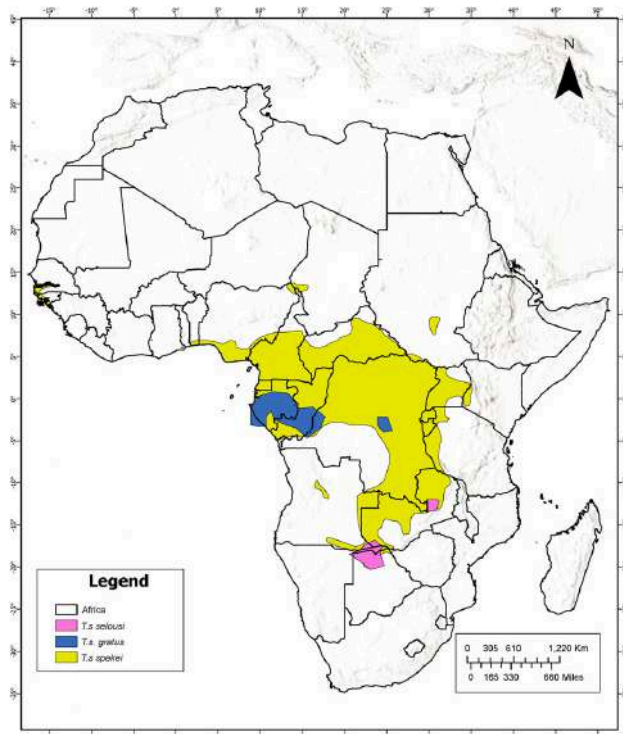


Figure 58: Distribution of the three different subspecies of the African sitatunga. [Image Source](#)

The **African buffalo** (*Syncerus caffer*) is water-dependent and has to drink at least every two days, unable to survive solely on the moisture content of their food ([ref](#)). Savanna buffalo herd size varies across their distribution from as few as 20 to as many as 2,000 individuals in the floodplains of eastern and southern Africa.

The African buffalo occupies an important niche, opening up habitats that are preferred by short-grass grazers. Although the African buffalo are primarily grazers, savanna buffalo can partially switch their diet to browse when grasses become tall and lignified ([ref](#)). In many savanna regions of Africa, pronounced seasonal variability in rainfall results in wildlife being restricted to floodplains and other habitats adjacent to permanent surface water in the dry season - which also applies to the African buffalo ([ref](#)). Nearly 100 per cent of the biomass density of large water-dependent grazing herbivores has been found within a 15 km radius from surface water ([ref](#)). The large herds of up to 2,000 individuals in floodplains likely play an important role in the nutrient cycle within wetlands.

Otters: Africa hosts four otter species—three Sub-Saharan and one (the Eurasian otter) in the Mediterranean region ([ref](#)):

- ◇ Spotted-necked otter (*Hydrictis maculicollis*): The most aquatic of the African species, specialises in hunting fish by sight in clear, deeper, and flowing waters. This otter will also prey on frogs, crabs, and small water birds. If there is enough prey, it will form large, social, all male or juvenile groups; two females with cubs have been known to form loose packs using the same core area simultaneously.
- ◇ Congo clawless otter (*Aonyx congicus*): The least studied of Africa's otters, little is known about this species. Its reduced whiskers, absent webbing, tiny claws and generalised dental

morphology, combined with rare sightings, show that this species is mainly terrestrial, exploring marshes and forests.

- ◇ African clawless otter (*Aonyx capensis*): The third largest otter species in the world, the African clawless otter is highly versatile. It inhabits a wide range of environments, from towns, cities and highly polluted rivers to natural freshwater and marine habitats, provided there is freshwater close-by to wash off the salt. The African clawless otter has large molars adapted to crushing crabs and lobsters, its diet also includes frogs, fish and insects.
- ◇ Eurasian otter (*Lutra lutra*): Although nearly extinct in Africa⁵, the Eurasian otter is usually nocturnal and can be found in many freshwater environments. In some environments, however, it has diurnal habits and forages in the sea, later looking for freshwater pools to wash the salt out of its pelt. It has a varied diet which includes fish, crustaceans, amphibians and sometimes reptiles, birds, eggs, insects, and worms.

Detailed ecological knowledge of the three sub-Saharan otter species remains limited. However, the food habits of two co-existing otter species were studied in a catchment in the KwaZulu-Natal Drakensberg ([ref](#)). Food preferences differed: the African clawless otter ([Figure 59](#)) largely ate crabs, whereas the spotted-necked otter was primarily piscivorous. The spotted-necked otter showed greater trophic plasticity in different habitats and exhibited a wider trophic niche than the African clawless otter. Dietary patterns fluctuated for both species, however, and both ate fishes in winter when water temperatures were low. Frogs were a supplementary food resource, but the otters seldom caught reptiles, birds, or mammals. In the Okavango Delta, the Spotted-necked otter and African clawless otter are expected to play an important role in recycling nutrients ([ref](#)).



Figure 59: The big African clawless otter hunts crabs both in inland and coastal waters, but it's unclear if the otter exerts a top-down impact on its prey species, generating trophic cascades. [Image Source](#)

8. Practical conservation aspects

The following section outlines practical conservation applications informed by the findings discussed above and illustrated through the eleven case studies.

⁵ Kingdon, J. 2015: «The Kingdon Field Guide to African Mammals», 2nd edition, Bloomsbury Wildlife, London

8.1 Ecosystem specific key species

The literature overview and the area-specific case studies indicate the following connections between different wetland ecosystems and the keystone role of different animal species:

- ❖ Shallow lakes: Lake Chad - Predatory fish feeding on zooplanktons (e.g., Pebbly fish, Upside-down catfish) and on benthic molluscs (e.g., Red tailed synodontis and Wahrindi), hippo (silicon pump)
- ❖ Deep lakes: Lake Victoria - Predatory fish like Nile perch (introduced) or prior: the Silver butter catfish and the African sharptooth catfish.
- ❖ Inland deltas: Example, Okavango Delta – Hippos, savanna elephants, African buffalo, fish eating and colonial breeding birds, in permanent swamps - predatory fish, such as tigerfish, African sharptooth catfish and threespot tilapia, in seasonal swamps – predatory fish like silver catfish and African pike, and termites
- ❖ Coastal lagoons and estuaries: Predatory and migratory fish, West African manatee, large waterbirds (cormorants, egrets/herons, bitterns, ibises, spoonbills & storks)
- ❖ Seagrass meadows: Dugong, predatory fish (e.g., species like Orange-lined triggerfish and Humphead wrasse that feed on sea urchins), tiger shark, Mediterranean monk seal (?)
- ❖ Mudflats: Fiddler crabs, shorebirds
- ❖ Coastal sandy beaches and islands: sea turtles, colonial seabirds
- ❖ Mangroves: Bivalves, gastropods, “shipworms”, shore crabs, frigatebirds, red-footed booby; large waterbirds
- ❖ Tropical coral reefs: Parrotfish, grey reef shark
- ❖ Kelp forests: Great white shark, West Coast lobster
- ❖ Offshore/ marine - Atlantic Humpback Dolphin, sharks and rays

This kind of basic information could be used for a first assessment of the functionality of a wetland and to what extent it is in need of restoration efforts. Good ecological knowledge is required for site-specific assessments and for more precise conservation recommendations.

8.2 Species specific ecosystem services

Table 3 provides examples from the literature review of how different individual species and species groups contribute to supporting and regulating ecosystem services. Additional information is provided in the global report released in February 2025, such as the role of different animal species in climate mitigation and adaptation ([ref](#)). These overviews clearly demonstrate how important various animal species are in securing the basic supporting services of inland and coastal wetlands, and that the conservation and restoration of these places must consider these functional relationships.

Table 3: Contribution of different animal species and groups to various supporting and regulating ecosystem services in African inland and coastal wetlands (tbc = to be clarified).

SUPPORTING SERVICES	SPECIES
Ecosystem engineering and habitat modification	Common hippo, Savanna elephant, African buffalo, Termites, West African manatee, Dugong, Shorebirds, Teredinid bivalves ("shipworms"), Shore crabs (<i>Carcinus spp.</i>), Fiddler crabs (family <i>Ocypodidae</i>), Coral fish (especially Parrotfishes), Nile crocodile, West African crocodile, Southern/Red lechwe and Nile lechwe (tbc), Sitatunga (tbc)
Nutrient cycling and ecosystem productivity	Spotted-necked otter, African clawless otter, Termites, Colony breeding waterbirds, Fishes in coastal lagoons & estuaries, West African manatee, Dugong, Shorebirds, Bivalves, Gastropods, Great frigatebird, Lesser frigatebird, Red-footed booby, Nile crocodile, Common hippo, Southern/Red lechwe and Nile lechwe (tbc), Sitatunga (tbc), African buffalo, Spotted hyena (?), Grey reef shark
Sediment/soil formation and control (e.g., reduced erosion)	Coral fish (e.g., Parrotfishes), Shorebirds
Seed dispersal	West African manatee, catfish (e.g., African sharptooth catfish and Silver catfish), Large herbivores
Mediating cross-ecosystem linkages	Dugong (from seagrass meadows to coral reefs), Hippo, Nile crocodile
Biodiversity enhancement	Coral fish (e.g., Parrotfishes), Shorebirds, Mediterranean monk seal (tbc), Common hippo (both aquatic and terrestrial)
Food webs and trophic cascading	Pebbly fish, Upside-down catfish, Graham's cichlid, Nile perch, Tiger fish, Sharptooth catfish, Threespot tilapia, Silver butter catfish, African pike, Tiger shark, Orange-lined triggerfish, Humphead wrasse, Shorebirds, Bivalves (aquatic molluscs), Gastropods (slugs & snails), Giant trevally, Otters (tbc)
Water distribution and flow	Common hippo, Savanna elephant, African buffalo
Ecosystem heterogeneity	Large mammals (e.g., large herbivores), parrotfish,
REGULATING SERVICES	SPECIES
Carbon dynamics, climate regulation and adaptation	Tiger shark, Shorebirds
Flood regulation	tbc
Water purification	tbc
Invasive species control	West African manatee, waterbuck, reedbuck, impala, oribi and African buffalo (combatting <i>Mimosa pigra</i>)

The wise use of all wetlands is a fundamental concept “underpinning the work of the Convention on Wetlands”, with the “**ecological character**” as a central concept “to stem the progressive encroachment on and loss of wetlands now and in the future”. As for the definition of “ecological character” – “the combination of the ecosystem components, processes and benefits/services that characterise the wetland at a given point in time” – we recommend recognising and including the fundamental role wild animals play in shaping inland and coastal wetlands, including their ecosystem services. The above data from Africa, together with the global assessment published in “Taking Animals into Account”, serve as proof of this essential connection.

8.3 Five key messages from the case studies

1. Rewilding works! A vital part of the rewilding journey is to facilitate the return of wild animals to areas where they once occurred so that they again can play their critical ecological role. The Maputo National Park ([Case Study #7](#)) and Gorongosa National Park ([Case Study #8](#)) Mozambique serves as prime examples that this conservation strategy works very well, when implemented together with the local communities. Here is the ecological side of the stories.

The **Gorongosa Project** has been labeled “the most ambitious and successful large-scale rewilding efforts anywhere in the world to date” ([ref](#)). With its significant scientific reporting ([ref](#)), it’s also one of the best documented. From “once known as the crown jewel of Africa’s national parks” ([ref](#)), the runaway poaching during the Mozambican Civil War 1977-1992 stripped the Gorongosa National Park of more than ninety percent of its large-mammal fauna and extirpated several top carnivores, like leopard, African wild dog, and Spotted hyena ([ref](#)). Only a handful of lions had survived. The defaunation led to invasion of the “once lawn-like” grasslands, the “wetland-chocking” invasive shrub (see below) proliferated in the floodplain ([ref](#)). The rewilding efforts started in 2008. In addition to curtailing illegal hunting, around 500 animals of nine species were translocated into the park ([ref](#)):

- ❖ Blue wildebeest: 180 (from Limpopo Province, South Africa),
- ❖ African buffalo: 210 (from Limpopo & Kruger National Parks, South Africa),
- ❖ Eland: 35 (from Mozambique),
- ❖ Elephant: 6 (from Kruger National Park, South Africa),
- ❖ Hippo: 5 (from Isimangaliso Wetland Park, South Africa),
- ❖ Zebra: 15 (from Mozambique),
- ❖ African wild dog: 45 (from Kwazulu-Natal, South Africa, [ref](#)),
- ❖ Spotted hyena: 6 (from Mozambique, [ref](#)),
- ❖ Leopard: 4

By 2018, the total large-herbivore biomass had reached nearly pre-war levels and the lion population was also approaching pre-war abundance ([ref](#)). However, the abundance of buck species was heavily skewed towards medium-sized, solitary-to-moderately-social ungulates (Waterbuck, Reedbuck, Kudu, Nyala, Warthog) in contrast to the pre-war fauna dominated by larger-bodied gregarious species (Elephant, Hippo, Wildebeest, Zebra). In aerial wildlife counts in 2024, more than 110,000 animals of 20 species were recorded ([ref](#)), which is higher than the numbers documented in the

1960's and 1970's. However, there were still more smaller-bodied individuals and waterbuck as compared to the number of larger-bodied buffalo, wildebeest and zebra in the past. Time will show if and when the system will have returned to the pre-war situation, which is also more typical for other savanna areas in southern and eastern Africa.

From the point of the wetlands in the park, the rewilding efforts have already removed one major threat - the Giant sensitive tree, *Mimosa pigra* (see below).

The rapid recovery of mid-sized ungulates has enabled the Park to export animals to other rewilding areas: 1619 Waterbuck, 200 Warthog, 193 Reedbuck, 50 Oribi, and 48 Sable (*Hippotragus niger*) ([ref](#)). The rapid re-establishment of wild dogs even allowed five to be exported in 2021.

In **Maputo National Park**, which was also defaunated in the past, the first 54 animals of four species - zebra, warthog, nyala & impala - were reintroduced in 2010 followed by another 5,334 animals until 2024, with an additional eleven species, including five ungulates - African buffalo, Wildebeest, Giraffe, Kudu, and Eland - and two large carnivores - Cheetah and Spotted hyena ([Figure 60](#)). The numbers of free-living animals have already doubled, with an estimated 13,800 'game' animals in the park at present. There is a continued northwards dispersal of some of the reintroduced species into the open grassland areas, and at this rapid growth rate, no further introductions are required, only a continuation of the high standard of wildlife protection currently being undertaken.



Figure 60: The Spotted hyena was included in the pool of species reintroduced to both the Gorongosa National Park and the Maputo National Park. The [ecological role of scavengers in wetlands](#) is not well documented, but through their feeding on carcasses they may play an important role in nutrient recirculation and disease control. Spotted hyena feeding on Greater kudu (*Tragelaphus strepsiceros*) in a wetland. [Image source](#)

A third rewilding success story is the Chumbe Island Coral Park in Zanzibar, Tanzania ([Case Study #5](#)). Through the establishment of a no-take fishing reserve (see below), 80% of the hard coral reef recovered, providing habitat for 529 species of reef fish and 257 reef-based invertebrates. The return of the ecologically important black-tip reef shark and the vulnerable neonate shark is witness to the return of a more functional reef. The staggering increase in commercially valuable fish biomass from

194 kg per hectare of reef in the 1990s to today's 1,506 kg/ha also shows that the rewilding of a reef can have very significant, positive spillover effects for neighbouring fisher communities.

2. Combat unsustainable use of key wetland species: As noted in section 6 of this report, Africa has experienced the greatest decline of terrestrial, freshwater and marine species of any continent for utilized species since 1970 ([ref](#)). The [Case Study #9](#) on the Hippo from Uganda's Murchison Falls National Park and Conservation Area illustrates this issue, with a dramatic decline of a species that is critically important for the functions of inland wetlands. The Common hippopotamus is listed under Appendix II of CITES, which means that it is "not currently threatened with extinction, but that may become so without trade controls" ([ref](#)). Only an export permit (or re-export certificate) from the country of export/re-export is required for trade, but no import permit is needed unless required by a country's national law.



Figure 61: Following the listing of African elephant species in CITES Appendix I in 1989, the export of illegal hippo ivory increased by an estimated 200% – a trend that has continued in the intervening decades. [Image source](#)

While the overall population is considered stable, the IUCN states: "Conservation status of hippos remains precarious, and the need for direct conservation action to protect hippos and hippo habitat across their range is a priority. Although hippo populations have stabilised in some countries, declines are still reported in many countries. The growing and unabated threats of habitat loss and unregulated hunting ([Figure 61](#)) are major challenges to hippo population viability and persistence" ([ref](#)). The most common trade in hippos is in ivory carvings. The USA, France and Hong Kong are among the top importers, while the leading countries of origin are Tanzania, Zimbabwe, Uganda, South Africa, and Malawi ([ref](#)). Hunting hippos is completely banned in 14 African countries: Angola, Burkina Faso, Cameroon, Central African Republic, the Democratic Republic of Congo, Gabon, Ghana, Guinea Bissau, Kenya, Niger, Nigeria, Rwanda, Senegal and Somalia ([ref](#)). Although the trade from Uganda is legal, the information from the case study indicates that it's not sustainable. Hippos are particularly vulnerable to overexploitation due to their low reproductive output ([ref](#)). Females only reach sexual maturity at around ten years, and mature cows produce just one calf at a minimum of two-year intervals. Research suggests that for the hippo, even an offtake of 1% of the adult

population sustained over several decades can result in population declines when accounting for rainfall variability and habitat loss ([ref](#)). Yet in all the top countries of origin except Zambia, the estimated legal trade exceeded 1% of the total population ([ref](#)). What's considered a "sustainable" harvest of the hippo, also needs to evaluate the negative impacts on the functioning of wetlands. This is an illustration that wetland conservation often needs to look for policy solutions outside the traditional working areas, in this case in relation to the CITES convention.

3. Establish effective no-take fishing zones in inland and coastal waters : Fishing poses a challenge for maintaining functional wetlands. As described in the global "Taking Animals into Account" report ([ref](#)), fishing in marine and freshwater ecosystems with a gradual shift in landings from long-lived, high trophic level, piscivorous bottom species to short-lived, low trophic planktivorous fish - "fishing down the food web" – dramatically influences the functions of the entire systems. The selection for large and old specimens of fish also alters the trophic dynamics and ecological processes in ocean ecosystems, rivers, and lakes. Therefore, it is rewarding to learn from the Chumbe Island Coral Park ([Figure 62](#)), [Case Study #5](#), that the introduction of a fully protected no-take area increased the biodiversity of coral reefs, allowed the recovery of key species like the Black-tip shark and Parrotfishes, increased the coral resilience against climate change, and dramatically increased the biomass of commercially fished species outside the reserve. There is an urgent need for many more truly effective no-take fishing areas, both in inland waters and marine environments.



Figure 62: The success of Chumbe Island Coral Park extends beyond its boundaries through robust community engagement and strategic partnerships. Local people are not only beneficiaries but active participants in the island's mission to protect the environment. [Image source](#)

4. Intact ecosystems with megaherbivores are more resilient against alien invasive plant species than degraded: Herbivory is known to regulate plant biomass, increase light at ground levels, increase plant richness and structural diversity ([ref](#)). Megaherbivores have the capacity to persist on lower quality diets and thus tend to have a qualitatively broader selection of available food plants. Consequently, megaherbivores may have an impact on a greater diversity of plants than smaller herbivores ([ref](#)). In a study in India with elephants, rhinoceros, wild buffalos, and gaur (Indian bison),

a positive association between high abundance of megaherbivores, high cover and richness of native plants and low cover of invasions were documented ([ref](#)). The study shows great potential for megafauna-based trophic rewilding as a nature-based solution to counteract dominance of plant invasions.

In Africa, the neotropical semiaquatic shrub *Mimosa pigra* (“the Giant sensitive tree”, [Figure 63](#)), which has been listed among the world’s 100-worst invasive alien species, poses a big threat to biodiversity, ecosystem services and human livelihoods in wetlands ([ref](#)). The species is notorious for degrading tropical wetlands by forming [impenetrable prickly thickets](#).



Figure 63: The Giant sensitive tree, *Mimosa pigra*. [Image source](#)

The Gorongosa National Park in Mozambique ([Case Study #8](#)) provides a prime example of how large herbivores can control the Giant sensitive tree ([ref](#)). In the mid-1990s, as a result of the civil war (1977-1992), 90% of the park’s large mammals were gone. The floodplain’s formerly open grasslands had begun to be overgrown by woody plants, especially *Mimosa pigra*. However, with the rewilding of the park initiated in 2008, large herbivore species like waterbuck, reedbuck, impala, oribi, and buffalo returned and started to feed on the Giant sensitive tree ([Figure 64](#)). And today, we’re back to the situation in the 1970s when the floodplain teemed with wildlife and *Mimosa pigra* but not an existential threat.



