

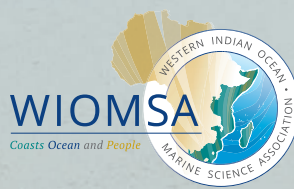
WESTERN INDIAN OCEAN

# MARINE PROTECTED AREAS OUTLOOK

Towards achievement of the Sustainable Development Goals



## COUNTRY CHAPTER: FRENCH TERRITORIES IN THE WESTERN INDIAN OCEAN



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## FOREWORD

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It is indeed an honour to launch the *Western Indian Ocean (WIO) Marine Protected Areas (MPA) Outlook* in my capacity as the Minister for Agriculture, Climate Change & Environment in the government of Seychelles. I commend the Contracting Parties to the Convention for this excellent example of regional collaboration in documenting the progress made towards the attainment of the SDG 14.5 Target of 10 percent protected area of each country's EEZ.

The WIO region has a coastline stretching for more than 15 000km, a continental shelf area of some 450 000km<sup>2</sup> from Somalia in the north to South Africa in the south and covers ten countries (Comoros, France, Kenya, Madagascar, Republic of Mauritius, Mozambique, Seychelles, Somalia, South Africa and the United Republic of Tanzania) five of which are island States. The combined population for the WIO region is 244 million, and the ten countries in the region are Contracting Parties to the Nairobi Convention for the protection, management and development of the coastal and marine environment of the WIO region.

The combined economic value of the WIO ecosystems goods and services is estimated at over USD 20 billion Gross Marine Product per annum and a total asset base of over USD 333.8 billion. With over 30 percent of the WIO population (about 60 million people) living within 100km of the coastline, the coastal and marine ecosystems provide essential sources of livelihoods and income to coastal communities and significantly contribute to national economies.

However, the WIO is threatened by ecosystem degradation from rapid urbanization, increased population growth, coastal development, land reclamation and conversion. Impacts of climate change and variability have led to coral bleaching, sea-level rise, flooding and other effects. In response to the emerging natural and anthropogenic challenges, Contracting Parties to the Nairobi Convention are adopting an integrated approach in the management of ocean resources to maintain a balance between conservation and development. The approach aligns with the 2030 Global Agenda for Sustainable Development with Sustainable Development Goal (SDG) 14 focusing on the need to mobilize global effort to conserve and sustainably use the oceans, seas and marine resources for sustainable development.

The *MPA Outlook* outlines the significant strides made in the region in promoting the protection of critical coastal

and marine resources. The *MPA Outlook* prepared by the Contracting Parties to the Convention documents the progress made in the WIO region towards achieving MPA targets based on the Convention of Biological Diversity (CBD)'s Aichi Target 11/SDG 14.5 and provides a baseline for the post 2020 Global Biodiversity Framework.

The region has established 143 MPAs (or equivalent), covering a total of 555 436.68km<sup>2</sup>, representing 7 percent of the total combined exclusive economic zone (EEZ) of the nine countries covered in the *MPA Outlook*. Most of the MPAs predominantly protect coastal habitats. Notably, a few MPAs have been proclaimed over very large areas of deep-sea habitats contributing to a larger proportion of the 7 percent.

By March 2020, Seychelles had designated 30 percent of its EEZ as protected marine areas, tripling the UN CBD Target 11 for 10 percent marine protection by 2020, and the UN SDG-14.5 for 10 percent coastal and marine protection. Seychelles with an EEZ of 1 374 000km<sup>2</sup> and a land mass area of 455km<sup>2</sup> achieved this milestone through the debt for nature swap spearheaded by The Nature Conservancy (TNC). Promising initiatives on trans-boundary MPAs are being developed between Kenya and Tanzania and between Mozambique and South Africa.

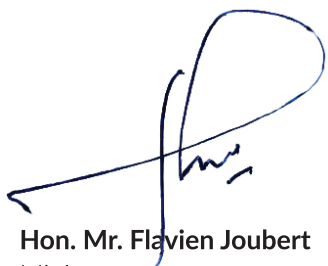
The establishment of MPAs has a long history in the region. South Africa declared the first MPA in 1964, the Tsitsikamma MPA, which was the first MPA in the region and since then South Africa has steadily increased the number and coverage of its marine conservation estate. By 2019, South Africa had 42 MPAs raising the total MPAs cover from <0.5 percent to 5.4 percent of the EEZ.

The *MPA Outlook* comes at a time when the region has embarked on large-scale socio-economic developments that are equally exerting pressure on MPAs. The *MPA Outlook* thus provides some answers and innovative approaches to minimize the scale of negative impacts on MPAs.

The *MPA Outlook* is the best form of experience sharing, and documenting best practices in MPA management across the WIO.

On behalf of the Contracting Parties, I wish to acknowledge and thank the Nairobi Convention Secretariat for the overall coordination of the process; the Western Indian Ocean Marine Sciences Association (WIOMSA) for technical and financial support through the Marine Science for Management (MASMA) Programme and the Global Environment Facility for funding the preparation and production of the *MPA Outlook* under the GEF funded

Project on the Implementation of the Strategic Action Programme for the protection of the Western Indian Ocean from land-based sources and activities (WIO-SAP) executed by the Secretariat.

A handwritten signature in blue ink, consisting of a large, stylized loop at the top and a series of smaller, connected strokes below it.

**Hon. Mr. Flavien Joubert**

Minister

Ministry of Agriculture, Climate Change & Environment

Republic of Seychelles

## EXECUTIVE SUMMARY

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The Western Indian Ocean (WIO) is renowned for the richness of its marine biodiversity, especially that associated with the region's widespread coral reef systems. The mangroves, seagrasses, rocky and sandy shorelines with associated dune systems and coastal forests, and the deep-sea features such as seamounts, ridges and abyssal plains also contribute substantially to the biodiversity of the region. The innumerable islets and atolls scattered across the WIO also support extraordinary biodiversity, including vast numbers of often rare, endemic and endangered marine species.

This rich marine biodiversity supports burgeoning coastal populations both directly, through the provision of a variety of marine resources and vital ecosystem services such as coastal protection, and indirectly, through the opportunities it provides for economic growth through sectors such as fisheries, tourism, infrastructure development and others. However, the marine resources are coming under increasing pressure in the coastal areas through the escalating needs of the local populations, exacerbated by the use of illegal fishing techniques, such as "blast" or dynamite fishing and the use of poisons, and in deeper waters from the legal and illegal harvesting of vast quantities of resources by international commercial fishing fleets. The tourism sector that brings benefits to coastal communities is in many places damaging the very resources the tourists wish to enjoy. In addition, interest in mineral resources including oil and gas reserves, found under the seabed, is exacerbating pressure on coastal ecosystems. Developing coastal nations in the WIO region, particularly those faced with financial constraints, are keen to exploit mineral resources for the benefit of their populations, leading to an exponential increase in the issuing of prospecting and extraction rights.

To these pressures are added increased levels of land and sea-based pollution, sedimentation from silt-laden rivers, and extensive coastal development; together with the increasingly evident impacts of climate change including sea-level rise, ocean warming and acidification, and increased frequency and intensity of storm events. If the twin threat from coastal development and climate-related pressure, is left unmitigated, with no protection afforded to the marine and coastal systems, there is every likelihood that the marine biodiversity of the WIO region would be irreversibly compromised. The consequential impacts on the livelihoods of coastal communities, and the well-being of the populations across the region, are likely to have long-term and negative ramifications on the national economies of the coastal states.

Aware of the global threat from both human-caused and climate change-related stressors, the global community in 2015 committed to achieving the United Nations Sustainable Development Goals (SDG). With particular relevance for the marine environment is SDG 14, "Life below Water".

The SDG 14 has several targets including Targets 14.2 on sustainable management and protection of marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration, to achieve healthy and productive oceans by 2020; and 14.5 that aimed at all countries conserving at least 10 percent of coastal and marine areas, essentially their exclusive economic zones (EEZs), consistent with national and international law and based on the best available scientific information by 2020. Target 14.5 was aligned to the Convention on Biological Diversity (CBD) Strategic Plan for Biodiversity 2011–2020 Aichi Target 11, which encouraged all signatory nations to ensure that:

"By 2020, at least 17 percent of terrestrial and inland waters, and 10 percent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascapes." (Secretariat of the Convention on Biological Diversity, 2010).

This *MPA Outlook* reviews the commitment by governments to achieve 10 percent protection of important marine and coastal areas through effectively and equitably managed MPAs and other effective area-based management measures (Aichi Target 11 and SDG 14). The review takes into account the formulation of the CBD's post 2020 biodiversity framework, that proposes, among other goals a zero net biodiversity loss by 2030, as well as providing a baseline for the post 2020 framework.

