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IN MEMORY OF DR. DANIEL (WOODIE) HARTMAN



1941-2022

UNION INTERNATIONALE POUR LA CONSERVATION DE LA NATURE ET DE SES RESSOURCES
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In Memory

Dr. Daniel Hartman (Woodie)

Fifty-five years ago, my life changed as did the community of Crystal River, Fl. where I grew up. At the time, I was a young teen passionate and inquisitive about the aquatic animals and plants that lived in the river's clear water (at that time) and nearby gulf estuaries. Crystal River, and its spring-fed headwaters, was known for fishing, crabbing and as a dive spot. Not much else.

In 1967, Daniel "Woodie" Hartman, a PhD candidate from Cornell University, came to Florida searching for a subject for his dissertation. He travelled around the state, considering potential candidates that included feral hogs and manatees. He stopped at a dive shop called Aqua Peer, the only one in Crystal River at the time. On the walls were underwater black and white photographs of manatees, taken with a Kodak Instamatic camera in a waterproof case by the owner of the shop, Tom McQuarrie. Tom told Hartman that manatees were occasionally seen in the river during colder months but were shy and tended to flee from divers. The following fall Hartman returned to Crystal River and bought the camera from Tom. He also purchased an aluminum Jon boat with a 6hp Sears & Roebuck kicker which he named "Trichechus". It took him a couple of hours to putt down the river.

I spent most of my free time growing up on or under the water of Crystal River. It was my backyard and personal playground...then this odd guy showed up in a weird named boat. I would see him day after day, standing in his little boat looking through binoculars or snorkeling alone in the extremities of the river. As both practices were not particularly smart, it focused my curiosity about this stranger. Finally, I mustered the courage to talk to him and we became friends. He confided in me later that he wasn't so interested in having a young teen friend with endless questions, but he coveted my fast boat left to me by my grandma and a personal guide. I became his volunteer assistant/sidekick. It was with that instamatic camera that he would take photographs that pioneered the decades of photo-id work and longitudinal study of manatees in Crystal River and surrounding rivers.

Hartman published in *National Geographic*, the first popular article on manatees titled "Mermaids in Peril". The piece was read by the producers of the "Undersea World of Jacques Cousteau" who came to Crystal River and Blue Springs in 1971 with Hartman as an advisor to produce the first in-depth documentary about the plight of manatees called "The Forgotten Mermaids". The film led to the purchase of Blue Springs in Volusia County to become a state park specifically for the protection of the species. Both the *National Geographic* article and film were pivotal in raising public awareness about threats to manatees and also that they could be seen in the clear waters of Crystal River and Blue Springs driving tourism in both of these areas. Today, visitors from around the world visit Crystal River to see or swim with manatees providing a major component of the local economy.

Manatees were federally protected in 1966, Woodie, while still a graduate student, provided testimony leading to further federal protections. In the mid-1970s, Hartman and I had the opportunity to work together again on the first distribution and status study of manatees in the United States. This seminal work, "Distribution, status, and conservation of the Manatee in the US", was published in 1981 by National Technical Information Service. Two years earlier, Hartman's "Ecology and behavior of the manatee (*Trichechus manatus*)" in Florida was published as a Special Publication of the American

Society of Mammalogists and became the “manatee bible”. The work was the culmination of his PhD thesis and what he had learned during the distribution and status study. Woodie’s power of observation, insights and speculations were truly remarkable. His pioneering work provided the basis for much of what we know about manatees today and led to many of the protections.

After completing his earlier manatee work, Woodie traveled the world with kindred spirits conducting wildlife tours sharing his passion and teaching others about nature. A typical job was never in his cards. Woodie married Nan Hauser in 1983 and like many others he touched her life deeply; she transitioned from a nursing career to become one of the world’s foremost whale biologists. Over the last 10 years with his partner poet and Professor Emerita Sidney Wade, they have traveled the world in search of exotic places and new birds to see. In November, Woodie passed away at 81 of cancer in his beloved Maine surrounded by friends and family. This past winter to honor his wishes, Woodie’s ashes were sprinkled on Crystal River surrounded by manatees. There is not a day that goes by when I’m on Crystal River when I don’t fondly remember those days in my youth watching manatees and laughing with Woodie 55 years ago.

James (Buddy) Powell

LOCAL NEWS

BRAZIL

What's in a name? Toponymy can bring light to the former distribution of manatees in coastal Brazil

In this note we call attention to the fact that the name of a single locality located in northern Rio de Janeiro State coast, southeastern Brazil, can shed light to the former distribution of manatees in coastal Brazil. This locality is called Gargaú, known since colonial times as an important commercial warehouse (Lamego, 1946) and now a small fishing village and a beach resort in the municipality of São Francisco do Itabapoana, northern Rio de Janeiro State. Gargaú in Tupi language comes from Guaraguã-ú or Guaraguá-ú, which means “where the manatee grazes” (= a derivation of “garga”, the name of the manatee, and ú = water, what now means: the water of the manatee or where the manatee grazes, its feeding ground) (Sampaio, 1928). Not a coincidence, the only other location that receives this name in Brazil is in the State of Paraíba, that gives name to a river (Gargaú River), also a former Indian village and then a sugar mill (Herckmans, 1886). This river is located close to Mamanguape, the birth of the Manatee Project in Brazil.

Historically, the former southern range of manatees in South America is the mouth of Rio Doce (19°37'S), Espírito Santo State, in the southeastern Brazil (Anchieta, 1876; Whitehead, 1977). Even historical records along Bahia and Espírito Santo are hard to find, with a few citations to Ilhéus, Alcobaça and Juparanã More precisely (see Vieira and Brito, 2017 for a review). There is a manatee rib found amid a pile of weathered bones of humpback whales in Barra de Caravelas (17°43'S), Bahia State, in September 1990, posing the intriguing possibility that they have been present at this latitude (Siciliano & Barbosa-Filho, 2016) in recent times. The Caravelas record has been included in the map and gazetteer provided by Bonvicino et al. (2020), accounting for the likely southern limit of *Trichechus manatus* in South America.

Gargaú in the State of Rio de Janeiro is located inside a well-protected mangrove estuary, with warm waters all year-round, providing easy access to freshwater, which could naturally shelter manatees (Figure 1). It is thus important to consider the need to evaluate the historical southern distribution of manatees in South America, that can be much more intriguing than originally supposed.

