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Greater Caribbean manatee in Puerto Rico. Photo by Abimael Márquez.





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IMPORTANT CONTENT A new publication standardizes the vernacular names for manatees

Source: <u>New publication standardizes the vernacular names for manatees | Centro de Conservación de Manatíes del Caribe (manatipr.org)</u>

A new publication in the journal Caribbean Naturalist has re-named manatees throughout North, Central and South America with standardized vernacular names. What's in a name? Standardization of vernacular names for *Trichechus manatus*, is the title of the article, which is in press, and available soon.

Mignucci-Giannoni AA, González-Socoloske D, Álvarez-Alemán A, Aquino J, Caicedo-Herrera D, Castelblanco-Martínez DM, Claridge D, Corona-Figueroa MF, Debrot AO, de Thoisy B, Espinoza-Marín C, Galves JA, García-Alfonso E, Guzmán H, Khan JA, Kiszka JJ, Luna FO, Marmontel M, Olivera-Gómez LD, O'Sullivan C, Powell JA, Pugibet-Bobea E, Roopsind I, Silva CJ. 2024. What's in a name? Standardization of vernacular names for Trichechus manatus. Caribbean Naturalist (in press).

Twenty-four co-authors from each country where manatees naturally reside have agreed to standardize the common or vernacular name for the *Trichechus manatus* species. The species presently has two recognized subspecies, *T. manatus latirostris*, and *T. manatus manatus*. Additionally, the authors surveyed 40 Spanish-speaking active manatee professionals in 11 Spanish-speaking countries to vote on the names to be used in Spanish. Currently, it is known by various vernacular names, none of which are descriptive of the biology and known distribution of the species. This lack of standardization has led to confusion and miscommunication, hindering conservation efforts for this species. The publication suggests that from now on, the vernacular name for the species should be American manatee, and its two subspecies should be known as Florida manatee and Greater Caribbean manatee. The publication also standardizes these names in Spanish, French, Dutch, and Portuguese.

Spanish: *T. manatus* — manatí de las Americas, *T. manatus latirostris* — manatí de la Florida, *T. manatus* — manatí del Gran Caribe

French: *T. manatus*—lamantin d'Amérique, *T. manatus latirostris*—lamantin de Floride, *T. manatus manatus*—lamantin des Grandes Caraïbe

Dutch: *T. manatus*—Amerikaanse lamantijn, *T. manatus latirostris*—Florida lamantijn, *T. manatus manatus*—Grotere Caribische lamantijn

Portuguese: *T. manatus*—peixe-boi das Américas, *T. manatus latirostris*—peixe-boi da Flórida, *T. manatus manatus*—peixe-boi do Grande Caribe

Scientific names for species are unequivocal to an animal's designation, however, standardized vernacular names minimize the proliferation of other vernacular names used, help communicate to lay audiences, disseminate important information about the species, and raise awareness about conservation, threats, and plight for survival.

"By establishing clear and universally recognized standardized vernacular names, we foster a sense of connection and scientific language responsibility, improving public awareness and understanding of these magnificent creatures and ultimately aiding in their protection and preservation," said Antonio Mignucci, director of the Caribbean Manatee Conservation Center and marine sciences professor at Inter American University of Puerto Rico, one of the lead authors of the publication.

LOCAL NEWS

AUSTRALIA

Second edition of 'Dugong: status report and action plans for countries and territories'

The UNEP Convention on the Conservation of Migratory Species of Wild Animals (CMS) has contracted James Cook University in Australia to prepare a second edition of this report. The new report which is tentatively titled 'Global Dugong status report in sub-tropical and tropical coastal and island waters of the Indo-West Pacific' includes an Executive Summary and the following 11 chapters: (1) an introductory chapter (Chapter 1) that provides the global context for the report; (2) 9 regional chapters that provide information for each of the following regions: East Africa (Chapter 2), Red Sea (Chapter 3), Arabian/Persian Gulf (Chapter 4), South Asia (Chapter 5), Continental Southeast Asia (Chapter 6), Maritime Southeast Asia (Chapter 7), East Asia (Chapter 8), Pacific Islands (Chapter 9) and Australia (Chapter 10; (3) Chapter 11 which summarizes the new information obtained through this review process.). Each of the regional chapters has been coauthored with at least five and up to nine regional experts and will be downloadable as a separate PDF.

The JCU team has also compiled an Endnote database of the more than 800 references (including PDFs of all that are available on-line) that have been cited in the report and a list of the available metadata on dugong status and trends across their range.

The report, which will total ~150,000 words exclusive of the references, is expected to be released online later this year.

- Helene Marsh

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DENMARK

Cuvier's empirical study of sea cows (Cuvier, 1809), and the challenge of a sea cow record in Fauna Groenlandica (Fabricius, 1780)

Abstract from: Hoch E. 2024. Cuvier's empirical study of sea cows (Cuvier, 1809), and the challenge of a sea cow record in Fauna Groenlandica (Fabricius, 1780). In: Heran M.-F. & Thirion F. (eds), 5th Georges Cuvier Symposium "Images of vanished worlds", Montbéliard, 19 to 22 October 2022. Revue de Paléobiologie 43(1): 3-25.

