Sirenews

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IN THIS ISSUE:

NEW SIGNATORIES AND FUNDS FOR DUGONG AGREEMENT

Bonn, 1 September 2008: Last week's meeting in Bali, Indonesia, of the signatories to the UNEP/CMS Memorandum of Understanding on the Conservation and Management of Dugongs (Dugong dugon) included a ceremony at which representatives of Comoros, Kenya and Philippines signed the agreement. These three signatures bring the total number of countries involved in the initiative to eleven, less than a year after it was finalised in Abu Dhabi, United Arab Emirates.

Participants summarised the conservation challenges and priorities in their countries and discussed a mechanism for funding future activities. Terms of reference for project funding were agreed and a simple system which will allow Range States to apply for grants will be elaborated. Further details will be posted on the CMS website in due course.

The most exciting news was the welcome and generous offer from Environment Agency - Abu Dhabi (EAD) to provide full funding for the operations of the MoU, including the establishment of a secretariat to service the Dugong agreement. Details of the offer, which had been circulated to interested States earlier in the year, were spelled out in a paper tabled at the meeting. The EAD offer also foresees the creation of a sub-regional coordination unit for the northwestern area of the Indian Ocean and South East Asia Marine Turtle MoU (CMS/IOSEA) and additional staff to service the CMS Raptor Agreement currently under negotiation.

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INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES

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Delegates welcomed the EAD offer, which will inject some USD 3.4 million into CMS-related activities over the first three years of the arrangement.

Executive Secretary Robert Hepworth, who attended the meeting described the Emirate's offer as "extremely generous" and said it would provide a springboard for success for two of the ten CMS regional agreements negotiated since the last CMS COP in 2005, as well as relieving future budgetary pressures on both the Convention and IOSEA.

The photo above shows Philippine Ambassador H.E. Vidal Erfe Querol signing the Dugong Agreement in the presence of CMS Executive Secretary, Robert Hepworth, and CMS Senior Advisor, Douglas Hykle

The Dugong meeting was held back-to-back with the Fifth Meeting of IOSEA Signatory States during the period 19-23 August 2008. A total of one hundred delegates from 30 countries attended the combined events.

-Submitted by **Helene Marsh** (helene.marsh@jcu.edu.au), from the Convention on Migratory Species website (http://www.cms.int/news/PRESS/nwPR2008/09_Sep/nw_010908_Dugong_Bali.htm)

CMS WATCH II MEETING IN LOME, TOGO

On October 2-3, 2008 the United Nations Environment Programme, Convention of Migratory Species (CMS) hosted the second meeting of Western African Talks on Cetaceans and their Habitats (WATCH) in Lome, Togo. This meeting followed upon the initial success of last year's WATCH meeting in Tenerife, Canary Islands, Spain to establish a Memorandum of Understanding Concerning the Conservation of the Manatee and Small Cetaceans of Western Africa and Macronesia, as well as two separate Action Plans. WATCH II was attended by representatives from 22 West African range countries, as well as three marine mammal scientific advisors and staff from five NGOs. Over two days the participants reviewed the action plans and the MoU to check facts, verify references and harmonize the English and French versions. On the afternoon of October 3 a signing ceremony was held and the MoU was signed by representatives from 15 countries, as well as three NGOs (including Wildlife Trust and Wetlands International, which are specifically focused on West African manatee work in the region). The MoU takes effect immediately after seven countries become signatories, so it has been successfully ratified and will remain open indefinitely for other countries to sign. It is now hoped that this ambitious document will lead to greater research and conservation efforts for the species. For more information, please see the UNEP website:
http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=548&ArticleID=5939&l=en
-**Lucy Keith (**Wildlife Trust, keith@wildlifetrust.org)

MARINE MAMMAL CONSERVATION NETWORK OF INDIA

The site of this newly initiated network is www.marinemammals.in. There are some 30 marine mammal species including the Dugong to be found in the Indian and South Asian seas. This site has an illustrated account for each of these species. It also has an identification guide that is meant for assisting with the recognition of both animals at sea and stranded specimens. A printable stranding booklet is available from the site. A database of records of marine mammals from the Indian region dating from the 19th century is an important component of this novel web-based project. The information gathering and dissemination is dynamic. Anyone visiting the site can upload text and photographs to the site for inclusion in the database. Researchers

will find the bibliography and uploaded papers helpful. This website is associated with the marinemammalsofindia yahoogroup. –**Kumaran Sathasivam** (k_sathasivam@yahoo.co.in)

NEW INFORMATION ON THE BARNACLE *Chelonia manati* GRUVEL, 1903, A COMMENSAL EPIBIONT OF SIRENIANS: AN APPEAL FOR MUCH-NEEDED SAMPLES

Barnacles of the superfamily Coronuloidea (Cirripedia: Balanomorpha) are obligate commensals of marine animals – including sea turtles, sea snakes, crustaceans, cetaceans and sirenians (Newman and Ross, 1976). Over twenty coronuloid barnacle species are currently recognized, with two species known to attach to sirenians: *Chelonibia manati* Gruvel, 1903 and *Platylepas hexastylos* (Fabricius, 1798). While *P. hexastylos* commonly attaches to garfish, sea snakes, sirenians and most often to sea turtles, *C. manati* is believed to be exclusive to manatees and dugongs.

Two subspecies assigned to *C. manati* were described by Pilsbry (1916): *C. manati crenatibasis* and *C. manati lobatobasis*. These two forms have only been recorded from sea turtles in the western North Atlantic Ocean. Minute differences in shell morphology distinguish these two subspecies from *C. m. manati* from sirenians.

When compared to congeners that attach only to turtles and crabs: *Chelonibia caretta* (Spengler, 1790), *Chelonibia patula* (Ranzani, 1818) and *Chelonibia testudinaria* (Linnaeus, 1758), *C. manati* is unique in that it forms dendritic, bifurcating longitudinal ribs or 'fingers' that extend outwards and downwards from the periphery of the basal margin (Figure 1). These structures serve to anchor this species to the skin of the host by holding or pinching the epidermis.

