

Sirenews



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A TRIBUTE TO JUDITH VALLEE, EXECUTIVE DIRECTOR OF SAVE THE MANATEE CLUB

After 21 years serving as Save the Manatee Club's executive director, Judith Vallee has decided to step down so she can pursue some of her other many talents and interests. Judith's dedication and self sacrifices on behalf of manatees is unequalled and there is no question that Save the Manatee Club could not have been nearly so successful without her. I remember when I first spoke to Judith in 1984 as she was organizing a manatee protection and awareness event in Broward County. I was immediately struck with her unwillingness to take "no" as an answer when it came to furthering manatee protection. Just a short time later I had the honor as Vice Chairman of Save the Manatee Club to interview and hire Judith as the Club's Director. To this day I can think of no other person that could have lead Save the Manatee Club so successfully through the many challenges and pitfalls the future had in store for both the Club and the manatees.

UNION INTERNATIONALE POUR LA CONSERVATION DE LA NATURE ET DE SES RESSOURCES
INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES
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The Save the Manatee license plate is an example of both Judith's great foresight and willingness to sacrifice for the cause of manatee protection and recovery. Although the license plate was Judith's idea as a fundraising tool for Save the Manatee Club, she was willing to sacrifice for the Club in order to help insure that the state of Florida's manatee program could be expanded to meet the challenges manatees were facing statewide. Even though this made Judith's job of growing the Club's resources much more difficult, without this sacrifice Florida's manatee research and protection programs would never have been so successful. Her commitment to state and federal efforts did not stop there as she regularly looked for other opportunities for the Club to fund both state and federal research and rescue programs on behalf of manatees.

Fortunately for Save the Manatee Club Judith has graciously agreed to work part time as the Club's Director of Development while she takes a little more well-deserved and overdue time for herself. *—Pat Rose*

Thank you, Judith, for your past and continuing dedication to saving manatees and their habitat!

NEW BOOKS

The Florida Manatee: Biology and Conservation, by Roger L. Reep and Robert K. Bonde. A new book on the Florida manatee released by University Press of Florida.

"With a depth that comes from decades of working on manatee research in both the field and laboratory, Roger Reep and Bob Bonde lead readers on a journey into the world of this unique and endangered marine mammal. This journey reveals new discoveries about manatee brains and behavior, delves into current controversies surrounding manatee conservation, and is told from the perspectives of the authors' personal experiences and the individuals who have made a difference in the field."--Charles Deutsch, Florida Fish and Wildlife Research Institute

"A must-read for anyone with an interest in the conservation of this important species."--Jim Valade, U.S. Fish and Wildlife Services Manatee Recovery Activities

In the field of marine biology, there is a uniqueness to manatee research, and in this book, Roger Reep and Robert Bonde make clear both its rewards and challenges. Veteran researchers with 45 years' experience between them, they have created an instantly engaging, accessible tale of this mysterious creature for professionals and interested lay people alike.

Having played integral roles in many of the research efforts discussed in the book, Reep and Bonde humanize the sometimes difficult-to-grasp characteristics of manatee biology, their relation to the environment, and the biopolitics that result from the intersection of science and wildlife management. They weave fact with real-life scenarios to explain what science has learned about this unusual animal--from microorganisms that cause manatee die-offs during red tide blooms to the complexity of long-distance migrations to the curiosities of manatee physiology. The evolutionary basis of the sirenian language (how manatees communicate with each other) is also revealed.

Technological innovations and conservation efforts since the landmark protection legislation of the early 1970s are also central to the manatee story. Captive rehabilitation, radio tracking, and advanced boating regulations are discussed as methods to ensure manatee survival. Reep and Bonde argue that increasing interaction between man and manatee, most notably through the shared use of waterways, makes ongoing scientific research essential if successful coexistence is to be possible.

Roger Reep is a neuroscientist and professor in the College of Veterinary Medicine at the University of Florida. Bob Bonde is a biologist with the U.S. Geological Survey Sirenia Project. The book is available through Amazon.com and other major book stores.

Marine Mammals Ashore: A Field Guide for Strandings (J.R. Geraci & V.J. Lounsbury) - in the hardcover format - is back!

A comprehensive manual for understanding and dealing with a stranded seal, manatee, dolphin, whale, or sea otter, this book contains information for the interested beach dweller or student and for the scientist or marine resource manager.

Marine Mammals Ashore describes rescue operations, how to organize a response team, and how to deal with the media and the public. It includes basic information on marine mammal biology, life history and health, and an extensive bibliography.

The book also provides stranding network participants with practical guidelines for collecting data and specimens to better understand the biology and behavior of marine animals and the condition of their environment.

All chapters have been updated and expanded, with emphasis on topics that include:

- * Enhancing network organization, public education, and media relations.
- * Natural and human-related mortality in each major marine mammal group.
- * Recognizing, responding to, and investigating unusual mortality events.
- * New or updated protocols for specimen and data collection (e.g., samples for PCR analysis; basic guidelines for investigating possible noise-related strandings; collecting environmental data and samples; and a detailed protocol for examining marine mammals for signs of human interactions).
- * Zoonoses and other public health issues.
- * Updated overview of marine mammal stranding frequency and distribution in North America, with coverage extended to Canada and Mexico.
- * Overview of special topics provided by invited authors: disentanglement (Peter Howorth, Santa Barbara Marine Mammal Center, Santa Barbara, CA); tagging and monitoring (Anthony Martin, British Antarctic Survey); and GIS applications (Greg Early, A.I.S., Inc., New Bedford, MA).
- * Close to 600 new references (and a few new carcass disposal stories!).

The 372-page second edition features water- and tear-resistant paper, a vinyl cover and durable plastic coil binding.

Cost = \$38 U.S. plus shipping and handling. Total with shipping and handling =

- * U.S. or Canada - \$44
- * Other countries (surface, 4-8 weeks) - \$47
- * Other countries (airmail, 7-12 days) - \$54

For more information or to order, please visit
www.aqua.org/research_marinemammalsashore.html.

A review of this book is provided below.

2005 MARINE MAMMAL CONFERENCE

The 16th Biennial Conference on the Biology of Marine Mammals was held in San Diego, California, USA, 12-16 Dec. 2005. Numerous papers and posters were devoted to sirenians. Unfortunately, copies of the abstract volume are sold out.

BOOK REVIEW

J.R. Geraci and V.J. Lounsbury. 2005. *Marine Mammals Ashore: A Field Guide for Strandings*, Second Edition. National Aquarium in Baltimore, Baltimore, MD. 371 pp.

Back in the Dark Ages before the original version of *Marine Mammals Ashore* was published, students, biologists, veterinarians and anyone else who wanted to understand what to do about a stranded marine mammal mostly had to rely on information passed down from one person to another which, as we all know, can sometimes be good information, and sometimes a horrible lesson in what not to try again. Thus, with the publication of the first volume in 1993, it immediately became recognized as a wonderful general resource with good descriptions and standardized techniques written in a way that was user-friendly for everyone in the field.

This new edition of the original volume has been updated and greatly improved with the addition of almost 600 new, well-researched references, special topics including chapters on Disentanglement, Tagging and Monitoring (although this does not include manatees), and GIS Applications, as well as updated protocols and sample forms. There has also been some good reorganization; for example, the Guide to Marine Mammals of North America has been consolidated into one chapter, rather than descriptions interspersed throughout the book. Another highlight for many readers (because a requirement for most people who deal with carcasses is a healthy sense of humor) will be the chapter on Carcass Disposal which includes several wonderful new anecdotes, and the funny but enlightening cartoons all through the book.

The manatee chapter (which one might assume Sirenews readers will be most interested in!) has been expanded to give a general introduction to all four sirenian species, a new map detailing West Indian manatee range, and updated information about subjects such as causes of mortality and rescue equipment needs. The only unfortunate aspect of the chapter is that some drawings were not updated and show techniques that are either outdated (Florida manatees are not usually transported in a box resembling a coffin) or dangerous (rescue crews pull netted manatees to shore head first to avoid drowning, not tail first as shown in the picture). Additional good information for manatees can be found in the Specimen and Data Collection chapter, which has very detailed descriptions and drawings of techniques for manatee blood draws and necropsy procedures.

All chapters have been expanded with emphasis on topics including network organization, media relations, recognizing unusual mortality events, zoonoses and other public health issues. In short, topics that have become increasingly important as more people become involved and respond to strandings. The hard plastic cover, plastic coil binding and waterproof pages make *Marine Mammals Ashore* durable and field-worthy, and there are blank pages for notes at the end of each chapter. I am certain this book will continue to be a useful resource for the stranding network community for many years to come. - **Lucy Keith** (keith@wildlifetrust.org).

LOCAL NEWS

AUSTRALIA

Language Matters in Dugong Conservation. - The Great Barrier Reef region in northeastern Australia, covering an area of 344,400 square kilometres, is the largest World Heritage Area in the world. The Great Barrier Reef World Heritage Area (GBRWHA) is also the feeding and breeding ground for many threatened species including the dugong. The GBRWHA is functionally divisible into two regions: the remote region off Cape York (Northern Great Barrier Reef) and the urban coast. Marsh et al. (2002) estimate that the coastal waters of Cape York support about ten thousand dugongs, some 10 percent of the Australian dugong population.

