

# Information Sheet on Ramsar Wetlands (RIS)

*Categories approved by Recommendation 4.7, as amended by Resolution VIII.13 of the Conference of the Contracting Parties.*

Note for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.
2. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Bureau. Compilers are strongly urged to provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of maps.

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**1. Name and address of the compiler of this form:**

United Republic of Tanzania, Ministry of Natural Resources and Tourism, Wildlife Division, Nyere Road, Dar es Salaam

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Designation date

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Site Reference Number

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**2. Date this sheet was completed/updated:**

29<sup>th</sup> October 2004

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**3. Country:**

United Republic of Tanzania

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**4. Name of the Ramsar site:**

The Rufiji – Mafia – Kilwa Marine Ramsar Site

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**5. Map of site included:**

Refer to Annex III of the *Explanatory Note and Guidelines*, for detailed guidance on provision of suitable maps.

a) **Hard copy** (required for inclusion of site in the Ramsar List): *yes* x -or- *no*

b) **Digital (electronic) format** (optional): *yes* x -or- *no*

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**6. Geographical coordinates** (latitude/longitude):

39°15 – 40°00 E and 07° 30 – 08° 45 S

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**7. General location:**

Include in which part of the country and which large administrative region(s), and the location of the nearest large town. The RMK Ramsar Site falls within the Coast and Lindi Regions and the three districts of Rufiji, Mafia (Coast Region) and Kilwa (Lindi Region). The district capitals are Utete, Kilindoni and Kilwa, respectively. The northern boundary i.e. the northern part of the Rufiji Delta and the mangroves can be reached by road from the capital of Dar es Salaam, within about four hours, and is situated about a 100 km to the south. However, to reach the town of Kilwa – the nearest township south of the Site - it takes about eight hours by road from Dar es Salaam (about 140 km). There are regular flights from Dar es Salaam to Kilindoni on Mafia Island and to Songo-Songo Island, the largest island in the Songo-Songo Archipelago.

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**8. Elevation:** (average and/or max. & min.)

The land-based areas of the Ramsar Site are situated at sea level and up to about 25 – 40 m.a.s.l. The extensive coastal waters located on the continental shelf have water depths down to 6 and 10 m whereas the deeper areas included within the Ramsar Site and situated in between the islands and/or the mainland have water depths down to 30-40 m e.g. in the Mafia Channel and the depths of the water in between Songo-Songo Archipelago. Towards the sea the Ramsar Site ends with the continental shelf followed by an abrupt increase in water depth down to 100 m and more.

**9. Area:** (in hectares) The Ramsar Site covers 596,908 hectares based on a flat projection.

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**10. Overview:**

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland. The Ramsar Site comprises a variety of coastal and marine habitats made up of four significant features. The Rufiji Delta formed by the outflow of Rufiji River; the Mafia Island about 25 km off-shore and surrounding smaller islands, sandbars and coral reefs; the Songo-Songo Archipelago to the south; and the deeper waters in between i.e. the Mafia Channel and the water between Mafia and Songo-Songo Archipelago.

Fishing and extraction of other coastal and mangrove resources, as well as cultivation (especially rice), seaweed farming and tourism are the major activities in the Ramsar Site. A large part comprises of mangrove forests (an estimated 550 km<sup>2</sup>), as well as extensive intertidal flats and sandbars. The delta is formed by the Rufiji drainage basin, which covers about 20% of mainland Tanzania. About 20 km straight east from the delta lays Mafia and a number of much smaller rocky coral islands and islets and to the south the Songo-Songo Archipelago, which consists of about 30 km of outer fringing reef, 5 islands and 38 reef patches. The size of the Rufiji Delta is approximately 1,400 km<sup>2</sup> and presently it protrudes 15 km into Mafia Channel.

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**11. Ramsar Criteria:**

Circle or underline each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11).

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**12. Justification for the application of each Criterion listed in 11. above:**

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Group A of the Criteria: Sites containing representative, rare or unique wetland types

*Criterion 1: 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 biogeographical region*

The Rufiji Delta, Mafia Island and surroundings and the Songo-Songo Archipelago comprise a unique situation of extensive and varied mangrove forests, extensive intertidal flats, numerous sandbanks, extensive seagrass beds and extensive unique coral reef formations intersected by deeper marine waters.

It is believed that the estuarine, coastal and marine ecosystems are ecologically interlinked. The Rufiji River brings freshwater, and loads of nutrients and sediments, which are absorbed by the mangroves, intertidal flats and seagrass beds. The extension of the mangrove stands comprises the largest continuous forests in eastern Africa. The coral formations in the Mafia Island Marine Park are considered unique in the sense that they are physically well protected and at the same time oxygen saturated because of well, circulated water brought in by different currents. The Songo-Songo Archipelago has a highly diverse and extensive coral assemblage with existing records of 49 genera of hard and 12 genera of soft corals (see annex 1).

## Group B of the Criteria: Sites of international importance for conserving biological diversity

- *Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered or critically endangered species or threatened ecological communities.*

The Ramsar Site is important for threatened coastal and marine wetland habitats and for a number of globally threatened coastal and marine species. The Ramsar Site encompasses some of the most important (in terms of their variation and extension) coral reefs, mangrove forests and seagrass beds in eastern Africa. These are threatened wetland ecosystems, which at the same time are underrepresented in the global list of Ramsar Sites.

Five species of globally threatened Marine Turtles have been recorded in the Ramsar Site, and two: the Green Turtle *Chelonia mydas* (Globally Threatened) and the Hawksbill *Eretmochelys imbricata* (Endangered) are nesting in the area. The other species, which are only rarely reported, are: Loggerhead Turtle *Caretta caretta*, Leatherback Turtle *Dermochelys coriacea* and Olive Tiddley Turtle *Lepidochelys olivacea*. Due to a drastic decline in numbers they are listed by a number of international conventions: Appendix 1 by CITES; Class A protected species by the African Convention on Conservation of Marine and Natural Resources; Appendix 1 by CMS. Dugong *Dugong dugong* does still occur, however, in low numbers. Dugongs are listed on Appendix I of the CITES list and classified globally as 'vulnerable to extinction' due to a population decline of at least 20% in the last 90 years (IUCN, 2000). Their habitat requirements and slow rate of reproduction render them particularly vulnerable to anthropogenic activities, and they are threatened by hunting, incidental fish net captures, pollution, coastal development and diseases (Korrubel & Cockcroft, 1997; Marsh *et al.*, 2001). The distribution of Dugong, as well as of turtles nesting sites can be found in annex 2.

- *Criterion 3: A wetland should be considered internationally important if it supports population of plant and/or animal species important for maintaining the biological diversity of a particular biogeographical region*

The populations of the Green Turtle *Chelonia mydas* and Hawksbill *Eretmochelys imbricata* as well as for the critically small population of Dugong *Dugong dugong* are important to the region. The Ramsar Site is regionally important in terms of its mangrove communities, where the Ramsar site contains the most extensive and varied stands in eastern Africa. Moreover, regionally important coral communities are included in the Ramsar Site i.e. around Mafia Island and in the Songo-Songo Archipelago. The mangroves, intertidal flats, seagrass beds and corals provide the habitats large and commercially important populations in the region of a number of coastal and marine species of prawns, shrimps, bivalves, and fish (see annex 4 and 5 for further details).

- *Criterion 4: 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 Ramsar Site constitutes vital breeding, nursery and feeding grounds for a number of coastal and marine species some of which are economically important i.e. prawns, shrimps, sea cucumbers, octopus and fish (see annex 4 and 5). It is especially the large stands of mangroves, extensive intertidal flats and large areas of seagrass beds, which provide the necessary breeding conditions in terms of e.g. shelter, food and protection.

The high productivity of these extensive habitats in the Ramsar site is internationally significant. The large varieties of coral communities are equally important for many species of fish and invertebrates' species, especially through their breeding cycles. Many islets and beaches on Mafia Island, in Songo-Songo Archipelago and on the mainland provide breeding habitats for Green Turtle and Hawksbill Turtle. Here Dugong has its last stand along the Tanzanian coast.

- *Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more water birds.*

A first attempt to make a total count of the waterbirds in the Rufiji Delta was undertaken in December 2001 (Nasirwa *et al.* 2001 see annex 4) and it resulted in a total of 40,160 waterbirds belonging to 62 species. This number would be considered a minimum because some birds hide in the mangroves and along upstream rivers and are therefore not counted. The intertidal flats of Mafia Island and the Songo-Songo Archipelago were not counted during the December 2001 survey. However, the Mafia Island and surrounding islands were counted in 1989 (Bregnballe *et al.* 1990 see annex 4) with a resulting total of 11,878 waterbirds. Again these figures must be considered minimums and there is little doubt, that the total number of waterbirds during migration from about October to March is much higher than the 20,000 level in any given day. It is likely that some of the birds utilise a larger area between the Rufiji Delta and Mafia Island depending on the tides, disturbance and local feeding conditions. Waterbird numbers in the Songo-Songo Archipelago are not known.

There are no earlier records or counts available from the area.

- *Criterion 6. A wetland should be internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbirds.*

Although comprehensive and regular counts of the whole area have not been possible, on the basis of a 2001 total count of the Rufiji Delta area and a 1988-89 count of Mafia Island and its surrounding islands (and a partial count of the Rufiji Delta in the same period) - see annex 4 - at least eight waterbird species occur in numbers in excess of 1% of their relevant biogeographic populations (as listed in Waterbird Population estimates 3rd edition). These are: Curlew Sandpiper *Calidris ferruginea* (up to 4.9% of the biogeographic population), Crab Plover *Dromas ardeola* (up to 4.3%), Grey Plover *Pluvialis squatarola* (up to 1.1%), Greater Sandplover *Charadrius leschenaultii* (up to 2.9%), Lesser Sandplover *Ch. Mongolus* (up to 1.8%), Caspian Tern *Sterna caspia* (up to 3.1%), Gull-billed Tern *gelochelidon nilotica* (up to 26.4%), Lesser Crested Tern *Sterna bengalensis* (up to 6.5%). In addition, it is probably that more than 1% of populations of other species, including Saunderson's Tern *S. saundersi*, also occur in the site.

