

# Paraíba Coast IMMA

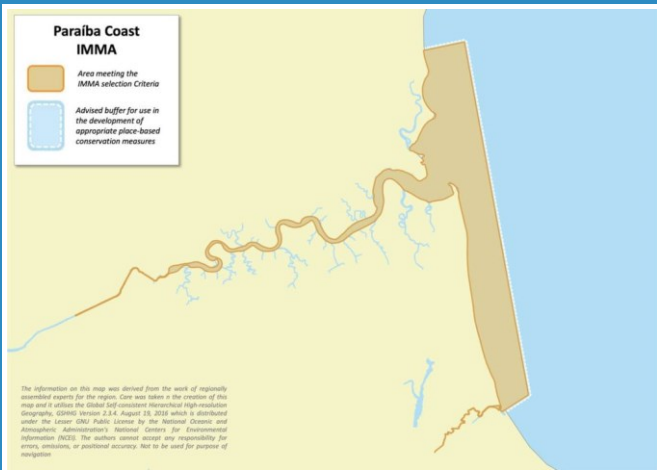
## Description:

In the State of Paraíba, Brazil, the extensive chain of sandstone reefs parallel to the coast has an important function for the West Indian manatee (*Trichechus manatus*) on that coast. It provides substrate for seaweed and seagrasses (manatee food) and corridors for moving from one location to another (protection). The reefs create an environment of protected, shallow, calm and warm waters (Lima et al., 2011), where needle grass (*Halodule* sp.) and macroalgae grow - food items that make up the diet of manatees (Borges et al., 2008) can grow. Due to the ecological attributes found, the coast of Paraíba is considered one of the main areas of occurrence of the species in Brazil (Lima et al., 2011; Alves et al., 2013; Alves et al., 2015).

The Brazil Current (a southern branch of the South Equatorial Current) flows along the coast in a SSW direction. Water temperatures range between 24°C and 30°C, and salinity is higher than 36 ppm. Within this territory, the annual temperature variation of coastal waters is very small, and it can be considered almost constant, favorable to the occurrence of manatees (Lima et al., 2011; dos Santos, 2020).

Despite a continuous distribution of manatees along the entire coast of Paraíba (Alves et al., 2015), the occurrence of the species showed a positive correlation with estuaries (Alves et al., 2013). For this reason, the IMMA includes the Camaratuba, Mamanguape, Miriri, Paraíba and Tracunhaém River estuaries.

The estuary of the Mamanguape River, located in the Municipality of Rio Tinto, Paraíba State (6°45'S; 35°05'W) is approximately 30 km long and it is



## Area Size

41 km<sup>2</sup>

## Qualifying Species and Criteria

West Indian manatee – *Trichechus manatus*

Criterion A; B (1); C (1,2)

## Other Marine Mammal Species Documented

*Sotalia guianensis*

## Summary

The Paraíba Coast is one of the most important areas in Brazil for West Indian manatees (*Trichechus manatus*). The availability of needle grass, algae, and macrophytes provides food sources, while freshwater inputs and shallow, protected waters provide ideal habitat for the species to mate, give birth and nurse young.



Figure 1: Mouth of the Mamanguape River estuary. Area used by manatees and Guiana dolphins. Photo credit: Felipe Lima

surrounded by 6,000 hectares of mangroves. Its mouth in the Atlantic Ocean, referred to as the Bar of Mamanguape, is totally protected by an extensive line of reefs, forming an environment of shallow and calm waters, with depths from 1 to 5 meters in the channels zone and many sandbanks which emerge in the low tide. The tide cycle has an amplitude of 2.5 m in the spring tides. At the mouth of the Mamanguape River, wave energy is diffused by a line of reefs that extends along the coast (da Silva et al., 2011).

In the coastal area near the mouth of the estuaries, the tides have an average spring height of 2.18 m and an average squaring height of 1.04 m. The current system is governed by the ebb and flow of the tides and the discharge of the Miriri and Mamanguape Rivers, with the preferred direction of the currents corresponding to that of the main axis of the channels (ICMBio, 2013).

Mangroves cover an area of approximately 6,000 ha on the banks of the Mamanguape River, close to its

mouth. Several species of mangroves have been identified within the IMMA, including *Rhizophora mangle*, *Avicennia germinans*, *Avicennia schaueriana*, *Conocarpus erectus* and *Laguncularia racemose* (ICMBio, 2013).

## Criterion A: Species and Population Vulnerability

Populations of West Indian manatees (*Trichechus manatus*) are sensitive to changes in coastal environments, and are threatened by entanglement in fishing gear, boat strikes, and primarily by the loss of habitat (Borges et al., 2007; Meirelles, 2008). In Brazil, the frequent occurrence of stranded manatees, in particular neonates, reflects anthropogenic threats including accidental capture in fishing nets, and the degradation of the estuaries in which the species breeds (Parente et al., 2004; Meirelles et al., 2014 ; Aquasis, 2016; Medeiros et al., 2021).