Sea cows, Order Sirenia Illiger, 1811, absent from European waters after the late Pliocene cooling, entered the cultural sphere of Western Europeans about 500 years ago, when Oviedo (1535) described "el Manati" in the New World. Columbus had mentioned mermaids in his logbooks from the warm seas, and increased sailing to faraway coasts gave sailors occasion for bringing stuffed sea cows to Europe. Linnaeus grouped sea cows (: manatees, sole sea cows known by L.) with whales in 1735,

but classified them with walruses in the genus Trichechus in 1758. In Systema Naturae, 12th edition (1766-68), Linné ranged manatees and Steller's sea cows in the species T. manatus. Young Otho Fabricius sailed from Copenhagen in 1768 to take up the post as Lutheran missionary and Pastor to Frederikshaab / Pâmiut in southwest Greenland. With the Inuit hunters, he learned about the fauna, which was rich over the 'West Greenland fishing banks'. Around 1772 he identified a worn cranium found locally as that of a sea cow, based on the Greenlanders' auveKajaK, "looking like walrus", and descriptions in Systema Naturae (Linné, 1766). Returned from Greenland, he recorded it in Fauna Groenlandica (Fabricius, 1780) as Steller's sea cow. Georges Cuvier, who studied animals and fossils anatomically, and had good access to literature and skeletons in Paris, expressed reservation about Fabricius' determination (Cuvier, 1809). He doubted that a Steller's sea cow could pass through the Arctic Ocean and the Baffin Bay to Greenland. The present study deciphers former thinking and applies results of satellite monitoring of sea currents to approach the truth about the worn cranium. It now seems that, in the essence, both men were right: A Steller's sea cow, Hydrodamalis gigas, could hardly have reached Greenland through the North-West Passage. A West Indian manatee, Trichechus manatus Linné, 1758, could well be represented by the worn cranium in southwest Greenland. "Fabricius' sea cow", doubted by many, in all probability was a West Indian manatee carried off by a "freakish" Gulf Stream.

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GABON

Knowledge about the African manatee (*Trichechus senegalensis* link, 1795) in the Ndougou lagoon (Gabon)?

The study was carried out in the Ndougou lagoon in south-west Gabon. The aim of the study was to establish the distribution of the African manatee (*Trichechus senegalensis*) by transect and to determine the perception of indigenous communities about the species. The results presented here are based solely on perception. The theoretical framework for addressing the issue is based on multispecies ethnography, which focuses on the complexity of relationships between humans and non-humans (Kirksey and Helmreich, 2010). The methodology was based on questionnaire surveys of people living in the Ndougou lagoon.

At the start of the interview, and before focusing on manatees, the residents of the Ndougou lagoon were asked to name the animals that frequent the lagoon: the elephant systematically came first, while the hippopotamus, and the African manatee, came second, followed by the monkey and then the crocodile. Amphibians are not mentioned. Overall, the African manatee is very well understood: 91% of local residents are aware of the presence of the African manatee. Knowledge of the African manatee by those interviewed is based on the transmission of ancestral knowledge orally and through direct contact with the animal during fishing trips.

They rely on their observations, sometimes combining them with beliefs that they have not systematically verified. Some knowledge is based on personal experiences dating back to childhood, with recurring images of African manatees playing on the banks of the lagoon, particularly around sunset. In addition, certain informants who lived their childhood and adult lives around the lagoon have inherited a singular cultural approach in terms of anecdotes: they report that if the bones of a consumed manatee were not returned to the water, at night, crying would echo throughout the village without knowing the source. A traditional ritual had to be done to apologize to the "spirits" so that this phenomenon would stop.

Some residents of the Ndougou lagoon said that the African manatee was part of daily life in the village when they were children, through stories, traditional rites and hunting. The age range of those interviewed was deliberately broad in order to obtain generational information. However, it was difficult for them to answer whether the manatee population was larger today than in the last 20 years, which is the case for 60% of users. On the other hand, over a shorter period of 5 years, 43% said they had seen fewer manatees. The multicultural dimension of the relationships between the communities living in the Ndougou lagoon and the African manatees must not be neglected. Local knowledge about African manatees includes their habitats, biological functions, behavior, and reproduction. Local residents are able to remember the areas where manatees are concentrated, as these sites are feeding grounds for the species.

Regular fishermen also retraced their daily itineraries according to the season. At the same time, the inventory (Nkollo 2022) reveals that manatees frequent the western zone of the lagoon, which corresponds to the representations of the informants. The knowledge mentioned with varying degrees of confidence also concerns the apparent 'good health' of the manatee (size, activity) and its diet; all interviewees affirmed that manatees are herbivorous. Some people described the manatee's feeding behavior as 'grazing'. The manatee is considered harmless because it is very shy and furtive when approached by humans. However, some people are concerned about the risk of the dugout canoe overturning when manatees flee from the sight of humans. The actions of the African manatee refer to movement, which is expressed by verbs such as "swim", "dive" and "flee". But they also often behave in other ways, such as "sunbathing", "staying on sandbanks" and "exposing themselves". The question of reproduction, essential to the character of the species, was raised by the fishermen. They claim to have seen several individuals fall back on a single female to mate. Sometimes, the female undergoes too many attacks and ends up dying. These observations corroborate data from other countries such as Côte d'Ivoire and Senegal (Ndour 2010 ; Akoi 2004).

