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Dugong dugon Eastern Africa subpopulation, Dugong

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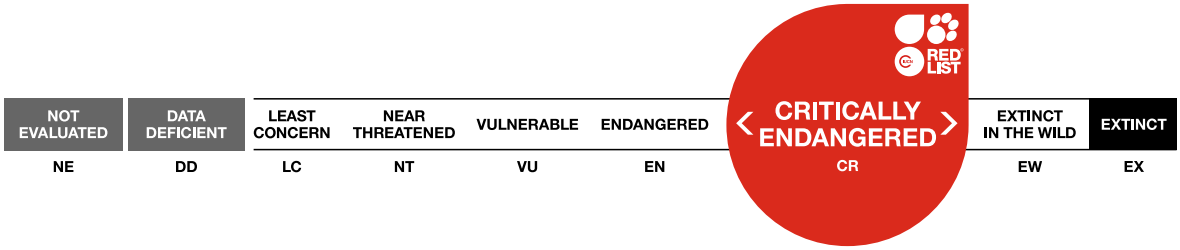

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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Sirenia	Dugongidae

Scientific Name: *Dugong dugon Eastern Africa subpopulation* (Müller, 1776)

Parent Species: See *Dugong dugon*

Common Name(s):

- English: Dugong, Sea Cow
- Portuguese: Dugongo
- Swahili: Nguva
- Uncoded languages: Nguluve-ndjange

Assessment Information

Red List Category & Criteria: Critically Endangered C2a(ii) ver 3.1

Year Published: 2022

Date Assessed: August 30, 2022

Justification:

Historically, the East African coastal subpopulation of Dugong (*Dugong dugon*) ranged from southern Somalia to southern Mozambique in relative abundance. However, the number of mature individuals in the geographically-isolated East African coastal Dugong subpopulation is now estimated to be fewer than 250 based on aerial surveys of East Africa, including the Bazaruto seascape. This location is estimated to support more than 90% of all mature individuals. Groups of Dugong in Mozambique, Kenya, and Tanzania outside this seascape are small (1–10 animals) and rarely sighted. Various pressures, including habitat loss and unsustainable fishing techniques, continue to threaten the entire subpopulation and participatory appraisals in coastal communities throughout the region over the past 30 years indicate continuing decline. Given this information, we conclude that this subpopulation qualifies as Critically Endangered under criterion (CR C2a(ii)).

Red List Categories & Criteria

The full range of Red List categories this subpopulation qualifies for are:

- Criterion A: Insufficient data to determine eligibility.
- Criterion B: Vulnerable (VU B2ab(v)).
- Criterion C: Critically Endangered (CR C2a(ii)).
- Criterion D: Endangered (EN D).
- Criterion E: Insufficient data to determine eligibility.

Geographic Range

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Range Description:

The Dugong is listed as Vulnerable at a global scale (Marsh and Sobtzick 2019). Dugongs are found in coastal and island waters from East Africa to Vanuatu between approximately 27°N and 27°S (Marsh and Sobtzick 2019). The western limit of their range includes the Red Sea, Arabian Gulf, continental East Africa, and the islands and archipelagos of the Western Indian Ocean (WIO) such as Madagascar, the Comoros and the Seychelles.

The Dugong's regional status is heterogenous across its large range (Marsh *et al.* 2011). Along the East African coastline, large herds (hundreds of individuals) were historically reported off Kenya and southern Somalia (Jarman 1966, Travis 1967), and groups of tens were seen in Tanzania and Mozambique (Hughes and Oxley-Oxland 1971, Muir *et al.* 2003). Nonetheless, Husar (1975) suggested that Dugong populations in coastal East Africa were discontinuous. Occupied habitats were limited to the following sites: Maputo, Inhambane, and Bazaruto Bays, as well as the Primeiras and Segundas (Angoche) and Quirimbas Archipelagos, in Mozambique (Hughes and Oxley-Oxland 1971, Cockcroft *et al.* 1994, Findlay *et al.* 2011); the Tanga region and Mafia-Rufiji-Kilwa seascape in Tanzania (Hughes 1969, Muir *et al.* 2003, Muir *et al.* 2012); and Ungwana, Manda, and Gazi Bays in Kenya (figure 1, supplementary material; Wamukoya *et al.* 1995, Wamukoya *et al.* 1996). Observations and strandings of Dugongs are now very rare outside the Bazaruto seascape (Cockcroft *et al.* 2018), which includes Bazaruto Bay.

