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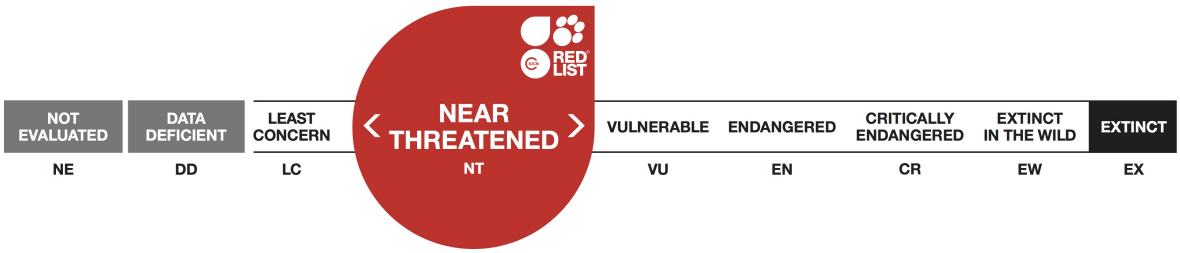
# *Caretta caretta (South East Indian Ocean subpopulation),* Loggerhead Turtle

**Assessment by: Casale, P., Riskas, K., Tucker, A.D. & Hamann, M.**

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# Taxonomy

| Kingdom | Phylum | Class | Order | Family |
|---|---|---|---|---|
| Animalia | Chordata | Reptilia | Testudines | Cheloniidae |

**Taxon Name:** *Caretta caretta (South East Indian Ocean subpopulation)* (Linnaeus, 1758)

**Parent Species:** See *Caretta caretta*

**Common Name(s):**

- English: Loggerhead Turtle, Tortue caouanne
- Spanish: Caguama, Tortuga Boba, Tortuga Cabezona, Tortuga Careta, Tortuga Comun

# Assessment Information

**Red List Category & Criteria:** Near Threatened ver 3.1

**Year Published:** 2015

**Date Assessed:** August 20, 2015

**Justification:**

***Rationale***

The South East Indian Ocean Loggerhead subpopulation nests in Western Australia. Its marine habitats extend throughout a wide area including the Timor and Arafura Seas (Hamann *et al*. 2013, Limpus 2008) (Figure 2 in the Supplementary Material). This subpopulation has been identified as one genetic stock different from other Loggerhead stocks (Shamblin *et al*. 2014) supporting its designation as a single subpopulation, or regional management unit (RMU) (Wallace *et al*. 2010).

The subpopulation does not qualify for any threatened category under criterion D and could not be assessed under criteria A and E due to lack of data. Data are uncertain for assessing the sub-population under criterion C, while data are incomplete for assessing the sub-population under criterion B. Specifically, the subpopulation meets two out of three subcriteria needed for a threatened category (area of occupancy and number of locations), while the third subcriterion cannot be assessed due to lack of data. In such circumstances the subpopulation qualifies for the Near Threatened category, also considering the current threats.

In spite of the several gaps of knowledge, the subpopulation cannot be considered as Data Deficient. Only a subpopulation for which both Least Concern and Critically Endangered are plausible categories qualifies for the Data Deficient category (IUCN 2014). Differently, while the uncertainty of data would allow the South East Indian Ocean Loggerhead subpopulation to qualify for the Least Concern category (criteria A, B, C, D), the available data show that the subpopulation does not meet the requirements for the Critically Endangered category under criteria B, C and D. Regarding criterion A, a reduction of 80% or more (required for the CR category) is very unlikely to have occurred (A2) or to occur in the future (A4) even considering the current anthropogenic threats.

***Assessment Procedure***


*http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T84189617A84189662.en*

**Criterion A**

A reduction of the subpopulation is suspected for the occurrence of threats such as heavy animal predation on clutches and anthropogenic disturbance at nesting sites (Baldwin *et al*. 2003, Hamann *et al*. 2013). For the Loggerhead global and subpopulation assessments we only considered time series datasets of ≥10 yr. Unfortunately, such datasets are not available for the South East Indian Ocean subpopulation. For this reason, criterion A could not be applied to this subpopulation.

