Information Sheet on Ramsar Wetlands (RIS)

- 2006-2008 version -

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

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Designation date | Site Reference Number

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2. Date this sheet was completed: 15th January 2009

3. Country: Sudan

4. Name of the Ramsar site: Suakin-Gulf of Agig

5. Designation of new Ramsar site or update of existing site:

This RIS is for (tick one box only)**:**
a) Designation of a new Ramsar site ☑; or
b) Updated information on an existing Ramsar site ❑

6. For RIS updates only, changes to the site since its designation or earlier update:

Not applicable

7. Map of site:

a) A map of the site, with clearly delineated boundaries, is included as:

i**) a hard copy**: ☑;

ii**) an electronic format** ☑;

iii) **a GIS file providing geo-referenced site boundary vectors and attribute tables** ❑.

b) Describe briefly the type of boundary delineation applied:
The boundary follows the Suakin Archipelago where most of the biodiversity is found, and includes both a proposed marine protected area and the surrounding beaches. This area is the most important for conservation purposes, and also concentrates important nesting and fishing areas (El Hag,A.E.1978).

8. Geographical coordinates:
From 18° 00' N to 19° 07' N and 37° 20' E to 38° 50' E

9. General location:

Eastern Sudan – Red Sea State (Estimated population as of 2008 is 684,271)

The proposed Ramsar Site extends between Suakin (19° 07' N, 37° 20' E) in the north to the Gulf of Agig (Agig is located at the southwestern corner of the Gulf at 18° 14' N, 38° 11' E) and extending further up to the southern coastal borders with Eritrea (18° 00' N).

Estimated population of key Red Sea State localities;
Port Sudan 454,573
Suakin 99,636
Sinkat 70,488
Agig 49,836
Tokar 48,733
Dordeb 45,000
Halaib 36,226
Source: ICZMO (2008) and HCENR (2007)

Distance from the nearest significant town or city centre is approximately 50km from Suakin to Port Sudan is 50 km.

10. Elevation: Sea level

11. Area:
The coastal stretch extends for about 125 km. Given an average width of 90 km, the total area of the proposed site represents approximately **1,125,000 hectares**. Most of this area is water to include the proposed offshore Suakin Archipelago.

12. General overview of the site:
The site is an extensive coastal stretch and marine quarter including various biotopes of coral reefs, mangroves, off-shore islands, soft-bottom mud flats and agricultural areas, in addition to saltmarsh, sabkha and khor basins. The northern limit is Suakin island, a historical port that has been recently revived. South of Suakin the shoreline is inundated and rich in *Avicennia marina* mangroves, sand bars and mud flats. Located at the seaward terminations of Khor Quab and Khor Ashat, this part receives considerable seasonal freshwater and alluvium during the rainy season. Further south the Tokar Delta is formed by seasonal flooding of the Baraka River. This is the single area with agricultural potential in the Red Sea state. The Delta together with the Gulf of Agig and southern marsa are the most important shrimp trawling sites at the Sudanese coast. An agricultural scheme is based at Tokar, a few kilometers inland which represent the second major town in the area. Offshore numerous islands form the Suakin archipelago which together with other scattered islets represents important marine turtle nesting and seabirds sites.

13. Ramsar Criteria:

1 •	**2** •	**3** •	**4** •	**5** •	**6** •	**7**	**8** •	**9**
☑	☑	☑	☑	❑	☑	❑	☑	

14. Justification for the application of each Criterion listed in 13 above:

Criterion 1: The site includes well-developed coastal *Avicennia marina* mangrove stands extending south of Suakin, which are more dense and extensive than stands found on the northern parts of the coast. Rich coral reef exhibits unique diversity at Suakin and near the harbour entrance, in addition to well developed fringing reefs extending parallel to the

shoreline seaward to mangroves. The site includes a large number of coastal and off-shore islands such as Mukkwar, Umm Al-Gorosh, Umm Al-Sheikh and Saad-Allah Archipelago, which provide nesting sites for seabirds and turtles (See criterion below)

Criterion 2: It has been reported that fishermen in the area claim that dugong (*Dugong dugong*) is common. The dudong is considered vulnerable in the IUCN Red List. At least two species of marine turtles, the hawksbill turtle (*Eretmochelys imbricata*) and green turtle *(Chelonia mydas*) have been reported in the site (Abdellatif, 1980). The green and hawksbill turtles are considered endangered and critically endangered, respectively, by the IUCN Red List. They are also both included in CITES Appendix I. Additionally, the Barbary sheep (*Ammotragus lervia*) and the dugong or sea cow (*Dugong dugon*) are considered vulnerable by the IUCN Red List, the dugong also being included in CITES Appendix I. Finally, the Nubian ibex (*Capra ibex nubiana*) is considered endangered by the IUCN Red List; and the ostrich (*Struthio camelus*) is included in CITES Appendix I.

