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Pompeyo (Photo: Sarita Benavides)

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## **Note from IUCN SSC Global Center for Species Survival:**

The Species Survival Commission is now encouraging species specialist group members to include their SSC affiliation on all relevant documents and publications, in addition to their respective home institutions. This is a win-win situation, in that it gives further IUCN credibility to members and their publications, and allows the SSC to track specialist group contributions. As a member of the Sirenia Specialist Group, please feel free to add the following affiliation to any work you deem relevant to Sirenia conservation:

*IUCN Species Survival Commission Sirenia Specialist Group*

New e-book to be published by Springer in the next few weeks

<https://link.springer.com/book/9783030907419>

## **Ethology and Behavioral Ecology of Sirenia**

Edited by Helene Marsh

Despite their rich fossil history, there are only four surviving species of sirenians or sea cows, the only fully aquatic herbivorous mammals. The three species of manatees and the dugong live in the coastal waters, rivers and lakes of more than 80 tropical and subtropical countries and are all on the IUCN Red List of Threatened Species. This book examines sirenian conservation biology through the lens of their behavioral ecology and ethology. Sirenian feeding, diving, movement, social and reproductive behaviors are reviewed by an international team of scientists from eight countries, with an emphasis on data gathered in the past 15 years.

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## LOCAL NEWS

### AUSTRALIA

#### **Implementation plan for dugong population surveillance in the Southern Great Barrier Reef, Australia**

Standardized observer aerial surveys have provided data on the distribution and abundance of the dugong in various parts of its range in Australia, including the Great Barrier Reef World Heritage Area, since the mid-1980s. Analysis of the time series of surveys conducted in the southern Great Barrier indicate that the dugong population in this region is declining and a resurvey of the area is overdue.

The emergence and rapid development of aerial imagery-based technologies, including the use of drones, have the potential to enhance the monitoring of dugongs and other species of marine megafauna in the Great Barrier Reef and globally. Necessary steps towards the use of such new survey methods and tools are to obtain a comprehensive understanding of the state of knowledge of the technology and essential considerations for the transition from observer surveys to aerial imagery surveys, and to assess the applicability of new survey technologies to the survey of dugongs in the Great Barrier Reef.

Our team is currently developing a Transition Strategy for implementing drone surveys for dugongs, with particular reference to large-scale surveys such as the sGBR survey. The transition will be outlined as a series of steps and considerations; from which we will determine the appropriate survey approach for the next sGBR survey. The latter will form the basis of a 2022 sGBR Aerial Survey Plan that will incorporate aerial imagery techniques and will aim to provide the most accurate dugong population estimate possible, and will explicitly outline how data obtained using new techniques will be compared to historical surveys.

Our work will be achieved (1) in consultation with experts in the field of wildlife imagery surveys and data processing and analysis, and (2) in liaison with Traditional Owners associated within the sGBR region to ensure that our approach is scientifically sound and culturally acceptable.

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*Work undertaken for the Department of Agriculture, Water and the Environment, Commonwealth of Australia.*

## BRAZIL

### **West Indian manatee (*Trichechus manatus*) extinction risk in Brazil was assessed and revealed the population is Critically Endangered**

In Brazil, the West Indian manatee (*Trichechus manatus*) was intensively hunted in the past and currently faces several threats. Overhunting resulted in the species extirpation in the southern range of its distribution, in the states of Espírito Santo (ES), Bahia (BA), and Sergipe (SE) (approximately 1,500 km of coast) (Whitehead, 1977, 1978; Albuquerque & Marcovaldi, 1982; Domning, 1982; Lima, 1997) and several other areas, leading to low abundance and discontinuities in distribution (Alves et al., 2013, 2016; Lima, 1997; Luna et al., 2008, 2010). Human threats are acting simultaneous and synergistically on West Indian manatees as a result of their coastal and estuarine habitats, and these threats are not expected to diminish, rather their magnitude is likely to increase.

One important step for species conservation planning is to characterize extinction risk (Miller et al., 2007), which must be periodically reassessed because new information, taxonomic changes, errors in previous assessments, modifications in assessments, and changes in threats (increase, decrease or the emergence of new threats) may result in a change of category. Although West Indian manatee extinction risk was assessed by the Brazilian Federal Government (MMA, 2014), it was based only on available data at the time. To elaborate a more accurate assessment, we generated information based on currently available publications, following the IUCN guidelines (IUCN, 2012a, 2012b, 2019).

Criterion B Extent of Occurrence (EOO) was calculated at 34,899 km<sup>2</sup> by using the manatee density estimated along the coast of Ceará and Rio Grande do Norte states (Petrobras, 2014), with a species population size at the national level projected in 1,047 individuals (95% CI: 538–2,038). Six scenarios of annual mortality were inferred based on the strandings reported in the area, and considering that strandings represent only a small fraction of animals that died at sea. We decided to adopt the conservative approaches of 33% (Wells et al., 2015) and 50% of dead animals that are found ashore, avoiding the worst-case scenarios. We adopted a simple discrete logistic growth model to project population reduction in the past and future (three generations – 69 years) in 18 scenarios (Figure 1). Among the 18 projected scenarios, four resulted in extinction, six in decline and eight in population growth. Considering the low abundance bound, all scenarios indicate a reduction larger than 80% in population size, classifying the species as ‘Critically Endangered’ based on A4de (Figure 2).

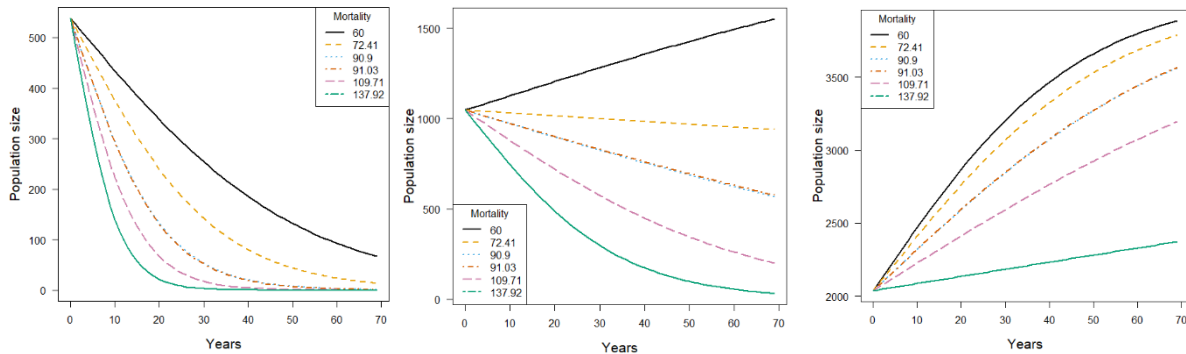


Figure 1. Eighteen scenarios of population growth projected for the West Indian manatee population from 2014 to 2083, considering three initial sizes: 538, 1,047 and 2,083 (Source: Meirelles et al., 2022).