In order to obtain accurate results, a comparison was made between the results of the transect inventories from the previous work on the manatee. The inventory led to 67 counts, the sorting of which resulted in the observation of three manatees in the eastern sector, one manatee in the central sector and 63 in the western sector. This represents a kilometer index of abundance of between 0 and 2.56.

Compared with this initial estimate, the abundance of the African manatee in the representations of the people surveyed is systematically underestimated and some believe that the scientific data do not reflect reality. For example, a former manatee hunter considers our inventory to

be very incomplete. He said; "I wouldn't be surprised to learn that there are hundreds of them. When we see them resting on the sandbanks underwater to graze 'tsani', they are often piled up and there may already be 20 or 30 of them together".

Overall, the abundance perceived by users is greater to the west of the lagoon, which corresponds to the reality of previous inventories.

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Man versus African manatee: towards a new wildlife conflict in Gabon?

The cohabitation between man and wildlife has always been conflictual. These human-wildlife conflicts are becoming increasingly frequent, severe, and widespread due to human population growth, agricultural expansion, infrastructure development, climate change, and other drivers of habitat loss (IUCN 2020). Human-wildlife conflict can occur wherever wild and human populations overlap, so any factor that forces wildlife and humans closer together makes conflict more likely (FAO 2021).

In Gabon, human-wildlife conflicts are a recurring problem that threatens communities. It's no longer just rural farming communities that must contend with elephants. But now also the fishing community with manatees.

The conflict between fishermen and manatees is twofold. The first is the destruction of fishing gear. Manatees are known to tear their nets to move across waterways. This state of affairs is marked in the Setté Cama Ramsar site in southern Gabon (NKOLLO 2022 et 2014).

The second point is the consumption of fish caught directly in fishing nets. This recent phenomenon is recorded in the Komo River in the Estuarine province. According to previous scientific work on the African manatee, it is considered almost exclusively herbivorous. It prefers flowering plants and seagrass beds. A total of 32 plant species consumed by the species throughout its African range have already been recorded (Ndour 2010). This report of the African manatee eating fish is not new. It has already been documented in Korup, Cameroon in 2015 by Koh Dimbot. In fact, local residents have modified the banks of the river for farming. No longer able to find a source of food, the manatees have changed their habits, eating the fish caught directly in the nets.



Figure 1. Manatee suspected of "stealing" fish from a net that eventually became entangled. He was released by the fishermen. (Mombo, 2023)

The difficult cohabitation between manatees and fishermen on the Komo causes a lot of damage to fishing nets and fishing products. These nets are often destroyed, leading to loss of production and therefore loss of income. Some fishermen report that at certain times of the year they are discouraged from setting their nets. In fact, it is impossible to travel without encountering large herds of manatees. According to some, this conflict is due to the increasing number of manatees in the river (Unpublished data). The manatee is fully protected throughout Gabon by Law No. 16/2001 of December 31, 2001.

Effective management of human-wildlife conflict protects local communities, prevents conflict escalation, builds confidence in conservation, and avoids retaliation against wildlife. Each human-wildlife conflict has unique ecological, cultural, social, historical, physical, economic and political characteristics that conflict management strategies must take into account. It has become imperative to find lasting solutions to reduce this conflict. The objective is to ensure the food security of communities and improve their living conditions, without compromising the biodiversity conservation efforts underway in Gabon for several years.

One of the solutions will consist of carrying out in-depth studies on this problem, on the one hand to establish the causes of this new phenomenon, and on the other hand to establish an effective strategy to mitigate its scale.

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GUATEMALA

"Museo del Manatí": A space to raise awareness about the importance of the manatee conservation in Izabal, Guatemala

The Foundation for the Development of the Dry and Semi-Arid Zones of Mesoamerica (FUNDESEM by its Spanish acronym) is a non-profit organization created in 2013 with the objective of working on projects that contribute to sustainable development in areas affected by climate change,

drought, and land degradation, maintaining a transgenerational gender approach oriented to the rational use and exploitation of natural resources and ecosystem services (www.fundesemgt.org). FUNDESEM has worked to promote the training and awareness of national and local actors on issues related to climate change, sustainable development, the rational management of natural resources, the protection and conservation of endangered species and the environment.

That is why, in 2022, FUNDESEM began to work with the National Council of Protected Areas (CONAP by its Spanish acronym) in three strategic areas. One of them is "Las Camelias" site, located within the Río Dulce National Park (CONAP, 2019; Figure 1). Due to an agreement signed between FUNDESEM and CONAP, in Las Camelias they agreed to develop and implement actions that promote the monitoring of the manatee within the framework of the National Strategy for the Conservation of this species and its habitat in Guatemala (CONAP, 2004), as well as develop actio to implement a biological station.



Figure 1. Location of the "Museo del Manatí" in the Río Dulce National Park protected area, Izabal, Guatemala. The boat route to visit the museum is also shown here.

As a first step, we have worked on enabling an area that will function as an educational and informative space, both forming the "Museo del Manatí" (Figure 2). This project seeks to create a space dedicated to the conservation, research, and dissemination of information about the manatee, an endangered species of aquatic mammal (Self-Sullivan & Mignucci-Giannoni, 2008; DCA, 2021). Through this museum we aim at raising awareness among visitors about the importance of conserving this species and its habitat. We will also promote scientific research to contribute to its conservation and the mitigation of the impacts of human activities in the area. This museum will exhibit the skeleton of an adult manatee, and several posters with information about the habitat, diet, and distribution of manatee species in the world (Figure 3). There will also be a space for educational activities and conservation programs, becoming a reference place for the study of the manatee.