Criterion 3: The site includes mangrove forests, extensive coral reefs, and coastal and off-shore islands which support biodiversity characterized by typical Red Sea and Indo-pacific communities (e.g. Acropora, Pocillopora, Stylophora and Porites species), many of which still in pristine state (see justification for criterion 1 above). According to Fishpool and Evans (2001), this site coincides with an Important Bird Area (IBA) and is known to hold, on a regular basis, greater than 1 % of the biogeographic population of the Lesser Crested Tern (*Sterna bengalensis*) with 750 breeding pairs and Crested Tern (*Sterna bergii*) with 370 breeding pairs.

Criterion 4: Islands at the site provide nesting sites for true seabirds (e.g. gulls and terns), and marine turtles (*Eretmochelys imbricata*, *Chelonia mydas*). Mangroves and marsas are breeding and feeding grounds for several fish species and shrimps, as well as nesting sites for some birds such as *Pelecanus rufescens*. The coral reefs support rich typical reef communities in addition to major artisanal fishery activities in the area

Criterion 6: The site includes an elongated, largely undisturbed stretch of coastline for passage and wintering of shorebirds, gulls and terns. The site also includes numerous inundations and a large number of inshore and offshore islets of different size and substrate type that support breeding marine birds. According to a recent PERSGA survey (Shobrak 2002), which collected information for only one year, the site supports over 1% of the biogeographic population of the lesser crested tern (*Sterna bengalensis*): 6,000 to 8,000 individuals, i.e. 13.6 to 18%; of the white-cheeked tern (*Sterna repressa*): approximately 6850 individuals, i.e. 1.1%; and of the bridled tern (*Sterna anaethetus*): 14.020 individuals, i.e. 1.4%.

In addition, according to Fishpool and Evans (2001), this site is known to hold on a regular basis, greater than 1% of the biogeographic population of the Crested Tern (*Sterna bergii*) with 370 breeding pairs. This represents 3.7 % of the population of this species (the 1% threshold = 200 individuals as reported by Wetlands International, 2006).

Criteria 8:
Mangroves and marsas are breeding grounds and nurseries for several fish species and shrimps. Khalil & Krupp (1994) described the relations of fish species to mangroves in the Sudanese Red Sea and identified three main categories:

- True residents, which spend their entire life cycle in the mangroves and include Aphanius *dispar, Gerres oyena* and some gobiids.
- Closely associated species, which are found in the mangroves as juveniles or juveniles and sub-adults. These species apparently utilize the mangroves as nursery and feeding grounds and include *Acanthopagrus berda, Chanos chanos, Crenidens crenidens, Hypoatherina*

temminckii, Leiognathus equulus, Terapon jarbua, Pomadasys commersonni and some Mugilidae spp.

- Loosely associated species, which occur in the mangroves as occasional visitors entering there searching for food or protection e.g. *Sillago sihama, Thryssa baelama* and several others.

The marsas and associated mangrove stands are important habitats for commercial shrimp species in the area. Studies at Tokar Delta reported 6 important species in the catches, which include the species *Penaeus semisulcatus, P. latisulcatus, P. japonicus, P. monodon, P. indicus, Metapenaeus monoceros* and *M. stebbingi* (El Hag 1978; Brandford 1980).

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15. Biogeography:

a) biogeographic region:
Western Indo-Pacific, Tropical African
This site also falls under the North African Bioregion. It is part of the Red sea coastal ecoregion and contains xeric systems (these generally receive less than 250 mm of rainfall per year) as the major habitat type (Michelle L.T. *et al.*, 2005)

b) biogeographic regionalisation scheme:
Coastal complexes of mangroves, seagrass beds and coral reefs , Red Sea (see map).
(Krupp et al,1994)
The classification scheme used for Fresh water eco-regions of Africa and Madagascar (Michelle L.T. *et al.*, 2005).

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16. Physical features of the site:

In geological terms the region belongs to the Nubian segment of Arabian-Nubian shield, and is underlined by volcano-sedimentary sequences into which granitoid batholiths have been intruded. The tectonic setting is described by Körner et al. (1987). The basement complex, comprising the Red Sea hills, is characteristically a series of volcanic structures separated by basement rock formations. This north-south trending east facing escarpment represents an abrupt transition from the coastal lowlands to the uplands which have elevations of 1000 m and above. The western-facing slope towards the Nubian Desert is a gentle one, and is marked by the presence of a wind-blown sand cover.