The land bordering the GBRWHA is also home to 70 Indigenous traditional owner groups (approximately 11,000 Indigenous people), many of whom continue to harvest dugongs as a traditional right, and for whom hunting continues to be of high cultural and dietary value (Baldwin 1985). Indigenous hunting of dugong however is an activity that has historically polarized communities living along the GBRWHA. Population models indicate that the current Indigenous harvest levels of dugongs are unsustainable both within the northern Great Barrier Reef Region and neighboring Torres Strait.

In the last twenty years the Great Barrier Reef has worked in various ways with Indigenous peoples to manage traditional hunting practice. Specifically, Hope Vale Aboriginal community, located within the Northern reef section, has had an ongoing dialogue with Management Agencies and worked towards effective management of Indigenous dugong hunting activities. These management initiatives have included (i) the implementation of the first permit system within the reef, (ii) development of a Turtle and Dugong Hunting Management Plan (the first in Australia), and most recently (iii) the establishment of Traditional Use Marine Resource Agreements (TUMRAs) with the Great Barrier Reef Marine Park Authority (GBRMPA).

Our research has focused on the relationship between Management Agencies and the Hope Vale community in relation to management of dugong hunting. Using a discourse approach, our research, funded by the James Cook University, the CRC Reef Research and the Pew Foundation via Professor Helene Marsh, aimed to identify whether or not differences between linguistic understandings of Indigenous hunting, planning and management had any effect within on the ground management initiatives, such as the Hope Vale Plan.

A key finding of our research was that significant linguistic differences exist between Management Agencies and Hope Vale Community about dugong hunting,

planning and management. Management Agency staff, for example when talking about dugong management, prioritized this need in the context of biodiversity protection, while Indigenous members viewed dugong management primarily as a mechanism that would address cultural survival objectives. In this context, Management Agency staff prioritized the production of a *plan*, whereas Hope Vale prioritized planning *processes*, a priority reflected in their respective discourses about planning and management.

Further, while the same terminology was used throughout the management process, our research revealed core differences in understanding between Hope Vale and Management Agency personnel. 'Equity', for example, was a term employed by Hope Vale community members within dialogue about Indigenous rights. For Indigenous people, hunting was seen as a value-laden activity and therefore an equity issue. Terms used to describe the rights held by the community included: (i) who had the right to hunt; (ii) who had access to permits; (iii) who had the right to speak with Management Agencies; and (iv) who had the right to manage hunting activities. Achieving equity was understood then as achieving parity within this rights framework. Management Agency staff, by contrast, discussed the term equity in a far broader context. Management Agency staff employed the term equity to explain the problem of reconciling Indigenous interests with those of non-Indigenous groups (including scientific and conservation) in management. This concern reflects the wider community perception that Indigenous people received preferential treatment in relation to Indigenous harvesting of Green turtles and dugongs in the GBRWHA. This difference in understanding offers an important insight into how negotiations over dugong management can end up at cross-purposes because the fundamental concepts and actions being discussed are understood completely differently.

Many other examples could be discussed. Overall, however, our research revealed that how language is used and interpreted within resource management does matter because different linguistic interpretations within such programs have a direct impact on their efficacy. In this case, the ebb and flow between the different discourses and their impacts on the ground, were a significant contributing factor that explained the difficulties in implementing the Hope Vale Plan.

The research highlights that species such as the dugong, which are so vulnerable, need to be protected by management regimes that address both social justice and biodiversity objectives, in ways that are politically feasible, socially just and economically viable. The research calls for the establishment of a small integrated group, led by an Indigenous person, to provide a briefing to the Commonwealth of Australia on how to achieve a national 'Caring for Country and Culture' scheme that will ensure both species protection and respect Indigenous rights to hunt. - **Melissa Nursey-Bray and Helene Marsh** (for further information you can contact: Melissa Nursey-Bray, Australian Maritime College on m.nursey-bray@amc.edu.au or Professor Helene Marsh, James Cook University on Helene.Marsh@jcu.edu.au).

Update on Captive Dugong in Australia. -More than three years have passed since Pig, the male dugong hand-raised at Sea World (Australia) and released in March 2002, was recaptured in extremely poor body condition after spending eight months in the wild (*Sirenews* No. 39, April 2003). Over that period, numerous tests were done to try to pinpoint the reason(s) that he failed to regain the good health he had shown prior to release,

but there was no clear indication of why he now failed to thrive. For 18 months prior to release he had flourished when housed outdoors, where water temperatures reached a minimum of 17°C during winter. Now, in his emaciated (and therefore poorly-insulated) post-recapture state, it seemed that he could be compromised by water temperatures somewhere around the mid-20°C's or perhaps even higher. For this reason, he has had to be maintained in a specially heated rehabilitation pool adjacent to the Veterinary Quarantine Centre (VQC) since his return to Sea World.

Many months into his recuperation, consensus grew amongst various stakeholders that it would be unjustifiable to contemplate any future attempt at re-release of this particular individual. Eventually, in August 2004, Sea World made a formal application to the Queensland Environmental Protection Agency (QEPA) to transfer Pig off the Rescue Permit under which he was hand-raised and released, and on to Sea World's Wildlife Exhibitor's License. Permission to do so was granted in October 2004. Plans were made to house Pig where he could be seen by the public - in a dedicated area with a heated pool which allowed underwater viewing. Demolition and refurbishment of the interior of the building that had once been the World of the Sea Theatre began. Photographs, video footage, object galleries, and several interactive stations were utilised, in addition to standard textual graphics with a strong emphasis on dugongs and dugong conservation in general (as well as lots of specific information about Pig and his story), to increase the educational impact of this interpretive material. The new exhibit "Dugong Discovery" opened on Boxing Day 2004.

In addition to Pig's unique contribution to raising public awareness of dugongs and threats to their survival, the hand-raising techniques developed during his original rehabilitation have already proven useful, after the January 2005 stranding of yet another baby dugong in central Queensland. This female calf is currently making steady progress at Sea World after being rescued from a beach at Emu Park (between Rockhampton and Yeppoon) by Rosslyn Bay Marine Parks rangers and an elder of the local Darumbal community. She has been named "Wuru", a Darumbal word meaning 'young child'. As Wuru continued to thrive, in July 2005 we sought QEPA permission to move her into Dugong Discovery where she could be seen by the public in lieu of Pig. Wuru is currently housed in the 3.9m deep Dugong Discovery tank, an environment she shares with various species of fish, small benthic sharks (grey carpet sharks, epaulette sharks) and stingrays. She still gains most of her nourishment from bottle-feeds of milk, but will be weaned gradually over the next six months.

Pig was taken off display and back to his rehabilitation pool adjacent to the VQC, where it was more practical to closely monitor changes in his body weight, blood values, food intake and faecal output. Subsequently, staff came back to revisit the idea that the bacterial flora in Pig's intestine, essential to allow him to digest a herbivorous diet, was somehow not up to scratch. Within the first couple of months of his recapture, re-inoculation of his gut with faeces from wild dugongs was attempted on two occasions, but in retrospect it was felt that for various reasons this process might not have been successful. In September and October 2005, more freshly-passed faeces was collected in the vicinity of feeding dugong herds in Moreton Bay, and efficiently delivered to Pig (and, as he was going through yet another downturn in his appetite and body weight, a number of medications were also administered around the same time). Since then he has rallied and begun to eat very well, regaining a great deal of lost condition and, for the first time since

his recapture, is steadily closing in on his release weight. -**Wendy Blanshard** (Sea World, P.O. Box 190, Surfers Paradise, Queensland 4217 Australia; tel.: +61-7-5588-2222; fax: +61-7-5588-2266; e-mail: <wendy.blanshard@wvtp.com.au>).

BELIZE

Dry Season Manatee Captures in Belize – March 2006. -Wildlife Trust's Manatee Project in Belize began in late 1996; the first manatee, an adult male, was captured in November 1997. This past March made the 16th time we have assembled a crew from Belize and abroad to catch manatees in the Southern Lagoon, a 9000 ac Wildlife Sanctuary in the heart of Belize's coast. Our schedule is now to capture animals once in the dry season and once in the wet season.

Starting on March 18, we had three priority animals to catch; specifically those that had satellite (PTT) tags. The first attempt was an adult male originally captured and tagged with a PTT tag in November 2005 within the marine environment of the Drowned Cays. As the PTT component stopped functioning in February, and we were unsuccessful in detecting a signal from the VHF component of the tag, we were unable to find the animal to catch.

The team then moved to the more reliable waters of the Southern Lagoon, a brackish estuarine system, where we track between 5-10 manatees throughout the year. We caught four new males, and one new female in the Lagoon. We were able to capture and change the tag of a female originally caught in 1997 as a calf, and who we have been tracking since November 2004. We are awaiting signs of the first mating or pregnancy from this female named "Morgan".

The most challenging task was to catch "Super-K", one of the priority three, a large adult male (424 kg) originally tagged in November 2005. "Super-K" had moved out of the Lagoon, southward along the coast to a small lagoon area about 10km away, as identified by the satellite reading. Our efforts resulted in receiving the tag's VHF signal, which was only two to three beeps every 10 minutes; we were therefore unable to locate its exact position.