Figure 64: *Mimosa pigra* thrives inside a herbivore enclosure, whilst it is absent outside the enclosure where waterbuck, reedbuck, impala, oribi, and buffalo can freely graze and browse. [Image source](#)

5. Ensure the ‘flow’ of water and wildlife in large-scale Landscapes, “Wetlandscapes” & Seascapes: It is essential to place individual wetlands within a wider landscape perspective - “[wetlandscapes](#)” (Figure 65) - not only in terms of hydrological aspects but also the critical role animals play in this wider geographical perspective, like migratory fish, mammals, and birds. In Africa, the seasonal rain patterns, with dry and wet periods, determine how these animals shape the landscapes, including the wetlands ([ref](#)). Many wetlands, including coastal, are also dependent on the flow of nutrients across the terrestrial-aquatic interface generated by birds and mammals.

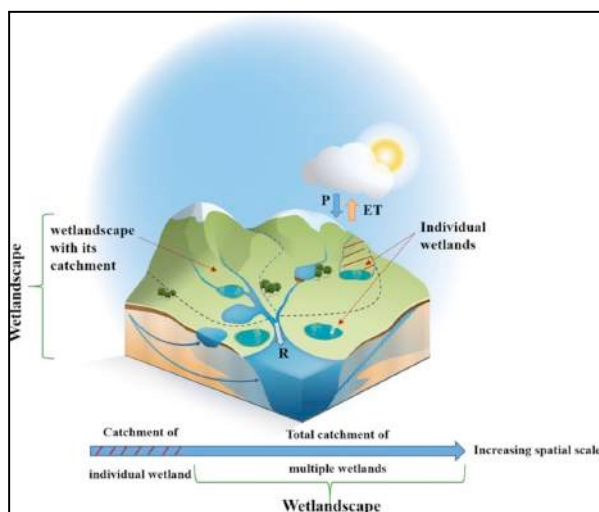


Figure 65: Conceptual sketch of a “wetlandscape” consisting of multiple wetlands that are hydrologically connected within an associated hydrological catchment - larger than that of an individual wetland. [Image source](#)

The seasonally flooded Okavango Delta is shaped by wild species like hippos, elephants, African buffalos, migratory fish as well as colonial breeding waterbirds – e.g. heronry sites ([ref](#)). Some of these animals undertake large annual migrations, like elephants and [zebras](#) (Figure 66).



Figure 66 The restored migration routes of the Common zebra (*Equus quagga*) in northern Botswana. [Image source](#)

To ensure the different functions of this inland delta, there is a need to maintain free-flowing rivers as well as free passage for key migratory species at large scale. The good news is that the delta is part of the 520,000 km² Kavango Zambezi Transfrontier Conservation Area (KAZA) ([Figure 67](#)), one of the largest of its kind on the Planet ([ref](#)).

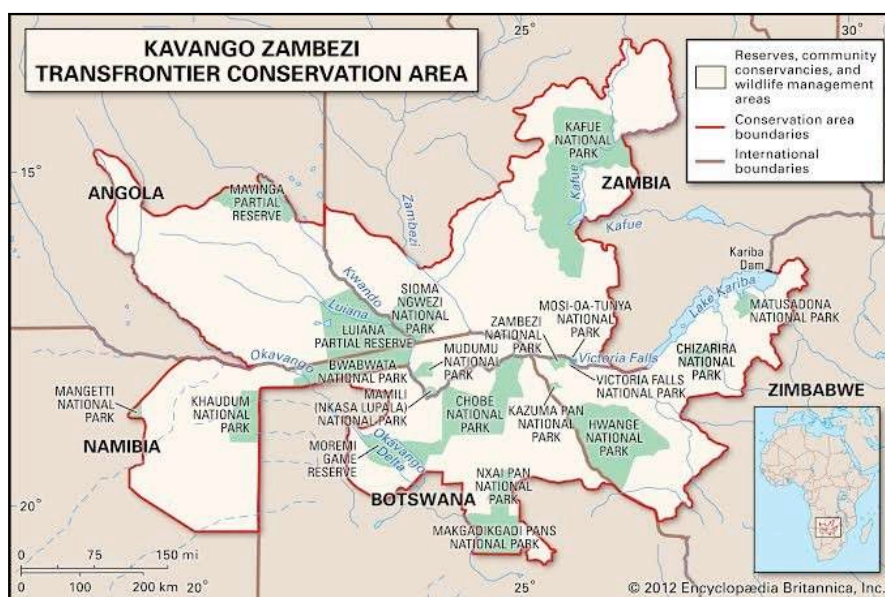


Figure 67: The Kavango Zambezi Transfrontier Conservation Area (KAZA) spanning the Kavango and Zambezi River basins in Angola, Botswana, Namibia, Zambia, and Zimbabwe. [Image source](#).

The following five additional case studies provide other examples of the integration of key wetland areas and animal species in larger conservation areas of Africa, with a strong human dimension:

- ❖ The Urema floodplain – Gorongosa National Park, Mozambique (#8),
- ❖ The Banhine and Maputo National Parks, Mozambique (#7),
- ❖ The Grand Mano Landscape, Sierra Leone & Liberia (#10),
- ❖ The Parc National du Banc d'Arguin, Mauritania (#4),
- ❖ Tondwa Game Management Area, Zambia (#11),

The Urema floodplain and Banhine and Maputo National Parks in Mozambique as well as the Tondwa Game Management Area provide interesting examples of how to integrate a rewilding agenda into a local development perspective. The Tondwa case study also briefly describes a future perspective of how to generate new, innovative financing.

8.4 Consequences for Ramsar Site designations

As indicated by this report (see section 6), only in one percent of the cases were “other taxa” considered for the Ramsar Site designation in Africa. The use of waterbirds and fish was restricted to 14% and 15% respectively. The extent to which the presence of additional species was used in applying the criteria, (e.g. for #1-4), is unclear and will require a review of the individual site descriptions.

A preliminary analysis of the main findings of the global “Taking Animals into Account” report in relation to the strategic framework and guidelines for Ramsar Site designations is already available ([ref](#)). For the criteria, there “seems to be a general lack of recognition regarding the critical role some animal species play in shaping the composition and functionality of various wetland categories and associated ecosystem services”. Two options were proposed to fill this gap:

- “Add a new, specific criterion, addressing the critical role animal species play in the ecological status of wetlands”, or
- “Provide enhanced guidance on this issue in the Strategic Framework, to explicitly encompass a diverse range of organisms, including mammals, birds, reptiles, amphibians, fish, macro-crustaceans, while reflecting the distinct differences between wetland categories”.

As to the four species-associated criteria, #5, 6, 7 and 8, only the ones for fish (7 and 8) incorporate an ecological perspective. By adding an explicit reference to ecological functionality, criterion 3 has an interesting potential to also encompass the findings of this and the global “Taking Animals into Account” reports.

Based on the information in this study, it is highly recommended to nominate some **additional sites** in Africa as Ramsar Sites of International Importance, which show a high degree of ecological functionality, such as:

- ❖ The Banhine and Maputo National Parks in Mozambique ([Case Study #7](#)),
- ❖ The Gorongosa National Park in Mozambique ([Case Study #8](#)),

9. Conclusions

The Africa Special Report reaffirms the core findings of the global “Taking Animals into Account” report: wild animals, as ecosystem engineers, play a fundamental role in delivering essential supporting ecosystem services - including nutrient cycling, ecosystem productivity, sediment and soil formation, seed dispersal, biodiversity enhancement, food web regulation, and cross-ecosystem connectivity. These “supporting services” act as the basis for important “regulating services”, such as carbon cycle, climate regulation and adaptation, flood control, water purification, and the control of invasive alien species. Although Africa retains the most preserved assemblage of megafauna species on the Planet, these critical ecological functions are increasingly at risk due to the rapid decline of many wildlife populations. Urgent action is needed to protect existing populations and rewild these wetlands to restore and sustain their critical ecological functions.

10. References

The information provided in the main report is referenced with help of hyperlinks, allowing for quick access to the original information. Some of the case studies also provide traditional literature references.

11. Acknowledgement

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The mission of the **Global Rewilding Alliance (GRA)** is to mainstream rewilding in science, policy and practice globally by 2030.

The alliance is a partnership of over 250 rewilding organisations that are active on every continent, bringing back dozens of missing species and reinstating whole ecosystems in land- and sea-scapes. Together, they are currently helping to influence the rewilding of 2.2 million sq.km of land and 5 million sq.km of sea in 124 countries.



Black Lechwe. [Image Source](#)



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ANNEX I: Case Studies 1–11

Case Study #1: The Okavango Delta – A Living System Engineered by Animals

Magnus Sylvén, Global Rewilding Alliance



Figure 1: The Okavango Delta in Botswana at the peak of flooding when water spreads over an area of 6,000–15,000 km². [Image Source](#)

In the Okavango Delta ([Figure 1](#)), three important ecosystem engineers - hippos, elephants, and termites - play a vital role in its creation and ongoing maintenance ([ref](#)). The annual floods peak in the upper delta between February and April and reach the distal end of the delta five months later, between June and August. The water moves from the main channels to the side arms and lagoons in a dynamic equilibrium between sediment deposition and the actions of large animals, especially hippos and elephants. The vegetation is shaped by a complex interaction of water flow, soils, nutrients, and fire. In addition to the annual flooding regime, the large-scale processes that link the terrestrial and aquatic ecosystems determine the shape of the delta. Three key processes have been identified ([ref](#)):

- Role of large animals,
- Role of termites,
- Biotic mobilisation of nutrients.

Large Animal Engineers

Hippos: Through their daily movements between water and land, hippos ([Figure 2](#)) create vegetation-free channels that facilitate water flow during flooding ([ref](#)). Hippos regularly break through dense papyrus and reed beds, diverting water and sediments into new areas. The lagoons created and maintained by hippos also act as major habitats for fish. Hippos also play a critical role in transferring organic matters (carbon, nitrogen and hydrogen) from land to water, ([ref](#)) as well as silicon ([ref](#)) (more information on the ecological role of the hippo is given in section 7).

Elephants: Elephants create channels, both by walking through flooded vegetation ([Figure 3](#)) and through creation of depressed pathways during the dry season, which subsequently serve as

conduits for floodwaters ([ref](#)). Through killing and mangling trees along with other plants, elephants keep areas open within the delta. They also play an important role in seed dispersal through their dung.

African buffalo: Live in high densities in the delta ([Figure 4](#)), affect vegetation structure and fertilize floodwaters through their droppings, enhancing fish productivity.

Other key fauna, such as otters, Nile crocodiles, water monitors, and fish-eating birds, play essential roles in nutrient recycling and food web maintenance.

The delta also supports a globally important population of the **Southern lechwe antelope** (*Kobus leche*), with numbers rising from 57,637 in 2014 to 88,585 in 2018 ([ref](#)). Their ecological role is detailed in section 7 of the main report.



Figure 2: The common hippo is a true keystone species in the Okavango Delta, facilitating the flow of nutrients from land to water, creating and maintaining lagoons and channels for the water flow, benefitting the entire wetland ecology. [Image Source](#)



Figure 3: The savanna elephant creates channels in the Okavango Delta, both by walking through flooded vegetation and through creation of depressed pathways during the dry season, which then serve as conduits for floodwater and the dispersal of fish and other aquatic organisms. [Image Source](#)



Figure 4: A group of buffalo plough through the wetlands of the Okavango Delta, creating new canals for fish and other aquatic animals and plants to colonise. By defecating in the water, the buffalos also fertilise the water. [Image Source](#)

Invertebrate Engineers: The Role of Termites

Termites (*Macrotermes michaelseni*) play an important role in the ecology of terrestrial and water ecology of the delta. During dry periods, they colonise areas with suitable clay soils and vegetation. Some of these mounds ([Figure 5](#)) become colonised by trees and other plants, serving as feeding grounds by many mammals and birds, like colony breeding species, which fertilise the soils. During flooding the termite colonies create local influxes of nutrients from the fungi gardens and from the

termites themselves ([ref](#)). For fish, the 150,000 termite-derived islands not only determine the location of channels but also provide complex habitats with fallen trees (often the result of elephants' actions) and other structures, which attract terrestrial insects that become an important source for fish ([ref](#)).



Figure 5: Termite mounds serve as the foundation for new islands in the terrestrial-aquatic mosaic of the Okavango Delta. [Image Source](#)

Biotic Mobilisers: Birds and Fish in Nutrient Cycling

Okavango Delta is also important for breeding waterbirds, and with 31 breeding species distributed across 8 colonies ([Figure 6](#)) it's one of the most important breeding areas for many species in the whole of southern Africa ([ref](#)). Since breeding colonies of waterbirds generate a lot of nutrients (nitrogen and phosphorus) in other wetlands around the world ([ref](#)), it can be safely assumed that the same applies to the delta with positive impacts on the oligotrophic water conditions ([ref](#)).

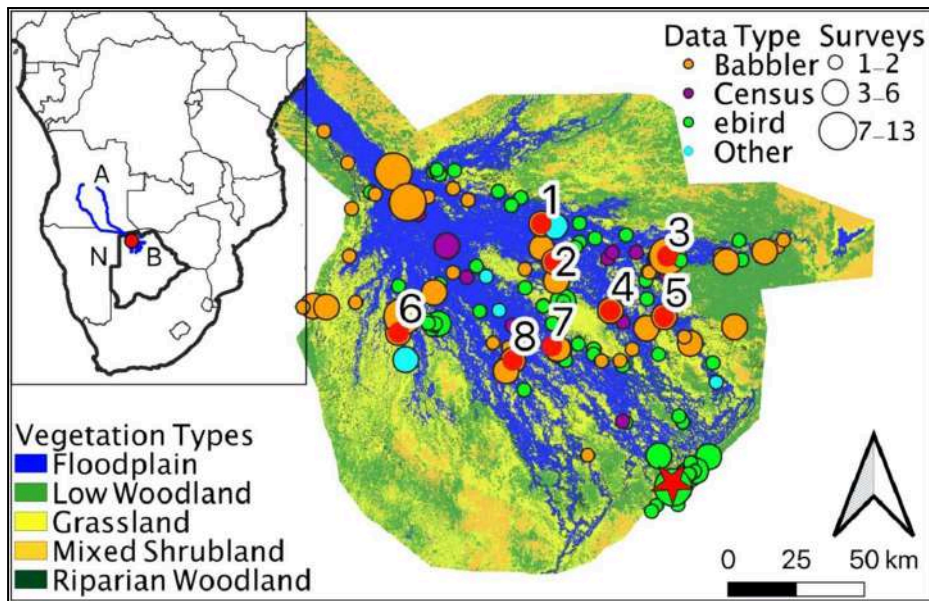


Figure 6: Distribution of the eight main breeding colonies of herons, egrets, storks, ibises, spoonbills, and cormorants in the Okavango Delta. [Image Source](#)

Fish is a very prominent feature of the delta ([ref](#)). The approximately 70 species exhibiting a wide range of life history strategies adapted to the delta's mosaic of permanently and seasonally flooded habitats. Predatory species such as Tigerfish (*Hydrocynus vittatus*) ([Figure 7](#)), sharptooth catfish (*Clarias gariepinus*) and Threespot tilapia (*Oreochromis andersonii*) dominate the permanent swamps, while the most common fish species in the seasonal swamp are Silver butter catfish (*Schilbe intermedius*) and African pike (*Hepsetus odoe*). The ecological relationships within the fish community, such as the annual catfish runs, are finely tuned to the hydrological, chemical, and biological components of the delta ecosystems. Understanding and protecting these components and processes is key to maintaining the Okavango Delta as one of the world's most remarkable wild places ([ref](#)).



Figure 7: The predatory Tigerfish is one of the keystone species in the permanent swamps of the Okavango Delta. It can grow up to 1 metre in length and has been described as a “fierce hunter”, living in schools when smaller but hunting alone when larger and older. It has even been found jumping out of the water to catch Barn swallows (*Hirundo rustica*) on the wing as they fly near the surface of the lake feeding on insects. [Image Source](#)

Case Study #2 : West African Manatees and Dugongs - Ecological Roles of African Sirenians

Magnus Sylvén, Global Rewilding Alliance

Among the megafauna tied to these coastal and riverine systems are the dugongs and manatees, large herbivores dependent on tropical and subtropical shallow-water habitats rich in plant resources. Africa is home to two of these iconic species: the Dugong, found along the eastern African coastline, and the West African manatee.

West African Manatee Ecology

The West African manatee (*Trichechus senegalensis*) is a large aquatic mammal found in coastal and inland wetlands of Western Africa between Mauritania and Angola, and inland as far as Mali, Niger, and Chad (Figure 1 and 2) (ref). It occupies coastal and estuarine habitats, coastal lagoons, and the lower reaches of most river systems from the Senegal River of Mauritania/Senegal to the Longa River in Angola. It has also found its way into the mid and upper reaches of several rivers in this region, notably the Senegal and Niger Rivers. It feeds on a diverse set of aquatic angiosperms in marine, estuarine, and freshwater habitats, and occasionally on fish, clams, crabs, and mussels (ref).

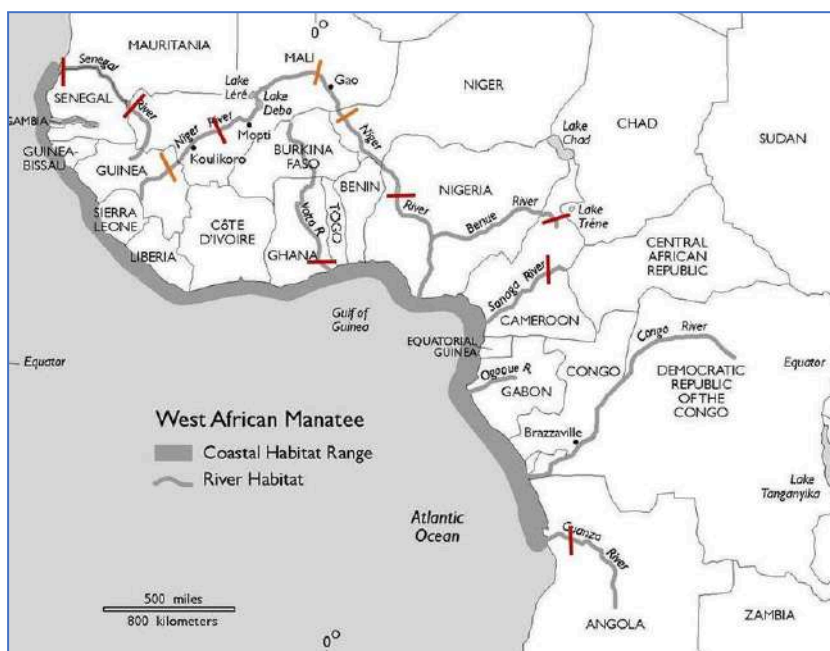


Figure 1: Distribution of the West African manatee, showing how the species reaches far inland exploring freshwater ecosystems. [Image Source](#)

Manatees consume 4 to 13% of their body weight (166-640 kg⁶) daily, hence between 2.4 and 30.4 tons yearly. This substantial intake has ecological implications: through vegetation removal and fertilization, manatees have been found to affect the biomass, structure, community composition, and dynamics of the vegetation, although concrete information on each of the potential impacts is very limited for the West African manatee (ref). The lack of information also applies to two other

⁶ Kingdon, J. 2015: «The Kingdon Field Guide to African Mammals», 2nd edition, Bloomsbury Wildlife, London

potential impacts: seed dispersal and bioturbation ([ref](#)). It has been hypothesised that the West African manatee exert a form of biological control against the proliferation of water hyacinth in rivers and streams, a function of particular interest in Niger ([ref](#)). In some areas, there may be a positive relationship between the presence of manatees and an increase in fisheries productivity, due to the enrichment of water by manatee dung ([ref](#)). To support the long-term survival of the species, a Conservation Strategy for the West African Manatee ([ref](#)) was developed under the Abidjan Convention, followed by an Action Plan for the Conservation of the West African manatee developed under the auspices of the Convention on the Conservation of Migratory Species of Wild Animals, CMS ([ref](#)).



Figure 2: The West African manatee is an animal of both coastal and inland wetlands. [Image Source](#)

Dugong Ecology and Distribution

The Dugong (*Dugong dugon*) is the only herbivorous mammal that is strictly marine ([ref](#)). The three other species in the sea cow group (order *Sirenia*), the manatees, all of which use freshwater habitats to varying degrees. Dugongs are seagrass specialists, feeding on leaves or uprooting whole plants when they are accessible. Their world distribution is determined by specific seagrass species, *Potamogetonaceae* and *Hydrocharitaceae*. The African populations are at the western fringe of the distribution ([Figure 3](#)). Dugongs appear to be rapidly declining in East Africa ([ref](#)). Dugongs were known to occur off Somalia, Kenya, Tanzania, Mozambique, Comoros, Madagascar, and Mauritius. Currently there appear to be very few individuals remaining along the coasts of Somalia, Kenya, Tanzania, Mayotte (in the Comoros Archipelago), Madagascar and the Seychelles, and there have been no reports of dugongs off Mauritius for many years. The population in Mozambique waters has also declined rapidly in recent years, with one small left in Bazaruto Archipelago National Park ([ref](#)). In contrast, the situation seems to be more positive in the Red Sea region where an estimated 4,000 dugongs were recorded in 1986 ([ref](#)).