Figure 2. The "Museo del Manatí" seen from the outside. Credits: Andrés Caal Chalib.



Figure 3. Interior part of the museum. Some posters are shown here. Credits: Andrés Caal Chalib.

The "Museo del Manatí" will be open to the public and opening hours will be announced soon. The only way to visit the museum is by boat, taking it from the docks of the Fronteras village (Figure 1; the cost of the boat ticket is Q75 per person, \$10 USD approx.) or by coordinating scheduled visits to the email jennifer.calderon@fundesemgt.org

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MEXICO

The short life of Pompeyo the manatee: lessons learned about manatee rehabilitation in Quintana Roo, Mexico

Pompeyo was an orphan manatee (*Trichechus manatus manatus*) calf found in 2021 in Milagros Lagoon by inhabitants of Huay Pix, at the south of Quintana Roo state in Mexico. The small calf was promptly rescued by members of the Marine Mammals Stranding Network of Quintana Roo, and translocated to Laguna Guerrero for rehabilitation (Castelblanco-Martínez et al., 2021). Most of the orphan manatees rescued in Mexico in the past were sent immediately to private aquariums. Although the welfare and health of these individuals were guaranteed, they remained under human care and didn't contribute to repopulating the already diminished population of wild manatees. From the first day of this rescue, the researchers were committed to Pompeyo's rehabilitation aiming his further release back to the wild.

Because the record of orphan manatees in the state is very small (only three cases in the last two decades: Daniel, Angel and Pompeyo), no rehabilitation/release program is in place. Moreover, government resources or proper infrastructure are not in place. Therefore, Pompeyo's rehabilitation process was adaptive to our local conditions and resource limitations, but we were always vigilant to any eventual concerning sign that required our prompt reaction. Also, regular health assessment sessions were conducted to monitor his growth and health. When he was rescued, Pompeyo was not placed in a special quarantine pool, instead, he was translocated directly to an enclosure within the Guerrero Lagoon, under uncontrolled environmental conditions. Hence, the individual endured temperature oscillations, wavy waters, rains, and storms, with a great adaptability to all the environmental changes. During the winter seasons of 2021 and 2022 (November – February), when the average water temperature dropped from 28°C to 22°C, the individual showed changes of behavior during cooler night times, by burying himself in the mud, which was some degrees warmer than the water. Thus, he was learning on his own how to cope with low temperatures.

Pompeyo was bottle-fed for 14 months, accepted the lacto-replacer formula very well, and never showed any digestive complications. Since February 2022, we started to offer natural algae (*Batophora* sp. and *Chara* sp.) collected from the same lagoon. Soon after, the algae volume was not enough to satisfy its needs, and we complemented Pompeyo's diet with lettuce. Although Pompeyo showed an evident preference for lettuce, he would also eat all the offered algae. The transition to a fully solid diet implied many logistical challenges for our team, not only due to the lack of institutional support to cover the price of the lettuce but also because we relied almost completely on volunteers to collect and prepare the algae. Despite all the limitations, we managed to guarantee the daily food for the manatee, and Pompeyo was growing steadily and healthily. He never suffered any infection, and his physiological parameters were always among the normal values for his age and species. His behavior was very playful, curious, and active; and he was several times seen interacting with wild manatees that approached the enclosure, particularly females with calves. One time, he managed to escape from the enclosure and returned ten hours later with an adult manatee and her calf.

Based on his health and behavior, we were very confident in his capabilities to find feeding resources by himself, to socialize, and to survive weather fluctuations. Thus, in June 2023, we started to plan his release to the wild. The animal was smaller than any other American manatee (Trichechus manatus) ever released (71 kg, 151 cm of total length). One of the arguments supporting manatee release at a bigger size is the fact that small manatees cannot be tagged with the traditional tetherequipped GPS telemetry device, as they don't have the strength to break the tether in case of entanglement. Therefore, in September 2023 we equipped Pompeyo with a VHF antenna coupled to a belt (without tether), following the same system used with dozens of Amazonian manatees (Trichechus inunguis), some of them tagged and released at the same size as Pompeyo. Another reason is that in some areas (for example on the coast of Brazil), released manatees must face big waves and currents and need to be strong to surf these kind of waters to reach food and freshwater resources (Borges J., Fundação Mamíferos Aquáticos, comm. pers.). However, this is not the case for Guerrero Lagoon, which is a shallow and sheltered waterbody, relatively easy to navigate for a young manatee. Additionally, manatee mother-calf pairs commonly use this lagoon, which could be an advantageous scenario for a young manatee. Based on all these criteria, the release was proposed to take place in September 2023, during the warm months. We carefully designed a soft-release protocol, along with a post-release monitoring plan including not only VHF telemetry monitoring, but also visual assessments of body condition and behavior, and periodical re-captures for health assessments. However, due to reasons out of our control, the release was delayed until the 3rd of November 2023 in the Guerrero Lagoon, at the beginning of the cold season. Once released, unfortunately, we only could monitor the individual from the shore using the VHF receiver, and we couldn't do any close assessment of his body condition, behavior, or health. Nevertheless, the manatee seemed to be adapting successfully, as he was reported eating algae and shyly exploring the areas a few hundred meters around his rehabilitation pen.