Serendipitously, while tracking for "Super-K", we picked up the signal for a female, "Ellie" who we were looking for since we began the week's captures. "Ellie" was another target adult that we have been tracking since April 2003; the PTT component of her tag was no longer functioning and therefore needed to be retrieved. Sitting within a mile of our boat in about 4.5 meters deep water, she was with a group of about 10 other manatees. Through the great skill from the team and some luck, we were able to retrieve the tag and catch her for a medical examination.

Within the last three years we have been tagging mother and calf pairs to observe weaning and subsequent calving by the adult. In some cases we also tag the weaned calf to monitor long-term reproductive patterns (as we did with "Morgan".) This capture we had targeted a mother and female calf pair originally tagged in November 2005, as the mother lost her tag (the belt broke off). Unfortunately we missed that pair in the process of the capture and the calf too lost her tag. Fortunately, all animals we capture are tagged with two unique microchips (PIT tags) so we can identify them if caught in the future.

For this capture event, all animals were considered in "excellent" body condition, save "Ellie" who was classified as "good" – she had new scars and appeared a little thin.

Two were previously caught animals, and six of the eight had boat scars. Until the next capture in the wet season (October), we will be tracking eight manatees in Southern Lagoon and one in the offshore cays. We collect positional data, basic physical water quality data, and behavioral data of the manatees we monitor. - **Nicole E. Auil** (Belize Program Manager / Conservation Biologist, Wildlife Trust; auil@wildlifetrust.org).

BRAZIL

Some recent records of manatees in the great Belém area, on the north coast of Brazil. -The distribution and occurrence of manatees (*Trichechus* spp.) is poorly understood in the surroundings of Belém, Pará State capital, as well the Marajó Island and nearby coastline in Brazil. The high hunting pressure in the past has decimated most of the existing populations but apparently some small groups are thriving. Also important is the fact that both species can coexist, and hybrids have been recorded in the mouth of the Amazon River and the great Belém area. Due to these facts we strongly recommend further investigation of their conservation status.

There is an increasing interest in their occurrence by biologists and as a consequence their presence is being reported from several localities. Additionally manatees and cetaceans were included as a key topic and will be investigated by the staff of Projeto Piatam (Potenciais Impactos Ambientais do Transporte de Petróleo e Derivados na Zona Costeira Amazônica) Mar supported by PETROBRAS-Brazil Oil Company. Major institutions from the northern Brazilian coast are involved in the project such as Museu Paraense Emílio Goeldi (MPEG) and Universidade Federal do Pará.

Recent manatee records are known from Cametá (02° 14' 54''S; 49° 30' 12'' W) and the Salgado region. The Cametá specimen was found on February 1 2006 with several wounds inflicted from a probable hunter. It was a 2 m long pregnant Amazonian manatee. The latter was a confiscated specimen found during a routine patrol by local authorities. Additional records include two specimens found in 2005 from the localities of Soure and Salvaterra, Marajó Island. The skull from the latter specimen is deposited at MPEG and represents an important confirmed record for the area.

We thank Rosália F. C. Souza (UFRA/IBAMA/CEPNOR/PIATAM Mar) for providing information on the specimen from the Salgado region. S. Siciliano and N. Renata Lima have received support for field studies from Projeto Piatam Mar and Projeto Piatam Oceano/Cenpes/Petrobras. – **Salvatore Siciliano¹, Neusa Renata E. de Lima², Adriana C. Colosio³, and José de Sousa e Silva Jr.⁴**. (¹Grupo de Estudos de Mamíferos Marinhos da Região dos Lagos (GEMM-Lagos), Laboratório de Ecologia, Depto. de Endemias Samuel Pessoa, Escola Nacional de Saúde Pública/FIOCRUZ. Rua Leopoldo Bulhões, 1480-térreo, Mangueiras, Rio de Janeiro, RJ 21041-210 Brasil; ²Universidade Federal do Pará, Depto. de Biologia, Laboratório de Ornitologia e Bioacústica; ³Novos Curupiras, Soure, Ilha do Marajó, PA; ⁴Museu Paraense Emílio Goeldi, Coordenação de Zoologia (CZO), Av. Perimetral, 1901, Terra Firme, Belém, PA 66077-530).

Amazonian Manatee Project – Brazil. -The Amazonian manatee is one of the aquatic mammals belonging to the Sirenia family and is one of the biggest species of this type. It can reach 2.8 meters in length and it can weigh up to 500 kg. Its color varies from dark gray to black, with many animals having white or pinkish patches on their bellies.

This species is endemic to the Amazon basin and is categorized on IUCN's Red List as "Vulnerable" (facing a high risk of extinction in the wild in the medium-term future) and is on the Brazilian official list of species as threatened (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis - IBAMA). It is also included in Appendix I of the Convention for International Trade of Endangered Species (CITES) that addresses threatened species.

Our greatest long-term challenge is for this species to be protected enough to be removed from the list of threatened species in Brazil and to guarantee the survival of the manatee population, especially the population in the Anavilhanas Ecological Station (350,018 hectares), one of the largest fluvial archipelagos in the world, composed of more than 400 islands in the Rio Negro region where this project is being carried out. Both governmental and non-governmental agencies and the riverine communities are involved in this conservation program.

The general objectives of this research are to determine relative habitat use and movement patterns of manatees and design management plans for the species and its wetlands habitat, and to implement environmental education for local people in order to raise their awareness about the importance of conservation.

The ecological studies will require the radio-tagging of at least two manatees per year. Temporal and spatial habitat maps with descriptions for manatees in each area will be developed, along with reports of threats to manatees and wetland habitats. This information and results will be compiled and presented by our project staff in the form of recommendations and for mitigation of threats. Furthermore, the information gathered through this study will be used to develop a Manatee Management Plan for the Amazon Basin, together with other researchers from Amazonas. During the next few years, we will hopefully be able to obtain the necessary data for a manatee population viability analysis, which will ultimately provide the tools for the implementation of a management program for the Amazonian manatee.

We began project activities in 2003 interviewing workers from IBAMA and hunters from the region, and making expeditions on the lakes and paranás (arm of a large river separated by an island from the main course) of Anavilhanas Ecological Station in areas where we had been told that the Amazonian manatee (*Trichechus inunguis*) could be sighted. The places where the manatees were seen were documented with GIS and plotted on a map. We explored the lakes and paranás to find incidence of the following aquatic plants that compose the manatee diet. We identified 19 species of aquatic plants whose young leaves had been fed upon by the manatees: "feijoarana" (*Puerasia phaseolades*), "cipó-icica", "maracarana" (*Coccoloba densiflora*), "feijoarana" (*Phaseolus pilosus*), "melanciarana" (*Cayaponia* sp.), "batatarana" (*Ipomoea squamosa*), "cararana" (*Passiflora pohlii*), "arroz-bravo" (*Oryza perennis*), "embaúba" (*Cecropia* sp.), and others.

On the morning of June 18 2004 the first sighting of a manatee was made approximately 300 meters from the boat while the animal was submerging, exposing its rounded fluke. The location of the sighting was the river arm known as "paraná do Siriri" which passes through the lake. We did see manatees at other times, including feeding on the leaves of "embaúba" and "feijoarana" near Prato Lake, and a manatee feeding in the Siriri Lake 20 meters from the boat. That animal was probably feeding on wild rice (*Oryza perennis*), which at this time is found at the bottom of the lake. We followed its

activity for 45 minutes when it moved and went into the Siriri Channel, where it was possible to see its entire body. Manatees were sighted in Araçá Lake at different points. In most of the sightings only the nostrils were visible, as it is rare for the Amazonian manatee to expose its backside (dorsal) or face out of the water.

In 2003, we also began environmental education activities directed towards students and teachers of public schools. These activities were executed during the traditional celebration in the municipality of Novo Airão known as the Manatee Eco-festival. During this festival the entire municipality of Novo Airão takes part in festivities in honor of the Amazonian manatee. The environmental education activities resulted in the “Mini Eco-festival of Student’s Art and Culture for the Manatee”. The purpose of this activity was to transmit the importance of conservation of the Amazonian manatee and also to honor the students’ creative work.

Teachers from two state schools (Balbina Mestrinho and Danilo Mattos Areosa), three municipal schools (Bandeirantes, Aristóteles Freire Arnoud and Violeta Cardoso Alves de Mattos Areosa), Agape Foundation, and the Program to Eradicate Child Labor (PETI) participated in the workshops. As a result, the teachers presented work developed in the classroom, involving around 3,000 students where their creativity was widely applied and expressed in works of theater, dance, folders, music and poetry. This event occurs in the schools in October, since 2003. In June, another important event commemorating Environment Week occurs in the schools from Novo Airão. The purpose of this event is to work on questions related to biodiversity, environment and its importance to the maintenance of life in the world.

These environmental education activities count on the support of other institutions, including the Almerinda Malaquias Foundation (FAM), IBAMA/AM and the Center for the Preservation and Research of Aquatic Mammals (“Centro de Preservação e Pesquisa de Mamíferos Aquáticos” - CPPMA), strengthening and stimulating partnerships in the township of Novo Airão.