The declaration of marine protected areas (MPAs), has long been considered a key tool in the fight to conserve the world's marine biodiversity, and the WIO countries have played their part, by identifying and declaring MPAs; from Tsitsikamma, the first MPA in Africa, proclaimed by the Government of the Republic of South Africa in 1964, to the MPAs proclaimed in 2019 by the Governments of Seychelles and the Republic of South Africa, and those proposed for imminent declaration by the government of Comoros. It is also evidently clear that the mere proclamation of an MPA is no guarantee of effective protection. An assessment on MPA management effectiveness showed

that many MPAs in the region lack human resources, skills, equipment, and institutional commitment to fulfil their functions adequately. The assessment also revealed serious declines in conservation funding. The COVID-19 pandemic led many countries to adopt lockdown measures, affecting tourism revenues on which many MPAs in the WIO depend to finance MPA operations. Marine conservation in the WIO region needs a post-COVID recovery plan and marine conservation efforts must now be funded not only at the level that they were at before the pandemic but at an even higher amount that reflects the severity of the unprecedented threats to biodiversity and associated economic sectors.

Madagascar has pioneered an interesting approach to protecting marine areas through a rapid increase in the number of Locally Managed Marine Areas (LMMAs), where coastal communities work in collaboration with government and other stakeholders to protect their coastal resources. A similar approach has been recorded under a variety of names in different countries, across the region. Over three hundred LMMAs have been established across the region in the last ten years. While most of these do not, as yet, provide the levels of protection afforded by the more established formal and effectively managed MPAs, they have great potential to increase the coastal areas under conservation management in the region quite substantially.



Prime targets (prawns and fish) from inshore beach seining off Malindi, Kenya. © Peter Chadwick

At a transnational scale, the moves to initiate trans-boundary MPAs, such as between Kenya and mainland Tanzania, and Mozambique and South Africa, must be lauded and supported. Coastal states are also taking a large-scale approach to marine conservation, often within “Blue Economy” initiatives such as the Blue Economy Roadmap developed by the Government of Seychelles and Operation Phakisa in South Africa. In both cases, these initiatives have involved thorough and complex marine spatial planning processes, identifying areas suitable for different uses and activities, including for conservation.

In Seychelles, two new MPAs covering an area of 208 365km<sup>2</sup> were declared as a result of this process. In South Africa, 20, mostly offshore MPAs covering an area of 54 214km<sup>2</sup>, have been proclaimed under Operation Phakisa following an intense consultation process with all stakeholders. The Seychelles and South African experiences provide excellent models for other WIO countries for the planning, identification and declaration of offshore MPAs. These two experiences were underpinned by strong policy support, evidence-based decision making and requisite financing. These are key lessons in any successful MPA establishment and eventual operationalization and management programmes.

The Republic of Mauritius, Kenya, Tanzania, and other countries have embarked on Blue Economy initiatives and adopted the application of area-based planning tools such as marine spatial planning processes, underpinned by scientific information and understanding of the marine environment. The WIO region is fortunate to be home to some highly productive and effective marine science institutions and scientists, all linked to the Western Indian Ocean Marine Science Association (WIOMSA), which has partnered with the Nairobi Convention Secretariat in the production of this *MPA Outlook*. It is the science emanating from these institutions which provides the evidence required firstly to identify and assess the threats to marine ecosystems and species, and then secondly to identify the areas and habitats most in need of protection and the forms of protection most appropriate to them. However, while the scientific understanding of the coastal and inshore environments is solid, this is not necessarily the case with the offshore deep-sea environments, which have only recently been the focus of concerted scientific attention and research. The value of such research is shown in the proclamation of the South African offshore MPAs.

To achieve its prime purpose of assessing progress towards meeting the SDG and Aichi targets, this *MPA Outlook* set out to document and celebrate the



achievements up to 2020 in the establishment of MPAs, or equivalent levels of protection, across the WIO region. It also documents the exciting move towards more community-based coastal conservation initiatives as represented by the LMMAs and other sites managed collaboratively with coastal communities. In addition to this documentation, there are elements of assessment and analysis to guide the expansion and strengthening of marine conservation in the region, particularly towards the achievement of the post-2020 Global Biodiversity Framework (GBF).

More specifically, the body of the *MPA Outlook* is structured as follows:

#### **Part I**

Outlines the purposes for the development of the publication, the key methodologies employed in gathering and documenting the information, and some of the challenges faced in compiling the *MPA Outlook*. The specific purpose of the *MPA Outlook* was to provide a baseline assessment of existing coastal and marine conservation efforts in the region. This involved not only a quantitative assessment of the areas and habitats under protection, but also a qualitative assessment. In addition to the primary technical purposes of this *MPA Outlook*, it was intended to document and celebrate the achievements of governments in furthering the conservation of their marine and coastal environments. It also provides the opportunity to encourage and motivate governments, supported by the scientific community, in increasing efforts towards long-term conservation of vital marine resources, species and ecosystems, including those in the deep-sea.

#### **Part II**

Describes the international and regional marine conservation contexts in which the *MPA Outlook* is located. This *MPA Outlook* was not developed in isolation; rather it is embedded in, and is intended to contribute significantly to, the increasing momentum of initiatives aimed at securing the biodiversity and productivity of coastal and marine areas. These initiatives operate from the global to the local levels, with increasing emphasis on the synergies between them as exemplified by the “think globally act locally” environmental mantra.

#### **Part III**

Provides detailed descriptions of the MPAs (and equivalents) in each WIO country, together with information on proposed MPAs and areas such as LMMAs under less formal forms of protection. The

data revealed that there are 143 MPAs (or equivalents) in the WIO region, covering a total of 555 436.68km<sup>2</sup>, representing 7 percent of the total combined EEZ of the nine countries included in this analysis. The numerical majority of MPAs in the region protect predominantly coastal habitats. However, the few MPAs proclaimed over large areas of deep-sea habitats (by France, Seychelles and South Africa) contribute by far the largest proportion of the total area under protection, and make the greatest quantitative contribution (6.2 percent of the 7 percent) to the percentage of total EEZ protected. To strengthen the emerging LMMAs as an approach to community level protection, an enabling policy environment and capacity building of both communities and their supporting agencies will be key for the effective establishment and management of these community managed areas.

#### **Part IV**

Provides an assessment of the management effectiveness of MPAs across the region, and makes initial recommendations for improving levels of management effectiveness. The key finding was that legislative and institutional frameworks that support the establishment and management of MPAs exist in every country, suggesting that there is the political will to meet the global and regional marine conservation objectives and targets. However, widespread failure to implement legislation, and in many countries, the ineffective functioning of mandated institutions was observed. Among the challenges identified, those that are cross-cutting throughout the region include shortfalls in financial and personnel capacity, insufficient clarity on MPA boundaries, leading to compliance challenges, and management decision support systems that are only weakly guided by science.

#### **Part V**

Draws on the information provided to analyse the current situation regarding marine conservation in the WIO region, in particular in relation to the achievement of the SDG and Aichi targets. Part V also makes initial recommendations on where future marine conservation efforts, particularly the siting of MPAs, might be concentrated as countries work towards the Targets in the post-2020 GBF.

The key findings of this *MPA Outlook* indicate that there are 143 sites across the WIO region that are considered as MPAs or as having equivalent legal status and levels of protection. The vast majority of these are coastal and/or inshore, however the largest, covering by far the greatest extents of the ocean are the few MPAs with considerable offshore deep-sea elements. These include the MPAs

declared in Seychelles and South Africa's 20 MPAs, of which 14 are offshore sites, proclaimed in 2019. Since it is not practically feasible for the SDG or GBF target to be achieved through the declaration of only coastal and inshore MPAs, as this would require the protection of entire national coastlines extending 37km offshore, or equivalent (i.e. half the coastline extending 74km offshore), identification, declaration and management of offshore MPAs by regional countries remains the most viable option of achieving this target.

A further finding is that the majority of existing MPAs across the region are not managed as effectively as they could and should be, due primarily to lack of funding for essential staff, equipment and capacity development, and weak institutional support and commitment. The question is raised whether the immediate priority should be for governments to firstly ensure effective management of their existing MPA estate, before embarking on expansion of this estate. A balance between establishment of new MPAs and effective management of existing sites is a critical decision, which each country will need to continuously consider.

A very positive finding is that there is every indication of the willingness and commitment of the Nairobi Convention contracting parties to strengthen marine conservation in areas within their jurisdiction. This is evidenced by improvements in legislation, including the development of new MPA-specific legislation, such

as in Comoros, and the declaration of new MPAs in Mozambique, Seychelles, Comoros and South Africa.