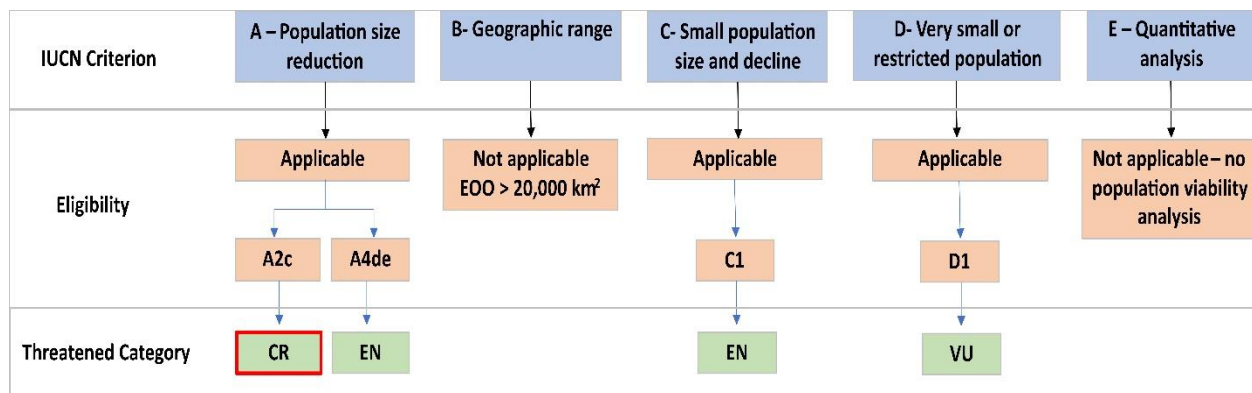


Figure 2. A summary of the assessment process and the higher extinction risk category identified (Source: Meirelles et al., 2022).

We are not against a species downlisting, on the contrary, we consider that a reassignment to a lower threat category, when made based on more complete information and/or following the implementation of successful conservation measures, is a positive outcome and deserves celebration. However, this is not the case here. Neither Luna et al. (2018) presented evidence to the downlisting, nor did our results point to a lower threat category. This finding raises a red flag and indicates that *T. manatus* conservation actions effectiveness in Brazil needs to be evaluated, also considering population differences between Brazilian West Indian manatees and others, as well as interspecific hybridization (with *T. inunguis*) are not properly considered.

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## **Are harpoons regularly produced in the Central Amazon a threat to manatees?**

The practice of harpooning manatees in the Amazon is well-described for hunting these mammals at least since the 1990s (Luna et al, 2008; Siciliano et al, 2021). As a result of the advance of the Brazilian conservation legislation, hunting has decreased in most manatee distribution areas. In this regard, the Brazilian National Conservation Action Plan (PAN) for mammals in the Amazon foresees as a priority action to carry out the compilation and availability of information related to manatee hunting to subsidize inspection activities. In this context, this study aimed to report the current sales of hunting gear in Brazil.

A recent technical visit by ICMBio/CMA in February 2022 to the town of Itaituba, in southwestern Pará, in the Brazilian Amazon, confirmed harpoon sales in commercial establishments for hunting manatees. On that occasion, steel-made harpoons were easily found ranging from R\$14,00-70,00 (≈ US\$ 14 – 28.00). Local sellers mentioned that the harpoons were homemade, and that the last known craftsman lives in the city. He informed the team that, as a young 15-year-old (he is currently over 60 years old) he learned to hunt manatees from his father to provide food for his family and neighbours. This strategy of sharing food imposes an obligation on others to reciprocate. He also spoke about harpooning techniques and that the harpoon has to enter the animal's head from the front so that it dies soon and does not sink the canoe. Hunting was limited to locations far from cities. He himself hadn't hunted in over thirty years, but still manufactured about 30 hunting gear pieces a month. An Itaituba survey confirmed that these harpoons are sold in at least three commercial establishments.

Two types of harpoons were found, a trident and a single spear (Fig. 1 A, B). This equipment can be split into three parts, the rod, the harpoon itself and the rope (Fig. 1, C, D). The harpoon is located at the end of the shaft and several cords are attached to the rope. After the assembly is thrown towards the animal, the rod is released, with the barbed tip of the harpoon remaining inside the animal, and the rod is maintained between the animal and the hunter, held by a loop in the main rope.





Figure 1. Types of harpoons found at Itaituba, in the state of Pará, northern Brazil. A. Trident gear. B. Simple gear. C, D. Rod and mooring. Pictures by LHP Jr. and ALF.

When sellers were asked about the origin and production of these hooks, they mentioned Santarém as the location of workshops that regularly produce these tools. Surprisingly, boxes full of these harpoons were found in Itaituba, indicating regular marketing. Sellers indicated the harpoons are also sold in two other cities, Santarém and Manaus. Currently these harpoons are also used hunt alligators and turtles (Rebêlo et al. 2005), as well as manatees (Domning, 1981).

Although not openly labelled or advertised as a specific product to hunt manatees, the regular production of harpoons should be notified to local managers to track their use in the vast Amazon realm. As manatees may be now recovering from centuries of exploitation, with seemingly increasing numbers, hunting pressure may become a threat to this endangered species once more.

