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SIRENIA SPECIALIST GROUP UPDATE

Thanks to all of you who responded to the article published in the April *Sirenews* calling for applications for membership to the Sirenia Specialist Group for the 2012-16 quadrennial cycle. We received some 40 replies; these have been acknowledged. Contact details have been passed on to the appropriate Regional Co-chairs who have been asked to issue the invitations to join their group. Not all whom we hoped would apply actually did so. If you would like to contribute please contact the appropriate Regional Co-Chair and offer your services to the Group.

As advised in the April Issue of *Sirenews*, we decided that it would be appropriate to modify the structure of the Sirenia Specialist Group along the lines used successfully by the Marine Turtle Specialist Group. The model has evolved somewhat since the April *Sirenews* to better reflect the applications received and changes in the availability of some members.

The revised structure of the group follows:

1. Specialist Group Co-Chairs (one each for dugong and manatee; preferably resident in a dugong/manatee range state): Benjamin Morales is prepared to serve as the Manatee Co-Chair for a second term which will provide continuity. Donna Kwan initially agreed to become the Dugong Co-Chair but as a result of her other commitments was not able to commit to undertaking the task of Co-chair at this time. Consequently, after email correspondence with Simon Stuart from IUCN, I agreed to continue in the role with a view to mentoring someone else to take over preferably mid-session.

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

INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES

Commission de la sauvegarde des especes - Species Survival Commission



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2. Regional Co-Chairs for the following geographic regions:
 - (1) Indian Ocean (East Africa, Arabian Region and Asia): Himansu Sekhar Das, Tint Tun
 - (2) Pacific Ocean (Australia and Pacific Islands): Amanda Hodgson, Donna Kwan.
 - (3) United States: Chris Marshall, TBD
 - (4) Meso-America: Nicole Auil Gomez, Haydee Dominguez
 - (5) South America: Nataly Castelblanco, Miriam Marmontel.
 - (6) West Africa: Edem Eniang, Lucy Keith Diagne.

3. A Listing Authority: Ivan Lawler has agreed to assume this role which overlaps with his day job, which is good.

4. Sirenews Co-Editors: Cyndi Taylor and Buddy Powell have agreed to continue in this role.

5. Biennial Workshop Conveners: Bob Bonde and Nicole Adimey have agreed to continue in this role.

6. Invited Experts: The Group Co-Chairs decided to invite two additional members to the Executive Committee who have a long-term, big-picture perspective and a track record for making things happen: Ellen Hines and John Reynolds.

7. Members of Regional Groups: The Regional Co-Chairs will be responsible for inviting and maintaining the membership of their group. A list of the people who have expressed interest in being members of the Sirenia Specialist Group has been forwarded to them along with a list of their email addresses. The membership of regional groups is not limited to these people. There are some notable omissions, especially for the dugong. If they choose, Regional Co-Chairs may also appoint 1-2 people who are members of the Sirenia Specialist Group, but who have not worked on the species in that particular region to ensure new perspectives. An individual may be a member of more than one regional group. The Group Co-Chairs are not eligible to be Regional Co-chairs but would be expected to be a member of the appropriate regional group.

8. The Executive Committee of the Specialist Group will be made up of the Group Co-Chairs, Regional Co-Chairs, the Listing Authority, the Editors of *Sirenews*, the Workshop Conveners and the Invited Experts.

Roles of the Regional Groups

The Co-Chairs will work with the other members of their group to:

- define the objectives of the group;
- identify issues of concern;
- work with the Listing Authority to revise the status of the various species and sub-species of Sirenia;
- provide an annual regional report to *Sirenews*;
- work with the Executive Committee to develop strategies (including funding) for dealing with critical issues or needs.

The West African manatee sub-group is the exemplar and they have already identified their objectives as:

- (1) To further determine the status of the West African Manatee;
- (2) To be an expert resource panel for the IUCN and other stakeholders;
- (3) To lead and advise others in the growing field of manatee research and management in West Africa;
- (4) To promote and facilitate communication and collaboration among African manatee researchers.

We greatly look forward to working in the new structure which we trust will more effectively represent the diversity of Sirenian conservation problems and solutions.

Many thanks to Cyndi Taylor for her sterling work as the Listing Authority over many years. She leaves big shoes to fill. **-Helene Marsh and Benjamin Morales**

TRIBUTE TO DR. EDWARD "ED" KEITH:
*A simple, caring, and humble marine mammalogist at
Nova Southeastern University*



Dr. Ed, as his friends called him, had a big heart for friends and wildlife, particularly marine mammals, and especially the West Indian manatee. Dr. Keith spent more than 40 years studying marine and terrestrial wildlife, focusing the majority of his time on marine mammals. Dr. Keith was born on October 16, 1951, and graduated from Davis Senior High School in 1970. He received a BS in Wildlife Biology from Colorado State University (CSU) in 1975 and an MS from CSU in 1978. In 1984 he received a Ph.D. in Biology from the University of California Santa Cruz. In 1986, he started working at Nova Southeastern University (NSU). Dr. Keith's initial exposure to wildlife was through his father, who worked on the impacts of DDT in birds in Berkley, California, in the 1970s.

The last 20 years of his life were spent mainly on studying and guiding students studying manatees, dolphins, and whales. He supervised both undergraduate and graduate students who studied manatees in the Everglades area and Mexico. Dr. Keith also supervised students who studied cetaceans in Florida, California, and the Philippines. Dr. Keith touched so many hundreds of lives of NSU students at the Farquhar College of Arts and Sciences, especially those who took his undergraduate Marine Mammalogy course. Dr. Ed also taught classes on human nutrition, clinical chemistry and biology at NSU.

Dr. Ed Keith will be remembered as a simple, caring, and humble teacher and mentor, colleague, and friend. His commitment and passion for teaching is reflected in the numerous students he has mentored and assisted through the years. He also took pride in taking under his wing new colleagues in the area. As a result, many of his students and colleagues who moved to other places have remained good friends with him throughout the years. In the southeast Florida area, Dr. Keith has been the main

marine mammal expert sought out by the media during marine mammal strandings and other marine-oriented newsworthy situations. He was the chair of the 15th Biennial Marine Mammal Conference in Greensboro, North Carolina in 2005. Dr. Keith authored many scientific papers, reports, book chapters and books. Given all of this, Dr. Ed Keith remained a simple and humble man.

Dr. Keith died on September 14, 2012 at the age of 60. He is survived by his wife Kathy, his mother Burnice Keith, and two sisters.