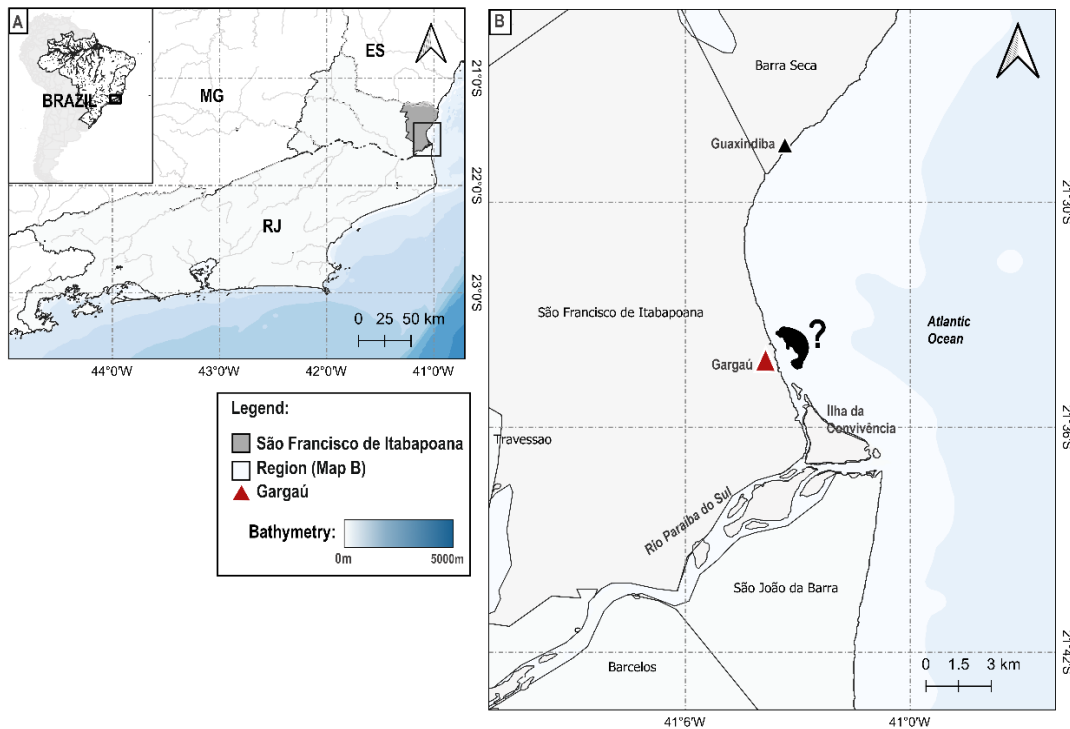


Figure 1. Location of Gargaú, in northern Rio de Janeiro State, southeastern Brazil. Map kindly prepared by G.F. Ruenes.

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ICMBio celebrates one-year anniversary of the release of the manatee “Raimundo”

In November 2021, the Aquatic Mammals Center (Centro Nacional de Pesquisa e Conservação de Mamíferos Aquáticos – CMA) and APA Costa dos Corais (APACC) both linked to the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio), in partnership with the NGO Associação Peixe-boi, conducted the release of “Raimundo”, following the recommendations by the protocol of release and monitoring of manatees issued by ICMBio (2021). The protocol was produced by CMA/ICMBio together with several partner institutions in Brazil. It presents in detail techniques recommended for the release of manatees in order to get better results in the activity. The protocol represents a successful experience that was established on the National Program of Release of Manatees conducted by ICMBio and their partners since 1994. Based on the measures recommended in this protocol, the first integrated analysis of release of Antillean manatees in Brazil have verified an index of success in 75% of all releases (Normande et al. 2016). Recently, Attademo et. al (2022) have confirmed the success of such procedures by means of the birth of calves in several reintroduced females. Raimundo has a long history of releases as he has been unsuccessfully liberated two times before in 2015 and 2018. On both occasions, he had to be recaptured soon after initial release for a new adaptation period in the acclimatization enclosure. By November 2021, a third trial occurred and for any reason it failed, Raimundo would be considered unable for the release program. So, high expectation surrounded the CMA and APACC teams regarding this release. Fortunately, Raimundo indicated that he adapted well to the environment, moving steadily and searching for food. At the beginning, he remained inside the Manguaba estuary, in Alagoas State, and surroundings. There he foraged mainly on mangrove trees and possibly other plants found in the mangrove area. Gradually Raimundo alternated his movements from the estuary and the nearby open sea (Figure 1), always interacting with other released manatees that normally use the area.

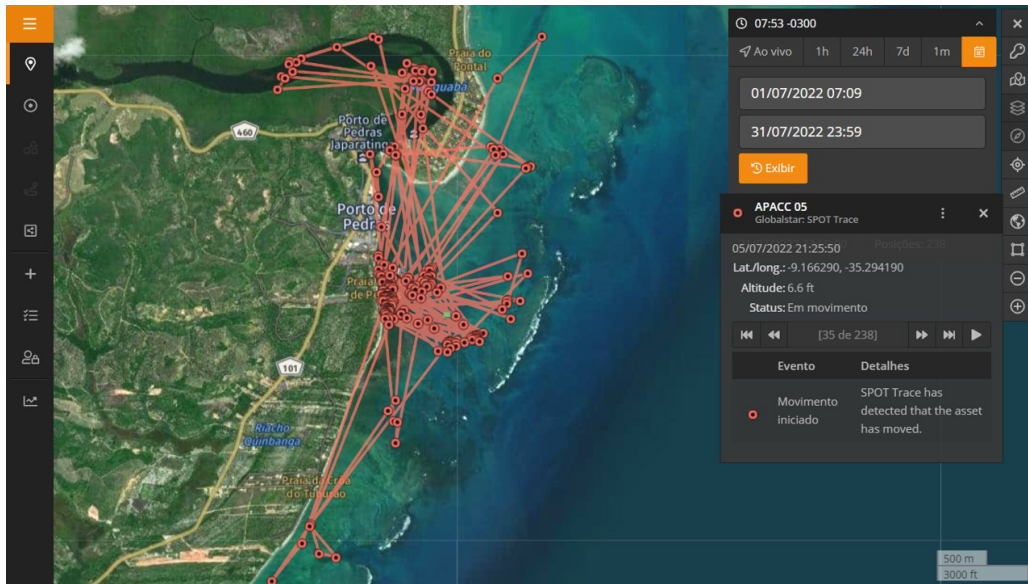


Figure 1. Displacement of the released manatee Raimundo for a month (July 2022) when he stayed in the Manguaba River estuary and surroundings. Map generated by remote monitoring made by satellite telemetry (APACC files).

Remarkably, Raimundo was observed escorting a mother and calf and acting to protect them when vets and other staff members tried to get closer to them. Curiously, Raimundo could not be the father of this calf considering the time lapse of the release. In the first year of release, Raimundo lost the radiotelemetry equipment several times, but it was recovered with success on all occasions and a new fixing was made (Fig. 2). Notably, no clinical intervention was necessary to be made on this manatee but only its monitoring in the wild. After a year, his equipment was removed, and now Raimundo can be seen among other manatees in the same spot and even copulating. In November 2022, the team responsible for the release of Raimundo could celebrate the great success in the adaptation period. As such, we highly recommend the adoption of well-established protocols for achieving the goals of the release and keep the high rates of success in such management procedures as it was verified in previous works.



Figure 2. The APACC team monitors Raimundo at one of the fidelity sites established on the beaches of Porto de Pedras, Alagoas. The animal during exchange of telemetry equipment.

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Manatees interacting with fishing tools and treatment of a severe wound with zonized sunflower oil and Brazilian native plants: “aroeira” and “barbatimão”

On August 19th, 2022 a manatee calf named Ariana, an approximately two-year old, daughter of a female released (Attademo et al. 2022) by the program under Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio), was rescued after the notification of a severe wound in her right flipper. It was presumed that the wounding occurred on the 9th of August and caused by a nylon rope used for anchoring small boats. The calf was then transferred to an isolated area inside the acclimatization enclosure from the quarantine area of ICMBio (09°13'4.72"S; 35°19'59.03"O), located in the Área de Proteção Ambiental Costa dos Corais (APACC), in the Tatuamunha River, Porto de Pedras municipality, Alagoas State, Brazil.