Figure 1. Pompeyo few weeks after the release. Photo credits: J. Padilla.



Figure 2. Monitoring Pompeyo through VHF telemetry system. Photo credits: J. Padilla.

Sadly, on the 2th March 2024, only one week before the first scheduled health assessment and after four months of the release, we were informed about the decease of Pompeyo near the enclosure area. The necropsy was conducted at El Colegio de la Frontera Sur (Chetumal, Quintana Roo). The carcass was considered in decomposition state 3 according to Pugliares et al. 2007 (i.e. the individual died approximately 4 days before the necropsy), and showed good fat and muscular conditions. We did not detect any hematoma, wound, or skin damage that could indicate vandalism, boat collision, entanglement with fishing gear, or drowning due to the telemetry gear. The internal inspection demonstrated that Pompeyo was feeding upon native algae but stopped eating at least five days before his death. Hard and rounded faeces at the last portion of the lower intestine near the rectum were found. The most prominent finding of the necropsy was the presence of purulent drainage in the muscles between the anus and the fluke. Further laboratory analysis confirmed the presence of *Escherichia coli* in this exudate.

After Pompeyo's release (November 2023 – February 2024), we had an atypically strong and long cold season with heavy rains. This factor, altogether with the change of diet, plus the expected stress related to conditions change, could have imperiled the immune response of the individual. Thus, we concluded that the manatee died due to a systemic infection and suggested that his immune system was likely compromised. Many orphan manatees die during the rehabilitation process, and many others do not adapt successfully to the wild after release. All the decisions regarding Pompeyo's process were consulted with national and international experts and were carefully taken after agreement among the experts of the ad hoc specialist's committee. However, as managers and researchers, we can always increase the chances of individual survival. We are taking this opportunity to highlight some recommendations for manatee rehabilitation in Mexico:

- Although the release area had all the manatee requirements (it is a sheltered area, offers enough feeding resources and freshwater, and is a traditional area for wild manatees), the only available feeding resource for manatees consisted of algae mats, which probably are not the most nutritional food for manatees in terms of digestive efficiency (Arévalo-González, 2020). Hence, other release areas offering for example seagrasses should be contemplated.
- The release should carefully follow the protocols of soft-release and minimize as much as possible any additional source of stress for the manatee during this important moment of the rehabilitation process. Factors of another nature should not influence decisions about rehabilitation nor releasing protocols, particularly if they can impact the well-being of the specimen in any way.
- After release, the manatee should be monitored daily and closely, observing directly any change in body condition and behavior. Telemetry monitoring is not enough, particularly if it is only through VHF systems. The authorities should work in collaboration with the researchers' team to facilitate such monitoring. This is particularly important when the released manatee is still young.
- Manatees in the Mexican Caribbean should be released during the warmest months of the year (April-September). Also, a temporal tendency of mom-calf pairs visiting Guerrero Lagoon has been suggested, with more individuals reported for the warm season, which could favour adaptation.
- Financial resources for manatee rehabilitation should be secured from the beginning of the process, including salaries for the personnel in charge, for as long as it is needed. National and international efforts should be invested in guaranteeing emergency funds for manatee rehabilitation.
- Manatee rehabilitation protocols should be flexible enough to adapt to local scenarios, particularly in developing countries were the funding support and infrastructure are not the ideal.

During Pompeyo's rehabilitation, almost 100 young volunteers from Mexico and abroad had the opportunity to participate and learn about manatee care. We also welcomed colleagues from Guatemala and Cuba to exchange experiences in manatee management (e.g., Corona-Figueroa et al., 2023). Pompeyo was also a study subject and helped us to learn more about the species. Several thesis focusing on Pompeyo were produced regarding manatee behavior (Cárdenas-Pérez, 2024 ; Charles, 2023), rehabilitation protocols (Soto-Arvizu, 2023), and health parameters (Zambrano-Burgos, 2023). Pompeyo was the ambassador of our educational campaign 'Pompeyo, de regreso a casa' (Lara-Sánchez et al., 2022), and was fundamental to incentive manatee awareness by reaching more than 600 children along the state (Castelblanco-Martínez et al., 2023b). Pompeyo's image was also critical for our campaign to promote coexistence between humans and manatees, including avoiding touching, harassing, or feeding wild manatees in the Manatee Sanctuary.

Even though Pompeyo's death was a profoundly heartbreaking event for our team, we are proud of the huge collective, inter-institutional and international effort invested on this individual. We keep the learning process, and we are still convinced that any effort to rescue, rehabilitate and release manatees is worthy to try.

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 ³Asociación Mexicana de Hábitats para la Interacción y Protección de Mamíferos Marinos (AMHMAR), México.

⁴Consejo Nacional de Humanidades, Ciencia y Tecnología (CONAHCYT), México.

"Manatees of the Mayan Coast: A new book about manatees in Mexico"

Derived from over 33 years of scientific research and conservation efforts, this book reflects multiple interactions with social, academic, and governmental fields in Mexico and Belize. These collaborations have fortified long-term conservation goals and led to the establishment of protected areas for manatees in both countries.