A coastal plain of generally gentle topography lie between the Red Sea and the scarp that bounds the Red Sea hills. A typical profile shows that the coastal plain is made of interdigitating marine and continental deposits of Pleistocene and recent ages that overlay un-conformably tertiary deposits of the Red Sea littoral. The continental fraction includes extensive stream deposits forming fans deltas, wadi-fillings and terraces. These deposits are composed of boulder conglomerate, gravel, sand and clays, which lie over tertiary marine, lagoonal and clastic deposits, as well as basalts. Sediments in the central Red Sea systems are superficial and up to 1 km thick. Much of the coastal shelf is covered by sediments as a result of alluvial deposits.

A major feature of the coastline is the presence of emerged reef complex deposits, which may rise up to 16 meters above the high water mark (e.g. in Mukkwar Island), and may extend a few kilometers inland. The main primary deposits in the shallow coastal zone are coral reef deposits, formed and eroded under a variety of physical processes. The form of most contemporary reefs and many reef-flats, sharms, mersas and wadis outwashes reflect fossil reef-rock structure. Mollusca, algal foramineferan and diatomaceous deposits also occur but are less important in the coastal zone, although they provide heterogeneity to soft-bottom substrates, which for instance can enhance growth of various sea-grasses. Living biological associations generate and maintain the structure of the coastal zone and stabilize its substrate, and they integrate to enhance productivity. Four biotopes have particular importance in these respects: coral reefs, mangroves sea grasses and salt marshes.

The Red Sea Hills are well dissected by a network of steep dry valleys (*khors*), which drain surface water resulting from infrequent but intense rainstorms that occur in the region towards the coastal plain. El Tom (1991) notes that precipitation in the region is produced by two wind patterns, a northeasterly wind which picks up moisture over the Red Sea and produces rainfall over the coastal plain, and a southwesterly moist air-stream which affects the Red Sea Hills towards the end of the summer. The eastern slopes thus receive their highest rainfall during winter, while for western slopes the rainfall peaks occur in summer. Higher regions are generally subject to both regimes. The mean annual rainfall at Suakin during 1951-1980 was 164 mm; Tokar 74.4 mm, Agig 136.7 mm. A general drop in the annual rainfall occurred in the past three decades with extreme drops during the eighties. Since the beginnings of the 1990s a relative recovery in the rainfall to the normal rates has occurred (Sudan Meteorological Department cited in Khalil 2001), however, recovery of indigenous vegetation is rather difficult due to severe impacts of the prolonged drought on plant cover and soil coupled with human disturbance.

Tidal movements along the Red Sea coast are very small. In the central part there are virtually no daily tides. However, seasonal variations in the water level occur. In the summer the mean water level in the central region is nearly a meter lower than winter (Pazert 1974, cited in Khalil 2001). Such seasonal changes together with surface currents are influenced primarily by monsoonal winds and secondarily by temporal variations in density and evaporation. Water salinity is relatively high (38-41 ppt), and it could be much higher in shallow lagoons and coastal depressions (Wilkei 1995). Generally the surface waters of the Red Sea are nutrient-poor, with nitrate being depleted more than phosphate. However, in the central Red Sea, where the Sudanese coast is located, relatively higher nutrients concentrations have been recorded.

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17. Physical features of the catchment area:

Hydrological studies were carried out in the region during the 1980s as part of a Sudanese German project, to evaluate the water potential of the main wadis and the coastal strip by means of borehole investigation of wadi fills and deltas (Budesanstalt für Geowissenschaften und Rohstoffe 1980, Rein-Ruhr Ingenieur Gessellschaft Mbh 1989). There are no records of boreholes that penetrate the crystalline basement and so the groundwater potential of the basement remains largely unknown. Submarine springs occur in the Red Sea; these springs discharge freshwater, possibly originating in the highlands and flowing seaward via an interconnected fracture system. There is a lack of rivers permanently flowing into the Red Sea. Freshwater in the area is mainly obtained by harvesting seasonal rainwater in the major khor basins and groundwater pumping.

A relationship was demonstrated between surface drainage, fracture characteristics and lithology on the one hand, and groundwater flow patterns in the region on the other. In hard rock aquifers groundwater flow is generally restricted to fractures such as faults, joints, and bedding planes, which serve as major conduits. Recharge is via surface water which is concentrated in drainage channels (wadis or khors), as described earlier. Major khors in the coastal area occupied by the site are (from north to south) Khor Quwab and Khor Ashat, which together form an extensive alluvial fan extending between Suakin and Ashat area. At the southern part the Baraka River floods seasonally forming an extensive delta at Tokar area.

Please see section 14 for the general geology and geomorphology features, climate and soil types.