The Bazaruto seascape extends from ~21 to 22°S. Dugongs are usually sighted in shallow, near-shore waters or sheltered areas such as within Bazaruto Bay or in mangrove-fringed estuaries along the mainland coast (Trotzuk *et al.* 2022). Most individuals are observed in shallow (< 20 m) waters less than ~10 km offshore. We consider that it is possible but unlikely that this subpopulation extends tens of kilometres further north, south or offshore, because these areas are less suitable for Dugongs due to higher wave action and sediment loads (Findlay *et al.* 2011). Furthermore, reports of Dugongs from these adjacent areas are very rare.

Dugongs are seagrass community specialists (Marsh *et al.* 2018). Ten species of seagrass occur in Bazaruto Bay, where shallow-water meadows cover ~ 90 km² (Everett *et al.* 2008, K. Allen pers. comms. 2022). Seagrass also occurs to the north of this bay, although in this area coverage and species composition have not been quantified. Dugongs are also regularly observed over sandy flats that are sometimes covered with macroalgae (E. Trotzuk pers. obs. 2021). As in some other areas (Keith-Diagne *et al.* 2022), Bazaruto Dugong may be feeding on macroalgae, invertebrates or low density seagrass on these sandy flats.

Dugongs in East Africa are geographically isolated from the Red Sea subpopulation to the north (Marsh *et al.* 2011). The distance from the northern-most record of Dugongs along the east coast of Africa in Somalia to the southern-most observations of Dugongs in the Red Sea at Al Hudaydah in Yemen is ~1,700 km (see Figure 1 in the Supplementary Material; Travis 1967, Nasr *et al.* 2019). The geographic separation is further than documented large-scale displacements of Dugongs (Deutsch *et al.* 2022b), apart from movements of occasional vagrant animals. The exposed, high-energy coastline of central and northern Somalia is unlikely to be suitable Dugong habitat due to lack of seagrass (UNEP-WCMC and Short 2021). Indeed, Funaioli and Simonetta (1966) noted that records of dugong sightings from the Gulf of Aden were infrequent. While it may be possible for Dugongs to move along this coast between Somalia to the Red Sea, Dugong abundance appears to be very low in southern Somalia, and it is likely

that such movements, if they occur, are very rare. Similarly, deep water habitats without seagrass are expected to limit the movement of Dugongs from continental East Africa to the islands of the Western Indian Ocean (WIO) such as the Comoros, Madagascar and the Seychelles. Analysis of mtDNA indicates that Dugongs from the Comoros and Madagascar are a separate genetic lineage from most other WIO Dugongs (Plön *et al.* 2019). Cockcroft *et al.* (2018) did not observe any Dugongs in the Quirimbas Archipelago, the closest historical Dugong habitat in continental East Africa to the Comoros Archipelago (separated by ~ 300 km), and reported only one (dead) Dugong from northern Mozambique during the past two decades. Regional currents also appear to be unfavourable for Dugong movements from northern Mozambique to these WIO islands (Ali and Huber 2010), with water moving from the east past the Comoros before splitting into northerly and southerly currents that follow the continental coastline (see Figure 2 in the Supplementary Material; Collins *et al.* 2016). Therefore, regardless of whether displacement between the African continent and these islands is possible, Dugong movements between the two locations are probably infrequent.

For further information about this species, see Supplementary Material.

Country Occurrence:

Native, Extant (resident): Kenya; Mozambique; Somalia; Tanzania, United Republic of

FAO Marine Fishing Areas:

Native: Indian Ocean - western

Distribution Map

Legend

EXTANT (RESIDENT)

Compiled by:

IUCN (International Union for Conservation of Nature) 2022

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

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Population

Surveys over the past two decades suggest that the Bazaruto seascape is the only area in East Africa where robust estimates of Dugong abundance can be obtained (Cockcroft *et al*. 2018). Elsewhere in East Africa, Dugongs are likely highly depleted and geographically isolated, and sightings are too infrequent to estimate abundance (Cockcroft *et al*. 2018). The Bazaruto Dugongs were most recently estimated at 325 (SD = 145) individuals from aerial surveys carried out in 2021 (Trotzuk *et al*. 2022). N_{min}, the accepted metric for estimating the minimum population size of marine mammal stocks (Wade 1998), is thus calculated to be 228.