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## **An infant West Indian manatee born contaminated by metals: A direct effect of the 2019-2020 oil spill in northeastern Brazil?**

The most destructive environmental disaster in the South Atlantic Ocean basin and tropical oceans took place from August 2019 to January 2020, when an oil spill reached the northeastern and southeastern Brazil coastlines (Soares et al., 2020a, 2020b). This significantly affected threatened ecosystems such as mangroves, seagrass meadows, coral reefs, estuaries, sandy beaches and rhodolith beds resulting in severe ecological and human health impacts (Magalhães et al. 2021). This accident affected over 325 km<sup>2</sup> of Brazilian seagrass meadows (Magris and Giarrizzo, 2020), directly impacting one of the most threatened aquatic mammals in Brazil, the West Indian manatee (*Trichechus manatus manatus*), classified as endangered by the Brazilian Ministry of the Environment (MMA, 2014, 2018) and as vulnerable by the IUCN (Deutsch, Self-Sullivan and Mignucci-Giannoni, 2008). Particularly, Alagoas and Pernambuco coastline have been the most impacted area by the oil spill. As such, the oil also reached areas frequented by released and native manatees, in the state of Alagoas, almost daily for at least four months, contaminating the seagrass meadow at low tides (Magalhães et al, 2021).

Local wild manatees could not avoid feeding on contaminated seagrass and macroalgae, leading to significant concerns, especially as several oil components are notably toxic. These include metals, which are highly persistent in the environment, able to bio-accumulate and, in some cases bio-magnify throughout food webs, and many are noted as highly carcinogenic and mutagenic (Singh et al., 2011). Furthermore, maternal transfer of many metals has been observed for several mammal groups,

including dolphins (Lahaye, et al., 2007), seals (Wagemann, 1988) and elephant seals (Habran et al., 2011). No studies have, however, been conducted for the West Indian manatee in this regard.

Our research group came across an infant West Indian manatee, measuring 123,0 cm in total length, dead on Praia de Bitingui (09°05'59.0" S, 35°15'32.2"W), Japaratinga, Alagoas (Figure 1) on the 14th of August, 2021. The specimen was estimated to be about two weeks old (still displaying umbilical cord remnants), male, with no sign of the mother in the vicinity. ICMBio staff of the APA Costa dos Corais (APACC) was called by local partners through information from a tourist who was passing by the beach and spotted the calf carcass.

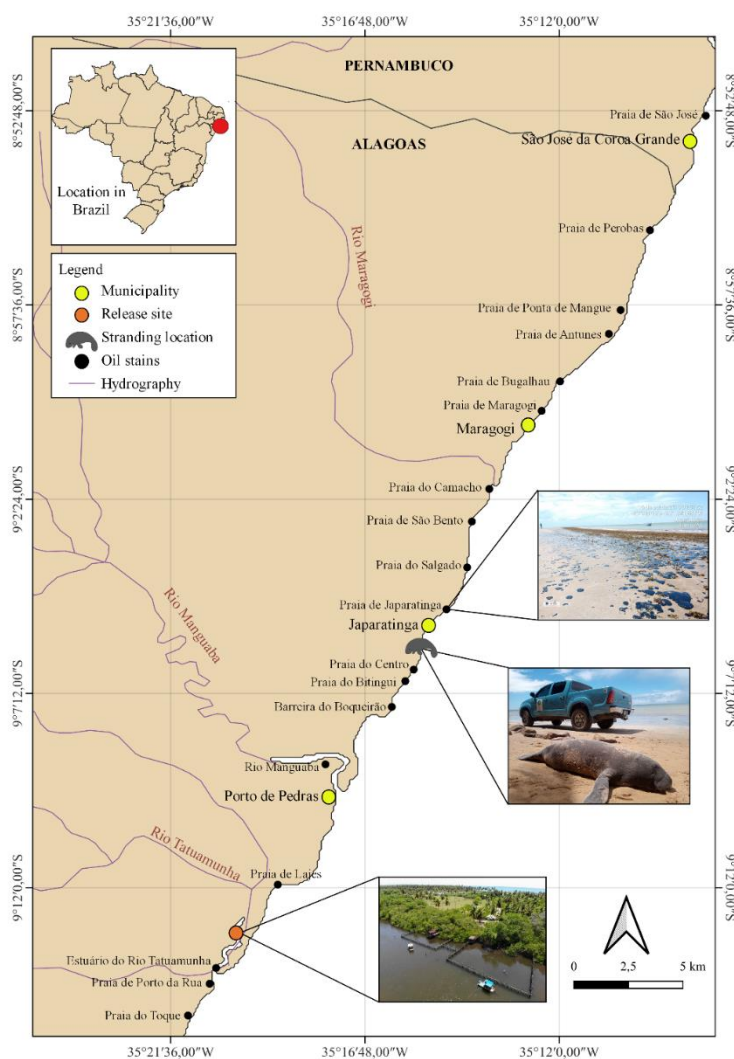


Figure 1. Spatial distribution of oil stains on the north coastline of Alagoas and the stranding location of manatee calf. Black circles are oiled beaches, yellow circles municipalities, orange circle is captivity acclimatization and manatee release site in Porto de Pedras (AL). Images: Oiled beach in Japaratinga, on 16/10/2019 <https://www.ibama.gov.br/manchasdeoleo-galeria#imagens>; stranding location (APA Costa dos Corais collection, photo by Ledenilson Santos, aerial photo of the captivity (Caio Salles).

The carcass was taken to APACC facilities for biometric assessments and a detailed examination (Figure 2). The carcass was then frozen for a subsequent necropsy. On November 8, 2021, the necropsy was performed for tissue sample collection and a general evaluation (Figure 3). A muscle sample was removed for metal analyses, performed through inductively coupled plasma mass spectrometry.



Figure 2. External evaluation of a stranded manatee calf in Alagoas, Japaratinga, August 2021. Note typical newborn skin folds and umbilical cord remnants. Photo by A.F. Costa.



Figure 3. Newborn specimen during the necropsy performed at the ICMBio/CMA facilities in Itamaracá, Pernambuco on November 2021. Photo CMA collection.