On a personal note, I approached Dr. Keith at the 14th Biennial Conference in Vancouver in 2001. I was told by Helene Marsh, my PhD adviser, to introduce myself to Ed and ask for his assistance on who may need my expertise in the South Florida area. Ed wholeheartedly took me under his wing. Ed connected me with Linda Farmer at the University of Miami, where I was able to teach Introduction to Marine Mammals from 2002 to 2006. Ed and I then received funding to conduct research and conservation on cetaceans in the southern Tañon Strait area in the Philippines from 2004 to 2007. I will always be grateful to Ed for his support, concern and genuine friendship when I was in Miami and even when I returned to the Philippines towards the end of 2006. I will always remember him as a gentle, considerate and humble person, and one who found joy in helping others. And finally for being a genuine friend. **-Lemuel Aragonés (Associate Professor, University of the Philippines, lemdva2001@yahoo.com)**

BOOK ANNOUNCEMENT

Sirenian Conservation: Issues and Strategies in Developing Countries

Edited by Ellen M. Hines, John E. Reynolds III, Lemuel V. Aragonés, Antonio A. Mignucci-Giannoni, and Miriam Marmontel

SAVING MANATEES WORLDWIDE

This important scientific volume comprehensively explores the biology and ecological status of manatees and dugongs from the Caribbean to Eastern Africa, from Arabia to the Amazon, and from Japan through the South Pacific to Australia. Many of these dwindling populations are situated in developing countries- locales that have previously received little attention in the scientific literature. In these areas, people occupying rivers or coastlines still capture sirenians for food and other uses (oil, bones for carving, leather). In addition, disruption, erosion, or complete loss of sirenian habitat occurs because of dredge and fill, coastal run-off, chemical pollution, and damage from boat propellers. *Sirenian Conservation* features contributions from an international group of scientists who share stories



of programs that rescue, rehabilitate, release, and monitor these animals; describes reports on practical, replicable, and cost-effective management techniques; and summarizes current research strategies.

Ellen M. Hines is professor of geography and human environmental studies at San Francisco State University. **John E. Reynolds III**, senior scientist at the Mote Marine Laboratory in Sarasota, Florida, and chairman of the United States government's Marine Mammal Commission, is author of *The Bottlenose Dolphin: Biology and Conservation* and *Mysterious Manatees*. **Lemuel V. Aragonés** is associate professor at the Institute of Environmental Science and Meteorology at the University of the Philippines. Biological oceanographer **Antonio A. Mignucci-Giannoni** is research professor at the Interamerican University of Puerto Rico. An expert on the ecology of

Amazonian manatees, **Miriam Marmontel** is a conservation biologist at the Sociedade Civil Mamiaraú in Brazil.

“A practical ‘state of the science’ review of the conservation of manatees and dugongs in developing countries. The editors have done an excellent job of selecting an international team of more than 80 authors, including researchers and managers who have the responsibility of working with stakeholders to ensure conservation of both the cultural and biological diversity of sirenians. An excellent primer that provides both strategies and tools for continued research progress.”—Annalisa Berta, San Diego State University

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NEWS FROM THE SECRETARIAT TO THE UNEP/CMS DUGONG MOU

Global Environment Facility (GEF) project aims to contribute to the conservation of dugongs and their seagrass habitats across seven Dugong MOU range states

In line with its mission to facilitate and coordinate the protection of dugongs across its range states, the Secretariat to the UNEP/CMS Dugong MOU has initiated an innovative and vast GEF project, which is the first significant investment of its kind and scale in terms of funding contribution and geographic scope. *The Dugong and Seagrass Conservation Project’s* objective is to “enhance the conservation effectiveness of protected and non-protected areas hosting significant populations of dugongs across the Indian and Pacific Ocean basins”. The Secretariat will be supporting seven country partners: Indonesia, Madagascar, Malaysia, Mozambique, Sri Lanka, Timor-Leste, and Vanuatu. The first step has been initiated with national meetings, which have commenced in the partner countries.



Participants at the National Meeting in Colombo, Sri Lanka, to discuss the GEF project, 9th -10th of October, 2012.

The project aims to contribute to the adoption of sustainable fisheries practices and enhanced community stewardship of seagrass-dependent biodiversity. The project will also collate the available information and improve access to as well as to fill information gaps necessary for management and conservation of dugongs and their seagrass habitats. Furthermore, the project will also help to ensure that governments prioritize the conservation of dugongs and their critical seagrass habitats in their relevant national legal, planning, policy and sectoral framework operations.

Project on addressing net fishery and incidental by-catch in the Northwest Indian Ocean planned for 2013

In collaboration with the Environment Agency – Abu Dhabi, the Emirates Wildlife Society, the Environment Society of Oman, the League of Arab States, the UNEP/ROWA office, the Regional Organisation for the Protection of the Marine Environment, and participating state governments, the UNEP/CMS Office - Abu Dhabi has initiated the *Northwest Indian Ocean Regional Marine Megafauna By-Catch Project* to contribute efforts to reducing the risk of incidental by-catch on marine megafauna and as well as reduction of degradation of habitat associated with net fisheries including shrimp trawling. Incidental by-catch is one of the greatest threats to the dugong population in the Gulf region. Gill nets have been identified as being particularly destructive as they are cheap, accessible and have long ‘soaking times’ that increase the chances of drowning voluntary air-breathing marine animals.

The project is now at a stage of raising funds to start initial data scoping to gain a better understanding of the issues at hand. Project outline and concept note are being developed together with promotional materials, and the project is envisioned to start in 2013.

The Second Signatory State meeting of the Dugong MOU in Manila, Philippines

On 4-5 December 2012 the Department of Environment and Natural Resources -Protected Areas and Wildlife Bureau, Philippines, in cooperation with Dugong MOU Secretariat will be organizing and hosting the Second Signatory State Meeting of the Dugong MOU (SS2) in Manila, Philippines. The meeting will review the Signatories’ implementation of the MOU Conservation and Management Plan; provide an overview of ongoing operations, initiatives and progression of dugong conservation pilot projects. It will also provide further guidance relative to future policies and directions with a view to promote effective and sustainable dugong conservation.

Signatories and range states of the Dugong MOU who have not yet pre-registered should do so as soon as possible by using the online form at <http://www.unep-cms.com/>. International agencies or NGOs qualified in protection, conservation and management of dugongs and their seagrass habitats who are interested to attend the SS2 may also wish to pre-register. Additional information on the Dugong MOU SS2 is available at http://www.cms.int/species/dugong/meeting_of_sigs2.htm.

