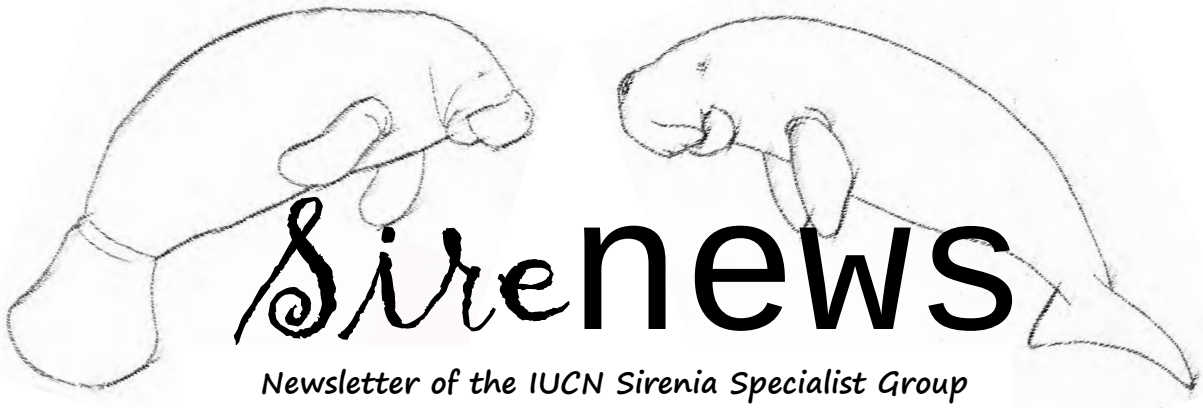

Sirenews

Newsletter of the IUCN Sirenia Specialist Group

October 2010 Funded by the U.S. Marine Mammal Commission Number 54

IN THIS ISSUE

FIRST OFFICIAL SIGNATORY STATES MEETING OF THE UNEP/CMS DUGONG MOU - ABU DHABI 4-6 October 2010

On 4-6 October 2010, the UNEP/CMS Office – Abu Dhabi, with the support of the Environment Agency – Abu Dhabi (EAD) as the host and funding agency, held the First Official Signatory State Meeting of the Memorandum of Understanding on the Conservation of Dugong and its Habitat throughout their Range (Dugong MoU) at the Radisson Blu Hotel on Yas Island, United Arab Emirates.

The meeting served as the first official gathering of dugong range states and discussed a variety of issues and potential solutions in relation to progressing positive conservation outcomes for dugongs across their global range. Over 90 delegates, including representatives from the governments of 26 (out of 46) dugong range states as well as technical experts, inter-governmental organisations, NGOs, and industry environmental managers with an interest in dugong conservation, attended the meeting. Two Ministers (from Palau and Yemen) also attended the Signatory State Meeting.

During the meeting, leading researchers including Professor Helene Marsh and other invited technical experts, presented updated information on the conservation status of dugongs which highlighted the need to take urgent actions if we are to conserve dugong populations in many range states. The delegates from dugong range states had the opportunity to consider a range of novel and innovative management tools which have potential to address key threats such as the incidental catch of dugongs in fishing nets, habitat loss and degradation, illegal poaching and unsustainable customary take of dugongs.

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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Sirenews is available online at www.sirenian.org/sirenews.html

A dugong catch/incidental catch survey tool, developed by a group of technical advisors, has produced some quality data from 20 countries in the Pacific Islands, South Asia and the United Arab Emirates. The data will be combined into a geographical information system to identify the trouble spots, provide crucial information on existing populations and map important habitat areas. In 2011, the survey will be extended to range states in East Africa and the Western Indian Ocean littorals, Northwestern Indian Ocean, as well as South Asian regions. Other solutions to protect valuable dugong habitat include establishing spatial closures as marine reserves and temporal constraints to fishing operations. Incentives, such as loans for buying dugong-friendly fishing gear, educational campaigns and measures to improve the livelihood of local communities were also considered as a way to complement conservation efforts. Potential pilot projects will be developed to implement these new incentive based tools, from which other marine species may benefit as well.

Through its commitment to the Dugong MoU, the EAD and UAE Government have taken the lead in international efforts to conserve the dugong across its global distribution. Although much more work, effort and funding will be required, this meeting made a substantial contribution toward ensuring the global conservation of dugongs. The meeting concluded that the conservation strategy should address the need for greater protection of marine biodiversity by combining different conservation tools. At the meeting, Bahrain, Palau, Seychelles, Vanuatu and Yemen signed the CMS Dugong agreement bringing the number of signatories to 18. More countries are likely to follow in the near future. The next Dugong MoU meeting is planned to take place in 2012. **-Donna Kwan and Jenny Rennell** (dkwan@cms.int; jrennell@cms.int)

HISTORIC TECHNICAL MEETING ON DUGONG RESEARCH AND CONSERVATION HELD IN MADAGASCAR

As one of the first Signatory States of the UNEP Convention on Migratory Species of Wild Animals (CMS)'s Memorandum of Understanding (MoU) for the Conservation and Management of Dugongs and their Habitats throughout its Range, it was particularly apt that Madagascar played host to the first regional technical meeting on this species. The meeting was held on 4-6 August 2010 at the Colbert Hotel in Antananarivo, with government, UNEP/CMS and fisheries and wildlife management representatives in attendance as well as NGOs currently engaged in dugong research. Representatives from the Environment Agency – Abu Dhabi, the host agency and sponsor to the Secretariat of the Dugong MoU, were also present at this significant event. After three days of sharing information and brainstorming, the meeting was felt to be a resounding success by its organizers and participants.

Opening speeches were given by the Honorable General de Brigade Herilanto Raveloharison, Minister of the Environment, Forests and Water and Dr. Donna Kwan, the Program Officer from the UNEP/CMS Dugong Secretariat in Abu Dhabi and the momentous event was broadcast on national television, raising awareness about this elusive and highly endangered marine mammal, believed to be the source of the legendary mermaid myth.

The Dugong MoU came into effect on 31 October 2007 after only 2 years of consultation with experts and relevant officials from range state governments. A non-binding instrument, it seeks to conserve and protect the dugong throughout its global range across over 40 range states. A number of range states including those from the region have indicated interest in signing the Dugong MoU in the near future. In the lead-up to the First Official Signatory State Meeting of the Dugong MoU (held in Abu Dhabi on 4-6 October 2010, see above), a number of sub-regional projects were initiated, including the convening of technical workshops to support dugong conservation efforts in range states and the implementation of the Dugong MoU.

The workshop, organized by Community Centred Conservation (C3), a non-governmental organization now in its fifth year of dugong research and conservation in the western Indian Ocean region, saw representation from the majority of range states in the region, including Comoros, Kenya, Madagascar,

Mayotte, Mozambique, Somalia, Seychelles and Tanzania. In fact, it was a historic occasion in that this was the first ever dugong meeting attended by Somalia. Of all the sub-regions of the Dugong MoU, this region is the one with the highest number of signatories, perhaps in recognition of the degree to which this species is threatened with extinction in the waters of the western Indian Ocean.

After decades and in some cases, centuries, of intensive hunting for its tasty meat, the dwindling remnants of dugong populations number only handfuls of individuals around small island groups and just hundreds off eastern African states. Clinging precariously to the coastlines where their sole source of food, seagrass, grows, they are frequently entangled in artisanal gill nets, currently the greatest threat to their existence.

