CHAPTER 7

CRITICAL HABITATS OF THE WIO, THEIR ASSESSMENT AND KEY DRIVERS OF CHANGE

Michael H Schleyer

Critical Habitats

The term Critical Habitat appears first to have been coined in the US Endangered Species Act (ESA), this being part of US enacting legislation for implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES; www.cites.org). The term defines areas essential for the conservation of endangered or threatened species and, paradoxically, such areas need not be inhabited by the species in question when designated, but are needed for their recovery. The US Fish and Wildlife Service take into consideration areas needed for individual and population growth of a species; its normal behaviour, shelter, and nutritional and physiological requirements; sites for breeding and rearing offspring; and habitats protected from disturbance or representative of its historical geographical and ecological distribution (https://www.fws.gov/endangered/what-we-do/critical-habitats-faq.html). The focus is clearly species-orientated and overlooks other important attributes of habitats. The International Finance Corporation of the World Bank (https://www.ifc.org/wps/wcm/connect/bff0a28049a790d6b835faa8c6a8312a/PS6_English_2012.pdf?MOD=AJPERES) thus devised a broader, more rigorous definition for Critical Habitats:

> 'Critical habitats are areas with high biodiversity value, including a) habitat of significant importance to Critically Endangered and/or Endangered species; b) habitat of significant importance to endemic and/or restricted-range species; c) habitat supporting globally significant concentrations of migratory species and/or congregatory species; d) highly threatened and/or unique ecosystems; and/or e) areas associated with key evolutionary processes.'

These broader World Bank criteria have been employed in identifying and assessing the critical nature of habitats in the WIO. The focus has thus not been on species alone; threatened and unique ecosystems have been included.

It is important to note that biodiversity offsets are considered an option in the World Bank criteria, but only on a 'like-for-like' or 'better than' basis that will provide a net gain in habitat.

Critical Habitats Assessment

Critical habitat assessment can be a difficult and intricate process. However, the Convention for Biodiversity (CBD) has developed an elegant process to identify Ecologically or Biologically Sensitive Areas (EBSAs; see Dunn et al. 2014) for their protection. This is done within the framework of a marine spatial planning process. In its development, the CBD

basically adopted and adapted a Canadian process for environmental evaluation, employing the following criteria to evaluate marine habitats for their:

- **Uniqueness or rarity:** Examples here would be the coelacanth (*Latimeria chalumnae*), which appears limited in habitat to submarine canyons, or the dugong (*Dugong dugon*), populations of which have been harvested to extinction in many WIO countries.

- **Special importance for life history stages of species:** A good example here would be fish aggregation sites for breeding, such as Pinnacle Reef in southern Mozambique, which is annually visited for this purpose by the giant trevally, *Caranx ignobilis*.

- **Importance for threatened, endangered or declining species and/or habitats:** Turtles are vulnerable when nesting and the nesting beaches of endangered species warrant protection.

- **Vulnerability, fragility, sensitivity or slow recovery:** The most obvious case here would be that of coral reefs, which are globally under threat from human activities and climate change. In terms of species, an example would be the African penguin (*Spheniscus demersus*) which is classified as endangered and Bird Island in Algoa Bay provides its most important WIO breeding habitat.

- **Biological productivity:** Probably the best example here would be the rich tuna fishing grounds in and around the EEZ of the Seychelles.

- **Biological diversity:** Here coral reefs again provide a good example as they support some of the richest biological diversity in the world. Similarly, the islands of Mayotte and Europa have diverse habitats that are rich in biodiversity.

- **Naturalness:** The relatively pristine habitats of the Bassas da India atoll and Europa Island provide good examples of truly natural habitats.

There has been some debate as to the efficacy of the EBSA process (Dunn et al. 2014). Clearly, the process is qualitative rather than quantitative and the assessments, unless undertaken by specialists in the relevant fields, may be subjective. Furthermore, it merely identifies priority areas in need of protection but cannot institute the process whereby this is accomplished.