- *Criterion 7. A wetland should be 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 values and thereby contributes to global biological diversity.*

The Ramsar Site supports significant populations of fish that are representative of wetland benefits and/or values and contribute to the biological diversity in the eastern Africa coastal waters (the western Indian Ocean). Studies of by-catch of prawn trawlers, conducted in 1992 and 2001 reveal 100+ finfish species (Bwathondi *et al.* 2002). The delta artisanal finfish fishery is estimated at producing about 4,500 tonnes per annum (Hogan *et al.* 2001). At least 7,000 artisanal fishermen make a living from fishing in the Rufiji Delta alone and of these 3,000 are

engaged in the prawn fishery (Fottland & Sørensen 1996). The most important prawn species are: *Ferropenaeus indicus*, *Metapenaeus monoceris*, *Penaeus semisulcatus* and *P. mondon*, which are dependent on the extensive and varied mangroves of the Rufiji Delta. In the Songo-Songo Archipelago about 5,000 residents make a living from fishing. On Mafia Island the number of fishermen comprises several thousands.

- *Criterion 8. A wetland should be 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*

The mangroves, seagrass beds and corals are essential for the large numbers of fish (and marine invertebrates) in the area and in the region. Especially the Rufiji Delta with its extensive mangrove stands and intertidal flats, as well as the coastal areas with seagrass beds and coral reefs especially around Mafia Island and in Songo-Songo constitutes vital spawning and nursery grounds for a number of fish (see annex 5 for a list of fish species commonly caught in the Ramsar Site). The deeper coastal areas between the Songo-Songo Archipelago and Mafia and in the Mafia Channel are considered to be very important for migration of a number of pelagic fish species (J. Rubens pers. comm.) and the waters between the coral reefs of Songo-Songo Archipelago and Mafia would expectedly be important for exchange of individuals between populations, as well as for the securing of the overall survival of these fish communities.

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**13. Biogeography** (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

**a) biogeographic region:**

Not known

**b) biogeographic regionalisation scheme** (include reference citation):

Not known

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**14. Physical features of the site:**

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Overall, the RMK Ramsar Site is formed of the protruding Rufiji Delta into the Indian Ocean, the deep but narrow waters of the Mafia Channel, the rocky coral islands of Mafia and surrounding islets and reefs, and the Songo-Songo Archipelago with its reefs and sandbars. The Ramsar Site covers approximately 4,851 km<sup>2</sup>.

Rufiji Delta:

The RMK Ramsar Site covers the Delta from about where the Rufiji starts to branch out. The size of the delta is estimated at approximately 1,400 km<sup>2</sup> (Sørensen 1998). The north-south extent is 65 km protruding 15 km into Mafia Channel (Mwalyosi 1993). A large part comprises of mangrove forests (an estimated 550 km<sup>2</sup>) and there are extensive intertidal flats and some sandbanks. The area with mangrove may have increased from an estimated 400 km<sup>2</sup> in 1947 (Sørensen 1998), however this needs verification. In any case mangroves are expanding in the southern delta, which has increased levels of salinity (negative impact on rice farming) due to a

shift of the main course of the Rufiji towards the northern delta but decreasing in the north due to rapid conversion into rice fields. The watercourses in the delta are ever changing due to the dynamics of the floods and so are the levels of salinity in the different water bodies. The tidal range reaches approximately 4 metres at spring tide, and tides may influence the river up to 40 km upstream (Sørensen 1998). The intertidal flats along the delta are extensive and are estimated from sea charts to cover an area of 175 km<sup>2</sup> at spring low tide (Fottland & Sørensen 1996). The flats support productive shallow water fisheries, heavily exploited by local fishermen (Sørensen 1998) and the areas are very important for coastal invertebrates and fish.

#### Mafia Channel

The Rufiji Delta and Mafia Island is separated by the Mafia Channel, which is about 20 km wide with the about 3 km long Bwejuu Island and coral reefs in between. Except for two deep (down to 30 m) south north running channels, of about 5 km width each on each side of Bwejuu the water depths are between 0 and 9 meters. From the air extensive areas of seagrass is observed, however, no detailed study has established the exact coverage of the seagrass distribution neither between Rufiji and Mafia nor in the Songo-Songo Archipelago.

#### Mafia Island

Mafia Island and its chain of small Islets are situated opposite the mouth of the Rufiji River. It is a narrow Island 48 km long and 16 km wide. At its nearest point it is 21 Km from the mainland (7° 40' S and 39° 40' E). Mafia consist of a main island and a number of much smaller coral islands and islets. They are essentially coral rock islands with adjacent live corals and sandbanks scattered around. The Mafia Island Marine Park occupies the south eastern part of Mafia Island and adjacent islands, corals and coastal waters and covers an estimated 822 km<sup>2</sup>. The Marine Park was designated in 1995 and is covered by the Ramsar Site.

#### Songo-Songo Archipelago

The Songo-Songo Archipelago is a productive and diverse coastal ecosystem including habitats such as shallow sheltered reefs, fringing reefs, extensive seagrass beds and intertidal flats. The reefs are more extensive than the coral reefs of Mafia and consist of 30 km of outer fringing reef, 5 islands and 38 reef patches (Guard, 2000). There is no information present on the extension of seagrass beds and intertidal flats.

The climate of the coastal zone is strongly influenced by the monsoon or “trade winds”, the northeast monsoon and the southeast monsoon. The southeast monsoon blows from April to September with strong winds; it is the colder dry season and there is a lower tidal range. The northeast monsoon blows from November to March there is less wind, a higher tidal range and a more humid climate.

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#### **15. Physical features of the catchment area:**

Describe the surface area, general geology and geomorphological features, general soil types, general land use, and climate (including climate type).

Beside the utilisation of resources in the Ramsar Site itself, the land use practices upstream in the Rufiji Floodplain and Catchment (outside the Ramsar Site) have an important bearing on the delta and the whole area because contributory rivers are responsible for the dynamics of flooding in the delta, as well as the loads of sediment and nutrients, which are carried to the delta and the sea.

The mean annual flow of the Rufiji River is about 900 m<sup>3</sup>/s at its outflow to the Indian Ocean, however, this figure covers large variations between dry and wet seasons and between years. The large drainage basin (outside the RMK Ramsar Site covering about 20% of the mainland i.e. about 177,420 km<sup>2</sup> is the largest in Tanzania.) includes important catchment areas and inland deltas such as the Usangu Flat (Ruaha River) and the Kilombero Valley Floodplain (Kilombero River) of which the latter has Ramsar Status.

The Great Ruaha River supplies 22 per cent of the total flow of the Rufiji catchment system. And the catchment of the River Rufiji plays a role of great importance in the country as a whole. The Rufiji River rises in various tributaries, principally from the South-western Kipengere and Livingstone Mountain Ranges. Of these, three tributaries provide more than 90 per cent of the total flow of the Rufiji, and the largest of these tributaries is the Kilombero river, contributing up to 62 per cent of the total flow. Along its length, the tributary receives additional waters from the southward-flowing streams falling from the forests on the Udzungwa mountains. From its headwaters, also in the Kipengere Mountains, the Great Ruaha River descends to the Usangu plains, a critically important region in Tanzania for irrigated agriculture (mostly rice) and livestock. The wetland system of the plains is also important for the households around the area and for the adjacent Usangu Game Reserve. The river eventually reaches the Mtera reservoir and then flows south to the Kidatu dam. These two dams together generate about 50 per cent of the Tanzania's electricity. The Ruaha continues southwards and cuts across the Selous Game Reserve before feeding into the Rufiji. The catchment of the River Rufiji lies entirely within the borders of Tanzania and plays a role of great importance in the country as a whole. While just 10 per cent of the country's population lives within the catchment, significantly larger proportions rely on the resources produced by the river. These include:

### **Hydroelectric power**

Power generation from the Mtera regulating reservoir and the downstream Kidatu Dam - both on the Great Ruaha River - currently supplies nearly 50 per cent of Tanzania's electricity. Whilst these two facilities were designed to produce 80 and 204 MW of power respectively, a further hydroelectric power station has just been commissioned along the Kihansi river (a tributary of the Kilombero river), which currently produces 180 MWs.

### **Irrigation**

Early identification of the extent of wetlands in three main areas of the Rufiji catchment has led to extensive exploitation of the areas for irrigated agriculture to provide rice, sugar cane and other crops. The floodplain wetlands of Usangu, Kilombero and the lower Ruaha/Rufiji have all been extensively developed for irrigation.

### **Livestock**

Major livestock rearing in the floodplain areas of Usangu and the Rufiji/Ruaha floodplain provides animal protein for the major urban centres of Mbeya, Iringa and even Dar-es-salaam.