Within its pages illustrated with extraordinary photographs from the co-author and professional photographers, readers will discover insights into manatee biology, history, past uses, conservation efforts, and the threats they face. It aims to empower citizens and governments alike to take action for the permanency of manatees along the coast of Quintana Roo in collaboration with Belize.

Offering new biological information and highlighting achieved conservation strategies, the book underscores the importance of protected natural areas and proposes solutions for mitigating threats and risks. It also recounts the touching story of Daniel, an orphaned manatee found in 2003, who was successfully reintroduced into his natural habitat after spending his early months in captivity. Moreover, the book delves into the fascinating discovery of a polychromed pot at the archaeological site of Xcambó, which references manatees and the extinct Caribbean monk seal, further illustrating the historical significance of these creatures.

In closing, the authors extend an invitation to join them in their mission to ensure the enduring presence of manatees along the Mayan coast, hoping that the long tradition of study, the human resources formation, and the knowledge of this species, which ECOSUR has achieved contribute to the conservation of the manatee in Mexico and other Latin American countries. Together, let us embrace our responsibility and work towards a future where manatees thrive in harmony with their environment.

-Benjamin Morales-Vela



Sirenews – Dugong (End of Local News)

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Daryl Domning

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<END OF CITATIONS>



Sirenews – Dugong

SYMPOSIA/CONFERENCES MANATEE RESEARCH SYMPOSIUM

UNIVERSITY OF FLORIDA

NOVEMBER 6, 2023







Abstracts

Morphological comparison between manatee and rat olfactory epithelium. Ania Simoncek¹, Meghan Barboza¹

¹ Southern Connecticut State University, New Haven, CT

Olfaction is a predominant sensory system for most terrestrial mammals, but fully aquatic mammals have little to no sense of smell. Manatees have olfactory abilities but the strength of their olfaction remains unknown. Manatee olfactory epithelium was compared to a model species, the rat. We calculated thickness, number of sensory neurons, and density of the olfactory epithelium. The comparison showed that rat olfactory epithelium is almost 60 times denser while manatee epithelium is thicker with fewer neurons. While this provides evidence that manatees have weaker olfaction, behavioral studies must be performed to support this conclusion.

Using vibrissae to identify manatee diet and habitat use in the northern Gulf of Mexico. Mackenzie L. Russell¹, Levette Tucker², Carl Cloyed¹, and Ruth H. Carmichael^{1,2}

¹Dauphin Island Sea Lab, Dauphin Island, AL ²University of South Alabama, Mobile, AL

As manatee vibrissae (facial whiskers) grow, they may acquire diet information through time, comparable to samples from skin, liver, or muscle, but within a single tissue. To test the use of manatee vibrissae as an indicator of diet and associated habitat use, we sampled carbon and nitrogen stable isotopes (SI) along the vibrissae length. We found individual variation in SI values along the vibrissae, indicating that manatees moved among and foraged in a range of habitats in the nGOM. Our data suggest vibrissae are a viable tissue for SI analyses to assess changes in diet and habitat use by manatees.

Neurogenic nasal inflammation in manatees: Identifying peptidergic nociceptive nerve fibers in respiratory tissue.

Meghan Barboza¹, Tamarko Oakes¹

¹Southern Connecticut State University, New Haven, CT

During acute response to respiratory infections, peptidergic nociceptive nerve fibers are activated to cause a range of responses including changes to the respiratory rate. This is mediated by immune cells, solitary chemosensory cells, when pathogens are detected. Our goal was to identify these nerve fibers within respiratory tissue of Florida manatees. We utilized antibody stains against PGP9.5 and substance P within manatee respiratory nasal tissue to identify nociceptive fibers within the mucosa and submucosa. These stains will next be used to correlate this innervation with the presence of solitary chemosensory cells to better describe response to respiratory infections in manatees.

C-reactive protein ELISA development for Florida manatees as a possible indicator of inflammation. Maite De Maria^{1,2}, Lillian Maxwell^{2, 3}, Kevin J. Kroll², Jason Ferrante³, Michael Walsh ⁴, Margaret Hunter³, and Nancy Denslow²

¹ Cherokee Nation System Solutions In support of the United States Geological Survey, Florida, USA. ² Department of Physiological Sciences and Center for Environmental and Human Toxicology, University of Florida, Florida, USA

³ U.S. Geological Survey, Wetland and Aquatic Research Center, Florida, USA

⁴ Department of Comparative, Diagnostic, and Population Medicine, University of Florida, Florida, USA Inflammation in mammals can be quantified in plasma using markers such as serum Amyloid A (SAA) and C-reactive protein (CRP). SAA shows a poor correlation with white blood cell counts in manatees. CRP, on the other hand, has shown to be an excellent biomarker for early stages of inflammation in other mammals. We created a polyclonal antibody to test against manatee CRP using a synthetic peptide matching the CRP N-terminus to develop a diagnostic tool for detecting it in manatee plasma. CRP antibody specificity was corroborated using western blots with manatee plasma and protein sequencing. We developed an indirect enzyme-linked immunosorbent assay (ELISA). We compared CRP quantification as an indicator of cold stress syndrome with cytokine gene expression (n=52) for interleukin-2, - 6, and TNF-alfa. Our results show a functional and sensitive assay to quantify CRP in Florida manatees that can be possibly used as an indicator of early stages of inflammation.