The main barrier to dugong conservation in East Africa and the West Indian Ocean islands is the lack of technical and financial capacity to implement suitable actions. The Dugong MoU Conservation and Management Plan (CMP) for dugongs in the West Indian Ocean now provides a framework to progress conservation and management actions in this region. This meeting provided a vital opportunity for the countries to present updates on the status of their dugong populations and associated habitat, as well as to seek grounds for future collaboration in the fields of both research and management. Furthermore, in-depth analyses were conducted on the current financial and technical capacities of range states to implement dugong research and conservation activities.

The UNEP-CMS Standardised Survey methodology was presented and explained in detail and will be launched in various countries in early 2011, supported in part by small grants provided via the Secretariat and administered by C3. The surveys will help to identify key dugong habitat, population numbers and trends, and impacts including direct harvest, habitat degradation and fisheries by-catch. Since the methodology is questionnaire-based it is sufficiently flexible and low-cost to be adapted regionally and will yield comparable data, to be housed by the Secretariat in its coordinating role. The survey and an accompanying Project Manual can be downloaded from the Secretariat's website at http://www.cms.int/species/dugong/dugong_noticeboard.htm under the relevant notices posted. The meeting report with details of discussions and presentations will be available from the same site later this month.

C3 has been generously supported via the BP Conservation Leadership Programme since the inception of its first community-based dugong research in the western Indian Ocean in 2006 and more recently by the CMS Dugong secretariat. -**Patricia Z.R Davis, (**Community Centred Conservation (C3), www.c-3.org.uk)

Madagascar Meeting Participants

U.S. GEOLOGICAL SURVEY NEWS RELEASE

Manatee Subspecies Genetically Confirmed, But Diversity Challenge Looms: Two Belize Populations Offer Opportunity in a Desert of Genetic Diversity

Gainesville, FL - The first genetic study to compare nuclear DNA of endangered Antillean manatees in Belize with Florida manatees confirmed their designation as separate subspecies. Belize's manatees, however, were found to have extremely low genetic diversity, raising questions about their long-term genetic viability.

The Central American country of Belize hosts the largest known breeding population of Antillean manatees and is touted by biologists for its potential to repopulate other parts of Central America where manatees are severely reduced, rare or absent.

"It turns out that the genetic diversity of Belize's manatees is lower than some of the classic examples of critically low diversity" said U.S. Geological Survey (USGS) conservation geneticist Margaret Hunter, Ph.D., who led a molecular DNA study of genetic diversity in the Antillean subspecies in Belize.

Belize's Antillean populations scored lower in genetic diversity than textbook examples of "bottlenecked" endangered species such as Wanglang giant pandas, the East African cheetah and an island koala population founded by only three koalas.

Endangered species need genetic diversity to weather threats to their survival, including random or rare shocks such as disease, hurricanes or habitat destruction. When a population drops to low numbers, the diversity of its gene pool also shrinks. Even after it rebounds to greater numbers, that population decline leaves a legacy of reduced genetic diversity known as a bottleneck. This renders the population more vulnerable to future shocks, explained Hunter.

The low genetic diversity in Antillean manatees is attributed, in part, to centuries of hunting that were only curtailed early in the 20th century. Once found throughout coastal regions of Central and South America, Antillean manatees are now rare or absent in parts of Central America where they used to be considered abundant. Today, even Belize only hosts about 1,000 individuals — a number well below the threshold recommended for long-term sustainability, said Hunter.

Distinct Populations Offer Opportunity

Although the study found low overall genetic diversity in Belize, notable differences were found in manatees that live near Belize City compared to manatees living in lagoons, rivers, and cayes farther south. These differences, said Hunter, equate to genetic variation, which is valuable for sustaining a diverse gene pool.

"When it comes to the sustainability of a species, this is the type of genetic diversity you want to preserve for the future," explained Hunter.

To sustain the diverse gene pool these populations offer, managers will need to consider methods of enabling natural migration and mixing to take place between the two populations.

"These results show the importance of corridors of suitable habitat and low human impact that allow manatees to travel between key sites," said co-author Nicole Auil Gomez, a Belizean biologist who does consulting for the Florida-based conservation organization Sea 2 Shore Alliance. "Leaving pockets of habitat is no longer enough," she added.

Confirmation of the Subspecies

The genetic evidence that Florida manatees (*Trichechus manatus latirostris*) are not regularly mixing with populations of Antillean manatees (*Trichechus manatus manatus*) in Belize means they don't naturally affect each other's population size or genetic diversity, Hunter said.

The question of whether these two seemingly distant populations were interbreeding had been raised in light of radiotracking evidence that manatees are capable of migrating long distances. Florida manatees have turned up in places as far as Rhode Island, the Bahamas and Cuba.

The only prior genetic data comparing the subspecies came from mitochondrial DNA, which is useful for understanding historical relationships on an evolutionary time scale (think millennia, not decades). By including nuclear DNA, this study provided a modern-day assessment of whether the two populations are migrating and interbreeding.

"We are continuing to piece together the genetic relationships of manatees throughout the Caribbean and it's giving us insights into how to maintain healthy and stable populations," said USGS biologist and co-author Bob Bonde, Ph.D.

Article Citation: M. E. Hunter, N. E. Auil Gomez, K. P. Tucker, R. K. Bonde, J. Powell, and P. M. McGuire. 2010. Low genetic variation and evidence of limited dispersal in the regionally important Belize manatee. Animal Conservation. Published online in advance of print. http://onlinelibrary.wiley.com/doi/10.1111/j.1469-1795.2010.00383.x/abstract

SIRENIAN ACTION PLAN IN BRAZIL

Approximately 30 institutions involved in manatee research, conservation, education and protection met in Itamaracá Island (NE Brazil) on 22-24 March 2010, in a workshop to review the country´s action plan for sirenians. Including both species present in Brazil, the West Indian (*T. manatus manatus*) and Amazonian (*T. inunguis*) manatees, the National Plan for the Conservation of Sirenians was officially approved and published on 1 September through Portaria ICMBio 84/2010.

AQUATIC MAMMAL STRANDING NETWORK IN BRAZIL

As a result of a 2-day (9-10 Sept 2010) workshop in Belém, PA, Brazil, over 15 institutions committed to research, education and protection of aquatic mammals, and agreed on implementing a concerted response to strandings and fishery-related events involving aquatic mammals in the northern region of Brazil (REMANOR). In October, all four regional groups (from SE, S, N and NE Brazil, the latter established 12 years ago) shall officially compose the Brazilian stranding network (REMAB). Manatee calves are the subject of disturbingly numerous stranding events, both in coastal and wetland areas.

SIRENIAN WORKSHOP DURING LATIN AMERICAN AQUATIC MAMMAL MEETING

Fundação Mamíferos Aquáticos and Instituto de Desenvolvimento Sustentável Mamirauá are organizing a workshop on manatees to take place 25-26 October 2010. The aim is to discuss strategies to prevent and deal with the growing number of rescued manatee calves (the result of intentional capture with harpoons or incidental entanglement in fishing nets). All institutions dealing with the issue now or in the past are being invited to the event, which will take place during the 8th Congress of the Latin American Society of Experts on Aquatic Mammals to be held in Florianópolis, SC, 25-28 October.