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## **16. Hydrological values:**

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

Mangroves stabilise the shoreline by their roots and the trees act as a windbreaker towards inland pastures and villages. The huge loads of sediment and nutrients coming with the Rufiji River is trapped and accumulated in the mangrove delta; the delta and mangroves are growing seawards. A further probable cause for the rich growth of different mangrove communities is the physical

barrier i.e. the presence of Mafia Island some 20 km from the coast combined with the amplified freshwater outlet by the Rufiji River. Mangroves are vulnerable to extreme storms and it is likely that Mafia offers some physical protection for the delta and its plant communities. The extensive areas of seagrass have a similar function of sediment trapping and accumulation (although high densities of suspended particles in the water will lower growth rate and depths). The main function is derived from the ability of the seagrass roots to bind sediments thereby reducing re-suspension and movements of sand and mud along the shores. In this respect, both the mangrove and the seagrass play a crucial role in maintaining the corals free of sediment and stabilising the delta and coastline. Moreover, corals assist - as do the mangroves - to prevent coastal erosion by mitigating strong wave action (Wagner 2001). More research is needed on the relationship between the interactions between the various ecosystems.

The importance of the upper catchment areas of the Rufiji Delta is not fully known, however, flooding downstream and the hydrologically dynamics of the delta is closely linked to the water catchments i.e. the Rufiji Floodplain, the Selous Game Reserve, and the sub-catchments of the Luwegu, Kilombero and Great Ruaha Rivers. This huge combined catchment area contains two National Parks (Ruaha and Udzungwa), several Game Reserves and dams containing more than 80% of the hydropower generating capacity of the country. If the situation in the catchment is significantly altered it will have consequences for the downstream Ramsar Site .

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## 17. Wetland Types

### a) presence:

Circle or underline the applicable codes for the wetland types of the Ramsar "Classification System for Wetland Type" present in the Ramsar site. Descriptions of each wetland type code are provided in Annex I of the *Explanatory Notes & Guidelines*.

A • I • B • G • F • C • H • E • J • M • D • Ss • Sp • Ts • Tp

### b) dominance:

List the wetland types identified in a) above in order of their dominance (by area) in the Ramsar site, starting with the wetland type with the largest area.

**Ranked from the most to the least dominant, The Ramsar Site is a Marine/Coastal Wetland.**

**A = Permanent shallow marine waters** in most cases less than six metres deep at low tide; include sea bays and straits.

**I = Intertidal forested wetlands;** includes mangrove swamps, nipah swamps and tidal freshwater swamp forests.

**B = Marine subtidal aquatic beds;** include kelp beds, sea-grass beds, tropical marine meadows.

**G= Intertidal mud, sand, sand or salt flats.**

**F = Estuarine waters;** permanent water of estuaries and estuarine systems of deltas.

**C = Coral reefs.**

**H = Intertidal marshes;** includes salt marshes, salt meadows, saltings, raised salt marshes; includes tidal brackish and freshwater marshes.

**E = Sand, shingle or pebble shores;** includes sand bars, splits and sandy islets; includes dune systems and humid dune slacks

**J = Coastal brackish/saline lagoons;** Brackish to saline lagoons with at least one relatively narrow connection to the sea.



- M = Permanent rivers/streams/creeks;** includes waterfalls.  
**D = Rocky marine shores;** includes rocky offshore islands, sea cliffs  
**Ss = Seasonal intermittent saline/brackish/alkaline marshes/pools**  
**Sp = Permanent/saline/brackish/alkaline marshes/pools**  
**Ts = Seasonal intermittent freshwater marshes/pools** on inorganic soils; include sloughs, potholes, seasonally flooded meadows, sedges, marshes  
**Tp = Permanent freshwater marshes/pools;** ponds (below 8 ha), marshes and swamps on inorganic soils; with emergent vegetation water-logged for at least most of the growing season.

**18. General ecological features:**

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site.

Tanzania has a coastline of about 800 km long and a continental shelf lying from 6 - 64 km off shore with an approximate area of 12,000 km<sup>2</sup>. The general ecological features of the Ramsar Site are geographically variable areas of stratified mangrove forests with rice fields along the coast and on islands, marshes of variable salinity and bare sandy areas in parts of the delta and a slowly outwards expansion of the delta and mangroves towards the sea. Extensive intertidal flats replace the mangroves seawards followed by extensive areas of seagrass below the mid-tide mark. Deeper areas of marine water separates the many islands and islets made up of coral rocks with adjacent shallow waters and sandbanks. Mafia comprise the largest island in the area and it contains a special freshwater bog habitat with a unique flora. To the south the Songo-Songo Archipelago comprises numerous small islands, sandbanks and extensive coral reefs.

Mangroves

This Ramsar Site covers the most extensive stand of mangroves along the eastern African coast. According to the Mangrove Management Plan (MMP, see point 23) the total extension is approximately 579 km<sup>2</sup>. As can be seen from the table below by far the largest area is in the Rufiji Delta.

Table: Mangrove area in the Rufiji-Mafia-Kilwa Ramsar Site

Location	Area (ha)
Mafia*	3,473
Rufiji	53,255
Northern Kilwa (to Somanga Funga)	1,165
Total	57,893

Nine mangrove species grow in the Ramsar Site (see point 17. noteworthy flora). More isolated mangroves are found on Mafia and near Kilwa. The mangroves on Mafia Island are distributed in the following localities: Ras Mkumbi, the Northern tip of Mafia Island (52 ha), Kanga – Kirongwe (1,251 ha) Ras Mbisi – Ngesa (704 ha), South Kilindoni – Kisimani (669 ha) and Chole bay (539 ha). Kilwa District has extensive mangroves (about 225 km<sup>2</sup>) of which only 5% (about 12 km<sup>2</sup>, compartments 1-14 from the northern border to Somanga Funga) is included in the Ramsar Site. The natural break in mangrove vegetation at this point forms the southern land based boundary of the Ramsar Site.

Seagrasses

Tanzania coastal waters host 12 species of seagrasses (Government of Tanzania 1998, TCMP 2001), including the dominant genera of *Cymodocea*, *Thalassia* and *Thalassodendron* (UNEP 1989). Seagrass habitats are highly productive and play an important ecological role as a nursery ground for fish and crustaceans and provide food and shelter for many other organisms, including Green Turtle and Dugong (Mgaya 2000, Richmond 2002) and interact with corals and mangroves in a wide range of physical functions. More research is needed on the extension and composition of seagrass in the Ramsar Site. During a coastal study along the Tanzanian coast (UNEP 1989) seagrass beds were found “in all bays and on the western side of all reefs and islands lying off the mainland”. Seagrass form dense beds that cover large areas of sandy or muddy coastal bottom, from the mid tide mark to a depth of 20 m or more. Studies also document the presence of numerous patches of sea grass beds around the reefs and islands of the Songo Songo Archipelago (Darwall *et al* 1996, 1997, 1994).

### Corals

The species diversity of corals is only matched by that found in tropical rain forests. Thousands of free-living species are associated with coral reefs, including species of fish, crustaceans, gastropods and echinoderms. Many of these organisms rely on three-dimensional features, which only well-developed corals possess. Studies suggest the Songo-Songo Archipelago to have the most diverse coral species assemblages in southern Tanzania with records of 49 genera of hard coral and 12 genera of soft corals (see Annex 1, Darwall, 2000). The reefs in the Mafia Island Marine Park are considered unique due to a combination of well-circulated and protected waters (J. Rubens pers. comm.) and with scenic coral rocks above the surface water the area attracts a number of tourists. Some of Tanzania’s coral reefs were badly affected by coral bleaching in the late 1990’s with some areas recording an 80% loss in coral cover. Evidence suggests that the Songo-Songo Archipelago largely escaped the bleaching events (Wilkinson, 2000, Richmond pers. comm.) possibly providing a source of healthy coral communities for recolonisation of certain species of coral (with a free-living pelagic larval stage). The same is true for corals in Chole Bay on Mafia Island, however, other reefs on Mafia has been severely affected. Reefs play, as it is the case with mangroves and sea grass, an ecologically important role as they serve as breeding, nursery and feeding grounds for numerous coastal and marine animals. It is believed that the Mafia and Songo-Songo reefs may serve as a “seed bank” for other reefs in eastern Africa because of the strong currents in the Mafia Channel.

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### **19. Noteworthy flora:**

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 12. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

The extensive stands of mangroves in the RMK Ramsar site and most notably in the Rufiji Delta are biogeographically important in eastern Africa. The region is poor in mangrove species (nine to ten species occur) however, specific mangrove communities mainly confined to the upstream areas (due to less saline water, less exposed to storms etc.) are threatened by clear-felling e.g. *Heritiera littoralis*, which is also the only species not found on Mafia Island. Eight of the species are found in the Rufiji Delta and seven on Mafia (see the table below). The mangroves in the delta have a dense understory of plants such as mangrove ferns and more recently an aggressive climber (*Derris trifoliata*), found particularly in areas with high fresh water input. The Mangrove Management Project of the Forest and Beekeeping Division has mapped all mangroves.

Table: Species of mangrove in the Ramsar Site and summary of their ecological characteristics.

Mangrove species	Local name	Characteristics
<b>Lumnitzera racemosa</b>	Mkandaa dume	Always found as landward mangrove in the littoral fringe, where there is an influence of freshwater.
<b>Herritiera littoralis</b>	Msikundazi	Littoral fringe or riverine, especially river mouths in sandy loam and inland areas.
<b>Xylocarpus granatum</b>	Mkomafi	Usually at landward margin of mangrove forests in the littoral fringe, where there is an influence of freshwater.
<b>Sonneratia alba</b>	Milana	Upper littoral.
<b>Avicennia marina</b>	Mchu	On compact substrates, sand flats and newly deposited sediments. Tolerates high salinity and varied flooding regimes, thus widespread throughout the mangrove forest both on the landward and seaward side of mangroves.
<b>Ceriops tagal</b>	Mkandaa	Littoral fringe, on landward side of mangrove forest.
<b>Bruguiera gymnorrhiza</b>	Mshinzi	At variable salinity, often mixed with or between Rhizophore and Ceriops zones.
<b>Rhizophora mucronata</b>	Mkaka	Upper eulittoral, at variable muddy soils. Forming extensive, pure stands in estaurine conditions

Seagrass represent a unique flora of grass-like herbaceous angiosperm adapted to salinity and occasional desiccation and hydrophilic pollination. The extensive areas with seagrass in the Ramsar Site are biogeographically important although more research is needed to establish their true extension. The occurrence of Dugong in the area – as one of the last localities in the western Indian Ocean – indicate the importance of the seagrass, as well as the large production of fish, crustaceans and other invertebrates (see point 19. socio and cultural values).