Proportion of mature individuals

We use multiple lines of reasoning to support our conclusion that there are fewer than 250 mature individuals throughout East African coastal waters. Deutsch *et al*. (2008) estimated from population modelling and carcass recovery that ~ 45–70% of a Caribbean Manatee (*Trichechus manatus manatus*) population were mature. Assuming a similar proportion of mature individuals in the East African coastal Dugong subpopulation, we estimate that there are 131 (SD = 30) mature individuals in the Bazaruto seascape (see Table 1 in the Supplementary Material). Considering that observation rates are so low outside the Bazaruto seascape and that an estimated 90–100% of the East African coastal Dugong subpopulation occurs at this site, we can conclude that the entire East African region supports a maximum of 145 (SD = 33) mature individuals. In reality, our estimate of the proportion of mature individuals may be high, as manatees reach sexual maturity at a younger age than Dugongs (Marsh *et al*. 2011).

Even if every other known Dugong habitat in coastal East Africa supported ten Dugongs, which recent aerial surveys demonstrate is extremely unlikely (Cockcroft *et al*. 2018), we can use similar reasoning as above to conclude that the East African subpopulation would still be less than 250 mature individuals and that >90% of these animals still occur in the Bazaruto seascape (see Figure 1 in the Supplementary Material).

Population trend

Together with historical records, participatory appraisals and aerial surveys indicate that Dugongs have become much rarer throughout coastal East Africa over the past six decades (Marsh 2002, Pilcher *et al*. 2017, Cockcroft *et al*. 2018). Severe declines in Kenya, Tanzania, and parts of Mozambique have been inferred from the literature. No data are available for Somalia, but the pressures responsible for declines elsewhere in coastal East Africa were also present (possibly at exacerbated levels) in that country. Interviews and aerial surveys in the offshore islands of the Comoros and Madagascar suggest similar declines in that region (Muir *et al*. 2012). Dugongs have become extinct at some sites elsewhere in the WIO, such as the Mascarene Islands (Husar 1975, Cockcroft and Young 1998). Estimates from the Bazaruto seascape indicate no significant change over the past two decades, although wide error margins make any conclusion uncertain. The decline observed elsewhere in East Africa, however, is inferred to be substantial and projected to continue over the next few decades (Marsh *et al*. 2011).

Population structure

Husar (1975) suggested that the East African Dugong subpopulation was discontinuous, a pattern that is characteristic of most Dugong subpopulations elsewhere in its range. Most Dugongs occur close to seagrass communities which are limited to sheltered seascapes, which tend to be interrupted. Despite

this geographic discontinuity, mtDNA indicates genetic homogeneity throughout different geographically isolated groups in coastal East Africa (Plön *et al*. 2019). Given the geographic isolation of the Bazaruto Dugong subpopulation, as well as the very low detection rates elsewhere, over 90% of coastal East Africa's Dugongs are almost certainly limited to this one location.

The extent of occurrence (EOO) for the entire East African subpopulation is difficult to estimate given the paucity of recent data. However, we assess that historical limits stretching from the Bajuni Archipelago in Somalia to Maputo Bay in Mozambique are still potential north-south limits of this population. We also assumed that dugongs had an offshore range of waters with a depth of less than or equal to 20 m. Under these conditions, we calculated the EOO of the East African subpopulation to be around 40,000 km², well over the limits for criterion B1 thresholds (GEBCO 2020). The area of occupancy (AOO) of this subpopulation is limited to a single location: the Bazaruto seascape. Overlaying observations from 2017 to 2021 on 4 km² (2 x 2 km) cells indicates that Dugongs occupy ~ 488 km² in the Bazaruto seascape, mostly in coastal waters shallower than 20 m (Trotzuk *et al*. 2022). However, given the extent of seagrass and aforementioned paucity of recent data, it is probable that Dugongs in this location occupy over 500 km². Since the Bazaruto seascape supports more than 90% of the region's mature individuals and that participatory appraisals in coastal communities indicate continuing decline in the number of mature individuals, the East African coastal subpopulation of the Dugong is eligible for listing as Vulnerable under criterion B (VU B2ab(v)) and Endangered under criterion D (EN D). The data are insufficient to determine the eligibility of this subpopulation of Dugongs under criteria A or E.