Figure 2: Evidences of manatee using the estuarine areas of the Mamanguape River. Photo credit: Sarah Kather / FMA Collection

Given the considerable pressures on the surviving wild populations, West Indian manatees are considered one of the Brazilian aquatic mammals most threatened with extinction (MMA, 2022), with a total population in the Brazilian Northeast estimated to be just over 1,000 individuals (Alves et al., 2015). The species is globally classified as “Vulnerable” (Deutsch et al., 2008) and nationally in Brazil listed as “Endangered” (MMA, 2022). However, recently an independent assessment classified the species as “Critically Endangered” in Brazil (Meirelles et al., 2022).

## **Criterion B: Distribution and Abundance**

### **Sub-criterion B1: Small and Resident Populations**

Aerial surveys and other studies indicate that the Paraíba coast hosts relatively high densities of manatees in comparison with other areas of Brazil's

coastline (e.g. Alves et al., 2015). However, there are indications that the population has been reduced over the years due to various anthropogenic factors (Lima et al., 2011; Alves et al., 2013; Alves et al., 2015).

Since the first manatee surveys conducted in Brazil in the 1980s, the estuaries of the Mamanguape and Miriri Rivers, both contained within this IMMA have consistently registered the highest frequency of occurrence and abundance of the species.

Albuquerque and Marcovaldi (1982) indicated that the estuary of the Mamanguape River, in Paraíba state, hosted the highest manatee concentration on the northeastern coast in Brazil, where groups of up to 15 animals were documented near the mouth of the river and along the coast.

In addition to the native manatee populations, the region is a release area for rehabilitated manatees.

Radio and satellite tracking of some these released individuals provides insight into the home ranges and fidelity to sites in the region (Normande et al., 2016; dos Santos et al., 2022). Home range size of tracked individuals was 2.56 – 42.07 km<sup>2</sup>, small enough to be contained within the IMMA. The longest distance travelled from the coastline upriver was 14.24 km and the longest distance offshore was only 0.93 km (dos Santos et al., 2022).

## **Criterion C: Key Life Cycle Activities**

### **Sub-criterion C1: Reproductive Areas**

The estuaries of the Mamanguape and Miriri rivers are considered relevant areas for the reproduction of manatees, as they have reefs that provide sheltered environments with shallow waters (Silva et al., 2011). Births generally occur between October and March, when sightings of females with calves are frequent (Lima et al., 2011). Mating is more frequently observed during the dry period (austral summer) (Balensiefer et al., 2017).

### **Sub-criterion C2: Feeding Areas**

Dos Santos (2020) characterized the home range areas of rehabilitated manatees released in this region. The results showed that manatees exhibited a preference for sites shallower than two meters, with food resources and freshwater availability.

The presence of reefs covered with marine algae is a determinant factor in the occurrence of the manatee. They were sighted feeding on algae that grow over the reefs close to beaches that were of high energy during high tide. They occur in depths of 0.4 to 3.8 m; the distance from the beach varies according to the tide level (Paludo & Langguth, 2002).

Paludo (1998) recorded, through direct observations, the manatees feeding on banks of algae, where a large proportion of red algae were recorded. Borges et al. (2008) analysed stomach content samples from manatees accidentally caught in the states of Rio Grande do Norte, Paraíba and Alagoas, in addition to



Figure 3: Copulation behavior among manatees in the Paraíba coast. Photo credit: FMA Collection



Figure 4: Manatee feeding on banks of algae and seagrass. Photo credit: Edson Acioli / FMA Collection

samples of faeces from released and wild animals in northern Paraíba. A wide range of items was recorded, such as seagrass, algae and mangroves. The authors draw attention to the significance of red algae found in the contents studied. These findings support the direct observations made by Paludo (1998). These algae appear to be abundant on the coast of Paraíba, where the majority of the samples studied came from. The findings indicate that seaweeds are an important item in the diet of the species in the region, different from what has been recorded in other places, where this item seems to be consumed occasionally or accidentally along with seagrass.

## Supporting Information

Almeida, I.C. 2022. Estimativa do tamanho populacional, área de uso e fatores de ameaças de boto-cinza (*Sotalia guianensis* VAN BENEDEN, 1864) no Nordeste do Brasil. Dissertação apresentada ao Programa de Pós-Graduação em Ecologia e Monitoramento Ambiental como parte dos requisitos para obtenção do título de Mestre em Ecologia. Universidade Federal da Paraíba. 87 p.

Alves, M.D.O., Schwamborn, R., Borges, J.C.G., Marmontel, M., Costa, A.F., Schettini, C.A.F., and Araújo, M.E. 2013. Aerial survey of manatees, dolphins

and sea turtles off northeastern Brazil: Correlations with coastal features and human activities. *Biol. Conserv.* 161, 91–100. doi:10.1016/j.biocon.2013.02.015.

Alves, M.D.O, Kinas, P.G., Marmontel, M., Borges, J.C.G., Costa, A.F., Schiel, N., and Araújo, M.E. 2015. First abundance estimate of the Antillean manatee (*Trichechus manatus manatus*) in Brazil by aerial survey. *J. Mar. Biol. Assoc. United Kingdom* 96: 1–12. doi:10.1017/S0025315415000855.