Tanzania coastal waters host 12 species of seagrasses (Government of Tanzania 1998, TCMP 2001), including the dominant genera of *Cymodocea*, *Thalassia* and *Thalassodendron* (UNEP 1989). Seagrass habitats are highly productive and play an important ecological role as a nursery ground for fish and crustaceans and provide food and shelter for many other organisms, including Green Turtle and Dugong (Mgaya 2000, Richmond 2002) and interact with corals and mangroves in a wide range of physical functions. More research is needed on the extension and composition of seagrass in the Ramsar Site. During a coastal study along the Tanzanian coast (UNEP 1989) seagrass beds were found “in all bays and on the western side of all reefs and islands lying off the mainland”. Seagrass form dense beds that cover large areas of sandy or muddy coastal bottom, from the mid tide mark to a depth of 20 m or more. Studies also document the presence of numerous patches of sea grass beds around the reefs and islands of the Songo Songo Archipelago (Darwall *et al* 1996, 1997, 1994).

#### Seaweeds

The majority of villages are cultivating *Eucheuma denticulate* and *Kappaphycus alvarezii*. Successful seaweed farming depends on careful site selection. It is farmed in sheltered reef lagoons with salinity levels above 30 ‰ and preferably on sandy to coral bottom substrate subject to moderate water currents and with clear water and water depth at low tide about 0.6 – 1.0 m. Sea weed farming is a success story in Tanzania (Richmond *et al*, 2002). The Government has produced guidelines for seaweed production.

Several endemic plants species exist in the freshwater inland bogs on Mafia Island. These include species (Herbs) such as *Eriocaulon strictum* and *Eriocaulon truncatum* found in Kitomondo swamps,

*Tristemma shliebenii* in swamp forest of Ngomeni and *Xyris parvula* found in Mwembe kwa Hoyo along the road to Kilindini. However, more research is needed to establish their full extension.

## 20. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 12. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

### Waterbirds

The internationally important waterbird populations (see Annex 4) and other waterbird species are mainly confined to the open areas i.e. intertidal flats, beaches and sandbanks for feeding and resting, but some also use the stands of mangroves for roosting at high tide. Many of the important waterbird populations are inter-continental migrants which spend their non-breeding season at the site. The inner Rufiji Floodplain holds populations of other waterbirds including African Skimmer, White-headed Plover, and Open-billed and Yellow-billed Storks.

### Marine Turtles

The Green and Hawksbill Turtles *Chelonia mydas*, *Eretmochelys imbricata* are locally abundant and rare respectively in the Ramsar Site and both are globally threatened. The Ramsar Site is important for the survival of Marine Turtles, however, there are many indications that the populations have decreased and that former breeding sites are no longer used (Clarke *et al.* 1993). A Community-based Marine Turtle and Dugong Research & Habitat Protection Programme in Mafia (Muir 2002a) have located 27 nesting beaches for Marine Turtles around Mafia alone. A map showing the known nesting sites is shown in Annex 2.

### Dugong *Dugong dugong*

Prior to the mid 1970s, dugongs were reported to be relatively abundant in Tanzanian waters when herds of 20–30 animals were not uncommon, and it was possible for gillnet fishers to capture 3-5 animals per day (Muir *et al.* 2003). In the study by Muir (*et al.* 2003) some 281 (67%) respondents claimed personally to have seen a dugong, of which 272 had sighted dugongs in Tanzanian waters, 3 in southern Kenya and 6 in northern Mozambique. Of these respondents 41% (115) had themselves captured a dugong in gillnets (*jarifé*), with a mesh size of between 8 – 12 inches (*sinia*). Others reported seeing a carcass at a landing site or meat sold in a market and 8% (23) of respondents reported having seen live, free-swimming dugongs (i.e. not caught in gillnets).

During the survey (Muir *et al.* 2003) 32 dugong sightings were reported along the Tanzanian coast since January 2000 (Table 3). Of these, 24 were incidental captures in gillnets and 8 were sightings of live, free-swimming animals. Of the 32 sightings, 22 (69%) were from the Rufiji-Kilwa area indicating that the largest remaining concentration of dugongs in Tanzanian waters occurs there. A single sighting from Moa in Tanga supported the general opinion of fishers there that a small number of dugongs persist close to the northern border with Kenya from where they were previously thought to have disappeared. Other isolated sightings were reported from Mafia, Pangani and Pemba but there was little indication to support the view that there are resident populations in these areas.

### Corals

Corals are highly diverse and productive, they are found along a third of the coastline and so far about 127 species in 13 families have been identified in Tanzania (TCMP 1998). The most important coral reefs in the area are situated in the Marine Park such as those in Chole Bay,

Kitutia and Mange their status is considered “good” with a diverse coral cover down to depths of 25-30 m. The reefs comprise a variety of different types (Horrill & Ngoile 1991) e.g. exposed hard coral, soft coral and algae dominated reefs. The Songo-Songo Archipelago also contains extensive reefs with an expected larger diversity than seen in Mafia.

Table: Number of coral genera recorded in the Ramsar Site.

Group	Mafia Island	Rufiji Delta	Songo-Songo Archipelago
Hard Coral (Scleractinian)	45 genera	n/a	49 genera
Soft Coral (Non-Scleractinian)	n/a	n/a	12 genera

### Fish

More than 500 commercially important fish species alone occur in connection to corals (TCMP 2001). The numbers and variety are biogeographically important.

Table: Number of fish species recorded in the Ramsar Site.

Group	Mafia Island	Rufiji Delta	Songo-Songo Archipelago
Fish	396	?	270

For more information please refer to annex 5

### Invertebrates

Corals, seagrass and mangroves are ecological important by supporting an abundance of finfish (see above), lobsters, prawn, crabs, octopuses, shellfish and sea cucumbers all of which are important in artisanal and commercial fisheries (Wagner 2001) as a biodiversity resource. The numbers and variety are biogeographically important.

Table: Number of gastropods recorded in the Ramsar Site.

Group	Mafia Island	Rufiji Delta	Songo-Songo Archipelago
Gastropods	89	n/a	93

### Dragonflies

The species *Teinobasis alluandi* whose main distribution is Australasia has been recorded in the part of the Rufiji floodplain and delta included in the Ramsar Site. It is believed to be second record for Africa of this species (REMP pers. comm.).

## **21. Social and cultural values:**

e.g., fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values.

### Rufiji Delta

The human population in the delta numbered approximately 33,000 people in 1998 (Sørensen 1998). There were 19 registered villages organised in five wards. The delta economy rests on three main activities: fishing, farming and mangrove pole cutting. People were not able to prioritise among these three activities in terms of importance. Mangroves and rice are valuable

items of international trade and there is a long history of exporting mangrove poles from Rufiji to destinations in Tanzania and abroad. This selective harvest of mangrove poles can be conducted in a sustainable manner because the trees are able to regenerate fast. Since the 1960's the Rufiji prawn fishery has become another driving force in the delta economy. Sørensen (1998) listed the following export products in Rufiji at producer prices after subsistence needs have been met:

Rice USD 1.8 million; Prawn USD 1.5 million; Ukindu (palm leaf fibre for making mats) USD 400,000; Nazi (ripe coconuts) USD 830,000; Uduvi (small shrimp) USD 280,000 and Dried fish USD 330,000.

These figures are based on extensive interviews with producers, professionals and from tax collection data. The mentioned values do not show the total value, which must be considered to be several times higher than the figures stated. Some of the earnings were estimated to be: Prawn fisher USD 100 per months; Prawn collector USD 116 per months; Pole cutter USD 100 per months; Uduvi fisherwoman USD 75 per months.

In the introduction Sørensen (1998) writes about the people living in the Rufiji Delta: "The people of the Rufiji Delta, the Nyagatwa, have established a culture, which reflects the reciprocal relationship developed between people and their environment. The Rufiji people live in what is considered an isolated and difficult or complex place, where they have been able to develop and enrich their knowledge of the locality over hundred years. The Nyagatwa, however, are not an isolated people, on the contrary, they develop and maintain links to the outside world. Their culture is influenced by impulses from outside the delta, not just from neighbouring areas, but also because of their seafaring and trading traditions, from a range of far off places. Therefore, despite living in an isolated ecosystem, the indigenous people of the Rufiji Delta are actively part of a larger world; and their knowledge of their environment is constantly constructed and transmitted, shaping culture and society".

As mentioned earlier the productivity of the mangroves and the intertidal flats in terms of coastal resources is high and important to people. Commercial interests also arise from these resources. It has for example been estimated that the Rufiji mangroves and Mafia Channel seagrass beds are the nursery ground for 80% of all shrimps caught in Tanzania. Along the same line the commercial and growing prawn fishery is dependent on the mangroves. In total 18 prawn trawlers are now based in Dar es Salaam (TCMP 2001) for the industrial prawn fishery. Total landings in five years between 1984 and 1992 varied from 1,081 tons to 2,190 tons per year (the season is closed between November and March and night fishing is prohibited). The fishery consists mainly of three species: *Penaeus indicus*, *P. monodon*, *Metapenaeus monoceros* (Mwalyosi 1993), which are dependent on the extensive and varied mangroves of Rufiji.

Table: The local use of mangrove trees based on interviews (Sørensen 1998).