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18. Hydrological values:

Natural vegetation of the saltmarsh and coastal plains provides pasture for camels and goats. Animal breeding is the major economic activity for the coastal population. The shoreline is

rich in inundations (marsas) that represent fish landing sites. These often support mangroves which stabilize the shoreline and provide breeding grounds and nurseries for several commercial fish species, as mentioned earlier. The wide deltas of the Khor Quawb and Khor Ashat basins support the most extensive and dense mangrove stands in the country. These khors and Baraka River also support seasonally cultivable lands at their deltas and lower reaches, the most significant of which is Tokar Delta. The mangroves also provide fodder for camels, especially during the dry season, when the land pasture shrinks. Its wood is also used for building fishermen huts and as firewood. Coral reefs protect coastal areas from waves and erosion and support fishery resource.

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19. Wetland Types

a) presence:

Marine/coastal: **A • B • C • D • E • F • G • H • I • J • K • Zk(a)**

Inland: **L • M • N • O • P • Q • R • Sp • Ss • Tp Ts • U • Va • Vt • W • Xf • Xp • Y • Zg • Zk(b)**

Human-made: **1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • Zk(c)**

b) dominance:
A > C > B > G > H > I > D > E > J > K.

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20. General ecological features:
The area comprises more than 1,000,000 hectares of Red Sea coastal stretch and marine environment with a variety of habitats including intertidal flats, inlets, bays, salt marsh, mangroves, seagrass beds, islands, agricultural land, rocky shore, coral reefs and khor basins.

The rocky shore in vicinity of the Suakin islands and adjacent to the harbour entrance is rich in coral growth. This was a major reason for transferring the port to Port Sudan at the beginning of the last century. Reopening of the harbour recently has necessitated large-scale dredging of coral reefs at its entrance. The coastal area south of Suakin to the Eritrean border comprises a flat coastal stretch, with numerous tidal inlets and inundated depressions, rich in alluvium. This is transported by flash floods and run-off originating from the Red Sea hills, across the relatively wider coastal plains, to be deposited at the seaward termination of extensive basins (khors), which support *Avicennia* mangroves at their mouths. The wide deltas of the two major basins, Quawb and Ashat, support the most extensive and dense mangrove stands in the country. The stands grow at localities very adjacent to each other forming a thin belt, comprising from north to south: Fagum-Lagagengeeb (19° 01' N, 37° 23' E), Haydob (18° 57' N, 37° 23' E), Sheikh Ibrahim (18° 56' N, 37° 24'), Sheikh Saad (18° 50' N, 37° 26' E), Shabarango-Gafud (18° 46' N, 37° 29' E) and Ashat (18° 45' N, 37° 30' E).

The distribution of the mangroves in the area is probably greatly influenced by the amount of surface run-off and alluvium reaching the sea, which depends upon the geological characteristics of the Quwab and Ashat basins. Recent investigations using space photography revealed that the status of the two basins as hard rock aquifers is quite different. The northern part of khor Ashat is underlain by a granitic batholith, which is bounded to the south by a volcano-sedimentary complex. This occupies the whole central part, including the drainage basin mouth. Volcano-sedimentary rocks have, as opposed to fracture granitic rocks, a retarding effect on groundwater flow. Thus most of the water coming via Khor Ashat fractures from the upland will continue its flow down as surface run-off. Khor Quwab, for which the lithology is mostly granite, shows a different situation, making this basin more favourable for groundwater flow. This may explain

the occurrence of relatively more extensive mangroves towards Marsa Ashat.

Further south the most prominent features are Tokar Delta, the small bay and headland at Trinkitat and the Gulf of Agig where two other extensive mangrove stands occur. These are all important shrimp trawling grounds. The shoreline north and south also supports relatively dense mangrove stands. Offshore, to the east the Suakin Archipelago is located. This comprises numerous isles of different size, some of which, e.g. Talla Talla Kabir and Talla Talla Sagir support well developed reefs. The archipelago is an important area for turtles and seabirds and is a proposed MPA.

Terrestrial vegetation comprises mainly halophyte bushes such as *Suaeda* sp. and *Zygophyllum* sp., which grow in sandy areas and sabkhas above the high water mark. Towards the plains, the vegetation is dominated by *Acacia tortilis* desert scrub. Kassas and Zahran (1967) distinguished 13 different communities of plants within the littoral saltmarsh of the Red Sea. However, within any locality only a few of these zones are represented. Furthermore, considerable degradation of the saltmarsh vegetation has occurred during the past few decades, mainly due to increased human disturbance and drought. For example, Kassas (1957) reported six recognizable zones at Marsa Atta (south of Port Sudan), but Ali and Mohamed (1991) found only three of these remaining.

The khor basins in the area support more woody vegetation than the surrounding desert coastal plains. At many parts of the site the main indigenous woody vegetation (*Acacias* and *Suaeda* shrubs) has been extensively replaced by a dense cover of the introduced *Prosopis* sp. At Tokar Delta the species invaded the agricultural land creating severe troubles.