**Criterion B**

Since the subpopulation area includes the large marine area from the long coast of the Western Australia to Indonesia, the extent of occurrence (EOO) exceeds the threat category threshold (20,000 km²) for criterion B1. Regarding criterion B2, the area of occupancy (AOO) for sea turtles is quantified based on linear extent of nesting beach habitat, which represents the smallest habitat for a critical life stage. The total length of monitored Loggerhead nesting beaches in Western Australia (Dirk Hartog Island, Ningaloo, Muiron Islands, Gnaraloo) is 64 km (Coote *et al*. 2012, Riskas 2014, R. Prince, A. Tucker pers. comm). Since the appropriate scale for AOO is a grid 2x2 km, the above linear measure is converted to 128 km², which meets the threshold for the Endangered category (<500 km²). However, diffuse low-level nesting occurs at other non-quantified and non-monitored beaches within the ~450 km of coastline between the northern and southern extent of known nesting (estimated through Google Earth), making the actual AOO uncertain but maximum 900 km², which meets the 2,000 km² threshold for the Vulnerable category. Key nesting beaches are monitored to varying degrees and can be grouped in four locations (Dirk Hartog Island, Gnaraloo, Ningaloo, Muiron islands) according to a geographic range where a single threat can affect all the beaches in each group, like an increased predator population, unmanaged vehicular traffic, coastal development (which are all plausible threats for this subpopulation; see the Threats section). However, the current management of at least a part of those beaches and the lack of a clear assessment of threats make the identification and quantification of locations, as defined for this Criterion (IUCN 2014), questionable. Regarding the third subcriterion (continuing decline or of extreme fluctuations) there are no available data to assess it. In conclusion, the subpopulation would meet only two out of three requirements for a threatened category, partly because of insufficient data, and so does not qualify for a threatened category under criterion B.

In summary, the population might qualify as Vulnerable based on AOO (which, however, is an estimate) and number of locations, but it does not trigger all of the subcriteria. In this situation the subpopulation can be considered as Near Threatened under criterion B2.

**Criterion C**.

To apply criterion C, the total number of adult females and males is needed. About 1,000-2,500 females are estimated to nest annually in the Shark Bay area, where the majority of nesting of the subpopulation occurs (Baldwin *et al*. 2003, Wirsing *et al*. 2004), hence the total number of females nesting annually in the entire subpopulation is higher than that. The number of adults can be derived from the number of females per year with the following formula: adults = annual females * remigration interval * female proportion$^{-1}$. Unfortunately, the proportion of females is not available and without it only the number of adult females can be tentatively estimated with the following formula: adult females = annual females * remigration interval. Considering the above range of values for annual nesting females and a remigration interval of 3.5 years (Western Australia Parks and Wildlife, unpubl. data, through A. Tucker, pers. comm.), the total number of adult females would range from 3,500 to 8,750 individuals. The range of values of the proportion of females known from other Loggerhead subpopulations makes it possible

that the number of adults of the South-Indian subpopulation is either greater than or less than 10,000, which is the threshold for the Vulnerable category. Moreover, no data are available for assessing whether or not the subpopulation meets the other subcriteria also required, such as continuing decline, % of mature individuals in one subpopulation, and extreme fluctuations. In conclusion, the subpopulation cannot be assessed under criterion C because of insufficient data.

**Criterion D**

The subpopulation does not meet the threshold for number of mature individuals (<1,000) under criterion D1. Regarding criterion D2, AOO exceeds the suggested threshold (<20 km²; see criterion B). The number of locations may be considered as four (see Criterion B above), but no future threats have been identified that could drive the subpopulation to CR or EX in a very short time. In conclusion, the subpopulation does not meet the requirements for a threatened category under criterion D.

**Criterion E**

No population viability analysis was available for this subpopulation.