The IUCN ecosystem status categories for ecosystems (Bland et al. 2017) have been applied to the habitats assessed in this document (Fig. 1). The categories employed are summarised below, details of which can be found in Bland et al. (2017):

- **Collapsed (CO):** A habitat has Collapsed when its defining biological or physical features are lost, and its characteristic natural fauna and flora are no longer maintained. This category has been used in the context of national or regional, not global, collapse. The IUCN (2016) makes allowance for this in what it terms 'sub-global' assessments that can be confined to political or ecological boundaries, such as a river catchment or ocean basin.

This is the most straightforward category and assessment of the balance is variably based on:

- **Reduction in distribution:** The extent to which a habitat has been reduced over the last 50 years, or since 1750, or is likely to be reduced in the next 50 years.

- **Environmental degradation:** The severity and extent to which a habitat has become environmentally degraded over the last 50 years, or since 1750, or is likely to become degraded in the next 50 years.

- **Disruption of biological processes:** The severity and extent to which the biological processes have been disrupted in a habitat over the last 50 years, or since 1750, or is likely to become degraded in the next 50 years.

- **Restricted distribution**: Habitats that that are naturally restricted in distribution and are potentially threatened as they occur at very few localities or are very small in area.

- **Quantitative analysis:** The probability of collapse of a habitat based on modelling and risk assessment.

- **Critically Endangered (CR):** A habitat is Critically Endangered when it has, for example, been reduced in extent, environmentally degraded or the biological processes have been disrupted by 80% over the past 50 years, or 90% since 1750, or are likely to be reduced by 80% in the next 50 years. The assessment of the level to which habitats are restricted in distribution is more subjective and is made by specialists. The probability of collapse of a Critically Endangered habitat is ≥50% within 50 years.

- **Endangered (E):** A habitat is Endangered when it has, for example, been reduced in extent, environmentally degraded or the biological processes have been disrupted by 50% over the past 50 years, or 70% since 1750, or are likely to be reduced by 50% in the next 50 years. The assessment of the level to which habitats are restricted in distribution is more subjective and is made by specialists. The probability of collapse of a Critically Endangered habitat is ≥20% within 50 years.

- **Vulnerable (VU):** A habitat is Vulnerable when it has, for example, been reduced in extent, environmentally degraded or the biological processes have been disrupted by 80% over the past 50 years, or 90% since 1750, or are likely to be reduced by 80% in the next 50 years. The assessment of the level to which habitats are restricted in

distribution is more subjective and is made by specialists. The probability of collapse of a Vulnerable habitat is ≥10% within 100 years.

- **Near Threatened (NT):** A habitat is Near Threatened when, upon assessment, it does not qualify for a threatened category but is close to qualifying, or is likely to qualify, for a threatened category in the future.
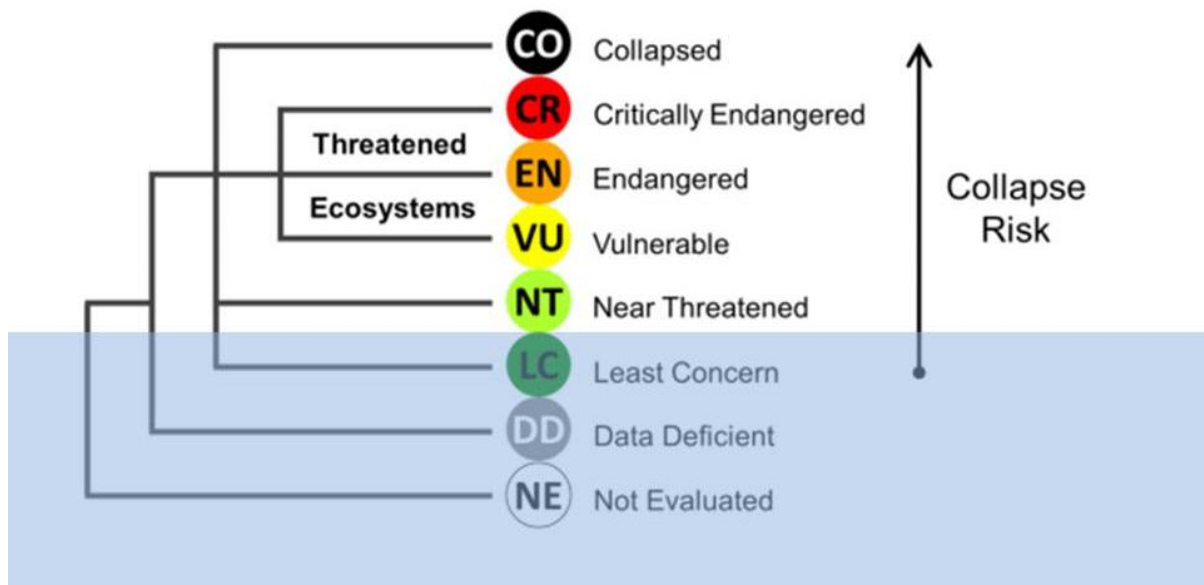