Mangrove species	Local name	Use of tree

<i>Lumnitzera racemosa</i>	Mkandaa dume	
<i>Heritiera littoralis</i>	Msikundazi	Timber for doors, windows & furniture. Boat building: keel, boom, planking and ribs
<i>Xylocarpus granatum</i>	Mkomafi	Timber for doors, windows & furniture. Medicinal: fruit for treating hernia. Fruit used for poisoning fish. Boat building: ribs and cross pieces. Canoe last 7-10 years.
<i>Sonneratia alba</i>	Milana	Favoured fuel for cooking (no smoke). Boat building: ribs.
<i>Avicennia marina</i>	Mchu	Medicinal: sap for ear ache. Good fuel for pots, salt production & fish smoking (good embers & plenty smoke). Good smoke for collecting honey. Flowers good bee-food. Canoe last 2-3 years.
<i>Ceriops tagal</i>	Mkandaa	Mangrove pole (boriti), favoured poles for building. Good fuel for providing golden colour in smoked fish.
<i>Bruguiera gynorrhiza</i>	Msinzi	Mangrove pole (boriti).
<i>Rhizophora mucronata</i>	Mkaka	Mangrove pole (boriti).

#### Songo-Songo and Mafia Island - Fisheries

Songo-Songo Archipelago and Mafia are extremely important artisanal and commercial finfish fishing grounds, with boats coming from Tanga, Dar es Salaam, Lindi and Mtwara to fish in these waters. Sea cucumbers, shells, lobster, and octopus collected in the Songo-Songo Archipelago and Mafia are sold to traders who transport them to Dar es Salaam where they are sold on the local market or for export. Darwall (2000) estimates that 62 mt/yr of octopus, and 7 mt/yr of sea cucumbers were harvested from the Songo-Songo Archipelago during 1995.

#### Prawn fisheries

Tanzania has a valuable prawn fishery located in the Rufiji Delta, the Mafia Channel, Ruvu, Wami (Bagamoyo) and Pangani estuary. The Rufiji Delta is Tanzania's most important prawn producing area, accounting for about 80% of the national industrial catches (Richmond *et al* 2002). At least part of this prawn fishery in Rufiji is within the Ramsar Site.

#### Kilwa Kisiwani and Songo Mnara

Kilwa Kisiwani and Songo Mnara are two islands outside the Ramsar Site but within Kilwa District comprising a complex of ruins and monuments. They comprise of vestiges and remains of palaces, mosques, fortresses and burial grounds dating back to the medieval age. There is a serious and rapid deterioration of the archaeological and monumental heritage of these two islands due to erosion and vegetation re-growth. The government of Tanzania with assistance from UNESCO, France and Japan governments has embarked on a rehabilitation and promotion of these resources as one of the few World Heritage sites in Tanzania. The restoration process is being undertaken through "training youth camps". CHAM (Chantiers Medieval History and Architecture) recognised for its know-how in heritage projects is engaged in the field of architectural conservation. The programme aims at developing the sites and it will include a number of actions such as the installation of a visitor centre and museum, the construction of a boat jetty, conservation awareness events for the local population, reinforcing legislation to protect the monuments, training guides and a research programme (Kamamba, 2001). The presence of the World Heritage Site is likely to increase tourism in the Kilwa area. Given appropriate co-ordination this could provide an opportunity for the Ramsar Site to develop tourism activities and linking activities perhaps also to include wildlife safaris in the nearby Selous Game Reserve.

Table. The scale and estimated annual yields for the dominant finfish fisheries (Darwall, 2000)

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## **22. Land tenure/ownership:**

### At the site:

The land in the proposed Ramsar Site is under the District Councils (Rufiji, Mafia and Kilwa). Within the Site there are 43 legally registered villages of which two belong to Kilwa, 33 belong to Rufiji and eight are within Mafia. Private ownership of land by villagers for agriculture and housing is common.

All mangroves in the Ramsar Site (and in the country) are regarded as Forest Reserves to be managed by the Mangroves and Catchment Section in the Forest and Beekeeping Division (FBD) under the Ministry of Natural Resources and Tourism. A permit issued by FBD is needed before utilisation of the mangroves and their products. The total area of mangroves in the Ramsar Site is estimated to be about 580 km<sup>2</sup>. The mangroves of the mainland were gazetted as Forest Reserve in 1928-32 (Semesi 2000). They are now divided into four management zones:

- Zone I, forests which will receive total protection
- Zone II, forests that are ready to be brought into production
- Zone III, degraded areas that will be closed to allow recovery
- Zone IV, areas that will be set aside for different developments

The Mafia Island Marine Park covers about 822 km<sup>2</sup> and its management is under the responsibility of the Marine Parks and Reserves in the Fisheries Division under the Ministry of Natural Resources and Tourism. However, local communities are living in the park and have the rights to utilise the resources. More information is given under point 23.

### Around the Site:

The Selous Game Reserve upstream of the Delta is managed by the central Government (Wildlife Division). Further, Forest Reserves in the Rufiji Floodplain are under the management of the central Government (Forest and Beekeeping Division) or the District.

Villages are under the administration of the Local Government Authority.

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## **23. Current land (including water) use:**

### At the Site:

A large number of wetland-related land use activities are carried out in the different wetland habitats in the Ramsar Site. Most notably perhaps are fishing, farming including rice cultivation, mangrove utilisation etc. More elaboration of the main activities is given below.

### **Fisheries**

Productive and profitable fisheries occur in the Ramsar Site. Species of fish commonly caught include; snappers, rabbit fish and catfish as well as prawns, lobsters, crabs, octopus, sea cucumbers and shells. The Rufiji, Songo-Songo and Mafia are extremely important artisanal and commercial finfish fishing grounds, with boats coming from Tanga, Dar es Salaam, Lindi and Mtwara to fish. In addition prawns and shrimps are caught in large quantities. Fishing is year-round, with less of a marked seasonal change in catches, as fishers tend to track the availability of prawns along the coast (Richmond *et al* 2002).



### **Mangrove utilisation**

About 30,000 people who reside in about 20 villages inhabit the mangrove ecosystem in the Rufiji Delta. These communities depend directly upon the mangroves for their livelihoods and day-to-day activities Sorensen (1998), MNRT (1991) and Von Mitzlaff (1989). Selective logging of mangrove poles is carried out in most mangrove areas in the delta - and is large-scale business – with the relevant permissions from the forest mangrove office. Clear felling of mangrove is not allowed, however, it does take place (see point 22). The mangrove and catchment project in the Forest & Beekeeping Division developed a mangrove management plan for Rufiji in 1991 with the support from NORAD, however, these plans need to be revised and they have only partly being implemented due to financial constraints. On Mafia Island there is no commercial trade with mangroves because the Island does not have commercial quality poles, but harvesting is practiced on a small scale, especially at Chole and Jibondo Islands.

### **Seaweed farming**

Within the Ramsar Site the importance of seaweed farming varies, it is an important economic activity in Mafia (particularly in Jibondo) and Kilwa (particularly Songo-Songo) but less so in Rufiji. This is largely due to the difference in the physical environment. The majority of villages are cultivating *Eucheuma denticulate* and *Kappaphycus alvarezii*. Successful seaweed farming depends on careful site selection. It is farmed in sheltered reef lagoons with salinity levels above 30 ‰ and preferably on sandy to coral bottom substrate subject to moderate water currents and with clear water and water depth at low tide about 0.6 – 1.0 m. Sea weed farming is a success story in Tanzania (Richmond *et al*, 2002). The Government has produced guidelines for seaweed production.

### **Farming**

Rice farming is an important economic activity within the delta and floodplain upon which the communities depend. Farming in mangrove areas has the advantage that yields are unaffected by failing rains. The current rice farming methods in the mangroves – especially in the northern part of the delta - are environmentally unfriendly due to the illegal clear felling of mangrove forest (see point 22.).

Some other activities include small-scale salt production and lime production, which provides a source of cash income to communities.

### **b) Around the Site**

Much of the upstream area is dominated by an extensive floodplain (composed of natural forests, swamps, rivers and scattered cropland) and most of the districts economic activities are carried out outside the Ramsar Site in form of agriculture. Agriculture is e.g. the main occupation (93% of households) in the Rufiji Flood Plain and Delta (Ochieng, 2002). It is estimated that about 11,000 tonnes of rice is produced annually (cash and domestic use). Maize is produced to some extent, as well as vegetables etc.

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## **24. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:**

### **a) At the site**

#### **Rice Farming**

The current rice farming methods in the mangroves are environmentally unfriendly due to the illegal clear felling of mangrove forest. A freshly cleared rice cultivation area remains free of

weeds for about 3 years. However, as a result of changes in soil structure due to farming, increased sunlight and the introduction of seeds, the rice field eventually becomes choked with weeds and develops into grassland. Once this has happened the area is considered by farmers to be “an old farm unfit for farming” commonly known as ‘mashokora’. It takes several years for cleared land to regenerate mangrove forest. The tendency is therefore for old farms to be abandoned and new virgin farms are opened at the expense of clear felling mangrove forests. This kind of shifting cultivation - commonly practiced – has contributed to the decrease in mangrove forest area between 1990 and 2000 of about 1,769 ha (Wang, et al, 2002). It is reported that rice farming has claimed more than 5000 ha since 1963 to 1993 (Njana, 2001). On the other hand, rice farming is an important economic activity within the delta upon which the communities depend. Conversion to farmland is especially taking place in the northern part of the delta and in upstream areas and often carried out by immigrants. The implications for the original users of the mangroves i.e. the fishermen and the pole cutters are negative and the extensive use of DDT (Pearson 1987, UNEP 1989, Sørensen 1998) is detrimental to the food webs and the ecosystems including people.