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21. Noteworthy flora:

Terrestrial vegetation includes mainly xerophytes and halophytes. Relatively dense stands of *Avicennia marina* mangroves are found at several intertidal locations and islets of the site (see 18 above for stand locations).

Mangrove vegetation:

The mangrove area at Fagum-Lagagengeeb (19° 01' N, 37° 23' E), south of Suakin, comprises well-developed *Avicennia* mangrove adjacent stands, extending along approximately 4km long shore strip. The outer mangrove belt fringing the shore bends at the northern end to enclose a relatively wide lagoon, bordered seaward by another dense stand growing on a small semi-islet. This is connected to the mainland only through a narrow entrance at the southern parts of the stand. The inner stand runs parallel to the outer belt and becomes fully inundated by shallow water at high tide. Landward most of the forest is backed by dense growth of terrestrial halophytes.

Beside camel browsing, the mangroves have been severely destroyed by felling, which has significantly reduced the tree cover at the more accessible southern parts of the stand. At these parts the number of felled trees (estimated from the remains of the removed barks) amounts to around 40% of the total tree density counted in quadrates. As the accessible parts of the outer stand have been extremely destroyed by cutting, camel browsing has extended to the exposed parts of the inner stand. Some standing trees also suffered mortality and top dying, mostly because of excessive browsing by camels. Severe destruction of pneumatophores and young seedlings, pressed by camels feet, was reported at the outer belt. Good regeneration occurs at the inner stand, where relatively rich seedling growth occurs. However, their chance to grow up to fully mature trees is rare due to the risk of being destroyed under the camels' feet. The success of natural regeneration and recovery of the stands will largely depend on controlling the open access for camels.

The mangrove area at Haydob (18° 57' N, 37° 23' E) represents a good example of formerly well-grown mangroves that has been extremely abridged by severe cutting and grazing. From the remains of the destroyed vegetation, the original stand was extending for at least 7-8 km

length, fringing the shore of an elongated inlet, which intrudes from the southern site of the marsa and runs parallel to the shoreline. The inlet is permanently inundated by deep water. The mangroves growing on the inner bank are accessible through a narrow shallow passage at the northern end of the inlet. At high tide, this part becomes fully inundated by shallow water and mangroves on the inner bank of the inlet are converted into small islets surrounded by shallow water.

The part of the forest that formerly covered the outer landward bank of the inlet has been completely destroyed and removed. The remaining few standing trees indicate that the removed belt had consisted of well-grown *Avicennia* trees attaining up to 5-7m height and 50-80cm GBH. The stand on the inner bank suffers from severe cutting and grazing that threaten its overall existence. Around 80% of the total tree number estimated in a quadrate at the outer zone and 35% at the inner zone of this stand, were felled and removed. The remaining living part of the stand suffers from excessive browsing, cutting of the tree limbs, top dying, demolition of pneuomatophores and some mortality among the standing trees. This indicates severe degradation of what is left of the mangrove cover at the site. Although the stand supports some seedlings, successful regeneration will apparently require replanting of the removed outer belt and the large denuded patches among the inner parts of the stand. The present open access for camels and wood harvesters should be controlled to protect the mangrove and replanted seedlings from damage caused by browsing and cutting.

The mangrove stands at marsa Sheikh Ibrahim (18° 56' N, 37° 24') consist of a narrow belt of *Avicennia* marina extending along 300-400m of the shoreline. Outer fringes of the stand consist of stunted *Avicennia* bushes badly affected by camel browsing. These are followed by low-growing trees of 3-5m height and 15-50cm GBH. The inner zones consist of well-grown trees reaching up to 6-8m height and 35-70cm GBH. The stand is severely affected by cutting and felling.

The mangrove stands at marsa Sheikh Saad (18° 50' N, 37° 26' E) are relatively small. Each consists of a narrow belt of *Avicennia* marina extending along 300-400m of the shoreline. Outer fringes of the stands consist of stunted *Avicennia* bushes badly affected by camel browsing. These are followed by low-growing trees of 3-5m height and 37-85cm GBH. The inner zones consist of well-grown trees reaching up to 6-8m height and 65-125cm GBH. The stands are severely affected by cutting, especially at S. Saad, where a great ratio (50-70%) of the trees estimated in quadrates were felled and the remaining ones are with dropped limbs. Branched and dead pneumatophores are common and seedling populations are very sparse. The area is important for fishing and sea cucumber and shell collection.

The mangroves at Shabarango-Gafud (18° 46' N, 37° 29' E) form a dense belt extending for approximately 3.5km fringing the shore of a rounded inundated inlet. The northerly located stand bends around the northern edge to enclose the inlet from the north and extends forming an inner belt parallel to the outer one. The southerly located stand also bends around the southern end of the inlet forming with the opposite northern stand a semi-circular belt surrounding the inlet. The southern stand is however much smaller and supports a relatively sparse *Avicennia* growth.