Figure 1.   The IUCN ecosystem status categories (Bland et al. 2017). Shaded categories were not considered in this document. The category 'Collapsed (CO)' was used in the context of national or regional, not global, collapse.

Levels of protection of the habitats are provided using the South African National Biodiversity Act (NBA) codes (Sink et al., 2011):

- **Well protected:** 100% or more of the SDG 14 target (10%) for a habitat is protected within an MPA (or similar structure), with sufficient 'no-take'.

- **Moderately protected:** 50 to <100% of the SDG target is in an MPA (or similar structure).

- **Poorly protected:** 5 to <50% of the SDG target is in an MPA (or similar structure).

- **Hardly protected:** 1 to <5% of the SDG target is in an MPA (or similar structure).

- **Zero protection:** No formal protection.

The scale is based on the proportion of each habitat or ecosystem under protection but the actual degree of protection will vary – in 'paper parks' it might technically be zero. Where this is known, the information has been included in the assessment. However, where unknown and the assessments are based only on gazetted proclamations, they may be exaggerated.

Critical Habitats of the WIO

Critical habitats in the WIO comprise a wide suite of tropical, subtropical and temperate habitats, both coastal and marine; these are dealt with in separate chapters. In brief, they range from:

- **Coastal forests, lakes and lagoons:** Expansive coastal forests are found along the shores of the WIO mainland states, Madagascar and some of the islands. While they are of value and are exploited, their biodiversity has not been fully explored. For example, a new endemic species, *Incuria dunensis*, was recorded as recently as 2004 near Moma, central Mozambique (Albano, 2004). What are possibly the highest vegetated dunes in the world are also found along the north-east coast of South Africa, extending into southern Mozambique. Coastal lakes and lagoons are found in this area up to Vilanculos and along the east coast of Madagascar, ranging in salinity from fresh to saline, and are fished by local communities.

- **Mangroves and estuaries with associated salt marshes and seagrass beds:** While most estuaries along the South African coastline are unwooded, these become heavily forested with mangroves to the north, accounting for 5% of global mangrove cover. A narrow band of salt marsh plants is found at the landward edge of many mangroves but become more extensive in temperate South African estuaries and lagoons. Expansive seagrass beds are found on shallow sedimentary banks in the tropics and are often associated with estuarine systems. These may themselves be small in comparison to the habitats they link. All are valuable for their resources and mangroves also play a significant role in shoreline protection.

- **Beaches and the nearshore habitat:** Beaches are not considered a productive habitat, yet are used both for fishing and recreational activities. The nearshore habitat is commercially important as it supports artisanal commercial fisheries for prawns, squid, finfish and sharks.

- **Rocky shores, reefs and coral reefs**
  - **Rocky shores and reefs:** Rocky shores and reefs are far more accessible to fishers than the nearshore environment and both are gleaned for a diversity of algal and invertebrate resources as well as finfish.