### **Illegal Mangrove Harvesting**

The management plan of the mangroves makes a provision for legal harvesting in prescribed zones set aside for production. Usually legal harvesting of mangrove poles is allowed in Zone II (see point 20 for information on the different zones). Licences for legal harvesting are issued from licensing stations. The licence prescribes the place/locality/compartments and the species to be felled and the size of the trees. The regulations if not adhered to, makes one an offender of forest laws. Village Natural Resources Committees have been given the mandate to issue permits that direct the applicant to collect tree/poles in a respective village after being given a licence from the forest officer. However, despite these regulations illegal felling takes place i.e. unfaithful traders both from outside and within the villages are not paying fees to the respective stakeholders i.e. Government, District and Village Councils and it contributes to loss of natural resources and cash income to all stakeholders. About the illegal activities in the mangroves Semesi (2000) wrote: “Generally, no overall national authority exists that can effectively resolve conflicting issues related to conservation and development of the mangroves. Although the Forestry Division is charged with the managing of the mangroves at present, conflicts arise between those branches of government responsible for forests, fisheries, wildlife, agriculture, ports, surveying of land and issuing of titles, and mineral mining”.

### **Fishery**

Fisheries law enforcement is ineffective in all the three districts, due to shortage of staff, lack of monitoring facilities and lack of funds to facilitate the few field staff. Illegal fishing practices that destroy both the resources and the environment are common albeit at different levels. The use of dynamite for fishing has been singled out in the past as the major cause of the serious decline of fish stocks in the territorial waters of Tanzania. Many breeding sites have been devastated by dynamite fishing resulting in a significant decline of fish stocks. Following a special operation in collaboration with the Tanzania Peoples’ Defence Forces (TPDF) between 1998 and 2000, the illegal practice has significantly been reduced. However, dynamiting still occurs occasionally just south of Dar es Salaam, around Nyororo, Mbarakuni and Shungu Mbili (small Islands in Mafia District) Somanga village (Kilwa district) and between Mafia Island and Kilwa waters where monitoring is not effective. Several of these areas are within the Ramsar Site and dynamite fishing is an issue that will have to be closely monitored.

TANPESCA is a fish processing company based in Mafia Island, which buys lobsters, sea cucumbers and octopus from local fishers. The company had intended to start processing finfish

fillets for local sale and export. However, the government stopped this move because national food security was being threatened (National Fisheries Policy 1997). The full reasoning behind prohibiting this development is not fully understood at the local level. A sister company of TANPESCA, Alphakrust (owned by the same parent company) is establishing a 283 ha prawn farming project in North East Mafia and the work has started. An EIA has been undertaken, however it was felt by reviewers of the EIA, that it lacked sufficient detail to judge the full impacts of the project.

Recent research recommendations suggested that number of trawlers operating along the Tanzanian coast should be dramatically reduced in order to ensure sustainability in the fishery. In 1999, when there were 18 licensed trawlers, the Fisheries Division reported, 'the current number of fishing vessels and the fishing methods used, if not controlled, will lead to environmental destruction as well as over-harvesting of stocks' (Fisheries Division 1999). In 2002 there were 20 licensed prawns fishing vessels (Richmond, 2002), and was reported to grow to 24 in 2003. Generally there is serious concern at the fishing intensity and activities of prawn trawlers in Tanzania. The process of investigating this issue began several years ago and workshops and meetings have been conducted e.g. Fisheries Division, 1999, NEMC, 2002. The First Prawn Fishery Co-Management Plan Workshop was held in August 2000.

Current management of the industrial prawn fishery is based on a licensing system granting vessels the right to fish in territorial waters for nine months of the year (March to November). Night fishing is not allowed and transshipping outside of Dar es Salaam harbour is illegal. There is a system of on-board observers from the Division of Fisheries whose role is to ensure trawlers keep to allocated zones and do not fish at night. There are no quotas set to limit catches (Richmond, 2002). The Tanzanian Fishery is divided into three zones: zone 1 extends from the Kenya border to Dar es Salaam; zone two extends from Dar es Salaam south to Ras Twana in the northern Rufiji Delta; and zone three extends from Ras Twana to the Mozambique border. Within these zones there are spots that are good for fishing, these are obviously fished more heavily than other areas in the zone, which can be left relatively un-fished. The trawling fleet is divided into groups, the group then rotate through the zones so that each get a chance to fish in each of the areas. The boats in each group frequently fish the same stretches of water as has been observed from Jaja in the southern Rufiji Delta, where there are reports of 7 trawlers working at the same time. As Rufiji waters are divided into two zones, during times of high productivity there can be one group of boats trawling the southern delta (Jaja) whilst another group are trawling the northern delta (Simba Uranga) (Richmond, 2002).

'Between 40 – 80 % of prawn trawlers catch comprises fish, most of which are undersized and juvenile. The mean by-catch of finfish in the trawls of prawn trawlers (in Rufiji) is estimated to be 1,532 kg per day. The average proportion of finfish in the catches (by-catch) is 74% (range 48.8 – 88.6) while prawns form only 26% (range 11% to 51%). However, the catch reported through landings shows the proportion of by-catch as only 46% with prawns forming 54%. This discrepancy results from the discard of 28% of the finfish by-catch (Haule *et al.*, 1998). The boundary that separates the fishing grounds of artisanal fishers and industrial prawn trawlers is not well defined. In principal, the artisanal fishermen fish in areas up to 3 m deep while trawlers are supposed to fish between 3 – 20 m. This is related to the size and seaworthiness of the boats. In certain areas there is a serious conflict of interest between the two groups as they tend to fish on the same fishing grounds (Fisheries Division, 1999). The local communities frequently raise concern about the activities of prawn trawlers and generally there is a serious concern about the environmental damage of the trawlers and the impact on artisanal fishers.

### **Marine Turtles**

Some of the important nest sites for Marine Turtles such as the Shungi-Mbili, Mbarakuni and Nyororo Islands (Muir 2002b) at Mafia Island are under pressure from immigrant young fishermen, especially from Mtwara at the Mozambique border. A management proposal has been developed in cooperation with adjacent communities on Mafia Island, which includes a proposal to close off the islands for part of the year. Marine turtles are also under heavy pressure from collection of turtle eggs and persecution. Earlier studies indicated a large off take of turtles in shark nets at about 2-3 per day especially Green Turtle and Hawksbill (Clarke *et al.* 1993).

### **Dugong**

In the study by Muir *et al.* (2003) 79% of the responders to a questionnaire reported a dramatic decline in Dugong numbers since the mid to late 1970s. In some areas of their former range, such as Unguja (Zanzibar), Lindi and Mtwara they were said to have become locally extinct. The capture records since 2000 suggest that 8-10 dugongs are killed annually in Tanzania. The perception in all areas including Rufiji-Kilwa is that it may already be too late for numbers to recover. Dugong is globally threatened and the records are of biogeographically importance. A map showing recent records of Dugong in the Ramsar Site is shown in Annex 2.

### **The Rufiji Delta Prawn Farming Project**

The plan to establish a large-scale prawn farm project (by a Korean Company) in the middle of the Rufiji Delta raised so many questions and concerns that it was never implemented. There was an uprising among the local communities against the project supported by the district. An EIA carried out by the National Environmental Management Council (NEMC) dismissed the project.

### **Songo-Songo Gas**

The Songo-Songo Gas Field is located in Songo-Songo Island. It is expected that gas production from Songo-Songo will start to take place from 2004.

### **Oil Exploration**

Companies are still exploring the Tanzania coast for oil reservoirs.

### b) Around the Site

#### **Hydropower Project at Stiegler's Gorge**

A large-scale plan for damming of the Rufiji River at Stiegler's Gorge (inside the Selous Game Reserve) was prepared in the start 1980s and produced piles of reports. The hydropower assessments were carried out by Norwegian and Dutch Consulting Companies and supported by NORAD under the title: "Stiegler's Gorge Power and Flood Control Development". The Tanzanian counterpart was the Rufiji Basin Development Authority (RUBADA). The project was later cancelled for economic reasons. The implementation of such a project at Stiegler's Gorge is envisaged to have severe impacts on the ecological balance downstream in the Rufiji Floodplain and Delta. The impacts will influence the biodiversity and people dependent on the natural resources in the floodplain and delta including the fishery along the coast of Tanzania.

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#### **25. Conservation measures taken:**

List national category and legal status of protected areas, including boundary relationships with the Ramsar site; management practices; whether an officially approved management plan exists and whether it is being implemented.

#### **Mafia Island Marine Park (MIMP)**

Part of the Mafia Island was declared to be a Marine Park in 1995 under the Marine Parks and Reserves Act No. 29 of 1994. The boundaries were gazetted in 1996. MIMP covers an area of about 822 km<sup>2</sup> in the southern part of Mafia Island, including the inhabited islands of Chole,

Juani, Jibondo and Bwejuu, as well as some islets and associated waters. Four villages lie entirely in the MIMP and 10 villages lie partly within the Marine Park boundary including an estimated 18,000 people. A rather comprehensive general management plan was published by the Ministry of Natural Resources & Tourism in 2000, and was endorsed by the Minister and the Board of Trustees. Four management zones are recognised in the document: (i) A core zone, (ii) a specified user zone, (iii) a general zone outside the core and specified zones, as well as (iv) a buffer zones situated adjacent to the MIMP. Marine Parks and Reserves with the support of WWF are implementing the plan and they have boats, buildings and extension staff located in Mafia. Evidence shows that fish stocks have increased since the implementation started.