The stands consist of generally low-growing trees of 2-5 m height, although some trees are rather higher, with GBH ranging between 10-65cm. Cutting is severe at all parts of the stand. The ratio of felled trees was estimated as 30-40% of the total. The remaining living trees greatly suffer from camel browsing, top dying and limb cutting. Significant numbers of pneuomatophores (up to 90% at some parts of the stand) are with dead tips. Good seedlings growth occurs at some fringes and denuded patches, indicating a good potential for natural regeneration provided that suitable protective measures are undertaken.

The mangrove stands at Ashat (18° 45' N, 37° 30' E) are apparently the most extensive and dense mangroves in the country. This may be attributed to the relatively higher drainage density of Khor Ashat. However, this mangrove area had suffered from extensive mass mortality during the last decade, resulting in a significant loss in the mangrove cover in the area. The area

comprises three stands. The northerly and southerly located stands bend around the northern edge to enclose a large inlet in the middle. A third stand is located seaward on an elongated islet forming the inner bank of the inlet. The northern stand is narrow and about 2.5 km long. The southern stand is relatively broader and longer, extending along 4 km of the inlet bank. The inner stand is smallest forming around 500 m belt. The forests cover a wider area, compared to other mangrove areas in the country, which may reach well above 500 m width at some parts. The vegetation is dense low-growing trees rarely exceeding 5-6 m height. The GBH mostly falls between 15-75 cm.

The southern stand is dominated by dead standing trees. The mass mortality included a wide area of the stand (around 1.5 km long X 500 m wide patch). Collection of the dry limbs and tree barks for fuelwood and timber uses has cleared a considerable part of the mass mortality area. Recent cutting among living trees was also reported, in spite of the presence of ample amounts of dry wood of the dead trees, mostly because of the low quality of the latter, which became heavily infested by insect woodborers. Top dying of uppermost and outermost branches, and curling leaves are common also among other stands in the area. This may indicate that the stand is still under stress. The cause of the mortality is uncertain. However, it could be attributed to localized changes in tidal flow regimes. This might have been caused by excessive sediment loads on the entrance and channels of the inlet. Similar situations were reported in some stands in Djibouti and southern Red Sea coast of Yemen during a recent PERSGA survey (2002). Many seedlings were observed growing at the inner fringes and some denuded patches. However, owing to the large size of the area affected by mass mortality and excessive damage by destructive cutting and grazing, regeneration should be enhanced by planting and controlling of the presently open access for camels and people.

Seagrass and algae:
Eight seagrass species have been reported to occur on shallow Sudanese coastal water. The most common are *Thalassia hemprichi* and *Halodule uninervis*. *Halophila ovalis* and *H. stipulacea* occur frequently at several localities. Around 24 marine algal species were reported as common in the Sudanese coastal water. The calcareous algae *Halemida sp., Corallina sp.* and *Padina sp.* Occur widely in reefs and rocky substrates. At soft-bottom sheltered areas the red algae *Gracilaria sp., Hypnea sp.* and *Laurencia sp.* are very common.

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22. Noteworthy fauna:
Two species of marine turtles, hawksbill turtle (*Eretmochelys imbricata)* and green turtle *(Chelonia mydas*) were reported to nest on Suakin Archipelago. The threatened dugong (*Dugong dugon*) was also reported to occur in the area. The bottlenose Dolphin *Turciops truncates* is often observed in open waters and inshore water. Around six other sharks species and 20 commercial bony fish species are considered as important. Among the most conspicuous are *Caranx spp., Lethrinus fletus, Lutjanus bohar, Lutjanus gibbus, Epinephelus aereolatus, Plectropomus maculates, Aprion virescens, Chelinus undulates, Mugil spp., Naso unicornis, Agryops spinifer, Siganus lineatus, Variola louti* and some others (see Reed 1964). Coral reefs in particular support a high fish diversity.

Important terrestrial wildlife in the area includes the mammalian species *Gazella littoralis, Oreotragus oreotragus* reported from seasonal valleys across the coastal plains. *Capra ibex nubiana* and *Ammotragus lervia* were also reported from remote areas in the region. Among resident birds *Pterocles senegalensis, Clamidotis undulata* and *Struthio camelus* were also reported. The introduced Indian craw is widespread near urban and rural settlements, and considered now as a serious pest.