Topical therapy was applied from August 26th to November 22nd 2022, according to the response to the recommended treatment. This included small changes in the procedures, including the permanence time of the products in the wound as well as the need of the injuries debridement. By the severity of the wound that may lead to septicemia, arm amputation was considered during the first days. It was also believed that the calf would lose some degree of movement.

During all phases, ozonized sunflower oil (Philozon®) was used intensively as the basic treatment for 15 minutes every two days. We tried to reduce the manipulation stress but guaranteed that the injuries would be cleaned and medication would be applied. Part of the treatment included the use of effusion of chipped barks of the native Brazilian pepper tree (Anacardiaceae – *Schinus terebinthifolius* Raddi) (Silva-Luz et al. 2023) and “barbatimão” (Fabaceae – *Stryphnodendron* sp. Mart.), a native tree distributed widely throughout the Cerrado and Amazon region. The name “barbatimão” originated from the indigenous Tupi-Guarani language and means “the tree that tightens”. The plants’ effusion was prepared with 70% alcohol separately and mixed at the time of use in a 1:1 proportion. Additionally, pharmacological products of veterinary and human use were added by the end of each cleaning session in order to speed the healing process.

The treatment proved to be quite efficient with fast wound healing and recovery of arm movements (Figure 1). The use of ozonized sunflower oil proved to be appropriate and it thus suggested to be a new possibility of medication in case of wounding in manatees. In addition, local ecological knowledge proved also to be effective as it was the case with using effusion of aroeira and barbatimão. For manatees that need medical care in remote areas the use of natural products could help the vet treatment and protocols. It is even more relevant to consider the concept of citizen science as part of the solution even in such severe case like this. We would like to thank Ozoncare Philozon, Ozoncare_recife Mônica Cavalcanti and Leticia Philippi and for the donation of ozonized sunflower oil and Derma regenerating ointment. All our thanks to the teams from ICMBio/APACC, ICMBio/CMA and Associação Peixe-boi who were essential in the numerous procedures for the complete recovery of the manatee Ariana and ICMBio/DIBIO for financial support for activities, exams and purchase of medicines.



Figure 3. Treatment of lesions on the pectoral fin of the manatee Ariana carried out at APA Costa dos Corais, Porto de Pedras, Alagoas, Brazil. A and B. External portion of the pectoral in July and November 2022. C and D. Lower portion of the pectoral in September and November 2022.

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Bilateral congenital cataract in a newborn Antillean manatee (*Trichechus manatus manatus*) stranded alive in Brazil

Ocular alterations in Antillean manatees (*Trichechus manatus manatus*) in Brazil are poorly reported although they deserve special concern for its implications. “Wind” (01S0112/353) is a newborn Antillean manatee found stranded in April 27th 2022 in Praia de Macapá (-2.91 L/ -41.44 S), Luís Corrêa municipality, Piauí State, Brazil. It was assumed that he was 2-4 days old. This beach is located inside Área de Proteção Ambiental Delta do Parnaíba (APA Delta do Parnaíba) under ICMBio jurisdiction. In April 30th the calf was relocated by air to the ICMBio rehabilitation center (CRAS/CMA – Centro Nacional de Pesquisa e Conservação de Mamíferos Aquáticos, located at Itamaracá, Pernambuco State.

The newborn activities were accompanied from April 30th to July 31st 2022 according to the ethogram prepared by Attademo et al. (2020), which includes its postural behavior. As such, it was noted that the calf did not present a natural mobility inside the enclosure, possibly related to limited sight as it constantly fenced the enclosure walls.

We conducted the Brightness Acuity test (BAT) that revealed a limited glare or even absence of perception accounted for the difficulties to the subjects presented, closing immediately his eyes. It was confirmed the opacity/cloudy in the posterior region of the crystallin in both eyes, with no inflammation signs, thus characterizing a bilateral congenital cataract.

The external ocular anatomy of manatees (*Trichechus manatus*) is constituted of small eyes, 13 to 19 mm in diameter, with no eyebrow and the presence of a nictating membrane that covers the eye and protects it from getting damaged (Mass & Supin, 2007; Hartman, 1971; Cohen et al., 1982).

Internally, ocular globes of manatees present distinct format compared to other aquatic mammals, being relatively laterally spherically their rostral portion, rear and a shallow anterior chamber (Hartman, 1971; Cohen et al., 1982; Mass & Supin, 2007). The crystallin has an oval shape, small and anteriorly dislocated attached to the globe by means of ciliary bodies. But contrary to most

mammals, the cornea of manatee's eyes is vascularized by several blood retia (Mass & Supin, 2007; Samuelson et al. (1997).

We considered the possibility of a surgical intervention or treatment with eyedrops. In this sense, the calf received an intensive monitoring specially of its postural behavior. As a palliative measure, Wind was trained to listen and respond to sound signals, using distinct objects such as brushes, sieves, mangroves leaves and food, as she can perceive its environment and move safely in the enclosure.

Presently, Wind moves easily inside the enclosure, but notably he has a deep sensibility to sounds and touch. She also feels more confidence to reach and accept food of different textures. Future examinations of the eye condition of Wind are expected to occur in the coming weeks. To our knowledge, this is the first report of congenital cataract in manatees in Brazil. We call the attention for more studies regarding the occurrence of possible ocular lesions in stranded, wild or captive manatees and a better evaluation of these conditions.

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Successful reproductive results of manatees released under coordination of a national program in Brazil

The Aquatic Mammals Center (ICMBio/CMA – Centro Nacional de Pesquisa e Conservação de Mamíferos Aquáticos/Instituto Chico Mendes de Conservação da Biodiversidade) established a national program of release of manatees together with partners back in 1994. Partnership includes local NGOs, Universities, local supporters and especially the Conservation Units where the releases are made. Lua and Astro were the first manatees released, both in Alagoas State (Luna e Passavante, 2010). Since then, 50 manatees were released in the states of Alagoas and Paraíba. Most of them were delivered in Tatuamunha River, Porto de Pedras municipality, in Alagoas. Very recently, in February 15th 2023, CMA/ICMBio, Área de Proteção Ambiental Costa dos Corais (APACC) and the Associação Peixe-boi (APB) celebrated the birth of the 17th calf of a released female, of which 16 only in Alagoas (Figure 1).



Figure 1. First observations made by the APACC and CMA teams of Joana and her calf. Boarding point of the Peixe Boi Association, Tatuamunha River, on February 15, 2023. Photo by Flávia Rêgo.

The calf, of unknown gender, has been called Nick, son of Joana, released in 2014. In the first days, the duo remained on the Tatuamunha River, moving close to the ICMBio enclosures and the APB boarding point. The area where the birth occurred was previously selected to start the release of manatees as it represents a region with no recent records and would be considered the southern limit of the regular presence of sirenians in Brazil. Specimens released have contributed significantly to the recognition of an area of occurrence in this particular region. The increase in the number of releases has shown that manatees move to nearby areas, helping the connection with other groups in areas where they were considered locally extinct (Normande et al, 2015; 2016). Joana has proved to be a successful case in adaptation after release, showing great ability to search for food, water and use of distinct areas, in the estuary and in the surrounding coastal marine area. After 22 days of birth, the APACC team, together with a team of cameramen, recorded Joana and her calf near the mouth of the river, feeding on sea grass meadows (Figure 2). Indeed, she always interacted with other manatees, including mating. Joana gave birth to its first son, Nick, by the age of 13, and 9 years after the release,

corroborating the findings of Attademo et al. (2022). They identified the mean age of first pregnancy of released females was 11,7 ($\pm 1,49$) years and 8,0 ($\pm 1,41$) years after release. This birth, besides been considered a relevant record for the success of the National Program of Releases, strengthens the need for stimulating these activities, is also a valuable tool for the conservation of manatees. In fact, it also contributes to the next steps for evaluation of the status of manatees in Brazil.