Preliminary information derived from genetic analyses conducted by Dr. John D. Zardus and David T. Lake of the Citadel in Charleston, South Carolina indicate that the distinctive *C. manati* is actually a specialized morphological form of the more commonly reported *Chelonibia testudinaria* from sea turtles. Moreover, similar analyses conducted by the author and Dr. Paul Rawson of the University of Maine at Orono indicate that the barnacle *Chelonibia patula*, which attaches most commonly to crabs and chelicerates, is also a specialized morphological form of *Chelonibia testudinaria*. That is, the barnacle *C. testudinaria* is morphologically plastic and the size and shape of its shell varies with respect to the host it has settled upon.

Conversely, *C. testudinaria* also displays cryptic diversity when specimens are assayed from widely separated localities (Rawson *et al*., 2003). Although specimens appear similar superficially, DNA analyses indicate that *C. testudinaria* actually consists of three different species: an Atlantic/Mediterranean species, an Indo-Pacific species and an Eastern Pacific species. Whether 'manati' follows this same trend is unknown.

To date, our analyses include a large number of barnacles collected from sea turtles world-wide and a small number of barnacles from manatees from the Western North Atlantic Ocean. We are currently in the process of reclassifying the genus *Chelonibia* and are in need of barnacle samples from manatees and dugongs in order to reinforce and strengthen our findings with respect to 'forma manati'. Any help in obtaining these samples would be greatly appreciated and acknowledged. Researchers interested in helping with this study should contact the author for further details and necessary sampling/preservation methodologies. -**Michael G. Frick (**Caretta Research Project, P.O. Box 9841, Savannah, Georgia 31412; e-mail: caretta05@aol.com).

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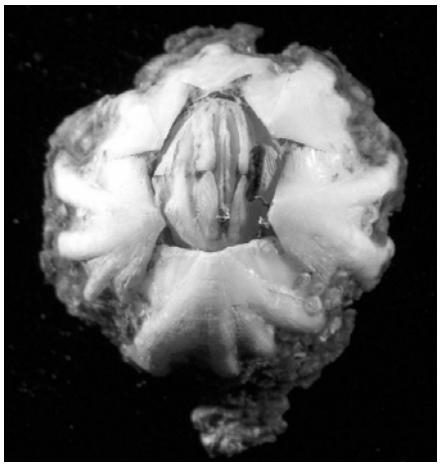

Figure 1. *Chelonibia manati* with manatee (host) skin still attached.

IDENTIFYING DUGONG STOCK STRUCTURE

The global range of the dugong is vast (~ 140,000km). However, it is highly fragmented. For example, the length of coast between the northern limits of the dugong's range in East Africa to the Red Sea is ~1700 km; the distance between the dugong habitat in the Arabian Gulf and the Gulf of Kutch in India is also ~1700 km; the distance from dugong habitat in southern India to the Myanmar Border with Bangladesh is ~4,000 km.

Because of this fragmentation, the global assessment of the dugong's status needs to be supplemented by understanding of its regional stock structure. Our group at JCU has been studying stock structure with a focus on Australian dugongs using both mtDNA and microsatellites. The results show that: (1) Australian dugongs are genetically distinct from most dugongs sampled from outside Australia; (2) there are two major genetic lineages within Australia that apparently reflect historical sea level changes; (3) both Australian and South East Asian lineages occur at Ashmore Reef on the edge of the Australian continental shelf about 370 km from Western Australia and 150 km from Timor Leste.

In order to better understand the stock structure of dugongs, as a basis of regional assessments of its conservation status, we need additional samples from various parts of the dugong's range, particularly: (1) anywhere outside Australia; (2) the Gulf of Carpentaria, Northern Territory and Western Australia.

We would like to collaborate with researchers throughout the dugong's range. The data resulting from the genetic analysis of each sample will be placed on a secure website for the use of all sirenian researchers. A sample of the DNA from each dugong will be returned to the contributor to enable it to be used for further research.

Potential collaborators should contact: **Professor David Blair**, david.blair@jcu.edu.au, or
Associate Professor Michelle Waycott, michelle.waycott@jcu.edu.au
Many thanks. – **Helene Marsh**, James Cook University (helene.marsh@jcu.edu.au)

LOCAL NEWS

ABU DHABI

ABU DHABI TRIES TO SAVE THE DUMPY "LADY OF THE SEA"
The National, 18 September 2008

ABU DHABI, United Arab Emirates - It's a little puzzling exactly how the shy, dumpy dugongs that graze in Abu Dhabi's warm coastal waters were once mistaken for mermaids. As a species listed by the World Conservation Union as "vulnerable to extinction," the dugongs of Abu Dhabi are a national treasure, according to the Environment Agency – Abu Dhabi (EAD). In fact, the emirate's shallow coastal waters are home to a dugong population second in number only to that in Australia.

The species, whose name comes from the Malay term "duyung", meaning "lady of the sea," has been spotted in the channels around Abu Dhabi Island as well as within two kilometres of the Corniche. Of the approximately 7,000 dugongs believed to live in the Arabian Gulf and the Red Sea, Abu Dhabi is home to about 40 per cent of them, according to EAD estimates. But pressures from urbanisation and human activities such as fishing and trawling, not to mention oil spills, are further putting the creatures in peril. So, the EAD's Marine Research Centre has embarked on conservation efforts to restore the population.

Next month will mark the first anniversary of the UAE becoming the first Arab country to sign a Memorandum of Understanding concerning the conservation and management of dugongs. The city's expansion along the coastal belt has encroached on the dugongs' habitat, and dredging has disturbed the seagrass beds, the mammal's only source of food, explained Thabit Zahran al Abdessalaam, the director of the marine biodiversity management sector at the EAD. "Abu Dubai is attractive for dugongs as almost all the sea grass beds in the entire UAE are here," he said, adding that dugongs are protected under UAE law and anyone found to be harming them can be prosecuted.

Although dugongs are distributed in the coastal waters of more than 35 countries, the EAD's effort to save its dugong population is tied to the heritage of local people. With so much at stake, preserving the life of creatures that have lived in the Arabian Gulf for millions of years is seen as important for both present and future generations.