There is also a good reason to be optimistic about the potential for coastal communities, with the support of governments and other stakeholders in LMMAs (or equivalents) to take on the mantle of coastal and inshore conservation, while the governments themselves focus on the offshore areas. Ongoing efforts on the development of the post-2020 GBF provide a basis for the WIO region to work towards a no-net loss of biodiversity by 2030. This may include exploring the immense opportunities for better recognizing and supporting conservation by local communities and private actors and adopting new models for Ocean Stewardship that reward sustainable actions by stakeholders.

The expansion of the MPA estate by 2030 and by 2050 is also among the goals of the post-2020 Framework. From a regional perspective, configuring an effective post-2020 regional network of effectively managed MPAs would require concerted efforts towards implementing the proposed theory of change that assumes transformative actions are taken to (a) put in place tools and solutions for implementation and mainstreaming, (b) reduce the threats to biodiversity and (c) ensure that biodiversity is used sustainably to meet people's needs and that these actions are supported by (i) enabling conditions, and (ii) adequate means of implementation, including financial resources, capacity and technology.

**Lawrence Sisitka**

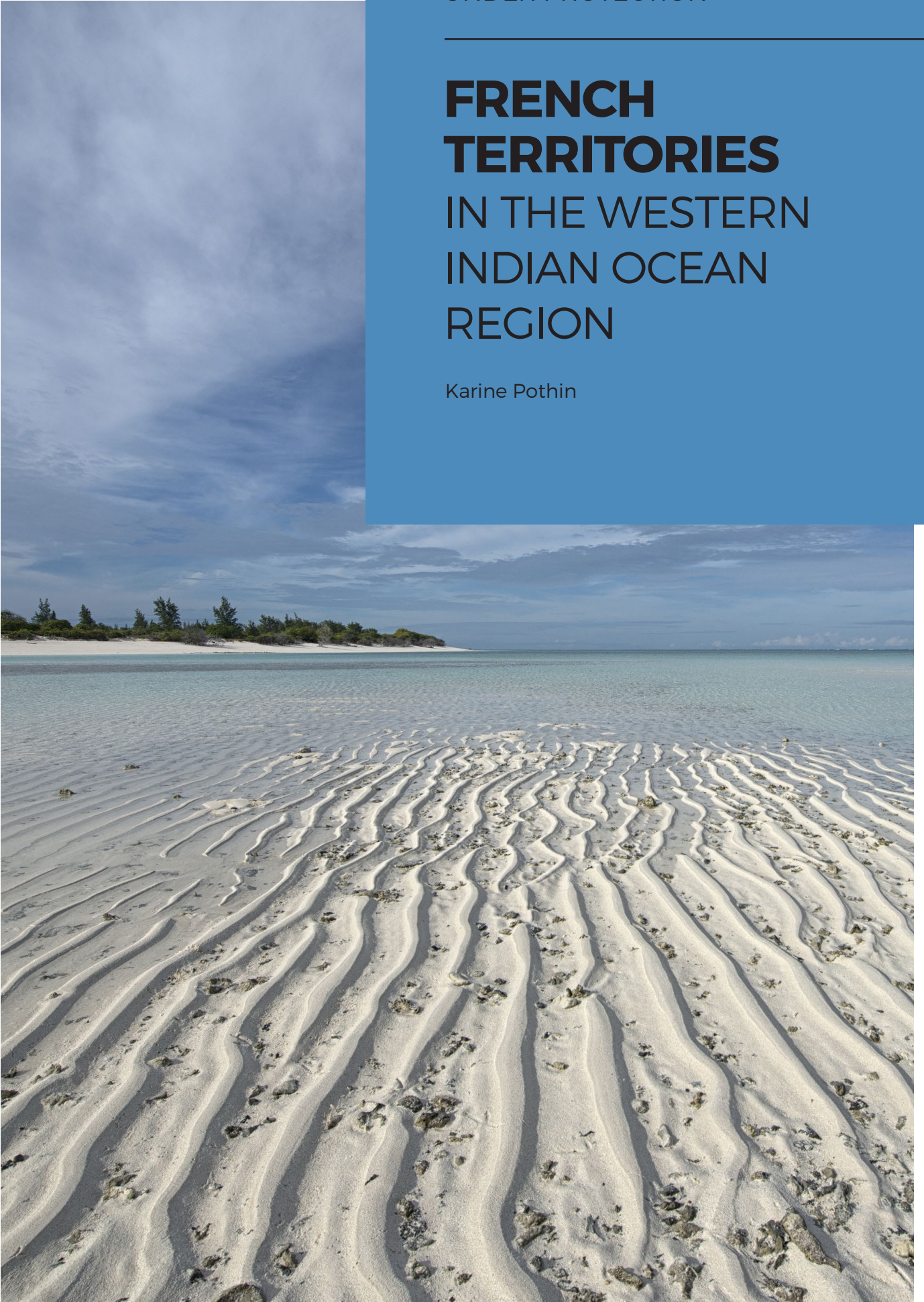
Co-editor

MARINE & COASTAL AREAS  
UNDER PROTECTION

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# **FRENCH TERRITORIES** IN THE WESTERN INDIAN OCEAN REGION

Karine Pothin



## COUNTRY OVERVIEW

### French territories

In the Western Indian Ocean (WIO), three French territories exist: La Réunion, Mayotte and îles Éparses (Table 1).

Table 1: French territories in the Western Indian Ocean and areas of land, coral reefs and Economic Exclusive Zone.

NAME OF FRENCH TERRITORY	LAND (km <sup>2</sup> )	LAGOON (km <sup>2</sup> )	EEZ (km <sup>2</sup> )
La Réunion	2512	15	311 426
Mayotte	374	1500	63 176
Îles Éparses (Glorieuses, Tromelin*, Bassas da India, Juan de Nova, Europa)	42.5	752	634 853

\* Tromelin is subject to a disputed claim between France and Mauritius.

Source: Andréfouët *et al.*, 2009; TAAF, 2018.



A school of Yellow goatfish over a fringing coral reef at La Réunion. © Matthew D. Richmond

### La Réunion

La Réunion (previously *Île Bourbon*) is a department and region of France in the Indian Ocean, east of Madagascar and 175km southwest of Mauritius. The exclusive economic zone (EEZ) covers 311 426km<sup>2</sup>. The varied terrain and micro-climates of the 2512km<sup>2</sup> island create a high diversity of terrestrial habitats and species. The island has been a French “Department” since 1946. The population has grown almost fourfold from 227 000 in 1976 to 850 996 in 2016 due to improved medical facilities and high birth rates.

Marine habitats include coral reefs, and both rocky and sandy geological formations, the later two with poorly-known biological communities. The relative youth of the island, estimated at 3 million years (Smietana, 2011), means that coral reefs are poorly developed, particularly in the east where there is still an active volcano. The main reef development is on the western side of the island. Here, the fringing reef has a total length of 26.5km, and an area of 18.5km<sup>2</sup> (Nicet *et al.*, 2016). Reef structures in La Réunion are divided into coral communities growing directly on the volcanic rock, reef platforms where the reef flat extends from the shoreline, and fringing reefs (the most mature reefs on the island). The fringing reef, estimated to be 8500 years old (Montaggioni, 1978) is divided into four complexes: Saint-Gilles/la Saline, Saint-Leu, Etang-Salé and Saint-Pierre. Seagrass beds are rare, and mangroves are totally absent (Obura *et al.*, 2017).

### Mayotte

Mayotte (French: *Mayotte*; Shimaore: *Maore*) is an insular department and region of France. It consists of a main island, Grande-Terre (or Maore) that is 360km<sup>2</sup> in area, a smaller island, Petite-Terre (or Pamandzi), of 14km<sup>2</sup>, and several islets. The archipelago is located in the northern Mozambique Channel between northwestern Madagascar and northeastern Mozambique. Mayotte, with 256 518 people recorded by the 2017 census (INSEE, 2017), is very densely populated with 686 people/km<sup>2</sup>. The EEZ covers 63 176km<sup>2</sup>.

Mayotte is surrounded by a 157km barrier reef interspersed with numerous gaps (Thomassin *et al.*, 1989); internal reefs including a double internal barrier of 18km (Guilcher *et al.*, 1965); and discontinuous fringing reefs covering 195km of coastline (Wickel and Thomassin, 2005). The barrier reef encloses one of the world’s largest and deepest lagoons, and is flanked by a fringing reef, interrupted by many areas of mangroves. The reef area, including the lagoon, is four times greater than the land area with 1500km<sup>2</sup> compared to 374km<sup>2</sup> (Dinhut *et al.*, 2008).

## 2. FRENCH TERRITORIES

Table 2: The îles Éparses in the Western Indian Ocean.