Breeding birds reported by a recent PERSGA survey (SHOBRAK 2002) on seven of these islands include little green heron (*Butorides striatus*): 2 pairs on Shubok I, 9 pairs on Shubok II, 2 pairs on Shubok III, 1 pair on Sararah; pink-backed pelican (*Pelecanus rufescens*): 11 pairs on Abu Abdallah (Suakin); Western reef heron (*Egretta gularis*): 15 pairs on Shubok I,

5 pairs on Shubok II, 1 pair on Sararah, in addition to 9 western reef heron nests on Shubok I, 3 on Shubok III and 3 on Zahari II; osprey (*Pandion haliaetus*): 3 pairs on Shubok I, 1 pair on Shubok III, 2 pairs on Sararah, 2 pairs on Zahari II; sooty falcon (*Falco concolor*): 4 pairs on Shubok I, 2 pairs on Shubok III, 1 pair on Sararah; crab plover (*Dromas ardeola*): 1 pair on Shubok I, 250 pairs on Sararah (plus 273 crab plover nests); sooty gull (*Larus hemprichii*): 1 pair on Shubok I, 1 pair on Shubok II, 2 pairs on Shubok III, 1 pairs on Sararah, 2 pairs on Zahari II, 1 pairs on Abu Abduallah (Suakin); Caspian tern (*Sterna caspia*): 1 pair on Shubok I; lesser crested tern (*Sterna bengalensis*): 1 pair on Sararah, 3000-4000 pairs on Zahari I (plus 1520 lesser crested tern nests on Shubok I, and 2800 L.C.T. nests on Zahari I); white-cheeked tern (*Sterna repressa*): 56 pairs on Shubok II, 120 pairs on Sararah, 200-300 pairs on Zahari II, 3000 pairs on Abu Abdullah (Suakin); and bridled tern (*Sterna anaethetus*): 10 pairs on Shubok III, 7000 pairs on Sararah.

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23. Social and cultural values:

a) Describe if the site has any general social and/or 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:

Marine fishery is a major activity centered at Suakin. Smaller fishing populations are also found at the southern marsas (Haydob, Elshiyokh, Ashat, Trinkitat and Agig), where fishery has a major economic and cultural value in the area. Fishery development will largely contribute to development and raising of living standards of people. The site includes a variety of biotopes of great basic and problem-oriented research potentials. Little is known about biology of most of the economic important species, as well as status of their fishery and resource exploitation. However, for most people nomadism is the main kind of living, camels being the main animals kept, which are of great social and economic value.

Agriculture is practiced at Delta Tokar, which represents the sole site with significant potential for cultivation in the whole coastal zone. An agricultural scheme was established there since the early colonial period. The number of tenants varies from year to year, averaging around 10,000, mostly from the indigenous Beni Amir and Hadandawa tribes. The major crops are cotton, sorghum, millet and vegetables.

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning?

If Yes, tick the box ❑ and describe this importance under one or more of the following categories:

i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:

ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:

The historical town of the Suakin was a major Red Sea harbor during the Middle Ages, described by ancient visitors to the region. The historical buildings, constructed mainly of hard and fossil corals are now reserved as important archeological sites, visited by national and foreign tourists. Tourism in the area is however, at its infancy and does not currently have any significant contribution to the economy. Lack of infrastructure and business plans are the main reasons for this.

iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:

iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

24. Land tenure/ownership:

a) within the Ramsar site:
According to land legislation in the country, the government is the principal owner of the land. Based on the federal system, land rights are at relevant state level. The Land Directorate which affiliates the Red Sea State Ministry for Urban and Planning General has the authority of planning for land use, issuing and registration land ownership. According to the law all non registered lands are owned by the government. However, most of the local inhabitants in the area are nomadic tribes who consider that they have the land rights, so some conflicts are often reported.

b) in the surrounding area: In the surrounding area the same is true.

25. Current land (including water) use:

a) within the Ramsar site:
The main land use at the site is livestock grazing. The Red Sea State in general supports around 693,186 livestock heads, mainly camels, goats and sheep. People are primarily nomadic and pastoral. Unpublished surveys classified 55% of the land in the Red Sea State as pastoral lands, 42% as saline sabkhas and desert and only 3% as agricultural lands (Saeed et al. 2002). Except for Suakin and Tokar towns population at the site is extremely scarce. Small fishing settlements and landing sites are found at Haydob, Elshiyokh, Ashat, Trinkitat and Agig. Suakin is a major fish landing harbour and fish market in the coastal area.

Other activities include petty trading, wood cutting or seasonal migration for labor in adjacent urban areas, mainly Port Sudan, Suakin and Tokar. There is an unpaved car track connecting Tokar with Suakin through which agricultural products are exported from Tokar Delta to other parts of the State. Remoteness and lack of land transport infrastructure is the main obstacle for economic development and resource exploitation.

b) in the surroundings/catchment: In the surrounding area the same is true.