We observed the presence of relatively high nickel and vanadium concentrations, known as crude oil components, as well as other metals, such as lead, and even the rare earth element lanthanum (ranging from 0.005 to 0.0259 mg kg<sup>-1</sup> wet weight), all of which are known to be highly toxic. As the pregnant mother would have fed on contaminated seagrass during her thirteen months of gestation, the presence of these metals is indicative of maternal ingestion, metabolization and transfer to the newborn, most likely caused by the 2019-2020 Brazilian oil spill. This is extremely concerning as, besides being threatened, manatees exhibit low reproduction rates (Anzolin et al., 2012). Even though pollution has recently been identified as a priority for the conservation for endangered groups (Consales and Marsili, 2021; Cooke et al., 2021), environmental contaminant assessments for manatees are still scarce, and this novel maternal metal transfer report, and the first report for a manatee potentially affected by the 2019-2020 oil spill in Brazil, may aid in opening up new field of investigations concerning ecotoxicological assessments and conservation efforts for this flagship marine species.



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## **Organizing the marine mammal collection at the Centro Mamíferos Aquáticos (CMA), Itamaracá, Brazil**

The Center for Aquatic Mammals (Centro Mamíferos Aquáticos) (CMA), located in Itamaracá Isl., Pernambuco, Northeastern Brazil, has a large collection of Brazilian marine mammals, including toothed whales, small cetaceans, pinnipeds and manatees. The CMA marine mammal collection comprises approx. 250 specimens, the oldest of which date back to 1990. In November 2021, a team of professionals began organizing the collection, performing the following: cataloging specimens, along with sorting and identifying; taxonomic arrangements, incorporating new material into the collection and preparing skeletal material, labeling and installing and, by the end, maintaining the database. We note that taxonomic changes are incorporated into the specimen ID's, in the case of previous misidentifications, or name changes. This task included re-labelling specimens accordingly, altering catalogues and re-installing (Figures 1 and 2). Other aspects were checked, including alcohol level maintenance, looking for infestations, and maintaining room air quality. The Antillean manatee (*Trichechus manatus manatus*) is well represented, with at least 160 specimens housed in the collection, covering the species vast distribution in North-Northeastern Brazil. Next steps include the acquisition of new drawers in standard museum cases and installing air conditioning for humidity control. During the skeleton organization, researchers verified that some specimens have extensive bone pathologies, which became the object of study that may contribute towards identifying the cause of manatee strandings. With the work started, it will be possible to tell the manatee project story through the stored samples. In addition, this will serve as a source of studies for national and international researchers in the most diverse research fields. The marine mammal collection at CMA is open for researchers, who should submit a visitation request to the Collection Manager prior to their proposed visit.



Figure 1. Data entry and labelling specimens at Centro Mamíferos Aquáticos (CMA/ICMBio), Itamaracá Isl., Pernambuco, Brazil, in November 2021.



Figure 2. Checking and labelling marine mammal specimens at Centro Mamíferos Aquáticos (CMA/ICMBio), Itamaracá Isl., Pernambuco, Brazil, in November 2021.

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## EAST AFRICA

### **Aerial surveys over the Bazaruto seascape identifies priority zones for conservation interventions**

#### *Summary*

While the wide confidence intervals around the abundance estimates for the dugong (*Dugong dugon*) population in Mozambique's Bazaruto seascape dugong from 2006 – 07 and 2017 - 2021 did not allow for the detection of significant changes over time, what is certain is that this population is still threatened by intense resource extraction and the use of illegal and/or unsustainable fishing gear (Findlay et al., 2011; Cockcroft et al., 2018; Trotzuk et al., 2021). Dugongs in the Bazaruto seascape regularly occupy seagrass meadows targeted by artisanal fisheries, which often depend on net-based methods. One such technique, gill nets, has driven significant declines in dugong populations elsewhere throughout East Africa (Findlay et al., 2011). Indeed, despite being banned in Mozambique, gill nets are still used outside of conservation areas in the Bazaruto seascape, and have been responsible for a number of dugong deaths over the past decade in the region (Cockcroft et al., 2018). To better understand the spatiotemporal relationship between artisanal fisheries and dugong occupancy patterns throughout the Bazaruto seascape and, hence, to inform strategies that mitigate unnatural dugong mortalities, we organized eight semi-structured aerial surveys from 22 November until 2 December 2021. In total, we observed 354 dugongs, of which 13% were calves, along with a variety of other marine megafauna including 159 dolphins and over 1,500 sea turtles. We also recorded 365 independent fishing activities, including the wide-spread use of seine nets throughout the entire seascape and persistent presence of gill nets in remote, unmonitored areas.

Notably, we also observed a large herd of dugongs on three different days (Fig. 1). This group varied between 57 - 71 individuals between days, and is the largest group ever recorded in the Bazaruto seascape. The group was repeatedly detected within the same, relatively small 20-km<sup>2</sup> intertidal zone, located far outside any conservation area. Similarly-sized herds have not been reported elsewhere along the East African coast since at least the 1960s.

Spatiotemporal analysis of overlap between artisanal fisheries and key megafauna reveals priority zones for targeted conservation initiatives such as increased law enforcement monitoring and collaborative sustainable fisheries management, both within and outside the seascape's largest conservation area, Bazaruto Archipelago National Park (BANP).