ISLAND	EMERGED LAND (km <sup>2</sup> )	REEF AREA (km <sup>2</sup> )	EEZ (km <sup>2</sup> )	LOCATION
GLORIEUSES (Grande Glorieuse, Ile du Lys, Wreck Island, South Rock, Verte Rock, three un-named islets) with Geyser Bank included	4.9	405	46 073	North Mozambique Channel
JUAN DE NOVA	5.3	207	62 947	Central Mozambique Channel
BASSAS DA INDIA (10 un-named islets)	0.1	87	129 126	South Mozambique Channel
EUROPA (Europa Island and 8 un-named islets)	31.2	47	121 304	South Mozambique Channel
TROMELIN	1	6	275 403	Western Indian Ocean
TOTAL	42.5	752	634 853	

The Mayotte ecosystem is associated with 150km<sup>2</sup> of coral reefs, extensive mangroves covering some 6.66km<sup>2</sup> (Cremades, 2010) and seagrass meadows. All Mayotte waters have been proclaimed as a Marine Nature Park, and M'bouzi is designated as a Nature Reserve (IUCN, 2013).

### Îles Éparses

Îles Éparses (French: *Îles Éparses*). These scattered islands in the WIO are part of the French Southern and Antarctic Lands (TAAF) since February 2007 (Table 2). Juan de Nova (17°03'S, 42°45'E), Europa (22°22'S, 40°22'E), and Bassas da India (21°28'S, 39°42'E) lie in the Mozambique Channel west of Madagascar, while Glorieuses (11°33'S, 47°20'E) lie northwest of Madagascar (Chabanet *et al.*, 2015). By extension, Geyser Bank is included within the Glorieuses (Andréfouët *et al.*, 2009; TAAF, 2018). Tromelin lies east of Madagascar (15°53'S, 54°31'E). Details on the îles Éparses islands are provided in Table 2.

### Key institutions and legislation related to MPAs or equivalent proclamations

#### French Biodiversity Office

In January 2017, the Marine Protected Areas Agency was subsumed into the French Biodiversity Agency. The French Biodiversity Agency (Agence Française pour la Biodiversité) is a public organization under the auspices of the Ministry for the Ecological and Inclusive Transition (effectively, the ministry in charge of environment) established for the purpose of supporting the implementation of public policies in order to improve knowledge, and to protect, manage and restore terrestrial, aquatic and marine biodiversity. The Office acts in support of the public stakeholders and works in close partnership with

the socio-economic actors. The Office is also committed to communicate with the general public and to engage the citizens in support of the conservation of biodiversity (FBA, 2018).

#### MPAs in France

In France, there are several types of MPA:

- Marine sections of National Parks
- Natural Reserves
- Prefectural Order for protection of biotopes or special areas
- Natura 2000 sites
- Sections of the maritime public domains entrusted to Coastline Conservation Agency
- Natural Marine Parks: Mayotte, Cap Corse, Martinique, Iroise, Golfe Normand-Breton, Golfe du Lion, Estuaires Picards, Bassin d'Arcachon, Estuaires de la Gironde
- Glorieuses archipelago natural national reserve
- National wild fauna and hunting reserve with a marine section: Morbihan Gulf
- Categories from international designations (RAMSAR and UNESCO World Heritage sites, or from Regional Seas Convention)

#### MPA Managers' Forum

The French Biodiversity Office stimulates the dynamics of technical exchanges and shared experiences between MPA managers and more widely between organizations involved in the marine environment. Its purpose is to create links and share information on marine environmental protection and MPA issues and objectives.

At a national level, it manages the Marine Protected Area Managers' Forum which meets yearly, bringing together the 80 members representing French MPAs.

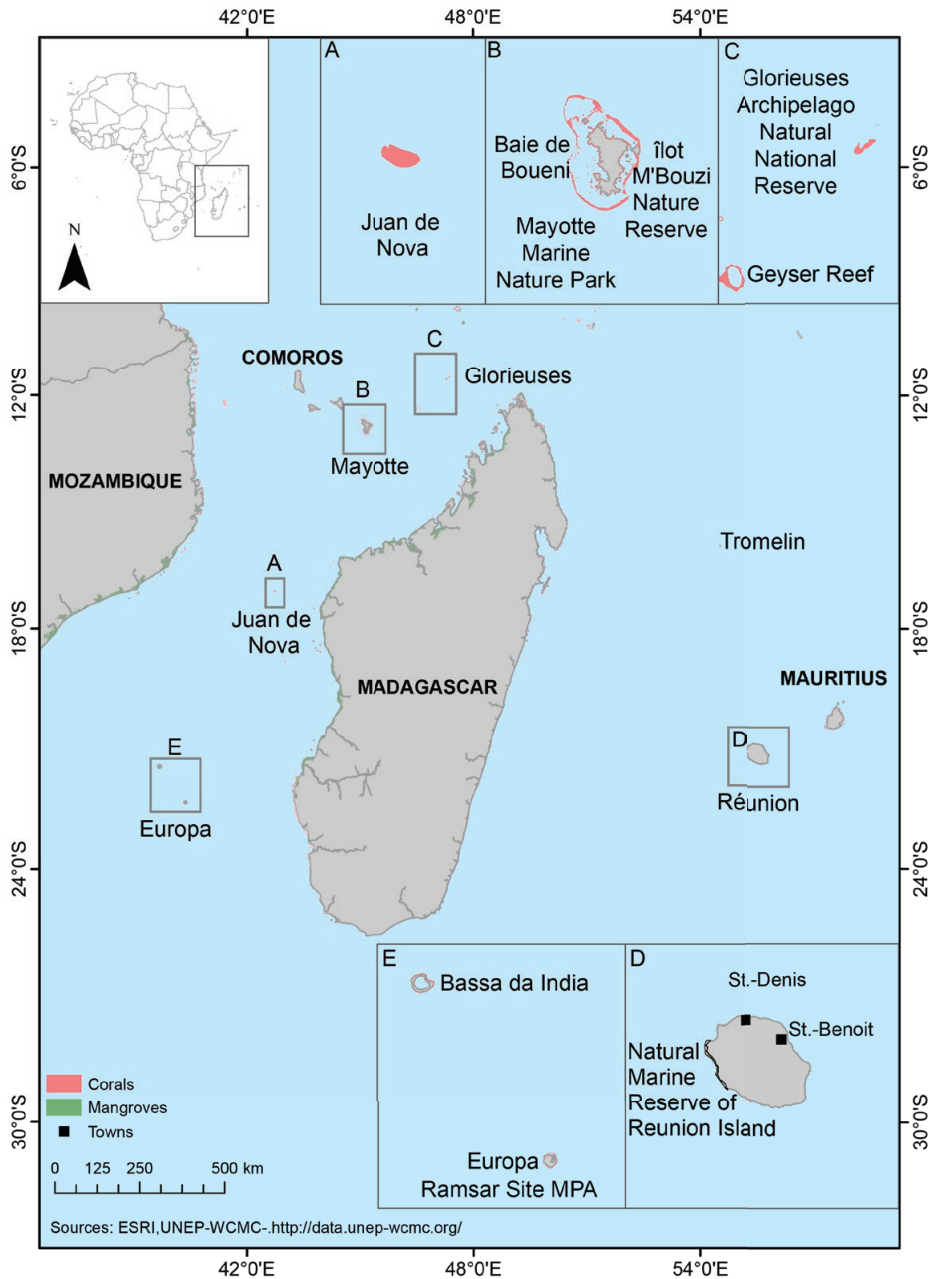


Figure 1: French territories in the Western Indian Ocean with marine protected areas.

## OVERVIEW OF FRENCH MPAs IN THE WESTERN INDIAN OCEAN

In the French Territories of the WIO there are now five distinct MPAs: one in La Réunion, two in Mayotte and two in the îles Éparses. Until recently, there were four individual protected zones on Mayotte, but these are now absorbed within the Marine Nature Park of Mayotte, under two prefectural decrees of 2018 that changed their statutes.

It can be noted that all the îles Éparses are classified as natural reserves at the local level with associated regulations, but only two sites (Glorieuses and Europa) are declared MPAs at the national level with status recognised by IUCN (Figure 1).

These MPAs cover 111 427km<sup>2</sup>, which represents 11.04 percent of the EEZ of the French territories in the WIO (Table 3). The MPAs protect various habitats such as coral reefs, seagrass beds, mangroves, subtidal rocky subtidal, subtidal sandy-mud, and seamounts (inside the Marine Nature Park of Mayotte).

## 2. FRENCH TERRITORIES



Close encounter with a Hawksbill turtle on Juan de Nova. © Jerome Bourjea

Table 3: French MPAs in the Western Indian Ocean including the exclusive economic zones of the Territories.