For further information about this species, see Supplementary Material.

Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

Little is known as to how Dugong habitat and ecology differ between the East African coastal subpopulation and other subpopulations studied elsewhere (Marsh and Sobtzick 2019). It is unlikely that the life history ethology and behavioural ecology are substantially different (Marsh *et al.* 2011, Marsh 2022). Only in the Bazaruto seascape have sufficient observations been made to infer any behavioural patterns. As in other areas (Deutsch *et al.* 2022a), the Dugongs' distribution in the Bazaruto seascape appears to be driven partially by tides, with individuals foraging in the near-shore when tides are high and moving further offshore or into deeper channels as water levels recede. Tidal patterns in the Bazaruto seascape are mixed semidiurnal, with spring tide differences of over 5 m (Sumich 1996).

Certain areas within the seascape may be associated with specific Dugong behaviours. In the north of this subpopulation's range, herds of over 50 individuals have been observed on multiple occasions as recently as 2021 (E. Trotzuk pers. obs. 2021). The function of such herds is uncertain, but herding behaviour has been associated with feeding or mating elsewhere (O'Shea *et al.* 2022). Cow-calf pairs are regularly encountered in the sheltered waters of Bazaruto Bay, suggesting they may selectively occupy these calmer waters.

For further information about this species, see Supplementary Material.

Systems: Marine

Use and Trade

As in many other parts of their range (Marsh 2002, Ponnampalam *et al*. 2022), Dugongs were traditionally harvested for food and medicine in coastal East Africa. Dugong meat was a prized source of protein and according to local beliefs, consuming it would lead to an eternal life (Muir *et al*. 2012). Taboos around the consumption of Dugong meat were once widespread along the Swahili coast because of the animal's supposed resemblance to humans (Ponnampallam *et al*. 2022). However, these traditional restrictions were typically flexible, and culturally sanctioned mechanisms existed to allow for consumption (Muir *et al*. 2012).

Various parts of the Dugong were used in traditional medicine to treat a variety of ailments including asthma, burns and muscle pain (Muir *et al*. 2012). Dugong oil had many non-medical uses, including as a cosmetic product to soften hair (Awadh *et al*. 2021) and for waterproofing boats (Muir *et al*. 2012). Parts of the Dugong were also utilized in religious practices, since they were believed to provide protection against evil spirits (Muir *et al*. 2012).

Take is now banned in all countries by the 1985 Fisheries Law in Somalia, 2016 Fisheries Management and Development Act in Kenya, 2003 (national) and 2010 (Zanzibar) Fisheries Acts in Tanzania, and the 2020 General Regulation on Marine Fisheries in Mozambique. Given low densities throughout the region, current trade and use occur primarily as a result of incidental catch. Meat from both live and dead Dugongs is retained for consumption and can fetch a high price (Pusineri *et al*. 2013). Due to the illegal nature of this activity, meat is often traded rapidly and in secret, so it can be challenging to obtain detailed information about current use and trade practices. However, recent participatory appraisals in coastal communities suggest that bycaught animals are still used in the same way today.

Threats (see Appendix for additional information)

Marsh *et al*. (2011) and Marsh and Sobtzick (2019) indicated that threats to Dugongs often differ between subpopulations. In East Africa, the major threats include:

• Incidental capture in fishing gear (e.g., gill nets or seine nets); illegal, unreported, and unregulated (IUU) fishing, particularly if "targeted" for later consumption (Pilcher *et* al. 2017, Cockcroft *et al*. 2018).
• Hunting and direct fishing: historically legal, currently illegal.
• Damage/modification/loss of habitat caused by human settlements or infrastructure development on coasts, oil and gas exploration and production, shipping, trawling, destructive fishing, natural processes (e.g., cyclones and tsunamis).
• Degradation of seagrass habitat (including untreated sewage disposal, coastal dredging and reclamation, inshore commercial trawling, agricultural pollution).
• Chemical pollution (e.g., oil spills and heavy metal loads).
• Climate change impacts on seagrass communities (e.g., extreme weather events, marine heatwaves; Marsh *et al*. 2022).
• Boat strikes and boating activities (including acoustic pollution).