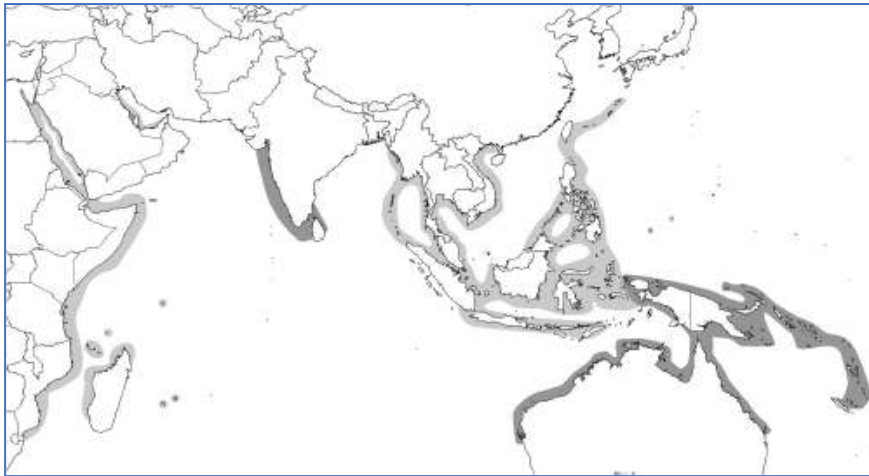


Figure 3: Global distribution of the dugong in the Indo-Pacific region. [Image Source](#)

Dugongs as Seagrass Engineers

Dugongs interact closely with the ecology of seagrass meadows ([ref](#)) (Figure 4). They consume 10-15% of their body weight (250-420 kg⁷) daily ([ref](#)), equivalent to between 9.1 and 23 tons yearly, and they require up to 3.5 hectare of seagrass habitat annually for sustenance ([ref](#)). Dugong grazing can lead to significant reductions in seagrass biomass: up to 96% of aboveground biomass, 73% of belowground biomass, 86% of total biomass, and as much as 94% in aerial coverage ([ref](#)). Though dugongs can rapidly remove seagrass biomass, the latter have been found to be resilient and to recover over relatively short time periods (3-8 months) ([ref](#)). Through bioturbation, dugongs may affect nutrient dynamics and increase microbial activity in the sediment, therefore contributing to increased nitrogen fixation. By visiting coral reefs to reduce the risk of predation by tiger sharks in seagrass areas, dugongs may also facilitate the translocation of nutrients from the productive coastal systems to the nutrient-poor reefs ([ref](#)).

In some regions, tiger sharks rely heavily on young dugongs as a food source, which in turn influences their feeding behaviour ([ref](#)). In subtropical seagrass ecosystems in Western Australia, large tiger sharks influence the foraging behaviour of dominant grazers - including dugong and green turtles - by inducing shifts in their habitat use and foraging tactics ([ref](#)). The non-consumptive effect of the sharks creates a landscape of fear where sea turtles and dugongs preferentially forage in seagrass microhabitats that are low in predation risk. Seagrass habitats associated with high predation risk have higher carbon stocks than those with low predation risk ([ref](#)). In Shark Bay, Western Australia, the impact by tiger sharks on the foraging of dugongs and green sea turtles have been estimated to increase the capture of carbon dioxide by 134% ([ref](#)). It has therefore been suggested that to reduce negative impacts of dugongs on seagrass habitats, it's important to concurrently rebuild both populations of predator species and dugongs ([ref](#)). Since tiger sharks also exist in the East African waters ([ref](#)), this appears to be both feasible and ecologically beneficial.

⁷ Kingdon, J. 2015: «The Kingdon Field Guide to African Mammals», 2nd edition, Bloomsbury Wildlife, London



Figure 4: Dugong feeding on a seagrass bed off the coast of Egypt. [Image Source](#)

Conclusion

West African manatees and dugongs are Africa's only sirenians and play key roles in shaping aquatic ecosystems. Manatees influence freshwater and coastal wetlands through heavy grazing, possible seed dispersal, and nutrient cycling. Dugongs, restricted to marine habitats, reshape seagrass meadows through intense grazing, sediment disturbance, and nutrient redistribution, processes that may enhance productivity and carbon storage, especially when predator-prey dynamics are intact.

Both species face serious threats. Manatees are impacted by poaching, entanglement, and habitat fragmentation from dams. Dugongs have declined sharply across East Africa, with only a small population remaining in Mozambique. Habitat degradation and insufficient protection are driving their decline.

Conservation must focus on habitat protection, predator restoration, and local stewardship. Dugongs require healthy seagrass beds and marine management; manatees need connected freshwater systems and enforcement of anti-poaching laws. Research on their ecological roles and contributions to ecosystem services like carbon capture is also needed.

Protecting these species supports biodiversity, ecosystem resilience, and local communities - their survival is essential for the health of Africa's coastal and freshwater systems.

Case Study #3: Fish - Urchin Imbalance and Seagrass Decline in Coastal Kenya

Chloe Eckert, Global Rewilding Alliance

Background

Seagrass meadows along Kenya's coastline are crucial for marine biodiversity, coastal livelihoods, and climate resilience. These ecosystems serve as nurseries for fish and feeding grounds for a range of marine animals, including rabbitfish, parrotfish, sea turtles, dugongs, and seahorses. They also play a key role in carbon sequestration. Despite this, Kenya has experienced a steady decline in seagrass cover, 1.6% per year since 2000, largely due to anthropogenic pressures, particularly fishing and population growth.

Observed Changes

Between 2000 and 2016, seagrass declined by 1.9 km² per 25 km² area on average, with losses concentrated near urban centers such as Mombasa, Kilifi, and Lamu. One key factor is the overfishing of predatory fish like the Orange-lined triggerfish (*Balistapus undulatus*) and the Humphead wrasse (*Cheilinus undulatus*), which normally help control sea urchin populations. With these natural predators removed, urchin populations have surged, leading to overgrazing and localized die-off of seagrass beds. Experimental fishing trials showed that a single sweep of a seine net reduced seagrass cover by 8.3%, largely through uprooting and sediment disturbance.



The Sea urchin, Tripneustes gratilla. [Image source](#)

Ecological Consequences

The unchecked growth of sea urchins, especially *Tripneustes gratilla* (Figure 1), linked to the loss of fish predators, has resulted in overgrazing of seagrass meadows. This leads to "urchin barrens," where vegetation is stripped and recovery is inhibited. Alcoverro and Mariani (2002) reported that sea urchin grazing significantly degraded seagrass beds in Kenya, confirming how animal interactions can drastically alter seagrass structure and productivity (as cited in Mwikamba et al., 2024).

Destructive fishing practices like seining exacerbate these dynamics. Dragging nets stirs up sediment, reduces light availability, and physically removes both seagrass and resident fauna. One seine net sweep removed 11.1 g/m² of seagrass biomass. This reduces the carbon storage potential of seagrass beds and disrupts the microhabitats that many invertebrates and juvenile fish rely on.

Loss of grazing megafauna, like sea turtles and dugongs, also affects nutrient cycling and sediment dynamics in seagrass ecosystems. These animals feed selectively on specific species and can help maintain meadow structure. Their decline, along with declining fish herbivory, shifts the balance toward more opportunistic grazers like urchins, which are less selective and more damaging.

Impacts on Biodiversity and Fisheries

Seagrass beds are foundational to the productivity of Kenya's artisanal fisheries. They provide habitat for key commercial species such as rabbitfish and seagrass parrotfish. Their loss threatens food security and livelihoods in coastal communities, where the number of small-scale fishers rose from 9,000 in 2004 to over 13,000 in 2016. Basket trap fishing showed minimal impact in field trials, suggesting that more sustainable methods can reduce harm while maintaining fish harvests.

Animal-dependent species, such as green turtles, dugongs, and seahorses, rely on dense seagrass cover for food and shelter. Seagrass loss forces these species to shift habitat or face starvation and reproductive decline. Reduced grazing pressure from large herbivores also means more organic detritus and epiphytic algae can build up, further lowering seagrass health.

Supporting Data and Metrics

- **Seagrass Decline:** 1.6% annually, equating to a loss of 1.9 km² per 25 km² cell (Mwikamba et al., 2024)
- **Population Growth:** 68.2% increase in coastal population density from 2000–2016 (Mwikamba et al., 2024)
- **Fishing Impact:** Seine netting reduced cover by 8.3% in a single sweep and removed 11.1 g/m² of biomass (Mwikamba et al., 2024)
- **Animal Impacts:** Overfishing of parrotfish has allowed urchin populations to surge, driving overgrazing and the formation of "urchin barrens" (Mahan, 2023)
- **Species at Risk:** Rabbitfish, sea turtles, dugongs, and seahorses depend on healthy seagrass beds; their decline disrupts food webs and ecosystem function (Mahan, 2023; Mwikamba et al., 2024)

References:

Mwikamba, E. M., Githaiga, M. N., Briers, R. A., & Huxham, M. (2024). Understanding the drivers of seagrass loss in Kenya: Evidence for the impacts of population and fishing. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 34:e4229. <https://doi.org/10.1002/aqc.4229>

Mahan, W. (2023). The Environmental Crisis on Kenya's Coast and Why We Must Solve It. *International Policy Digest*. <https://intpolicydigest.org/the-environmental-crisis-on-kenya-s-coast-and-why-we-must-solve-it/>

Case Study #4: Banc d'Arguin National Park in Mauritania

Djibril Diallo, [BirdLife Africa](#); [Nonie Coulthard, Consultant](#)

Banc d'Arguin National Park is one of the top conservation areas of Africa. This study aims to deepen the understanding of the ecological importance of the place and its biodiversity. Firstly, it will briefly present the values of the park followed by a closer look at two aspects: the birds associated with the wetlands and the Mediterranean monk seal (*Monachus monachus*).

Presentation of the Banc d'Arguin National Park:

Created in 1976 and designated a UNESCO World Heritage Site in 1989, Banc d'Arguin National Park (PNBA) is one of the largest marine protected areas in Africa. The park was designated as a Ramsar site in 1982. It spans 12,000 km², including 5,400 km² of marine zones, and covers nearly one-third of Mauritania's coastline. The intertidal flats extend across 453 km², of which 80% is covered with seagrasses, mainly *Zostera noltei* ([ref.](#)). The area borders the Sahara Desert and is unaffected by river inflows or human waste discharges ([ref.](#)).

The park is a biodiversity hotspot, home to numerous species of fish and crustaceans, and hosts over two million migratory birds annually. It also shelters endangered species such as the Atlantic humpback dolphin (*Sousa teuszii*) ([ref.](#)), marine turtles, and the Dorcas gazelle (*Gazella dorcas*) ([PNBA, 2018, p. 2](#)). In addition to its rich avian diversity, a satellite reserve on the Cap Blanc peninsula and adjacent coastline is home to the endangered Mediterranean monk seal (*Monachus monachus*), which contributes to the marine ecosystem's health.

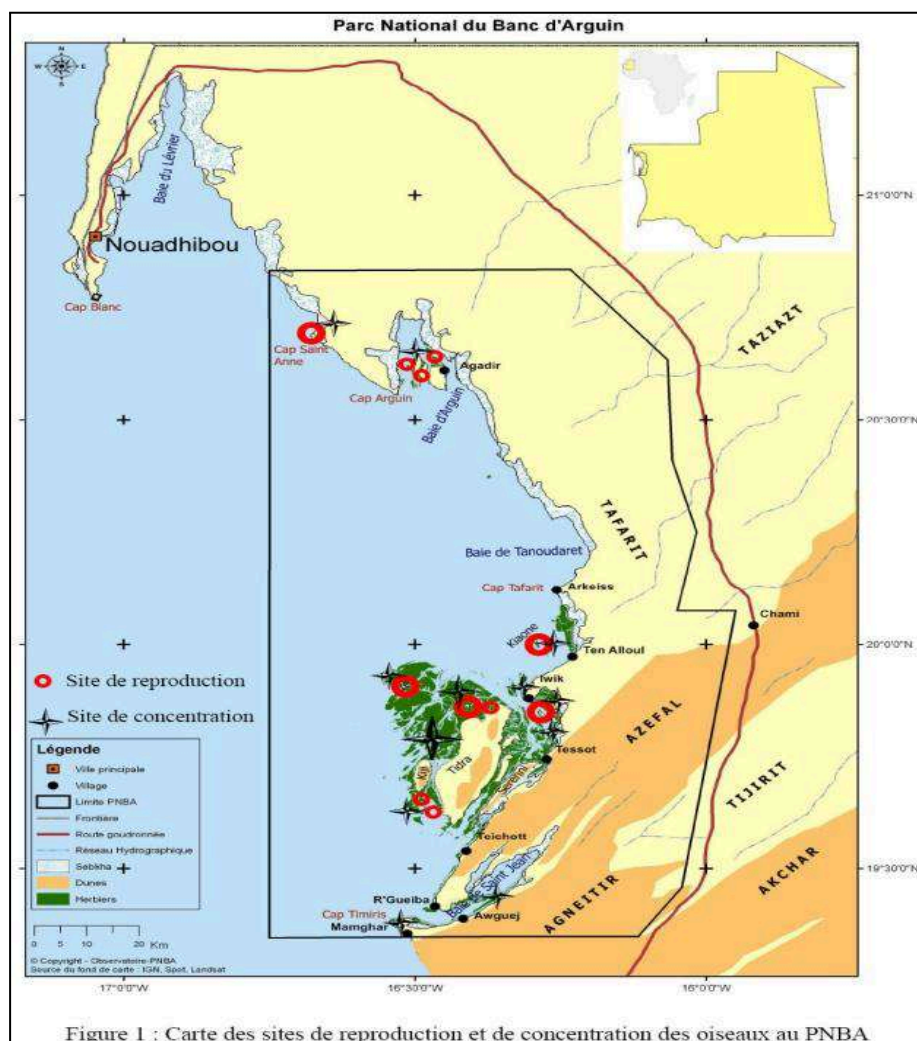


Fig. 1 Map of breeding sites and concentrations of birds in the Parc National du Banc d'Arguin

The PNBA's unique ecological value stems from its shallow waters, mudflats, and seagrass beds, which support high biological productivity. This productivity is driven by upwelling, a natural phenomenon where deep, cold, nutrient-rich waters rise to the surface, sustaining dense populations of waterbirds, fish, invertebrates, and marine mammals. The park is a critical wintering ground for migratory birds from Europe and far away breeding areas in Northern Siberia, Greenland, and eastern Canada ([PNBA, 2018, p. 6](#)).



Banc d'Arguin is the most important non-breeding area for migratory shorebirds in Africa. [Image source](#)

PNBA is also an important breeding ground of Afrotropical fisheating bird species, such as the White/Mauritanian spoonbill (*Platalea leucorodia balsaci*), Pale/Mauritanian Grey heron (*Ardea cinerea monicae*), West African Crested tern (*Thalasseus albidorsalis*), Caspian tern (*Hydroprogne caspia*), Greater flamingo (*Phoenicopterus roseus*), Great cormorant (*Phalarocorax carbo maroccanus*), Western reef heron (*Egretta gularis*), and Great white pelican (*Pelecanus onocrotalus*). They form large colonies, and an average of 46,000 breeding pairs was reported between 1969 and 2007⁸.

The PNBA is home to two notable endemic bird subspecies: the Pale/Mauritanian Heron (*Ardea cinerea monicae*) and the (Banc d'Arguin) White/Mauritanian Spoonbill (*Platalea leucorodia balsaci*). These species are unique to the region and are part of the park's exceptional avian biodiversity, which includes migratory, nesting, and endemic birds. Their presence highlights the ecological uniqueness of the PNBA and underscores its importance as a conservation area for rare and localized species as well as for far away migratory birds.

⁸ El-Hacen Mohammed El-Hacen 2024: A journey through the natural world of the Parc National du Banc d'Arguin, Mauritania,. In: "The East Atlantic Flyway of Coastal Birds", editor: Peter Prokosch, Lynx Nature Books, Barcelona.



Banc d'Arguin is also a key area for colony breeding Afroropical fisheating bird species, like the West African crested tern and the Great cormorant. [Image source](#)

Total waterbird numbers in Banc d'Arguin decreased between 1980 and 2017, with only Great white pelicans showing a significant increase in numbers ([ref](#)). Five species showed significant declines: Long-tailed Cormorant (*Phalacrocorax africanus*), Red Knot (*Calidris canutus*), Bar-tailed Godwit (*Limosa lapponica*), Eurasian Curlew (*Numenius arquata*), and Western Marsh Harrier (*Circus aeruginosus*). In the remaining species, the variation in numbers between counts was too large, and the number of complete counts too small, for trends to be detected. Species depending on the intertidal mudflats for feeding generally declined whilst species depending on fish and crustaceans in the sublittoral and offshore zones increased.

On land, Dorcas gazelles contribute to the desert ecosystem by grazing on vegetation, helping to maintain ecological balance ([PNBA, 2018, p. 2](#)). Until 2013, the Striped hyena (*Hyaena hyaena*) was common but has not been reported since⁹. The only remaining (meso) predators are the Golden jackal (*Canis aureus*), Fennec fox (*Vulpes zerda*), Rüppell's fox (*Vulpes rueppellii*), and Sand cat (*Felis margarita*). The Golden jackal has been reported causing regular "enormous breeding failure" on one of the key breeding islands for colonial birds, Nair¹⁰. The Golden jackal and Striped hyena have been found to considerably overlap in feeding habits, which indicates high resource competition between the two species ([ref](#)). The disappearance of the hyena might have favoured the Golden jackal. Maybe the return of the Striped hyena would become beneficial for the breeding bird colonies of the park, reducing the number of jackals and their predation on colony nesting birds?

⁹ See footnote #1.

¹⁰ See footnote #1.



Maybe the return of the Striped hyena would become beneficial for the breeding bird colonies of the park? [Image source](#)

The park is also culturally significant as the traditional territory of the Imraguen fishermen, whose sailboats are the only vessels permitted to fish within the park. However, overfishing, urban expansion in Chami, and the growth of artisanal gold processing are increasing environmental pressures and pollution risks ([PNBA, 2018, p. 7](#)).

The PNBA has received several international recognitions:

- Ramsar Wetland of International Importance (1982)
- UNESCO World Heritage Site (1989)
- WWF Gift to the Earth (2000)

These distinctions underscore the park's global importance in coastal and marine biodiversity conservation, including its role in replenishing regional fishery resources ([PNBA, 2018, p. 6](#)).

The ecological role of the birds in the Banc d'Arguin National Park

Banc d'Arguin is the most important non-breeding area for migratory shorebirds in Africa. It serves as a vital feeding and resting stopover site for migratory species along the East Atlantic Flyway and provides essential breeding grounds for several endemic and threatened birds. Notably, the park recorded 221 nesting pairs of the Pale (Mauritanian Grey) Heron on Arel and Kiaone islands, 81 pairs of Great White Pelicans on Arel, and 332 pairs of Caspian Terns on Kiaone and Zira islands. The PNBA's diverse habitats - mudflats, seagrass beds, and shallow waters - offer rich feeding grounds that support these species throughout their life cycles. The extent of seagrass meadows is, however, not stable. During a severe drought from 1970 to 1995 (with the lowest levels of rainfall in 1984) and the expansion of the Sahara desert, the intertidal seagrass meadows declined through sedimentation and desiccation ([ref](#)). Since then, the seagrass cover has increased twofold. During the last three decades, the benthic secondary production - which provides food for the shorebirds - has decreased by a factor of four ([ref](#)). These shifts in community structure and production have most likely contributed to recent declines in the numbers of some migratory shorebirds, such as Bar-tailed

godwit (*Limosa lapponica*), Curlew sandpiper (*Calidris ferruginea*), Grey plover (*Pluvialis squatarola*), Ringed plover (*Charadrius hiaticula*), and Kentish plover (*Charadrius alexandrinus*), which all feed on polychaete worms, especially tube-building ones.

Shorebirds play a central role in mudflat trophic webs and exert major predatory, physical, and chemical impacts on mudflats ([ref](#)). During peak overwintering and start of the migratory periods species such as Dunlin (*Calidris alpina*) and Red Knot (*Calidris canutus*) have also been found to have positive impacts on ecosystem functions in British intertidal mudflats ([ref](#)), reducing erosion, controlling and engineering nutrient fluxes between the sediment and water column, and increasing carbon sequestration (uptake of dissolved organic carbon, DOC). Through ecological cascade, a large number of resting Semipalmated sandpipers (*Calidris pusilla*) have been shown to positively impact the sedimentation in North American mudflats ([ref](#)). A 2023 [study](#) in China's Yellow Sea demonstrated that shorebirds could also restore wetland multifunctionality by controlling crab populations, which enabled vegetation recovery and improved sediment accretion. It's likely that some of these processes also apply to Banc d'Arguin.

Breeding colonies of waterbirds generate a lot of nutrients (nitrogen and phosphorus) in wetlands around the world ([ref](#)). This is likely also to apply to the Afrotropical fish-eating bird species breeding in large colonies in the PNBA.