For additional news on activities of the Dugong MOU Secretariat, follow our noticeboard:
http://www.cms.int/species/dugong/dugong_noticeboard.htm

ENGLISH LANGUAGE WRITING ASSISTANCE

I’d like to coordinate a group of sirenian scientists and students who are fluent in reading and writing research papers in English to assist non-English speaking scientists in editing potential journal articles for submission. My idea is to edit already written drafts using a back and forth process with authors in developing countries. Please let me know if you’d like to join this group and how much time you have to devote. Also let me know any other thoughts and ideas. My grad students and I have been

working with a few authors already, and it's been quite useful all around. -**Ellen Hines** (ehines@sfsu.edu)

THIRD INTERNATIONAL CONFERENCE ON MARINE MAMMALS OF SOUTH EAST ASIA (SEAMAM III)

The Third International Conference on Marine Mammals of South East Asia (SEAMAM III) will take place March 4-10, 2013, on Langkawi Island, Malaysia. Please note: We have quite limited funds for delegates. Please email ehines@sfsu.edu if interested in attending, especially if you can contribute to status reports on dugongs in SE Asia.

SEAMAM III will be a forum for consideration of issues related to the conservation and biology of coastal/inshore, estuarine and riverine marine mammals in Southeast Asia. We plan to bring together marine mammal researchers who are working in Southeast Asian countries to report on their results and plans, exchange information on research methods, and assist colleagues who are new to the field. Our goal is to ensure that the research being conducted is grounded in robust methods and designs and that the results lead to improved conservation of marine mammals in the region. The conference will consist of a symposium where updated status reports on marine mammals in each country/region will be presented, followed by a series of workshops and discussion/training sessions. The workshops will be interdisciplinary, for example: economics and conservation issues in small-scale fishing communities, acute environmental hazards and pollutants, creation of marine protected areas, educational activities in local communities, marine mammal bycatch. Our workshop leaders are local scientists or other individuals with extensive experience working in Southeast Asia.

SEAMAM III, like its predecessor conferences in the Philippines in 1995 and 2002 (see below), will be an important platform for capacity building and information exchange. It will inevitably allow us to identify information gaps and knowledge deficiencies. We anticipate that it will also generate momentum for future SEAMAMs, which were originally intended to be held every five years (or more often) to facilitate regional research and conservation efforts. As previously, a report of the proceedings will be compiled and published for SEAMAM III, providing a benchmark to identify research and conservation needs and to address issues faced by local scientists in different countries in the region.

Below please find the reports that were produced in the past SEAMAMs:

1. *Report of the workshop on the biology and conservation of small cetaceans and dugongs of Southeast Asia. United Nations Environmental Programme (1995)* www.cms.int/reports/small_cetaceans/Perrin.htm

2. *Report of the Second Workshop on the Biology and Conservation of Small Cetaceans and Dugongs of South-East Asia (2005)*

<http://swfsc.noaa.gov/uploadedFiles/Divisions/PRD/Publications/Perrinetal.05%2889%29.pdf>

Organizing Committee of SEAMAM III: Louella Dolar (Philippines); Ellen Hines, Co-chair (USA/Canada); Samuel Hung (Hong Kong); Fairul Jamal (Malaysia); Louisa Ponnampalam, Co-chair (Malaysia); Randy Reeves (Canada); John Wang (Canada)

LOCAL NEWS

AUSTRALIA

The future of marine mammals and marine turtles in the Great Barrier Reef. The Great Barrier Reef World Heritage Area supports a diverse fauna of approximately thirty species of marine mammals and

six of the seven species of sea turtles. The importance of the region as a feeding ground for the dugong and as a nesting ground for green and loggerhead turtles were explicit reasons for the region's World Heritage Listing.

All species of marine mammals and marine turtles are long-lived and slow breeding, thus mortality and particularly adult mortality is the life history parameter that has the greatest influence on population change. Mortality tends to be more important than habitat loss in conserving these species. Nonetheless, and particularly for coastal species, habitat loss along the urban coast of the Great Barrier Reef is a significant influence on their long term prospects.

Many species of marine mammals and sea turtles migrate across oceans, thus the future of these species in the World Heritage Area will not only depend on actions within the Area, but also on anthropogenic pressures outside the Area. In addition, climate change is expected to have a very significant adverse impact on many species in ways that are as yet poorly understood. Although most of the major nesting grounds of sea turtles in the Great Barrier Reef World Heritage Area are highly protected (most of the reef islands are national parks), nesting success is likely to be adversely affected by climate change. Impacts include the flooding of nesting habitat, the destruction of nesting habitat by extreme weather events, and feminisation and/or increased egg mortality resulting from increased sand temperatures. The impact of these factors will be spatially variable.

Of great concern is the decline in nesting success at Raine Island, the most significant green turtle rookery in the world, due to a reduction of the depth of sand on the island and resultant flooding of nests with sea water. Raine Island is very highly protected and is an example of the inadequacy of habitat protection *per se* against some forms of natural habitat loss. Nonetheless, the sea turtle populations in the Great Barrier Reef region are generally considered to be relatively robust on a global scale, and species extinctions are unlikely. The greatest impact on adult green turtles is Indigenous harvest of green turtles but this tends to be localised and there are many areas of very significant feeding habitat that are not hunted. In contrast, the inshore populations of sea turtles along the urban coast of the Great Barrier Reef south of Cooktown are vulnerable to habitat loss from extreme weather events, deteriorating water quality and urban development, particularly ports.

Other species of marine wildlife that are vulnerable to impacts outside the region include the great whales. The humpback whales that migrate up the eastern coast of Australia are from the Area 5 stock. The population has recovered remarkably since the cessation of whaling and is now increasing at near the theoretical maximum rate of 10-11% per year. The future of this stock will depend on the effects of climate change on the Antarctic ecosystem. The same is likely to be true of the dwarf minke whale, a likely new sub-species of whale that winters in the northern Great Barrier Reef where it is the target of a well-managed tourism industry.

The pressures on the dugong parallel those on the green turtle. The northern Great Barrier Reef supports globally significant populations for which the major impact is Indigenous hunting. Like the green turtle, however, hunting is localized and many significant dugong habitats in the northern Great Barrier Reef are highly protected and in good condition. The situation on the urban coast is completely different. The temporal changes in the catch per unit effort of the Queensland shark Protection Program suggest that the dugong population declined precipitously from the 1960s. This decline was largely halted by the 1990s presumably through marine park zoning and the establishment of dugong protection areas and the removal of shark nets for bather protection from key locations. However, along the urban coast, the inshore seagrasses on which the dugongs depend have been badly damaged by a series of wet seasons and this has had adverse effects on dugong mortality and fecundity. These impacts have been exacerbated by coastal development, especially ports, and deteriorating water quality from terrestrial

land use. Water quality is improving but the impacts of extreme weather events through climate change are likely to increase and the prospects for the dugongs along the east coast are poor.