We are aware that we have established a relationship of trust with the community of Novo Airão and also with the communities located in the area surrounding Anavilhanas and that this involvement allows us to work in partnership with the diverse players in region: teachers, students, the public sector and with other NGOs active in the region. We believe that our action in the region will result in the successful execution of activities and programs both for scientific research and community involvement and in building credibility for IPE’s work in Amazonia. – **Clarice Bassi** (Researcher / Biologist, M.Sc. in Ecology, IPÊ – Instituto de Pesquisas Ecológicas -Institute for Ecological Research).

Creative ways to see and count manatees in murky waters. -One of the biggest questions about Amazonian manatees is: how many are there? The answer is often frustrating – we don’t know. And we don’t have a baseline number for populations in the past. All that is available is a minimum number of culled animals during the years of the commercial harvest. The reason for such a situation is three-fold: the Amazon is a huge area, most waters where manatees occur are sediment-laden in nature and consequently coffee-and-milk in appearance, and the beast is just “fino”, a local expression to convey the idea that the animal is shy, secretive and very witty. In an attempt to overcome such handicaps, Mamirauá Institute’s Aquatic mammal research group has been using

alternative ways to “see” and count animals. Following a lead by the Natutama group from Colombia (previously with Omacha Foundation), we used the help of local hunters during the height of the past dry season to attempt a community-based Amazonian manatee estimate of manatees concentrated in deep holes in the Amana lake, a manatee refuge during the dry-water period. Although we concluded the number of counters was too small and the survey time too short considering the extent of the lake (40 km long by 3 km wide), it was an interesting experiment which will help us plan better for the next time around.

A novel way we intend to obtain an index of abundance of Amazonian manatees is by setting up an imaging sonar device to see them under turbid water conditions. The device, a bit more sophisticated than the commonly-used fish finders, operates at frequencies ranging from 310 kHz to 1 MHz, well above manatee hearing range. The equipment can be set to work either as a rotary sonar (covering anywhere from 1 to 360°) or a single side-scanning sonar, and is capable of recording all the images on disk. The sonar is being tested in clear water springs in Florida during this winter season, in cooperation with USGS’ Sirenia Project, which shall allow for calibration of the signature obtained in the sonar record. The tests have been very promising, and most of the manatees seen in the wild have been captured on record, especially up to a 40-m range. During the next receding-water period the equipment will be set up such as to create an acoustic fence across one of the well travelled channels by manatees during their yearly migration in the Amazon, in order to estimate the number of animals using the Amana lake. In addition, we are planning to use a hydrophone in the same floating station as the sonar, to record manatee sounds as they move by. –*Miriam Marmontel* (marmontel@mamiraua.org.br).

Manatees and the 2005-2006 water cycle in the Brazilian Amazon. -Manatee life down in the Amazon is intimately linked to water level variations. In the year 2005 the state of Amazonas underwent one of the most dramatic climatic phenomena in the last few decades. Significant reduction in the rain levels in the months of May, June and July relative to previous years caused a very rapid and severe drought. Most water bodies became reduced in extent, communities became isolated and a large number of fish died. The rigorous decrease in water levels allowed researchers to observe with relative ease the footprints that reveal the presence of manatees in lakes and canals. The bad news was that this improved the chance of detection, increasing the vulnerability of animals gathering in certain restricted areas, and resulted in local hunters catching a large number of manatees along the Amazon basin. Stories appeared frequently in the media about culls in different towns, notably Coari and Codajas. Several orphaned calves were rescued by environmental agencies and taken to rehab centers (Manaus and Balbina) already filled to their capacity. The Mamiraua Institute’s aquatic mammal research group confirmed three manatee deaths due to hunters in the Tefe Lake (700 km west of Manaus), although the real number may have exceeded 10. In the Amana Lake (within the Amana Sustainable Development Reserve, 100 km west of Tefe), on the other hand, greatly due to the work conducted with the local hunters, it is believed that the animals were relatively safe in their refuge, which may not have been true in the nearby Castanho Lake and channel, and adjacent areas in the Amana reserve.

During 2005, funding from Petrobras, the Brazilian oil company, allowed us to conduct a new manatee capture in the Amana Reserve. Due to the extreme drought, the deployment of the large nets had to be adapted to use in the large blackwater Amana Lake rather than the usual capture site on the narrow Castanho channel. Two males of over 240 cm total length were fitted with belt-mounted VHF transmitters and their movements have been monitored since the time of release. Due to La Nina conditions in the tropical Pacific, the Amazon basin has been receiving a lot of rain since early this year, and the flood is being predicted as one of the largest in the century. By mid-December 2005, at least two months earlier than expected, the animals started moving out of the deep water lake back to the floodplain areas. - *Miriam Marmontel* (marmontel@mamiraua.org.br).

FLORIDA

Florida Manatee Recovery and Implementation Team – Update. -The Florida Manatee Recovery and Implementation Team was re-convened in 2003. Its purpose is to oversee and facilitate the implementation of recovery actions as outlined in the third revision of the Florida Manatee Recovery Plan and to make recommendations for revised implementation actions to include in the next revision of the recovery plan. The team currently has over 100 members, representing 60 agencies and organizations. It is led by a 7-member Steering Committee and has 10 officially-appointed Working Groups and Task Forces.

The Recovery Team Steering Committee serves in a liaison capacity between recovery team members and the U.S. Fish and Wildlife Service. Its role is to foster communication among Team members and provide guidance and direction to the Working Groups and Task Forces on recovery priorities. The Steering Committee identifies recovery tasks needing to be accomplished, and monitors progress on implementation efforts.

The Working Groups and Task Forces are responsible for the implementation of specific recovery actions according to the four objectives outlined in the recovery plan. Some of these groups were already in existence prior to 2003 and actively engaged in manatee conservation activities before being incorporated under the umbrella of the recovery team. Others were newly created for specific recovery efforts. The following is a brief summary of their activities and accomplishments.

Protection Working Group – Provides guidance on ways to reduce threats to manatees. This group is reviewing current manatee protection strategies and evaluating potential new methods of protection. They have developed draft guidance on the marking of manatee protection areas, and will prepare recommendations to help reduce manatee harassment.

Regulatory Working Group – Recommends ways to improve regulatory and permitting programs affecting manatees and their habitat. This group's efforts include reviewing and evaluating relevant science as it relates to regulatory programs, evaluating manatee regulatory programs and decision-making criteria, and identifying information needs for improved regulatory decision-making. Their first accomplishment was to educate stakeholders on the state and federal permitting procedures.

Population Status Working Group – Provides an assessment of the current status of the manatee population. They provide advice on manatee demographic criteria, interpret and review information and data relevant to population biology, and make recommendations on potential research needs and methods. They recently completed a biological population assessment of the Florida Manatee that will be useful for the Service’s 5-year review of the species. They are currently evaluating manatee habitat carrying capacity, assessing the scientific justification for the designation of the four manatee “subpopulations,” reviewing manatee mortality information, and providing refinements to population survey methodology and estimation procedures.

Habitat Working Group – Identifies threats to manatee habitat and develops strategies to reduce those threats. They are addressing broad, habitat-related issues such as water quality, freshwater sources, foraging habitat, resting and calving areas, and migration and travel corridors. They advocate the protection of springs, and are addressing minimum flows and levels. In 2004, they helped host a Manatee Habitat Workshop. They are currently working on an assessment methodology for important manatee wintering sites. This assessment process will be used to evaluate habitats throughout Florida and may be used to estimate winter foraging carrying capacity.

Warm Water Task Force – Develops and implements strategies to ensure safe and dependable warm-water refuges for manatees. This Task Force is developing a conceptual plan for a long-term network of warm-water refuges throughout Florida. They are prioritizing the importance of individual springs and identifying warm-water enhancement opportunities for spring systems. They are also developing a plan to reduce the potential loss of manatees in the event that a power plant goes off-line, either permanently or for an extended period, and exploring potential new sources of artificial warm water. They helped host the Manatee Habitat Workshop and are working with the Population Status Working Group to assess warm water manatee carrying capacity in Florida.

Education Working Group - Facilitates manatee recovery through public awareness and education and through coordination with other Working Groups and Task Forces. In 2005, this group awarded a contract for a statewide inventory and preliminary assessment of existing manatee education materials and programs. This assessment is expected to be completed this year. The results will help us to better understand what types of information has been most effective for reaching the public and improving our understanding and awareness of manatee conservation.

Rescue, Rehabilitation, Release Partnership – Assists distressed manatees and reintroduces them back into the wild. In 2005, an estimated 65 manatees were rescued. Thirty of these animals were subsequently released (15 died as a result of their injuries or illnesses). Manatee rescues, captive manatees, and manatee releases draw attention to the manatee and their associated threats. As a result, this partnership is also an extremely important outreach tool for promoting manatee conservation. The media heavily publicize rescues and releases, and more than 10,000,000 visitors a year see manatees at critical and long-term care facilities. The facilities do an outstanding job of interpreting the challenges that manatees face and promoting recovery efforts.

Entanglement Working Group – Decreases and eliminates manatee entanglements in fishing gear through education and outreach efforts, gear recovery and clean-up,

data collection protocols, entanglement research, and potential technique/gear modifications. This group has a number of successes to report, particularly with regard to monofilament recycling efforts around the state. They produced an entanglement brochure and created an educational video on the impacts of improperly discarded monofilament for education and outreach purposes; they routinely conduct derelict crab trap removals and assist other organizations in initiating such efforts; and they tag and monitor formerly entangled manatees to better understand how manatees become entangled and cope with entanglements. In 2005, approximately 16 manatees were rescued from entanglements in fishing gear.