Dugong are protected throughout coastal East Africa (Muir *et al*. 2012). However, low development levels, increased migration to coastal areas due to armed conflict and climate change adaptation strategies, and high human population growth rates along the East African coast have put severe pressure on marine ecosystems to support food provisioning. The use of passive fishing gears that can yield a high catch, such as gill nets, remains relatively widespread throughout East Africa (Marsh 2002,

Pilcher *et al*. 2017, Cockcroft *et al*. 2018). Marsh and Sobtzick (2019) concluded that unattended gill nets were currently the most widespread source of anthropogenic mortality for Dugongs at a global scale. Declines in abundance throughout East Africa appeared to correlate with the growing use of these nets over the past few decades (Muir *et al*. 2012). Gill nets are still used within the Bazaruto seascape (Cockcroft *et al*. 2018). Seine nets, which are always attended, have also caused Dugong mortality in East Africa.

Habitat decline, particularly loss of seagrass, also poses a threat to East Africa's Dugongs. Although the extent of seagrass decline throughout East Africa over the past few decades has not been fully quantified, seagrass coverage across the tropical Indo-Pacific has declined by ~20% over the past century (Dunic *et al*. 2021). Coastal development and declining water quality are considered as the principal drivers of seagrass loss (Dunic *et al*. 2021). There are large towns (100,000 + people) and numerous tourism-related facilities around the Bazaruto Archipelago. If development is unmanaged, associated activities may increase sedimentation on seagrass meadows and negatively affect the health of these critical habitats. Such pressures transcend conservation area boundaries. Additionally, the waste associated with urban centres and tourism may decrease water quality and exacerbate declines in seagrass habitat. Finally, while not currently a significant issue, boat strikes may become more common as tourism- and fishing-related activities increase alongside human population growth.

Resource extraction throughout East Africa also threatens Dugongs across the subpopulation’s entire range, including in parts of Kenya and Tanzania, where Dugongs are already rare. Ongoing, large-scale infrastructure development such as port expansions, which have been proposed in at least Lamu and Maputo, as well as the construction of the East Africa Crude Oil Pipeline in northern Tanzania and offshore gas extraction in Mozambique’s Rovuma Basin, will probably exacerbate ongoing declines in Dugong abundance throughout these areas. Such projects may thus further increase the proportion of mature individuals isolated to the Bazaruto seascape.

Activities associated with the extraction of three commodities (sand, oil, and gas) around the Bazaruto Archipelago could also lead to Dugong mortality in this particular seascape. Sand mining, involving dredging, can severely disturb seagrass meadows (Erftemeijer and Lewis III 2006). Indeed, sand mining in Mozambique has been associated with a variety of negative ecological outcomes such as increased sedimentation and decreased coastal resilience (Amnesty International 2018). There are currently four coastal mineral concessions adjacent to the Bazaruto seascape, three of which are reserved for heavy sand mining.

The effect of oil and gas extraction on Dugongs and their forage is less certain, but St Aubin and Lounsbury (1990) suggested that oil may negatively affect Caribbean manatee health due to potential irritation from direct contact. Similar effects can be inferred for Dugongs. Indeed, an oil spill in Saudi Arabia in 1991 may have been responsible for an observed decline in local Dugong abundance following the incident, although direct links are unclear (Khan 1992). Seagrass and other aquatic vegetation may also be vulnerable to oil spills (St. Aubin and Lounsbury 1990). Acoustic pollution associated with oil and gas exploration may also negatively impact the health of the Bazaruto Dugongs. There are currently two blocks reserved for oil and gas exploration and extraction that cover the entire northern range of Dugongs in the Bazaruto seascape. In addition, two off-shore (> 50 km from mainland coast) concessions have recently been offered as a part of an ongoing licensing process for potential exploration. The development of any of these projects could adversely affect the Dugongs of the Bazaruto seascape due

to aforementioned impacts.

Climate change, which may increase the frequency of high-impact storms like tropical cyclones (Mendelsohn *et al*. 2012), is likely to adversely affect the East Africa subpopulation in the future (Marsh et al. 2022), particularly given that an estimated > 90% of the subpopulation is limited to a single location that could be severely disturbed by a single, or series of, natural disaster(s). The Bazaruto seascape is seasonally battered by cyclones, and severe storms can cause widespread seagrass loss (Marsh et al. 2022). Cyclones elsewhere have damaged hundreds of square kilometres of seagrass (Marsh *et al*. 2008, Groom *et al*. 2017, Griffiths *et al*. 2020). A series of floods and storms caused the loss of roughly 1,000 km² of seagrass in Hervey Bay, Queensland (Preen et al. 1995). A similar event in the Bazaruto seascape would severely affect resident Dugongs, particularly since they apparently lack adjacent suitable habitats to which they could migrate.