***Sources of Uncertainty***

Several important sources of uncertainty exist for this subpopulation assessment, the most important of which are annual female abundance, adult sex ratio, long term census of nesting females or nests, and threat assessment.

# Geographic Range

### Range Description:

The Loggerhead Turtle has a worldwide distribution in subtropical to temperate regions of the Mediterranean Sea and Pacific, Indian, and Atlantic Oceans (Wallace *et al*. 2010) (Figure 1 in the Supplementary Material).

The South East Indian Ocean subpopulation breeds in Western Australia (Baldwin *et al*. 2003). Tag returns showed that foraging habitats extend as far as the Java and Arafura Seas (Hamann *et al*. 2013, Limpus 2008) (Figure 2 in the Supplementary Material).

For further information about this species, see Supplementary Material.

### Country Occurrence:

**Native:** Australia (Northern Territory, Western Australia); Indonesia

### FAO Marine Fishing Areas:

**Native:** Indian Ocean - eastern, Pacific - western central

# Population

Loggerheads are a single species globally comprising 10 regional management units (RMUs: Wallace *et al*. 2010), which describe biologically and geographically explicit population segments by integrating information from nesting sites, mitochondrial and nuclear DNA studies, movements and habitat use by all life stages. Regional management units are functionally equivalent to IUCN subpopulations, thus providing the appropriate demographic unit for Red List assessments. There are 10 Loggerhead RMUs (hereafter subpopulations): North West Atlantic Ocean, North East Atlantic Ocean, South West Atlantic Ocean, Mediterranean Sea, North East Indian Ocean, North West Indian Ocean, South East Indian Ocean, South West Indian Ocean, North Pacific Ocean, and South Pacific Ocean (Figure 2 in the Supplementary Material). Multiple genetic stocks have been defined according to geographically disparate nesting areas around the world and are included within RMU delineations (Wallace *et al*. 2010) (shapefiles can be viewed and downloaded at: http://seamap.env.duke.edu/swot).

The South East Indian Ocean Loggerhead subpopulation is probably one of the largest globally, with an estimated number of females nesting annually probably exceeding 2,500 (Baldwin *et al*. 2003, Wirsing *et al*. 2004). However, consistent annual censuses of adults or nests are still lacking, especially at the major nesting sites, as well as long-term monitoring datasets and key demographic parameters (e.g., remigration interval, adult sex ratio, number of clutches per female, etc).

For further information about this species, see Supplementary Material.

**Current Population Trend:** Unknown

# Habitat and Ecology **(see Appendix for additional information)**

The Loggerhead Turtle nests on insular and mainland sandy beaches throughout the temperate and subtropical regions. Like most sea turtles, Loggerhead Turtles are highly migratory and use a wide range of broadly separated localities and habitats during their lifetimes (Bolten and Witherington 2003). Upon leaving the nesting beach, hatchlings begin an oceanic phase, perhaps floating passively in major current systems (gyres) that serve as open-ocean developmental grounds (Bolten and Witherington 2003). After 4-19 years in the oceanic zone, Loggerheads recruit to neritic developmental areas rich in benthic prey or epipelagic prey where they forage and grow until maturity at 10-39 years (Avens and Snover 2013). Upon reaching sexual maturity Loggerhead Turtles undertake breeding migrations between foraging grounds and nesting areas at remigration intervals of one to several years with a mean of 2.5-3 years for females (Schroeder *et al*. 2003) while males would have a shorter remigration interval (e.g., Hays *et al*. 2010, Wibbels *et al*. 1990). Migrations are carried out by both males and females and may traverse oceanic zones spanning hundreds to thousands of kilometers (Plotkin 2003). During non-breeding periods adults reside at coastal neritic feeding areas that sometimes coincide with juvenile developmental habitats (Bolten and Witherington 2003). However, none of these parameters have been quantified for this South East Indian Ocean Loggerhead subpopulation.