LOCAL NEWS

AUSTRALIA

Distribution and abundance of dugong (dugon dugon) in the Kimberly Region, North Western Australia from 1995 to 2005. Dugong distribution on the Kimberley Coast of Western Australia has not been formally surveyed and there are no published data records or even anecdotal information on this aspect of dugong

activity. In this study, I report sightings made by Australian Customs observers during routine surveillance flights. Data on survey effort is unavailable, due to the classified nature of Customs activities. However, their input is sufficient to show that dugongs are present throughout the coastline from Broome to the Northern Territory border and their presence was observed throughout the year. Sightings were also made regularly at the offshore reefs across deep ocean stretches in excess of 200km from other habitat. Data is also presented on indigenous hunting in the region. There is a clear necessity for quantitative information to assess the relative importance of the region to the nation's dugong population and to determine the sustainability of their hunting practices.

Introduction

The dugong is widely distributed in the tropical areas of the Pacific and Indian Oceans. This species has been listed as vulnerable to extinction by the IUCN (2006) and their population is severely depleted in most countries where they are found (Marsh et al., 2002) due to the impact incurred by increased hunting, boat traffic and habitat destruction. Northern Australia has often been cited as the last stronghold for the species, as the range of dugong stretches from Moreton Bay in Queensland to Shark Bay in Western Australia; an area with relatively little human population or coastal development. In Australia a number of surveys have been undertaken to assess the distribution and abundance of dugongs, along with any threats to its survival. These have covered the entire Queensland coastline (Marsh et al., 2002), parts of the Northern Territory coastline (Bayliss & Freeland, 1989), and much of the central areas of Western Australia, including Shark Bay, Ningaloo, Exmouth and Pilbara Coast (Gales et al., 2004).

Some of these surveys suggest that the dugong population may be under threat in the relatively developed areas on the East Coast, where a significant decline in dugong numbers has been reported (Smith & Marsh, 1990). In fact, current estimates show that the present rate of indigenous hunting in the Torres Strait Islands is unsustainable. In most other countries where dugongs are found, they are subjected to multiple sources of man-induced mortality and habitat damage (Heinsohn & Marsh et al., 2004).

Despite the comprehensive knowledge of dugongs for most of their range in Australia, an insufficient knowledge base of distribution exists on the coast of Western Australia between Broome and the Northern Territory borders. No formal survey has been undertaken in this remote and thinly populated region, despite its likely having a significant dugong population and being cited as the highest priority for dugong research in Western Australia (Marsh et al., 2002). This paper seeks to partially redress our limited knowledge of the dugong populations using data composed by the Australian Customs Services.

In addition, information on dugong harvesting by three aboriginal communities between Broome and One Arm Point, in far Northwestern Australia, have been obtained through personal observation. I resided within the Badi Aboriginal Community in order to assess if there was a threat posed to the dugong population by harvesting activities.

Methods

Aerial Surveys

As dugongs feed in shallow water, aerial surveys are the most feasible method of determining their distribution and abundance (Marsh & Sinclair, 1998). While formal standardised surveys such as those conducted by Marsh & Sinclair (1998) are ideal, at the time of writing only a limited amount of investigative procedures have been carried out, perhaps because of the logistical difficulties and inadequate financial resources available for surveying such a remote region. Consequently, this study uses non-quantitative data.

The sightings data was collected by observers from the Australian Government Coast Watch program supplementary to their primary surveillance task. The latter involves regular flights using a Pilatus Britten-

Norman Islander aircraft, modified for their work, with enlarged bubble windows, gyroscopically stabilized binoculars and cameras for observers seated on each side of the aircraft and additionally an integrated laptop computer to record sightings. These flights are carried out at relatively low altitudes and follow a variety of routes. Unfortunately, the flight paths are classified for security reasons and I am thus unable to assess spatial coverage.

It is not possible then to say whether the absence of dugong sightings in an area indicates their true absence or rather low/no survey effort over a specific area. Accordingly, I cannot make quantitative comparisons over time or space.

The coastline considered in this study runs in a broadly northeasterly direction between Broome in Western Australia (17º 57'S and 122º 14E) and Joseph Bonaparte Gulf on the Northern Territory border (12º 16'S and 128ºE). The shoreline is deeply indented by large shallow inlets and bays and covers a lineal distance of about 1,300 km. Many small islands are scattered along its length at distances of up to 20km from the shoreline. The sea bottom in this area is largely composed of muddy sand with a gentle gradient. As a result, the area supports the growth of seagrass, which is essential to support a significant population of dugongs (Lal-Mohan, R.S., 1993)

Indigenous Knowledge

The Aboriginal population on the Dampier Peninsula is estimated at 4,200 (Aboriginal Land Council, Broome, 2007). Approximately 300km north of Broome, along the Dampier Peninsular at latitude (16º 30'south), "traditional" aboriginal communities are found at One Arm Point, Djaridjan and Lomabadina (Figure1). Both Djaridjan and One Arm Point are the home to Badi and Jawi communities. Their predecessors have exploited this environment with its huge tidal range (9.1-m) for thousands of years. The people in these communities have strong interrelationships between one another and with the Moamjum people of Derby. The Badi community hunt the dugong on a regular basis in the dry season, between April and October. Sunday Island, east of One Arm Point, is a sacred site for the men of the community. A powerful tidal current surges through the bay entrance of the Island, causing whirlpools and cross currents. The hunters from One Arm Point enter and leave only during the change of tides.

The dugong meat forms a significant part of the diet of indigenous people in the region, along with fish, turtles, shellfish, clams and crabs. As in many hunter/gatherer societies, the hunter sees the dugong not just as a food source, but as an element important in cultural, spiritual and social practices. For these reasons, its meat is commonly distributed between communities on the Dampier Peninsular where it is shared between families. John Kernot, who operated the bush taxi services from Broome to One Arm Point for 20 years, regularly transported dugong meat to these communities. Occasionally the meat is flown to Derby from One Arm Point, particularly when a death occurs in the community. On the contrary, a report to Cairns Fisheries Queensland indicates that those traditions had broken down to the extent that "commercial" hunting for dugong meat and teeth is practiced. However, there is no hard evidence to support the view that such activity is conducted in the region surveyed here.

Although Broome has a transient indigenous population, only one group, the Hunter family, hunt dugong in Roebuck Bay, Broome. This shallow bay is a favorable habitat for dugongs because of the abundance of seagrass, which is their primary food source. Their feeding trails are commonly seen when the bay is covered with water. However, in this relatively developed area, more dugongs are killed due to their exposure to human activities such as boating, cargo vessel movements and fishing rather than by indigenous hunting (the late "Dicko" Hunter, dugong hunter, pers.comm.)

Within this study, the Bardi community on the Dampier Peninsula are by far the most active in hunting the dugong. For this reason, input from John Kernot (bush taxi driver), Bruce Wiggan (Aboriginal), and others was sought in estimating the harvesting of dugongs in this area over the period 1996 to 2005.