Figure 2. The released female Joana and her calf Nick recorded in seagrass meadows near the mouth of the Tatuamunha River, Porto de Pedras, Alagoas, on March 12, 2023. Photo by Luciano Candisani.

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The first report of a manatee born in a natural acclimatization enclosure in Northeast Brazil

Paty, a female manatee planned to be released in November 2021, was confirmed pregnant during regular clinical evaluation in the acclimatization enclosure. The release program is conducted by the Aquatic Mammals Center (CMA-Centro Nacional de Pesquisa e Conservação de Mamíferos Aquáticos) and Área de Proteção Ambiental Costa dos Corais (APACC), both linked to the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio).

Since then, the clinical procedures in dry environment were stopped while monitoring her behavior in captivity and underwater evaluation as a means of preserving her health and the calf as well. As manatee newborns range from 115-130cm in body-length, we tried to avoid possible escaping from the enclosure. As such, the connection aisles in the enclosure were renovated reducing the spaces between the wooden sticks.

Since February 2022, the pregnant female was kept in the smaller enclosure and was monitored daily by the ICMBio/APACC attendants. Birth was expected to happen at sometime between January and April 2022 and the vet team was put in alert all day long in order to come into action during birth.

On April 26th 2022, the ICMBio/APACC team noted the presence of a newborn outside the enclosure, alongside the released females Telinha and Joana, which alternate the care of the baby keeping it on their backs. The staff members immediately moved to the place to check the situation. It sounded somehow unexpected that the newborn was found outside the enclosure, under care of other females, as the renovation was intended to avoid such situation. Surprisingly, the newborn was less than one meter long, and this facilitated its escaping from the enclosure. It should be emphasized that the roll spacing in the enclosure was made to a minimal to facilitate the debris (leaves, branches, plastic) carriage during river flow. The ICMBio enclosures are built inside the mangrove estuary so there are mangrove trees all around the edge of the enclosures. As this is a conservation unit, we considered it to have the best conditions for a mother and its calf to learn about their environment, and also so the rehab manatees gets the shade from the mangrooves. The newborn was named Flori

and was cause of celebration for the uniqueness of the birth in an enclosure in a natural environment and for being Paty's first calf. Paty exhibited excellent parental care since the first hours of birth, always keeping Flori by her side, and nursing her constantly. The newborn was evaluated for biometrics, and substantial weight gain was observed (Figure 1).



Figure 1. The new mother Paty in parental care in the first days of the calf Flori. ICMBio team during assessment and biometrics performed inside the APACC quarantine enclosure, April 2022. (APACC files, by Alexandra Costa).

However, on the fifth day after birth, a fatal accident happened, a mangrove tree branch fell inside the enclosure just on the calf's back, and the mother was unable to take it away, causing its death (Figure. 2).

It is both saddening and disheartening to have such situation amid our team, but it was proved that reproduction inside the acclimatization enclosure is possible and could be a tool in conservation practice.

Even though, the adoption of specific protocols in such particular cases were noted as adequate enclosures for newborns deserve special needs.



Figure 2. The manatee calf Flori after being removed from the enclosure and its death confirmed. Mangrove branches as they were found around the animal's body causing its premature death (APACC files, by Alexandra Costa).

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FLORIDA

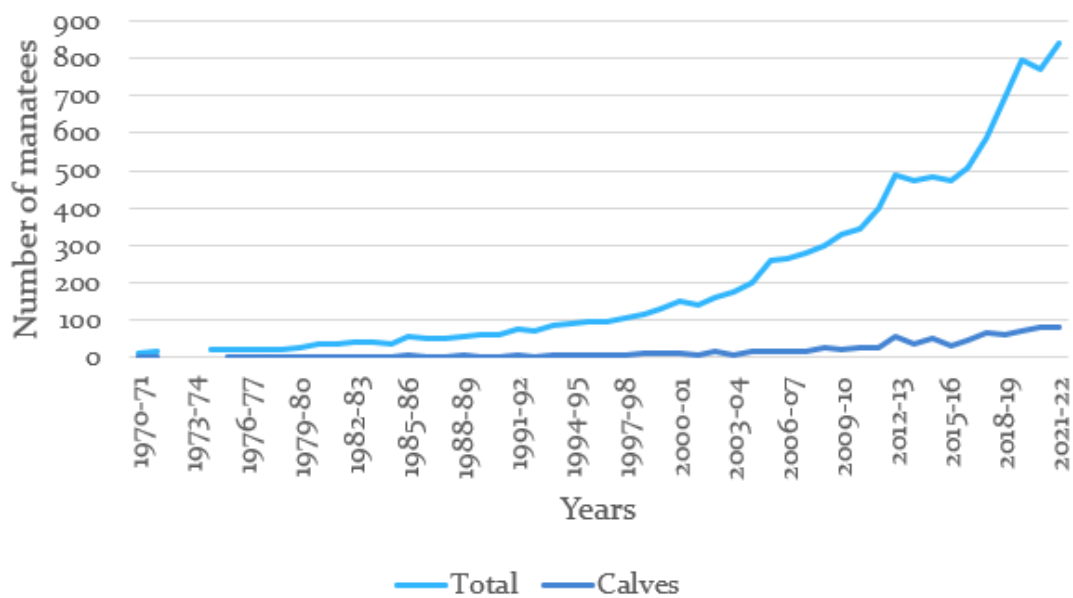
Springs as vital winter warm-water habitat and the need for increased education and protections

Data from our photo-ID and genealogy research at Blue Spring State Park in Volusia County, FL has shown a dramatic increase in the manatee population over the last 40 years (Figure 1). The population has grown from a total of 11 manatees recorded during the 1970-71 winter season to a record of over 800 manatees in the 2021-22 season and a record count of 729 manatees in a single day in January of 2023. Over the past years, more than 80 first-year calves have been recorded each winter season. The increase in the population can be attributed to good reproduction and survival rates,

migrants from other springs and from the east coast of Florida, and ample vegetation in the vicinity of Blue Spring, which is likely due to an ongoing moratorium on vegetation removal in effect from October - March. Blue Spring is also unique because it is a fully protected manatee sanctuary during the winter months where no human in- or on-water activity is allowed.

Blue Spring has always been an important site to release manatees after rehabilitation. Recently, due to the ongoing manatee unusual mortality event on Florida’s east coast, many manatees rescued as orphans along the coast were released at Blue Spring once they had reached the required size and weight. On February 13th, 2023, twelve manatees were released at Blue Spring in a single day, which was an all-time record.

Unfortunately, many other unprotected warm-water sites, including Silver Glen Spring and Salt Spring along the St. Johns River, are experiencing an increase in harassment which has resulted in many manatees historically wintering at those springs now seeking out Blue Spring.



*No data for 1972-72 and 1973-74 winter season

Figure 1. Blue Spring State Park winter season numbers 1970 – 2022.