### **The Mangrove Management Plan**

Mangrove Forest Reserves were gazetted in 1957 and their management is entrusted to the Government i.e. now the Mangrove Management Project under the Forestry and Beekeeping Division in the Ministry of Natural Resources and Tourism. Detailed mapping of the mangroves along the Tanzanian coast and development of management plans began in 1989. Detailed management plans were published in 1991 and the mangrove management project was inaugurated in 1994 and implemented by the Government with support from NORAD. Mangrove management has been executed in phases of four years supported by NORAD. Phase I of the project ran from 1994 – 1997. The approach during this phase was a traditional top-down management approach. The second phase commenced in 1998 and ended in 2001, during which a participatory management approach was introduced. A third phase (2003 - 2006) involves income generating and private sector involvement whereby community participation is taken on board and development of alternative income generating activities both by involvement and assistance from the government and the private sector are prerequisites. Under this approach, local communities are facilitated to create Joint Forest Management Agreements and assisted in the formulation and approval of by laws. Communities directly protect the mangroves by undertaking patrols and monitoring resource use. Joint Forest Management was introduced by the new Forest Policy of 1998 and is enforced by the Forest Act of 2002 and involves, among others, formation of Natural Resource Committees and assistance to formulate by laws.

### **The Rufiji Environmental Management Project (REMP)**

IUCN in collaboration with the Rufiji District Council, and other stakeholders at both regional and national level developed the Rufiji Environment Management Project based in Utete in Rufiji District. Activities since 1999 have included a wide reaching environmental awareness programme, facilitation of four pilot villages to draw up village environment management plans, ecological studies and capacity building at village and district level. The purpose of REMP is: To promote the integration of environmental conservation and sustainable development through environmental planning within the Rufiji delta and floodplain; to promote the sustainable use of natural resources and enhance the livelihoods of local communities by implementing sustainable pilot development activities based on “wise use” principles; to promote awareness of the values of forests, woodlands and wetlands and the importance of “wise use” at village, district, regional and central government levels and to influence national policies on natural resource management emphasising the non-sectoral, multi-biome, integrated approach to the environment. REMP phase I closed in October 2003 and REMP phase II is being planned, but it is expected to start immediately.

A number of project reports have been prepared by the project, as well as the establishment of a library in the district. Some of the lessons learned from REMP are: Any interventions in the delta area must start at the community level, with the community identifying intervention requirements and management required; representatives from the communities should be

involved in decision-making; all communications of meetings/ decisions etc should be distributed in Kii-Swahili to all the communities involved; there is still a very strong negative feeling towards any type of prawn aquaculture activities in the delta. The REMF experience has shown that given support, communities are able to organise and implement village environment management plans. Further, that a strong emphasis (including training) on good governance is required at all stages of the process.

Community-based Coastal and Marine Conservation is a conservation initiative, which aims at building capacity in the local communities to manage resources through workshops, training, restoration and education. The National Environmental Management Council through a Pew Fellowship supports these initiatives.

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**26. Conservation measures proposed but not yet implemented:** e.g. management plan in preparation; official proposal as a legally protected area, etc.

### **Tanzania Coastal Management Partnership (TCMP)**

Tanzania's implementation of ICM is being carried out through the Tanzania Coastal Management Partnership (TCMP). TCMP was formed in 1997 and it is a joint initiative between the Government of Tanzania through the National Environment Management Council (NEMC) and the United States Agency for International Development (USAID) and the Coastal Resources Centre (CRC) of the University of Rhode, USA. The TCMP works with an existing network of Integrated Coastal Management (ICM) programmes and practitioners, to facilitate a participatory, transparent process to unite government and communities, science and management, sectoral and public interests to wisely conserve and develop coastal ecosystems and resources. The goal of the partnership is to establish a foundation for effective coastal governance in Tanzania. During the first phase (1997 - 2001) the TCMP worked towards an ICM policy; intersectoral mechanisms for addressing emerging coastal economic opportunities; improve enabling conditions for ICM; build human and institutional capacity. The National Integrated Coastal Management Strategy was launched in 2003. The Strategy aims at improving the decision making process for sustainable coastal development by providing guidance on sound resource use at both national and local levels. The Strategy aims to link sectors at all levels and create partnerships among them towards [wise] sustainable use and development of the coastal environment and associated resources' (TCMP 2003). The introduction of the strategy is a step towards Integrated Coastal Management, it is however only the beginning, implementation by all partners has to follow for benefits to be realised.

### **World Bank / GEF (pilot project – Kilwa and Zanzibar)**

WB is considering funds for a programme that would support poverty reduction by participatory planning and management of coastal and marine resources in Tanzania and be part of the implementation of the National Integrated Coastal Environment Management Strategy.

### **SADC Wetland Project**

A demonstration management plan covering the Mafia Channel will be developed. Focus is on collaboration among key stakeholders. The project is expected to close down in July 2004, but the work still has to be started. As a demonstration site Rufiji marine area was selected by SADC member states under the regional wetlands project administered by IUCN-ROSA and funded by NORAD

### **WWF - The Eastern African Marine Ecoregion (EAME)**

WWF has been involved in marine conservation in Tanzania since 1990 when the work started in Mafia Island Marine Park as well as activities in Menai Bay in Unguja. These projects embodied a site-specific approach to conservation. Of relevance to the RMK Ramsar Site, WWF has developed a new conservation approach and defined 238 so-called ecoregions worldwide, based on their biological features. The Eastern African Marine Ecoregion (EAME) is one of these regions (WWF 2000), which covers the East African coast and sea from southern Somalia to northern South Africa. WWF then defined 21 priority areas within this EAME Ecoregion and eight of these priority areas were ranked as being of global importance (WWF 2001). The Rufiji - Mafia – Songo-Songo complex is one of these eight sites identified as globally important, and the only priority area within Tanzania. WWF has expressed an interest in funding a development plan for the Rufiji – Mafia - Kilwa complex.

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**27. Current scientific research and facilities:** e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

During the first phase of REMP a number of research reports were produced and a library has been established in Utete. Efforts to bring conservation and research stakeholders together were carried out by REMP in November 2001 at a workshop entitled: “Towards a Research Master Plan for the Rufiji Floodplain and Delta”. Among the recommendations emphasis on environmental education, awareness and integration of environmental issues in public services and environmental capacity building.

WWF with the Marine Parks and Reserves has produced a number of reports and they have an office in Mafia Island.

The Rufiji Basin Development Authority (RUBADA) is planning to establish a permanent field station in the area.

The area will be included in The National Waterbird Count, taking place in January 2005.

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**28. Current conservation education:**

e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

REMP has worked on conservation education in Utete and selected villages in the Rufiji Delta.

WWF and Marine Parks and Reserves are working on education of the local communities within and outside the Mafia Island Marine Park.

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**29. Current recreation and tourism:**

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

The number of foreign visitors to the Ramsar Site is limited, however, not insignificant.

Especially the Mafia Island Marine Park is attracting tourists. Major activities include SCUBA Diving, snorkelling, swimming, sport fishing and sailing. The coral reefs of Mafia offer some of the most rewarding diving and snorkelling opportunities in East Africa, however, the number of visitors have somewhat been lower than expected partly because access and communication to Mafia has been difficult. There are five tourist lodges on Mafia with a max capacity of 142 pax per night. These hotels are Mafia Islands Lodge (80 beds), Kinasi Lodge (28 beds), Dolphins – Pole Pole Lodge (18 beds), and Chole Mjini Lodge (16 beds). Kinasi Lodge is the most expensive and offers all the activities mentioned above. The price varies but will be about 120 USD per person night. The Mafia Island Marine Park is utilized by these lodges and their clients and a Park fee is paid.

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**30. Jurisdiction:**

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept of Agriculture/Dept. of Environment, etc.  
The Ministry of Natural Resources and Tourism in collaboration with the Rufiji, Mafia and Kilwa Districts.

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**31. Management authority:**

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Rufiji, Kilwa and Mafia Districts in collaboration with the Wildlife Division.

District Executive Director Rufiji District PO Box Utete	District Executive Director Mafia District PO Box Kilindoni	District Executive Director Kilwa District PO Box Kilwa Masoko
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scientific/technical references only. If biogeographic regionalisation scheme applied (see 13 above), list full reference citation for the scheme.

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**Annex 1**

Diversity of selected flora and fauna at Mafia Island, Rufiji Delta and in the Songo-Songo Archipelago (Guard, 2000)

<b>Group</b>	<b>Mafia Island</b>	<b>Rufiji Delta</b>	<b>Songo-Songo Archipelago</b>
Hard Coral (Scleractinian)	45 genera	n/a	49 genera
Soft Coral (Non-Scleractinian)	n/a	n/a	12 genera
Algae	132 species	n/a	75 species
Sea grasses	12 species	n/a	9 species
Mangroves	7 species	8 species	2 species