Assessing the effectiveness of CRP as a biomarker of inflammation in manatees. Courtnie Ulrich¹, Kevin Kroll¹, Maite De Maria¹, Lillian Maxwell¹, Nicole Stacy², Martine deWit³, Nancy Denslow⁴

¹ Department of Physiological Sciences and Center for Environmental and Human Toxicology, University of Florida, Gainesville, FL

² Department of Comparative, Diagnostic and Population Medicine, University of Florida, Gainesville, FL

³ Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission, St. Petersburg, FL

⁴ Department of Biochemistry and Molecular Biology, University of Florida, Gainesville, FL Serum amyloid A (SAA) is currently considered the most sensitive diagnostic marker for assessing inflammation in the Florida manatee (*Trichechus manatus latirostris*). However, C-reactive protein (CRP) has shown greater sensitivity in domestic species. Since there is no available current diagnostic test to measure CRP in manatees, we used a custom-developed ELISA against manatee CRP to measure CRP concentrations in 74 archived plasma samples collected from manatees during annual health assessments. CRP values correlated with SAA values in some manatee plasmas but were quite distinct in others, suggesting that CRP is identifying alternative endpoints in manatees.

Pesticide Prevalence in Florida Manatees and the Indian River Lagoon.

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Florida's main agricultural activities include sugarcane, citrus, and cattle production, which utilize pesticides for their production that may subsequently run off into the aquatic environment. We investigated manatee exposures to pesticides by analyzing plasma from manatees sampled across Florida (2015-2019, n=101) and environmental samples from the Indian River Lagoon. All samples were analyzed for a broad panel of 183 pesticides and pesticide transformation products. Manatee plasma contained both insecticides (e.g. bifenthrin and DDE metabolites) and herbicides (e.g. dithiopyr). Plants and water samples from November 2022 showed the presence of herbicides (e.g. as atrazine and diuron. Insecticides (e.g.. bifenthrin) were also detected in plant samples. Exposure to these contaminants might impact metabolically expensive processes like the immune response and consequently manatee health.

Technology driven behavioral observations of manatees in rehabilitative care.

Ashley Nelsen¹, Sharon Spencer¹

¹ Jacksonville Zoo and Gardens, Jacksonville, FL

Behavioral observations are a significant component of enhancing animals' welfare in the care of zoos, aquariums, and other facilities. Incorporating a software platform to record and analyze observations can uncover additional insights in understanding these behaviors and allow staff to more efficiently and effectively address questions related to care and wellness. Through documentation of behaviors, this technology facilitates the ability of care staff to compare case studies and identify patterns, trends, and abnormalities. This presentation highlights the use of such technology in three case studies at the Jacksonville Zoo and Gardens Manatee Critical Care Center. In addition to continuing the collaboration between manatee partners and our understanding of these magnificent marine mammal species, the hope for this ongoing project is to further connect observations of manatees in the wild to those in rehabilitative care.

Update on the Manatee Unusual Mortality Event from Starvation on the Florida Atlantic Coast. Martine de Wit¹

¹ Florida Fish and Wildlife Conservation Commission, Marine Mammal Pathobiology Laboratory, Florida,

USA

An Unusual Mortality Event was declared for manatees along Florida's Atlantic coast beginning in winter 2020. Since December 2020, more than 1,450 manatee carcasses have been verified within the Atlantic region and more than 145 manatees were brought into rehabilitation. This UME is caused by starvation due to lack of forage in the Indian River Lagoon, where, for over a decade phytoplankton blooms fueled by excess nutrient loading have led to extensive seagrass losses. In this third year of the UME, the number of verified carcasses on the Atlantic coast has been much lower than the first two years, which is likely

due to manatees finding more forage options with the first signs of recovery of seagrass in some portions of the IRL.

Lipidomic profiling in Florida manatees affected by chronic malnutrition due to seagrass die-off in the Indian River Lagoon.

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Since December 1, 2020, over 1,450 Florida manatees died and over 145 were brought into rehabilitation during an unusual mortality event (UME) along the Atlantic coast caused by chronic malnutrition following seagrass die-off in the Indian River Lagoon. To understand metabolic effects and the severity of the condition, plasma samples from clinically normal (n=20) and UME (n=20) manatees were assessed via global lipidomics profiling. Five-hundred sixty-nine lipid species were identified, which showed distinct patterns of up to several hundred-fold change between both manatee groups. The results from this study provide detailed insight into lipid metabolism and associated pathophysiologic mechanisms in starved manatees.

Changing climate and thermal refugia affect migratory phenology of West Indian manatees in the northern Gulf of Mexico.

Elizabeth E. Hieb¹, Carl S. Cloyed¹, Kayla P. DaCosta^{1,2}, Ruth H. Carmichael^{1,2}.

¹ Dauphin Island Sea Lab, Dauphin Island, AL, USA

² University of South Alabama, Mobile, AL, USA

Under changing climate conditions, distribution and migratory patterns of thermally constrained species like manatees may be facilitated by use of thermal refugia. We used aerial thermographic imaging to detect thermal anomalies in manatee habitats and compared cold season manatee sightings to anomaly locations and surface water temperatures during a 12-year period. Manatee sightings overlapped with anomaly locations and increased during the study period, particularly during the late fall and early winter, as regional water temperatures also increased. These data suggest manatees may use passive thermal refugia to delay seasonal migrations to Florida, remaining longer in the northern Gulf of Mexico.