The species of marine megafauna that face the most uncertain future are the coastal dolphins, especially the Australian endemic snubfin dolphin and the likely endemic Australian humpback dolphin. Both species occur in small, geographically isolated populations where the anthropogenic mortality of just one animal every few years can cause the population to decline. The populations are threatened by low levels of incidental bycatch in commercial fishing industries and shark netting for bather protection. Although the species have been protected by the zoning arrangements initiated to protect dugong, their long-term future is not bright, particularly as port developments threaten several important habitats.

In summary, the future of marine mammals and sea turtles in the Great Barrier Reef is likely variable. The populations off the coast of Cape York Peninsula are likely to remain healthy. The prospects for the populations along the inshore urban coast are poor despite the extensive protection via zoning. The greatest impact of climate change, although uncertain, is likely to be the increase in extreme weather events and the loss of sea turtle habitat. The impacts on many populations of marine megafauna from areas outside the Great Barrier Reef are also of great concern. **-Helene Marsh (helene.marsh@jcu.edu.au)**

BRAZIL

Amazonian manatee release in Brazil. On August 18 2012, five Amazonian manatees were successfully returned to the wild in the Amanã Sustainable Development Reserve, in western Brazilian Amazon. The Mamirauá Institute for Sustainable Development (MISD), with support by Petrobras through its Programa Petrobras Ambiental and the Georgia Aquarium, established in 2007 a community-based manatee rehabilitation center in the Amana reserve, authorized by IBAMA, the Brazilian environmental agency. The center consists of three plastic pools and a large floating pen located in a natural environment, in the Amana lake, where manatees occur throughout the year and large numbers congregate during the dry season.

Males Piti, Alagoilton, Negão, Jovenal and female Benguela, now between 2.5 and 5 years of age, were received by the MISD's Amazonian Aquatic Mammal Research Group between 1997 and 2010 as young orphan calves, either harpooned (in an attempt to keep the mother nearby for easier capture), or entangled in fishing nets. Manatees were either confiscated by environmental police or turned in by local dwellers of Mamirauá and Amana sustainable development reserves and surroundings. Those injured underwent veterinary treatment and all of them were fed individually customized milk formulas, offered with an underwater bottle to mimic more closely natural behavior with the mother. The animals were raised in close proximity to local communities and with strong involvement by local dwellers in different aspects of the process.

Native aquatic plants available in the lake were offered at an early age, and weaning started several months before release in a slow process. Prior to release clinical exams were performed to ensure animals were healthy and all animals but one (due to his slender body shape) were adapted with belt-mounted VHF transmitters for monitoring. All four belted manatees have been monitored daily since release and at this point (dry season) remain roughly at the same area of release, in the headwaters of Amanã Lake.

The Mamirauá Institute was a pioneer in returning the first Amazonian manatee to the wild ever (Mixirinha in 2000) in the Mamirauá Sustainable Development Reserve, adjacent to Amanã reserve. **-Miriam Marmontel (marmontel@mamiraua.org.br)**

First capture of wild Antillean manatees (Trichechus manatus manatus) in Brazil. In 1980 the Federal Government of Brazil, through the Brazilian Institute of Forest Development (IBDF) created the Manatee Project (Projeto Peixe-Boi), in order to obtain knowledge about the species on the Brazilian coast. During the first decade of the project interviews were conducted on the occurrence and distribution of the species, where it was found to be extinct from the State of Espírito Santo (ES) and the State of Bahia (BA). Conservation priority areas were defined. At the beginning of the second decade, investigations were intensified and the entire north and northeast of Brazil was traveled in search of more information.

Some problems were identified, including a determination that the species was extinct along the coast of the State of Sergipe (SE). The distribution area was discontinuous and newborn individuals were being separated from their mothers and stranding on the beaches of the northeast coast. Since then, the project actions began to focus on the rescue and rehabilitation of calves that cannot survive without their mothers. Research increased on captive animals, and knowledge about native populations grew. In 2010, an Action Plan for Conservation of Brazilian Sirenians was developed, identifying the need to increase knowledge about ecological, ethological and biological species in the wild, as the information obtained so far was mainly arising from captive and released manatees.

In parallel, IBAMA, through CGPEG-issued environmental conditions, created the Sirenia Monitoring Program (PMS). ICMBio coordinates PMS with support from Aquasis and UERN, and cooperation with the USGS Sirenia Project/USA, through a contract signed between Petrobras, FUNBIO and ICMBio. The program is generating the opportunity to conduct original research in Brazil, using techniques and methodologies applied in the USA, and adapted to the field conditions in Brazil for the capture of wild animals. PMS Field activities were conducted in Icapuí-CE for 15 days with a team made up of researchers from all institutions. Five manatees were captured, including a cow-calf, all of whom were tagged and are being monitored daily by observers at fixed sites and via information sent by satellite. Information about travel patterns, use of area, cow-calf relations, inter- and intraspecific interactions are unique and extremely important to support the conservation of the species in Brazil. Although the capture method has been utilized in the United States, the methodology required adaptations for use in Brazilian waters due to different environmental conditions. In Florida, manatee captures are mainly performed in calm waters which the animals frequent during winter months. In Brazil, captures were performed in open water with strong waves, winds and currents. As such, the boat, the nets and other equipment were modified to safeguard staff, animals and to ensure the success of the expedition. The information collected will help with future studies of the species, as well as the determination of actions to be performed in the areas of occurrence for the conservation of manatees in Brazil.

Acknowledgements: We would like to say thanks to the researchers from the USA that participated in the first capture of Antillean manatees in Brazil, including Robert Bonde, James Reid, Coralie Nourisson, Susan Butler, Martine de Wit, Andy Garrett, Kane Rigney, Michael Husk, and Margaret Hunter. -**Fabia de Oliveira Luna (CMA/ICMBio-UFPE), Fernanda Loffler Niemeyer Attademo (CMA/ICMBio-UFRPE), Iran Normande (CMA/ICMBio), Cristine Negrão (Aquasis), Flavio José de Lima Silva (PCCB/UERN), Bernadete Lima Fragoso (PCCB/UERN), and Carla Carneiro Marques (CMA/ICMBio)**

CMA/ICMBio will release more Amazonian manatees (Trichechus inunguis) for the conservation of the species. In the Amazon manatees are still hunted for subsistence and small-scale selling by riverside communities which in many cases capture the calves to attract the mother. The majority of people interviewed during nine expeditions conducted by the Aquatic Mammals Center/ Chico Mendes Institute

for Conservation of the Biodiversity (CMA / ICMBio) said that manatees taste very good. The expeditions occurred in the major rivers and lakes of the Amazon basin between 2000 and 2005. A large number of people advised that the calf does not have enough meat, and therefore they are not being used for consumption.