Moreover, birds serve as important indicators of environmental health and support migratory pathways. Changes in bird populations can reflect broader ecological shifts, such as those caused by climate change, habitat degradation, or changes in food availability. Monitoring bird populations provides valuable insights into the overall health of the park's ecosystems. The park is a critical stopover for migratory birds traveling along the East Atlantic Flyway, providing essential resting and feeding grounds that enable these birds to complete their long migrations. This makes the conservation of the Banc d'Arguin National Park crucial not only for the local ecosystem but also for the broader migratory patterns of these species ([ref](#)).

Cap Blanc Reserve: A Beacon of hope for Mediterranean Monk Seal Conservation

Located near the PNBA, the Cap Blanc Reserve and coastal areas northwest of the reserve, on the Cap Blanc Peninsula just north of Nouadhibou, play a vital role in the conservation of the Mediterranean monk seal, hosting the largest population of this critically endangered species, with over 350 individuals recorded in 2024, up from just 100 in 1998. The Mediterranean monk seal is one of the rarest marine mammals in the world, typically measuring 2.1 to 2.7 m in length and weighing between 300 to 335 kg. Adults have short, bristly coats; males are usually black with a white belly patch, while females are brown or grey with lighter undersides. Pups are born with a dark woolly coat and a distinctive white belly patch, which helps in early identification ([NOAA Fisheries](#)). This conservation success is the result of 24 years of continuous surveillance, supported by the BACoMaB Trust Fund and implemented by the PCPM (Mediterranean Monk Seal Conservation Program) in partnership with CBD-Habitat and Annajah. In 2024, 44 new pups were born, and significant progress was made on the translocation project at Cap Alzaz, including the construction of acclimatization enclosures in preparation for the first transfers planned for 2025 ([BACoMaB, 2024, pp. 36–38](#)).

Ecological Role of the Mediterranean Monk Seal

Mediterranean monk seals contribute significantly to the marine ecosystem through their role as apex predators. They feed on a variety of prey, including bony fishes, cephalopods, and crustaceans, which helps maintain the balance of marine life by controlling the populations of these species ([NOAA Fisheries](#)). Their presence indicates a healthy marine environment, as they require clean, undisturbed habitats for resting and pupping. The seals' selection of remote marine caves for giving birth and resting (to avoid human persecution on open beaches) also highlights the importance of preserving these specific habitats to ensure their survival ([Marine Mammal Commission](#)). Furthermore, the Mediterranean monk seal serves as an indicator species for marine conservation efforts. Their population trends can reflect broader environmental changes, such as habitat degradation, pollution, and human disturbances. Conservation programs aimed at protecting the monk seal also benefit other marine species and habitats, promoting overall biodiversity and ecosystem health ([NOAA Fisheries](#)). The success of these programs, as seen in the increasing population of monk seals at Cap Blanc, underscores the importance of sustained conservation efforts and international cooperation in preserving marine biodiversity ([Marine Mammal Commission](#)).

Main Threats to waterbirds in the Banc d'Arguin National Park

The main threats to waterbirds in the Banc d'Arguin National Park, as identified in the [East Atlantic Flyway Assessment 2023](#), include:

- **Fishing:** This is a significant pressure at most sites along the flyway, including Banc d'Arguin. It represents a major threat to seabirds, particularly due to bycatch and habitat degradation.
- **Buildings and Infrastructure:** Development activities such as construction contribute to habitat loss and fragmentation, pollution, and disturbance to sensitive species like flamingos and pelicans.
- **Recreation and Tourism:** These activities can lead to disturbance and habitat degradation, impacting bird behavior and habitat quality.
- **Roads and Cars:** Infrastructure development facilitates illegal hunting and land conversion, contributing to habitat loss and pollution.
- **Climate Change:** This disrupts migration cycles and causes the loss of critical habitats. It also exacerbates other threats like flooding and water scarcity.
- **Pollution:** Improper waste disposal, oil spills from boating, and chemical runoff from wetlands are significant threats, often linked to recreational activities.
- **Avian Influenza:** Outbreaks have impacted several waterbird species in West Africa, between 2021 and 2023.

These threats collectively undermine the ecological integrity of the park, necessitating concerted efforts by scientists, governments, site managers, and civil society to mitigate negative impacts and conserve the park's unique biodiversity and ecological values.

Case Study #5: The return of biodiversity and resilience to Chumbe Island

Jack Coupland, Conservation Manager, Chumbe Island Coral Park (CHICOP)



Figure 1: Chumbe Island and surrounding reef, situated 8 km from Unguja.

Introduction

The Zanzibar Archipelago is famed for its beautiful and abundant coral reefs, attracting hundreds of thousands of tourists each year. With a population increasingly dependent on its natural resources however, many of its reefs have been overexploited and damaged through unsustainable fishing practices. This has left many reefs with reduced resilience to combat the effects of climate change, further reducing coral reef health (Bravo *et al.*, 2021).

Sitting eight km off the southwest coast of Zanzibar, Chumbe Island is an internationally recognised biodiversity hotspot and boasts one of the healthiest coral reefs in the region. This marine protected area (MPA) was established through the advocacy of a private company, Chumbe Island Coral Park Ltd. (CHICOP), and gazetted in 1994 through a public-private partnership with the Revolutionary Government of Zanzibar. The company fully manages and finances the MPA, which includes a Coral Reef Sanctuary (CRS) and Closed Forest Reserve (CFR). Since its establishment, Chumbe has been recognized as a UNEP global laureate for ‘Outstanding Environmental Achievement’, is an accredited ‘Global Ocean Refuge’ (Blue Park), which is one of the highest accolades for marine protected area management effectiveness (PAME) and was recently ranked as the top MPA globally for marine protected area governance (MPAG) effectiveness.

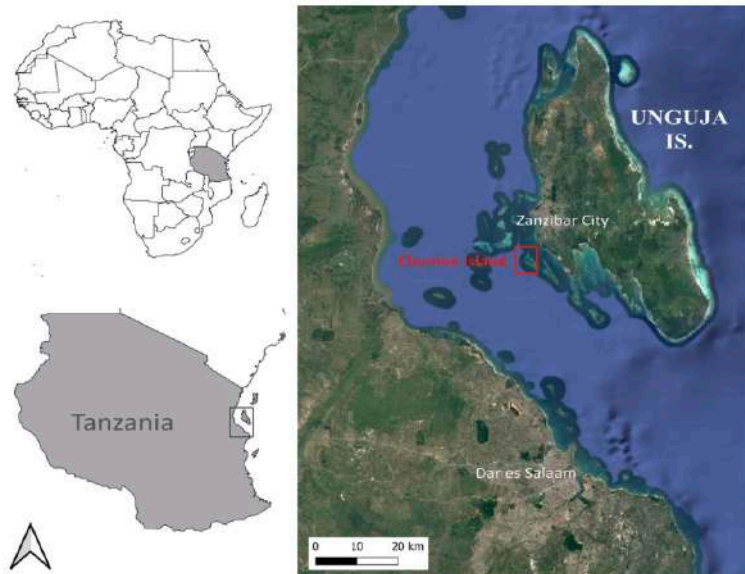


Figure 2: Chumbe Island location.

Management, enforcement and education

CHICOP operates through three key pillars: **conservation, education and ecotourism**. Since its inception, all costs associated with protected area management and environmental education services to schools, fishers and communities, are borne by CHICOP, funded through the revenue generated by the small ecolodge located on the island. Built using high-end award-winning eco-architecture and technology, the lodge has a strict carrying capacity (18 pax) and operates to ensure zero environmental impact. Through this model, Chumbe became the first privately managed and financially self-sustaining MPA in the world.

One of the primary tasks upon commencement was the eradication of rats from the island, an undertaking that took over two years of baiting and trapping. Post trapping resulted in an increase in terrestrial biodiversity, with the CFR now host to 80 species of bird, five reptiles and a healthy population of coconut crabs (*Birgus latro*), the world's largest terrestrial arthropod (Carter, 2017). Recent studies in the region have illustrated the large ecological benefits of removing rats from island ecosystems, with the impacts filtering down from terrestrial habitats into adjacent marine environments, boosting productivity through processes such as the marine subsidy (Graham *et al.*, 2018; Gunn, 2023).

The CRS is a fully protected no-take area, ensuring the conservation of vibrant coral reefs, seagrass beds, and diverse marine life. The enforcement of the no-take regulations is carried out by a team of CHICOP rangers, mostly former fishers themselves, who conduct daily patrols of the MPA in order to ensure compliance. When fisher incidents do occur in the CRS, enforcement is conducted through educating local fishers on the 'spill over' benefits of having a no-take area as a refuge. This is further supported through ongoing community outreach and engagement, with local community leaders and women's groups participating in Chumbe's Advisory Committee for collaborative governance and decision making. This enforcement approach has been incredibly successful, with reported poaching attempts decreasing from 170 in 1994 to only 10 in 2023 (Kloiber *et al.*, 2023).



Figure 3: The revenue generated from the ecolodge's 7 bungalows finances all the conservation and education activities

Key Outputs: Biodiversity returns

Through the effective management of the coral reef sanctuary, Chumbe is now host to the healthiest and most productive coral reef system in Zanzibar:

- **Increased biodiversity:** protected from destructive fishing practices, the reef has seen recoveries of up to 80 percent live hard coral cover and 59 genera of hard coral species recorded, providing habitat for 529 species of reef fish and 257 reef-based invertebrate species identified in the sanctuary (Carter, 2017; Kloiber *et al.*, 2023). Green turtles (*Chelonia mydas*) and critically endangered Hawksbill turtles (*Eretmochelys imbricata*) are supported with foraging grounds that include seven different seagrass species.
- **Black-tip reef shark recovery:** with the increase in biodiversity, there has also been a return of black-tip reef sharks (*Carcharhinus melanopterus*). These are vital predators that maintain optimal productivity of food webs in the ocean, maintaining healthy fish populations and transporting nutrients to the reef (Roff *et al.*, 2016). Sightings were rare when the park was first gazetted but have since become regular sightings in the 'Big 5' and 'SHARE' citizen science initiatives. This includes regular sightings of neonate sharks, a life stage in which they are particularly vulnerable to fishing pressure, highlighting the importance of the CRS as one of the few remaining breeding grounds in Zanzibar for this species listed as Vulnerable on the IUCN Red List.
- **Dramatic increase in commercially valuable fishery species biomass:** increasing from 194 kg/ha in the 1990s to a staggering 1,506 kg/ha by the 2020s (Kloiber *et al.*, 2023). This increased productivity of the MPA is vital for maintaining fishery livelihoods in Zanzibar. Commercially important fish can reach sufficient size to produce exponentially more offspring that are able to stay in the 'refuge' of the sanctuary until they reach optimal ages for dispersal and 'spillover' to areas accessible to local fishers. Tagged fish studies reveal effective spillover from Chumbe reaching many kilometres beyond the CRS (Tyler, 2005). As nearshore fisheries are facing a crisis across Zanzibar due to overexploitation, CHICOPs re-stocking services are increasingly essential for the livelihoods and food security of coastal communities.

- **Increased coral resilience:** whilst the CRS is healthy compared to control sites outside the MPA, it is still vulnerable to external anthropogenic pressures such as increased sea surface temperatures and declining water quality. Severe bleaching events have occurred at the CRS in 1998 and 2016, causing coral stress and mortality, leading to algal encroachment. With a high number of herbivorous reef species however, such as parrotfish, this macro algae can be kept in check, allowing hard corals time to recover, preventing a regime shift to an algal dominated reef common on unprotected reefs (Carter, 2017).



Figure 4: The CRS boasts up 80% coral cover, meeting the threshold requirements to be regarded as pristine

Conclusion

The management strategy of CHICOP has not only seen a boost in biodiversity within its CRS and CFR but has also run education courses that has reached nearly 13,000 stakeholders (school children and community members), and through carefully managed ecotourism has generated millions of dollars that has gone back into conservation management, job creation and community support (Kloiber *et al.*, 2023). Despite the relatively small size of Chumbe (~74ha), the impact of effective management on biodiversity recovery has been profound. Indeed, its scale has been an important factor in enabling highly effective management, ensuring the control of localized threats (such as crown-of-thorns) and exploring advanced coral restoration possibilities. If replicated to wider key sites of biodiversity importance, the network effect on regional biodiversity preservation has extraordinary potential, by not only protecting key habitat areas, but also creating linked refugia, migration corridors and supporting regional resilience against the impacts of climate change.



Figure 5: A boost in fish biodiversity with 529 species of reef fish identified

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Figure 6: The CRS is a refuge for species such as the Critically Endangered hawksbill turtle



Figure 7: Black-tip reef sharks are commonly sighted in the CRS, providing essential ecological benefits and an important indicator of ecosystem health



Figure 8: The no-take zone allows commercially important reef fish a refuge to reach larger sizes, producing exponentially more offspring which can spillover to outside the MPA, providing fisheries benefits



Figure 9: Educating local fishers on the 'spill over' benefits of having a no-take area as a refuge



Figure 10: Visiting school children learning to snorkel as part of the CHICOP Environmental Education program

Case Study #6: Ecological Impacts of Great White Shark Decline in False Bay, South Africa

Chloe Eckert, Global Rewilding Alliance



Breaching White shark at Seal Island, False Bay, at the southern tip of South Africa. [Image source](#)

Background

False Bay, on South Africa's southwestern coast, was once a stronghold for Great white sharks (*Carcharodon carcharias*), especially near Seal Island, a key habitat for Cape fur seals. As apex predators, great whites played a critical ecological role by regulating populations of mesopredators and influencing the behavior of prey species. The bay's kelp forests, dominated by *Ecklonia maxima* (sea bamboo) provide complex habitats which support diverse marine life, including invertebrates, fish and smaller sharks. These forests also stabilize coastal food webs through nutrient cycling and carbon sequestration.

The cold nutrient rich waters of False Bay, influenced by the Benguela and Agulhas currents, sustain these kelp ecosystems, which have expanded consistently due to ideal environmental conditions. However, between 2015 and 2019, sightings of great white sharks declined dramatically, with their near-total disappearance from the bay by mid-2018. This loss removed a key stabilizing force in the marine food web, raising concerns about the cascading ecological effects, particularly given the interconnected role of kelp forests in supporting predator-prey interactions.

Drivers of Great White Shark Disappearance

The sudden and dramatic decline of great white sharks in False Bay is closely linked to a pair of orcas (*Orcinus orca*) which began preying on great white sharks with great efficiency. These orcas were targeting their nutrient-rich livers, creating intense predation pressure that not only resulted in direct mortality but also prompted the surviving great white sharks to leave False Bay for safer areas.



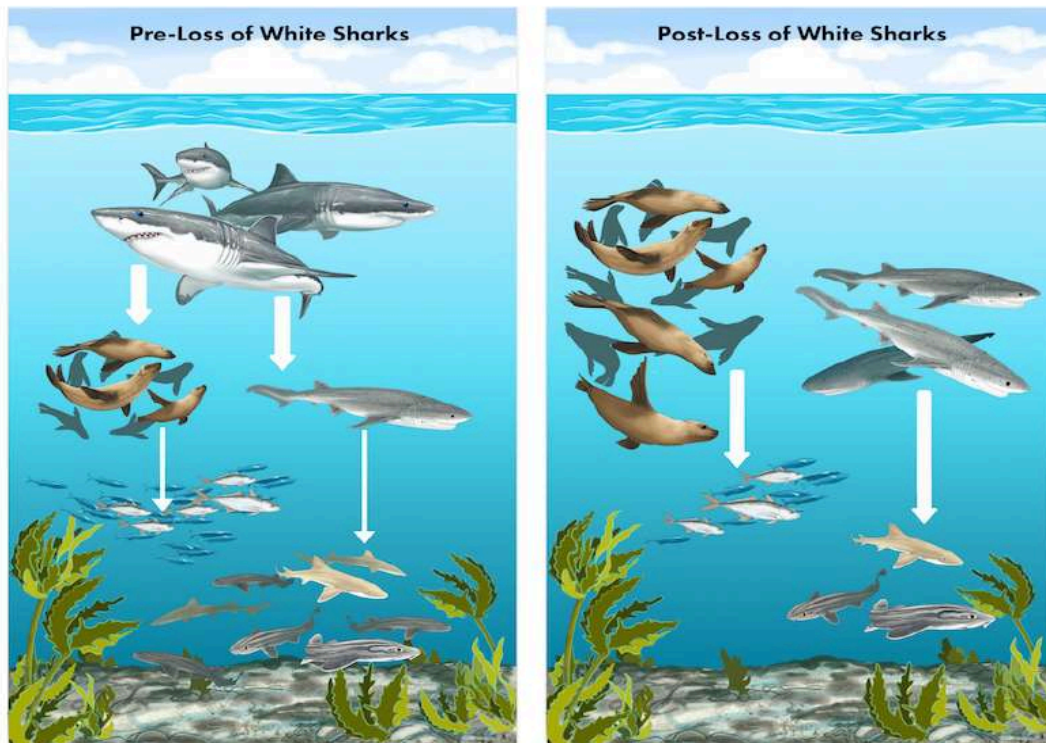
Orca attacks Great white shark in South Africa. [Image source](#)

In addition, human pressures such as incidental capture in shark nets, bycatch from commercial fisheries, and habitat disturbance from coastal development and pollution have further affected the local shark population. While broader environmental changes may influence shark populations elsewhere, the rapid and near-total disappearance of great whites from False Bay is most clearly explained by the combined impact of targeted orca predation and ongoing human pressures. Together, these factors have fundamentally disrupted the role of this apex predator in the ecosystem.

Observed Changes

The absence of great white sharks triggered several immediate changes in False Bay's predator-prey dynamics. Populations of Cape fur seals and broadnose sevengill sharks increased sharply in areas like Seal Island, where their numbers had previously been controlled through predation. Sevengill sharks, once scarce in this region due to their vulnerability to great white predation, began frequenting kelp-dense zones they had long avoided. This led to increased predation pressure on smaller shark species like the pyjama catshark and smooth-hound sharks, as well as declines in forage fish targeted by seals, such as anchovies and horse mackerel.

The rising numbers of mesopredators, particularly fur seals and sevengill sharks, have placed additional strain on fish populations critical to ecosystem balance and local fisheries. Schooling fish species, such as anchovies and horse mackerel, already targeted by human fisheries, are now further depleted due to intensified seal predation. At the same time, benthic fish and smaller shark species are experiencing increased predation from sevengill sharks, which is changing the structure of their communities and triggering cascading effects through the food webs weakening the resilience of key fish populations.



A graphic illustrating the marine food chain with and without great white sharks. As shown in the right panel, the number of Cape fur seals and sevengill sharks increased, but there was a decrease in smaller fish. Image via [Hammerschlag, N., et al. \(CC BY 4.0\)](#).

The Role of Kelp in a Shifting Marine Web

Kelp forests in False Bay are vital to the region's ecosystem, profoundly influencing shark behavior, population dynamics and broader ecological stability. These dense forests serve as shelter, hunting grounds, and nursery areas for a variety of shark species, including the pyjama catshark and sevengill sharks. The kelp provides refuge from larger predators and supports high biodiversity. With the decline of great white sharks, sevengill sharks have increasingly moved into kelp - dominated areas, taking advantage of the protection and abundant food resources that dense kelp offers - habitats they previously avoided due to predation risk.

Kelp forests also influence the movement and hunting strategies of larger sharks; dense kelp can act as a barrier, sometimes restricting great white sharks' access to traditional hunting grounds and altering their behavior. Healthy kelp forests provide crucial shelter and nursery habitats for sharks, supporting their survival and reproduction. When kelp density declines due to factors like urchin overgrazing, warming waters, or human impact, sharks - especially juveniles - become more vulnerable, disrupting food webs and weakening ecosystem resilience.

Ecological Impacts

The disappearance of great white sharks has also altered the landscape of fear in False Bay. Without their top-down control, mid-level predators such as sevengill sharks and fur seals proliferated unchecked, altering the structure and function of the marine ecosystem. These shifts changed species abundances and disrupted established ecological roles and food web dynamics. Kelp forests,

while providing critical habitat, are now experiencing shifts in predator occupancy and prey pressure, potentially reshaping interactions within these habitats. Species like Cape fur seals, which once avoided certain hunting grounds due to shark presence, are now venturing into previously risky areas, altering their foraging strategies and spatial patterns. Researchers warn that this imbalance could reduce the ecosystem's long-term resilience, making it more vulnerable to external stressors and potentially leading to a less biodiverse and less stable marine community.

Impacts on Biodiversity and Fisheries

The rise and redistribution of mesopredators have placed added stress on smaller marine species, contributing to local biodiversity declines. Smaller shark species, already facing fishing pressures, now contend with increased predation from sevengill sharks, while forage fish populations - essential for both seals and local fisheries - may decline under heightened seal predation. The expansion of mesopredators into new areas may also disrupt fisheries targeting affected species. Because many of these species depend on kelp forests for shelter and spawning, increased predation within kelp zones could accelerate declines. In the long term, this restructured food web could reduce the productivity and stability of coastal fisheries as foundational species are consumed at unsustainable rates or displaced from critical habitats.