Full story and source: http://www.thenational.ae/article/20080918/FRONTIERS/50094519/1036

COLOMBIA

Implementation of a management plan and conservation of* Trichechus manatus manatus *in the lower Sinu River Basin, Department of Cordoba, Colombia. The Antillean manatee is listed as endangered on the IUCN Red List. In Colombia the populations are affected principally by human alterations such as fragmentation, drought and contamination. Currently the availability of suitable habitat is reduced, and it is necessary to carry out projects that guarantee the survival of this herbivore mammal, which is important for the balance and productivity of the habitat. The present study determined the distribution, feeding and use of habitat of the manatee. From September 2005 to July 2006, data was collected in five samplings using two components: one biologic and one social. The biologic component consisted of the search for indirect evidence (feeding areas, feces) and direct evidence (sightings). In the social component interviews, sightings were

recorded and educational activities with fishermen were conducted. A total of 182 feeding areas were registered: 117 in the river and river mouth, 51 in the Cienaga Grande de Lorica, and 14 in the mangroves. Twenty-six feces samples were recovered: 22 in mangroves, 3 in the Cienaga Grande de Lorica and one in the sea. The results documented in the direct evidence surveys were 9 sightings with 18 individuals and 411 events: 3 in the river, 3 in the Cienaga Grande de Lorica, 2 in the sea and one in the mangroves. One-hundred forty-nine interviews were conducted with fishermen and 45 sighting points were taken. The results showed the manatee has an important population distributed in the Cienaga Grande de Lorica, in Sinu river from Caño Aguas Prietas, in the antiguo delta (mangrove zone) (Ciénaga de Ostional, Caño Salado), in San Bernardo del Viento, and San Antero (marine zone). This distribution is located principally in the Cienaga Grande de Lorica where river level fluctuations affect distribution and behavior. The river is used for reproduction and feeding when the river levels are high. This is not an important variable in the other ecosystems; the river, mangroves and the river mouth are used for transit, resting and feeding. The sightings in the sea were related with marine kelps possibly used for feeding.

-Dalila Caicedo-Herrera (Bióloga Marina, Fundación Omacha, Calle 86A No. 23 – 38, Bogotá D.C., Colombia, Tel: 57 1 2362686, dalila@omacha.org, www.omacha.org)

Distribution and conservation status of the manatee (Trichechus manatus manatus) in the lower Atrato River Basin, Choco, Colombia. The Antillean manatee is an endangered species due to the deterioration of ecosystems through fragmentation, drought, sedimentation, and contamination. The manatee also continues to experience hunting pressure in some regions of Colombia, including the Atrato river basin. In Colombia the Antillean manatee is distributed in the river basins of Magdalena, Sinu, Orinoco and Atrato. There are very few studies of the populations in the Atrato River, therefore an investigation of the population was initiated to gather information on the status of the species in the region. In this project we studied the distribution and the conservation status of manatees in the lower Atrato river basin using two methodologies, one biological and one social. For the biological component we searched for direct evidence (sightings) and indirect evidence (feeding areas). For the social component we conducted short interviews, education activities and gathered sighting points. The sampling was conducted during high water and in the transition period. Seven sightings (of seven manatees) and 128 feeding areas were recorded. Seventy-nine interviews were conducted and 24 sighting points of fishermen and 12 hunting locations were noted. Manatees were distributed in Unguía, Riosucio and Carmen del Darien. Based on the data collected by the community, it was observed that the distribution of the manatee is related to the hydroclimatic period; during winter the manatee was found along the river in cienagas, caños and rivers with more feeding availability and low levels of human alteration. During summer, the manatee was found in the river, in the deep zones of the cienagas. The manatee continues to be hunted in the study zone and is used as a protein source. The main factor that affects the viability of the population is indiscriminate hunting, particularly of the most vulnerable animals, mothers and newborn calves. Hunting is an unsatisfactory activity in the study zone and it will be necessary to implement management measures in the region to protect the species.

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EAST AFRICA

Monitoring the rare eastern African dugong: a methodological perspective. The dugong (*Dugong dugon*) is probably the most endangered large mammal in eastern Africa, an area which marks the western-most boundary of the species' global range. In 2001, in recognition of the need for effective management of dugongs in the western Indian Ocean, Decision CP.3/4 of the third Conference of Parties of the Nairobi Convention

requested regional and international organisations to facilitate the development of a regional initiative to protect the dugong. In 2004, UNEP through the Nairobi Convention, with assistance from WWF and IUCN, published a report on the status, distribution and conservation needs of dugongs in the southwest Indian Ocean region (WWF EAME, 2004). The report underlined that dugongs are still present in the region (especially in Mozambique, Madagascar, Comoros, Aldabra in the Seychelles, Tanzania and Kenya), but in very low numbers, and that the species still faces many threats, particularly bycatch in gillnets and poaching. Following this preliminary regional dugong assessment, several organizations began collecting additional data on this species. In Tanzania and Mayotte (French island of the Comoros, Mozambique Channel), data have been collected to assess the occurrence, distribution and conservation status of dugongs from 2003 to 2008, including: opportunistic live sightings (collected by divers, whale watching operators, ULM operators, etc.), strandings, interviews with fishermen and other sea users, and data collected during systematic aerial surveys (strip transect surveys). In Tanzania, the NGO SeaSense collected 35 opportunistic sightings/strandings/catch/bycatch (from 2000 to 2004), 272 dugong records (incidental catch/sightings) from interview surveys from local fishermen (questionnaire survey undertaken in 2003), and no sightings from systematic aerial surveys (a single aerial survey in February 2006 in the Rufiji-Delta area). Around Mayotte, several organisations/institutions (Direction de l'Agriculture et de la Forêt, Office National de la Chasse et de la Faune Sauvage and Conseil Général de Mayotte) collected 73 opportunistic sightings/strandings (including 17 mother-calf pair sightings), 138 records (incidental catch/sightings) from interview surveys from local fishermen, and 5 sightings from systematic aerial surveys. Aerial surveys covered all the lagonal waters and insular slope waters until the 500-m isobath. One coverage was performed in 2005 and four in 2007-2008. 36 fishermen were interviewed in 2003 and 406 in 2007.