Since 2002 CMA/ICMBio, with partners, has been rescuing orphaned calves of Amazonian manatees in the State of Pará/Brazil. The animals are rehabilitated for a minimum of 2.5 years where they receive daily artificial nutrition and clinical care. Gradually they are being prepared for release back into their natural habitat. In September 2007, CMA/ICMBio, with the support of Mamirauá Institute, released the first two juvenile manatees rehabilitated in Pará state. The animals, called Hargos and Kika, were released successfully in a lake inside a Federally Protected area (RESEX Tapajós/Arapiuns). The lake, named Anuma, was chosen through a detailed survey of the hydrography of the Tapajós River region where the animals were originally captured. That lake remains isolated from the river for six months during the dry season, forming a natural protected area which is used for adaptation of the animals. The lake has a depth of 8m, presence of abundant food, and the water temperature was adequate for the survival of the species. After the dry season, with the flooding of the rivers, the lake opens and allows the manatees to access an open area along all Amazon basins. To protect the animals from hunting, educational campaigns were carried out for two years with the local communities. The animals were monitored intensively during the first few months. Despite access to the river, the animals remained in the lake during the flood which allowed for their monitoring to continue until 2010 when it was concluded that the individuals were fully capable of surviving in the wild. The project and educational campaigns were considered a success, and in the release area the communities showed affection towards the animals despite traditional hunting of the species in the region.

From 2008 to 2012 CMA/ICMBio, with CEPENOR and support of IBAMA/Pará, rehabilitated eight Amazonian manatees which are suitable for release. With the successful example of the first reintroduction, the CMA/ICMBio, IBAMA/Pará, CEPENOR, GEMARS, and Mamirauá Institute will release more individuals in order to promote the conservation of the species in Brazil. Four individuals were from the Tapajós River region and will be reintroduced in the same lake used in 2007. The other four are from the region of Marajó Island, inside another Federally Protected Area. Educational campaigns are underway and by the middle of 2013 the animals will be released into the wild, allowing them to fill their ecological role which would not be possible without the rescue and rehabilitation programs of the participating institutions. **-Fábia de Oliveira Luna (fabia.luna@icmbio.gov.br), Fernanda Loffler Niemeyer Attademo, Miriam Marmontel, and Carla Carneiro Marques**

Captive born Antillean manatees (Trichechus manatus manatus) in Brazil and increase of wild population. Since 1990, the CMA/ICMBio (National Aquatic Mammals Center/Institute of Chico Mendes for Biodiversity Conservation), has developed a rehabilitation program for Antillean manatee (*Trichechus manatus manatus*) stranded calves on the northeastern coast of Brazil. This work has been conducted in partnership with institutions from the aquatic mammal stranding network (REMANE). The objective is to contribute to the recovery and increase the population of the species, which is considered critically endangered in the country (MMA, 2008). From the late 1980s to date, CMA/ICMBio has managed 72 stranded animals which would not have been possible without the REMANE partnership. Most of the animals would have died without rescue due to their young age (average age less than 15 days) and inability to survive in the wild on their own.

REMANE has been very effective to the conservation of the Antillean manatee in Brazil. The fast work of the institutions allows the animals to receive clinical treatments very quickly (at the location where the manatee stranded), which has been adopted as a standard methodology in Brazil. After

emergency care, some animals go through a period of stabilization in the institution responsible for the rescue and afterward are transferred to the Rehabilitation Center of Wild Animals (CRAS), located at CMA/ICMBio, Itamaracá/PE. Once there the animals undergo a rehabilitation process until they are able to be transferred to a sea pen for adaptation to the wild. They remain for a minimum of six months in adaptation, when they are released and monitored by CMA/ICMBio and Aquatic Mammals Institute (IMA). At CMA/ICMBio in Itamaracá, the captive animals consist partly of stranded calves and partly of individuals rescued from illegal or inadequate captivity as adults. This group of animals has not been released and has established an *ex-situ* population, with three males and four females that have reproduced in this environment over the past 16 years.

The period which each animal spends in the different phases prior to release varies from individual to individual, however usually the minimum period of rehabilitation in aquariums is 6 months to 2 years. All steps are followed by veterinarians and biologists who report clinical and behavioral information before the release of the individuals. A team of trained animal care staff are responsible for providing food and cleaning the facilities.

In 1996 we documented the first calf born in captivity in Brazil. In 1997 there was a birth of twins (two females named Carla and Sheila), which was the first record of manatee twins in Brazil. To date, eleven living calves have been born in captivity. In August 2010 CMA/ICMBio and IMA promoted the transfer of three animals, all juvenile males, from Itamaracá to the Protect Area Costa dos Corais, in Porto de Pedras, Alagoas. Two of these animals have already been released, and the other will likely be released by the end of 2012. The Project continues to monitor the animals after release.

Others calves that were born in captivity at CMA/ICMBio will be released and thus it is intended with this initiative to increase the number of individuals in the wild, as well as contribute to the re-establishment of an extinct population. **-Fernanda Loffler Niemeyer Attademo, Carla Carneiro Marques, Ernesto Frederico da Costa Foppel, Ines, Fábila de Oliveira Luna (e-mail: niemeyerattademo@yahoo.com.br)**

CUBA

First manatee captures and health assessment in Cuba. In 2012 two expeditions took place in Siguanea Gulf, Isle of Youth (Isla de la Juventud), the first in February and the second in July. The main goals were: 1) Satellite tag two manatees to study movement patterns; 2) PIT-tag the manatees to identify recaptures; 3) Collect blood, skin, tears, feces, and urine samples, and 4) Evaluate the clinical status of the animals and record morphometric values. The trips were funded by Sea to Shore Alliance, the John D. and Catherine T. MacArthur Foundation, and the United Nations Development Programme-Global Development Facility (UNDP-GEF), and the Epply Foundation in collaboration with the Center for Marine Research from the University of Havana, the National Center for Protected Areas, and the National Enterprise for Flora and Fauna.

During the first trip the Cuban crew was trained on main capture techniques. We were able to find the proper place to set the net, based on results from boat surveys since 2007. Specialists from different U.S. institutions (USGS, University of Florida, and the Florida Fish and Wildlife Conservation Commission) participated in this training. We were not successful in capturing any animals and had only a few manatee sightings during the four-day expedition, probably due to the lack of fresh water in the area during that month.