Conservation Actions **(see Appendix for additional information)**

Dugongs are legally protected at a national level throughout the entirety of their East African range, and internationally through the Convention on Biological Diversity (CBD); the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES); the Convention on Migratory Species of Wild Animals (CMS) and the associated Dugong MoU; the African Convention on the Conservation of Nature and Natural Resources; and the Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region. Somalia, Kenya, Tanzania, and Mozambique are all signatories to these Conventions and to the Dugong MoU. However, in practice, neither national nor international policy provide meaningful protection for the East African coastal Dugong subpopulation (Muir *et al*. 2012). Ultimately, inadequate fisheries monitoring and weak enforcement of these laws limit their value along much of the East Africa coast. Further complicating the efficacy of these higher-level protections are complex political realities - Tanzania, Kenya, and Mozambique all rank in the bottom half of Transparency International's 2021 Global Perceived Corruption Index (Transparency International 2022). In Mozambique, for example, at least one resource extraction project that is known to have caused severe environmental damage advanced without a legally-required environmental impact assessment (Amnesty International 2018).

Mozambique is ranked as 181 out of 189 countries on the United Nations Development Programme's (UNDP's) 2020 Human Development Index (UNDP 2020). Approximately 46% of Mozambique's population lives below the national poverty line (UNDP 2020), and the country is ranked third-to-last out of 113 countries on the Economist Impact's 2021 Global Food Security Index (Economist Impact 2021). In the Bazaruto seascape, over 90% of community members living inside Bazaruto Archipelago National Park depend exclusively on local marine resources for food security and livelihoods (D'Agata 2016). Proportions are probably similar throughout the rest of the Bazaruto seascape. Ultimately, these realities put immense pressure on marine resources and habitats, including seagrass meadows, and regularly bring artisanal fishers into contact with Dugongs. This socioeconomic situation demonstrates the importance of developing alternative livelihoods and sustainable fisheries management in order to reduce unnatural Dugong mortality by decreasing by-catch rates and seagrass habitat degradation.

Numerous protected areas exist throughout the East African coastal Dugong subpopulation's range and at least one, Bazaruto Archipelago National Park, was designated partly for Dugong conservation (Husar 1975). This protected area was subsequently expanded in the early 2000s, again, in part, to protect resident Dugongs. Dugongs are still observed outside protected areas in the Bazaruto seascape,

however. Expanding the boundaries of existing protected areas in this area, and ensuring that these zones are well-managed, could help provide additional protection for the last known viable subpopulation of Dugongs in coastal East Africa.

Credits

Assessor(s): Trotzuk, E., Allen, K., Cockcroft, V., Findlay, K., Gaylard, A., Marsh, H., Matos, L., West, L. & Guissamulo, A.

Reviewer(s): Lawler, I.

Authority/Authorities: IUCN SSC Sirenia Specialist Group (dugongs and manatees)

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Disclaimer

External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
9. Marine Neritic -> 9.2. Marine Neritic - Subtidal Rock and Rocky Reefs	-	Marginal	-
9. Marine Neritic -> 9.4. Marine Neritic - Subtidal Sandy	-	Suitable	Yes
9. Marine Neritic -> 9.5. Marine Neritic - Subtidal Sandy-Mud	-	Suitable	Yes
9. Marine Neritic -> 9.6. Marine Neritic - Subtidal Muddy	-	Suitable	Yes
9. Marine Neritic -> 9.9. Marine Neritic - Seagrass (Submerged)	-	Suitable	Yes
9. Marine Neritic -> 9.10. Marine Neritic - Estuaries	-	Suitable	Yes
12. Marine Intertidal -> 12.2. Marine Intertidal - Sandy Shoreline and/or Beaches, Sand Bars, Spits, Etc	-	Marginal	-
12. Marine Intertidal -> 12.7. Marine Intertidal - Mangrove Submerged Roots	-	Marginal	-

Use and Trade

(http://www.iucnredlist.org/technical-documents/classification-schemes)