In both Tanzania and Mayotte, interview surveys provided the highest level of information, both on the extent of bycatch as well as occurrence over time (1970's to present). Opportunistic sightings/stranding records provided information on the occurrence of bycatch and documented reproduction (presence of mother-calf pairs) in both areas. Aerial surveys provided very limited information on the distribution, abundance and status of dugongs as sightings were very scarce. These findings indicate that interview surveys and the collation of opportunistic records provide highly valuable information on the status and occurrence of dugongs in eastern Africa, where dugongs are very rare and the capacity (financial and human) to conduct regular surveys is limited. In conclusion, monitoring rare and elusive species, such as east African dugongs, should be undertaken through multiple phases with the first being the implementation of a functional sighting/stranding network (involving sea users), conducting interview surveys (past and present status) and, capacity permitting, and carrying out quantitative aerial surveys where dugongs are regularly observed. This strategy allows for optimum collection of data to assess the past and present occurrence of such rare and elusive species. -**Jeremy Kiszka[1, 2], Catharine Muir[3] & Claire Pusineri[4]** ([1] University of La Rochelle, LIENSS (Littoral, Environnement et Sociétés), UMR 6250 CNRS-Université de La Rochelle. 2 rue Olympe de Gouges, 17000 La Rochelle, France. [2] Direction de l'Environnement et du Développement Durable, Conseil Général de Mayotte, BP 101, 97600 Mamoudzou, Mayotte. [3] SeaSense, P.O. Box 105044, Dar Es Salam, Tanzania. [4] Office National de la Chasse et de la Faune Sauvage, Cellule Technique Océan Indien. BP47 97670 Coconi, Mayotte.)

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Capacity Building for Dugong Conservation in Bazaruto Archipelago National Park, Mozambique. Dugong Aerial Survey Protocols, and Abundance Update. The World Wildlife Fund (WWF) is actively engaging stakeholders in conservation planning and implementation for the Bazaruto Archipelago National Park, (BANP) a marine park in the Inhambane province of Mozambique, east Africa. Several species of regional and global importance are known to inhabit this area including dugongs (*Dugong dugon*). Various reports have suggested that Western Indian Ocean dugongs may now remain in only small numbers in areas of Kenya, Tanzania, Mozambique, Madagascar, Seychelles, and the Comoros archipelago. Dugongs found in the Bazaruto Archipelago, Mozambique are considered to be the only viable dugong population within the entire Western Indian Ocean (Marsh et al. 2006, Dutton 1994, Pusineri et al. 2008). Cockcroft et al. (2008) reviewed recent records and indicated that few dugongs occur elsewhere on the Mozambique coast. An aerial census in May 2001 of the BANP and the eastern islands conducted by Mackie/WWF (2001) found small numbers of dugongs distributed throughout the northern, central and south central areas of the Archipelago between Bazaruto Island and the mainland. Reports of dugong abundance vary widely for this area. WWF (2004) reviewed aerial counts between 1990 and 2002 with estimates of 20 to 130 individuals (Dutton 1998, Guissamulo and Cockcroft 1997, Mackie, 1999) leading to the suggestion that the population is in decline. Unfortunately, details of some of the earlier surveys are not clear in terms of methods, areal extent and conditions, making comparison of animal numbers or trends very difficult to impossible.

In May 2008, WWF initiated what is proposed to be an annual systematic dugong monitoring program for the BANP to assess general distribution and use within and nearby the park. This effort also involved training local WWF staff to begin a regular aerial monitoring program for Mozambique's dugongs. The May 2008 aerial survey portion of the larger project combined skills of local Mozambicans including a WWF field biologist (other duties include extensive interaction with the fishing communities and creel censuses), a WWF community conservation educator (interacts with fishers, schools, and villages), a BANP park ranger, an Eduard Mondlane University GIS specialist, a U.S.A. NASA manatee biologist (with many years of aerial survey experience), a Mission Aviation Friendship pilot and aircraft, and the WWF coordinator for Mozambique. A draft report was submitted to WWF in September 2008 that describes in detail the methods and outcome of the 2008 WWF surveys. The following is a brief summary based on that preliminary report which will be available shortly.

Initial reconnaissance surveys and team training were performed from 23 – 26 May which allowed for familiarization of conditions in the area, determination of realistic survey flight path and time periods, preparation of observers including inclinometer use (for Distance sampling), and recorder for efficient data collection and communication. A Cessna 206 aircraft provided the aerial platform and included a communication system (headsets) to enhance communication efficiencies between the pilot and all team members. The official surveys were performed over three days from 27-29 May and included the Indian Ocean waters east of Bartolomeu Dias (S 21 deg 09 min) and south through the BANP to Cabo S. Sebastio (S 22 deg 13 min). The southern section originally included the shallow bay south of Vilanculos to Cabo S. Sebastio. The total original flight path was over 640km with transect spacing intended to allow for survey completion within a 4.5 hour period. The initial design was considered tentative depending on actual effort (air time, observer fatigue, etc.) experienced in the preliminary reconnaissance and training flights.

The pilot was familiar with flight lines based on preflight briefings and utilized the PDA with GPS and ArcPAD display for navigation along the predetermined flightpath. Survey data were recorded using ArcPad also running on an 8 x 11 inch Scribbler (Compaq) computer tablet with a Bluetooth GPS and a customized survey program (NASA/KSC manatee surveys). This "manatee entry form" eased the real time recording of multiple sighting records. Observers were positioned in the two back seats and the recorder sat in front next to the pilot. For fuel efficiency the aircraft carried only 4 people during the surveys. In the event the computer

recording system failed (i.e. low battery, etc.), back up paper maps were onboard for scribing sightings and adding GPS coordinates. The project effort focused on enumeration of dugongs but other information useful to Park management and dugong conservation were also collected as appropriate (sea turtles, dolphins, boats and fishing).