One of Save the Manatee Club’s objectives is to provide more education to people recreating at unprotected warm water sites. In 2022, we teamed up with UF-IFAS Extension- Seagrant and Get Up and Go Weeki Wachee to create the Manatee Awareness Through Education and Stewardship (MATES) program. The purpose of this collaboration is to have volunteers on the water in the Weeki Wachee River to educate people and prevent harassment. Similar efforts are underway for a program in collaboration with the Ocala National Forest for Silver Glen and Salt Springs.

In addition, we launched a new online sighting form in late 2021 to encourage the public to report sightings of healthy manatees both in Florida and other states to get a better idea which areas manatees are frequenting and what behaviors may be observed. The fully electronic form allows for photo and video submission alongside GPS coordinates and can be found at savethemanatee.org/sightings. The form is fully integrated with ARC GIS. (Figure 2). Since its initiation over 300 sightings have been submitted. Starting in 2022 we also partnered with Alachua County on a volunteer-based program to document manatee sightings in the Ichetucknee, Suwannee, and Santa Fe River.

With the decrease of good habitat near power plants and the retirement of some of these plants in the foreseeable future, it is important that more is done to protect natural warm water sources which more manatees will depend on in the future.

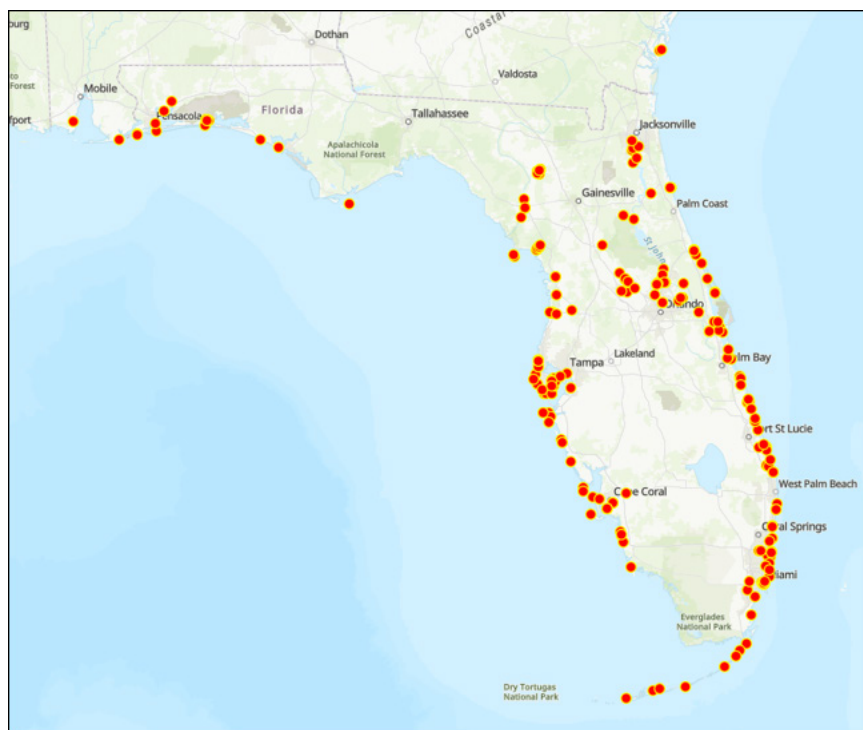


Figure 2 Reported manatee sightings through Save the Manatee Club’s online sighting form November 2021 – February 2023.

-Conservation Update by Save the Manatee Club

INDIA

India's first Dugong conservation reserve notified in Palk Bay, Tamil Nadu: bringing hope for extinction-prone dugongs

The Dugong Recovery Program, funded by Compensatory Afforestation Fund Management and Planning Authority (CAMPA), India was implemented in 2015 by the Wildlife Institute of India (WII). A study by WII reported that only 300 dugongs remain in the Indian waters (Pandey et al., 2010; Sivakumar & Nair, 2013). Critical dugong habitats were identified in previous years as part of the research in all dugong-ranging sites in India based on dugong distribution and the presence of threats associated with them. Among the three dugong-inhabited states, Palk Bay and the Gulf of Mannar in Tamil Nadu are home to approximately 150 dugongs. Marsh et al. (2002) concluded that India's Palk Bay and Gulf of Mannar are important dugong habitats.

Palk Bay is a shallow water area on India's southeast coast; it is unique in that it is almost an enclosed bay with an inflow from several rivers along the coast. The site harbors charismatic species such as the Dugong, sea horses, sea turtles, and pipe fishes and more than 50 species of mollusc, 20 hard corals, four species of mangrove, 16 species of coastal vegetation, including halophytes, and seven species of seagrass (Sivakumar, 2013). In Palk Bay, six seagrass genera were found: Cymodocea, Halophila, Halodule, Syringodium, Enhalus, and Thalassia (Sivakumar, 2019). Palk Bay's most common species was Cymodocea serrulata (Sivakumar et al., 2019). Five seagrass genera were found in the guts of stranded dugongs in Tamil Nadu: *Halophila* sp., *Halodule* sp., *Cymodocea* sp., *Enhalus* sp., *Syringodium* sp., and algae (Prajapati et al., 2021). A semi-structured questionnaire survey conducted in the Palk Bay region revealed that the majority of respondents (>75%) had seen dugongs, with nearly half of those sightings occurring recently (Sivakumar, et al., 2019). In 2018, a mother and calf were first encountered in Palk Bay and the Gulf of Mannar. Though dugongs were previously poached for meat, with increased awareness, this has declined significantly. Joint Conservation efforts of Tamil Nadu Forest Department, Marine Police Department, Fishery Department, Wildlife Institute of India, and OMCAR Foundation led to the successful rescue and release of ten dugongs in northern Palk Bay by Friends of Dugongs (a volunteer group of fishermen established by Tamil Nadu Forest Department and WII in coastal villages in the last six years) (Figure 1). Awareness programs for fishing communities are actively being carried out in order to disseminate more information about dugongs, seagrasses, and the importance of the conservation reserve. Appreciation awards were given to ten fishermen who released accidentally caught dugongs. The prize included a cash prize of INR. 10,000 (122 USD), a medal, a certificate, and Dugong souvenirs (Figure 1).



Figure 1. In the left dugong rescue operation in Palk Bay, Tamil Nadu and in the right, dugong rescuers felicitation program in Tamil Nadu.

As an outcome of the CAMPA-Dugong recovery project, and based on the frequent sightings of dugongs (Figure 2), a Dugong conservation reserve was proposed jointly by WII and state Tamil Nadu state forest department in the North Palk Bay, Tami Nadu, in 2020. Subsequently, the Hon'ble State Forest Minister in the Tamil Nadu state assembly announced the need to establish the Dugong conservation reserve in order to conserve dugongs. The Tamil Nadu government declared about 448-square-kilometer area in the northern part of the Palk Bay as a 'Dugong conservation reserve' notified by gazette order G.O. Ms. No.165, Environment, Climate Change and Forests (FR.5) dated 21st September 2022 (Figure 3).