- **Coral reefs:** These are amongst the most biodiverse and productive of habitats, terrestrial and marine. They are valuable for their resources and shoreline protection, yet are globally threatened by human activities and climate change.

- **Offshore habitats:** These are the least known and understood of habitats, yet are the most expansive. WIO countries have, within their EEZs, offshore banks, submarine canyons, sunken atolls, seamounts and deep trenches. Few have been explored but offer diverse resources, ranging from rich fish stocks to gas and mineral deposits.

The livelihood of coastal communities depends on these habitats and, to a greater or lesser degree all are used – and threatened - by coastal populations. Individual assessments of these critical habitats have been made at the national as well as the regional level and the evaluated information falls into three categories:

- **Habitats where single species or phyla are considered**, e.g. canyons where the coelacanth is found, pinnacles where fish breeding aggregations occur (e.g. the aforementioned giant trevally, *Caranx ignobilis* – accompanied by the predatory bull shark, *Carcharhinus leucas* – on Pinnacle Reef in southern Mozambique), or remote localities are used (nearly) exclusively by seabirds (e.g. *Île du Lys* in the Glorioso Archipelago and the aforementioned Bird Island in Algoa Bay).

- **Expansive habitats** such as the mangroves and seagrass beds in Mozambique that are connected through estuaries which are small in comparison. These habitats may be many square kilometres in extent, comprising nearly mono-specific stands of the dominant plant species, but provide shelter, nursery areas and feeding grounds for diverse animal life.

- **Island habitats** characterised by diverse communities **that are in close proximity and intimately connected**, e.g. oceanic islands where coral reefs, seagrasses and mangroves are found, and the diversity of habitats are used by sea turtles for nesting, seabirds and a diversity of marine life. These incorporate all the WIO marine habitats in a microcosm, frequently include endemic species, and are vulnerable to disruption by introduced species such as rats or invasive marine life. They range from relatively pristine (for instance, the Chagos Archipelago and Europa Island) to heavily impacted (the biodiversity hotspot of Mayotte).

The habitat chapters are colour-coded/have a symbol/are grouped to indicate the above characteristics, so that the reader will know the nature of the habitat under consideration.

Key drivers of change

Threats to the environment can be broadly categorised as those which are **natural**, for example episodic events (cyclones, tsunamis, floods) and climate change, and **anthropogenic or human in cause**, for example exploitation (direct and indirect), habitat destruction (land 'reclamation', urbanisation, dredging, mining and gas/oil extraction), pollution (point and diffuse sources) and climate change (including ocean acidification and sea level rise). The World Wildlife Foundation (WWF) broadly lists the following as threats to the environment (https://www.worldwildlife.org/threats):

- **Effects of climate change:** This is the first environmental threat that the average person thinks of in the present age because of the level to which it has been publicised. However, what most people do not immediately appreciate is that the only thing constant about climate is change, and some of the present changes in global climate are, in fact, natural. However, a problem arises when human activities increase the rate of climate change and this is occurring because of the unprecedented rate at which humans are generating greenhouse gases, principally atmospheric carbon dioxide (CO_2). This is causing the earth's climate to warm, resulting in changes in climate that include more violent and frequent storms, melting of the polar ice caps and expansion of the seas with a rise in sea level, and acidification of the seas as the CO_2 dissolves in seawater forming weak carbonic acid. Life within habitats has to adjust to these changes but, in many cases, cannot do so fast enough.

- **The exploitation of fossil fuels:** Burning fossil fuels are the greatest source of CO_2 (but it also comes from digestion in ruminants and the decomposition of waste material in e.g. municipal dumps). Increasing prospecting for and exploitation of fossil fuels is causing loss of habitat and poses major pollution risks.

- **Deforestation:** Growing plants 'fix', or sequestrate, CO_2 and trees play the biggest role in this regard. Greenhouse gas production could thus be alleviated by afforestation. However, deforestation of natural forests is occurring at an increasing rate for timber and agriculture, especially in the tropics where decomposition of the forest floor after clear-felling adds further CO_2 to the atmosphere. The rich biodiversity in these forests is being lost as valuable forest habitats diminish.