MPA	DATE OF CREATION	AREA (km <sup>2</sup> )	EEZ (km <sup>2</sup> )	% EEZ
MAYOTTE				
Marine Nature Park of Mayotte <i>N.B. in 2018, four small 'protection zones' and one 'biotope protection site' were merged into this MPA</i>	2010	63 176	63 176	100
Nature Reserve of M'bouzi	2007	0.6		
LA RÉUNION				
Marine Reserve of La Réunion	2007	35	311 426	0.01
ÎLES ÉPARSES				
Glorieuses Archipelago Natural National Reserve	2012	43 800	46 073	100
Europa Island Ramsar Site	2012	2142	121 304	1.76
Other islands	NA	0	467 476	0
<b>TOTAL</b>		<b>111 427</b>	<b>1 009 455</b>	<b>10.8</b>

## MARINE AREAS UNDER PROTECTION

All areas under protection, whatever their specific designation as described in the previous section, are considered MPAs, as they meet the IUCN criteria for formal protection, unless indicated (Table 4), under Category Ia Strict Nature Reserve. The governance and management frameworks as well the critical habitats and species for each of the MPAs are described here.

## Governance and management frameworks for each MPA

MPAs are presented in Table 4 according to their location from most northerly (Glorieuses) to most southerly (Europa).

**Table 4: Governance and management frameworks for the MPAs in the French Territories of the WIO.**

MARINE NATURE PARK OF MAYOTTE	
ECOSYSTEM AND LOCATION	Coastal/epipelagic: marine area; Comoros Archipelago, N Mozambique Channel
PROCLAMATION YEAR LEGISLATION	Decree No. 2010-71 (18 January 2010). Note: four protection zones (Saziley, N'gouja, Papani and Passe en S/Mayotte) and one biotope protection (Ambato/Mayotte) were recently merged within the Marine Nature Park of Mayotte according to the arrêté 865/DMSOI/2018 of 01/10/2018 and arrêté 2018-DMSOI-601 of 28/06/2018.
EXTENT	63 176km <sup>2</sup> (entire EEZ)
CONNECTIONS WITH TERRESTRIAL PAs OR OTHER MARINE PAs	Connection with the terrestrial part of the Nature Reserve of M'bouzi (the marine part of the reserve is included in the Marine Nature Park of Mayotte): in terms of sharing of experience, and mutualization of the technical and scientific cooperation, since they continue to ensure the coherence of the management of their MPA. Connections with the Glorieuses Archipelago Natural National Reserve.
INSTITUTIONAL FRAMEWORK	The French Ministry for Ecological and Inclusive Transition which delegates managing authority to the French Biodiversity Office.
GOVERNANCE STRUCTURE	Management advisory panel: 41 members (Marine Nature Park of Mayotte, 2013a) Advisory: Simple consultation and assent procedure.
MANAGEMENT PLAN	Management plan: 2013-2028 (Marine Nature Park of Mayotte, 2013b) plus an Annual Framework.
RISKS AND THREATS	Some threats impact the MPA (Marine Nature Park of Mayotte, 2013a): <ul style="list-style-type: none"> <li>- coral bleaching</li> <li>- mangroves threatened by deforestation and backfilling</li> <li>- agricultural practices cause land erosion leading to silting of the lagoon</li> <li>- sanitary and environmental problems, in particular because of the absence of waste-water purification, management of rainwater runoff, and waste collection</li> <li>- waste frequently abandoned in the natural environment and pulled towards the lagoon by runoff water (vehicle tyres, cans)</li> <li>- population in constant increase, very dependent on the natural resources offered by the lagoon, the fragile resources of reefs diminish</li> <li>- poaching of sea turtles, illegal fishing</li> <li>- anthropogenic disturbance of megafauna (sea turtles, marine mammals)</li> </ul>
SITE SPECIFIC MANAGEMENT OBJECTIVES	Seven management guidance pillars (Marine Nature Park of Mayotte, 2013b): <ul style="list-style-type: none"> <li>- knowledge and conservation of marine environment</li> <li>- sustainable fishery</li> <li>- aquaculture</li> <li>- good quality of water</li> <li>- tourism</li> <li>- uses</li> <li>- traditional activities</li> </ul>



## 2. FRENCH TERRITORIES

MONITORING/EVALUATION PROGRAMMES	Monitoring and surveys conducted inside the MPA are (Marine Nature Park of Mayotte, 2013a): <ul style="list-style-type: none"> <li>– species and habitat surveys (seagrass beds, marine turtles, marine mammals, seabirds)</li> <li>– coral reef observatory (Reef Check, Global Coral Reef Monitoring Network (GCRMN), bleaching)</li> <li>– marine water quality surveys</li> <li>– zone naturelle d'intérêt écologique, faunistique et floristique (ZNIEFF) [or natural zone of ecological, fauna and flora interest]</li> <li>– inventory of species</li> <li>– data collection on fisheries using the Système d'Informations Halieutiques (SIH) [or fisheries information system]</li> <li>– stranding network for marine mammals and sea turtles</li> <li>– scientific programs</li> </ul>
MANAGEMENT EFFECTIVENESS REVIEWS	Dashboard (French biodiversity office) according to the seven management guidance pillars (Marine Nature Park of Mayotte, 2016b).
<b>NATURE RESERVE OF M'BOUZI</b>	
ECOSYSTEM AND LOCATION	Coastal/epipelagic; marine island; Mayotte
PROCLAMATION YEAR LEGISLATION	Decree No. 2007-105 (26 January 2007)
EXTENT	Land surface: 0.8km <sup>2</sup> ; marine area: 0.6 km <sup>2</sup> Total surface: 1.4km <sup>2</sup> within which traditional and recreational longline fishing from non-motorized boats is permitted
INSTITUTIONAL FRAMEWORK	The French Ministry for Ecological and Inclusive Transition which delegates managing to the Regional directorate of the environment, land planning and housing.
GOVERNANCE STRUCTURE	Manager of the MPA: Naturalists of Mayotte Association (convention in 2008) Management advisory committee: 14 members (regional and local authorities, administrations, scientists from public institutions and associations for the protection of the environment). Scientific council: 15 members
MANAGEMENT PLAN	Adaptation of the Management Plan: 2013–2028 (Marine Nature Park of Mayotte, 2013b) plus an Annual Framework.
RISKS AND THREATS	Some threats impact the MPA (Marine Nature Park of Mbouzi, 2015; IUCN, 2013): <ul style="list-style-type: none"> <li>– coral bleaching</li> <li>– coral exposure to low tides</li> <li>– <i>Acanthaster planci</i> infestation</li> <li>– human pressure</li> <li>– pressure of the watershed (pollution)</li> </ul>
SITE SPECIFIC MANAGEMENT OBJECTIVES	The site management objectives are (Natural Reserve of Mbouzi, 2015): <ul style="list-style-type: none"> <li>– natural heritage preservation</li> <li>– socio-economical and scientific enhancement</li> <li>– make sustainable the functioning of Mbouzi</li> </ul>
MONITORING/EVALUATION PROGRAMMES	GCRMN survey and Reef Check survey
MANAGEMENT EFFECTIVENESS REVIEWS	Effectiveness based on percentage of realization of actions.
<b>MARINE RESERVE OF LA RÉUNION</b>	
ECOSYSTEM AND LOCATION	Coastal/epipelagic; La Réunion
PROCLAMATION YEAR LEGISLATION	Decree No. 2007-236 (21 February 2007)
EXTENT	35.4km <sup>2</sup> <ul style="list-style-type: none"> <li>– General protection zone = 100% (IUCN category IV)</li> <li>– Reinforced protection zone (17.35km<sup>2</sup> = 55% of MPA)</li> <li>– (IUCN Category VI)</li> <li>– Integral protection zone where all activities are forbidden: 1.9km<sup>2</sup> = 6% (IUCN Category Ia)</li> </ul>
INSTITUTIONAL FRAMEWORK	The French Ministry for the Ecological and Inclusive Transition
GOVERNANCE STRUCTURE	Regional Directorate of the Environment, Land Planning and Housing; Manager; Grouping of Public Interest National Marine Reserve of La Réunion (= management team).

