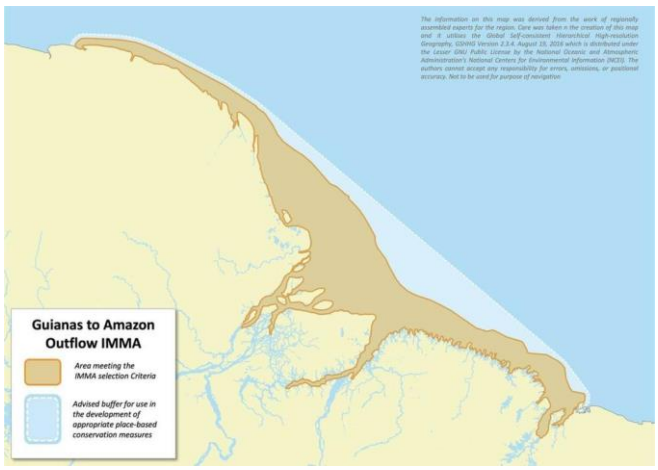

Area Size

152 890 km²

Qualifying Species and Criteria

Amazon river dolphin – *Inia geoffrensis*

Criterion A; C (2)

West Indian manatee – *Trichechus manatus*

Criterion A; C (1, 2)

Amazonian manatee – *Trichechus inunguis*

Criterion A; C (1); D1

Guiana dolphin – *Sotalia guianensis*

Criterion B (1); C (1)

Criterion D (2) - Marine Mammal Diversity

Delphinus delphis, Globicephala macrorhynchus, Grampus griseus, Inia geoffrensis, Lagenodelphis hosei, Lontra longicaudis, Megaptera novaeangliae, Pseudorca crassidens, Pteronura brasiliensis, Sotalia guianensis, Stenella longirostris, Steno bredanensis, Trichechus manatus manatus, Trichechus inunguis, Tursiops truncatus

Summary

The Guianas to Amazon Outflow IMMA extends from central Guianas to Maranhão, Brazil overlapping with the Amazonian-Orinoco Influence Zone EBSA. A predominant feature of the IMMA is the outflow, the world's largest river discharge, a low salinity (<35 ppt) plume with high

Guianas to Amazon Outflow IMMA

Summary, continued.

concentrations of suspended material and nutrients spreading over thousands of kilometers along the North Brazilian Continental Shelf and the Equatorial Atlantic Ocean. This freshwater plume and its associated nutrients lead to increased productivity, creating an important feeding area for the survival of a rich local community of aquatic mammals. The composition of the IMMA's cetacean community is more similar to those in the Caribbean than to cetaceans of the north-eastern Brazilian coast. The IMMA also encompasses the Great Amazon Reef System, which extends from French Guiana to Pará in Brazil. The IMMA provides habitat for several estuarine and coastal species that are threatened due to their restricted habitat requirements that overlap with human activity. These include the Guiana dolphin (*Sotalia guianensis*), the Amazon River dolphin (*Inia geoffrensis*). These dolphins rely on mangrove ecosystems and estuaries, forming discrete populations with small home ranges. Additionally, the IMMA provides habitat for both the Amazonian manatee (*Trichechus inunguis*) and the West Indian manatee (*Trichechus manatus*), representing unique contact zone where hybrids between both species occur.

Description:

This IMMA extends along the coasts of Suriname (up to the Suriname River), French Guiana and northern Brazil (up to São Luis, Maranhão state), and is part of the Amazonian-Orinoco Influence Zone EBSA. Within this IMMA are eight Ramsar sites, including the Amazon estuary and its mangroves.

Figure 1: Guiana dolphins (*Sotalia guianensis*). Photo credit: Collection of Green Heritage Fund Suriname

The estuary of the Amazon and its mangroves cover 3.8 million hectares in Amapá, Pará and Maranhão states, including 23 conservation units primarily designated as sustainable use protected areas. In the east of the IMMA, the Marajoara and Maranhense gulfs in Maranhão state represent dynamic estuarine complexes facilitating substantial solid discharges. Estuaries, coastal lagoons and mangroves are present along the entire northern coast (Abreu, 2015).

The coastal and marine habitats feature shallow depths over extensive mudflats along mostly intact coastal mangrove forests of *Avicennia germinans*, which in French Guiana are interspersed with rocky outcrops. The gently sloping continental shelf extends up to 150 km offshore in French Guiana and includes the Great Amazon Reef System (GARS).

The IMMA is an important environment for two manatee species, the Amazonian manatee (*Trichechus inunguis*) and the Antillean subspecies of the West Indian manatee (*Trichechus manatus manatus*), and two dolphin species, the Guiana dolphin (*Sotalia guianensis*) and the Amazon River dolphin (*Inia geoffrensis*) and its Araguaian population (Siciliano et al., 2016; Costa et al., 2017).