Data were analyzed using program DISTANCE version 5.0, release 2 (Thomas et al. 2006). The general logic of the analysis was to estimate the density of dugong clusters by modeling the detection rates for sightings as a function of distance. Abundance was calculated by multiplying the estimated cluster density by the expected cluster size and the area of the study site.

Results

The final official flight path totaled 23 east-west transects with 22 north south legs, yielding a path distance of 521 km. A total of 7.5 hours of aerial observation time were expended in reconnaissance-practice sessions and the official surveys resulted in a total search effort of 10.57 hours.

Dugong sightings were highly variable with a total of 46 dugong groups comprising 218 dugongs during the five day period. The dugong counts for the "official" surveys were: 9, 22, and 135 for each respective day from May 27 through May 29 (30 sighting events). Observed densities were 0.02, 0.05, and 0.32 dugongs per linear km, respectively. We estimated that 416 km^2 were searched by observers, representing 24% of the 1749 km^2 total area. Data screening indicated that 400m was an appropriate distance for right-truncation of the data; this eliminated about 5% of the sightings from the analysis. Preliminary abundance estimates incorporated two methods of estimation of cluster size. The size-biased regression method resulted in an abundance estimate for the study site of 112 dugongs, with a 95% confidence interval of (53,237). Using the mean cluster size for all groups seen within 400m of the adjusted centerline resulted in an abundance estimate of 463 dugongs with a 95% confidence interval of (155,1378). Size biased density was 0.06 dugongs per km^2 and mean cluster related density was 0.264 dugongs per km^2.

Most dugongs were found in the north half of the study zone between Bazaruto Island and Bartolomeu Dias. While dugongs were often sighted in the park, about 38% of the dugong sightings were outside of the park boundaries. The largest single dugong group (over 70 individuals) was sighted in the northern end of the study area near the Govuro and Inhassoro boundaries. This group was sighted within ca. 500 meters of a fishing boat that was tending what appeared to be a shark net. These nets are large mesh tangle nets capable of drowning dugongs and other air breathers.

Very few power and sail boats were observed and were associated with tourism. They were observed in very localized areas within the park or the mainland near tourist businesses. Artisanal fishing boats, most under sail power, were scattered throughout the bay. Many were supporting shore based net seining operations. The vessels were often observed many hundreds of meters offshore of the mainland, shoals, or islands with seine haulers back on shore with lines for each net end (5 or 6 people per end). These hauls were reported to require about 5 hours of effort (L. Muaves/ WWF, pers. comm., May 2008). Fishers were spread well beyond the shallow nearshore seining sites. Many of these sightings could have been traveling boats as we did not record whether a boat was actively fishing or traveling. Shore based fish traps, or gamboas were historically set up for long term use and were seen in 3-4 specific locations. We noticed that none of them appeared to be tended and most did not have nets attached to the structure. There are reports that they are seldom used any more in this region (H. Motta / WWF, pers. comm., May 2008).

Generally the numerous 2006-2007 surveys performed by Cockcroft and Guissamolo (2008) were similar to the 2008 surveys reported here. Their area of coverage was smaller but closer in extent to our 2008 work. Their total counts of dugongs showed the same high variability we experienced but the maximum (69 dugongs) was well below our maximum count of 135. Their more extensive dataset resulted in an estimate of

about 250 dugongs (global abundance of 247) which is within the range of our two estimates of 112 and 463. Their densities (also using truncated distance data) ranged from 0.004 to 0.09 dugongs/ km^2 as compared to our two methods for the three survey days yielding 0.06 and 0.26 dugongs / km^2.

Given that aerial surveys prior to 2006 were of varying methods, spatial scales, and timing, combined with the reality of the high variability in dugong sightings between days in the BANP region, we cannot state that dugongs are increasing but that the numbers are higher than previously reported in the literature. In addition to current ecosystem stewardship policies, these recent observations should provide significant motivation for Mozambique to continue implementation of protection for these animals and their habitats. Our sighting of one large group of over 70 dugongs within close proximity of a local shark fishing net (outside of the BANP) emphasized a lingering fishery related threat to local dugongs.

Dutton (2004) described what he believed to be a decline in dugongs in Mozambique. He reported that the southernmost population of Africa's dugong at Inhaca, once numbering about 20, is extinct with small numbers being reported at Inhambane. He also stated, based on interviews and visits, that the dugong was extinct on Mozambique's northern coast. He stated that an intensification of large mesh gill-netting from 1976, coupled with lack of law enforcement, was the principal cause of the decline of dugongs in Mozambique. WWF has also expressed concerns for this species and associated habitats within the region. WWF reports a particular concern regarding a predicted fisheries collapse due to overharvesting within the region. Several corresponding problems could cascade from this including a) destruction of seagrass beds underlying netting areas, reducing forage available to dugongs and turtles; b) direct entanglement of dugongs by netting operations; and c) anticipated collapse of fishery with reduced productivity (catch) resulting in a revival of human harvest of dugongs and sea turtles for local subsistence. If the Mozambique economy continues to improve, providing education and conservation alternatives to coastal communities, the dugong population may have a chance in this region.

Acknowledgements

Observers included Lara Mauves and Mario Fumo (WWF, Vilankulos), Thomas Chibate (Bazaruto Archipeligo National Park), Helena Motta (WWF-Mozambique) and Jane Provancha (Dynamac-NASA, USA). Recorders included Jose Rafael (UEM) and Jane Provancha. David LePoidevin (Mission Aviation Friendship) Nampula, Mozambique provided excellent support in daily piloting. NASA KSC Life Science Services contract (Dr. Carlton Hall and Doug Scheidt) supported the loan of manatee ArcPad software and custom data entry form for this dugong project. Resa Cancro (Dynamac) provided guidance and support in data screening and output development. Special thanks to the WWF staff at Maputo and Vilankulos for their hospitality, perseverance and patience.