## *Management Recommendations*

- 1- The estuaries to the south of the Save River should be afforded the highest degree of protection possible if an Environmental Protected Area (EPA) is declared throughout the Bazaruto seascape. Besides supporting the large dugong herd repeatedly observed in this area, the estuaries also hosted impressive densities of turtles and elasmobranchs, including rhinopristiformes.
  - 1.1. Development strategies, such as sustainable fishery management, should focus on communities throughout this area in order to reduce the potential for unnatural dugong mortality. Local buy-in to conservation strategies will be critical to ensure compliance with any high-level regulation. Indeed, these communities' actions and perceptions towards conservation could have significant implications for the regional dugong population.
  - 1.2. Interviews with residents of these communities may also be immensely valuable for contextualizing megafauna population trends and occupancy patterns.
  - 1.3. In order to further understand drivers of megafauna distribution and inform relevant conservation strategies, additional research and monitoring methods should be considered. This objective could be achieved through use of unmanned aerial vehicles (UAVs) in order to analyse finer-scale spatiotemporal distribution of priority species. Given high densities and encounter rates of dugongs and other marine megafauna, the identified estuaries repeatedly visited by dugongs would be an appropriate and logistically feasible study area for this type of research.
2. Dugong habitat within BANP is focused along the Park's western boundary. Conveniently, this area experiences low net-based fishing pressure perhaps due to its relative isolation and deep-water habitats where seine nets are ineffective. As local communities probably have little incentive to start fishing this area, its importance as dugong habitat should be stressed to avoid future exploitation.
  - 2.1. It may be necessary in the future to declare specific seagrass meadows throughout this region as no-netting zones.
  - 2.2. Zonation of corridors and other regulations for tourism-related movements of boats through this area may also help minimize disturbances.
  - 2.3. The tidal flats and seagrass meadows to the south of a large nearby town, Inhassoro, are likely a major zone of human-wildlife conflict, particularly between seine net fishers and turtles and dugongs. Given that turtles were repeatedly seen within nets during the survey in this area, this region should receive targeted alternative livelihoods development, increased law enforcement presence of the appropriate government ministries, such as the Maritime Police, and improved collaboration on fisheries management as soon as possible.

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## GUATEMALA

### Looking for the gentle giants in the dark rivers of Guatemala

Some research efforts on the Antillean manatee (*Trichechus manatus manatus*) and its habitat in Guatemala are related to its population estimate (Quintana-Rizzo 1993), the use and evaluation of their habitat (Romero 2007; Corona-Figueroa 2012) and behavior (Machuca-Coronado 2015). Additionally, there have been some advances in their conservation (e. g. protected areas, public policies) (Machuca-Coronado & Corona-Figueroa 2019); however, it has been difficult since the threats facing the species in our country are still latent.

Currently, there are information gaps regarding the habitat use of this species in Guatemala. Considering that tributary rivers or confluences are heterogeneous habitats favoring the presence of manatees (Jiménez-Domínguez & Olivera-Gómez 2014), one of the concerns we have is to know if the species use the rivers that are not easily appreciable by aerial surveys due to their nature conditions (e. g. dark waters, narrow causes, dense vegetation cover, etc.) (González-Socoloske & Olivera-Gómez 2012).

In this sense, we started a research project to answer this and other concerns related to the habitat of the manatee in Izabal, Guatemala. The objective of our research is to determine the presence of manatees and the characterization of the habitat in the dark waters of the Guatemalan Caribbean (Figure. 1). In January 2022, we conducted a pre-sampling in the Sartoon River with the logistic support of FUNDAECO in order to use the side-scan sonar to detect the presence of manatees and to characterize its habitat (MacLarty et al. 2019) (Figure. 2).

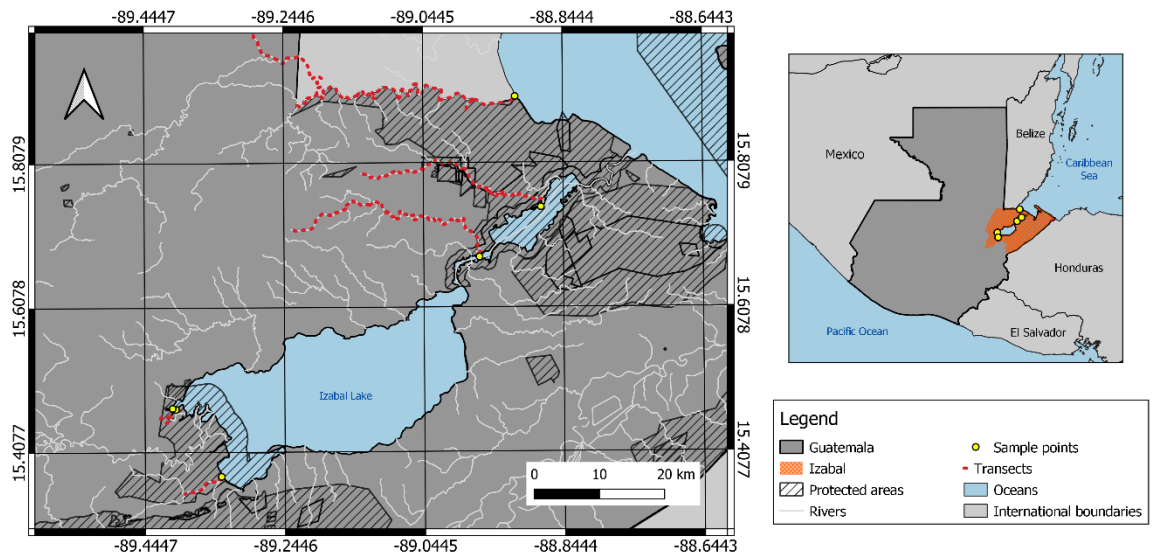


Figure 1. Study area of the project.



Figure 2. Pre-sampling to train on the use of side-scan sonar in the Sarstoon River, Izabal, Guatemala.

This research is part of the undergraduate thesis of two biology students from the Universidad de San Carlos de Guatemala. In addition, this study will have the logistical support of key entities in Izabal. So far, we are looking for funding to cover field expenses; however, we have received the donation of material and equipment from IDEA WILD (Figure. 2). We hope that the results generated through this research will be key inputs to strengthen conservation strategies for the manatee and its habitat in Guatemala.

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## MEXICO

### **Community engagement as a critical element for the rehabilitation of ‘Pompeyo’, a manatee calf rescued in Quintana Roo, Mexico**

Environmental Education (EE) is a lifelong learning process, which promotes critical and innovative thinking, affirms values of citizen responsibility, and facilitates the achievement of environmental sustainability goals (Barraza y Castaño, 2012). A major purpose of EE is to cultivate the necessary skills, principles, and attitudes that an Environmental Citizen should be equipped to be capable to actively influence in the solution of environmental problems (Parra et al 2020). Therefore, EE is a keystone element for the management and conservation of wild fauna, particularly for the Antillean manatee, an Endangered subspecies of the Order Sirenian.