End Use	Local	National	International
1. Food - human	Yes	No	No
3. Medicine - human & veterinary	Yes	No	No

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Whole (>90%)	Slow, significant declines
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
1. Residential & commercial development -> 1.3. Tourism & recreation areas	Ongoing	Whole (>90%)	Slow, significant declines
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
3. Energy production & mining -> 3.1. Oil & gas drilling	Past, likely to return	Whole (>90%)	Slow, significant declines
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		

		2. Species Stresses -> 2.2. Species disturbance	
3. Energy production & mining -> 3.2. Mining & quarrying	Past, likely to return	Whole (>90%)	Slow, significant declines
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance	
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.1. Intentional use: (subsistence/small scale) [harvest]	Ongoing	Whole (>90%)	Unknown
	Stresses:	2. Species Stresses -> 2.1. Species mortality	
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.3. Unintentional effects: (subsistence/small scale) [harvest]	Ongoing	Whole (>90%)	Unknown
	Stresses:	2. Species Stresses -> 2.1. Species mortality	
6. Human intrusions & disturbance -> 6.1. Recreational activities	Ongoing	Whole (>90%)	Unknown
	Stresses:	2. Species Stresses -> 2.2. Species disturbance	
9. Pollution -> 9.1. Domestic & urban waste water -> 9.1.1. Sewage	Ongoing	Whole (>90%)	Slow, significant declines
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation	
9. Pollution -> 9.2. Industrial & military effluents -> 9.2.1. Oil spills	Past, likely to return	Whole (>90%)	Slow, significant declines
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance	
9. Pollution -> 9.3. Agricultural & forestry effluents -> 9.3.4. Type Unknown/Unrecorded	Ongoing	Whole (>90%)	Slow, significant declines
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation	
11. Climate change & severe weather -> 11.4. Storms & flooding	Ongoing	Whole (>90%)	Slow, significant declines
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation	

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: Yes, over entire range
Occurs in at least one protected area: Yes
In-place education
Included in international legislation: Yes
Subject to any international management / trade controls: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed	Notes
1. Land/water protection -> 1.1. Site/area protection	-
2. Land/water management -> 2.1. Site/area management	-
4. Education & awareness -> 4.1. Formal education	-
4. Education & awareness -> 4.2. Training	-
4. Education & awareness -> 4.3. Awareness & communications	-
5. Law & policy -> 5.1. Legislation -> 5.1.2. National level	-
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.3. Sub-national level	-
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives	-
6. Livelihood, economic & other incentives -> 6.2. Substitution	-
6. Livelihood, economic & other incentives -> 6.4. Conservation payments	-
6. Livelihood, economic & other incentives -> 6.5. Non-monetary values	-

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed	Notes
1. Research -> 1.2. Population size, distribution & trends	-
1. Research -> 1.3. Life history & ecology	-
1. Research -> 1.4. Harvest, use & livelihoods	-
1. Research -> 1.5. Threats	-
1. Research -> 1.6. Actions	-
2. Conservation Planning -> 2.1. Species Action/Recovery Plan	-
2. Conservation Planning -> 2.2. Area-based Management Plan	-
3. Monitoring -> 3.1. Population trends	-
3. Monitoring -> 3.2. Harvest level trends	-
3. Monitoring -> 3.3. Trade trends	-
3. Monitoring -> 3.4. Habitat trends	-

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km²): 488
Estimated extent of occurrence (EOO) (km²): 40000
Population
Number of mature individuals: 145
Continuing decline of mature individuals: Yes
Extreme fluctuations: Unknown
Population severely fragmented: Yes
All individuals in one subpopulation: Yes
No. of individuals in largest subpopulation: 131
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Unknown
Generation Length (years): 22-25
Movement patterns: Nomadic

The IUCN Red List Partnership

The IUCN Red List of Threatened Species™ is produced and managed by the IUCN Global Species Programme, the IUCN Species Survival Commission (SSC) and The IUCN Red List Partnership.

The IUCN Red List Partners are: ABQ BioPark; Arizona State University; BirdLife International; Botanic Gardens Conservation International; Conservation International; Missouri Botanical Garden; NatureServe; Re:wild; Royal Botanic Gardens, Kew; Sapienza University of Rome; Texas A&M University; and Zoological Society of London.