GOVERNANCE STRUCTURE	<p>The governance of the Marine Reserve of La Réunion is organized as follows (Marine Reserve of La Réunion, 2013a):</p> <ul style="list-style-type: none"> <li>- an administrative board involving other authorities: Sub-Prefect (President), Government representatives (DEAL), Regional Council, Departmental Council, grouping of west territories (municipalities, user representatives)</li> <li>- a scientific council with 15 independent experts (consultative management)</li> <li>- an advisory council (44 members): consultative management with stakeholders (associations of users, sport leagues, environmental protection association, scientists, tourism professionals, elected territorial representatives)</li> </ul>
MANAGEMENT PLAN	<p>1st management plan: 2013–2017 (Marine Reserve of La Réunion, 2013b)  Review for the first management plan: 2018 (with meetings of dialogue with the users)  2nd management plan: 2021–2030</p>
SITE SPECIFIC MANAGEMENT OBJECTIVES	<p>The site management objectives (Marine Reserve of La Réunion, 2013b) are to:</p> <ul style="list-style-type: none"> <li>- conserve coral reefs and associated ecosystems</li> <li>- ensure sustainable fishing activities and the different uses reconcilable with the marine biodiversity</li> <li>- ensure adequate connection and networking of the La Réunion MPA with a view to good governance and integrated management of the marine environment</li> <li>- develop a sustainable and diversified policy on information, education and communication for all audiences</li> </ul>
RISKS AND THREATS	<p>The threats which impact the MPA are (Marine Reserve of La Réunion, 2013a):</p> <ul style="list-style-type: none"> <li>- invasive species</li> <li>- coral disease</li> <li>- cyclones</li> <li>- climate change</li> <li>- heavy rain leading to siltation</li> <li>- urban activities</li> <li>- agricultural activities and industrial activities</li> <li>- pollution</li> <li>- illegal fishing</li> <li>- bad practices in relation to some environment activities such as SCUBA diving and other watersports</li> <li>- high tourism levels</li> <li>- waterfront urbanization</li> </ul>
MONITORING/EVALUATION PROGRAMMES	<p>Monitoring and evaluation programmes implemented are:</p> <ul style="list-style-type: none"> <li>- coral reef observatory (GCRMN, Reef check, bleaching survey, study of coral reproduction, the European framework directive on water)</li> <li>- survey of traditional fisheries</li> <li>- inventories (molluscs, echinoderms, cniderians, sponges)</li> <li>- water quality monitoring: physical chemistry and chemical substances (DCE European surveys)</li> <li>- species and habitat surveys (seagrass beds, marine turtles)</li> <li>- topographic surveys of beaches</li> <li>- inventory of floristique natural zone of ecological interest, fauna and flora (or ZNIEFF)</li> <li>- national databases for species, habitats and surveys (SIE, SINP, BDRécif)</li> <li>- GIS data on SEXTANT platform</li> </ul> <p>Outcomes of these monitoring programmes have indicated that:</p> <ul style="list-style-type: none"> <li>- there has been a chronic increase in the cover of algae, including turf and fleshy algae, and algal growth on dead coral, and a decline in live coral. This shift in the benthic community structure to greater algal abundance has strong implications for the ecology</li> <li>- there is a shift in trophic dominance to greater abundance of herbivores, and a decreasing abundance and biomass of carnivorous and piscivorous fish due to excessive pressure from fishing</li> <li>- initial improvements in reef health as a result of the establishment of the reserve are visible some seven years after its initial establishment</li> </ul>
MANAGEMENT EFFECTIVENESS REVIEWS	<p>Dashboard (French biodiversity office), while the management effectiveness has been analyzed through the GCRMN coral reef status report in the WIO (Obura <i>et al.</i>, 2017).</p>
SPECIFIC ACTIONS	<p>Educational Marine Area (EMA) is a French initiative (IFRECOR / French Biodiversity Agency), since 2012 in Marquisas (Pukatai Project)  One site in 2016–2017 + four sites in 2017–2018  EMA is small marine and coastal zone managed by children</p>

## 2. FRENCH TERRITORIES

GLORIEUSES ARCHIPELAGO NATURAL NATIONAL RESERVE	
ECOSYSTEM AND LOCATION	Coastal and pelagic; North Mozambique Channel
PROCLAMATION YEAR LEGISLATION	French government Decree No. 2012-245 on the establishment of the Glorieuses Marine Nature Park (22 February 2012), later declared a natural national reserve on the 8th of June 2021 (national decree). The official name is Réserve naturelle nationale de l'archipel des Glorieuses.
EXTENT	46 073km <sup>2</sup> (entire EEZ)
INSTITUTIONAL FRAMEWORK	French Ministry for Ecological and Inclusive Transition French Biodiversity Office Delegated authority: Management committee
GOVERNANCE STRUCTURE	Management committee: 20 members (Marine Nature Park of Glorieuses, 2015a). Advisory: Simple consultation and assent procedure.
MANAGEMENT PLAN	First management plan: 2015-2030
RISKS AND THREATS	According to Marine Nature Park of Glorieuses (2015a): <ul style="list-style-type: none"> <li>- industrial fishing</li> <li>- coral bleaching</li> <li>- illegal artisanal fishing and poaching</li> <li>- vessel pollution</li> <li>- continental derived macro-wastes</li> <li>- oil and gas exploration /exploitation</li> <li>- global changes (cyclones, bleaching)</li> <li>- exotic and invasive species</li> </ul>
SITE SPECIFIC MANAGEMENT OBJECTIVES	Five guidance pillars of the management plan (Marine Nature Park of Glorieuses, 2015b): <ul style="list-style-type: none"> <li>- protection of natural heritage</li> <li>- sustainable fishery</li> <li>- ecotourism</li> <li>- governance</li> <li>- scientific observatory</li> </ul>
MONITORING/EVALUATION PROGRAMMES	The monitoring and survey realized inside the MPA (Marine Nature Park of Glorieuses, 2015b): <ul style="list-style-type: none"> <li>- species and habitats surveys (coral reefs, seagrass beds, marine turtles)</li> <li>- marine water quality surveys</li> <li>- coral bleaching survey</li> <li>- data collection on fisheries</li> <li>- Global Coral Reef Monitoring Network (GCRMN)</li> </ul>
MANAGEMENT EFFECTIVENESS REVIEWS	Dashboard (French Biodiversity Office) according to the five management guidance pillars (Marine Nature Park of Glorieuses, 2015c).
EUROPA ISLAND RAMSAR SITE	
ECOSYSTEM AND LOCATION	Coastal and pelagic; South Mozambique Channel
PROCLAMATION YEAR LEGISLATION	Ramsar site since 2012. Proclaimed as Natural Reserve at the local level since 1975 (as the other îles Éparses, except Juan de Nova).
EXTENT	Land surface: 32km <sup>2</sup> Marine area: 2142km <sup>2</sup> EEZ: 121 304km <sup>2</sup>
INSTITUTIONAL FRAMEWORK	The French Southern and Antarctic Lands (TAAF)
RISKS AND THREATS	The threats which impact the MPA are: <ul style="list-style-type: none"> <li>- climate change</li> <li>- cyclones</li> <li>- coral bleaching</li> <li>- illegal fishing, poaching</li> <li>- illegal pleasure activities</li> <li>- invasive species</li> <li>- pollution</li> <li>- erosion</li> <li>- acidification of the ocean</li> </ul>
MONITORING/EVALUATION PROGRAMMES	Monitoring and evaluation being implemented include: <ul style="list-style-type: none"> <li>- species and habitats surveys (coral reefs, seagrass beds, marine turtles)</li> <li>- marine water quality surveys</li> <li>- coral bleaching survey</li> <li>- data collection on fisheries</li> </ul>

## CASE STUDY

### Réunion's "shark crisis"

Karine Pothin

La Réunion has been afflicted by a "shark crisis" problem since 2011. Indeed, the waters around the island are affected by more and more frequent and very often fatal shark attacks. The majority of attacks, due in part to the location of water-based activities, take place on the perimeter of the marine reserve.

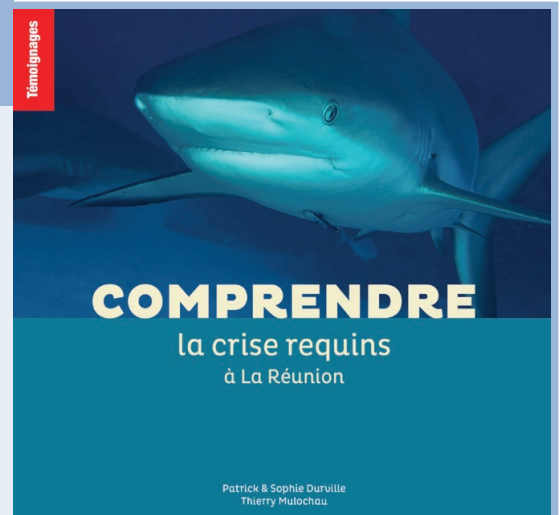
The authorities have come together to try to deal with this new situation through the deployment of safety nets, and the launching of a scientific research initiative, the CHARC Program, aimed at better understanding the current state of knowledge, ecology, habitats and behaviour of the offending Bull (or Zambezi) and Tiger sharks. Initially the Natural Marine Reserve of La Réunion became the target of detractors and was faced with serious accusations in relation to these shark attacks. It was alternately accused of being the food source that attracts sharks closer to shore; attracting sharks with its boundary delineation buoys; excluding some recreational and fishing activities leaving more room for sharks; and just for being the only MPA located in this coastal area. However Tiger and Bull sharks are not usually associated specifically with coral reefs, but with the deeper offshore channels, in the case of the former, and shallow estuaries in the case of the latter.