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GUATEMALA

First orphan manatee calf (Trichechus manatus manatus) recovered in Guatemala and transported to Belize for rehabilitation. The Antillean Manatee is considered "Endangered" (IUCN, 2008) – in danger of extinction throughout its range in the Caribbean, due in part to illegal hunting in many areas. This includes the Lake Izabal area of Guatemala, identified as one of the most important areas for manatees in Guatemala (Quintana-Rizzo 1993, 2005a,b), where human impacts are increasingly affecting the small population of manatees in the area. Manatee meat is illegally sold in some markets along the Atlantic Coast of Guatemala, despite the fact that manatees have been protected since 1959 and the Protected Areas legislation of Guatemala, which has a penalty of 5 to 10 years in prison and a fine of approximately US$1,320 to US$2,640 for individuals who collect or sell parts of this species. Manatees are further protected by the Fisheries legislation, with fines ranging from between US$1,055 and US$10,555.

Hunting, fishing and boat collisions all take a toll on the manatee population throughout its range, and result in cases such as this - the recovery of a calf, Guatecita, whose mother may well have been killed for meat. The calf, however, survived and is currently being rehabilitated for eventual release back into the wild.

On July 12, Guatecita was found entangled in a fishing net in Lake Izabal by a local fisherman, with no indication of the fate of the mother. The calf was transported to a swimming pool located at the Pataxte Ranch, owned by INDESA (Lake Izabal), a major palm oil producing company, who called Fundación Defensores de la Naturaleza (FDN), a non-profit organization involved in manatee research, to notify them of the rescued calf. Staff from the foundation visited the ranch to check the calf's condition - she appeared healthy, and based on her size (123 cm) and weight (68 pounds), was estimated to be approximately one month old, This is the first

time that an orphan manatee has been rescued in Guatemala, and external technical support was sought to keep the calf alive, ensuring that she was provided the right diet and maintenance conditions. However, whilst she gained some weight during the three weeks in which she was at the Pataxte Ranch, the weight gained was not proportional to her size and estimated age. Coupled with the problems of low weight gain, resulting in rapid fat loss, she also developed buoyancy issues linked to intestinal issues. Feeding became complicated by a sore that developed on the upper gum. Guatemala does not currently have the technical personnel and facilities for the rehabilitation of large marine mammals such as the manatee, and the financial support needed to do this type of rehabilitation was lacking. With increasing awareness of the need for intensive care, the complexities of stabilizing the small manatee calf, and the requirement for a heavy input of human resources, three weeks after being rescued, the Consejo Nacional de Áreas Protegidas (CONAP) decided to transfer her to Belize, to the Manatee Rehabilitation Centre. The Centre, established under the Belize Marine Mammal Stranding Network to cope specifically with situations such as this, is managed by Wildtracks, a Belize conservation organization, which has successfully rehabilitated several other manatee calves in the past, returning them to the wild population.

On August 2, following a bi-national process to ensure CITES permits were in order, Guatecita was transported by plane to Sarteneja, a small coastal community in northeast Belize, and the location of Wildtracks and the Rehabilitation Centre. With the rapid fat loss and increasing intestinal issues, NGOs and government departments in both Guatemala and Belize worked together to facilitate the process, ensuring rapid completion of the paperwork - a demonstration of the international collaboration that can occur between neighboring countries for the survival and conservation of threatened species.

Following her arrival, the first priority for the Wildtracks crew was to stabilize the calf, a task complicated by the very sensitive, open wound on the upper gum, preventing Guatecita from drinking easily from the bottle. Even after a month at the Rehabilitation Centre, the gum was still causing issues, though the healing process itself was relatively rapid. The calf also continued to have gut issues, gradually being resolved over time, though still causing occasional discomfort. However, Guatecita has settled into her new home, responding well to her caregivers – a team of dedicated volunteers from both Belize and abroad who have put their time and effort into ensuring she receives the care she requires for a full recovery.

It is, however, still a long haul from here to complete recovery and rehabilitation. She has grown to 129cms, and now weighs 92lbs…she will be closer to 500lbs when the decision will be made about when she will be ready to be released back into the wild – a two-year investment to ensure that we take even the small steps we can towards maintaining the viability of this species in the long term. With only 150 manatees estimated to be left in Guatemala, every individual counts.

Technical support has been provided by Dr. Dave Murphy (Lowry Park Zoo), Dr. Mike Walsh (University of Florida), Dr. Greg Bossart (Harbor Branch Oceanographic Institute), Dr. Antonio Mignucci-Giannoni (Puerto Rico Manatee Center), Dr. Rodrigo López (The Dallas World Aquarium), Daryl Richardson (The Dallas World Aquarium), and Bob Bonde (USGS-Sirenia Project).

Transport from Guatemala to Belize was facilitated by Ester Quintana (FDN), Oscar Machuca (FDN), and Kurt Duchez (CONAP). The paperwork preparation and logistical and financial support involved with the transport was provided by several organizations (INDESA, FDN, CONAP, Belize Forest Department, BAHA, Wildtracks, Wildlife Trust Belize, and the Belize and Guatemala International Airports).

Financial support for the rehabilitation of Guatecita in Guatemala has been provided by INDESA, Fundación Defensores de la Naturaleza, CONAP, The Dallas World Aquarium, and Autoridad para el Manejo Sustentable de la Cuencia Hidrografica del Lago de Izabal y Río Dulce. In Belize, Wildlife Trust (partly funded by The Nature Conservancy) and Save the Manatee Club have contributed towards maintenance costs for the

rehabilitation process, and Oak Foundation has provided a grant towards the reconstruction of the lagoon enclosure destroyed last year by Hurricane Dean.