With this in mind, a socialization and awareness campaign was launched in the communities of Laguna Guerrero and Raudales (Quintana Roo), as a cornerstone element of the rehabilitation process of Pompeyo, an orphan manatee calf. This manatee was rescued in August 2021 (See Castelblanco-Martinez et al 2021 for details) and is currently undergoing a rehabilitation program in the facilities of the Center for Care and Rehabilitation of Aquatic Mammals (CARMA), located in Laguna Guerrero town and near to Raudales town. The main objective of the educational campaign is to share with the local community the principles and phases of the rehabilitation process, as well as promoting community participation during the release and subsequent monitoring of the manatee.

The socialization process during this first stage consisted of conducting informative and awareness-raising talks in rural schools in the area, from preschool to junior high school. To accomplish this, we are using the educative-entertainment methodology (Tomatis-Riofrío, 2017), adapted for each educational level. During the talks, information was provided about the biology, life history and behavior of the manatees, as well as their conservation status and threats. We shared with the students the importance of this rehabilitation process, not only for Pompeyo but also for the local population of manatees, as well as the plans for its release and post-release (Figure 1).



Figure 1. Awareness campaign of Pompeyo's rehabilitation in schools of Laguna Guerrero and Raudales Quintana Roo.



During this first stage, we visited five schools for preschool education (n=2), primary education (n=2) and junior high school (n=1). A total of 207 students between three and fifteen years old, and nine basic level teachers (preschool, primary and junior high school) were reached (Figure 2).



Figure 2. Awareness campaigns regarding manatees in preschool, primary and secondary schools in Laguna Guerrero and Raudales, Quintana Roo

In addition, a logo was created to give identity to Pompeyo's rehabilitation process (Figure 3). The logo will be printed on several outreach materials, such as t-shirts, stickers, signs etc., and used in social media.



Figure 3. Logo of the Pompeyo's rehabilitation process

Environmental education processes are the basis for long-term conservation projects. Thus, it is extremely important to involve the community in each of the phases of the project, especially when dealing with endangered fauna such as the Antillean manatee.

### **Acknowledgements**

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## **PHILIPPINES**

### **Category 5 Typhoon Rai strikes dugong area in Roxas, Palawan: some implications for designing dugong conservation areas in the Philippines**

Dugongs have been documented in the Municipality of Roxas (Palawan, Philippines) for at least 27 years. Based on a 1994 aerial survey, JICA and DOT (1997) illustrated that eleven out of 56 sightings were in Roxas. Albasin and her colleagues (2003) found that 97% from among 350 Roxas fishermen interviewed had seen dugongs. Recently, Pilcher and his colleagues (2021) reported that fishermen interviewed still encountered dugongs in Roxas.

On December 17, 2021, Category 5 Typhoon Rai struck the Philippines, making nine landfalls, including Roxas, Palawan. On the national level, the widespread damage and destruction has been similar to the 2013 Category 5 Typhoon Haiyan (one of the strongest typhoons known to hit land). Super Typhoon Rai's tally as of March 2022: 11.8 million people affected, 1.7 million houses damaged, 426,000 homes destroyed (UN OCHA, 2022).

Biophysical assessments of Roxas' marine ecosystems are still forthcoming. In the meantime, applying the adage "as above, so below" (which been used to aid visualization of submerge landscapes based on above sea level, terrestrial features; Rickard 2017), it can be surmised that damage along the nearshore ecosystems would have also been appalling.

In 2013, Typhoon Haiyan struck two known dugong areas: (1) Concepcion, Iloilo; and (2) the Calauit-Coron-Culion-Busuanga complex in Palawan. The track of 2021 Typhoon Rai was along lower latitudes that had been categorized as having low probability to typhoon strikes.

Based on the foregoing, some implications to dugong conservation present themselves:

1. Since most typhoons that strike the Philippines are "born" in the Pacific Ocean, which is situated to the east of the country, eastern coasts of the Philippine Islands (such as Roxas Municipality) have a higher vulnerability to typhoon effects.
2. Although only a single event, Typhoon Rai's track signals a need for a higher degree of disaster risk reduction and preparedness to extreme hydrometeorological events, even



in the lower latitudes of the Philippines which were previously thought as having a low probability of typhoon strike.

3. Considering the first two implications, designing conservation areas for dugongs in the Philippines require a wider area, of lower latitude (for instance, Puerto Princesa City), and may need to prioritize the western shorelines (in the case of Palawan Island, the El Nido-Taytay Managed Resource Protected Area, the Malampaya Sound Protected Landscape and Seascape and the Puerto Princesa Subterranean River National Park).

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## **PUERTO RICO**

### **Antillean manatee ophthalmology case report**

An Antillean manatee calf rescued in Puerto Rico was admitted to the Caribbean Manatee Conservation Center, Puerto Rico's manatee critical care facility, with vision impairment and a condition called exophthalmia (eyes protruding). Immediately a team of veterinarians, a veterinary ophthalmologist, and marine biologists got to the task of treating the manatee calf and recovering his condition. Led by veterinarian Lesly Cabrias and board-certified veterinary ophthalmologist Dineli Bras, the manatee was aggressively treated in a combined endeavor that included medications, nutritional support, and water quality management. As a result, his exophthalmia and vision problems were resolved in a month and a half.

The medical case of Bajari (Figure 1), the name of the male manatee calf, was recently published in the peer-reviewed journal of Veterinary Ophthalmology. The article “Medical management and resolution of perinatal bilateral exophthalmia and secondary corneal ulcers in an Antillean manatee (*Trichechus manatus manatus*) neonate from Puerto Rico” (<http://doi.org/10.1111/vop.12983>), details the treatment and steps taken to correct his vision impairment and stabilize his rehabilitation.