During the second expedition we set the net for 10 days, usually between 1030 to 1500 hours. Eleven manatees were captured in seven days, but five of them escaped. We captured and did health assessments on six animals: three adult females, one juvenile female, and two calves (both males). We

used two different nets: a 40-meter-long net with a 5-cm mesh (designed with a sack in the middle section to facilitate manatee capture and manipulation) and a 30-meter-long net with a 24-cm mesh to block access to the main fresh water source in Siguanea Gulf (San Pedro Bay in the west part of “Lanier Swamp”) and confine the manatees inside this area. Once the manatees were on the boat we collected morphometric measurements; assessed body condition; conducted temperature, respiratory and heart rate monitoring; implanted PIT-tags (intradermal microchip); and collected blood, fecal and urine samples. All of these measurements and evaluations were completed within an hour. Average straight length was 311 cm on the adults, 219 cm on the juvenile, and 123 cm on the calves. Two manatees were released with radio-satellite tags and they are being monitored by Cuban researchers from the Center for Marine Research, University of Havana. After release, we were able to relocate the two tagged animals and evaluate their behavior and habitat use for nine days.

To date, these animals have continued using two lagoon systems on the west coast of the Isle of Youth, southwest coast of Cuba. More tags will be acquired in the next year. This study will help us better understand manatee habitat use and movement in the Cuban archipelago.

-Anmari Alvarez Alemán, Jorge Angulo Valdés, James Powell

IRAN

Dugong carcass recovered in Iran. On April 26, 2012 a marine mammal carcass was located by a marine expert during a rapid survey and monitoring in the Chabahar coastal area of Iran (exact location: Kachou village, 25 11 40.22 N, 61 4 40.05 E). Upon further investigation it was determined to be the carcass of a dugong (*Dugong dugon*). Examination results showed the dugong to be a male 3.1m long weighing more than 450 kg, with deep injuries on the underside of the right pectoral area.

While in previous years this area was known to be habitat for many marine species such as dugongs, recent data has indicated no presence of dugongs in this region in at least ten years. **-Nasir Soltanpour (Chabahar Dept. of Environment) and Hamed Moshiri (Plan for the Land Society, moshiri@plan4land.org)**





SURINAME

River seismic survey in manatee habitat in Suriname. **Issue:** A river seismic study is being conducted in Suriname in areas known to be inhabited by the West Indian Manatee (*Trichechus manatus manatus*). No proper baseline study was done prior to the river seismic study. As the project was classified as “category B” according to environmental guidelines used by the local environmental protection agency NIMOS, the required scope of the Environmental and Social Impact Assessment (ESIA) was a desktop study which did not include field verification. As a result, ongoing assessment of impacts will not be made and, more critically, no adjustments to mitigation or monitoring procedures can be made over the course of the seismic survey. In addition, because Suriname does not have any environmental legislation covering this, all ESIA’s are voluntary on the companies, and NIMOS only has an advisory opinion. Legislation specifically addressing marine mammals is also non-existent.

Background: Suriname is located on the northeastern coast of South America bordering on Brazil in the South, French Guiana in the East and Guyana in the West. The northern border of Suriname is a 380 km coastline characterized by alternating mudflats and sandy beaches. From east to west, four major rivers flow into the Atlantic ocean, respectively the Marowijne, Suriname, Coppename and Corantijn Rivers. The estuaries of these rivers all consist of a confluence of at least one minor contributing river at close proximity to the outflow of these major rivers into the ocean. The contributing rivers are always located on the eastern bank and are from east to west respectively the Mana (located in French Guiana), Commewijne, Saramacca and Nickerie Rivers. These four estuaries with contributing rivers are prime habitat for West Indian Manatees. Manatees have not been recorded on the coastline of Suriname, perhaps because of a lack of appropriate habitat, e.g. the shallow mudflats and sandy beaches and lack of edible vegetation types, but may simply have been missed because of insufficient research in these habitats.

All rivers occupied by manatees are typically shallow, narrow, meandering rivers of which the secchi depth (measured using a turbidity tube) ranges between 2-20 cm. In other words, marine mammal sightings are extremely difficult, especially if there was no baseline to determine where the manatees may likely occur. Based on maps 2225 and 2014 of the Maritime Authority Suriname, Table 1 provides an idea of width and depth of the Saramacca River. Although the data are old, major changes in depth or width are to be expected since the last measurement.

Table 1. Width and depth data for the Saramacca River.

Width	Depth	Location
3750 m	1.2 m	Boromofo kreek – Coppename punt
1125 m	1.6 m	Blakamamma kreek
825 m	2.4 m	Hildesheim
675 m	3 m	Carl François
500 m	3.5 m	Mokkum
500 m	3.6 m	Londonderry
500 m	5.2 m	Bombay
250 m	5.5 m	Tijgerkreek
250 m	7.5 m	La Prevoyance
225 m	8.4 m	Sara Maria
125 m	10 m	Wayamboweg
225 m	8.8 m	Groningen

The Green Heritage Fund Suriname (GHFS), an environmental volunteer organization, is currently monitoring the Guiana dolphin (*Sotalia guianensis*) population in the Suriname River using an ecosystem-based approach that also tracks other species encountered during the weekly monitoring trips, including the manatee, a species encountered from time to time in the Guiana dolphin habitat. After participating in the Second International Conference on Marine Mammal Protected Areas in Martinique in November 2011, the GHFS initiated a distribution survey of the West Indian Manatee (*Trichechus manatus manatus*) in all Surinamese rivers in late 2012.

In 2009 the Suriname State Oil company (Staatsolie N.V.) informed a group of stakeholders of its intention to perform a river seismic study and invited them to the first scoping meeting. The GHFS attended that and all subsequent stakeholder meetings, providing input at all stages of this ESIA process in the form of written submissions to the oil company and the local environmental protection agency (NIMOS). In addition, GHFS input included material solicited from international experts. Although the GHFS repeatedly asked that the seismic survey be postponed until additional data could be obtained and a baseline of manatee (and Guiana dolphin) distributions and habitat use established, the oil company continued planning without making adjustments. Further, the Environmental Management Plan (EMP) was not made available to the GHFS on the pretext of it still being a draft. The EMP was only made available to the GHFS by NIMOS after a meeting held on the 6th of September 2012 at the offices of NIMOS. Although NIMOS indicated during this meeting that they still had not given approval, the GHFS was informed by a dolphin tour operator on the 7th of September that the seismic survey would start on the 23rd of September in the Suriname River.