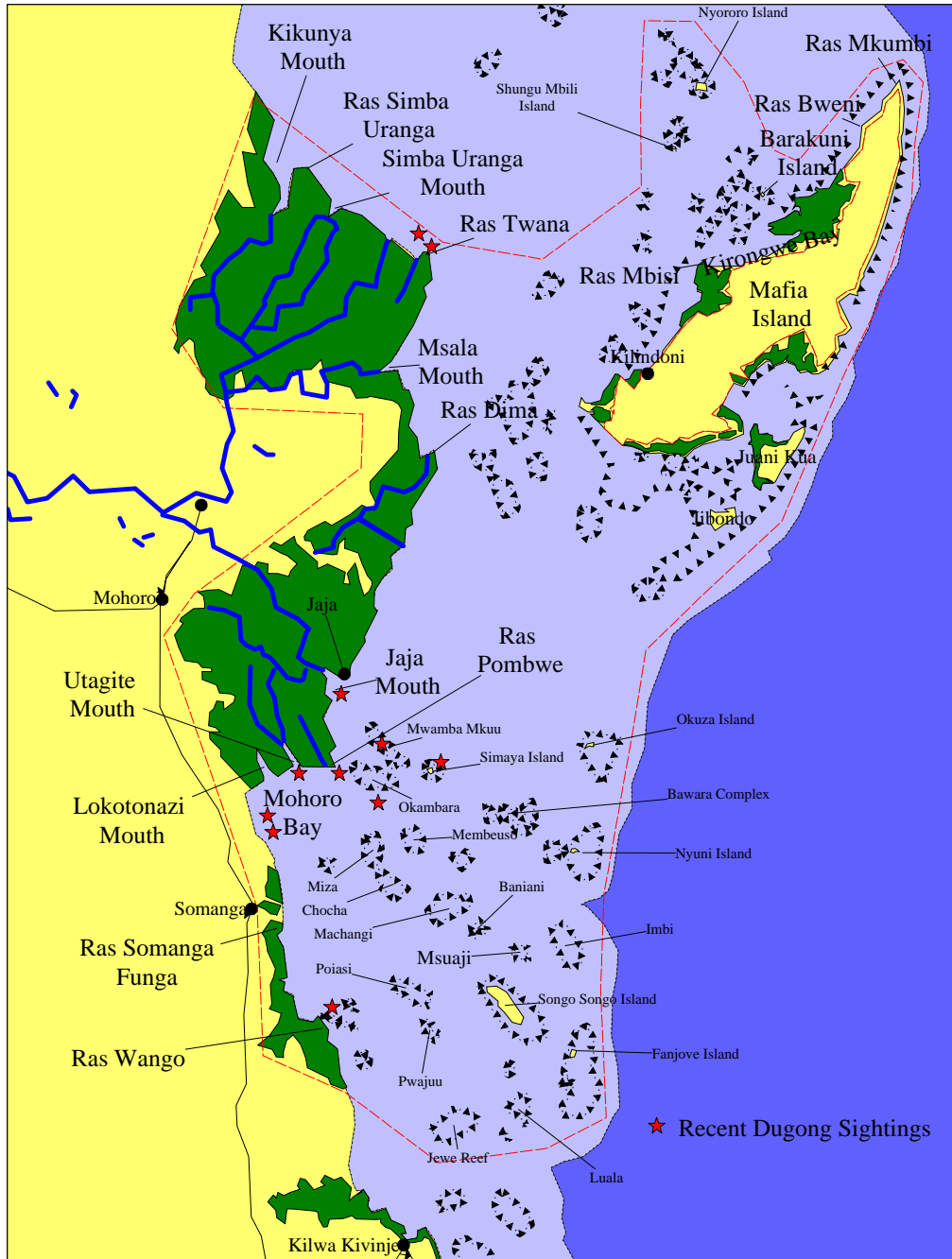
Diversity of selected flora and fauna in Mafia, Rufiji and Songo Songo Archipelago (Guard, 2000)

	Mafia Island	Rufiji Delta	Songo-Songo Archipelago
Gastropods	89	n/a	93
Fish	396	n/a	270

Please note that these figures reflect known diversity, many of these groups are little studied and the true diversity is likely to be higher, this is especially true of fish, gastropods, crustaceans, echinoderms and nudibranches.

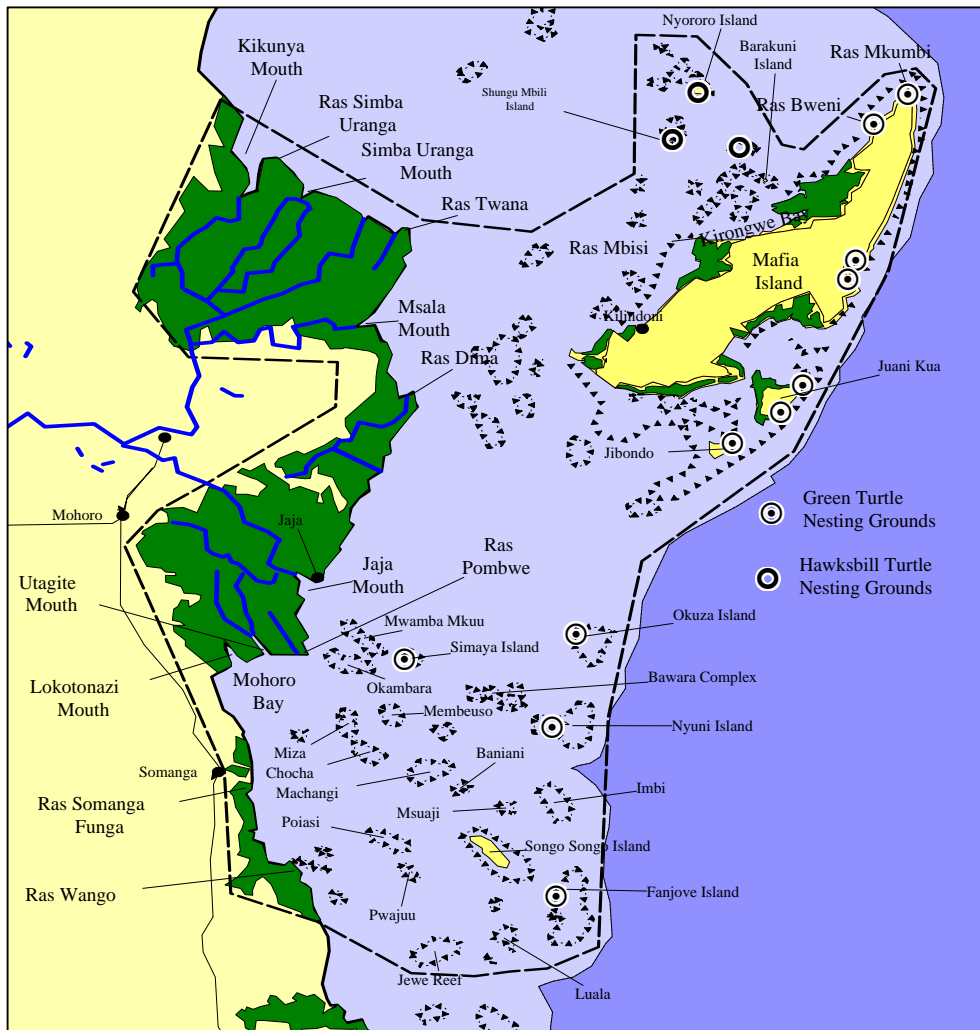
Annex 2

Map from annex 2 showing recent Dugong sightings





Map from annex 2 showing turtle nesting sites



**Annex 3**

Table: The scale and estimated annual yields for the dominant finfish fisheries.  
(Darwall, 2000).

Gear type	Mafia Island (1994)		Songo-Songo Archipelago (1996)		Msimbati / Mnazi (1997)	
	No. People	Total yield (mt/yr)	No. People	Total yield (mt/yr)	No. People	Total yield (mt/yr)
Seine Net	280	291	100	300	110-130	64
Shark Net	175	32	55	170	35	n/a
Long – line	35	12	0	0	0	0
Hand – line	260	200	140	200	>200	210
Box trap	140	50-60	32	31	18	93
Fence trap	10	19	4	n/a	12	86
Spear	n/a	n/a	N/a	n/a	50-80	n/a

**Annex 4.**

Waterbirds in the Ramsar Site meeting the 1% population threshold level as defined by the convention.

Species name	Scientific name	Rufiji count <sup>1</sup>	Rufiji count <sup>2</sup>	Mafia count <sup>3</sup>	1% population threshold
Curlew Sandpiper	<i>Calidris ferruginea</i>	16,043	3,633	6,184	3,300
Crab Plover	<i>Dromas ardeola</i>	3,042		1,887	700
Greater Sandplover	<i>Charadrius leschenaultii</i>	1,096			380
Lesser Sandplover	<i>Charadrius mongolus</i>	722			400
Grey Plover	<i>Pluvialis squatarola</i>	831		949	900
Caspian Tern	<i>Sterna caspia</i>		199		65
Gull-billed Tern	<i>Gelochelidon nilotica</i>	3,427			130
Lesser Crested Tern	<i>Sterna bengalensis</i>	1,939		227	300

<sup>1</sup> December 2001 (Nasirwa 2002).

<sup>2</sup> Counted in 1988-89 (Bregnballe 1990).

<sup>3</sup> Counted in 1988-89 (Bregnballe 1990).

**Annex 5.**

Common fish species caught in the Rufiji Delta (Richmond, 2002)

<b>English (Swahili) name</b>	<b>Genera / Species</b>
Fivespot Herring (Mbarata)	<i>Hilsa kelee</i>
Milkfish (Mwatiko)	<i>Chanos chanos</i>
Mullet (Mkizi)	<i>Mugilidae spp.</i>
Anchovies (Njonjo)	<i>Engraulidae spp.</i>
Cobia (Songoro)	<i>Rachycentron canadum</i>
Groupers (Chewa)	<i>Epinephalua spp.</i>
Hairtail (Mkongge)	<i>Trichiurus lepturus</i>
Trevallies (Kolekole)	<i>Caranx spp.</i>
Eels (Mkunga)	<i>Anguilla spp.</i>
Queenfish (Pandu)	<i>Scomberoides spp.</i>
Sea catfish (Hongwe)	<i>Arius spp.</i>
Halfbeak (Msusa)	<i>Hemiramthus spp.</i>
Goatfish (Mkundalji)	<i>Upeneus spp.</i>
Needlefish (Ngarara)	<i>Belondae spp.</i>
Barracuda (Mzia)	<i>Spyraena spp.</i>
Sharks (Papa)	<i>Carcharbinus spp.</i>
Rays (Nyenga / Taa)	