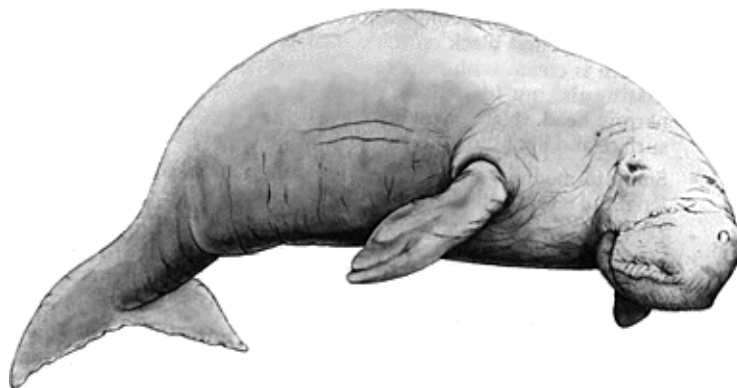
Following this protocol, the team also assisted another manatee calf patient in Colombia, South America, with vision loss due to corneal ulcers. This cooperative effort exemplifies how veterinary clinical, veterinary specialization, and academia can successfully treat and manage manatee cases in the Caribbean and contribute essential information through peer-reviewed publications that would help other manatee facilities in the US and Latin America to help injured, ill, or orphaned manatees survive.



Figure 1. Bajari

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**Sirenews – Dugong**  
(End of local news)

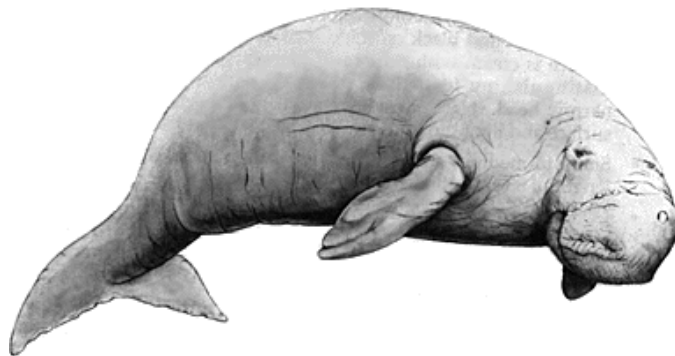
## UPCOMING SYMPOSIA/CONFERENCES

### TENTH INTERNATIONAL SIRENIAN SYMPOSIUM

## HOLD THE DATE!

The International Sirenian Symposium in conjunction with the 24th Biennial Conference on the Biology of Marine Mammals in Palm beach, Florida, USA has been rescheduled until August of 2022. Further details for this Symposium will be forthcoming early next year.

For questions, please contact Nicole Adimey ([adimey22@gmail.com](mailto:adimey22@gmail.com))



**Sirenews – Dugong**

## UPCOMING SYMPOSIA/CONFERENCES

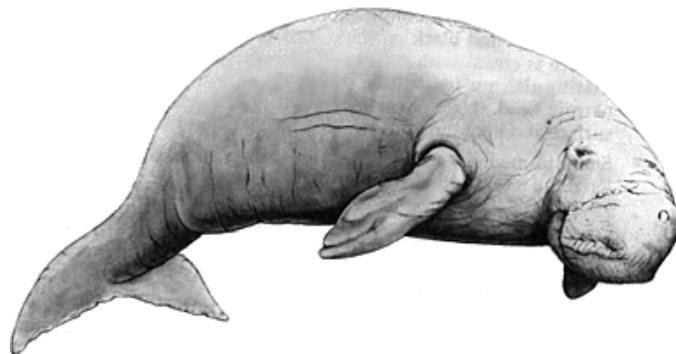
### SMM2022

### HOLD THE DATE!

### A SEA CHANGE: Transforming Science into Stewardship

UPDATE: Both the in-person and the virtual 24th Biennial Conference on the Biology of Marine Mammals postpone until 2022. The new dates will be Monday, August 1 to Friday, August 5, 2022 with workshops being held on Saturday, July 30 and Sunday, July 31, 2022. All conference venues will remain the same.

conference website ([smmconference.org](http://smmconference.org))



**Sirenews – Dugong**  
(End of upcoming conferences)

## UPCOMING SYMPOSIA/CONFERENCES

### WORKING MEETING OF SOUTH AMERICAN SPECIALISTS IN AQUATIC MAMMALS (RT)" AND "SOLAMAC CONGRESS (LATIN AMERICAN SOCIETY OF SPECIALISTS IN AQUATIC MAMMALS)

## HOLD THE DATE!

The biannual event "Working Meeting of South American Specialists in Aquatic Mammals (RT)" and "SOLAMAC Congress (Latin American Society of Specialists in Aquatic Mammals)" is the most important scientific forum in Latin America on the research and conservation of aquatic mammals, considered vital for the balance of the environments in which they live. The theme of the 19th RT/XIII SOLAMAC will be: "Aquatic Mammals in the Anthropocene: Challenges and Conservation Perspectives"



The last RT happened in Lima, Peru, in 2018. Next conference will be in Bahia in Brazil, initially scheduled to occur in 2020, due to the COVID-19 pandemic the date has been postponed, and now set to take place between 11 and 15 September 2022. As such, all efforts have been resumed to hold the event. Praia do Forte, Bahia, is a world tourism destination, best known for its natural beauty and excellent infrastructure.



*Praia do Forte, Bahia, Brazil*



*Praia do Forte Village.*

In order to bring the participants of the 19th RT/XIII SOLAMAC closer to the researchers and topics that will be discussed during the event, we have prepared talks/presentations in social media since September 2021, and which will continue until shortly before the event. All have been broadcast through the RT channel | SOLAMAC (Instagram and YouTube).

The RT is a great opportunity to take part in pre-conference workshops and courses on the themes proposed by SOLAMAC members. Pre-conference workshops and courses will be held in the Convention Centre, Humpback Whale Project and other adequate local venues on Saturday 10th and Sunday 11th September 2022, depending on demand.

The Conference schedule will be 5 days, starting on Sunday, September 11th with keynotes, poster presentations, roundtables, and opportunity rounds. The program also includes evening cultural activities (subject to local health and safety protocols) such as video screenings, live music and the traditional SOLAMAC awards. Friday will be reserved for whale watching (optional) with local tour operators.