***Generation length***

The IUCN Red List Criteria define generation length to be the average age of parents in a population (i.e., older than the age at maturity and younger than the oldest mature individual) and care should be taken to avoid underestimation (IUCN 2014). Although different subpopulations may have different generation length, since this information is limited we adopted the same value for all the subpopulations, taking

care to avoid underestimation as recommended by IUCN (2014).

Loggerheads attain maturity at 10-39 years (Avens and Snover 2013), and we considered here 30 years to be equal or greater than the average age at maturity. Data on reproductive longevity in Loggerheads are limited, but are becoming available with increasing numbers of intensively monitored, long-term projects on protected beaches. Tagging studies have documented reproductive histories up to 28 years in the North Western Atlantic Ocean (Mote Marine Laboratory, unpubl. data), up to 18 years in the South Western Indian Ocean (Nel *et al*. 2013), up to 32 years in the South Western Atlantic Ocean (Projeto Tamar unpubl. data), and up to 37 years in the South Western Pacific Ocean, where females nesting for 20-25 years are common (C. Limpus, pers. comm). We considered 15 years to be equal or greater than the average reproductive longevity. Therefore, we considered here 45 years to be equal or greater than the average generation length, therefore avoiding underestimation as recommended by IUCN (IUCN Standards and Petitions Subcommittee 2014).

**Systems:** Marine

## Threats (see Appendix for additional information)

Threats to Loggerheads vary in time and space, and in relative impact to populations. Threat categories affecting marine turtles, including Loggerheads, were described by Wallace *et al*. (2011) as:

• Fisheries bycatch: incidental capture of marine turtles in fishing gear targeting other species;
• Take: direct utilization of turtles or eggs for human use (i.e., consumption, commercial products);
• Coastal Development affecting critical turtle habitat: human-induced alteration of coastal environments due to construction, dredging, beach modification, etc.;
• Pollution and Pathogens: marine pollution and debris that affect marine turtles (i.e., through ingestion or entanglement, disorientation caused by artificial lights), as well as impacts of pervasive pathogens (for example fibropapilloma virus) on turtle health;
• Climate change: current and future impacts from climate change on marine turtles and their habitats (increasing sand temperatures on nesting beaches affecting hatchling sex ratios, sea level rise, storm frequency and intensity affecting nesting habitats, etc.).

The main threats to the South East Indian Ocean subpopulation are predation on eggs, especially by foxes (*Vulpes vulpes*) in mainland beaches (Coote *et al*. 2013, Hattingh *et al*. 2011) and vehicular traffic on the nesting beaches. Industrial development with the associated light pollution affecting hachlings and fisheries bycatch are also considered potential threats. However, the impact of all these threats to the subpopulation have not been quantified (Hamann *et al*. 2013, Limpus 2008).

## Conservation Actions (see Appendix for additional information)

Loggerhead Turtles are afforded legislative protection under a number of treaties and laws (Wold 2002). Annex II of the SPAW Protocol to the Cartagena Convention (a protocol concerning specially protected areas and wildlife); Appendix I of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora); and Appendices I and II of the Convention on Migratory Species (CMS). A partial list of the International Instruments that benefit Loggerhead Turtles includes the Inter-American Convention for the Protection and Conservation of Sea Turtles, the Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and Southeast Asia (IOSEA), the Memorandum of Understanding on ASEAN Sea Turtle Conservation and

Protection, the Memorandum of Agreement on the Turtle Islands Heritage Protected Area (TIHPA), and the Memorandum of Understanding Concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa.

As a result of these designations and agreements, many of the intentional impacts directed at sea turtles have been lessened: harvest of eggs and adults has been slowed at several nesting areas through nesting beach conservation efforts and an increasing number of community-based initiatives are in place to slow the take of turtles in foraging areas. In regard to incidental take, the implementation of Turtle Excluder Devices (TEDs) has proved to be beneficial in some areas, primarily in the United States and South and Central America (National Research Council 1990). Guidelines are available to reduce sea turtle mortality in fishing operations in coastal and high seas fisheries (FAO 2009). However, despite these advances, human impacts continue throughout the world. The lack of effective monitoring in pelagic and near-shore fisheries operations still allows substantial direct and indirect mortality, and the uncontrolled development of coastal and marine habitats threatens to destroy the supporting ecosystems of long-lived Loggerhead Turtles.