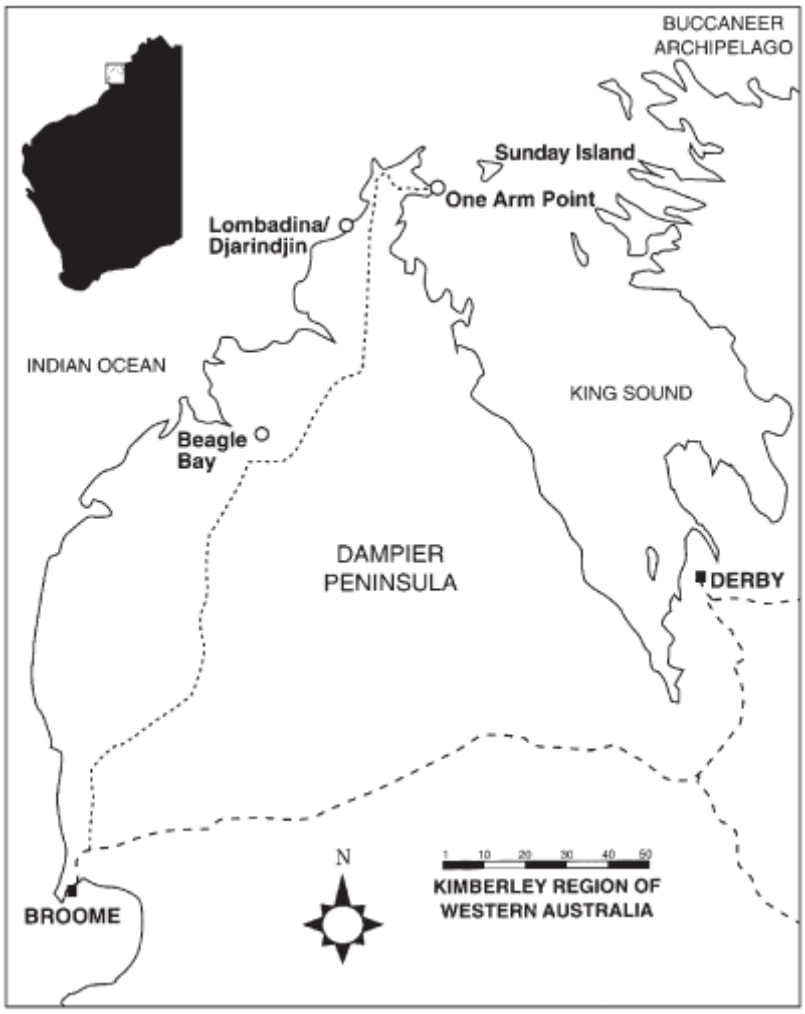

Figure 1. Map of Dampier Peninsula, W.A. (source: Rouji et al., 2003).

o Distribution of dugong meat from 1996 to 2005 (J. Kernot) by
.... Bush Taxi, Broome to One Arm Point, a distance of 250km

---- Flight route from Broome to Derby where dugong meat is transported by the Badi Aboriginal community for ceremonies

Boats to Sunday Island, from One Arm Point, W.A.

Roebuck Bay, Broome. (bottom left of map)

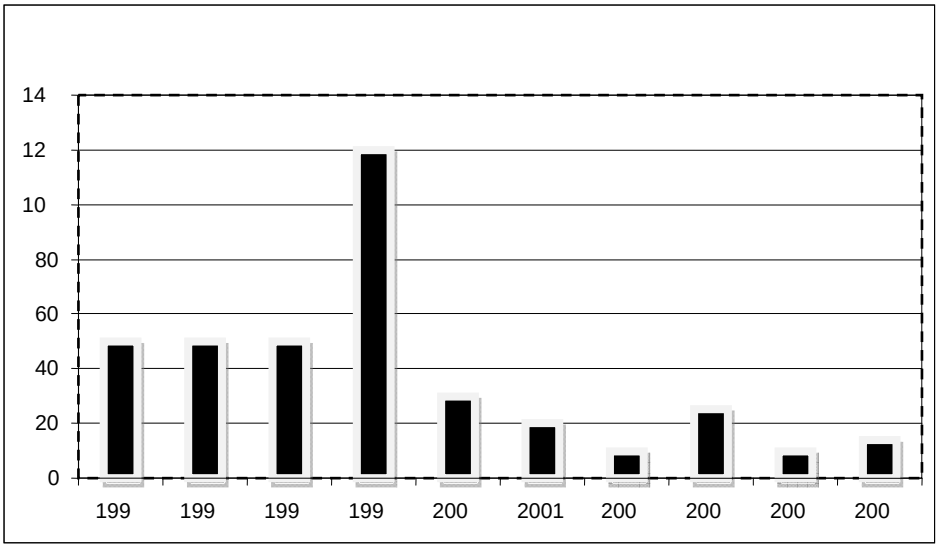

Figure 2. Estimated number of dugong harvested from the Dampier Peninsula Western Australia

Results of Indigenous Catch Estimates

I have combined dugong catch estimates from four locations of the Dampier Peninsula Beagle Bay, One Arm Point, Lombadina and Cape Laveque, from 1996 to 2005 (Figure 2). Between April and October 1999, dugongs were hunted in large numbers by the Badi community from One Arm Point. It is estimated that about four dugongs per week were killed during this season, giving a total take of 120 mammals. There was no explanation as to why the harvesting carried out in this period of 1999 was excessive. This additional hunting activity was confirmed by the observation of Australian Custom Observers during their flights over the area, and the transport of dugong meat to other communities by bush taxi (J.Kernot, pers. comm.). During the 2002 hunting season, the community experienced severe social problems which have had an impact on hunting trends. The following season saw a significant decline in hunting activities which occurred when a take-away food establishment was built in Broome 2003.

Whether the present take is lower or higher is difficult to assess. On the one hand, contact with Europeans has probably reduced the frequency of hunting activities; however, the use of power boats has probably increased the efficiency of the hunters. Nonetheless, the average figure of approximately 38 dugong per annum based on the data in Figure 2 probably overstates the likely take in the future.

The social problems of the communities in this survey seem to be typical episodes in the collision between European and Indigenous cultures in many areas of Australia. Experience has demonstrated that continued contact between the two cultures invariably leads to gradual abandonment of traditional ways by the indigenous people. In the present case, it seems highly likely that the taking of the dugong by indigenous communities will diminish over time for this reason.

However, more importantly, studies by Dr Rouji et al. (2003) have shown that some of the Badi aboriginal people who have moved away from western diets and returned to traditional marine foods have experienced beneficial effects on their health.

Australian Coast Watch Aerial Surveys

The area surveyed by Australian Coast Watch was approximately 3,500klm between Broome and the Northern Territory border which represents 9.89% of the Australian Coastline. At much greater distances from the coast, a number of offshore reefs encompass shallow lagoons which support seagrass (Aust. Coast Watch). Their data showed that these areas have dugongs present.

Flights were conducted January through December each year, with an average of 2.2 dugongs sighted per flight per month. On average, most dugongs per flight were sighted in January with 3.2 individuals, followed by May with 3.1 and March with 2.6 dugongs sighted (Figure 4). Eight dugongs (1.2%) were identified as calves, with calf sightings recorded in the months of January (1996, 1997, 1998), February and August (1998), and July (2002).

Calf numbers and group size recorded by Customs are purely approximations and discrepancies were inevitably present, largely due to the fact that dugong observations were of secondary significance as the primary activities carried out by customs personnel is aerial surveillance from a range of various altitudes.

The size of dugong groups sighted ranged between one and 22 individuals, with an average group size of 5.5 animal; 189 dugongs (27.6%) were sighted as solitary animals, 110 (16%) in pairs, 66 (9.6%) in groups of 3, 222 dugongs (32.4%) in groups of 4 to 9, and 99 dugongs (14.4%) in groups of 10 and above (Figure 5). Groups of 21 were recorded on two occasions, in January 1996 and May 2000, both in the vicinity of the Bonaparte Archipelago.

In the region, 686 dugongs were sighted between Broome and the Northern Territory border (18^{o}S and 128 E) by Australian Customs, surveyed between 1995 and 2005.