Figure 2. Dugong spotted during aerial survey in Dugong conservation reserve in Palk Bay, Tamil Nadu

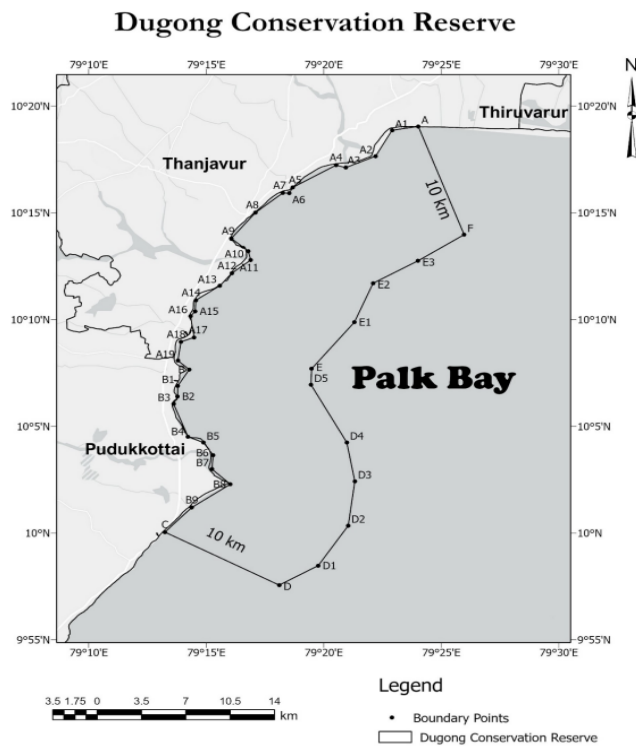


Figure 3. Dugong conservation reserve of Palk Bay, Tamil Nadu

This Dugong conservation reserve in the northern part of the Palk Bay from Adiramapattinam in Thanjavur district to Amapattinam in Pudukkottai district extends about 55 kilometers along the coastal line in both districts. According to the state Forest Department, INR. 5 crore (6,11,975 USD) will be released for the establishment of the conservation reserve. Furthermore, the State Environment, Forests, and Climate Change Department has directed the Principal Chief Conservator of Forests and Chief Wildlife Warden to send a draft notification for the proposal in order to obtain the approval of the Union Ministry of Environment, Forests, and Climate Change. Under the Climate Change Mission, the government also intends to construct an international conservation center and improve seagrass beds. Traditional fishing will be allowed to continue in the local communities. They will be actively involved in the conservation reserve's management. Alternative livelihood options for the coastal community will be encouraged in order to reduce fishing pressure on the habitat.

Dugongs are protected in India under Schedule 1 of the Indian Wildlife Protection Act 1972, which prohibits the killing and sale of dugong meat. Despite such legal protection, the dugong population in the region is vulnerable to multiple pressures, primarily from anthropogenic sources. However, conservation measures such as the proposed conservation area can help strengthen the dugong conservation activities and improve the dugong population in critical dugong habitats. Over the last ten years, researchers at the Gulf of Mannar Marine Biosphere Reserve, along with other marine experts, have restored 5.6 hectares of degraded seagrass on the seabed of the Gulf of Mannar region to conserve dugongs (Edward, 2019). WII, in collaboration with the OMCAR Foundation and the state forest department, is intensively surveying the dugong conservation reserve area for marine mammal sightings, seagrass habitats, other associated fauna, and the threats associated with them (Figure 4). This data will be included in the detailed project report for the conservation reserve, which will include a detailed management plan for the area. As a result, the conservation reserve can help to sustain a dugong population and save this vulnerable species from local extinction.



Figure 4. Intensive biodiversity assessment survey in Dugong conservation reserve by WII team.

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MEXICO

Moon, the manatee from the Atlantic coast of Florida, is still in Mexico and new evidence of the occasional presence of Florida manatees in Tamaulipas state

Moon appeared again on social media. She was sighted in Veracruz's port area on February 22nd, 2023. The pattern of white scars on its back and peduncle allowed Mexican and Florida biologists to confirm its identity (MIPS ID RB358) and (TBC-03) from the wildlife monograph of Deutsch et al (2003); it has been tracked over eight years (1986-1994).

Moon's first records on the Yucatan coast were on April 14th and 16th, 2021, showing calm and docile behavior (Morales-Vela et al., 2021). Moon has been in Mexico for 22 months and moved through approximately 990 km along the coastline to the north. This distance could be longer if exploring rivers and lagoons with the highest manatee presence in the Gulf of Mexico on her way, such as the Términos Lagoon and its tributary rivers in Campeche state, the Usumacinta and Grijalva rivers in Tabasco, and the Alvarado Lagoon, in Veracruz state (SEMARNAT, 2020).

All maritime authorities, park rangers of protected coastal areas and shore communities were warned of Moon's presence in Veracruz and Tamaulipas states (Fig. 1).

BOLETÍN DE AVISO

El pasado 22 de febrero se compartió en redes sociales un video de la presencia de un manatí a las orillas del muelle ó del Puerto de Veracruz. Se trata de la manatí Luna procedente de la costa de Florida con registro (MIPS: ID RB358)

Luna llegó a la costa de la Península de Yucatán el 14 de abril del 2021, su identificación está confirmada por especialistas de México y de Florida basados en su patrón de cicatrices blancas en su cuerpo.

Luna es una hembra adulta registrada en Florida por primera vez en 1982 y tiene una larga historia de seguimiento continuo en la costa este de Florida por más de 8 años (1986 a 1994).

Luna se describe como una hembra apacible y su ruta de movimiento hacia el norte indica que posiblemente se está moviendo en ruta de regreso a las costas de Estados Unidos.

Se les pide estar alerta de su presencia en aguas de Veracruz y Tamaulipas, tomar fotografía o videos de sus manchas blancas en su dorso y aleta caudal y enviar a: **Blanca Cortina IIB-UV** (tel. 228 988 5848) y **Benjamin Morales ECOSUR** (tel. 985 110 6448), también puedes dar aviso al telefono 01 800 PROFEPA (776 33 72) y **CONANP**-Sistema Arrecifal Lobos (tel. 785 690 5573)

Figure 1. Alert of manatee Moon for Veracruz and Tamaulipas states in Mexico

If Moon continues moving to the north, she will be in the northern part of the state of Veracruz and reaching Tamaulipas state, both coastal areas with an occasional presence of manatees, some of them from Florida. Who knows what it will do next, but it may well end up going through Texas, Louisiana and Alabama. We just want to warn you that Moon may well end up passing through these regions and being photographed by your networks (hopefully!). So keep your eyes peeled!

A recently confirmed case of manatees from Florida in Tamaulipas occurred on June 9th, 2022, in Laguna Carpintero, on Pánuco River, Tamaulipas state, with four adult manatees, one of them with two white scars on his back (Fig. 2). Kari Rood used these scars to confirm his identity (FP038). This manatee was recorded for the first time in St Lucie County, Florida, on April 2009 and, most recently, on January 15th 2019, at the Port Everglades Power Plant.



Figure 2. Scars pattern used to identify (FP038) manatee from Florida in Carpintero Lagoon, Tamaulipas

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PUERTO RICO

Director and veterinarian of the Manatee Conservation Center receive important professional certifications

The director of the Caribbean Manatee Conservation Center, doctor Antonio Mignucci, and the Center's veterinarian, Lesly Cabrias, received competency accreditations as a Certified Aquatic Veterinary Nursing Technician (CertAqVNT) and a Certified Aquatic Veterinarian (CertAqV), respectively, by the World Aquatic Veterinary Medical Association (WAVMA). Doctor Mignucci is the first Puerto Rican and Latin American to obtain this professional certification. In contrast, doctor Cabrias is the second Colombian and eighth Latin American to be certified as an aquatic veterinarian.