And last, but by no means least, is the team of Wildtracks volunteers who responded to the call for assistance issued through marine mammal networks in the US and UK. Paul and Zoe Walker, directors of Wildtracks, and their assistant managers, Kate and Adam Lloyd; the Global Vision International Volunteers Hannah Palmer, Szilvia Bartalos and Alistair Dawson, who stepped in, in the critical days following Guatecita's arrival at the Wildtracks facilities; Ruby Vasquez and Grecia Mendez, students from Belize willing to dedicate their spare days to manatee care; and Mika Ogilvie, Mary Odermatt, Lynda Green and Mayuko Otsaki…the first of many volunteers who have signed up for one month placements to assist in the rehabilitation of this charismatic individual. -**Ester Quintana** and **Oscar Machuca** (Fundación Defensores de la Naturaleza, Guatemala, tetequintana@comcast.net) and **Zoe Walker** (Wildtracks, Belize)

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Guatecita waiting to be fed by one of caretakers in Finca INDESA, Guatemala. (Photo taken July 20, 2008)

Part of the technical team that took care of Guatecita in Guatemala. From left to right: Arnoldo Caal (Fundación Defensores de la Naturaleza), Arnoldo Tiul (INDESA), José Cucul Choc (INDESA), Oscar Chub Coc (INDESA), Oscar Sam Caal (INDESA) y Oscar Machuca (Defensores de la Naturaleza).

Ester Quintana & Oscar Machuca assisting Guatecita during her trip.


Sarteneja: Wildtrack team was ready and waiting for Guatecita to arrive!

The saga of "Guatecita". On the edge of a sleepy lagoon in Sarteneja, Belize, bordering on a lush tropical forest, is the most unlikely rehabilitation facility for orphaned and injured manatees.

That facility is "Wildtracks" a non-profit run by an extraordinary couple, Zoe and Paul Walker. The Walkers not only care for manatees in distress, but are also active in Belizian conservation, writing management plans for the future as well as influencing preservation of the natural biodiversity in Belize.

There are two critical care pools situated on 28 acres of land which sit on ancient Mayan ruins. Wherever one walks, one can see Mayan pottery shards and tools made from shells and stone.

The newest patient at Wildtracks is a four month old West Indian Manatee (*Trichechus manatus*). Found in a fishing net in Lago Isabal Lagoon in Guatemala, this Antillean manatee is called "Guatecita" or "Little Guatemala". The manatee population there is only about 150 individuals, probably due to poaching. Not having the capacity for the intensive care that she would require, with the cooperation of the governments of both Guatemala and Belize, Guatecita was flown in style by airplane to Sarteneja and the Wildtracks facility.

When she arrived at Wildtracks, it was estimated that she was about two or three months old. She weighed 68 lbs. and was thin and lethargic. Taking care of a baby manatee is very labor intensive, requiring bottle-feeding every two hours by Zoe, Paul and very dedicated volunteers.

My mission was to help care for her. I boarded the plane with two 5-lb bags of Esbilac formula as well as a manatee toy I'd made consisting of a small buoy attached to a long thick rope. "Tenacity" would be the one word to describe a good caretaker. One must want to do anything it takes to ensure the survival of an animal irrespective of the mosquito bites and the long hours. This is not too difficult with a calf since it's important to do a lot of bonding, unlike other marine mammals which usually have a hands-off policy. Guatecita showed a little bit of interest in the buoy toy but her most favorite thing was sucking on my toes. The stronger she got, the stronger she would suck.

It's now two months later, she weighs 92 lbs. and, although she suffers from constipation which we hope is temporary, she is gaining weight and is more active. Following a risk assessment, she will go to the lagoon enclosure until she is ready for release to reintegrate into the wild population.

When there is an animal in distress, the Manatee Community comes together to help. So many people have assisted in the rescue and care of Guatecita from international assistance of veterinarians, to various non-profit organizations to the "tenacious" volunteers who have given their time. Thanks to all and especially thanks from Guatecita. **–Lynda Green** (greenlynda@mac.com)

QATAR

Conserving Qatar's dugongs. In 2007, the State of Qatar started work on an ambitious National Dugong Conservation Initiative (NDCI). The first phase of this initiative was recently completed, under the supervision of Qatar's Ministry of Environment, and generously funded by Dolphin Energy Ltd. The other partners on the project were the Qatar Emiri Air Force (QEAF) and Five Oceans Environmental Services LLC.

Qatar, situated on a peninsula in the Arabian Gulf, lies in the centre of the range of the world's second largest population of dugongs. As there had been no research on dugongs in Qatar since Tony Preen's surveys in 1986 (Preen 2004), the initial phase of the NDCI used a combination of methods to gain an overview of the current situation - gathering information on the current status of dugongs and their habitat in Qatari waters; raising awareness for dugong conservation; and training Ministry of Environment staff. To this end, we ran aerial surveys; conducted beach surveys for stranded animals and collected samples from animals found; interviewed fishers and set up a GIS for use with dugong-related data. Training the Ministry of Environment staff was integral to each facet of data collection and analysis.

Aerial surveys over Qatari waters of 10m depth or less were run using helicopters generously provided by the QEAF's helicopter wing. Over four days of aerial surveys, eight groups of dugongs were observed,

totaling at least 25 individuals. We also saw six groups of dolphins of two species, as well as turtles and rays. Survey results were comparable with those derived in approximately the same survey blocks over twenty years previously, although surveyed in a different season (Preen 2004).

Beach surveys located six dugong carcasses, as well as five carcasses of dolphins of three species; and five turtle carcasses of three species. Several fresh dugongs, dolphins and turtles were discovered in a relatively short period of time (although a quantitative estimate of mortality could not be estimated from our short survey period). Most of the fresh dugong carcasses were found in an area with several fishing camps. This indicates that marine megafauna are suffering regular mortality in the area and, based on fisher interview data, at least some of this is related to fishing.

Results of the initial phase of Qatar's NDCI suggest that currently, there is a threat to dugongs from fisheries - indicated by beach surveys and fisher interviews, but that mortality due to fisheries is not so substantial that it cannot be managed - suggested by the aerial survey results. This result demonstrates the value of combining techniques to maximize a programme's contribution to conservation and management.

Currently, the second phase of the NDCI is being developed, aimed at continuing and building on the successes of the first phase of the Initiative. A draft of the report on the NDCI is available as a pdf from Peter Corkeron or Robert Baldwin (emails below).