Water Control Structures Task Force – Eliminates manatee deaths and entrapments due to the operation of major flood control structures, navigation locks and drainage structures. This interagency partnership has successfully worked to have a majority of water control structures and navigation locks retrofitted to ensure manatee protection throughout the state. This effort has been an incredible asset toward eliminating this threat to the manatee population in Florida.

CERP Interagency Task Force – Assures that the implementation of the Cooperative Everglades Restoration Plan avoids and minimizes manatee conflicts. Task Force members conduct site visits and evaluate canal systems used by manatees. They prepared an issue paper that recommends that manatees be precluded from the Everglades portion of the Central and Southern Florida (C&SF) canal network.

The recovery team has made significant progress in overseeing the implementation of recovery actions as outlined in the recovery plan. The Working Groups and Task Forces have addressed some of the highest priority issues, and they are currently identifying additional recovery actions necessary to address specific threats to the Florida manatee. It is anticipated that the recovery implementation schedule will be updated later this year. The current Florida Manatee Recovery Plan can be viewed online at the FWS North Florida Ecological Services Field Office website at:

<http://www.fws.gov/northflorida/Manatee/manatees.htm#Manatee%20Recovery%20Plan>
-*Dawn Jennings, Jim Valade* (U.S. Fish and Wildlife Service).

Update on Manatee Forum. - In July 2004 the Florida Fish and Wildlife Conservation Commission (FWC) and the U.S. Fish and Wildlife Service (USFWS) initiated the “Manatee Forum.” The purpose of this 22 member group is to provide a forum where stakeholders can meet to discuss manatee issues, better understand competing views, and hopefully resolve conflicts. Manatee conservation in Florida had become increasing polarized in recent years with stakeholder groups focusing on litigation and Legislative fixes rather than engaging in productive dialogue. Conflicts range from environmental organizations who believe the agencies aren’t doing enough to protect manatees to boating interest advocates who believe there is too much regulation in Florida because of manatees. The Forum is held quarterly, typically for two days, and is professionally facilitated. Funding for the Forum is provided by FWC & USFWS. Each has focused on a different topic. The first Forum was used to determine the best course of action to address the conflicts and to establish the willingness of participants to engage in on-going dialogue. Forum II was devoted to developing a governance framework. Forums III and IV focused on research topics. Both included highly interactive discussions between researchers and the Forum participants. Forum V

combined presentation of information with conflict resolution efforts while Forum VI focused solely on conflict resolution.

The Manatee Forum has been a useful venue for stakeholders to express their concerns and communicate directly to the management agencies. There has been open dialogue which gives participants insight into various perspectives about the issues and allows for clarification of misinformation by the agencies. One of the most important outcomes has been the interactive dialogue between scientists and stakeholders which has made manatee research more transparent and has quelled many suspicions held by stakeholders relating to the science. However, the communication of scientific data and research results remains challenging, as Forum members will have varying interpretations of the same research. The Forum has fostered better communication between the agencies and stakeholders; whether it will facilitate conflict resolution remains to be seen. –**Kipp Frohlich** (kipp.frohlich@MyFWC.com).

Pregnancy Diagnostic for Sirenians. -Researchers at the University of Florida's College of Veterinary Medicine are interested in collaborating with manatee and dugong biologists worldwide, to assist in the validation of a progesterone-based pregnancy diagnostic for sirenians. Preliminary trials with Florida manatees have shown great promise for the detection of pregnancy, particularly in the first six months of gestation, when pregnancy cannot be detected visually.

Serum is required for this high sensitivity assay and should be banked in one milliliter (1mL) aliquots. Five milliliters of serum per animal is requested though not required. The minimum sample requirement is 0.5 ml serum (no anticoagulant added). Samples from females being bred in captivity, with known gestation, are of particular interest. Monthly sampling would be optimal for these pregnant females. For further information, please contact **Katie Tripp** (trippk@mail.vetmed.ufl.edu).

Are the Threats to Florida Manatee Changing Over Time? -Manatees and dugongs have long been threatened by human activities such as hunting, loss of habitat and boat strikes or collisions. The vast number of Florida manatees being seriously injured or killed by these boat strikes or collisions has resulted in strong legislation, numerous public awareness and education programs and the implementation of watercraft speed limits. However, since the implementation of these new programs or legislation, the population of the Florida manatee has not substantially increased. We were interested in exploring what other factors may be playing a role in preventing the population of the Florida manatee from increasing.

Looking at a 10 year period, from 1995 to 2004, data obtained from the Florida Fish and Wildlife Conservation Commission was examined pertaining to Florida manatee population numbers and their causes of death. Synoptic survey data and annual numbers of carcasses were examined to verify the causes of their deaths. The following information is expressed as the absolute number of manatee deaths, a percentage of the total number of manatee deaths, and a percentage of the absolute numbers of the causes of deaths.

Absolute numbers of Manatee deaths

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Water-craft	42	60	54	66	82	78	81	95	73	69
Flood gate/ canal lock	8	10	8	9	15	8	1	5	3	3
Other human	5	0	8	6	8	8	8	9	7	4
Perinatal	56	61	61	53	54	59	61	53	71	72
Cold stress	0	17	4	10	5	14	31	7	47	50
Natural	101	42	13	37	37	34	59	102	24	
Undetermined	53	154	61	71	61	60	107	65	67	51
<u>Unrecovered</u>	<u>2</u>	<u>12</u>	<u>4</u>	<u>4</u>	<u>7</u>	<u>8</u>	<u>2</u>	<u>2</u>	<u>10</u>	<u>3</u>
TOTAL	201	415	242	232	269	272	325	305	380	276

As it can be expected the number of deaths over the 10 years has variability but certain conclusions can be made. Despite having regulations and public awareness programs, the number of watercraft deaths have increased from 42 (1995) to 69 (2004) with a maximum number of deaths of 95 in 2002. Perinatal deaths gradually rose from 56 (1995) to a high of 72 (2004) and cold stress had a dramatic rise from 0 (1995) to 50 in 2004. Other causes have dropped substantially such as flood gate/locks- 8 (1995) to 3 (2004)- and natural- 35 (1995) to 24 (2004).

The Causes of Death as Percentages of the Total of Deaths for Each Year

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Watercraft	20.9	14.5	22.3	28.4	30.5	28.7	24.9	31.1	19.2	25.0
Flood gate/ canal lock	4.0	2.4	3.3	3.9	5.6	2.9	0.3	1.6	0.8	1.1
Other human	2.5	0	3.3	2.6	3.0	2.9	2.5	3.0	1.8	1.4
Perinatal	27.8	14.7	25.2	22.8	20.1	21.7	18.8	17.4	18.7	26.1
Cold stress	0	4.1	1.7	4.3	1.9	5.1	9.5	5.6	12.4	18.1
Natural	17.4	24.3	17.4	5.6	13.8	17.3	10.5	19.3	26.8	8.7
Undetermined	26.4	37.1	25.2	30.6	22.7	22.0	32.9	21.3	17.6	18.5
<u>Unrecovered</u>	<u>1.0</u>	<u>2.9</u>	<u>1.6</u>	<u>1.7</u>	<u>2.6</u>	<u>2.9</u>	<u>0.6</u>	<u>0.7</u>	<u>2.6</u>	<u>1.1</u>
TOTAL	100	100	100	99.9	100.2	99.8	100	100	99.9	100

When looking at the causes of death as a percentage of the deaths within the same year, it can be seen that certain causes form the majority of the deaths. For instance, watercraft (20.9%), perinatal (27.8%) and undetermined causes (26.4%) formed the majority of deaths and were over 20% in each case. However, in 2004, watercraft rose to 25%, perinatal stayed the same at 26.1% and undetermined caused dropped to 18.5%. All other causes had drops in percentages except for cold stress which went from 0% (1995) to 18.1% (2004).

The Causes of Death as a Percentage of Change Between 1995 and 2004

	1995	2004	Percentage Change
Water-craft	42	69	+39
Flood gate/ canal lock	8	3	-63
Other human	5	4	-20
Perinatal	56	72	+22
Cold stress	0	50	+100
Natural	35	24	-32
Undetermined	53	51	-4
<u>Unrecovered</u>	<u>2</u>	<u>3</u>	+50
TOTAL	201	276	

When comparing the causes of deaths as a percentage of change in only the first and last year, it is observed that the watercraft (+39%), perinatal (22%) and cold stress (100%) deaths had dramatic increases. Death due to other causes such as natural, flood gate/lock and other human causes had large percentage decreases.

From these results, it is clear that Florida manatees are still facing both human and environmental stresses whose relative impact has changed over time. Watercraft related mortalities continue to play a role in manatee deaths but other causes such as perinatal mortality and cold stress have risen to become significant contributors. Further research should focus on these specific causes (perinatal and cold stress) of death if we are to have a significant and favorable impact on Florida manatee conservation. - **Michael Belanger, Amanda MacNeill, Nesime Askin, Carin Wittnich** (Oceanographic Environmental Research Society, 12 Burton Ave., Barrie, Ontario Canada L4N2R2; tel. 1-416-978-0505; michael.belanger@utoronto.ca).