- **Infrastructural development:** Human populations are increasing, with most demographic growth occurring in cities and urban areas, particularly along the coast. Human needs for infrastructural development require space and resources, resulting in loss of habitat. This includes land and natural environment lost not only to cities but also developments such as dams, harbours, roads and airports.

- **Pollution:** Urbanisation, industrialisation and inadequate waste disposal associated with demographic growth in the WIO are resulting in pollution on land, the introduction of solid waste to waterways, dissolved toxins to the sea, and atmospheric pollution. Waste material from other countries is also being introduced to the WIO by currents. Persistent particulate material and micro-plastics are a globally growing concern.

- **Soil erosion and degradation:** Poor land use and agricultural practices, particularly overgrazing, are at the root of this environmental concern. Soil, nutrients and agrochemicals are being washed into waterways and lost to the ocean, resulting in turbidity, sedimentation and nutrient enrichment.

- **Water scarcity:** Of the ever-increasing demand for resources, the scarcity and quality of potable water is probably the greatest concern. Sources are being over-extracted or becoming contaminated, and water is the most limited commodity in many countries. This adversely affects both the aquatic habitats from which water is extracted as well as the habitats they feed this life-giving commodity.

- **Overfishing, illegal fishing and by-catch:** The world's growing demand for food has led to overfishing of many living marine resources. Much fishing is unregulated and there is substantial wastage of what is known as by-catch, unwanted fish caught incidentally while targeting a desirable species. "Ghost-fishing', the unnecessary and untargeted death of aquatic life in lost or disposed fishing gear is further reducing fish stocks.

- **The illegal trade in wildlife:** Wild animals and plants are hunted for bush meat, traditional medicine or the curio and pet trade, and are being captured and harvested to the point that they many have become threatened or endangered. Despite the practice being illegal, the rewards are high and poachers continue their activities unabated. Many species are thus endangered, examples within WIO critical habitats being the dugong (*Dugong dugon*), which has been radically reduced in number for its meat, and the coelacanth (*Latimeria chalumnae*), targeted in the past for scientific specimens.

These are drivers of change and the degree that they threaten WIO habitats under consideration in this Outlook is scored using the IUCN system depicted in Table 1 (Bland et al. 2017). In this, the IUCN ecosystem status categories derived from earlier analyses are finally assessed as to whether the habitats in question are under continuous threat from the above drivers, or the threats they face are likely to reoccur in the short or long term (Figure 1). The cumulative scores finally indicate whether the immediate, short- or long-term impacts of the threats are high, medium, low, negligible or non-existent (Table 1).

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Table 1. The IUCN scoring system for scoring of threats to ecosystems (https://iucnrle.org/; http://www.iucnredlist.org/technical-documents/classification-schemes/threats-classification-scheme) has been adopted in this document for the assessment of critical habitats.

Threat Impact Scoring System (based on additive scores and defined thresholds)
Version: 1.0

a) Continuing threat

Scope	Severity:	Very rapid Score 3	Rapid Score 2	Slow Score 1	Negligible Score 0	
Whole Score	3	6	5	4	3	3
Majority Score	2	5	4	3	2	2
Minority Score	1	4	3	2	1	1
Negligible Score	0	3	2	1	0	0

b) Threat may occur/return in the short term

Very rapid Score 3	Rapid Score 2	Slow Score 1	Negligible Score 0	
6	5	4	3	3
5	4	3	2	2
4	3	2	1	1
3	2	1	0	0

c) Threat may occur/return in the long term

Very rapid Score 3	Rapid Score 2	Slow Score 1	Negligible Score 0
6	5	4	3
5	4	3	2
4	3	2	1
3	2	1	0

Impact Coding:
- High impact
- Medium impact
- Low impact
- Negligible / No impact