In addition to studying zoology and marine sciences, doctor Mignucci also obtained a veterinary technician degree a few years ago to better apply his skills and knowledge in the rescue, rehabilitation, and treatment of manatees, sea turtles, and seabirds at the rehabilitation center he directs on the island of Puerto Rico. This new certification adds to the other academic achievements that the scientist and conservationist have acquired to improve his academic teaching skills and contribute to his daily work at the rescue and rehabilitation center. Doctor Cabrias studied veterinary medicine and animal sciences in Colombia, completed a master's degree in ecology and environmental sciences at the Inter American University, and acquired a postgraduate degree in exotic animal medicine and two diplomas, one in wildlife medicine and another in animal wound management. She has specialized in aquatic and marine fauna medicine for the past six years, particularly in manatees, sea turtles, and pelicans (Figure 1).

WAVMA is a guild of professionals that focuses on the care, clinical diagnosis, treatment, and welfare of aquatic and marine fish, reptiles, birds, mammals, invertebrates, and crustaceans such as shrimp, lobsters, and crabs. It is recognized as the most prominent international organization promoting and supporting aquatic veterinary medicine. "WAVMA's certification program for veterinarians and veterinary nurse technicians identifies the core competencies and subject areas needed to practice aquatic veterinary medicine worldwide. It awards two certifications, one for Aquatic Veterinarians (CertAqV) and one for Aquatic Veterinary Nursing Technicians (CertAqVNT). WAVMA currently has 157 certified aquatic veterinarians and five certified aquatic veterinary nursing technicians," said Mignucci, a marine sciences professor at the Inter American University of Puerto Rico, Bayamón Campus.

In evaluating candidates, applicants for certification must demonstrate acquired knowledge, skills, and experience in the following nine areas: Aquatic environment and life support systems; taxonomy, anatomy, and physiology; husbandry and industries; pathobiology and epidemiology of aquatic animal diseases; diagnostics and treatment of aquatic animal diseases; clinical veterinary

experience and client communications; public health, zoonotic and seafood safety; legislation, regulations, and policies; and principles of aquatic animal welfare.

"The need for an adequate and well-trained aquatic veterinary workforce serving aquariums, zoos, government agencies, aquaculture, seafood industries, and aquatic animal owners has become a global imperative, particularly in light of increasing concerns about fighting diseases, the safety of seafood, public health and dealing with zoonotic and pandemic events such as avian influenza and COVID," said veterinarian Ricardo Fernández, past president of the College of Veterinarians of Puerto Rico. "The CertAqV and CertAqVNT are official recognitions of knowledge and experience in the field of aquatic veterinary medicine and support and complement current and future academic efforts to ensure a global aquatic veterinary workforce that is adequate and well-trained," said aquatic veterinarian Chris Walster, WAVMA's administrative coordinator in England.

"These important certifications indicate to the profession, the government, and the general public that the member of the veterinary practice team, for example, that of the Caribbean Manatee Conservation Center, has demonstrated up-to-date competence in aquatic veterinary medicine, and this is very important to maintain the prestige of this Center that serves our students, the community, our native fauna in Puerto Rico, and the Caribbean region so well," said doctor Rafael Ramírez Rivera, Interim President of the Inter American University of Puerto Rico.

Additional information about WAVMA and its certification programs can be found in <https://www.wavma.org.change>.



Figure 1. Clinical evaluation of rehab manatees at the Center for Manatee Conservation, Puerto Rico.

-A, Mignucci

Caribbean Manatee Conservation Center

Ocular alterations in sirenians

Due to the complex enophthalmic ocular anatomy of sirenians (Samuelson et al. 2010), there is not much evidence of ocular alterations, except for some reports made in Puerto Rico (Cabrias-Contreras et al. 2022) and Brazil (Sousa et al. 2015; Attademo et al. 2022). Compared with other species of aquatic mammals (Colitz, 2019), little is known about the effectiveness of ophthalmological examinations, the incidence of ocular problems, risk factors, and their medical management (Freeman et al. 2022). This summary aims to characterize some of the ophthalmologic alterations that have occurred in manatees and dugongs upon admission and during their maintenance in rescue and rehabilitation centers.

The ocular pathologies in sirenians are usually associated with direct traumatic processes, stranding events, congenital abnormalities, and consequences of illegal hunting. In orphaned calves of Antillean manatees (*Trichechus manatus manatus*), it has been possible to observe through ophthalmological examinations with the use of biomicroscopy, Schirmer's test and cytology, the presence of ocular proptosis, lagophthalmos, corneal ulcers, irritative conjunctivitis, chemosis, corneal ulcers, and keratomalacia (Cabrias-Contreras et al. 2022). Additionally, ulcerative keratitis, exophthalmos, active corneal scarring (Figure 1), nictitating membrane gland prolapse, ulcer melting or collagenolytic ulcer (Figure 2), and microphthalmia-associated with progressive emaciation have been observed. Recently, Attademo et al. (2022) documented the first report of ocular dysplasia and bilateral congenital cataract in an Antillean manatee calf from Brazil, diagnosed by ophthalmological examination, computed tomography (CT scan), ultrasonography, and glare test.



Figure 1. Corneal scarring in an Antillean manatee calf.

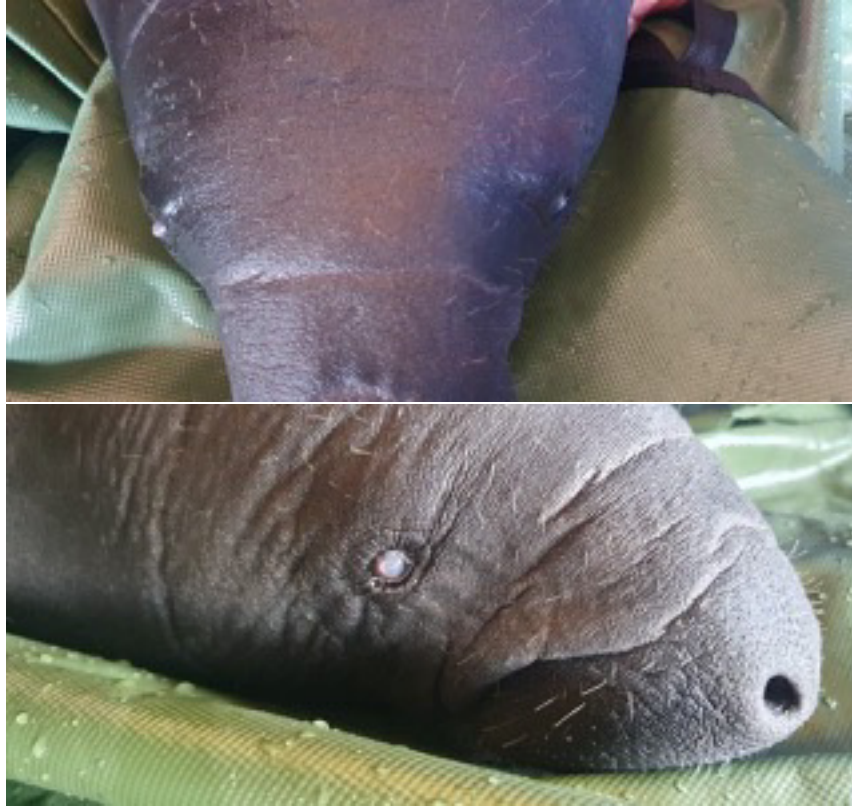


Figure 2. Collagenolytic ulcer in an Antillean manatee calf.