HONDURAS

Status and Distribution of Antillean Manatees (Trichechus manatus manatus) on the North Coast of Honduras: Preliminary Report From the Field. -On March 29, 30, 31 and April 2,3, and 4, 2006 aerial surveys were conducted on the North Coast of Honduras from the Rio Aguan (west of Trujillo) to the Laguna El Diamante (east of Tela). Flights were flown at 700ft and at a speed of 80kt in a Cessna 206. Three observers were located on the right side of the aircraft (front right – data recorder, middle right – secondary observer, and back right – primary observer). Surveys were flown with the doors removed to improve visibility. I led the team of three biologists as part of my Master’s program at Loma Linda University. The rest of the team included Saul Flores (Museum curator and professor of biology at the National University of Honduras, Tegucigalpa) and Cyndi Taylor (Senior Research Scientist with Wildlife Trust, FL).

This area of Honduras has not been extensively surveyed for manatees since Rathbun et al. (1983). During that survey they observed manatees at a rate of 0.8 per survey hour over the entire coast and at 13.3 per survey hour from Zambuco to El Porvenir on the North Coast. They also observed manatees in the coastal areas as well as the rivers and lagoons along the coast. Finally, during their March surveys of 1979 they detected 4 calves (17%) on the North Coast.

The end of March was chosen to conduct these surveys so that we could directly compare them with the surveys completed in 1979-80 by Rathbun et al. March represents the dry season and the water conditions are most favorable.

We averaged 3 animals per survey with a detection rate of 1.31 animals per survey hour. This was significantly lower than that in 1979-80. Our survey time ranged from 2 hrs 10 min to 2 hrs 40 min per survey. In all we sighted manatees 18 times during a total of 13 hrs 43 min of survey time. Interestingly, we never observed a manatee along the coast but rather always saw them within the rivers and lagoons. In addition, we only observed adults. This also marks a significant difference from the sightings in 1979-80.

Finally, we sighted manatees in the Rio Chapagua and Rio Aguan and the lagoon Laguna de Guaimoreto, all of which had no previous record of manatees in the literature other than anecdotally. The rest of the sightings were within Cuero y Salado Wildlife Refuge similar to those in 1979-80. Most of our sightings were in Cuero y Salado Wildlife Refuge (11), although a significant amount were clustered in both the Rio Aguan and Rio Chapagua (5), which may represent a new important area for the remaining manatees of the North Coast of Honduras. More detailed information will be provided in an up coming publication.

I would like to thank Cyndi Taylor and Saul Flores for participating in these aerial surveys. I would also like to thank Chuck Schroll for being such a cooperative pilot and LightHawk (Michele Gangaware) for providing the plane and pilot. I would like to thank Jose Herrero for assisting in attaining permits to fly in Honduras. This project was funded by a grant from USAID-MIRA. - **Daniel Gonzalez-Socoloske** (for more info contact Daniel at dgonzalez01x@llu.edu).

References

Rathbun, G. B., Powell, J. A., Cruz, G. (1983). Status of the West Indian Manatee in Honduras. *Biological Conservation*. 26, 301-308.

The use of side scan sonar to detect and study West Indian Manatees (*Trichechus manatus*). -Estuaries, lagoons and turbid rivers have long been complicated study locations for aquatic fauna, particularly in locations with dangerous animals. In the late 1970's, experiments were conducted using conventional sonar to detect manatees in Florida. These experiments did not have very positive results partially due to the large amounts of oxygen released by submerged vegetation in the clear waterways in Florida (Rathbun, personal communication).

Sonar technology has greatly improved since then and unlike the conventional sonar used in the 1970's, I used a side scan sonar, which provides a surface image of the bottom. I also targeted locations that had little or no submerged vegetation. The sonar unit that I used was released in January of 2005 by Hummingbird and is the first side scan sonar that is directly mounted on the back of a boat. Traditionally side scan sonar has been used for search and rescue of sunken ships or by oceanographers to study ocean and lake bottoms topology. This new unit represents the first time side scan sonar is used to detect aquatic fauna. Objects create a characteristic shadow which can be used to determine the shape.

To test whether large aquatic animals can be detected by side scan sonar I experimented with the unit for 10 hours in the dark turbid (tannin stained) rivers and

canals of Cuero y Salado Wildlife Refuge, on the North Coast of Honduras during July 21-23, 2005. I found that I was able to clearly distinguish large aquatic animals within the water column. Cuero y Salado Wildlife Refuge is home to both crocodiles (*Crocodylus acutus*) and caiman (*Caiman crocodilus chiapasius*) as well as the Antillean manatee (*Trichechus manatus manatus*) (personal observation, Rathbun et. al 1983). In addition, there are smaller animals such as sliders and river otters (personal observation), which I suspect are too fast and rare to represent the signals that were detected.

Due to the turbidity of the water and the extreme shyness of both crocodiles and manatees in the area, I was not able to confirm which animal I was detecting. Judging by the relative size of the response, the time of day, and the location in which I detected them, I suspect the signals to be from manatees.

To test whether the responses were indeed manatees I subsequently experimented with the side scan sonar in Crystal River, Florida on January 29 and 31, 2006 with the help of Bob Bonde (USGS Sirenia Project). Crystal River provides freshwater springs which are warmer than the ambient water temperature during the cool winter months. Manatees aggregate at these springs to survive. I took advantage of the aggregation and experimented with the sonar in late January when the manatees begin to move out of the springs (Bonde, personal communication).

I also chose Crystal River because, as its name implies, the water clarity is very good. This way we could compare what the sonar detected with what was actually in the water. After confirming that manatees can be detected by the side scan sonar I conducted 14 “blind” transects in which I would note the number of manatees I detected by only looking at the side scan sonar and Bob Bonde would confirm it by visual detection. We only worked with the left side of the sonar because the large outboard motor was causing too much interference. In addition to number of animals, I also noted how far from the boat (laterally) the animal was. Out of 60 animals detected visually (by Bonde), I was able to detect 44 with the side scan sonar (73.33%). All of the detections matched the approximate distance from the boat. When corrected for manatees that were further then 30 ft from the boat (laterally) and calves that were behind the mothers parallel to the sonar, the number of animals detected visually drops to 46, resulting in 95.65% sonar detection. The range I set to “see” laterally was 30ft so animals at that distance could have been missed. We saw no indication that the sonar could be heard by the manatees as was expected because the frequency of the sonar falls outside of their hearing range.

Finally on March 22-23, 2006 I tested the unit in the Laguna de las Ilusiones, Tabasco, Mexico with the help of Dr. Leon David Olivera-Gomez. This lagoon, which lies right in the middle of the city of Villahermosa, is home to at least 9 manatees (Olivera-Gomez, personal communication). This location was chosen because it provides water conditions similar to those found throughout Mesoamerica (dark and turbid). In addition, this location was chosen because the resident manatees are landlocked and can be detected by a trail of bubbles that they create by “walking” on the bottom substrate.

I conducted 29 “blind” transects with Olivera-Gomez similar to what was done in Florida. This time I used both sides of the sonar and I extended the range to 40ft on each side. Of 27 animals visually detected (by the bubble trails) on the right side I detected 24 with the side scan sonar (88.88%), and out of 15 animals visually detected on the left side I detected 15 with the side scan sonar (100%). The average of both sides was 92.86%. All of the detections matched the side where the animal was, its distance from the boat

and the number of animals. The relative size of the animal was also detected in the case of a mother and young calf.

This new technique aims at providing scientists and conservationists with a new tool for studying manatees in these complicated waterways. This technology could be applied to the other manatee species as well as dugongs in locations where the water conditions do not allow for visual confirmation. More information will be provided in upcoming publications.

I would like to thank my adviser Dr. Robert Ford for purchasing the sonar unit with his ESSE 21 grant. I would like to thank Mark Gibson (Hummingbird Inc.) for helping me understand how the sonar works and Galen Rathbun for historical use of sonar to detect manatees in Florida. I would like to also thank Bob Bonde, Miriam Marmontel, and Cathy Beck; Leon David Olivera-Gomez; Jose Paz, and Justo Carcamo for logistical support in Florida, Mexico, and Honduras respectively. - **Daniel Gonzalez-Socoloske** (for more info contact Daniel at dgonzalez01x@llu.edu).

References

Rathbun, G. B., Powell, J. A., Cruz, G. (1983). Status of the West Indian Manatee in Honduras. *Biological Conservation*. 26, 301-308.

INDONESIA

Recent developments in dugong research in Balikpapan Bay, East Kalimantan, Indonesia. - During 2005 our research team studied dugong-seagrass interactions in Balikpapan Bay, situated at the East coast of the Indonesian part of Borneo. Balikpapan Bay, a major industrial port located in East Kalimantan, is a large bay covering 16,000 ha that drains a watershed of 194,443 ha, bordering both rural and urban/industrial areas. The coastal and marine biodiversity resources in Balikpapan Bay form part of East Kalimantan's "mega diversity" in ecosystems that nowadays are still productive and support the livelihoods of the bordering communities. However, there is also a devastating degradation of coastal and marine resources that possibly affects, directly and indirectly, seagrass and dugongs in Balikpapan bay.