Detecting African Manatee (*Trichechus senegalensis*) Vocalizations: Harnessing Transfer Learning with a Convolutional Neural Network.

Athena Rycyk¹, Bolaji Dunsin², Clinton Factheu³, Ejimandu Christogonus Uzoma⁴, Aristide Kamla Takoukam,³

¹ New College of Florida, Sarasota, FL, USA
 ² Nigerian Institute for Oceanography and Marine Research, Lagos, Nigeria
 ³ African Marine Mammal Conservation Organization, Dizangue, Cameroon
 ⁴ University of Lagos, Lagos, Nigeria

African manatees (*Trichechus senegalensis*) are vulnerable and poorly understood, partially due to their elusive behavior that limits the effectiveness of visual surveys. However, their distinctive vocalizations offer a detection avenue. Manual identification of these vocalizations in recordings is labor-intensive. To streamline this, we trained a convolutional neural network using recordings from Cameroon and Nigeria, leveraging a transfer learning approach with GoogLeNet. Once validated, this network successfully extracted thousands of vocalizations. In the Nigerian recordings, we found an increase in detections of vocalizations at night similar to what has previously been reported in Cameroon.

Knowing Your Community through a Needs Assessment to Co-Design a Community Marine Science Education Project in Florida's Big Bend.

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 ¹ College of Education, University of Florida, Gainesville, FL, USA
 ² Department of Comparative, Diagnostic, and Population Medicine, College of Veterinary Medicine, University of Florida, University of Florida Marine Animal Rescue, Gainesville, FL, USA
 ³ Cedar Key Dolphin Project,

⁴ University of Florida College of Liberal Arts and Sciences ⁵ University of Florida Wildlife Ecology and Conservation Department

This presentation details the design, implementation, and initial findings of a needs assessment, representing the onset of a collaborative learning partnership among education researchers, marine scientists, and community members in Florida's Big Bend. This partnership centers on equity, placing value on local knowledge/practices, mutual reciprocity, and providing access to diverse scientific inquiry. Initial impressions from the assessment suggest a notable overlap between local practices and their aquatic environment. Moreover, local communities appear to possess rich local ecological knowledge (LEK) regarding manatees, cetaceans, and sea turtles, with many expressing a willingness to engage in a community marine science education project.

Florida Springs Heartland Manatee Sighting Network Pilot Project through Citizen Science. Lindsey Pavao¹

¹Alachua County Environmental Protection Department

Alachua County Environmental Protection Department implemented a new springs recreation campaign and manatee sighting network for the Santa Fe, Ichetucknee, and Suwannee Rivers during the 2022-2023 winter season. Through partnerships with multiple agencies and businesses, manatee sightings were reported by the public to the online reporting form managed by Save the Manatee Club. A piloted citizen science project collected weekly sighting data at set land-based locations throughout the region to mirror the aerial synoptic surveys conducted throughout the state. The project was funded by the Fish & Wildlife Foundation of Florida.

Using a Virtual Reality Simulation to Raise Awareness about Manatee Wellbeing and Conservation. Alexis Merker¹, Alex Wills², Riley Wood², Dr. Tania Roy³

¹Oregon State University

² Computer Science (AOC), New College of Florida, Sarasota, FL

³ Human Centered Computing, New College of Florida, Sarasota, FL

To increase awareness about eutrophication's impact on manatee wellbeing, my team and I used data on seagrass loss and unusual manatee mortality events in the Indian River Lagoon (IRL) to develop an

educational Virtual Reality (VR) game for the Oculus Quest 2 headset. Users play as manatees and experience eutrophication's adverse ecological impacts. In upcoming usability studies, participants will engage with the game and respond to questions regarding eutrophication and manatee conservation, both of which are comprehensively addressed within the game. The preliminary data includes three components: administering pre- and post-questionnaires using the Qualtrics platform, collecting ingame telemetry data, and asking open-ended questions. The pre-and post-questionnaires assess the impact of the simulation on participants' knowledge about manatees. The collection of telemetry data is necessary to assess the duration participants spend reading content and actively participating in the game's mechanics. The open-ended questions serve to gain a deeper understanding of participants' interactions and engagement with the game. Our preliminary results indicate that VR is an impactful way to engage with and better understand vital environmental issues.

Has the time come to create a Manatee Science and Conservation Consortium to coordinate and support manatee research?

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¹ New College of Florida

² University of Florida College of Veterinary Medicine, Aquatic Animal Health Program

Florida supports thousands of manatees in its waters and through its many scientists and institutions dedicated to their wellbeing. Manatee Rescue/Rehabilitation Partnership, state agencies, and UF's Aquatic Animal Health Program highlight the usefulness of collaboration in caring for manatees. The increasing number of manatees facing difficult environmental challenges and entering/exiting managed care requires data collection across contexts and academic disciplines, an enterprise that could benefit from more collaborative permit applications, pre-arranged access to rehabilitation facilities, and coordinated investigations related to manatee health, behavior, cognition, reintroduction, etc. Here we ask for your input and interest in creating a research consortium to manage these goals.



Sirenews – Florida manatee (Last page of abstracts) **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, 2024 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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