In adult and subadult Antillean manatees, there has been evidence of corneal opacity and edema associated with a hyposaline environment, irritative conjunctivitis during strandings, and keratopathy associated with environmental factors such as solar radiation. An episode of traumatic ocular prolapse (Figure 3) was found in a dugong (*Dugong dugon*) from Indonesia as a consequence of poaching. Immune-mediated disorders of follicular conjunctivitis (Figure 4) were diagnosed in an adult Florida manatee (*Trichechus manatus latirostris*) that presented immunosuppression with an expression of genital papillomavirus.



Figure 3. Traumatic proptosis of the eyeball in a male dugong.



Figure 4. Follicular conjunctivitis in an adult Florida manatee.

Behavioral manifestations often exhibited by individuals with visual disturbances, usually include using the edges of tank enclosures, or constant collisions with the walls of the tank, high sensitivity to sounds accompanied by the absence of the threat reflex, and incomplete closure of the palpebral sphincter. Individuals with conjunctivitis manifest scratching or rubbing of the flippers, accompanied by constant opening, and closing of the palpebral sphincter.

Among the treatments implemented to address ocular disorders include administration by ophthalmic route of hypochlorous acid, antibiotics (terramycin, tobramycin, moxifloxacin 0.5%), 5% hypertonic saline solution, tacrolimus, ocular epithelization (hydrolyzed casein, vitamin A and E) and autologous serum. Nutritional supplementation based on lutein, zeaxanthin, Omega 3, and vitamin A have also been provided. When supplemented with maintenance of good water quality and protection from sun rays, manatee ocular pathologies have responded well and their condition improved, especially with the reduction of oxidative stress and free radicals.

By identifying which alterations are frequently present in these sirenians, it is possible to begin to develop approaches to adapt ophthalmologic techniques used in domestic animals to manatees and dugongs. These techniques will facilitate the establishment of timely diagnoses and treatments that minimize the duration of the rehabilitation, recovery, and maintenance of individuals under human care.

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PHILIPPINES

Oil spill engulfs a UNEP CMS Dugong Questionnaire Survey site and affects two dugong priority conservation areas in the Philippines

After capsizing on February 28, 2023, the ship MT Princess Empress carrying 800,000 liters of industrial fuel sank off the eastern coast of Mindoro Island (approximately Latitude 13.290352°N, Longitude 121.560935°E).

On March 4, 2023, the Philippine Coast Guard (2023) reported areas of oil contamination in the Municipality of Caluya, Antique Province (Table 1) mirroring the University of the Philippines Marine Science Institute’s (UP MSI) Scenario 3 (<https://www.youtube.com/watch?v=UkH-33YsYfQ>) for the oil spill’s southwest trajectory using the General NOAA Operational Modeling Environment (GNOME). In the UNEP CMS Standardized Dugong Catch and By-catch Questionnaire Final Report, Caluya indicated high dugong sightings and extensive seagrass areas (Pilcher et al. 2017; p 52). Sadly, Caluya was also hit by the super typhoon Haiyan (Yolanda) in 2013.

Table 1. Locations affected by the MT Princess Empress oil spill in the Municipality of Caluya by March 04, 2023 (Source: Philippine Coast Guard, 2023; Google Earth, 2023) Note: a “barangay” is a basic Philippine administrative unit; multiple barangays then fall under the jurisdiction of a Municipality

Place Name	Latitude	Longitude
Barangay Tinogboc	12.007840°N	121.412402°E
Liwagao Island, Barangay Sibolo	12.199297°N	121.429905°E
Barangay Semirara	12.064276°N	121.391325°E

By March 10, the oil spread about 300 kilometers southwest to Northern Palawan. Severely affected included: Taytay (Latitude 10.816667°N, Longitude 119.516667°) and the Cuyo Islands (Latitude 10.850000°N, Longitude 121.016667°E); both dugong conservation priority areas identified during the Philippine Biodiversity Conservation Priority-setting Program (Ong et al. 2002).

Along the UP MSI’s predicted oil trajectories, the Disaster Risk Reduction Management Offices (DRRMOs) of local government units (LGUs) prepared ahead. However, given the complex interactions of surface ocean currents and a weakening of northeast monsoon (locally called “amihan”), the UP MSI’s (2023c) oil spill trajectory for March 12 (<https://www.youtube.com/watch?v=oa7iHKZ9LIk>) predicted a strengthened northward component inserting spilled industrial oil into the Verde Island Passage, also known as the “center of the center of global marine shore fish biodiversity” and an “epicenter of biodiversity and evolution” (Carpenter and Springer 2005).

Altogether, the UP MSI (2023b) estimates that the oil spill will damage 36,000 hectares of mangroves, coral reefs, and seagrasses, with Caluya and Cuyo Islands among the highest. As of March 11, 19,000 families have been affected (GMA Integrated News, 2023). Sadly, as the oil spreads, the numbers affected still grow.

Amid the efforts to respond to this large-scale ecological destruction as well as the disruption of the many lives and livelihoods depending on such coastal/marine ecosystems, the monitoring for affected dugongs (both fatal and sub-lethal) also needs to be conducted. Releasing an alert for orphaned dugong calves may also be necessary. Perhaps, actions on disasters (including responsive, rehabilitative and anticipatory) could be designed to service human lives and wildlife together.

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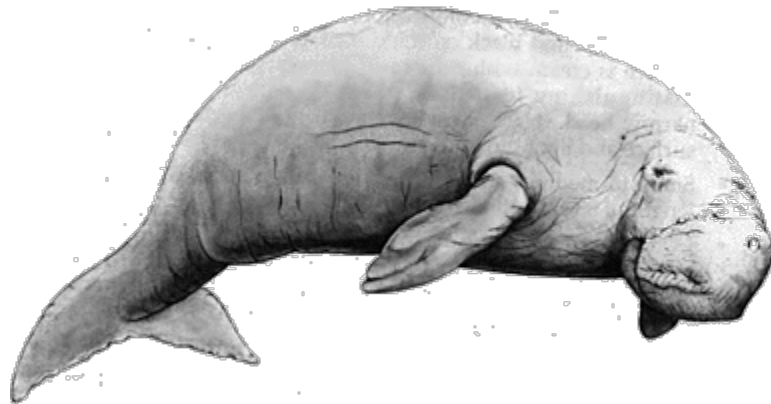
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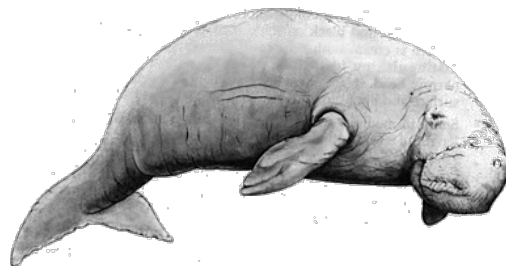


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NOTES FROM THE EDITORS: We would like to thank all of those who have contributed articles for *Sirenews*. On occasion, we have taken the liberty to make minor edits in an effort to accommodate our formatting style and provide clarity for our readership. 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!



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