De Bruijn (2002) had studied dugong-seagrass interactions in Balikpapan Bay during 2001, and she spotted at one location (Kariangau) mostly single individuals some 15 times. On one occasion the presence of three individuals was recorded. Since we discovered large surfaces of seagrass maintained ungrazed, we do not believe that the amount of seagrass is the limiting factor in Balikpapan Bay, but that the quality of the seagrass, especially in terms of available carbohydrates (sugars and starch), is the main limiting factor (De Iongh et al. 1995, De Iongh 1996). During our research we selected six intertidal mono-specific (*Halodule univervis*) seagrass meadows in Balikpapan Bay for regular monitoring of above and below ground biomass and the intensity of dugong grazing.

Once per month during 2005 we surveyed the selected seagrass beds in order to collect data for the biomass analysis and to determine the quality of the seagrass above and below ground. The seagrass beds were visited at the end of each month when the tide was most suitable to carry out the survey. In each survey 5 random samples were

collected per seagrass meadow with a plastic corer (15, 8 cm diameter and 15 cm deep) and gathered in plastic bags marked with date and location for the next process. At the location where each sample was taken, the percentage coverage was estimated based on the seagrass presence in a 40 x 40cm square and the location was marked with GPS. In The Netherlands at the lab of the Resource Ecology group (University of Wageningen), digestibility was determined using the method of Tilley and Terry (1963). This method is based on the simulation of the first two stages of digestion of ruminants. Using this method the proportion of digested material can be calculated and hence the quality of the seagrass bed can be estimated. For N, P, Ca, Mg and Na, a modified Kjeldahl destruction method was used. Dissolved nitrogen and phosphor concentrations were measured colorimetrically using a continuous-flow analyser and sodium and potassium concentrations were measured by using an Atomic Spectrophotometer. In addition we determined the ratio between Dry Weight (DW) and Ash Free Dry Weight (AFDW), which is a measure for the amount of carbohydrates (sugar and starch) in the seagrass below ground and above ground biomass.

During April and May very few dugong grazing tracks were found in the intertidal seagrass meadows, but this started to change in May 2005. Especially inside the meadow of Kariangau the presence of dugongs was confirmed by many new grazing tracks between May and June. In addition another seagrass bed, Petrosea, was grazed intensively in the same period. Dugong grazing continued in these two seagrass beds during July until December. The other four seagrass beds did not show any confirmation for the presence of dugongs during May and June, but in August and September dugong grazing also occurred in the Balang seagrass bed. Dugong grazing always started when the ratio of DW to AFDW of the below ground fraction was above 70%. Below this level almost no grazing tracks were found. No such relationship could be established with total N in the seagrass below ground and above ground fractions.

Dugong grazing is presumably mostly done at night. During the daytime only three individual dugongs were spotted during the whole study period. From the interviews it becomes clear that dugongs have been spotted in those locations over the four month period. In comparison with the former study by De Bruijn (2002), who spotted 15 individual dugongs during daylight hours, it can be concluded that during 2005 fewer individuals have been observed during daytime in the bay. On the other hand, the high number of new grazing tracks from May to December implies that there is night grazing and/or rotational grazing by at least five dugongs in Balikpapan Bay.

During interviews with fishermen it was determined that during 2005 two dugongs had been killed, one by the propeller of a speed boat and another was caught in a fishing trap. Dugong mortality was also reported during previous years, including dugongs killed by boat propellers. If this mortality continues, it may become a serious threat to the survival of this small population of dugongs. We have recommended that the local authorities consider the establishment of a dugong sanctuary at the Kariangau meadow, which is the most important seagrass bed for the surviving dugong population in Balikpapan Bay.

References

De Iongh, H.H., Wenno B. and Meelis E. (1995). Seagrass Distribution and Seasonal Biomass Changes in Relation to Dugong Grazing in the Moluccas, Indonesia. *Aquatic Botany* 50: 1-19

De Iongh, H.H. (1996). Plant-Herbivore Interactions between Seagrasses and Dugongs in a Tropical Small Island Ecosystem. *PhD Thesis, Katholieke Universiteit Nijmegen*.

De Bruijn, P., (2002). Population ecology of a recently discovered Dugong population, *Dugong dugon* in Balikpapan Bay, East Kalimantan, Indonesia. Final report at Institute of Environmental Sciences, Leiden University.

Tilley, J.M.A. and Terry, R.A., (1963). A two-stage technique for the in vitro digestion of forage crops. *Journal of the British Grassland Society* 18, 104-111

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JAPAN

An informative international symposium was held on 11-12 February 2006 in Okinawa, Japan. The symposium was entitled **Recent Advances in Cetology and Sirenology** and was hosted by the Okinawa Churaumi Aquarium under the direction of Dr. Senzo Uchida. Representatives from Brazil, Mexico, Taiwan, Australia, Denmark, and the United States complemented expertise provided by Japanese scientists. Primary topics included taxonomy, emerging diseases, strandings, feeding mechanisms, placentation, conservation, whaling, physiology, captive handling, and natural history. Proceedings will be forthcoming.

WEST AFRICA

West African Manatee Conservation. -The Regional Conservation Project for the West African Manatee (*Trichechus senegalensis*) led by Wetlands International (Dakar) in collaboration with PRCM, IUCN, WWF, FIBA and CSRP, is developing its second phase.

A series of field surveys, initiated in August 2005 and continuing through November 2006, have made it possible to collect information on the status of the manatee in the PRCM area (Mauritania, Senegal, The Gambia, Guinea Bissau and Guinea). This fieldwork has, in particular, enabled us to characterise the threats to the species. Our team, placed in the field by our regional network, has explored the deltas of Senegal and Saloum Rivers, some coastal wetlands in The Gambia, Lower Casamance, Guinea Bissau and Guinea. Fieldwork was recently initiated in Sierra Leone, the next PRCM guest. This

regional survey on the manatee, which includes Senegal and Mauritania (via the Senegal Delta), The Gambia and Senegal (via the Niimi - Saloum), and the South Guinea coast near Sierra Leone, sets the tone of a project that aims to be transboundary.

This investigative work has made it possible to organise National Forums, which are participatory assemblies that bring together the field participants in each of the survey areas. The Forums act to validate the field experience and focus on priority manatee actions to be developed. The Saint Louis (Senegal), Saloum, Ziguinchor, Bissau and Conakry Forums have made it possible to develop recommendations on the scientific monitoring of the species, the conservation of its habitat, increasing awareness, and economic support to communities, while conserving the species and its habitat. New recommendations should be made at the Banjul and Freetown Forums, to be held very soon. These Forums are in preparation for the Dakar Regional Forum planned in fall 2006.

The Programme calls for collaboration between Wetlands International, the United Nations Environment Programme (UNEP/RSP "Regional Seas Programme"), the Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment (Abidjan Convention, 1984), and the Secretariat of the Convention on Migrant Species (CMS). With support from the Government of Monaco, these institutions will join their efforts to develop a manatee conservation strategy encompassing all countries in which the species occurs. This collaboration will result in a regional scientific publication on the manatee. It represents the extension of the manatee conservation programme to about twenty countries in West Africa.

The first results of our surveys show that the West African manatee is still an endangered species in the PRCM area, largely due to loss of habitat. The degradation of mangroves, the manatee's main habitat in this part of West Africa, has resulted from climatic changes and overexploitation (fuelwood, building materials, etc.). Incidental catch in fishing nets represents the second major threat (Saloum, The Gambia, Guinea and mainly Guinea Bissau). These initial results, refined and completed, should make it possible to develop a relevant conservation strategy in the PRCM area and eventually throughout West Africa. The West African manatee, *Trichechus senegalensis*, remains a highly threatened manatee species. – **Mame Dagou Diop** (Wetlands International Manatee Conservation Project Officer, dagouwet@sentoo.sn).

ABSTRACTS

The following abstract is from the Annual Meeting of the American Association for the Advancement of Science, Feb. 16-19, 2006 in St. Louis, MO:

Red Tides and Sirens: Brevetoxicosis in the Endangered Florida Manatee
Gregory D. Bossart, VMD, PhD

Recent often unprecedented endangered Florida manatee (*Trichechus manatus latirostris*) epizootics have been associated with potent marine neurotoxins known as brevetoxins, which are produced by the 'red tide' dinoflagellate *Karenia brevis*. Brevetoxins are known to kill large numbers of fish and cause illness in humans who ingest toxic filter-feeding shellfish (neurotoxic shellfish poisoning) or inhale toxic aerosols. The pathogenesis of manatee brevetoxicosis is suspected to involve direct

inhalation of toxins and/or ingestion of toxins in food sources. Important new data indicate that brevetoxin vectors such as seagrasses can result in delayed or remote manatee exposure causing intoxication in the absence of toxin-producing dinoflagellates. Thus, unexpected toxin vectors may account for manatee deaths long after or remote from a dinoflagellate bloom. Diagnosis of brevetoxicosis in manatees is typically by exclusion and may be based on pathologic findings and postmortem demonstration of the toxins in fluids and tissues. The pathologic findings of inhalational brevetoxicosis in manatees are catarrhal rhinitis, pulmonary hemorrhage and edema, multiorgan hemosiderosis and nonsuppurative leptomeningitis. Immunohistochemical staining is used to determine the presence, abundance and distribution of brevetoxins in tissues. The present data suggest that manatee mortality resulting from brevetoxicosis may not necessarily be acute but occur after chronic inhalation and/or ingestion and involve the release of inflammatory mediators that result in fatal toxic shock. The inhalational route of brevetoxin exposure appears to be unique in marine mammals but shared with humans. Increases in human pulmonary emergency room diagnoses are temporally related to 'red tide' occurrences, which may be increasing in frequency along Florida coastlines.