Supporting Data and Metrics

Between 2000 and 2015, great white shark activity in False Bay remained relatively stable, but sightings dropped sharply between 2015 and 2018. During this period, Cape fur seal presence around Seal Island increased significantly, and sevengill sharks emerged as a dominant predator in areas they historically avoided. Declines were observed in key prey species, including small benthic sharks and schooling fish, highlighting the systemic impact of losing a top predator's loss.

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Case Study #7: The Banhine and Maputo National Parks in Mozambique – Rebuilding the Ecological Functionality of Two Key Wetland Areas in Southern Africa

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1. Introduction

Human evolution, the survival of prehistoric communities, and the development of civilisations owe much to the natural capital provided by wetlands (Maltby, 2022). According to Ti Xu et al. (2019), wetlands play an irreplaceable role in regulating the global climate, maintaining the global hydrological cycle, protecting the ecosystem diversity, and safeguarding human welfare (Hu, S.J et al, 2017 & Ramsar Convention Bureau 2001). Wetland ecosystems not only provide indirect services to human beings but also generate direct economic benefits to people (Constanza et al. 1997, Smardon 2009).

The Ramsar Convention ([1992](#)) defines wetlands as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary - with water that is static or flowing, fresh, brackish or salt, including areas of marine water where the depth at low tide does not exceed six metres. This definition provides a clear guidance for countries in shaping their policies and legal framework for wetland conservation.

According to [The Fourth Ramsar Strategic Plan 2016–2024](#) (2016), wetlands deliver a wide range of ecosystem services, including biodiversity support, water supply, water purification, climate regulation, flood regulation, coastal protection, useful fibres, spiritual and cultural inspiration and tourism. Wetlands play a key role in economic activity linked to transportation, food production, water risk management, pollution control, fishing and hunting, leisure and the provision of ecological infrastructure.

Two important wetland areas in Mozambique are Banhine National Park (BNP) and Maputo National Park (MNP). The Banhine National Park (725,000 ha) in the south-western part of the country is situated in the core area of the landscape of the Mozambique component of the Great Limpopo Transfrontier Conservation Area, GLTFCA. Positioned between the Limpopo and Zinave National Parks, it serves as a safe and vital wildlife corridor enabling safe migration across the borders of South Africa and Zimbabwe.



Location of the Banhine National Park in south-western Mozambique. [Image source](#)

Maputo National Park (170,000 ha), located southern Mozambique on the south-eastern coast of Maputo Province in the Matutuine District, lies within the Lubombo Transfrontier Conservation and Resource area. It forms part of the Ponta do Ouro/Kosy Bay Transfrontier Conservation area linking up with South Africa ISimangaliso Wetland Park, a World Heritage site. The Park also lies within the boundary of the Environmental Protected Area of Maputo, which was established in 2001, with 623,355 hectares.



Location of the Maputo National Park in southern Mozambique. [Image source](#)

The purpose of this paper is to examine how wildlife conservation and restoration shapes wetland functionality in these parks, with implications for conservation and local livelihoods.

2. Overview of Banhine and Maputo National Parks Wetlands

Both parks play a vital ecological role within their respective Transfrontier Conservation Areas (TFCAs) to which they belong. While each park has its own unique and distinguishing features, both contain diverse and ecologically rich seasonal wetland systems.

Banhine National Park

Banhine National Park's wetlands are fed by intermittent streams that originate near Mozambique's border with Zimbabwe. The largest of these is the Chefu River, which rises in the basalt and rhyolite formations of the Karoo system in southwestern Zimbabwe, near Gonarezhou National Park (see map). It has given the park the nickname "[The mini-Okavango Delta of Mozambique](#)". As the rains arrive, the park's wetlands stretch over 500 km² (50,000 ha), a welcome refuge for thousands of migratory birds.

The wetlands of the BNP are important for many migratory and aquatic species of birds. According to ANAC, 2024, the freshwater fish of the BNP have been surveyed (Bills & Da Costa, 2005, Darwall et al., 2009). There is evidence that the Mozambican tilapia (*Oreochromis mossambicus*) remains untainted by hybridisation with introduced species (Firmat, Alibert, Losseau, Baroiller, & Schliwen, 2013) and that it is uncommon and needs protection. The uncommon biophysical dynamics of BNP are likely to have resulted in novel biodiversity, including species yet undescribed, being discovered once more detailed survey work is conducted in the park.



*The seasonal wetlands in the Banhine National Park provide important habitats for many wetland birds, like the Red-billed teal (*Anas erythrorhyncha*) and African pygmy-geese (*Nettapus auratus*).*

[Image source](#)

Although the large mammal populations have been substantially depleted over the past decades, BNP is the natural home to populations of many of Africa's iconic wildlife species, such as elephant, lions, buffalo, wildebeest, ostrich, etc. There is considerable biodiversity value derived from the BNP enabling a fully functioning suite of ecological processes as well as delivering a range of ecosystem services from the area. This is due, in part, to the relatively intact state of the vegetation and the size of the park.

Maputo National Park

In contrast, the wetland system of Maputo National Park is sustained by the Maputo and Futi rivers all the year around, which originate in South Africa, as well as by several coastal lagoons and lakes—some permanent, others seasonal – ranging in size from eight kilometres long to less than 100 m wide. The Indian Ocean coastline, including rocky beaches and shorelines, subtidal reefs, mangrove forests and intertidal sand plains, seagrass meadows, estuaries, and mudflats, forms an integral part of the wetland system in the park.

The freshwater systems support animals ranging from Nile crocodiles (*Crocodylus niloticus*) and hippos (*Hippopotamus amphibius*) to three species of fish endemic or near-endemic to MCPE (*Croilia mossambica*, *Serranochromis meridianus* and *Aplocheilichthys myaposa*), and birds like the Small grebe (*Tachybaptus ruficollis*), Black-headed heron (*Ardea melanogaster*), Lesser flamingo (*Phoeniconaias minor*), Black coucal (*Centropus grillii*), Grey crowned crane (*Balearica regulorum*), and Rosy-throated longlaw (*Macronyx ameliae*).

The park is considered one of the eight key biodiversity sites (“Seascapes”) of global importance within the [Eastern African marine ecoregion](#) (PPF et al. 2024). The marine component of the national park stretches from the edge of the isiMangaliso Wetland Park in South Africa, to the Maputo River Mouth in Maputo Bay in the north, and includes the waters around Inhaca and Portuguese islands. It stretches three nautical miles into the Indian Ocean.



In the Maputo National Park marine ecosystems such as coral reefs, seagrass meadows, mangroves, estuaries and mudflats meet with inland wetland types such as lakes, rivers, and swamps. [Image source](#)



In the Maputo National Park elephants, hippos and dugongs could meet on the beach. Image sources: [top two](#), [bottom](#)

3. Wildlife Presence

Banhine National Park

The BNP management plan approved by the Ministry of Land and Environment in 2024 refers that in 1973, when the Park was first proclaimed, its primary objectives were to protect the ostrich, the tsessebe antelope (*Damaliscus lunatus*), and the waterbuck (*Kobus ellipsiprymnus*). Although antelope numbers were low, there were still reasonable numbers of elephant, giraffe, and ostrich present. The reduction in wildlife was primarily because of over-hunting, but the drying up of the Banhine wetland and Changane River during the drought of 1965-67 also impacted population numbers of the territorial, water dependent species.

In the mid-1970s, during the transition from Portuguese rule to independence, a wave of illegal elephant hunting occurred by Europeans who exported the ivory to Portugal and neighbouring countries. Between 1975 and the late 1990s, no law enforcement staff were stationed in the BNP and armed forces in the area hunted wildlife for food. This led to the local extermination of eland, wildebeest, giraffe and zebra. Although hostilities ended in 1992, there was still no government control over hunting in BNP until 1998, when the first staff from the National Directorate of Forest and Wildlife were stationed in the area.

Although the original Park boundary in 1973 excluded an area on the eastern side of BNP where irrigation and a cattle ranch were established, this area was included within the park around 2003. The boundary was revised again in 2013, in an effort to exclude larger human settlements and sites of habitation and to include areas of biodiversity significance. This exercise resulted in an approximate 8% increase in the total area of BNP, along with a noticeable change in shape, marked by a significant intrusion from the north.

The large mammal fauna of BNP is typical of the region, but has been severely reduced due to centuries of human activity. No systematic game count has been conducted in the BNP in the past decade, and knowledge of population sizes across all wildlife species remains limited. Figures from a 2012 and a more methodologically limited estimate in 2018, likely to reflect a minimum count with likely false absences, show small increases of some species. For example, the African buffalo (*Syncerus caffer*) population rose from 1 in 2004 to 138 in 2013, while ostrich numbers increased from 71 in 2004 to 505 in 2023. However, data on several species, such as bushpig (*Potamochoerus larvatus*) as well as larger predators, remain unavailable.

While certain key plains games, including zebra, wildebeest and giraffe appear to be locally extinct, anecdotal sightings include cheetah, spotted hyena, elephant and lion, which are known to move through the BNP. Hippos are also known to migrate between the Limpopo and Save rivers and BNP following good rainfall; however, the water level is usually insufficient for hippos in periods of drought.

The fish species within the park's wetland system form part of the Zambezian fauna, a biogeographic group with around 180 species which extends southward from the Zambezi River catchment to the eastern parts of South Africa and across to Namibia and southern Angola. Records suggest the area supports a relatively diverse fauna, with as many as 40 species of fish (Skelton, 2001).

Although not intensively surveyed, herpetological fauna numbers are seemingly low in BNP. A recent survey of the parks and its surrounding areas (Pietersen, Pietersen, & Haacke, 2013) identified four

chelonian species, 13 snake species, one amphisbaena, 16 lizard species and 15 frog species. An additional six snake, five lizard and two frog species were recorded in close proximity to the park and are likely also present within BNP.

Maputo National Park

The importance of the park to Mozambique's coastal ecosystems cannot be overstated. Its 80 km shoreline protects approximately 80% of all nesting turtles along the country's 2,800 km coastline. The last remaining individuals of the dugong are also found in the waters off the Inhaca Island's western shores.

Resilient coral communities, such as those at Barreira Vermelha and Ponta Torres, occur off the island's western shores and are unique within the Western Indian Ocean region. In addition, Inhaca Island has the largest coverage of seagrass (*Zostera capensis*), categorised as Vulnerable on the IUCN Red List.

These coastal habitats also support various other flagship species, including cetaceans, sharks, and rays. From June to November each year, Humpback whales (*Megaptera novaeangliae*) make their way up the east African coastline to their calving and mating grounds. The Ponta do Ouro Partial Marine Reserve, located within Maputo National Park, hosts the largest recorded aggregation of the giant trevally (*Caranx ignobilis*), an apex marine fish which is considered playing an important ecological role in coastal reefs, coral atolls, and granitic islands in western Indian Ocean (see section 8 on marine fish in the main report).



The Ponta do Ouro Partial Marine Reserve in Maputo National Park hosts the largest recorded aggregation of the giant trevally (Caranx ignobilis), an important marine apex species. [Image source](#)

The park is also home to more than 500 Nile crocodiles. Historically, the naturally occurring elephant populations of southern Mozambique moved freely across the border with South Africa.

The MNP supports at least three fish species that are endemic or near-endemic to the Maputaland Plant Endemism Centre (DNAC, 2009). The park also hosts reptile populations, and the marine coastline is an important nesting site for the leatherback turtle (*Dermochelys coriacea*) and loggerhead turtle (*Caretta caretta*). Both turtle species are currently in Appendix 1 of the

International Convention of Trade in Endangered Species (CITES). Levels of endemism are particularly high in digging burrow species in dune forests (DNAC, 2009).

4. Management arrangements and Rewilding Efforts

Under the Mozambique Transfrontier Conservation Area (TFCA) Program, both Banhine and Maputo National Parks benefited from collaborative management through co-financing agreements. Under these agreements, Peace Parks Foundation (PPF) in Maputo National Park and the African Wildlife Foundation (AWF) in Banhine National Park were responsible for providing technical support to the government agency by managing funds from the Transfrontier Conservation Area and Tourism Development Project (TFCATDP), funded by the World Bank. In addition to administering the co-financing agreements expired in 2014 when the TFCA program was closed. Following this, AWF abandoned the Banhine National, while PPF continued its support in Maputo National Park. PPF played a key role in the declaration of the Ponta do Ouro Marine Partial Reserve and supported operational activities of the Maputo Park, including anti-poaching community support and park operations. From October 2017, PPF took over the responsibility for most operational costs with ANAC covering most of the salaries. In 2018 PPF and ANAC signed a co-management agreement for the management of Banhine National Park .

A vital part of the rewilding journey is bringing wild animals back to areas where they used to occur naturally but, over time, have become locally extinct. In cases where population numbers are no longer viable, existing animal populations are supplemented to reinforce populations to above certain threshold levels. Once these thresholds are reached, populations often experience accelerated growth, reducing the time between vulnerability and the establishment of a self-sustaining population. Introducing keystone species invigorates entire ecosystems by improving the nutrient flow, bringing back ecosystem balance and restoring the carbon cycle. However, rewilding is about far more than just reintroducing species.. The greatest challenge lies in ensuring that animals remain safe and secure once reintroduced. Within protected areas, this requires securing robust governance models to ensure stability and continuity in management and, in parallel, generating revenue streams to sustain operational costs (PPF, 2024).

The first 54 animals were introduced in 2010 when the wildlife reintroduction program began in **Maputo Park**. In this first operation, 3 zebras , 9 warthogs , 20 nyala and 22 impalas were introduced. Over 5,385 game animals were introduced between 2010 and 2024, (see [table1](#) below), and the numbers of free-living animals have already doubled, with an estimated 13,800 ‘game’ animals in the park at present. There is a continued northwards dispersal of some of the re-introduced species into the open grassland areas, as is expected of plains’ wildlife. Species such as warthog, waterbuck, blue wildebeest, and zebra have shown marked population increases since their reintroduction. Notably, these animals are now found in larger groups than in previous counts. The introductions have clearly been successful for most species, as reflected in the steady increases in their minimum counts (Hanekon, 2024). At this rapid growth rate, no further introductions are required, only a continuation of the high standard of wildlife protection currently being undertaken. Carnivores have also been reintroduced to promote a fully functional ecosystem and restore the food chain, including eight spotted hyenas and five cheetahs.

Table1: Wildlife re-introduced to Maputo National Park 2010-2024.

SPECIES	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	TOTAL
Buffalo								31	42	127		7	45			252
Cheetah												4	1			5
Crocodile														1		1
Eland										21			26			47
Genet														2		2
Giraffe			8	12				12	6							38
Hyena, Spotted														5	3	8
Impala	22		74	75	125		199	498	20	22						1035
Kudu			84	26	14			50								174
Nyala	20		74	72	8			251	50							475
Oribi										50						50
Pangolin														1		1
Warthog	9		33	48			50	100		0						240
Waterbuck							204	812		250						1266
Wildebeest				73	65	127	60	201		30						556
Zebra	3	24	159	88	100	97	60	408	95	204						1238
TOTAL	54	24	432	394	312	224	573	2363	207	710	0	11	72	9	3	5388

Source: Peace Parks Foundation (2025)

The partners are planning to translocate 400 animals in a 6,000 ha sanctuary in the centre of the **Banhine National Park** from the Maputo National Park in 2025. Apart from restoring the functionality of the ecosystem it will play a role in the development of BNP's tourism offering..For MNP, the translocation aligns with its operational wildlife management plan, which includes strategic offtakes to manage its growing mammal populations. The species to be introduced in BNP includes zebra, wildebeest, waterbuck, reedbuck, nyala, warthog and impala. The giraffes are scheduled for introduction in 2026. The rewilding program aims to translocate a total of 2,000 animals to BNP, with the goal of establishing a population exceeding 10,000 animals by 2050.



In 2014, a joint operations strategy for Maputo Special Reserve and Tembe Elephant Park was signed and fences between the two Parks were coming down, which allowed elephants to recolonise the Maputo National Park. [Image source](#)



Bahine National Park. A fixed-wing aerial census was successfully completed in 2023. Good elephant, ostrich and buffalo count numbers were observed however smaller more difficult to observe species were undercounted. With the park now more secure, the first wildlife translocations are planned for 2024. Rewilding will rejuvenate the ecosystem, and stimulate the park's eco-tourism potential. [Image source](#)

5. Wildlife and Wetland Functionality

Based on the information provided in the main report, the following animal species could potentially play a key role for the future management and rewilding efforts of the inland and coastal wetlands in the two areas:

- **Banhine** (using the Okavango Delta as the baseline): Hippo, Elephant, African buffalo, Nile crocodile, colony breeding waterbirds, various fish species, and termites,
- **Maputo**: Coastal (coral reefs, mangroves, seagrass meadows, mud flats, estuaries) – sharks (e.g., grey reef shark), giant trevally, dugong, and parrotfishes; Inland (including swamps,

lakes and rivers) – Hippo, Elephant, African buffalo, Nile crocodile, colony breeding birds, and fish.

The Transfrontier Conservation Areas (TFCAs) – Banhine National Park/ Great Limpopo Transfrontier Conservation Area (GLTFCA), and Maputo National Park/ Lubombo Transfrontier Conservation and Resource Area (TFCRA) – provide ideal conditions for large mammal species to exert their critical role across large landscapes. Rivers, floodplains, and wetlands associated with megafauna typically exhibit more heterogeneous geomorphological and vegetation characteristics than those where [megafauna](#) have been extirpated. The possibility for large ungulates like elephants, buffalos, and hippos to move more freely in the TFCAs is therefore a big advantage.

Breeding colonies of waterbirds generate a lot of nutrients (nitrogen and phosphorus) in wetlands around the world, which can be [beneficial](#). However, there is a lack of information on colony breeding birds from the two areas. The [Zambezi River Delta](#) and [Lake Urema](#) in the [Gorongosa National Park](#) seem to host the few heronries reported from Mozambique (no heronries are included from Mozambique in the [continental overview](#) published in 2019).

For future wetland rewilding efforts, it will be essential to conduct a thorough assessment of the [fish fauna](#) and identify species that play a particularly important functional role. Integrating fisheries considerations are required to meet the needs of people and nature.

6. Human-Wildlife-Wetland Interactions

In both Banhine and Maputo National Parks, human and wildlife communities are dependent on wetland ecosystems, creating complex and dynamic interactions. The management plans of the Parks take that into consideration given high importance in wetlands in conservation and management of this ecosystem. The Banhine Management Plan (2024) recognises the importance of the Banhine wetlands for the community providing the wildlife-based/nature-based livelihoods, as well as the non-wildlife-based provisions. Communities living in and around BNP depend heavily on nature for their livelihoods. Key nature-based products include charcoal, wood poles, brewing local/traditional beverages, roots of trees, fishing, fruits, nuts and seeds from trees, and handicrafts. The same landscape offers opportunities for agriculture, livestock, and commercial activities of products that come from neighbouring districts.



Community members benefiting from fishing in Banhine Pan (BNP, SC, 2025)

The Maputo National Park Management Plan divides the park into the following resource utilization zones: (i) Total Protection Area, (ii) Tourism Development Area, (iii) Controlled Use Area, and (iv) Community Development Area. Wetlands are present within all these zones. The northern part of the park, which includes low-lying and seasonally flooded areas adjacent to Maputo Bay, is designated as a Total Protection Area. However, certain activities are permitted within designated zones. These include artisanal fishing, anchoring, industrial and semi-industrial fishing, demersal (bottom) fishing, and the use of specific fishing techniques such as vertical jigging and fish aggregation devices. Additionally, the use of jet-skis (limited to fishing purposes) and parasailing from motorized vessels is allowed.

To enhance climate resilience, the Government is implementing a project in Maputo National Park funded by the Blue Action Fund: “The Ecosystem-based Adaptation to climate change in Maputo Environmental Protection Area (MEPA): Conserving and building resilience”. The project aims to reduce climate change related risks and enhance resilience for vulnerable coastal communities through the conservation and sustainable use of vital ecosystems. It also focuses on raising the awareness and knowledge of an Ecosystem-based Adaptation (EbA) approach (EbA Call, 2021). The project supports subsistence and artisanal fishing, coral reef monitoring, beach patrolling, building walking trails, dune rehabilitation, and seagrass and mangrove restoration.

7. Co-management

Wildlife protection was one of the main activities that the co-managers took when implementing the collaborative management, with the intention of wildlife numbers recovery. Actions were also directed to mobilize local communities and integrate them in management of the Parks, while

providing support for their livelihoods. Until 2024, the two landscapes of the GLTCFA and LTFCFA have benefited 107 725 people.

Communities have received support in areas such as agriculture, fisheries and benefit-sharing mechanisms. The Government allocates **20% of park-generated revenue** to local communities through direct payments into the bank accounts of Natural Resource Management Committees. The benefits extend further into energy saving with distribution of cookstoves, agriculture and livelihoods support. Additional initiatives include:

- **Field Schools** providing hands-on training and technical assistance for both women and men,
- **Fishing access** within the parks,
- The **Herding for Health** program, which supports livestock health, pasture management, and market linkages,
- **Environmental education** through conservation seminars and awareness-building efforts.