Loggerheads are legally protected in Australia by the Environment Protection and Biodiversity Conservation Act (1999) and specific protection and management regulations are in place in some nesting sites (restricted access, predator control programs) and at foraging habitats (TEDs for all commercial trawlers) (Hamann *et al*. 2013, Limpus 2008).

# Credits

**Assessor(s):** Casale, P., Riskas, K., Tucker, A.D. & Hamann, M.

**Reviewer(s):** Wallace, B.P. & Pilcher, N.J.

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## 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 -> 9.1. Marine Neritic - Pelagic | - | Suitable | - |
| 9. Marine Neritic -> 9.2. Marine Neritic - Subtidal Rock and Rocky Reefs | - | Suitable | - |
| 9. Marine Neritic -> 9.3. Marine Neritic - Subtidal Loose Rock/pebble/gravel | - | Suitable | - |
| 9. Marine Neritic -> 9.4. Marine Neritic - Subtidal Sandy | - | Suitable | - |
| 9. Marine Neritic -> 9.5. Marine Neritic - Subtidal Sandy-Mud | - | Suitable | - |
| 9. Marine Neritic -> 9.6. Marine Neritic - Subtidal Muddy | - | Suitable | - |
| 9. Marine Neritic -> 9.9. Marine Neritic - Seagrass (Submerged) | - | Suitable | - |
| 9. Marine Neritic -> 9.10. Marine Neritic - Estuaries | - | Suitable | - |
| 10. Marine Oceanic -> 10.1. Marine Oceanic - Epipelagic (0-200m) | - | Suitable | - |
| 12. Marine Intertidal -> 12.2. Marine Intertidal - Sandy Shoreline and/or Beaches, Sand Bars, Spits, Etc | - | Suitable | - |

## Threats

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

| Threat | Timing | Scope | Severity | Impact Score |
|---|---|---|---|---|
| 1. Residential & commercial development -> 1.1. Housing & urban areas | Ongoing | - | - | - |
| | Stresses: | 1. Ecosystem stresses -> 1.2. Ecosystem degradation<br>2. Species Stresses -> 2.1. Species mortality<br>2. Species Stresses -> 2.2. Species disturbance<br>2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success | | |
| 1. Residential & commercial development -> 1.2. Commercial & industrial areas | Ongoing | - | - | - |
| | Stresses: | 1. Ecosystem stresses -> 1.2. Ecosystem degradation<br>2. Species Stresses -> 2.1. Species mortality<br>2. Species Stresses -> 2.2. Species disturbance<br>2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success | | |
| 1. Residential & commercial development -> 1.3. Tourism & recreation areas | Ongoing | - | - | - |
| | Stresses: | 1. Ecosystem stresses -> 1.2. Ecosystem degradation<br>2. Species Stresses -> 2.2. Species disturbance<br>2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success | | |

| | | | | |
|---|---|---|---|---|
| 5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.3. Unintentional effects: (subsistence/small scale) | Ongoing | - | - | - |
| | Stresses: | 2. Species Stresses -> 2.1. Species mortality | | |
| 8. Invasive & other problematic species & genes -> 8.2. Problematic native species | Ongoing | - | - | - |
| | Stresses: | 2. Species Stresses -> 2.1. Species mortality | | |

# Conservation Actions in Place

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

| **Conservation Actions in Place** |
|---|
| In-Place Education |
| Subject to recent education and awareness programmes: Yes |
| Included in international legislation: Yes |
| Subject to any international management/trade controls: Yes |

# Research Needed

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

| **Research Needed** |
|---|
| 1. Research -> 1.2. Population size, distribution & trends |
| 1. Research -> 1.3. Life history & ecology |
| 1. Research -> 1.5. Threats |
| 1. Research -> 1.6. Actions |
| 3. Monitoring -> 3.1. Population trends |
| 3. Monitoring -> 3.2. Harvest level trends |
| 3. Monitoring -> 3.4. Habitat trends |

# Additional Data Fields

| **Habitats and Ecology** |
|---|
| Generation Length (years): 45 |

# 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: BirdLife International; Botanic Gardens Conservation International; Conservation International; Microsoft; NatureServe; Royal Botanic Gardens, Kew; Sapienza University of Rome; Texas A&M University; Wildscreen; and Zoological Society of London.