Albuquerque, C. and Marcovaldi, G.M. 1982. Ocorrência e Distribuição das Populações do Peixe-Boi Marinho no Litoral Brasileiro (SIRENIA – Trichechidae, *Trichechus manatus*, Linnaeus, 1758). SIMPÓSIO INTERNACIONAL DE ECOSISTEMAS COSTEIROS: POLUIÇÃO E PRODUTIVIDADE.

Balensiefer, D.C., Attademo, F.L.N., Sousa, G.P., Freire, A.C.B., da Cunha, F.A.G.C., Alencar, A.M.B., Silva, F.J.L., and Luna, F.O. Three Decades of Antillean Manatee (*Trichechus manatus manatus*) Stranding Along the Brazilian Coast. *Tropical Conservation Science*. 10 : 1-9.

Borges, J.C.G., Araújo, P.G., Anzolin, D.G., and Miranda, G.E.C., 2008. Identificação de itens alimentares constituintes da dieta dos peixes-boi marinhos (*Trichechus manatus*) na região nordeste do Brasil. *Biotemas*. 21 (2), 77–81.

Borges, J.C.G., Vergara-Parente, J.E., Alvite, C.M.C., Marcondes, M.C.C., and Lima, R.P. 2007. Embarcações motorizadas: uma ameaça aos peixes-bois marinhos (*Trichechus manatus*) no Brasil. *Biota Neotrop.* 7: 199–204.

De Lima, R.P. and De Passavante, J.Z.O. 2013. Avaliação da primeira década (1994-2004) das reintroduções de peixes-bois marinhos (*Trichechus manatus*) no nordeste do Brasil. *Natural Resources*,

3:26-41.

De Lima, R.P., De Alvite, C.M.C. and Vergara-Parente, J.E. 2007. Protocolo de Reintrodução de Peixes-Bois-Marinheiros no Brasil. IBAMA, São Luis, Brazil.

Deutsch, C.J., Self-Sullivan, C. and Mignucci-Giannoni, A. 2008. *Trichechus manatus*. The IUCN Red List of Threatened Species 2008: e.T22103A9356917. <https://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T22103A9356917.en>. Accessed on 26 January 2023.

Dos Santos, S.S. 2020. Área de vida de peixes-boi marinhos (*Trichechus manatus*) soltos no Brasil. PhD dissertation. 87 f.

Dos Santos, S.S., Medeiros, I.S., Rebelo, V.A., Carvalho, A.O.B., Dubut, J.P., Mantovani, J.E., Ciriaco, R.D., Dos Santos, R.E.G., Marmontel, M., Normande, I.C., Velôso, T.M.G., and Borges, J.C.G. 2022. Home ranges of released West Indian manatees in Brazil. *ORYX*, 56 : 1-8.

Lima, R.P., Paludo, D., Soavinski, R.J., Silva, K.G., and Oliveira, E.M.A. 2011. Levantamento da distribuição, ocorrência e status de conservação do Peixe-Boi Marinho (*Trichechus manatus*, Linnaeus, 1758) no litoral nordeste do Brasil. *Natural Resources*, v: 41-57.

Medeiros, I.S., Rebelo, V.A., dos Santos, S.S., Menezes, R., Almeida, N.V., Messias, L.T., do Nascimento, J.L.X., Luna, F.O., Marmontel, M., and Borges, J.C.G. 2021. Spatiotemporal dynamics of mangrove forest and association with strandings of Antillean manatee (*Trichechus manatus*) calves in Paraíba, Brazil. *Journal of the Marine Biological Association of the United Kingdom* 1–8. <https://doi.org/10.1017/S002531542100045X>.

Meirelles, A.C.O. 2008. Mortality of the Antillean manatee, *Trichechus manatus manatus*, in Ceará

State, north-eastern Brazil. J. Mar. Biol. Assoc. 88: 1133–1137.

Normande, I.C., Malhado, A.C.M., Reid, J., Viana, P.C., Savaget, P.V.S., Correia, R.A., Luna, F.O., and Ladle, R.J. 2016. Post-release monitoring of Antillean manatees: an assessment of the Brazilian rehabilitation and release programme. *Animal Conservation*, 19: 235-246.

Paludo, D. and Langguth, A. 2002. Use of space and temporal distribution of *Trichechus manatus* Linnaeus in the region of Sagi, Rio Grande do Norte State, Brazil (Sirenia, Trichechidae). *Rev. Bras. Zool.*, 19: 205-215.

Parente, C.L., Vergara-Parente, J.E. and Lima, R.P. 2004. Strandings of Antillean Manatees, *Trichechus manatus manatus*, in Northeastern Brazil. *LAJAM*. 3: 69–75.

Silva, K.G., Paludo, D., Oliveira, E.M.A., Lima, R.P., and Soavinski, R.J. 1992. Distribuição e ocorrência do Peixe-Boi Marinho (*Trichechus manatus*) no estuário do rio Mamanguape, Paraíba, Brasil. 1 : 6-18.

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