Maputo National Park

Peace Parks has supported the development and management of this area for several years. In 2006 it signed a co-financing agreement for the Maputo Special reserve management and in 2009 for the management of the Ponta do Ouro Marine Partial Reserve. In 2018, a 15 year Co-management agreement with the National Administration of Conservation Areas was signed. In December 2019, the government of Mozambique proclaimed the Maputo Environmental Protected Area in effect. The declaration of Environmental protected Area (EPA) creates an enforceable buffer zone to protected areas and by including Inhaca Island, currently managed by Eduardo Mondlane University brings the whole network of protected areas under the umbrella of the National Administration for Conservation Areas. The protected area has now been extended from three nautical miles to 18 nautical miles into the ocean side through the declaration of the EPA.

The Co-Management Plan for the MNAP marine area aims to ensure sustainable use of fishing resources and the conservation of ecosystems in Maputo Bay. Its objectives include contributing to food security and improving the living conditions of local fishing communities, and ensuring the implementation of fisheries and ecosystem management instruments. This plan also serves as a guiding framework for the development and/or revision of related local plans, such as the updated Coastal Resources Management Plan for MNAP and the Co-Management Plans for Community Fisheries Councils (CCPs) (Maputo National Park Steering Committee, 2025). The **Community Fisheries Council (CCP)** is a legally recognized, community-based organization that collaborates in the participatory management of fisheries. CCPs are responsible for supporting conflict resolution related to fishing activities and ensuring compliance with fisheries management measures. Currently, CCPs for Mabuluku, Santa Maria, Muvukuza (freshwater), and KaNyaka Gala (freshwater) for fishing on Lagoa Piti are legalised with reinforced capacity and authority to co-manage local fisheries, empowering fishing communities decision-making participation, and for enforcing government regulations.

Banhine National Park

After the cessation of hostilities in 1992, there was still no government control over hunting in Banhine, which was responsible for decimation of wildlife. It was not until 1998 when the first staff from the National Directorate of Forest & Wildlife (DNFFB) were stationed in the area (Ministério do Turismo, 2010). Under the implementation of TFCATDP, the co-financing agreement between Government and AWF, played an important role in advancing activities that were centred in protection of flora and fauna as well as supporting community livelihoods.. As part of this initiative, the boundaries of **Banhine National Park** were revised to exclude community settlements while maintaining the representation of key habitats within the protected area. As a result, the population of ostrich increased, which was translocated to repopulate the Zinave National Park sanctuary. The implementation of the co-management agreement is showing progressive results in conservation. As part of these efforts, the partner started an ecological connectivity program, which led to the development of a land-use plan for the Mapai District, clearly defining ecological corridors. Ongoing monitoring of elephant movements has confirmed the migration of these animals between Limpopo and Banhine, providing further evidence of the importance of maintaining landscape-scale connectivity.

8. Banhine and Maputo National Parks as future Ramsar Sites

Mozambique has designated two Ramsar Sites of International Importance:

- [Zambezi Delta](#) (3,171,172 ha),
- [Lake Niassa and its Coastal Zone](#) (1,363,000 ha)

Given their high natural value and well-established management frameworks, both Maputo and Banhine National Parks would qualify for inclusion on the List of Wetlands of International Importance, also known as the Ramsar List. The vision for the Ramsar List is “to develop and maintain an international network of wetlands which are important for the conservation of global biological diversity and for sustaining human life through the maintenance of their ecosystem components, processes and benefits/services”. The “[Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance of the Convention on Wetlands \(Ramsar, Iran, 1971\)](#)”, adopted at COP11 in 2012 and updated at COP14 in 2022, serves as a key instrument for the practical implementation of the Ramsar Convention and the Site designation.

The rewilding plans for both parks will enhance the **ecological character**¹¹, which is a key element of the Ramsar's Wise Use pillar.

For the GLTFCA, there is no direct surface watercourse flowing from the [Makuleke Ramsar Site](#) (10,799 ha) across the border to South Africa into Banhine National Park, but both sites are part of the broader Limpopo River Basin. The Limpopo River receives inflows from the Luvuvhu (from Makuleke) and from the Changane (which drains Banhine). The migratory waterbirds visiting the Great Limpopo TFCA area provide another functional link. The designation of Banhine National Park wetlands under Ramsar has the potential to contribute significantly to filling a representational gap in the global network of arid-zone wetlands, support climate resilience strategies, and reinforce transboundary conservation within the Great Limpopo TFCA.

¹¹ “The combination of the ecosystem components, processes and benefits/services that characterize the wetland at a given point in time”.

The Maputo National Park wetlands are close to the Isimangaliso Wetland Park (239,566 ha) across the border to South Africa, with coral reefs, long sandy beaches, coastal dunes, lake systems, swamps, and extensive reed and papyrus wetlands. iSimangaliso includes four listed Ramsar Sites: [Kosi Bay](#) (10,982 ha), [Lake Sibaya](#) (7,750 ha), [St. Lucia System](#) (115,500 ha), and [Turtle Beaches/Coral Reefs of Tongaland](#) (39,5000 ha). There is a contiguous oceanic and ecological linkage between the marine and coastal components of the two transfrontier parks. A designation of the Maputo National Park as a Ramsar Site will reinforce the conservation of a unique and connected wetland mosaic spanning national borders, while enhancing international cooperation and ecosystem-based management in southern Africa. It would also strengthen functional ecological connectivity across borders and support climate adaptation and biodiversity protection strategies.

This opportunity comes at a key moment, as Maputo National Park is currently under consideration to become part of an extension to the iSimangaliso World Heritage Site, expected in July 2025. Such a designation would further solidify conservation collaboration between Mozambique and South Africa, elevating the shared ecological and cultural significance of the region.

9. Conclusion and Recommendations

The wetlands of the Banhine and Maputo National Parks provide prime examples of valuable, well-managed wetlands, covering a wide array of different inland and coastal types. Both parks are actively engaged in rewilding initiatives, which enhance the potential for key animal species to positively influence the ecological character, that is, the structure, function, and resilience, of these ecosystems. The large-scale conservation approach through the Transfrontier Conservation Areas (TFCAs) and collaboration across the borders of marine ecosystems facilitates movements of key animals of high importance for the ecological functions (“the ecological character”) of inland and coastal wetlands.

Given the exceptional wetland values of the Banhine and Maputo National Parks of Mozambique, it is recommended to nominate both areas as Ramsar Sites of International importance. This designation would not only recognize their global ecological significance but also foster the creation of transboundary Ramsar site management frameworks in collaboration with neighbouring Ramsar Sites in South Africa, under the umbrella of the Great Limpopo TFCA (GLTFCA) and the Lubombo TFCA (LTFCA).

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Case Study #8: Rewilding Case Study: The Urema floodplain - Gorongosa National Park, Mozambique

Chloe Eckert, Global Rewilding Alliance - Marc Stalmans, Gorongosa National Park



Floodplain grasslands with buffalo in the foreground, Mount Gorongosa in the background left and Lake Urema in the background right. Photo credit: Beto Tenente.

Background

The Urema floodplain in Gorongosa National Park in central Mozambique combines a striking landscape of waterways, marshes, and grassy plains. Situated in a Rift Valley depression, Gorongosa's wetlands are sustained by a complex ecohydrological system. While rainfall from nearby Mount Gorongosa is a primary source, where precipitation levels are particularly high, the area also benefits from an average annual rainfall of around 1000 mm. Additional inflows come from rivers originating on both Mount Gorongosa and the eastern shoulder of the Rift Valley. At times, supplementary flooding from the Pungue River further enhances the system when the river breaks its banks and diverts water into Lake Urema via a natural detour. This dynamic water input supports one of the most productive and biodiverse wetland systems in Africa (Figure 1).

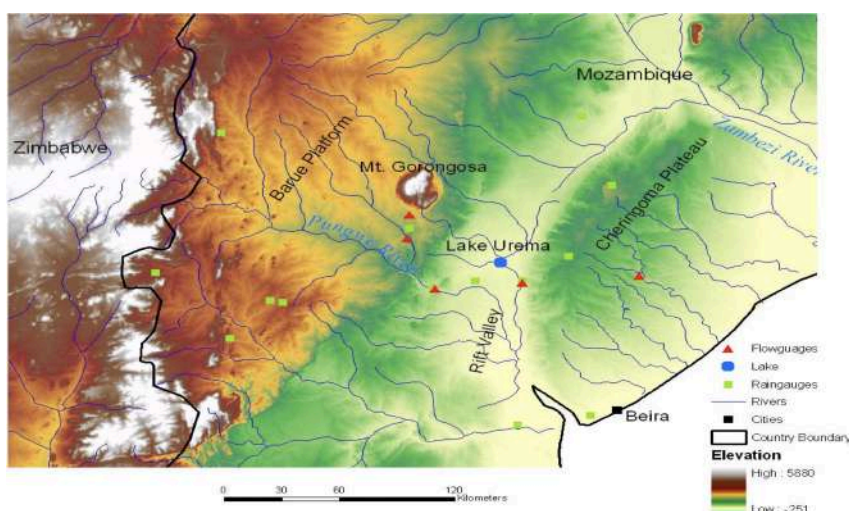


Figure 2: Map showing the location of Lake Urema as well as rain and flow gauges. [Image Source](#)

Observed Changes

This natural abundance was nearly obliterated by decades of conflict. Gorongosa National Park was at the heart of Mozambique's civil war (1977–1992), during which it became a contested zone and suffered severe degradation. Warring parties entrenched in the park decimated wildlife for ivory and meat and destroyed much of the park's infrastructure. The lack of funding and resources that followed the war, along with the absence of conservation enforcement, only worsened the situation. Armed poachers and desperate, food-insecure communities continued to hunt what little remained.

By the mid-1990s, aerial surveys revealed the devastation: Most large ungulate species suffered losses of 90 to 99% of their population by the year 2000. The ecological consequences were swift and severe. With the collapse of herbivore populations, the floodplain's formerly open grasslands began to overgrow. Woody cover in the Urema wetlands increased by 134% between 1977 and 2012. Invasive species such as *Mimosa pigra*, a wetland-choking shrub native to tropical America, proliferated unchecked, further degrading the landscape.



Figure 3: A hippopotamus charges into the waters of Lake Urema in Gorongosa National Park, Mozambique. Photo by Josh Daskin.

Conservation Challenges and Rewilding Strategies

At the invitation of the Government of Mozambique, the US-based Carr Foundation entered into a public-private partnership to rehabilitate the park starting in 2005. These are some of the key measures implemented since then:

- **Anti-Poaching and Law Enforcement:** A top strategy has been rigorous protection. The park revamped its ranger force after 2007, training teams to remove snares and arrest poachers. This sharply cut illegal hunting across Gorongosa, allowing animal numbers (including wetland species) to recover. Long-term monitoring has guided interventions, for example, wildlife counts help time patrols for high-risk zones.

- **Selective introduction of wildlife:** Whereas most ungulate species, as well as elephant and lion recovered from remaining viable nuclei following increased protection, for some species numbers were too low and natural recovery would have taken a very long time. A total of 210 buffalo, 180 blue wildebeest, and 40 zebra were introduced. Wild dog, spotted hyena and leopard that were extirpated have been re-introduced from 2018 onwards.
- **Habitat Protection and Connectivity:** Gorongosa has expanded and reinforced habitat safeguards. In 2010, the upper slopes of Mount Gorongosa (above 700m) were also proclaimed as National Park in order to better protect the important water catchment function as well as its high species diversity and endemism. This step protects the floodplain's water supply. Mozambique also designated a 5,400 km² Buffer Zone was proclaimed around the Park towards achieving a more sustainable land use and human development for its approximately 300,000 people, prohibiting destructive activities (mining, river diversion, pollution) that would dry out or degrade the wetlands. The Urema floodplain is a central component in a much larger connected landscape from Gorongosa Mountain to the Zambezi delta on the Indian Ocean. This landscape is recognized as the Gorongosa-Marromeu Key Biodiversity Area 49160.
- **Community Engagement and Sustainable Use:** The co-management agreement advances conservation and human development simultaneously in a mutually supporting manner at scale in the area surrounding Gorongosa's floodplain. This part of the central Sofala province is characterized by high levels of poverty and significant exposure to climate events such as droughts, floods and cyclones. The Protected Area is combined with the surrounding landscape to create lasting conservation of ecosystem services, biodiversity, natural land cover and productive soils, which in turn enables nature-based businesses and mitigates climate impacts. Activities are undertaken with human rights and gender equality values. Local human capital is developed and nurtured from pre-school to university education, including an emphasis on science.
- **Controlling Invasives:** Although herbivores have naturally curbed Mimosa, monitoring continues. The research includes diet studies of the antelopes which contribute to an understanding of their role in suppressing the Mimosa. Chemical control of weeds has not been needed so far, but remains an option if wildlife grazing alone proves insufficient in some areas.
- **Climate Resilience:** Climate change poses a growing challenge to Gorongosa's wetlands. Models predict that Mozambique will face reduced rainfall and more frequent droughts in coming decades. These shifts could shrink the Urema floodplain or alter its seasonal flooding. To prepare, Gorongosa is working on the protection of headwaters (like Mt. Gorongosa) and the preservation of floodplain hydrology. Maintaining intact river flows and flood regimes is a priority.

Biodiversity Recovery and Ecosystem Complexity

With the restoration of both grazers and carnivores, the Urema floodplain has reemerged as a biodiversity hotspot. The area's mix of open water, marsh grasses, and reedbeds now supports over 47 mammal species and hundreds of bird species. Hippos and crocodiles, key players in aquatic systems, have returned in large numbers, with 2,745 Nile crocodiles counted in 2020. Waterbuck and reedbuck are thriving in the floodplain, where natural features protect them from predators. Their varied and adaptable diets show how the ecosystem is beginning to recover and stabilize. As predator numbers recover, herbivores are expected to settle into more distinct roles in the ecosystem. Seasonal flooding connects upland forests with lowland marshes, helping animals move across the landscape and supporting the flow of nutrients. The return of colonial waterbirds and rare birds of prey, along with healthier habitats, points to a strong increase in bird diversity. Since 1994, herbivore populations have recovered in terms of total biomass, but species abundance is currently still skewed with more medium-bodied ungulates (such as waterbuck and impala) as compared to the dominant buffalo, hippo and elephant found pre-war. Altogether, these changes show that Gorongosa's wetlands are once again healthy and resilient, thanks to restored wildlife interactions and long-term conservation work.



Figure 5: Waterbuck in Gorongosa's Urema Floodplain in 2015.

Conclusion

Gorongosa's story shows that even heavily degraded wetlands can recover through scientifically informed, well-funded rewilding. Large herbivores and predators have returned, reinstating top-down ecological control. Ecosystem functions-such as vegetation regulation, nutrient cycling, and predator-prey dynamics-are being restored. Challenges remain, including climate change and long-term financial sustainability. However, the Gorongosa's integrated approach, combining ecological restoration, community engagement, and habitat connectivity, offers a global model for wetland recovery.

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Case Study #9: Restoring the Hippo in Uganda’s Murchison Falls National Park and Conservation Area

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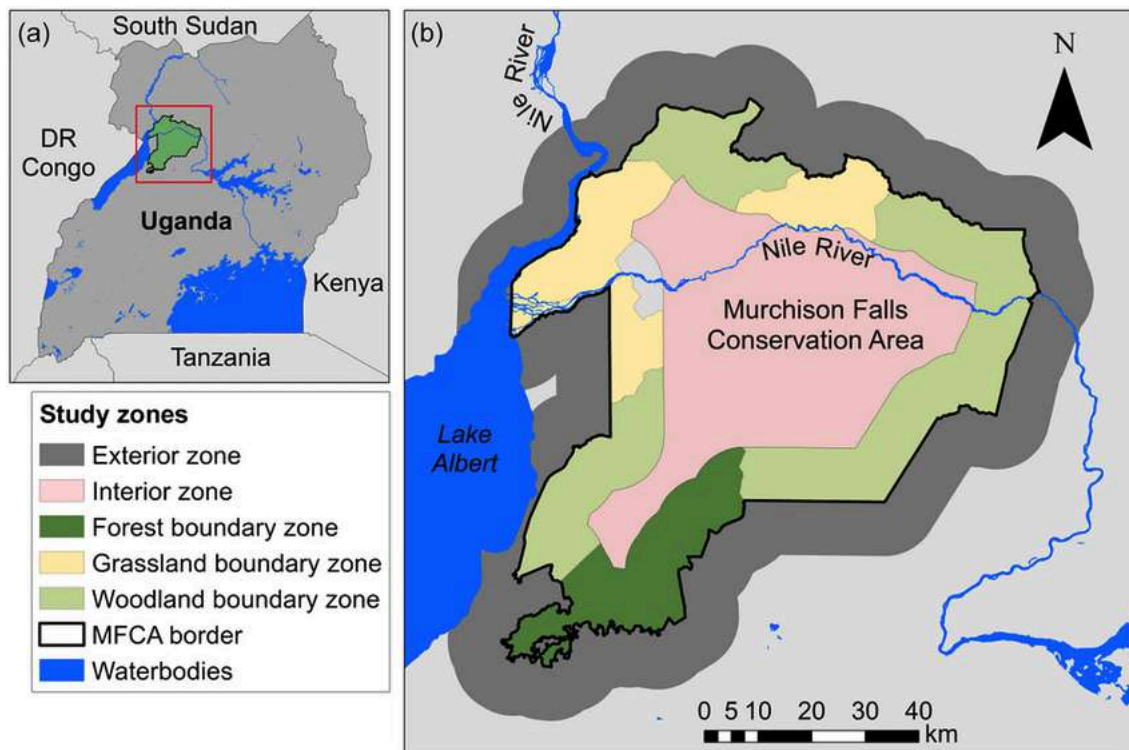
[Image Source](#)

Introduction

The Common Hippopotamus (Hippo) (*Hippopotamus amphibius*), one of Africa’s most iconic and ecologically significant megaherbivores, is facing growing threats in Uganda’s Murchison Falls National Park (MFNP), part of the Murchison Falls Conservation Area (MFCA). Although currently listed as *Vulnerable* on the [IUCN Red List of Threatened Species](#), recent field reports indicate a potentially dramatic decline in MFCA’s hippo population— annual MFCA censuses showed more than a 50% decline in its hippo population in the last five years.

Visual evidence, ranger accounts, and partner observations from the Uganda Conservation Foundation (UCF) point to a steep downward trend in hippo numbers, prompting [the Global Humane Conservation Fund of Africa](#) (GH-CFA) – a program of [Global Humane Society](#) to launch the **Hippo Recovery Initiative** in collaboration with UCF and in support of the Uganda Wildlife Authority (UWA). This initiative focuses on the urgent need for localized monitoring, conservation action, and long-term protection of this keystone species.

While the IUCN Red List assessment describes the species in Uganda as “widespread, locally abundant and increasing,” the on-the-ground reality in MFNP suggests that such global assessments may not fully capture region-specific dynamics. This underscores the importance of site-specific monitoring and adaptive management.



Location of the Murchison Falls Conservation Area in north-western Uganda. [Image Source](#)

Threats to Hippos in Murchison Falls National Park

Several interconnected factors are contributing to the decline of hippo populations in MFNP:

1. Poaching for Bushmeat and Ivory Teeth

A growing illegal trade in hippo teeth—often referred to as “hidden ivory”—has emerged as a serious threat. Investigations by *National Geographic* in [2016](#) and [2023](#), as well as a [2024 report by Africa Geographic](#), have highlighted that this illicit trade occurs in Uganda. It is estimated that approximately **87,000 kilograms of hippo teeth** have been exported from Uganda over the last decade, which corresponds to around 16,700 animals¹². This is a staggering figure with serious implications for wild populations, considering the current population estimate of 130,000 hippo in Africa.

¹² With an average 5.2 kg ivory from a hippo (calculated from data in [ref.](#) 14,000 kg corresponds to 2,700 animals), 87,000 kg of hippo teeth corresponds to 16,730 animals.



The ivory in a hippo consists of the four upper and lower canine teeth plus two incisors. [Image Source](#)

2. Human-Wildlife Conflict

As agricultural expansion and settlement encroach on natural habitats, encounters between hippos and people are increasing. Hippos can cause significant crop damage and occasionally injure or kill people, often leading to retaliatory killings. These incidents are frequently unreported, yet they play a significant role in reducing local hippo numbers.

3. Environmental Instability and Climate Variability

The Lake Victoria Basin—which includes MFNP and the Victoria Nile—has experienced unprecedented hydrological shifts, including [widespread flooding in 2019–2020](#) and [severe drought in early 2022](#). These climate anomalies have displaced wildlife and altered breeding patterns. For example, the flooding negatively impacted Nile crocodile reproduction in MFNP ([source](#)). It is likely that hippos experienced similar displacement, reproductive disruptions, and habitat stress.