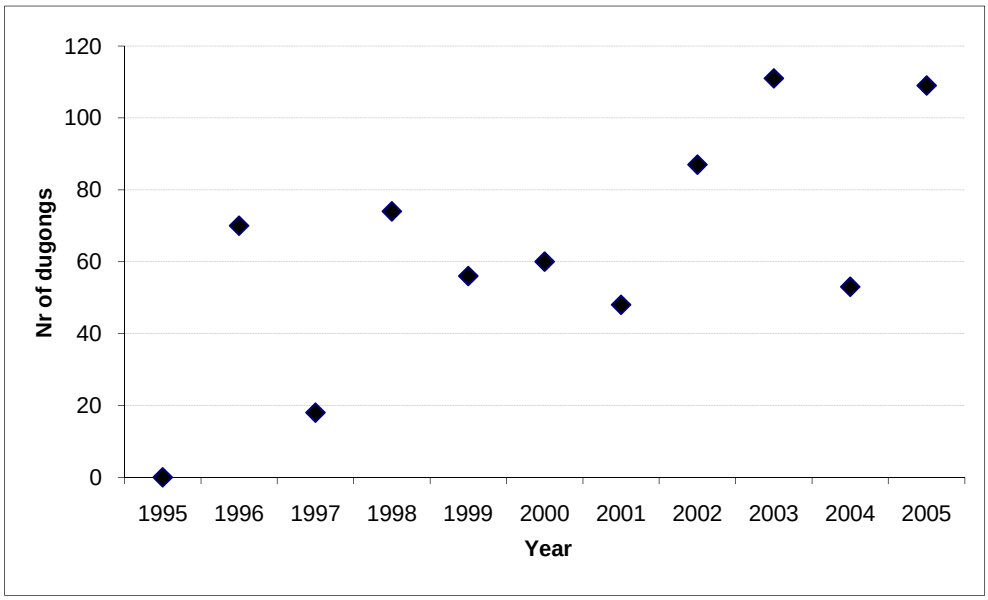

Figure 3. Number of dugongs sighted from 1995 to 2005.

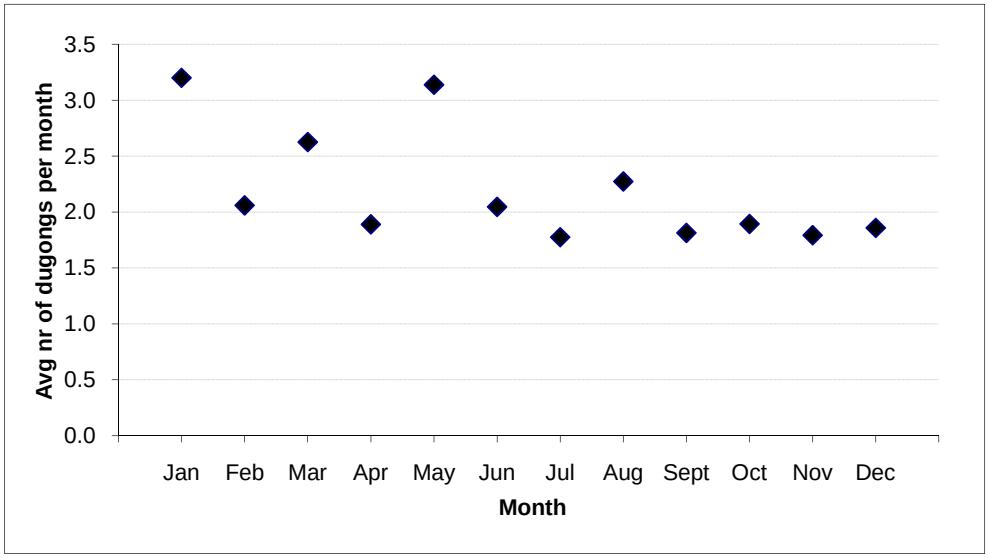

Figure 4. Average number of dugongs sighted per flight per month

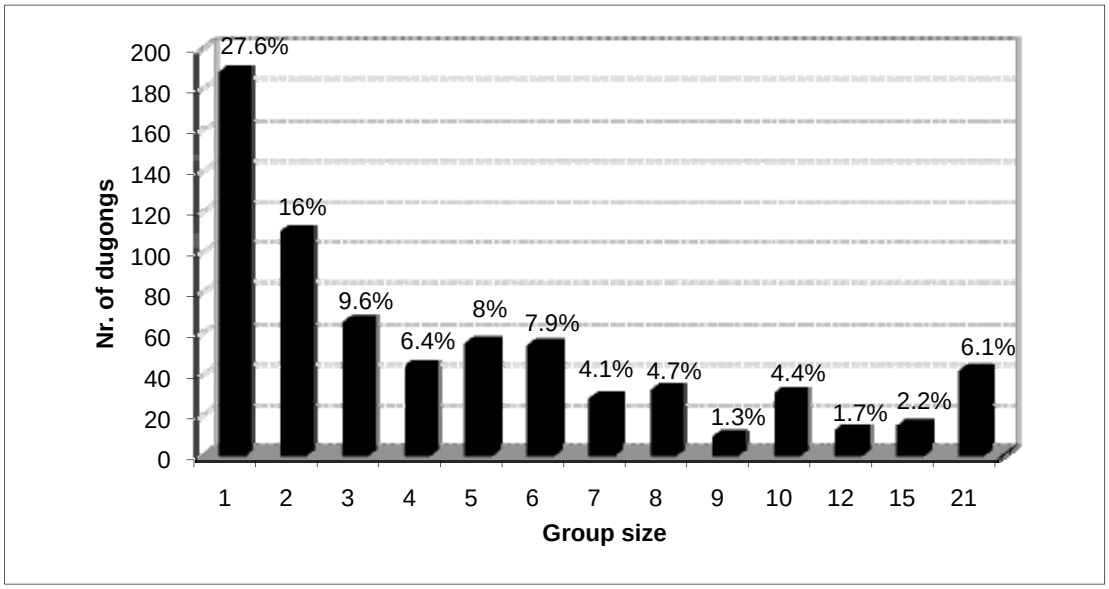

Figure 5. Number of dugongs sighted in group sizes from 1-21 animals.

Discussion

No wide-ranging study has occurred in the region of the northwest Kimberly on the distribution and abundance of dugongs. The remoteness of the area, an Archipelago of islands, and the distances between the reefs and the coastline contribute to the lack of knowledge about the range covered by individual mammals. The tidal range along the Kimberley coast varies from 9 to 10 metres and the sea bottom has a gentle slope. The result is very rapid tidal currents which make harvesting by the indigenous community (with a traditional canoe) difficult and often dangerous. Powered boats are used today which have reduced these problems. However, certain areas are inaccessible and cannot be easily reached, except at the turn of the tide.

I have shown in Figure 2 that harvesting by Aboriginal communities, in far north Western Australia, may possibly be sustainable where the average take is at a bare minimum. The baseline is appropriate

management by the community. However, in comparison to the Torres Strait and Cape York Peninsula communities, over-harvesting of the dugong indicate that it is unsustainable. (Heinsohn et al., 2004).