It appears that the Association of Tour Operators in Suriname (VESTOR) had already been requested by letter to provide its collaboration and make an experienced boatmen available to function as Marine Mammal Observer by way of additional mitigation measure. NIMOS requested a meeting with Staatsolie and the GHFS on the 11th of September to arrive at a solution. During this meeting the company was asked to respond to one particular letter from the GHFS and on issues raised during the

meeting. NIMOS would then give approval to start the seismic survey, however, not in the Suriname River for which a monitoring plan had to be put in place, and the government entity asked the company to start its activities in the West of the country. The GHFS mentioned during the meeting that in its opinion the Saramacca River would also require a monitoring plan, as the river is known to be inhabited by West Indian Manatees. The oil company responded in writing to the issues raised during the meeting on the 16th of September, but still did not respond to the specific letter submitted by the GHFS addressing issues of the bioacoustic profiling of the rivers. The company then announced it would start its seismic survey in the Saramacca River, after which the GHFS decided to raise the matter in the media on the 21st of September. In addition, Dr. Randall Reeves, Chairman of the IUCN Cetacean Specialist Group, wrote a letter requesting proper preparation for the seismic survey, and expressed his concern with regard to the possible impacts on the manatee population in the Saramacca River. This letter, as well as a monitoring plan drawn up by the GHFS, were submitted to the oil company and the NIMOS and other regulating bodies on the 24th of September. A media encounter occurred in which the oil company and the GHFS were given an opportunity to express their viewpoints. After that media encounter, there was no communication other than a letter announcing the start of the seismic survey on the 3rd of October and in which the cooperation of the GHFS was requested. The GHFS responded that it would provide its cooperation and asked to be allowed an observer on the vessel, to which request no response was received.



Saramacca River Habitat

Current Status: The river seismic survey started on the 3rd of October in the Saramacca River. As a result the Nature Conservation Division of the Ministry of Spatial Planning, Land and Forest Management (RGB), which is in charge of protected species and nature reserves, is facilitating a preliminary survey of all the rivers by the GHFS involving bioacoustic recordings, water quality measurements, and surveys of manatee presence. These activities are conducted within the framework of the Suriname Coastal Protected Areas Management Project (SCPAM) that falls under the Ministry of RGB and which is co-funded by the Global Environment Fund (GEF) through the United Nations

Development Program (UNDP). Prior to the initiation of the seismic surveys on 3 October in the Saramacca River no measurements were taken. However, the GHFS visited the Coppename River prior to the seismic survey being conducted there, made bioacoustic recordings, took water measurements (salinity, turbidity) along the projected seismic survey line, and recorded anecdotal and physical evidence of manatee presence. The GHFS was accompanied on 6 October by a Game Warden and Permitting Official of the Nature Conservation Division. Then on the 8 October trip the same was repeated prior to the seismic survey in the Corantijn River. The Saramacca River will be sampled after the seismic survey in the week of the 15th of October, and for the Suriname and Commewijne River, funding needs to be found as it falls outside of the scope of the SCPAM project.

Key Considerations: The GHFS Monitoring Plan submitted to the oil company was specifically written with a view to monitoring the seismic activities on the Suriname and Commewijne Rivers. The monitoring plan includes pre-survey monitoring, monitoring during the survey and post-survey monitoring. Considering that, as stated by Linda Weilgart (Weilgart, 2005) of Dalhousie University in Canada, “the burden of proof regarding adverse impacts should be placed on appropriate users, rather than requiring the regulatory agencies (and hence the taxpayers) to cover all costs. Successful implementation of a precautionary approach requires that the burden of proof should reside with the noise producers.” Thus, one would expect the oil company to cover the costs of the monitoring plan for these two rivers. Because Suriname does not have any specific environmental protection legislation, and NIMOS operates under draft environmental legislation, the government body only has an advisory opinion. This lack of legislation leaves NIMOS toothless, and the oil company can do as it likes, as entities that may cause environmental damage are not legally required to abide by the requirements of the draft legislation. In case of displacement of the dolphin population, the burgeoning dolphin-watching industry benefiting especially local communities along the Suriname and Commewijne Rivers could suffer considerable adverse impact, leaving these communities without any legal recourse towards the oil company for compensation. -**Monique Pool, Chairman of the Green Heritage Fund Suriname (info@greenfundsuriname.org)**

UNITED STATES

Update on Dauphin Island Sea Lab Manatee Program. The Dauphin Island Sea Lab’s (DISL) manatee research program, in collaboration with Sea to Shore Alliance and SeaWorld Orlando, successfully captured five manatees in the Mobile Bay, Alabama area during late August this year. Captured animals included two males previously identified from Crystal River and Homosassa Springs, Florida, and originally captured in the Mobile Bay area during August 2010. The DISL researchers and their collaborators were assisted by veterinarians from the University of Florida and manatee experts from the United States Geological Survey Sirenia Project in Florida, U.S. Fish and Wildlife Service (USFWS) biologists and veterinarians from an area practice.

Captured manatees were given health assessments and were fitted with GPS tracking tags to locate and record their movements while in Alabama waters and throughout their migrations. During the capture event, aggregations of 10 or more manatees were seen in both the Dog River and the Mobile-Tensaw delta areas.

Researchers from DISL first captured and tagged Alabama manatees in 2009. Data from tags deployed in 2009 and 2010 helped prove that manatees are regular seasonal visitors to Alabama waters and that some of these animals return to Alabama during warm weather year after year. From these data, researchers have also gained a better understanding of manatees' habitat use and foraging patterns within local waters.

DISL also operates the only formal manatee sighting network in the U.S., dedicated to receiving and cataloguing manatee sighting reports from western Florida through Mississippi. Manatee sighting data obtained from the public is vital to understand the distribution of these cryptic marine mammals and is a valuable complement to the capture and tagging portion of our research. Since inception in 2007, DISL's Manatee Sighting Network has processed more than 1,200 opportunistic manatee sightings primarily in Alabama, but also reported from Louisiana, Mississippi, Florida, Georgia, and North Carolina. All sightings are reported to the USFWS and entered into a permanent database for which FGDC compliant metadata are also published.

"Without the commitment and quality efforts from DISL's team lead by Dr. Carmichael, most that is known about the federally endangered manatee in Alabama would be little more than stories. She is documenting and verifying the animals' use patterns, health, and population that were unknown until now," said Dianne Ingram, USFWS endangered species biologist.

This research is funded by the Alabama Division of Wildlife & Freshwater Fisheries under traditional Section 6 of the USFWS. If you are interested in making a contribution to support this important research, or would like more information, a boat decal or dock sign with manatee reporting information, please contact DISL's Manatee Sighting Network on our Facebook page or visit manatee.disl.org and report sightings by calling 1-866-493-5803 or by email to manatee@disl.org.
-Allen Aven, Ruth H. Carmichael, and Lisa Young (Dauphin Island Sea Lab, Alabama, USA)

RECENT LITERATURE

Anzolin, D. G., J. E. S. Sarkis, E. Diaz, D. G. Soares, I. L. Serrano, J. C. G. Borges, A. S. Souto, S. Taniguchi, R. C. Montone, A. C. D. Bairy and P. S. M. Carvalho. 2012. Contaminant concentrations, biochemical and hematological biomarkers in blood of West Indian manatees *Trichechus manatus* from Brazil. *Marine Pollution Bulletin* 64(7):1402-1408.