The Hippo Recovery Initiative

In response to these escalating threats, GH-CFA, in partnership with UCF and in support of UWA, has launched a comprehensive **Hippo Recovery Initiative** focused on the following interventions:

Habitat Protection

- Strengthening protection of aquatic and terrestrial hippo habitats through increased deployment of wildlife protection units in critical areas of MFNP.



Marine patrol with UWA rangers

Community Engagement

- Supporting UCF's community-based programs that reduce human-wildlife conflict and promote coexistence.
- Recruiting and training local youth through UCF's *Scout Support Program*, fostering conservation stewardship and providing alternative livelihoods.



A mountain of snares and wheel traps collected by rangers on patrol in MFNP

Wildlife Rescue and Veterinary Support

- Establishing a dedicated Wildlife Rescue Unit to provide rapid response to hippos and other wildlife injured by poaching activities, especially snare-related wounds.



Wildlife Rescue Unit vehicle at MFNP



The Wildlife Rescue Unit team prepares to respond to an injured animal

Policy Advocacy

- Raising the profile of hippo conservation issues at national and international levels.
- Advocating for stronger enforcement and policy measures to curb the illegal trade in hippo ivory.

Next Steps: Data Collection and Monitoring

A central component of the Hippo Recovery Initiative involves establishing accurate, up-to-date data on hippo population size, distribution, and demographics in MFNP. This data will provide a baseline for tracking recovery trends, informing conservation strategies, and influencing policy.

Why It Matters

Hippos are **keystone species** and **ecosystem engineers**. Their movements maintain wetland dynamics, and their dung plays a vital role in nutrient cycling and aquatic food chains (for more

information on the ecological role of the hippo, see section 8 of the literature review). A decline in hippo populations could result in far-reaching ecological consequences, disrupting the integrity of river systems and biodiversity within MFNP.

In addition, hippos are a flagship species for ecotourism in Uganda. Their loss threatens not only the ecological health of wetlands but also the economic potential of wildlife tourism and conservation-linked livelihoods across the Nile Basin.

A Call to Action

The hippo crisis in Murchison Falls National Park is a stark reminder that species deemed "non-critical" can decline rapidly and quietly. It also highlights the urgent need for **localized conservation action, updated data, and strong collaboration** between governments, NGOs, scientists, and communities.

The GH-CFA urges donors, policymakers, and international conservation partners to support the Hippo Recovery Initiative. With timely intervention, Uganda's hippos can be protected—and the health of Africa's wetlands restored.

For more information about the Hippo Recovery Initiative or to support our work, please contact africa@globalhumane.org or visit our [website](#).

Case Study #10: Yawri Bay, Sherbro River Estuary and Lake Piso - Grand Mano Landscape, Sierra Leone & Liberia

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1. Context and landscape

The **Grand Mano Landscape** in **Sierra Leone and Liberia** is described as follows (see Terms of reference for the development of a **Grand Mano Master Plan** under the Wetlands International/EU-PAPBio project: *Management of Mangrove Forest from Senegal to Benin*) ([ref](#)) and map below):

Extending from the outskirts of Freetown (Sierra Leone) to Monrovia (Liberia), the Grand Mano Landscape includes, in Sierra Leone, the **Yawri Bay** and the **Sherbro River Estuary proposed Ramsar sites and Marine Protected Areas (MPAs)**, the Sewa Waanje Reserve, and the Strict Transboundary 2 Mangroves Reserve in Sulima. In Liberia, it includes the **Lake Piso Ramsar site and proposed MPA**. It hosts many species of global significance which, despite conservation efforts, continue to be threatened by various factors resulting from human activities and climate change, compounded by institutional, regulatory, financial, management, and governance weaknesses.

The **Grand Mano Master Plan** ([ref](#)) was prepared for the Governments of Sierra Leone and Liberia and the regional Mano River Union, to address these challenges and establish mechanisms to improve the situation, in particular to promote transboundary conservation efforts between Sierra Leone and Liberia. Formulation of the Plan was led by Wetlands International Africa (WIA) in consultation and collaboration with stakeholders, under the '*Management of Mangrove Forests from Senegal to Benin Project*', (part of the EU PAPBio programme). The Master Plan notes in the Preface:

"The coastal ecosystems in Sierra Leone and Liberia, including the vital mangrove forests, are facing severe challenges and are in decline. The exact size of coastal wetlands in these countries is unknown, but it is crucial to note that a significant portion of these ecosystems exists, totalling 1712.4 km², with 995.2 km² found within the Grand Mano Landscape.

Despite the importance of these ecosystems, they are under threat due to various factors such as population growth and inadequate governance. Over the past 13 years, beginning in 2010, approximately 129 km² of mangrove forests have been lost at a rate of 2% per year, largely due to excessive logging of mangrove wood and changes in land use for agriculture and settlements. This loss extends to lowland coastal forests, exacerbating the situation."



Map of the three proposed Marine Protected Areas and Ramsar sites in the Grand Mano Landscape

The Grand Mano Landscape is also part of wider designated and recognized coastal and marine seascapes, including 2 EBSAs (Ecologically or Biologically Significant Marine Areas) ([ref](#)) ([ref](#)) of the South Eastern Atlantic Ocean. These are: the (massive) **Area of Convergence of the Canary and Guinea Currents EBSA** ([ref](#)) and the **Yawri Complex EBSA** ([ref](#)), which follows a similar boundary to the coastal parts of the Yawri Bay and Sherbro Estuary MPAs (including Yawri Bay, Banana and Turtle Islands, and extending southward to Sherbro Island) It also extends further - 10 km west of the bay - into the adjacent continental shelf waters of Sierra Leone.

This whole West African coastline is enormously diverse and complex – with myriads of different habitats and zones on land, in fresh water, and in the open ocean. Some of the most productive ecosystems on the planet occur in the transition zones where land meets the sea, such as coastal zones and estuaries (including **mangroves, seagrass meadows and inshore coastal islands**), and further offshore, where open seas, oceanic upwellings, and converging currents harbour extraordinary marine biodiversity and life forms. There are multiple (and mostly very poorly studied) ecological interactions between animal species and groups, coupled with the influences of geography, hydrology and Atlantic oceanic weather systems – all affecting land, freshwater and marine habitats, wild animals and human communities along the coast and throughout the Grand Mano landscape.

The landscape, and the people and wild animals which inhabit it, epitomise connectivity – both

between land and water and along the coast. Coastal communities, fishers, and farmers move and interact along the whole coastline and crossing national boundaries. Many mammals, fish and birds (terrestrial, freshwater, and marine) move, feed, breed and roost in various habitats. Long-distance migrants (e.g. Afro-Palaeartic seabirds, shorebirds and landbirds) arrive or leave at different seasons and times of the year to breed or ‘overwinter’, interacting with people and resident wildlife species. These wider land and seascapes, along with the Ramsar sites and Marine Protected Areas, are critically important for people and livelihoods, biodiversity conservation, and for their contributions (including as part of wider ocean ecosystems) to maintain stability and resilience, and mitigating impacts of climate change for people and biodiversity. All these coastal communities (human and other species and habitats) are particularly vulnerable to the impacts of climate change, sea level rise, coastal erosion, loss of habitats, and decline in ecosystem services. (See, for example, outputs from the 2020 USAID/ WABiCC (*West Africa Biodiversity and Climate Change*) programme in Sherbro River Estuary ([ref](#))).

Yet despite their importance, these areas remain poorly understood from a scientific perspective. Despite protected area designations and various conservation efforts, many sites lack adequate management plans, regulatory, enforcement and monitoring mechanisms and funding and resources for their effective protection, restoration and monitoring. Most ecological and socio- economic research has related to productivity of systems and species for human uses (especially fishing and offtakes), sustainable use of habitats (e.g. mangroves) and issues of regulation, human-wildlife conflict or community livelihoods. This is needed for improved management but knowledge gathering also needs to go further, with more focus on ecological inter-dependencies, ecosystem services, impacts of climate change and adaptive management to develop ecosystem and community resilience.

Some processes for management planning, regulation and monitoring of land and resource management, including exploitation and harvesting, are underway in all three Ramsar sites. These efforts are supported by international bodies and donors helping partnerships to strengthen regulation, local governance and involvement of communities in co-management and citizen science monitoring (e.g. the Yawri Bay Management Plan funded by the Critical Ecosystem Partnership Fund – see *Sites, below*). New ‘Blue Carbon’ opportunities in mangroves are also bringing new finance into conservation management and community benefit-sharing (e.g. *West Africa Blue projects, see below*). These are also helping to strengthen and deepen understanding of these critical ecosystems and the roles that wild animals play in shaping them and maintaining their ecological health and functions.

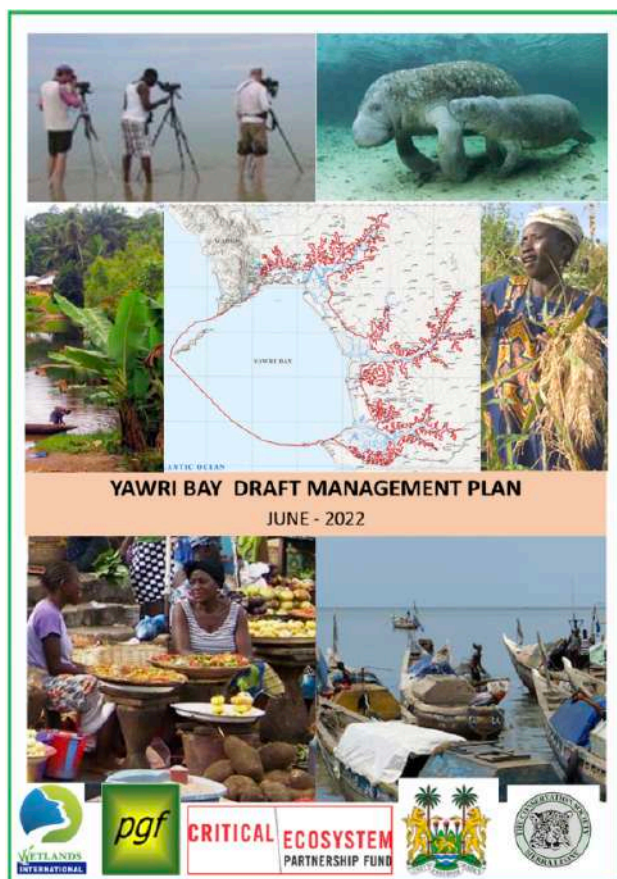
2. Ecosystems and Animals - impacts and interactions in the Grand Mano landscape

Here, we showcase a few of the species, habitats, ecosystems and ecological interactions which are known or likely to be important in the three Ramsar sites, MPAs and wider Grand Mano landscape. We highlight the need for more research and targeted monitoring for local communities, governments, scientists, site managers, community scientists and others, to understand, manage and protect these ecosystems in perpetuity. This is necessary for the benefit of local and wider communities who rely on their biodiversity, resources and ecosystem services for sustainable development and long-term resilience in the face of climate change.

As described above, the whole coastline where ‘the land meets the sea’ is incredibly complex, diverse and productive. Land and terrestrial habitats, forest and fresh water, transition into estuaries, mangrove swamps, brackish and saltwater lagoons, mudflats, seagrass meadows, open sea water, and coastal and offshore sand bars and islands. This transition zone is also highly vulnerable to impacts of human over-exploitation, development, pollution and the impacts of sea level rise, storm surges and other direct effects of climate change. These pressures result in erosion, saltwater intrusion, loss of land and property and rapid declines in biodiversity and the availability of ecosystem services. The term ‘interface environment’ was coined to describe these marine/continental complexes and classify the component ‘lagoon and estuarine environmental systems’ (LEEs) they contain ([ref](#)).

3. Ecosystems - three Ramsar sites in Grand Mano landscape

The Yawri Bay (proposed) Ramsar site is a mostly shallow coastal/ marine zone with intertidal mudflats and sand along the continental foreshore, backed by mangrove swamps and creeks. It incorporates the offshore islands and the stretch of sea water lying between Banana Islands and the Western Peninsula to the north, and Plantain Island and the Shenge Peninsula to the south. The whole area (except for the central bay and open sea more than 6 kms from the shore), also has the status of a **Marine Protected Area** (designated but not yet fully gazetted under Sierra Leonean law). The site includes all of the intertidal waters (and mangroves) extending many kms. up the Calmont Creek and three main rivers (Ribbi, Bumphe and Kagboro). It also contains some inland swamp and forest habitats (which, together with the coastal wetlands, also qualify as an Important Bird Area (IBA) ([ref](#)) and proposed Ramsar Site (principally for breeding seabirds and wintering sea and shorebirds, both Palaearctic and Afrotropical migrants and resident species). The bay and the whole Yawri Complex (including Sherbro) is rich in biodiversity, including the West Africa manatee (*Trichechus senegalensis*) and Royal tern *Sterna maxima*. In the National Biodiversity Strategy and Action Plan (NBSAP), the site is classified as a major breeding and nursery ground for a range of both pelagic and demersal fishes. The bay’s topography is mostly gentle, a feature that protects it from the strong current of the Atlantic Ocean, thus providing a very suitable spawning and nursery area for fish and other marine life.



Yawri Bay Draft Management Plan. Prepared on behalf of the Ramsar Steering Group and Yawri Bay stakeholders: Government of Sierra Leone (National Protected Areas Authority, Ministry of Fisheries and Marine Resources); Western Rural and Moyamba District Councils; NGOs Conservation Society of Sierra Leone (CSSL), Wetlands International (WI), The Reptiles and Amphibians Programme (RAP-SL); Paramount Chiefs and Elders (Ribbi, Bumpeh and Kagboro Chiefdoms) & community groups (Community Management Associations in 10 clusters) with funding from CEPF (Critical Ecosystem Partnership Fund) ([ref](#)).

The Sherbro River Estuary (SRE) Ramsar Site and proposed MPA is also a component part of the Yawri Complex, south of and contiguous with Yawri Bay. SRE has a comparable diversity of habitats, including lowland coastal forests, rocky waterways, sandy beaches, inter-tidal mudflats, sand flats and mangrove swamps at confluences with the sea or along rivers and creeks that receive salty water. Various vegetation types are present, with mangrove forests predominant (seven different species). There are four proposed estuarine/ coastal MPAs in Sierra Leone (with the Scarcies and Sierra Leone River (SLRE) estuaries in the north of the country). Together, these four estuaries (Scarcies, SLRE, Yawri Bay and SRE) account for over 90% of the country's mangrove area and Sherbro River Estuary alone accounts for over half ([ref](#)). Animal species include West African manatee, Maxwell's duiker, *Cephalophus maxwelli*, primates including Campbell's monkey *Cercopithecus campbelli*, Sooty mangabey *Cercopithecus atys*, Spot-nosed monkey *Cercopithecus petaurista*, Western Chimpanzee *Pan troglodytes verus* and at least four species of Atlantic marine turtles. As in the rest of the Yawri Complex, the SRE is a highly suitable spawning ground for fish and a reproduction ground for other marine fauna. Some 150 species of fish have been recorded

including commercial species such as herring (*Sardinella alba*, *Sardinella maderensis*, and *Sardinella aurita*), bonga (*Ethmalosa fimbriata*), latti (*Ilisha africana*), shine nose (*Galeoides decadactylus*), mullet (*Mugil* sp), tilapia, and catfish (*Synotondis* sp., *Chrysichthys* sp, *Arius* sp., *Bagrus* sp.) Other species such as groupers and sharks are present but are increasingly rare. Molluscs, crustaceans, and various zooplankton and phytoplankton are also found, but scientific information about them is scant ([ref](#)). A bird species of growing interest in terms of its use of and influence on mangrove ecosystems in and around Sherbro and elsewhere in Sierra Leone (as well as Guinea Bissau and Liberia) is the Endangered **Timneh Parrot**, *Psittacus timneh*. Recent surveys have discovered new breeding areas in the coastal regions, (potentially some of the highest numbers of Timneh Parrots known anywhere in their range), highlighted the importance of mangroves to these birds and identified critical habitat needing protection (see *Timneh Parrot* below).

Lake Piso Multiple Sustainable Use Reserve ([ref](#)) ([ref](#)) ([ref](#)) is the southernmost of the three Ramsar sites and MPAs in the Grand Mano landscape – near Robertsport to the west of Monrovia. The MPA boundary extends as far north as the border with Sierra Leone which is formed by the Mano River. The Reserve and MPA epitomise the terrestrial (freshwater) -coastal -marine interface, diversity and connectivity including trans-border between countries. Nearly contiguous areas of mangrove swamps, wetlands, sand dunes and mudflats cross this trans-border area, with strong ecological, hydrographic and oceanic connectivity likely influencing the whole area. This connectivity also applies to the fauna, with many key mobile species such as fish, manatees, sea turtles and seabirds dispersing and migrating across the different zones and along the coastline. It is hugely important to local communities, (more than 7,000 people from the Vai and Mende ethnic groups), who depend upon Lake Piso for transportation, commercial and non-commercial fishing, sand for construction, subsistence farming and trade and other activities including some tourism and water sports.

Lake Piso itself has multiple habitats and zones, supporting a high diversity of fauna and ecological processes. It consists of a large (40 sq miles) coastal lagoon open to the sea, fed by a number of creeks and rivers which drain swamps above the lagoon. Toward the seaward end, the swamps are tidal and support mangroves. Inland, the lagoon is surrounded by forested hillsides. There are four main vegetation types around the wetland: tropical evergreen forest, mangrove swamp forest, freshwater swamp forest, and coastal savannah woodland. Coastal sand covers most of the land area (inland for c. 8 to 10 km from the coast). There is a series of small lakes and swamps on the sandy forested spit that separates the lake from the sea. The site is important both as a nursery and spawning ground for fish and sea turtles and as feeding and roosting areas for large numbers of shore and seabirds. The lake is also known as Fisherman's Lake and the name Piso is said to mean "pigeon's hole" – a reference to the flocks of pigeons that once came to Lake Piso for water and are believed to have lived in caves on its banks. The surrounding area supports a variety of wildlife, including forest buffalo, antelopes, duikers, monkeys, bushbucks, crocodiles and manatees. Two globally endangered primates occur: the Olive colobus, (*Procolobus verus*) and the Chimpanzee (*Pan troglodytes*). The site is also an IBA (Important Bird Area) ([ref](#)) including for landbirds - biome-restricted (Guinea-Congo forest biome) bird species, indicating the importance of its diverse terrestrial as well as wetland habitats.



Local women's group project, Lake Piso Multiple Use Reserve and Ramsar site – photo SCNL
(Society for the Conservation of Nature in Liberia)

4. Wild animal impacts and ecosystems in the Grand Mano Landscape and Ramsar sites

4a) Wildlife in the land-sea-coastal interface – estuaries, mangroves, seagrass meadows Studies from coastal and estuarine systems elsewhere in Africa have revealed important roles played by animals in these ecosystems and show the need for more such studies and better understanding of the dynamics and ecological functioning of all the connected coastal, estuarine and oceanic ecosystems in the Grand Mano landscape.

Coastal and estuarine Fish, for example, play key roles in the flow of energy and nutrients and facilitate exchanges within and between coastal and marine systems through their migrations and use of inshore breeding refuges. Estuaries and mangrove ecosystems (including in Grand Mano) act as spawning grounds and nurseries for juvenile fish. The favourable conditions found in estuaries and lagoons, such as nutrition, shelter and often relatively high temperatures, encourage rapid growth in young fish. Most research studies carried out in Grand Mano Ramsar sites relate to the management, monitoring and regulation of exploited fish species in both artisanal and industrial fisheries. These studies inform conservation needs and management of exploited species and the establishment of mechanisms to ensure sustainable use and equitable distribution of benefits in fishing communities. Such efforts are central to conservation and fisheries management plans for the MPAs. (See for example CEPF (Yawri Bay) and EU-PAPBio Mangroves (Grand Mano) projects above and West Africa Blue projects (Sherbro) below).

The West African Manatee (*Trichechus senegalensis*) is a 'mega-herbivore' found in shallow-water coastal and inland riverine habitats with abundant plant resources in the sub-tropics. In West Africa,

from Mauritania to Angola, (including Sierra Leone and Liberia) and inland as far as Mali, Niger and Chad, in the lower, mid and even upper reaches of several major river systems. It is a diverse feeder consuming a wide range of aquatic angiosperms and occasionally fish, clams, crabs, and mussels. As a species which moves between marine, estuarine, and freshwater habitats and migrates along the coast and up and down river systems, it almost certainly has profound impacts on ecosystem dynamics and trophic and community interactions of many other species. Research on other Sirenians has shown marked impacts of their herbivory on the biomass, productivity, and composition of macrophyte communities, knock-on effects on other communities (e.g. invertebrates) and on carbon storage in vegetation and sediments. Manatees also connect disparate ecosystems via their movements, compete with other herbivores, and are prey for some predators, including humans. They may also play roles in seed dispersal and bioturbation and their presence may also contribute to increase in fisheries productivity, due to the enrichment of water by manatee dung. Despite these potentially vital ecological roles, there is a huge knowledge gap regarding the ecology, behaviour and conservation needs of the West Africa manatee. There is a crucial need for research to understand their ecology and conservation needs and the species' impacts on West African ecosystems and biodiversity, especially in the face of ongoing seagrass declines and other impacts of climate change ([ref](#)) ([ref](#)).