Criterion A: Species or Population Vulnerability

The Guiana dolphin (*Sotalia guianensis*) has a discontinuous distribution along most of its range along the Atlantic coast of northern and eastern South America, and small resident populations can be found in distinct pockets of habitat in mangrove

Figure 2: *Inia araguaiaensis* in Mocajuba. Photo credit: Paulo H. Ott

ecosystems, estuaries and bays (Bordin et al., 2022; Domit et al., 2021; Marmontel et al., 2021; Pool, 2019; Domit et al., 2021). Although the species is thought to occur along this entire range, Guiana dolphins usually form discrete populations, in which individuals typically have relatively small home ranges (Domit et al., 2021 and references therein). In 2018, the global IUCN Red list status of the Guiana dolphin was changed from Data Deficient to Near Threatened (Secchi et al., 2018). However, in French Guiana the Guiana dolphin is listed as *Endangered* (Moncorps et al., 2017) and in Brazil as *Vulnerable* (Secchi et al., 2018).

The Amazon Outflow IMMA is important for the survival and recovery of the Amazon River dolphin (*Inia geoffrensis*) which has been assessed as *Endangered* on the IUCN Red List of Threatened Species (Da Silva et al., 2018), and two species of manatees: the West Indian (*Trichechus manatus*) and the Amazonian manatee (*T. inunguis*) both globally classified as *Vulnerable* on the IUCN Red List (Deutsch et al., 2008; Marmontel et al., 2016) and *Endangered* in French Guiana (Moncorps et al., 2017). Moreover, the Amazon River plume has led to the expansion of the geographic distribution of the Araguaian form of *Inia geoffrensis,* the only endemic cetacean of Brazil, into the shoreline of Marajó Bay and to the east, into the Curuçá Estuary, the eastern part of the Amazon Delta (Pará River) and approximately 500 km downstream of the Tucuruí Dam (Siciliano et al., 2016).

Some studies indicate that the West Indian manatee population in South America has declined over the years due to various anthropogenic factors (Lima et

Figure 3: Dolphin perfume charm" from Tijuca, Rio de Janeiro, Rio de Janeiro state. Usage of cetacean product as 'love charm' in Brazil had threatened the Amazon river dolphin population. Photo credit: Siciliano et al. (2018)

al., 2011; Alves et al., 2013; Alves et al., 2015). Meirelles et al. (2022) evaluated the extinction risk of the West Indian manatee in Brazil. Although available data on the species' abundance and mortality are not sufficient to apply the IUCN criteria, the authors worked with limited information following the guidelines, inferring, and projecting based on evidence to produce information and properly evaluate the West Indian manatee risk of extinction. The results indicated that *T. manatus* is Critically Endangered in Brazil due to the extremely high suspected and projected population reduction (≥80%) in the past and the future. Furthermore, although the causes of significant mortality were reduced in some parts of the species' range, such as from hunting, other threats are increasing and are not expected to decrease in the coming decades.

Bonvicino (2020) established the presence of the Amazon manatee throughout the lower Amazon and its tributaries, including Marajó Island and its Atlantic coast and coastal islands, and from the northern (Amapá state, Brazil) to the southern shore of the Amazon estuaries (Pará state, Brazil). The current IMMA also hosts a hybridization zone of West Indian and Amazonian manatees. There are records of interspecific hybrids of *T. inunguis* and *T. manatus* close to the Amazon River mouth and along the Guiana Shield coastline (Noronha et al., 2022).

Criterion B: Distribution and Abundance Sub-Criterion B1: Small and Resident Populations

The Guiana dolphin has a discontinuous distribution along most of its range and small resident populations are present year-round in small pockets in estuaries and bays (Bordin et al., 2022; Marmontel et al., 2021; Pool, 2019). These areas are used by these resident populations for feeding, mating, resting, and

Figure 4: Guiana dolphins (*Sotalia guianensis*) spyhopping. Photo credit: Marijke N. de Boer

all biological functions related to reproduction, such as giving birth, nursing and caring for calves (Pool, 2019).

There are few abundance/density studies of Guiana dolphin distribution. Large scale aerial surveys conducted in 2008 and 2017 estimated Guiana dolphin abundance/density in French Guiana to be roughly 1,700 individuals (95% CI: 700-4 000; Laran et al., 2019; Mannocci et al., 2013). However, with coastal aerial surveys conducted in 2013,2014 and 2019 concluded lower estimates (Bordin et al., 2022).

Currently, the size of the population of Guiana dolphins in the Suriname River estuary is estimated to be between 80-100 based on photo identification. Of these, 67 are identified using dorsal fin identification and mark and recapture methodology, and some individuals have been resighted on multiple occasions since 2007 (Pool, 2019).

Criterion C: Key Life Cycle Activities Sub-Criterion C1: Reproductive Areas

The West Indian manatee and the Amazonian manatee occur in the Marajó Bay area and in the inlets and channels near Belém (under the influence of the Amazon River Plume). The Amazon Aquatic Mammal Study Group (GEMAM) coordinates a collaborative network to locate manatees trapped in fishing nets and conduct rescues along the coast of the state of Pará and in the interior of Belém. The presence of the Amazonian manatee is confirmed with the rescue and sightings of calves and adults in the great Belém area (Emin-Lima et al., 2021). On October 31st 2021, Amazonian manatees were sighted swimming near a beach in the Mosqueiro district, in greater Belém where mating behaviour was filmed by residents and tourists.