It is noteworthy that Bardi indigenous hunters have reduced their harvesting from 2003, owing to a population movement to Broome and Derby. Coast watch surveys over the 1995 to 2005 decade reveal that the Dampier Peninsula, north of Broome, is known to support a sizeable population of dugongs even though some dugongs may return to the same geographical location between flights by customs. On the other hand, a more accurate survey in the future could substantiate that the sizable numbers of dugongs could be greater than Shark Bay, surveyed by Holley et al., 2006. In 2008 a decision by the federal government to construct an L.N.G. processing plant in the Kimberly region will undoubtedly have a significant and irreversible impact on this marine environment. There are large areas of seagrass in the location where large container vessels could potentially cause turbulence to the sea beds and destabilize this ecosystem. The other area of vulnerability is illegal fisherman, operating in areas which are relatively remote from the Australian coastline such as Ashmore Reef, due north of Broome which is outside the range of indigenous hunting. In general, Indonesian fishermen capture mainly shark for their fins, Trochus shells and some turtles. It is apparent that Indonesian fishermen are using dugong as bait to catch dwindling stocks of sharks (Western Australian, 16/8/ 2006 p.1). Hopefully, activities by the Coast Watch program will adequately protect dugong populations, along with those of many other marine species on offshore reefs.

Summary and Conclusions

The data on the distribution and abundance of dugongs around the waters of the Kimberley coast has clearly provided useful information for research in the future. It may be that systematic counts of dugongs over a period of years could provide more reliable and specific data on this elusive mammal. It is difficult to assess the status of dugongs in such remote locations as the Kimberley; however Australian Customs have played a co-operative role in assisting me to compile the dugong population data. At this point, it must be noted that the sons of the families that hunted the dugong at various locations now reside in Broome and Derby and are part of a modern cosmopolitan society. Hunting by the local aborigines still occurs; however, their culture is diminishing as a new direction is emerging from their tribal and traditional customs. Whether this trend continues can only be determined by the communities who live around the Kimberley coast.

In my opinion, the Western Australian coastline is unique at present in relation to the dugong. It appears that the aboriginal communities of the Kimberley coast have demonstrated the obvious benefits of co-management. I view, with a considerable degree of concern, that this established practice as applied by the existing communities could be significantly impacted by western influence and ignorance of the sensitivity of this unique marine environment and ecosystem.

Acknowledgments

I would like to thank the following: Australian Customs Services, Broome Western Australia; Customs Dept. Canberra; Bruce Wiggan, aboriginal community resident of One Arm Point; Wally Wiggan and his navigational skills among the turbulent waters of King Sound, in addition to his ability to track dugongs and hunt them traditionally for his community; Roy Wiggan, Elder of the Bardi Community, gave authorization to enter Badi country; John Kurnot, transport driver (bush taxi) for aboriginal communities of One Arm Point, Beagle Bay, Djaridjin and Lombadina, who collected data on hunted dugongs which he transported to aboriginal communities; Dept of Coastal Valuations Section in Canberra; the late Dicko Hunter for his knowledge on dugong hunting in Roebuck Bay, Broome; Dr. Ivan Lawler, James Cook University, whose patience and time was invaluable; and Brigitte Sommer, Southern Cross University, for her outstanding ability with statistics. -**Sylvie Annie Adam** (sylviaadam@hotmail.com)

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BRAZIL

The presence of the manatee in Tapajós River, state of Pará, Brazil. Recently a photograph of a manatee (*Trichechus inunguis*) was published by Greg Grandin (Grandin, 2009: 283) portraying a specimen probably collected in the 1930's in Fordlândia, right bank of Tapajós River. This picture belongs to the archives of the Benson Ford Research Center at The Henry Ford and is perhaps the southernmost reference of this species in that river.

I have visited the lower Tapajós River several times since 1991, and have assembled fisherman records regarding the presence of the "peixe-boi" from the following localities: Iruçanga (02°35´S, 54º58´W); Cajutuba (02°40´S, 55°00´W); Maguarí (02°47´S, 55°01´W) (December, 1991); Aveiro (03°36´S, 55°19´W); Fordlândia (03°50´S, 55°30´W) (January, 1992); lago Jurucuí (02°33´S, 54°58´W); Piquiatuba (02°59´S, 55°05´W) (January, 1993); Tauarí (03°03´S, 55°07´W) (February,2007); and Aramanaí (02°42´S, 55°00´W) (April, 2010). On 1 June 2010 one young specimen was found in Porto Novo (02°37´S, 54°58´W) by local people, and forwarded to the Intituto Chico Mendes de Conservação da Biodiversidade (ICMBio).

Alfonso Maria Olalla (1899-1971) can be considered the greatest collector of mammals and birds of the Amazonian Basin. Between 1922 and 1969 he assembled thousands of specimens which are currently housed in several museums around the world. Concerning *T. inunguis*, he collected specimens in some localities from both banks of the lower Tapajós. In the American Museum of Natural History, New York, there are specimens collected in August 1931 in Santarém (02°26´S, 54°42´W) (AMNH 95765, 95766, 95767, 95768) and Inajatuba (02°52´S, 55°10´W) (AMNH 95763, 95764). In the Museum of Comparative Zoology, Cambridge, there is a specimen (MCZ 31767) from Tauarí obtained in October 1932.

The capture of specimens occurs accidentally in fishnets of local people. The greatest threat to *T. inunguis* seems to be, nevertheless, the contamination of waters by mercury remains of gold mining activities ("garimpos") in localities along the tributaries of the upper Tapajós. Studies about the presence of mercury in fish and human communities confirm the problem in the area (Malm *et al*, 1995; Lebel *et al*, 1997; Bidone *et al*, 1997; Roulet *et al*, 1998; Dolbec *et al*, 2000). – **S. M. Vaz** (Museu Nacional, Universidade Federal do Rio de Janeiro, Seção de Mamíferos, 20940-040 Rio de Janeiro, RJ, Brazil. E-mail: smvaz@mn.ufrj.br

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COSTA RICA

International field course in manatee research techniques in dark waters using sonar, Costa Rica: Summary of results and 1st announcement of future course. On April 7-9, 2010 an international field course for research techniques using sonar was held in Tortuguero, Costa Rica. The event was organized by the Costa Rican non-government organization (NGO) Fundacion Trichechus, Submon (Spanish NGO based in Barcelona), and the official Tortuguero Conservation Area (ACTo). Funding for the event was graciously provided by Barcelona Zoo, Ajuntament of Barcelona, and Pachira/Evergreen Lodge located within Tortuguero. The primary instructors were Dr. Leon Olivera-Gomez (Universidad Juarez Autonoma de Tabasco) and doctoral candidate Daniel Gonzalez-Socoloske (Duke University), with contributions from Vet. Maria Luz Parga and Manel Gazo, both of Submon. A total of 20 participants (see photo) attended the course from over 7 institutions representing NGO's, government agencies, and academic institutions interested in manatee conservation in Costa Rica. Representatives of all areas that contain manatees in Costa Rica were present including La Amistad Caribe Conservation Area (ACLA-C), Wildlife Refuge Barra de Colorado (REBACO), and Tortuguero National Park (PNT), as well as several students from the National University of Costa Rica. The field course was designed to be as hands-on as possible and consisted of a combination of presentations in the mornings and field training with the equipment in the evenings and nights. Participants were instructed on proper use and care of sonar equipment (see Gonzalez-Socoloske et al., 2009). In addition, instruction was provided on how to collect samples from dead manatees for genetic analysis. A presentation was given by Eduardo Chamorro, director of PNT, stressing the current needs of the park in terms of manatee research. As a by-product of the course, a research team consisting of members of Foundation Trichechus and ACTo was established to implement the use of this methodology in a pilot study within PNT. Preliminary results from this two-month study indicate that manatees were detected successfully with sonar in two locations within PNT. The research team is currently analyzing the results of this pilot study to see if it can expand it to the other areas of known manatee presence in Costa Rica. As an additional by-product of this course and pilot study, Fundacion Trichechus and ACTo teamed up to participate in a cultural fair in Tortuguero on Sep 9-12 where they had a booth with information about manatees. The sonar images of manatees from Tortuguero were a big hit among both children and adults and sparked a renewed interest in the local people of Tortuguero, many of whom still doubted that they existed in the area. For more information about this course, field study or the cultural fair contact Carlos Espinoza, director of Fundacion Trichechus (c_espin@racsa.co.cr).