The draft **Action Plan for the Conservation of the West African Manatee** ([ref](#)) prepared under the Convention on Migratory Species (CMS), summarises current knowledge of the numbers, distribution, threats, ecology and conservation status across the range states (which include Sierra Leone and Liberia), together with the needs for research and conservation action. Ecological values of the West African manatee (including potential positive impacts for wetland ecosystem management) include the control of plant growth in rivers and waterways, for example clearing channels of overabundant vegetation or invasive species such as water hyacinth. In some areas, there may be a positive relationship between the presence of manatees and an increase in fisheries productivity, due to the enrichment of water by manatee dung.

Many other groups and species of mammals, birds, reptiles, crustacea and invertebrates – which are generally considered 'terrestrial' may also use estuarine, coastal and inland riverine and wetland habitats at different stages of their life cycles or migrations. This is especially true in **mangrove ecosystems**, which are often the interface between land and sea and also a connecting ecosystem in the hinterland behind coastlines, sometimes reaching far inland and across country boundaries as in Grand Mano (*see site descriptions above*). Many 'freshwater' species can also migrate and interact up and down tidal estuaries and river systems and in different conditions of salty, brackish or freshwater which vary, depending on the season and the rains.

The Global Rewilding Alliance 'Global' report lists a wide range of animals and life forms which interact with and influence mangrove ecosystems around the world, sometimes acting as ecosystem engineers. For example, teredinid bivalves (shipworms), which burrow into dead wood in the intertidal zone of mature mangrove forests, creating refuges for terrestrial centipedes, crickets and spiders. Shore crabs (*Carcinus* spp) and fiddler crabs (family *Ocypodidae*) appear to be a major driver of recruitment, tree density and distribution, and size structure in mangrove and other coastal tropical forests. They also serve as a primary food source for stingrays, shorebirds and fish. Small-bodied 'terrestrial' predators, such as predatory ants and birds, may sometimes protect

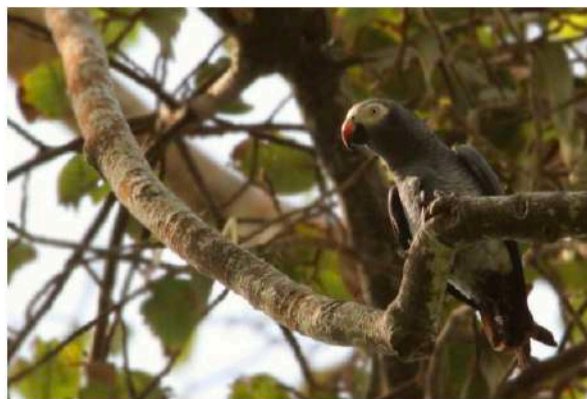
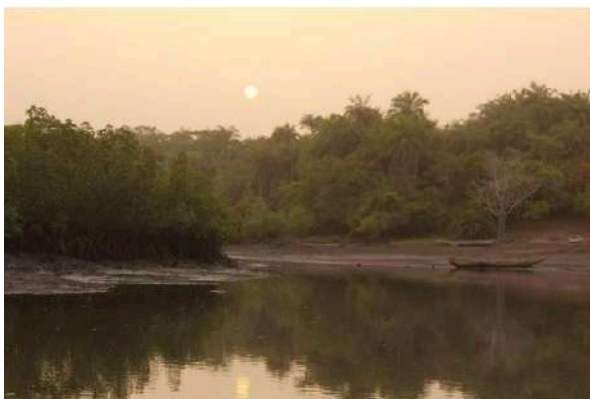
mangroves from the negative effects of insect and crab herbivory on mangrove photosynthesis. See [*Taking Animals into Account: GRA Report to the Ramsar Convention – pp. 25-25*](#).

Larger ‘terrestrial’ animals, typically not associated with ‘coastal or marine’ sites, may nonetheless occupy functional niches and influence many ecosystem processes in the interface zones between land and sea, especially in **mangrove ecosystems**. Their ecological roles include grazing, predation, disturbance, defaecation, seed dispersal and more. Species include forest buffalo, *Syncerus caffer*, small antelopes and duikers, various primates, **Timneh parrot**, and other landbird species occurring in these West African Ramsar sites and wider landscapes. However, there is very little published research on the specific influence of wild animals in mangroves in these sites.

The Timneh parrot, *Psittacus timneh* (EN) is endemic to the western parts of the moist Upper Guinea forests and bordering savannas of West Africa, from Guinea-Bissau east through southern Guinea, Sierra Leone, and Liberia east to at least 70 km east of the Bandama River in Côte d'Ivoire ([ref](#)). It is distinct from the grey parrot *P. erithacus* though not yet recognized as a full species by IUCN. There is no natural range overlap between Timnehs and the grey parrot. Timnehs typically inhabit dense forest, but also forest edges and clearings, gallery forest along waterways, savanna woodland and **mangroves** and may make seasonal movements out of the driest parts of their range in the dry season.

The connection between **Timneh parrots and mangroves** has been under-appreciated generally. They have now been documented nesting in mangroves in Guinea-Bissau and Sierra Leone (and grey parrots, *Psittacus erithacus*, in Nigeria and Angola). It is not clear whether these are ‘preferred’ breeding habitats or whether the nesting (or roosting) sites are refuges (possibly the only safe spaces left protected from human activities due to their inaccessibility) – *Rowan Martin pers. comm.*

The importance of the mangrove ecosystems in Sierra Leone and Liberia for Timneh parrots is just being discovered. World Parrot Trust (WPT) -backed surveys in 2018 found previously undocumented breeding areas in coastal Sierra Leone, and some of the highest densities of Timneh Parrots known anywhere in their range, where several hundred parrots congregate overnight. One of only two known, significant roost sites is also on Rendall island in Sherbro. Recent surveys in Liberia have identified a second comparably-sized roost site and ongoing work is building a more comprehensive picture of the region and identifying sites for potential reintroduction ([ref](#)). Mangroves, particularly those in western areas of the Grand Mano landscape (Yawri and Sherbro) are now considered a significant habitat for the conservation of this endangered species (*Rowan Martin, pers. comm.*).



Timneh parrots and mangroves, Guinea Bissau (Rowan Martin, World Parrot Trust)

The paragraphs above relate to the importance of mangroves for Timneh parrots and their conservation, not the ecological importance of the parrots and their impacts (as breeding and roosting populations) on the mangrove ecosystems and other species. Research into the diet and feeding habits of Timnehs in Guinea-Bissau, based on direct observations and the gathering of local ecological knowledge, found no evidence they specifically eat or disperse mangrove seeds ([ref](#)). There is emerging evidence that the role of some parrot species in dispersing seeds (and as ‘gardeners of the forest’) has been underappreciated ([ref](#)). Other species have been observed carrying tree fruits around and spilling seeds on the ground. This could be a very helpful line of research on Timnehs in Sierra Leone and Liberia, both to help illuminate their roles and impacts on mangrove and wetland ecosystems and to provide knowledge to support conservation and reintroduction programmes for the species in West African mangrove ecosystems.

4b) Wildlife in other coastal/ offshore habitats - islands, sand bars, marine

As described above, the West African manatee is a denizen of both coastal/ inshore and inland riverine systems, but may also move further offshore and migrate along coastlines. The other species and groups considered here are generally categorised as ‘marine’ or offshore but equally may move and migrate between different parts of coastal mangrove, inland and offshore marine ecosystems. In doing so, they interact with and influence these interconnected ecosystems and the other animal species within them.

The Atlantic Humpback Dolphin (*Sousa teuszii*) is listed as Critically Endangered on the IUCN Red List and considered one of the least understood coastal dolphin species, despite its dependence on nearshore habitats that bring it into close contact with human activities throughout its distribution

range. The principal threat to the species, similar to other marine mammals and the West African manatee, is bycatch (incidental entanglement or capture in artisanal gillnets and potentially by industrial trawler nets) – throughout its West and Central African range. Other threats come from deliberate hunting for ‘marine bushmeat’ for human consumption, habitat loss and degradation and disturbance from other human activities including tourism. The major challenge to effective conservation of the species is a lack of sufficient knowledge and understanding of the species’ ecology, its functional role in ecosystems and effects on other species. This knowledge gap weakens efforts to enhance conservation and build wider ecosystem and community resilience in MPAs and beyond. As a marine predator, *Sousa teuszii* almost certainly has substantial top-down ecological effects on nearshore ecosystems in areas with healthy populations. However, there are no targeted studies of their diet or interactions with prey species. Like other *Sousa* species, it is likely that Atlantic humpback dolphins feed on a wide variety of benthic and pelagic fish, cephalopods and invertebrates, and that importance of different prey species in their diet (and hence their ecosystem impact as a top predator) will vary between geographic areas and habitats ([ref](#)).

The species was already known from **Liberia**, (listed as one of the range states) and also one of six countries involved in the Consortium for the Conservation of the Atlantic Humpback Dolphin (CCAHD) project ‘*Harnessing local ecological knowledge to fill data gaps and support conservation of the Critically Endangered Atlantic humpback dolphin*’ ([ref](#)) ([ref](#)) ([ref](#)). This project worked with local coastal conservation groups (including in Liberia and Guinea just to the north of Sierra Leone) to conduct surveys and interviews with fishers and members of coastal communities. The aim was to document the valuable local ecological knowledge (LEK) they possess about dolphins, their habitats, their interactions with fisheries, and other perceived threats.

In **Sierra Leone**, *Sousa teuszii* was only discovered in February 2024 (‘*First confirmed records of Atlantic humpback dolphins in Sierra Leone!*’) ([ref](#)). The observation was made in the area of Sherbro River Estuary MPA by field workers carrying out coastal surveys as part of the West Africa Blue ‘*Sherbro River Estuary (community-centric mangrove conservation and restoration) project*’. This ‘Blue Carbon’ initiative promotes sustainable management of coastal ecosystems and is partly funded by carbon credits ([ref](#)). Subsequently there have been more (live and dead) observations by the West Africa Blue team who record all sightings as part of biodiversity surveys and project implementation.

Marine Sea Turtles

In **Sierra Leone**, five marine turtle species occur along the Atlantic coast and have been recorded nesting on beaches on the mainland and offshore islands in Grand Mano. These species include the Leatherback (*Dermochelys coriacea*), Olive Ridley (*Lepidochelys olivacea*), Green (*Chelonia mydas*), Loggerhead (*Caretta caretta*) and Hawksbill (*Eretmochelys imbricata*). All are considered globally threatened, including their Atlantic subpopulations ([ref](#)). Leatherbacks nest on beaches in the Turtle and Sherbro Islands (the 52km ‘long beach’ on Sherbro is thought to host the largest population of nesting leatherbacks in Sierra Leone based on recent nest monitoring carried out by RAP-SL - Reptiles and Amphibians of Sierra Leone). There is also evidence of nesting activities of the other species on the Sherbro and Turtle Islands, and other beaches on the mainland including Shenge, Lumley, Bureh Town, John “O”bey and the Turners Peninsula beach ([ref](#)) ([ref](#)).

All of these continental coastal areas are home to major settlements whose residents depend on the same mangrove, beach and marine ecosystems. Fishing is the main activity of coastal communities (90% of the estimated 6 million people in the country rely on coastal fisheries for their protein supplies) ([ref](#)) ([ref](#)). Unfortunately, pressures on fish stocks (including from commercial foreign fleets), coupled with lack of awareness and enforcement of endangered species and habitat conservation regulations has led to the exploitation of marine turtles and other threatened/endangered species within coastal areas. This is in addition to threats to marine sea turtles, (as with manatees and other marine animals) from accidental bycatch in fishing nets, collection of turtle eggs, pollution and loss of nesting habitats (through sand mining and natural erosion, especially where mangroves have been removed).



Green Turtle, Turtle Islands, Sierra Leone (Eddy Aruna, RAP-SL - Reptiles & Amphibians Sierra Leone)

As with other fauna in Grand Mano Ramsar sites, there are very few studies of ecological impacts and interactions between sea turtles and the wetland ecosystems they share with people. New approaches are considering the joint impacts on ecosystems and aiming to develop ‘win-win’ solutions for biodiversity conservation and peoples’ livelihoods as well as capacity to adapt to climate change and achieve future resilience. For example, supporting mangrove restoration, coastal stabilisation and more energy-efficient alternatives to using mangrove wood for fish drying can generate significant benefits for both people and wildlife. Central to the success of marine turtle conservation efforts is the active engagement and involvement of local communities. The head of RAP-SL is Eddy Aruna ([see video: Sierra Leone / Tusk Award for Conservation in Africa Winner 2024](#)). He reports that collaborations with the coastal communities and fishers not only minimize direct threats faced by marine turtles but also enhance marine turtle data collection, monitoring and support for jointly conceived conservation and sustainable development initiatives. RAP-SL is extending these programmes along other beaches and communities in Sierra Leone, with donor support and in collaboration with other initiatives, aiming to create long-term sustainable management of mangrove ecosystems and financial and community support mechanisms (e.g. West Africa Blue projects – *see above, under Atlantic Humpback Dolphin*). They are also extending monitoring to manatees, which share these same ecosystems and interact closely with communities. This work promotes greater understanding of ecosystem functions and services, and the joint benefits to human and wildlife communities. Research and monitoring under some of these wider programmes may start to help reveal more of the key wild animal roles in sustaining ecosystems and

ecosystem services important for human communities.

Seabirds and shorebirds – *resident, breeding and Afro-Palaearctic migrants (East Atlantic Flyway)*. Seabird nesting colonies and sea and shorebird congregations (for example migrant species wintering or in stop-over sites on migration in coastal habitats – including mangroves, mudflats and offshore islands) are certain to have impacts on the ecology of those ecosystems and through interactions with other animal species. These impacts are especially significant due to the large numbers involved (e.g. colonial breeding seabirds and large flocks of shorebirds), which are often the basis for the conservation designation of the coastal wetland IBAs, Ramsar sites and MPAs. However, the vast majority of research and monitoring in the Grand Mano landscape and along the West Africa coastline is focussed on monitoring populations and trends and assessing needs for conservation action. For example, the regular Wetlands International, coordinated International (African) Waterbird Census database and reports ([ref](#)) ([ref](#)).

Studies from other regions, for example, in the Seychelles islands (Indian Ocean), showed the huge influence that very mobile seabirds can bring to mangrove ecosystems on islands. Through the deposition of nutrient-rich guano in their breeding colonies, seabirds contribute substantial nutrient ‘subsidies’ that enrich mangroves and their associated invertebrate fauna. These nutrients are also exported to nearby coastal habitats through tidal flow, improving the nutrient status and health of mangroves and adjacent coastal habitats. The conservation of seabirds can therefore be vital to maintain and enhance their role in mangrove productivity, ecosystem function and provision of services and resilience ([ref](#)).

5. Conclusion

This case study shines a light on three proposed Marine Protected Areas (MPAs) and Ramsar sites in West Africa (Sierra Leone and Liberia) and some of the myriad creatures known to inhabit these wetland ecosystems and their different freshwater, coastal, transition and marine zones, especially in coastal mangroves. We argue that there is a huge need for greater attention and support to be given to these key sites and ecosystems and the wild animals which help to shape them, in order to maintain their essential ecological functions and services, without which coastal communities and animals cannot survive. Research and monitoring can help reveal more of the key wild animal roles in sustaining ecosystem services important for human communities. Greater knowledge and more attention to the impacts of animals on wetland ecosystems in West African Ramsar sites, as well as support to the adoption of rewilding approaches, will contribute to better conservation management of Ramsar wetlands and to developing solutions that support human communities and wild animals sharing the same landscapes, to help reverse biodiversity declines and adapt and develop resilience in the face of climate change.

Case Study #11: Wildlife, Wetlands & a New Way Forward – How Conserve is Rewriting the Rules of African Conservation in Zambia’s Forgotten Wilderness

Andrew Parker, Conserve Global



In the shadow of Africa’s famed national parks lies a hidden frontier—one with just as much ecological significance, but far less attention. It’s not the Serengeti, not the Okavango, nor the Kruger. Welcome to Tondwa Game Management Area, a forgotten gem in far northeastern Zambia characterised by pristine rivers, lakes and wetlands. Once teeming with wildlife and rich in indigenous heritage, Tondwa has for decades quietly eroded under the pressure of poaching, deforestation, and neglect.

That is, until now.

At the helm of this bold new chapter is Conserve, a conservation initiative shaking up the traditional blueprint of African environmental protection. Their mission? To go *beyond* the boundaries of national parks and into the overlooked connective tissue of Africa’s wilderness—its conservancies, concessions, and game management areas. It’s a philosophy rooted not just in biodiversity, but in *people, livelihoods, and equity*.

Beyond the Borders

Africa’s 850,000 km² of national parks are vital sanctuaries—but they are only part of the story. Surrounding them are an additional 1.7 million km² of conservation landscapes where communities live, farm, fish, and depend on the environment daily. These spaces are both buffer zones and biodiversity corridors. And while they’re often the first to fall victim to deforestation, mining, and commercial overexploitation, they also hold the greatest promise for reimagined, community-driven conservation.

Tondwa is a case in point.

Part of a vast ecological tapestry linking Nsumbu, Kaputa, and Mweru Wantipa national parks, the 134,000-acre Tondwa area is as crucial to wildlife migration as it is to local food systems and culture. Home to Tabwa-speaking people, along with Bemba and Lungu communities, the area's history traces back to the Luba–Lunda kingdom. But in recent years, it's been at a breaking point. Poaching, firewood harvesting, and snaring have pushed many species to the brink. Hardwood trees are vanishing, and with them, the ecological integrity that holds the system together.

Enter: Conserve in 2022

Founded to fill the gaping void between good intentions and boots-on-the-ground action, Conserve doesn't just support conservation—they manage it. In Tondwa, this has taken form through Tondwa Conservation Limited (TCL), an in-country entity backed by partnerships with the Frankfurt Zoological Society, Baobab Safaris Limited, and crucially, the Nsama Community Resource Board under the guidance of Senior Chief Nsama.

The aim? A radical rethink of what conservation looks like. Not fences and fines, but cooperation, capacity-building, and economic development. "This is conservation with communities, not around them," says Jimmy Muwowo, TCL's new Community Programmes Manager. And that's not just a slogan—it's the bedrock of their model.



Wildlife Returns & Local Revival

Despite decades of decline, the signs of ecological recovery are already emerging. In 2024, camera traps captured a long-missing resident: Lichtenstein's Hartebeest, roaming again in Tondwa's plains. Eland, roan, sable, elephants, and buffalo are also being regularly observed.

While much of this success is due to improved law enforcement, it's also about infrastructure and other operations. In just one year, TCL doubled its staff, built new ranger accommodations, opened critical firebreaks, and launched vehicle and tractor support to maintain roads and trails.

And they're not stopping at wildlife. TCL is restoring the *human* ecology of the landscape, too.

They've launched socioeconomic surveys across 700 households to inform their "resilient societies" framework. A key objective was to understand local dependency on natural resources, especially the abundant fish stocks of Lake Tondwa where a seasonal fishing camp supports many livelihoods. They're piloting Gender Action Learning Systems (GALS) in local villages, a tool that helps communities articulate their vision for their land and resources. They've even partnered with Margaret Pyke Trust and Ipas to assess sexual and reproductive health access across Nsama District.

Fires, Fisheries & Future Finance

Fire is one of the most pressing threats in Tondwa—and TCL is taking it seriously. They've implemented early burning regimes to avoid devastating late-season wildfires and even trained local teams in controlled burn practices. On another front, TCL is now managing fisheries governance on Lake Tondwa, laying down guidelines for sustainable offtake that are being adopted by local fisheries committees run by the communities. TCL is also implementing monitoring frameworks to ensure sustainable harvesting of the critical fish resource on which so many people are dependent.

The real game changer, however, could be in the form of **nature-based finance**. TCL has begun laying the groundwork for a **carbon credit** and **biocredit** system—innovative models that could turn ecological stewardship into sustainable income streams for communities. With a feasibility study underway, stakeholders from across the region are being brought to the table to ensure everyone understands the opportunities and implications of this emerging market.

A Spark for Sustainable Tourism

Tondwa's untouched landscapes and wildlife are its best asset, and now, with the Zambian government and the World Bank's Great Tourism Development Matching Grant project, the area is preparing to open up to visitors with a purpose. TCL has been named a mentor in the scheme, helping communities prepare for tourism that benefits, not displaces, the people who call this wilderness home.

The Bigger Picture

Tondwa may be one patch of protected land in a massive continent, but its story is emblematic of something bigger. Conservation in Africa is no longer about setting aside land and locking out people. It's about partnership, pragmatism, and reimagining nature not as a fortress, but as a foundation—one that supports livelihoods, empowers communities, and restores the balance between human survival and ecological health.

As Conserve looks to expand into Kaputa, the stakes and the possibilities grow. If their model works here—among the miombo woodlands and sparkling wetlands of northern Zambia—it could work elsewhere, too.

And that's something worth watching.