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

a) within the Ramsar site:
Serious threats exist due to anticipated major changes in land use. The stretch of the coastline south of Suakin near Ashat area is planned to host part of a huge shrimp and fish farming industry project. The project covers around 3150 hectares and includes 10 farms distributed at the site and north of Port Sudan. In addition to the farms the project includes several factories for Tuna and shrimps processing, livestock fodder production and ice plants. The planned shrimp farms are anticipated to create environmental problems in the future. Shrimp farms may result in irreversible conversion of coastal habitats. The mass discharge of effluent and nutrients will have serious impacts on mangroves and fringing reefs. The construction of channels to divert seasonal freshwater run-off from the mountains to protect the ponds will change the hydrological regimes in the area and adversely impact the coastal habitats

A general decline in rainfall during the last few decades has led to marked terrestrial and mangrove degradation in the region. The effects of this factor was however combined and accelerated by human stress on the resource. Natural degradation in land pasture has led to overgrazing, which in turn doubled the impact on plant cover. This has also forced the nomads and camel herders to shift to mangroves as alternative fuel-wood and fodder for their camels. The status of the mangroves at the site is detailed in 19 above. Major threats come from overgrazing, cutting, freshwater damming and change in land use.
Large-scale coral dredging and sediment dumping was carried out near Suakin to widen the entrance and ship channels and reconstruct the port. More dredging is anticipated to take place in the future phases of developing the capacity of the port. The impacts of this on marine biota and coral reefs have not been assessed and remain largely unknown.

The introduced tree species *Prosopis fulifora* is recently considered as problematic because of its high capacity to compete and exclude indigenous vegetation, as well as its serious invasion of farms and agricultural areas at Delta Tokar. However, some arguments suggest that *Prosopis fulifora* has successfully contributed to soil stabilization in the area, which is often subject to prolonged drought periods.

b) in the surrounding area: The same is true in the surrounding area.

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27. Conservation measures taken: None

a) List national and/or international category and legal status of protected areas, including boundary relationships with the Ramsar site: None

b) If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site (tick the box or boxes as appropriate): Unset

Ia ❑; Ib ❑; II ❑; III ❑; IV ❑; V ❑; VI ❑

c) Does an officially approved management plan exist; and is it being implemented?: No

d) Describe any other current management practices: None

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28. Conservation measures proposed but not yet implemented:
The Suakin Archipelago is a proposed MPA that occupies the southeastern quarter of the site. No information is available on activities or management plans for ratification, if any.

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29. Current scientific research and facilities:
Most of the few published research works and unpublished reports on the site have concentrated on mangroves south of Suakin (Khalil and Krupp 1994, Wilkei 1995), coral reefs and coral communities (Vine & Vine 1980). Some works are available on trawling fishery at southern Tokar delta (Brandford 1980).

National institutions involved in marine and coastal area research include the University of Khartoum, which has established a marine station at Suakin since the early 1970s, Marine Fisheries Research Center, Wildlife Research Center (both affiliate to the Federal Ministry for Science and Technology), and the Red Sea University in Port Sudan (founded in 1993). None of these institutions, however, currently run any sound research program. The main obstacles being the lack of sufficient funding, facilities and manpower as well as emigration of trained staff.

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30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site: None

31. Current recreation and tourism:

The historical town of Suakin Island is an important archeological site and together with the huge resource for SCUBA diving gives the site a great potential for tourism.

32. Jurisdiction:

The following institutions are directly involved in the use and management of coastal and marine areas including the suggested Ramsar site:

- The Higher Council for Environment and Natural Resources (HCENR) is the technical government environmental agency in charge of coordination, environment and conservation policy making and international cooperation.
- The General Administration for Wildlife Conservation is charged with the protection and management of wildlife, including protected areas.
- The Marine Fisheries Administration manages fisheries resources and controls the observation of fisheries regulations.
- The Sea Ports Corporation is in charge of all aspects of maritime transport and ports administration. The corporation is a major business government body and is responsible for implementation of plans regarding marine transport. It is very influential in developing master plans for urban areas as it has jurisdiction for huge coastal lands.
- Sudan Line is a commercial shipping company that plays an important role in observing maritime traffic at high sea.
- The Ministry of Defense is in charge of the Navy Forces in the Red Sea area. The Navy is responsible for security in the coastal and marine areas.
- The Ministry of Interior is in charge of the Police Force. The Wildlife Force is under administrative supervision of this Ministry.
- Sudan Meteorology Corporation provides weather forecasts for the area.
- The National Forests Corporation is responsible for forest resource management including mangrove areas.
- Department of Archeology is charged with archeological sites (Suakin island).
- Ministry of Mining coordinates coastal and marine mining activities, oil and gas explorations.

33. Management authority:

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