Beatty, B. L., T. Vitkovski, O. Lambert and T. E. Macrini. 2012. Osteological associations with unique tooth development in manatees (Trichechidae, Sirenia): A detailed look at modern *Trichechus* and a review of the fossil record. *Anatomical Record: Advances in Integrative Anatomy and Evolutionary Biology*, 295(9):1504-1512.

Bonde, R.K., P.M. McGuire, and M.E. Hunter. 2012. A review of the key genetic tools to assist imperiled species conservation: analyzing West Indian manatee populations. *J. Marine Animals & Their Ecology* 5(1): 8-19.

Burgess, E. A., J. M. Lanyon, J. L. Brown, D. Blyde, and T. Keeley. 2012. Diagnosing pregnancy in free-ranging dugongs using fecal progesterone metabolite concentrations and body morphometrics: A population application. *General and Comparative Endocrinology* 177(1):82-92.

Burgess, E. A., J. M. Lanyon, and T. Keeley. 2012. Testosterone and tusks: Maturation and seasonal reproductive patterns of live, free-ranging male dugongs (*Dugong dugon*) in a subtropical population. *Reproduction (Cambridge)* 143(5):683-697.

Castelblanco-Martínez D., C. Nourisson, E. Quintana-Rizzo, J. Padilla-Saldivar, J. Schmitter-Soto. 2012. Potential effects of human pressure and habitat fragmentation on population viability of the Antillean manatee *Trichechus manatus manatus*: a predictive model. *Endanger Spec Res.* 18:129-145.

- Daniel-Rentería, I. C., A. Serrano, G. Sánchez-Rojas. 2012. Distribution of the Antillean manatee (*Trichechus manatus manatus*) in the Alvarado Lagoon System (Veracruz, Mexico). *Ciencias Marinas*. 38(2): 459–465.
- D. P. Domning. 2012. Historical Perspectives: The early years of the Amazonian manatee project at INPA, Manaus, Brazil. *Aquatic Mammals* 2012, 38(2), 204-222.
- Gaspard, III, J. C., G. B. Bauer, R. L. Reep, K. Dziuk, A. Cardwell, L. Read and D. A. Mann. 2012. Audiogram and auditory critical ratios of two Florida manatees (*Trichechus manatus latirostris*). *Journal of Experimental Biology* 215(9):1442-1447.
- Guido, A., A. C. Marra, A. Mastandrea, F. Tosti and F. Russo. 2012. Micromorphological, geochemical, and diagenetic characterization of sirenian ribs preserved in the Late Miocene paleontological site of Cessaniti (southern Calabria, Italy). *Facies* 58(2):179-190.
- Guterres-Pazin, M. G., F. C. W. Rosas, & M. Marmontel. 2012. Ingestion of Invertebrates, Seeds, and Plastic by the Amazonian Manatee (*Trichechus inunguis*) (Mammalia, Sirenia). *Aquatic Mammals* 38(2):322-324.
- Hamylton, S. M., A. B. Hagan and N. Doak. 2012. Observations of dugongs at Aldabra Atoll, western Indian Ocean: Lagoon habitat mapping and spatial analysis of sighting records. *International Journal of Geographical Information Sciences* 26(5):839-853.
- Hautier L., R. Sarr, R. Tabuce, F. Lihoreau, S. Adnet, D. P. Domning, M. Samb and P. M. Hameh. 2012. First prorastomid sirenian from Senegal (Western Africa) and the Old World origin of sea cows. *Journal of Vertebrate Paleontology* (32)5:1218-1222.
- Kikuchi, M., V. M. F. da Silva, F. C. W. Rosas, D. Souza and N. Miyazaki. 2012. The implications of turning behaviour performed by Amazonian manatees after release into the wild. *Journal of Ethology* 30(1):187-190.
- Lacommare, K. S., S. Brault, C. Self-Sullivan and E. M. Hines. 2012. Trend detection in a boat-based method for monitoring sirenians: Antillean manatee case study. *Biological Conservation* 152:169-177.
- Lanyon, J.M., H. L. Sneath and T. Long. 2012. Evaluation of exertion and capture stress in serum of wild dugongs (*Dugong dugon*). *Journal of Zoo and Wildlife Medicine* 43(1):20-32.
- Luna, F. O., R. K. Bonde, F. L. N. Attademo, J. W. Saunders, G. Meigs-Friend, J. Z. O. Passavante, and M. E. Hunter. 2012. Phylogeographic implications for release of critically endangered manatee calves rescued in Northeast Brazil. *Aquatic Conservation: Marine and Freshwater Ecosystems* 22(5):665-672.
- Martin, J., H. H. Edwards, M. A. Burgess, H. F. Percival, D. E. Fagan, B. E. Gardner, J. G. Ortega-Ortiz, P. G. Ifju, B. S. Evers and T. J. Rambo. 2012. Estimating distribution of hidden objects with drones: From tennis balls to manatees. *PLOS ONE* 7(6) e38882. 8pp.
- Mathews, P.D., V. M. F. da Silva, F. C. W. Rosas, J. A. D. Neto, S. M. Lazzarini, D. C. Ribeiro, J. P. Dubey, S. A. Vasconcellos, and S. M., Gennari. 2012. Occurrence of antibodies to *Toxoplasma gondii*

and *Lepstospira* spp. In manatees (*Trichechus inunguis*) of the Brazilian Amazon. *Journal of Zoo and Wildlife Medicine* 43(1):85-88.

Rivas Rodriguez, B. A., A. F. Perez and G. Colonnello. 2012. Distribution, habitat use, and population status of the manatee (*Trichechus manatus*) in the middle region of the lower Orinoco River, Venezuela. *Memoria de la Fundacion La Salle de Ciencias Naturales* 173-174:155-172.

Sadchatheeswaran, S., M. Belanger and C. Wittnich. 2012. A comparison of published brevetoxin tissue levels in West Indian manatee, bottlenose dolphin and double crested cormorants in southwest Florida. *Journal of Marine Animals and Their Ecology* 5(1):20-27.

Sorbi, S., D. P. Domning, S. C. Vaiani, and G. Bianucci. 2012. *Metaxytherium subapenninum* (Bruno, 1839) (Mammalia, Dugongidae), the latest sirenian of the Mediterranean Basin. *Journal of Vertebrate Paleontology* 32:3, 686-707.

Stith, B. M., D. H. Slone, M. de Witt, H. H. Edwards, C. A. Langtimm, E. D. Swain, L. E. Soderqvist, and J. P. Reid. 2012. Passive thermal refugia provided warm water for Florida manatees during the severe winter of 2009-2010. *Marine Ecology Progress Series* 462:287-301.

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