The opinions expressed here are those of the authors. We thank our colleagues in Qatar's NDCI for their encouragement, assistance and support: Khalid Ahmed Al Obaidly from Dolphin Energy Ltd; Wing Commander Khalif Al Naimi from the QEAF for supporting the aerial survey; and Oliver Taylor, Fergus Kennedy and Fareed Al-Abdali from Five Oceans Environmental. -**Peter Corkeron** (peter.corkeron@gmail.com), **Robert Baldwin** (wosoman@gmail.com), **Mohammad Abdelmoati** (mamoati@qatarenv.org.qa), **Mohammad Al-Rumaihi** (marumaihi@qatarenv.org.qa), **Yousef Al-Hamar** (yihamar@qatarenv.org.qa), **Ghanem Abdullah Mohamed** (gamohammad@qatarenv.org.qa), **Khalid Al-Enzi** (khenzi@qatarenv.org.qa), **Rola Atiyeh** (Rola.Atiyeh@dolphinenergy.com) and **Marcus Chandler** (marcus.chandler@dolphinenergy.com)

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ABSTRACTS

ARE ORGANIC CONTAMINANTS A CONSERVATION THREAT TO ENDANGERED MANATEES?

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Persistent organic pollutants (POPs) are considered potential threats to wildlife due to their high affinity to lipids, environmental persistence, and tendency to bioaccumulate over time. The POPs tend to also accumulate in estuarine and coastal marine environments, which are essential habitats for many protected species, such as the endangered West Indian manatee *(Trichechus manatus)*. Like most other marine mammals, manatees' anatomical and life history attributes allow the species to serve as excellent sentinels of environmental and human health threats. Because manatees are herbivorous (i.e., at a low trophic level), it has been assumed by some scientists and managers that the species is less vulnerable to organic contaminants. To fully understand and mitigate potential threats to manatees, this assumption should be challenged. Our study analyzed blubber samples collected from recently deceased manatees found along the southwestern coast of Florida. Polychlorinated biphenyls (PCBs), organochlorine pesticides (OCPs), polyaromatic hydrocarbon (PAHs) and polybrominated diphenyl ethers (PBDEs) were analyzed using dual column gas chromatography with electron capture detection (Agilent Technologies 7890A) and mass spectrometry (Agilent Technologies 5975C). PCB congener patterns were distinctly different from those of marine mammals occupying higher trophic levels (i.e.,

dolphins). Although POP levels in manatees were generally lower than those reported for some other marine mammals, those levels were still sufficient to cause concern, especially since the metabolic capacity and threshold levels for adverse effects in the former are unknown. We believe that further research and monitoring of contaminants in West Indian manatees from different locations will help ensure that threats to this endangered species are properly identified and mitigated.

LaCommare, K.S.*, C. Self-Sullivan, and S. Brault. 2008. **DISTRIBUTION AND HABITAT USE OF ANTILLEAN MANATEES *(Trichechus manatus manatus) IN THE DROWNED CAYES AREA OF BELIZE, CENTRAL AMERICA.*** Aquatic Mammals 34(1):35-43. *University of Massachusetts, Boston, Department of Biology, 100 Morrissey Boulevard, Boston, MA 02125, USA: email: kslacommare1@hotmail.com

Belize, Central America, has long been recognized as a stronghold for Antillean manatees (*Trichechus manatus manatus*) in the Caribbean (O'Shea & Salisbury, 1991). The Drowned Cayes area, in particular, has been noted as an important habitat (Bengston & Magor, 1979; O'Shea & Salisbury, 1991; Auil, 1998, 2004; Morales-Vela et al., 2000). It is critical to evaluate habitat use and the relative importance of different habitat types within these cayes because this area is increasingly impacted by human activities (Auil, 1998). The two research objectives for this paper are (1) to document manatee distribution within the Drowned Cayes, Swallow Caye, and Gallows Reef, and (2) to examine habitat use patterns in order to identify habitat characteristics influencing the probability of sighting a manatee. Binary logistic regression was used to examine whether the probability of sighting a manatee varied in relation to several habitat variables. The probability of sighting a manatee across all points was 0.31 per scan (n = 795). Habitat category, seagrass category, and habitat category interaction with resting hole were the most important variables explaining the probability of sighting a manatee. The Drowned Cayes area clearly constitutes a manatee habitat area. Seagrass flats and cove habitats with resting holes were especially important habitat characteristics.

Sousa-Lima, R.S.*, A.P. Paglia, and G.A.B. da Fonseca. 2008. **GENDER, AGE, AND IDENTITY IN THE ISOLATION CALLS OF ANTILLEAN MANATEES *(Trichechus manatus manatus)***. Aquatic Mammals 34(1):109-122. *Bioacoustics Research Program, Laboratory of Ornithology, Cornell University, 159 Sapsucker Woods Road, Ithaca, NY 14850; email: rs132@cornell.edu

Empirical evidence of individual vocal recognition has been reported for the Amazonian manatee (*Trichechus inunguis*) and the West Indian manatee (*T. manatus*). Underwater vocalizations of 15 Antillean manatees (*T. m. manatus*) were recorded to verify if this subspecies also conveys individual information through their calls. The isolation calls selected for analysis were digitized to measure eight different variables. Individual vocal patterns were analyzed within two age classes (calves and others) and between sexes. Discriminant function analysis for each age class grouped vocalizations by individual, based on variables related to the fundamental frequency and call duration. Female calls were longer in duration and presented a higher fundamental frequency but lower peak frequency values than males. Calves had significantly higher values for all eight acoustic variables measured with respect to frequency and time. Higher values for all frequency parameters in calf calls and the inverse relationship between total body length and peak frequency suggests that younger, smaller animals emit higher frequency sounds. Furthermore, higher values obtained for the fundamental frequency range of calves and the inverse relationship of this variable with total body length suggest that the fundamental frequency becomes more defined as the animal ages. Vocal learning and genetic inheritance are discussed based on the analyses of vocal patterns among related individuals. In addition to facilitating individual recognition as a possible factor in Antillean manatee social interactions, vocal identity provides a potential means of estimating the size and structure of sirenian populations.

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