### **Organization**

Universidade Federal do Recôncavo da Bahia - UFRB

Universidade do Estado do Rio Grande do Norte - UERN

Universidade Federal do Rio Grande do Norte - UFRN

Instituto Chico Mendes de Conservação da Biodiversidade – Centro Nacional de Pesquisa e Conservação de Mamíferos Aquáticos – ICMBio/CMA

Centro de Estudos e Monitoramento Ambiental - CEMAM

Laboratório de Biologia Aquática e Comportamento Animal - LEAC

Projeto Cetáceos da Costa Branca - PCCB

Projeto Golfinho Rotador \_PGR

Projeto Viva

Instituto Baleia Jubarte - IBJ

### **Deadlines**

- Abstract submission (**April 1 to June 15**)
- Early bird registration (May 15 to August 1)
- Standard registration (August 2 to September 08)
- On-site registration (September 09 to September 15)



**Information:**

E-mail: [contato.19rtsolamac@gmail.com](mailto:contato.19rtsolamac@gmail.com)

Instagram: <https://www.instagram.com/19rtbrasil/>

**General Coordinators**

Prof. Dr. Marcos Rossi-Santos (UFRB-UFBA)

Prof. Dr. Flávio José de Lima Silva (UERN/PGR)

Organizing Committee

Prof. Dr. Marcos Rossi-Santos (UFRB-UFBA)

Prof. Dr. Flávio José de Lima Silva (UERN/PGR)

Dra. Fernanda Löffler Niemeyer Attademo (ICMBio/CMA / CEMAM)

Aline Bomfim Ventura (CEMAM)

MSc. Márcia Engel (IBJ)

MSc. Luena Fernandes (IBJ)

MSc. Rafaela Cristina Faria de Souza (IBJ)

Dra. Fábria de Oliveira Luna (ICMBio/CMA)

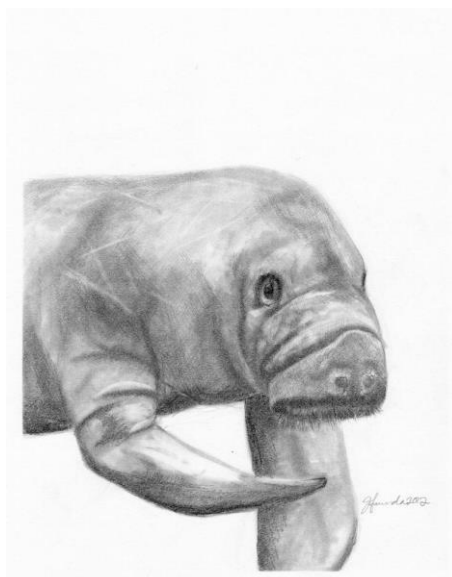
MSc. Adriana Vieira de Miranda (ICMBio/CMA)

Dr. Juan Pablo Torres-Florez (ICMBio/CMA)

Profa. Dra. Renata Sousa Lima (UFRN)

Dra. Maria Emilia Morete (VIVA Instituto Verde Azul)

Biol. Marina Leite Marques (VIVA Instituto Verde Azul)



***Sirenews* – Florida manatee**  
(End of upcoming conferences)

## RECENT LITERATURE

- Allen AC, Beck CA, Sattelberger DC, Kiszka JJ. 2022. Evidence of a dietary shift by the Florida manatee (*Trichechus manatus latirostris*) in the Indian River Lagoon inferred from stomach content analyses. Estuarine, Coastal and Shelf Science. <https://doi.org/10.1016/j.ecss.2022.107788>
- Cabrias-Contreras LJ, Bras-Silva ID, de Angel-Ramírez JE, Escobar-Torres SM, Fernández-Martínez R, Hernández-Lara E, Rivera-Guzmán AL, Rivera-Pérez CI, Mignucci-Giannoni AA. 2022. Medical management and resolution of perinatal bilateral exophthalmia and secondary corneal ulcers in an Antillean manatee (*Trichechus manatus manatus*) neonate from Puerto Rico. Veterinary Ophthalmology. <http://doi.org/10.1111/vop.12983>
- Derville S, Cleguer C, Garrigue C. 2022. Ecoregional and temporal dynamics of dugong habitat use in a complex coral reef lagoon ecosystem. Sci Rep. <https://doi.org/10.1038/s41598-021-04412-3>
- Landsberg JH, Tabuchi M, Rotstein DS, Subramaniam K, Rodrigues TCS, Waltzek TB, Stacy NI, Wilson PW, Kiryu Y, Uzal FA, de Wit M. 2022. Novel Lethal Clostridial Infection in Florida Manatees (*Trichechus manatus latirostris*): Cause of the 2013 Unusual Mortality Event in the Indian River Lagoon. Frontiers in Marine Science. <https://doi.org/10.3389/fmars.2022.841857>
- Mignucci-Giannoni AA, Cabrias-Contreras LJ, Dennis MM, Escobar-Torres SM, Ghim S, Howerth EW, Landrau-Giovannetti N, Rivera-Guzmán AL, Rivera-Pérez CI, Joh JJ. 2022. Characterization of a novel papillomavirus from free-ranging Antillean manatee *Trichechus manatus manatus* with genital papillomatosis. Diseases of Aquatic Organisms 149:1-10. doi.org/10.3354/dao03656
- Oliveira de Meirelles AC, dos Santos Lima D, de Oliveira Alves MD, Gomes Borges JC, Marmontel M, Carvalho VL, Rodrigues dos Santos F. 2022. Don't let me down: West Indian manatee, *Trichechus manatus*, is still critically endangered in Brazil. Journal for Nature Conservation. <https://doi.org/10.1016/j.jnc.2022.126169>
- Valdevino, G.C.M.; da Silva, V.M.F.; Amaral, R.S. 2021. Using osteological measurements to estimate body length in Amazonian manatees. Acta Amazonica 51: 156-161. <https://doi.org/10.1590/1809-4392202004731>

<END OF CITATIONS>





## Sirenews – Dugong

**NOTES FROM THE EDITORS:** We would like to thank all of those who have contributed articles for *Sirenews*. On occasion, we have taken the liberty to make minor edits in an effort to accommodate our formatting style and provide clarity for our readership. However, we have restrained from making all grammatical edits in an effort to preserve the original intent of the submitting author.

We would also like to encourage you to submit any manatee and dugong sketches or old-time prints for publication in future issues!



**COPY DEADLINE FOR NEXT ISSUE: October 1, 2022**



Material should be submitted  
(in Microsoft Word format, 500-word limit,  
using formatting examples from last issue) to:  
<https://www.seewinter.com/research/sirenews/>

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