A similar course is currently being planned for April 2011 in Villahermosa, Mexico. It will focus on methodologies using this technique and be as field-oriented as possible, taking advantage of the more than 20 resident manatees of Laguna de las Ilusiones in Villahermosa. For more information or if you are interested in attending this field course please contact **Dr. Leon Olivera Gomez** (leon_olivera@yahoo.com.mx) or **Daniel Gonzalez-Socolokse** (dg52@duke.edu)

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Field course participants, Costa Rica.

PERU

Conservation Actions of Amazonian Manatee (Trichechus inunguis) in Perú. The Amazonian manatee (*Trichechus inunguis*) inhabits the Amazon River and its tributaries in Peru. It is currently considered a vulnerable species in the IUCN and is legally protected by the Peruvian government. However, despite efforts to protect and conserve, their populations are still declining mainly due to anthropogenic factors, particularly indiscriminate hunting and illegal trade as pets.

Faced with this problem, efforts to rescue and rehabilitate the Amazonian manatee were initiated in 2007 in the department of Loreto, through the Gobierno Regional de Loreto, the Asociación para la Conservación de la Biodiversidad Amazónica – Dallas World Aquarium Zoo, The Dallas World Aquarium and the Instituto de Investigaciones de la Amazonía Peruana. These groups have formed the Foundation Iquitos - Amazon Rescue Centre, which aims to provide institutional support for the rescue and rehabilitation of specimens of aquatic mammals and endangered wildlife in Loreto, secured through a program of environmental education.

Thus, through suitable protocols 15 animals have been successfully rehabilitated, including 9 calves. This work is complemented with an environmental education program for 2009 which sensitized about 40,000 people, mainly children and young people, in educational institutions in the city of Iquitos and Amazon villages

The group has also worked with management for the conservation laws of this species and we intend to develop in the short term, with the support of ONGs and government institutions, a Plan of Action for the conservation of river dolphins and manatees in the Peruvian Amazon.

The Amazon Rescue Centre currently continues the task of rehabilitation of manatees, beginning with the release of individuals rehabilitated in the "El Dorado" lagoon located in Yanayacu Pucate River in Samiria Pacaya National Reserve. -**Carlos M. Perea-Sicchar[1], Luis J. Velásquez-Varela[2], Maribel Espinoza-Azan[2], Juan Sánchez Babilonia[2], Daryl L. Richardson[3] and Tulio C. Correa-Girón[1]** ([1]Dirección Regional de la Producción de Loreto, Ramírez Hurtado N° 645, Iquitos, Perú, www.acobia-dwazoo.org, maici_perea@yahoo.com; [2]Asociación para la Conservación de la Biodiversidad Amazónica - Dallas World Aquarium Zoo (ACOBIA-DWAZOO), José Gálvez N° 1509, Iquitos, Perú; [3]The Dallas World Aquarium, 1801 N. Griffin St., Dallas, Texas 75202 USA)

USA

Manatees in Alabama waters: Sighting network and research update. The West Indian manatee, indigenous to Florida (FL) in the United States, is a common visitor to the northern Gulf of Mexico, including coastal Alabama (AL). Researchers at the Dauphin Island Sea Lab have been studying manatees in AL since 2007, when the Mobile Manatees Sighting Network (MMSN) was founded to receive and track manatee sightings in AL waters. MMSN's 2010 research highlights include necropsy of a Tampa Bay manatee that washed ashore in Orange Beach, AL during the exceptionally cold winter, ongoing reconnaissance related to the Deepwater Horizon oil spill, capture and tagging of three additional manatees in Mobile Bay, regular monitoring of four manatees tagged in AL, and the placement of passive acoustic monitors (PAMs) to detect any belted manatees moving in AL.

Manatee necropsy in Orange Beach, AL

In January 2010, an adult male manatee was reported washed ashore in a residential area in Arnica Bay on the Intracoastal Waterway in AL. MMSN responded and performed a necropsy in collaboration with the Florida Fish and Wildlife Conservation Commission (FWC), which determined probable cause of death was cold stress (one of many for the season). The manatee was photographed and identified in the MIPS system (USGS Sirenia Project) as known from Tampa Bay, FL. Although this was the only known manatee mortality in AL last winter, at least two other manatees were reported in AL waters during the period of extreme cold. One manatee is believed to have succumbed to cold stress in FL, just east of the AL border. The fate of the other animal is unknown.

Manatee captures and tagging in Alabama waters

During August 2010, MMSN researchers collaborated with Sea to Shore Alliance, Sea World Orlando, and the University of FL to capture and tag three manatees in Mobile Bay. Located by aerial search, two animals were captured in Dog River, and one was captured in the Mobile-Tensaw River Delta. All three manatees were males in good condition, and all were tagged with GPS satellite telemetry tags. All three tagged manatees remain in northern Mobile Bay and the Delta, feeding on aquatic vegetation such as *Vallisneria*, *Najas*, and *Myriophyllum*, which are abundant in the area. By tracking and monitoring these animals, MMSN is collecting data on behavior, habitat use, and movement patterns within Alabama, as well as large-scale seasonal migration timing and direction.

MMSN has also continued monitoring two manatees tagged in Alabama in 2009 ("Bumpy" and "Bama"). These two manatees traveled from AL to the Crystal River, FL area in fall 2009 and departed those wintering grounds in late spring 2010. Both manatees resided in Apalachicola, FL for most of summer 2010 before Bama lost her tag (July) and Bumpy briefly returned to AL (late September). While in Apalachicola, Bumpy was frequently found in proximity to manatees tagged by the USGS Sirenia Project in FL.

Passive acoustic monitoring in Alabama

MMSN is currently deploying four PAMs in strategic locations throughout AL waters, including points of entry or exit from Mobile Bay and favored habitat sites. These PAMs will record the presence of belted manatees (animals previously tagged elsewhere but retaining some of the gear) in local waters. The monitors will record data from any belt-mounted sonic transmitter, regardless of where the manatee was tagged. MMSN personnel have observed at least three belted animals in AL waters in the past thirteen months. Using the PAMs will quantitatively confirm and track movement of these and other known manatees through AL waters and expand knowledge of their migrations.