# Loggerhead Turtle (*Caretta caretta*) – South East Indian Ocean subpopulation

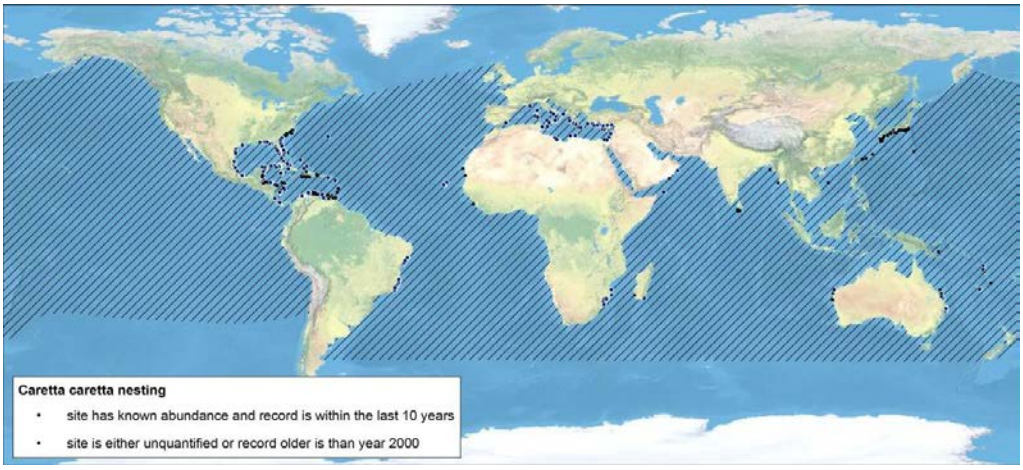


**Figure 1**. Global distribution and nesting sites for the Loggerhead Turtle *Caretta caretta* (Wallace *et al*. 2010).

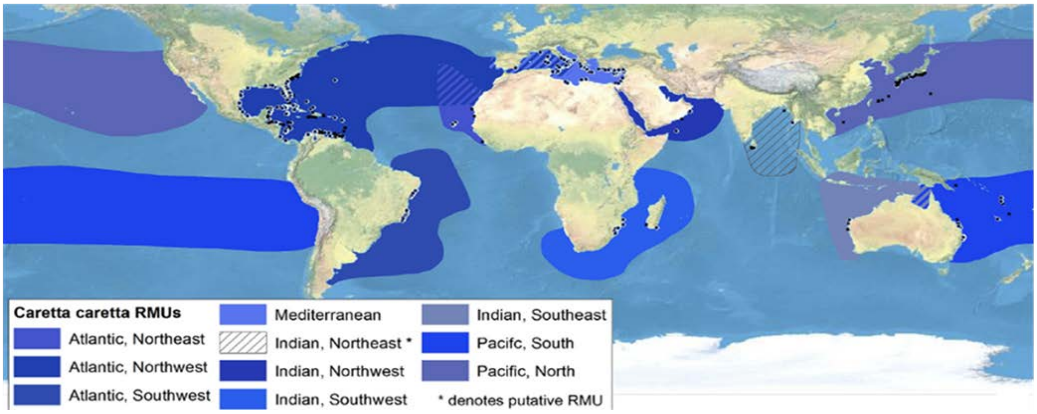


**Figure 2**. Global map of the 10 IUCN subpopulations (RMUs) of Loggerheads and nesting sites (Wallace *et al*. 2010).

## References

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