The CHARC Program as well as a more recent study "*Environmental and anthropogenic factors affecting the increasing occurrence of shark-human interactions around a fast-developing Indian Ocean island*" (Lagabrielle *et al.*, 2018) have shown interesting results in relation to the seasonal behavior of these species and have commenced identification of certain explanatory factors for the attacks, although still underlining the large unknowns and the essentially multifactorial nature of such attacks.

After a very hectic period fueled by media fever, the response to the crisis has moved to a more sober "risk management" phase. This has entailed a shift from an impassioned and irrational discourse, as promoted by various lobbies and personal interests, to a more reasoned and thoughtful discussion on the management of the situation. This has come about partly because of 1) better communication of the MPA's primary mission and its role in shark risk management, and 2) the establishment of a structure dedicated to shark risk management.

Local authorities and the state have provided the necessary human and financial resources to find lasting solutions through working on various fronts: securing water and seaside activities, and deployment of SMART (Shark-Management-Alert-in-Real-Time) baited drumlines (unmanned aquatic traps used to capture sharks) inside the MPA for scientific purposes, research, innovative solutions, prevention and communication. Caught sharks are then released in offshore waters. There is now a real synergy between the structure established to manage shark risk and the Réunion Marine Reserve, each acting in its field of competence but linked in the field of shark risk management. This synergy is apparent in the thematic meetings and workshops (on research, fishing campaign, innovations, etc.) and in the participation in the establishment and improvement of safety nets for people involved in water-based activities.

The Marine Reserve could be part of the solution by also 1) agreeing a relaxation of its regulations to allow deployment of more SMART drumlines, and 2) improving the quality of the coral reefs ecosystems inside the MPA, with the aim of rebalancing the natural environment.



Front cover of the recent book *Comprendre la crise requins à La Réunion* (Understanding the shark crisis in La Réunion).

## 2. FRENCH TERRITORIES

### Critical habitats and species

Although the French MPAs in the WIO include habitats such as coral reefs, mangrove forests and seagrass beds, other habitats are also present (Table 5). These habitats within the MPAs support a wide range of important key species (Table 6).

Table 5: Habitats protected by the French MPAs in the Western Indian Ocean.

	BEACHES AND NEARSHORE	MANGROVES	SEAGRASSES	SALT MARSHES	CORAL AND BIOGENIC REEFS	ROCKY REEFS	DEEP SEA AND OFFSHORE PELAGIC	SEAMOUNTS AND RIDGES	COASTAL FORESTS
<b>MAYOTTE</b> <i>(Marine Nature Park of Mayotte, 2013a; Marine Nature Park of Mayotte, 2016a; Natural Reserve of M'bouzi, 2015; IUCN, 2013)</i>									
Marine Nature Park of Mayotte	X	X	X	X	X	X	X	X	X
Nature Reserve of M'bouzi		X			X	X			X
<b>LA RÉUNION</b> <i>(Marine Reserve of La Réunion, 2013a; Nicet et al., 2016)</i>									
Marine Reserve of La Réunion	X		X		X	X			
<b>ÎLES ÉPARSES</b> <i>(Marine Nature Park of Glorieuses, 2015a, b; TAAF, 2016, 2018)</i>									
Glorieuses Archipelago Natural National Reserve			X		X	X	X		
Europa Island Ramsar Site		X	X		X		X		

Table 6: Biodiversity and key species recorded inside the MPAs of the French Territories in the Western Indian Ocean.

BIODIVERSITY	KEY SPECIES
<p><b>MARINE NATURE PARK OF MAYOTTE</b> (<i>Marine Nature Park of Mayotte, 2013a; Marine Nature Park of Mayotte, 2016; IUCN, 2013; Wickel et al., 2014</i>)</p> <ul style="list-style-type: none"> <li>- 7 spp. of mangrove trees</li> <li>- 10 spp. of seagrass</li> <li>- More than 300 spp. of hard corals</li> <li>- 25 spp. of marine mammals</li> <li>- 5 marine turtles; major spp: <i>Chelonia mydas</i>, <i>Eretmochelys imbricata</i></li> <li>- 24 shark spp.</li> <li>- 13 ray spp. including: <i>Manta birostris</i>, <i>Urogymnus asperrimus</i></li> <li>- More than 765 fish spp. including: <i>Plectropomus laevis</i>, <i>Epinephelus lanceolatus</i>, <i>Cheilinus undulatus</i>, <i>Bolbometopon muricatum</i></li> </ul>	<p>Whale: - <i>Megaptera novaeangliae</i> LC</p> <p>Dolphins: - <i>Stenella longirostris</i> LC - <i>Stenella attenuate</i> LC - <i>Tursiops aduncus</i> DD - <i>Peponcephala electra</i> LC</p> <p>Dugong: - <i>Dugong dugon</i> VU</p> <p>Turtles: - <i>Chelonia mydas</i> EN - <i>Eretmochelys imbricata</i> EN - <i>Caretta caretta</i> EN</p>
<p><b>NATURE RESERVE OF M'BOUZI</b> (<i>Natural Reserve of Mbouzi, 2015</i>)</p> <ul style="list-style-type: none"> <li>- 161 spp. of molluscs</li> <li>- 25 spp. of echinoderms</li> <li>- 190 spp. of fish</li> <li>- 25 crustaceans</li> <li>- 4 spp. of marine mammals</li> <li>- 6 spp. of mangrove trees</li> <li>- 39 spp. hard corals</li> <li>- 2 spp. turtles</li> </ul>	<p>Fish: - <i>Bolbometopon muricatum</i> VU - <i>Carcharinus albimarginatus</i> NT - <i>Carcharodon carcharias</i> VU - <i>Carcharhinus longimanus</i> VU - <i>Negaprion acutidens</i> VU - <i>Carcharinus amblyrhynchos</i> NT - <i>Sphyrna lewini</i> EN - <i>Sphyrna mokarran</i> EN - <i>Rhinocodon typus</i> VU - <i>Nebrius ferrugineus</i> VU - <i>Stegostoma fasciatum</i> VU - <i>Rhina ancylostoma</i> VU - <i>Rhynchobatus djiddensis</i> VU - <i>Taeniurops meyeri</i> VU - <i>Urogymnus asperrimus</i> VU - <i>Aetobatus narinari</i> NT - <i>Manta birostris</i> VU - <i>Mobula japonica</i> NT - <i>Hippocampus jayakari</i> DD - <i>Epinephelus coioides</i> NT - <i>Epinephelus fuscoguttatus</i> NT - <i>Epinephelus lanceolatus</i> NT - <i>Epinephelus malabaricus</i> NT - <i>Epinephelus polyphekadion</i> NT - <i>Plectropomus areolatus</i> VU - <i>Plectropomus laevis</i> VU - <i>Cheilinus undulatus</i> N - <i>Bolbometopon muricatum</i> VU - <i>Thunnus obesus</i> VU</p> <p>Seabirds: - <i>Ardea humbloti</i> - <i>Ardea idae</i> EN - <i>Phaeton lepturus</i> LC - <i>Sterna bengalensis</i> LC - <i>Anous stolidus</i> LC - <i>Onychoprion fuscatus</i> LC - <i>Sterna sumatrana</i> LC - <i>Butorides striatus rhizopora</i> - <i>Lumnitzera racemosa</i></p> <p>Plants: - <i>Lumnitzera racemosa</i></p>