Vianna, J.A., R.K. Bonde, S. Caballero, J.P. Giraldo, R.P. Lima, A. Clark, M. Marmontel, B. Morales-Vela, A.A. Mignucci-Giannoni, J.A. Powell, and F. R. Santos. 2006. Phylogeography, phylogeny and hybridization in trichecid sirenians: implications for manatee conservation. *Molecular Ecology* 15(2): 433-447.

The three living species of manatees, West Indian (*Trichechus manatus*), Amazonian (*Trichechus inunguis*) and West African (*Trichechus senegalensis*), are distributed across the shallow tropical and subtropical waters of America and the western coast of Africa. We have sequenced the mitochondrial DNA control region in 330 *Trichechus* to compare their phylogeographic patterns. In *T. manatus* we observed a marked population structure with the identifications of three haplotype clusters showing a distinct spatial distribution. A geographic barrier represented by the continuity of the Lesser Antilles to Trinidad Island, near the mouth of the Orinoco River in Venezuela, appears to have restricted the gene flow historically in *T. manatus*. However, for *T. inunguis* we observed a single expanding population cluster, with a high diversity of very closely related haplotypes. A marked geographic population structure is likely present in *T. senegalensis* with at least two distinct clusters. Phylogenetic analyses with the mtDNA cytochrome b gene suggest a clade of the marine *Trichechus* species, with *T. inunguis* as the most basal trichechid. This is in agreement with previous morphological analyses. Mitochondrial DNA, autosomal microsatellites and cytogenetic analyses of the presence of hybrids between the *T. manatus* and *T. inunguis* species at the mouth of the Amazon River in Brazil, extending to the Guyanas and probably as far as the mouth of the Orinoco River. Future conservation strategies should consider the distinct population structure of manatee species, as well as the historical barriers to gene flow and likely occurrence of interspecific hybridization.

RECENT LITERATURE

Dos Santos Lima, D., J. E. Vergara-Parente, R. J. Young, and E. Paszkiewicz. 2005. Training of Antillean manatee, *Trichechus manatus manatus* (Linnaeus, 1758), as a

management technique for individual welfare. *Latin American Journal of Aquatic Mammals* 4(1):61-68.

Laist, D.W. and C. Shaw. 2006. Preliminary evidence that boat speed restrictions reduce deaths of Florida manatees. *Marine Mammal Science* 22(2): 472-479.

Larkin, I. L. V., T. S. Gross and R. L. Reep. 2005. Use of faecal testosterone concentrations to monitor male Florida manatee (*Trichechus manatus latirostris*) reproductive status. *Aquatic Mammals* 31(1):52-61.

Natiello, M. and D. Samuelson. 2005. Three-dimensional reconstruction of the angioarchitecture of the ciliary body of the West Indian manatee (*Trichechus manatus*). *Veterinary Ophthalmology* 8(6):367-373.

Natiello, M., P. Lewis, and D. Samuelson. 2005. Comparative anatomy of the ciliary body of the West Indian manatee (*Trichechus manatus*) and selected species. *Veterinary Ophthalmology* 8(6):375-385.

Mann, D. A., D. E. Colbert, J. C. Gaspard, B. M. Casper, M. L. H. Cook, R. L. Reep, and G. B. Bauer. 2005. Temporal resolution of the Florida manatee (*Trichechus manatus latirostris*) auditory system. *Journal of Comparative Physiology A: Sensory, Neural and behavioral Physiology* 191(10):903-908.

Spiegelberger, T. and U. Ganslosser. 2005. Habitat analysis and exclusive bank feeding of the Antillean manatee (*Trichechus manatus manatus* L. 1758) in the Coswine Swamps of French Guiana, South America. *Tropical Zoology* 18(1):1-12.

Sweat, J. M., C. M. Johnson, Y. Marikar, and E. P. Gibbs. 2005. Characterization of surface interleukin-2 receptor expression on gated populations of peripheral blood mononuclear cells from manatees, *Trichechus manatus latirostris*. *Veterinary Immunology and Immunopathology* 108(3-4):269-283.

Vianna, J.A., R. K. Bonde, S. Caballero, J. P. Giraldo, R. P. Lima, A. Clark, M. Marmontel, B. Morales-Vela, M. J. De Souza, L. Parr, M. A. Rodriguez-Lopez, A. A. Mignucci-Giannoni, J. A. Powell, and F. R. Santos. 2006. Phylogeography, phylogeny and hybridization in trichechid sirenians: Implications for manatee conservation. *Molecular Ecology* 15(2):433-447.

Woodruff, R. A., R. K. Bonde, J. A. Bonilla and C. H. Romero. 2005. Molecular identification of a papilloma virus from cutaneous lesions of captive and free-ranging Florida manatees. *Journal of Wildlife Diseases* 41(2):437-441.

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The Call of the Siren (Caryn Self Sullivan): <<http://www.sirenian.org/caryn.html>>

Caribbean Environment Programme, Regional Management Plan for the West Indian Manatee: <<http://www.cep.unep.org/pubs/techreports/tr35/ct35indx.htm>>

Caribbean Stranding Network: <<http://netdial.caribe.net/~mignucci/>>

Columbus (Ohio) Zoo manatee exhibit: <http://www.colszoo.org/animalareas/shores/manatee_coast/index.html>

Dugongs: <<http://www.hans-rothauscher.de/dugong/dugong.htm>>

Dugong necropsy manual (available for downloading): <http://www.gbrmpa.gov.au/corp_site/info_services/publications/research_publications/rp64/index.html>

Florida Fish and Wildlife Conservation Commission, Bureau of Protected Species Management: <<http://www.floridaconservation.org/psm/>>

Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute (Florida manatee mortality data): <<http://www.floridamarine.org/manatees/>>

Friends of the Manatee Association, Manaus & Balbina, Brazil: <http://www.amigosdopeixe-boi.org.br/english/Ing_index2.htm> [Includes a bibliography of INPA aquatic mammal project publications and abstracts]

Fundación Salvemos al Manatí de Costa Rica: <www.fundacionmanati.org>

Great Barrier Reef dugongs: <http://www.gbrmpa.gov.au/corp_site/info_services/publications/dugong/index.html>

IBAMA manatee project, Brazil: <www.projetopeixe-boi.com.br>

Jacksonville University (Florida) Manatee Research Center Online: <www.ju.edu/juconnect/research/marco>

Manatee neuroanatomy: <<http://www.neurophys.wisc.edu/Manatee/>>

"Manatee Watchers" Internet discussion list: <<http://www.listbot.com/archive/MANATEE>>

News clippings on Florida manatees: <<http://www.n-jcenter.com/menus/enmanate.htm>>

Philippines Dugong Research and Conservation Project: <<http://www.wwf-phil.com.ph>>

Save the Manatee Club: <<http://www.savethemanatee.org>>

Sea World of Florida: <<http://www.seaworld.org>>

SEMARNAP, Secretaria de Medio Ambiente, Recursos Naturales y Pesca, Mexico:
<<http://www.semarnap.gob.mx/naturaleza/especies/manati/descrip.htm>>

Sirennews (texts of current and recent issues): <<http://www.marinemammalogy.org/snews.htm>>; <<http://www.sirenian.org/sirennews.html>> (for archive of most older issues)

Sirenia Project, U.S. Geological Survey: <<http://www.fcsc.usgs.gov/sirenia>> or <<http://www.nfrcg.gov/sirenia>>

Sirenian International, Inc.: <<http://www.sirenian.org/>> [Includes a bibliography of sirenian literature, and an archive of *Sirennews* issues.]

Smithsonian Institution sirenian bibliography: <<http://www.si.edu/resource/faq/nmnh/sirenia.htm>> [This is a relatively short bibliography, compiled by Joy Gold, that provides a very good introduction to both the technical and the popular literature.]

Steller's sea cow: <<http://www.hans-rothauscher.de/steller/steller.htm>>. This site also includes a searchable database of museum collections worldwide that contain bones of *Hydrodamalis gigas*: <<http://www.hans-rothauscher.de/steller/museums.htm>>. See also the website [in Finnish] of Dr. Ari Lampinen, Univ. of Jyväskylä, Finland: <<http://www.jyu.fi/~ala/ilmasto/steller.htm>>

Trichechus senegalensis skull: <http://digimorph.org/specimens/Trichechus_senegalensis/>. [CT imagery of an African manatee skull and mandible, viewable as individual thin slices, 3-D rotational movies, and slice movies. Excellent detail!]

West African manatee in Chad (Jonathan H. Salkind): <<http://members.aol.com/neebee/manatee-index.html>>

Xavier University manatee web site (Midwest Manatee Research Program; Chuck Grossman): <www.xu.edu/manateereseach>

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