Both species of manatees are threatened by anthropogenic factors, such as habitat loss due to coastal mangrove destruction, and bycatch in fishing gear (Parente et al., 2004; Borges et al., 2007; Meirelles, 2008; Silva et al., 2016).

Strandings of neonates and calves of both species have been reported in the Amazon estuary, Tocantins Bay and Oiapoque estuary, all important breeding sites for both, West Indian and Amazonian manatees (Parente et al., 2004; Borges et al., 2007; Meirelles, 2008; Silva 2015).

Sub-Criterion C2: Feeding Areas

The discharge of the Amazon River plume promotes a change in the freshwater layer and consequently in local productivity (Tosseto et al., 2022), creating an important feeding area for all coastal species, including Guiana dolphins and Amazonian manatees, as well as other aquatic vertebrates, such as fishes and sea birds (Siciliano et al., 2008; Costa et al., 2017; Costa et al., 2020; Tosseto et al., 2022).

The coastal waters of the IMMA are largely influenced by the massive suspended-sediment discharge, causing mega-turbidity on the shelf, a growth of a subaqueous delta and an intermediary salinity (Tosseto et al., 2022). All these factors have a direct influence on oceanic biodiversity, including marine species, coral reef endemics and threatened species completely dependent on ecosystems such as estuaries, mudflats, sandy beaches and, particularly, littoral mangroves (Artigas et al., 2003).

A study of bone and teeth samples collected from museum samples and stranded or floating aquatic mammal carcasses in the Amazon estuarine complex and adjacent coastal zone and along Northeastern coast of Brazil included 220 samples of Guiana dolphins, and 11 from Amazonian manatees. Stable isotope analysis to analyse trophic relationships revealed that both species were feeding in the area, and that there was clear resource partitioning between Guiana dolphins and Amazonian manatees. Isotopic niches were highly distinct, with no overlap among these two species inhabiting the Amazon plume. The study also indicated that both species had a fairly wide variety in their prey base and their 'isotopic niche', suggesting high habitat plasticity (Costa et al., 2020).

Criterion D: Special Attributes
Sub-Criterion D1: Distinctiveness

The West Indian (*Trichechus manatus*) and Amazonian (*T. inunguis*) manatee have an overlapping distribution at the mouth of the Amazon River. A result of this sympatry is the occurrence of hybrids, which are frequently found along the coasts of Amapá state in Brazil, French Guiana and Guyana. New genetic evidence (Lima et al., 2019) indicates the occurrence of a concentration of hybrids along the Guianas Shield coastline, which is an interspecific hybrid zone that also separates *T. manatus* populations located east (Brazil) and west (Caribbean, Gulf of Mexico, Florida and Antilles). In addition, Lima et al. (2019) suggest that this hybrid population, which occupies a unique mangrove-rich environment under strong influence of the Amazon River plume, requires independent conservation management measures.

The presence of hybrid manatees in this area under influence of the Amazon plume seems to be correlated both to the isolation of the western and eastern *Trichechus m. manatus* and the sympatric area between *T. inunguis* and *T. m. manatus* specimens (Vianna et al., 2006; Santos et al., 2016; de Oliveira et al., 2022).

Figure 5: *Omar* the hybrid manatee from Marajó Island, Pará. Photo credit: R. Baleia

Sub-Criterion D2: Diversity

The Amazon Outflow encompasses the Amazon River plume, including estuarine, coastal and oceanic zones. According to Siciliano et al. (2008) and Costa et al. (2017) local aquatic mammal richness ranged from 15 to 22 species, and the most common species are Guiana dolphins, Amazon river dolphins, and West Indian manatees (Siciliano et al., 2008; Santos et al., 2016; Costa et al., 2017). Common bottlenose dolphins (*Tursiops truncatus*) are also common throughout the IMMA (Mannocci, 2013; Pelagis, 2021). Additional species encountered during vessel-based and aerial surveys of the coastal areas of the IMMA include humpback whales (*Megaptera novaeangliae*), short-finned pilot whales (*Globicephala macrorhynchus*), false killer whales (*Pseudorca crassidens*), Risso's dolphins (*Grampus griseus*), rough-toothed dolphins (*Steno bredanensis*), Fraser's dolphins (*Lagenodelphis hosei*), common dolphins (*Delphinus delphis*), and spinner dolphins (*Stenella longirostris*) (Ramos et al., 2001; Costa et al., 2017; Pelagis, 2021; https://www.obsenmer.org/maps; Pusineri et al., 2021; De Boer, 2022). In addition, two species of otters are encountered in the area – giant otters (*Pteronura brasiliensis*) (e.g. Carter & Rosas, 2008; Duplaix et al., 2018) and neotropical otters (*Lontra longicaudis*) (e.g. Lopes Rheingantz, 2014).

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