## 2. FRENCH TERRITORIES

BIODIVERSITY	KEY SPECIES
<b>MARINE RESERVE OF LA RÉUNION ISLAND</b> <i>(Frike et al., 2009; Marine Reserve of La Réunion, 2013a)</i>	
<p>More than 6 433 species listed:</p> <ul style="list-style-type: none"> <li>- 20 spp. of sponges</li> <li>- 366 spp. of cnidarians</li> <li>- 1305 spp. of mollusks</li> <li>- 200 spp. of crustaceans</li> <li>- 97 spp. of echinoderms</li> <li>- 40 spp. of cartilaginous fish</li> <li>- 984 spp. of bony fish</li> <li>- 2 spp. of reptiles</li> <li>- 11 spp. of seabirds</li> <li>- 3 spp. of marine mammals</li> </ul>	<p>213 species listed under IUCN, CITES, CMS (2017) and Nairobi Convention <i>(Marine Reserve of La Réunion Island, 2013a)</i>, including:</p> <ul style="list-style-type: none"> <li>- 182 cnidarians</li> <li>- <i>Megaptera novaeangliae</i> (IUCN, CITES, CMS and Nairobi) VU</li> <li>- <i>Tursiops aduncus</i> (IUCN, CMS) EN</li> <li>- <i>Pterodroma barau</i> (IUCN) EN</li> <li>- <i>Pseudobulweria aterrima</i> (IUCN) N</li> <li>- <i>Chelonia mydas</i> (IUCN, CITES, CMS and Nairobi) EN</li> <li>- <i>Eretmochelys imbricata</i> (IUCN, CITES, CMS and Nairobi) EN</li> <li>- <i>Carcharinus amblyrhynchos</i> (IUCN)</li> <li>- <i>Carcharhinus melanopterus</i> (IUCN)</li> <li>- <i>Galeocerdi cuvieri</i> (IUCN)</li> <li>- <i>Triaenodon obesus</i> (IUCN)</li> <li>- <i>Nebrius ferrugineus</i> (IUCN)</li> <li>- <i>Rhynchodon typus</i> (IUCN, CITES, CMS)</li> <li>- <i>Manta birostris</i> (IUCN)</li> <li>- <i>Aetobatus narinari</i> (IUCN)</li> <li>- <i>Acanthrurus polyzona</i> (IUCN) EN</li> <li>- <i>Abudefdu margariteus</i> (IUCN) EN</li> <li>- <i>Amphyrion chrysogaster</i> (IUCN) EN</li> <li>- <i>Hyppocampus histrix</i> (IUCN)</li> <li>- <i>Hyppocampus whitei</i> (IUCN)</li> <li>- <i>Euripegasus draconis</i> (IUCN)</li> <li>- <i>Cephalopholis boenak</i> (IUCN)</li> <li>- <i>Epinephelus lanceolatus</i> (IUCN)</li> <li>- <i>Tridacna maxima</i> (IUCN, CITES, CMS)</li> <li>- <i>Tridacna squamosa</i> (IUCN, CITES, CMS)</li> <li>- <i>Pinctada imbricata</i> (Nairobi)</li> <li>- <i>Pinctada maculata</i> (Nairobi)</li> <li>- <i>Pinctada margaritifera</i> (Nairobi)</li> <li>- <i>Pinctada nigra</i> (Nairobi)</li> <li>- <i>Conus barthelemyi</i> (IUCN) EN</li> <li>- <i>Millepora exaesa</i> (CITES)</li> <li>- <i>Millepora platyphylla</i> (CITES)</li> <li>- <i>Millepora tenera</i> (CITES)</li> <li>- <i>Distychopora fisheri</i> (CITES)</li> <li>- <i>Distychopora violacera</i> (CITES)</li> </ul>

BIODIVERSITY	KEY SPECIES
<b>GLORIEUSES ARCHIPELAGO NATURAL NATIONAL RESERVE</b> <i>(Chabanet et al., 2015; Durville and Chabanet, 2009; Conand et al., 2016; Marine Nature Park of Glorieuses, 2015a,b)</i>	
<p>1435 species listed in Glorieuses (Glo) and 600 species in Geysers (Gey), including:</p> <ul style="list-style-type: none"> <li>- Bony fish: Glo 349 spp. Gey 88 spp.</li> <li>- Cartilaginous fishes: Glo 14 spp. Gey 14 spp.</li> <li>- Molluscs: Glo 247 spp. Gey 124 spp.</li> <li>- Arthropods: Glo 157 spp. Gey N/A</li> <li>- Echinoderms: Glo 54 spp. Gey 30 spp.</li> <li>- Cnidarians: Glo 110 spp. Gey 37 spp.</li> <li>- Bryozoans: Glo 95 spp. Geysers: NA</li> <li>- Algae: Glo 215 spp. Geysers: N/A</li> <li>- Phanerogams: Glo 6 spp. Gey 2 spp.</li> <li>- Plankton: Glo 179 spp. Gey: N/A</li> <li>- Marine mammals: Glo 5 spp. Gey 5</li> <li>- Sea turtles: Glo 2 spp. Gey: N/A</li> <li>- Seabirds: Glo 3 spp.</li> </ul>	<p>180 species in the Red List of IUCN including:</p> <ul style="list-style-type: none"> <li>- <i>Chelonia mydas</i> EN</li> <li>- <i>Eretmochelys imbricata</i> CR</li> <li>- <i>Papasula abotti</i> EN</li> <li>- <i>Bolbometopon muricatum</i> VU</li> <li>- <i>Cheilinus undulatus</i> CR</li> <li>- <i>Carcharon carcharias</i> VU</li> <li>- <i>Nebrius ferrugineus</i> VU</li> <li>- <i>Negaprion acutidens</i> VU</li> <li>- <i>Rhyncodon typus</i> VU</li> <li>- <i>Sphyrna</i> sp VU</li> <li>- <i>Manta birostris</i> VU</li> <li>- <i>Taenuria meyeri</i> VU</li> <li>- <i>Urogymnus asperrimus</i> VU</li> <li>- <i>Balaenoptera musculus</i> EN</li> <li>- <i>Physeter macrocephalus</i> VU</li> </ul> <p>Six species listed under the Nairobi Convention:</p> <ul style="list-style-type: none"> <li>- <i>Chelonia mydas</i></li> <li>- <i>Eretmochelys imbricata</i></li> <li>- <i>Megaptera novaeangliae</i></li> <li>- <i>Tridacna squamosa</i></li> <li>- <i>Birgus latro</i></li> <li>- <i>Pinctada margaritifera</i></li> </ul> <p>15 species listed in annex I or II of CITES including:</p> <ul style="list-style-type: none"> <li>- <i>Calloplepsiops altivelis</i></li> <li>- <i>Cheilinus undulatus</i></li> <li>- <i>Tridacna maxima</i></li> <li>- Milleporidae</li> </ul>
<b>EUROPA ISLAND RAMSAR SITE</b> <i>(Chabanet et al., 2015; Conand et al., 2016; Fricke et al., 2013)</i>	
<p>2 seabird subspecies endemic to the Indian Ocean:</p> <ul style="list-style-type: none"> <li>- Audubon's Shearwater <i>Puffinus lhermierei bailloni</i></li> <li>- Sooty Tern <i>Sterna fuscata nubilosa</i></li> </ul> <p>- Fin Whale <i>Balaenoptera physalus</i></p> <p>- Hammerhead shark <i>Sphyrna lewini</i></p>	<p>Green Turtle <i>Chelonia mydas</i> EN</p> <p>Pond Heron <i>Ardeola idea</i></p> <p>Threatened:</p> <ul style="list-style-type: none"> <li>- <i>Chelonia mydas</i></li> <li>- Fregatidae</li> <li>- <i>Vidua fischeri</i> (Straw-tailed whydah)</li> </ul>

(EN: Endangered; DD: Data deficient; LC: Least concern; NT: Near threatened; VU: vulnerable; CR: Critically endangered; N/A: Not applicable; Species: spp.; Glo: Glorieuses; Gey: Geysers Bank)



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This *MPA Outlook for the Western Indian Ocean (WIO)* is the first comprehensive regional analysis that provides a detailed update on the efforts by the Nairobi Convention countries to meet globally agreed marine conservation targets especially SDG14.5, which states that by 2020, to conserve at least 10 percent of coastal and marine areas, consistent with national and international law and based on the best available scientific information. This is also aligned to the Convention on Biological Diversity Strategic Plan for Biodiversity 2011–2020, Aichi Target 11. In 2019, the region had 143 proclaimed MPAs with several proposed across different countries.

A key purpose of this *MPA Outlook* was to establish baselines using appropriate indicators to assess the progress of the Contracting Parties to the Nairobi Convention in meeting these targets. Thirty authors contributed to the nine country chapters, the various case studies and other parts of this volume. Included are detailed descriptions of the MPAs in the countries of the region, the legal mandates under which they exist, the challenges they face and estimates of their management effectiveness. The main findings indicate that the vast majority of the sites across the WIO region, that are considered as MPAs or as having equivalent legal status and levels of protection, are coastal and/or inshore, however the largest, covering by far the greatest extents of the ocean, are those with considerable offshore elements. The assessment also established that the majority of existing MPAs across the region are not managed as effectively as they could and should be, due primarily to lack of funding for essential staff, equipment and capacity development, and commitment from relevant authorities. Recommendations are provided to support improved management of current MPAs and strengthen proposals from different countries for the establishment of further areas under protection, so as to reach conservation goals, including those being developed under the post-2020 Global Biodiversity Framework, while safeguarding coastal livelihoods and economies over the coming decades.