Deepwater Horizon response in Alabama

Immediately after the Deepwater Horizon oil spill in April 2010, MMSN collaborated with other marine mammal researchers to identify manatees and other large aquatic species potentially in danger or injured from the spill. We continue these collaborative monitoring efforts, including monitoring tagged manatees as they make their regular seasonal migration out of Mobile Bay and surrounding waters to warmer wintering grounds.
-**Allen Aven and Ruth Carmichael** (Dauphin Island Sea Lab, Dauphin Island, Alabama; The University of South Alabama, Mobile, AL)

One manatee captured in Dog River in August 2010 sports his new accessories – belt, tether, and GPS tag. Photo credit: JoAnn Mitchell

Tagged manatee "Bama" checks out the MMSN researchers in Apalachicola, FL, in May 2010. Photo credit: Katie Interlichia

ABSTRACTS

Aragones, L. V., M. A. Roque, M. B. Flores, R. P. Encomienda, G. E. Laule, and B.G. Espinos. 2010. **The Philippine marine mammal strandings from 1998 to 2009: Animals in the Philippines in peril?** *Aquatic Mammals***,** *36*(3), 219-233.

A well-maintained marine mammal stranding database can be an invaluable tool in understanding not only strandings but also changes in the marine environment. This study aimed to examine the following aspects of marine mammal strandings in the Philippines: species composition, temporal (i.e., frequency of stranding per year and seasonality) and spatial (i.e., frequency of stranding per region and province) variation, proportions of alive or dead specimens, and stranding hotspots. In 2008, a systematic collection of data on strandings, including out-of-habitat incidents, resulted in an initial 12-year database—from 1998 to 2009. A total of 178 stranding events were recorded: 163 single, 10 mass, and 5 out-of-habitat strandings, with an average of 15 observed stranding events annually. Twenty-three of the 28 confirmed species of marine mammals in the Philippines were recorded to strand, including first-recorded specimens for the Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), pygmy sperm whale (*Kogia breviceps*), and Longman's beaked whale (*Indopacetus pacificus*). The top five most frequent species to strand included spinner dolphin (*Stenella longirostris*) (*n* = 26), short-finned pilot whale (*Globicephala macrorhynchus*) (*n* = 14), melon-headed whale (*Peponocephala electra*) (*n* = 13), Risso's dolphin (*Grampus griseus*) (*n* = 11), and common bottlenose dolphin (*T. truncatus*) (*n* = 10). Dugongs (*Dugong dugon*) stranded seven times since 2001. Strandings occurred throughout the year with frequency significantly peaking during the northeast (NE) monsoon (November to March) season. Overall, Regions III (Central Luzon) and VII (Central Visayas) had the highest number of strandings (both *n* = 27) followed by Regions I (Ilocos) (*n* = 22) and V (Bicol) (*n* = 18). The following provinces or local government units were considered hotspots based on high number of strandings observed at each area:

Zambales, Cagayan, Zamboanga City, Negros Oriental, Bohol, Pangasinan, and Bataan. Sixty-five percent of all documented stranding events involved live (n = 116) animals. This high percentage might be linked to dynamite fishing (causing acoustic trauma), fisheries interactions, or biotoxins from harmful algal blooms coupled to their foodweb. These strandings in general validate the diverse marine mammal assemblage in the Philippines and reveal the various environmental threats with which they deal.

Beatty, B. L. and J. Geisler. in press. **A stratigraphically precise record of *Protosiren* (*Protosiren*idae, Sirenia) from North America**. Neues Jahrbuch für Geologie und Paläontologie - Abhandlungen 257(4). http://www.ingentaconnect.com/content/schweiz/njbgeol/pre-prints/0095 **DOI:** 10.1127/0077-7749/2010/0095

A partial left innominate of a sirenian, mostly consisting of the ilium, was recently recovered from the late Middle Eocene (Bartonian) Cross Member of the Tupelo Bay Formation in Orangeburg County, South Carolina. It most closely resembles the innominate of *Protosiren sattaensis* GINGERICH et al., 1995 from the Bartonian of Pakistan, though due to the present lack of knowledge of variation within the genus, it is best assigned to *Protosiren* sp. This specimen was collected from the same horizon as the holotype of *Carolinacetus gingerichi*, representing an unusual case of *Protosiren*id and protocetid co-occurrence. This new material is the first Eocene sirenian material diagnosable to the genus level that came from unambiguous, age-restricted strata in North America. Previous reports of Eocene Sirenia from South Carolina have consisted of indeterminate rib fragments and a skullcap described by Sanders, all from approximately Priabonian strata: the Pregnall Member of the Cross Formation or the Harleyville Formation. Recent geologic studies of the Castle Hayne Formation suggest that "Lutetian" *Protosiren* and dugongid material from North Carolina is instead Bartonian or Priabonian in age. Thus after presumably dispersing westward from North Africa, prorastomid sirenians in the Western Hemisphere first appear in Jamaica, *Protosiren*ids and/or dugongids on the Gulf Coast, and then *Protosiren*ids and dugongids later in the Carolinas. The Bartonian marks the beginning of the Middle Eocene Climatic Optimum, and this event may have aided the northward movement of sirenians in the Eocene.

Presented at the Society of Vertebrate Paleontology meeting, October 11th, 2010, Pittsburgh, PA:
Dental microwear of modern and fossil sirenia reflects changes in the physical environment in the neogene of Florida.
Beatty, Brian Lee, *Dept. Anatomy, New York College of Osteopathic Medicine, Northern Boulevard, Old Westbury, NY 11568*
Mihlbachler, Matthew C., *Dept. Anatomy, New York College of Osteopathic Medicine, Northern Boulevard, Old Westbury, NY 11568*

Manatees and dugongs are restricted to rivers and coastal habitats, feeding on plants usually bound to a substrate. Peninsular Florida has changed much over time, including a change from carbonate to siliclastic substrates during the Miocene and the emergence of a manatee-dominated ecosystem replacing a dugong-dominated one. This shift is presumably connected, reflecting the specialization of manatee horizontal tooth development as competitively advantageous in dealing with an increased source of abrasives over the primitive tooth replacement found in dugongs. To test this, we looked at dental microwear of all subspecies of modern and fossil *Trichechus* and compared them with Clarendonian and Hemphillian *Metaxytherium floridanum*, as well as *Crenatosiren* and a possible Eocene *Protosiren* for added insight. Using digital photomicrographs taken at 100x, pits and scratches were traced and partitioned into discrete size categories based on widths and diameters, and counted in a $1.6x10^5 \mu m^2$ square area, all by a single observer. Though the location on which teeth were sampled had a marginal effect on the data, ANOVA results indicate that all populations, including comparisons to modern aquarium-housed individuals, were significantly different for all features except for very wide scratches (≥20 µm width) and very wide pits (≥50 µm width). Curiously, *T. manatus* had more

scratches than *T. inunguis*, suggesting that microwear features in marine herbivores are less likely a reflection of wear by phytoliths and more likely wear by siliclastic substrate exposure. Rancholabrean *T. m. bakerorum* appear to have had fewer scratches and Irvingtonian *T. manatus* even fewer, but with more pits. Clarendonian *Metaxytherium* appear to have had many pits and scratches, compared to Hemphillian *Metaxytherium* which had similar numbers of pits, but fewer scratches. More data is needed to determine what the causes of dental microwear is for aquatic herbivores, yet our data suggests that microwear reflects measurable changes in feeding ecology, whether it be substrate or dietary composition, experienced by *Metaxytherium* from the Middle to Late Miocene and *Trichechus* throughout the Pleistocene.

Castelblanco-Martínez D. N., B. Morales-Vela, H. A. Hernández-Arana, J. Padilla-Saldivar. 2009. **Diet of manatees *Trichechus manatus manatus* in Chetumal Bay, Mexico.** Latin American Journal of Aquatic Mammals 7:39-46.

Manatees, as well as other sirenians, are aquatic, opportunistic herbivores. Knowledge of their diet is important to determine habitat requirements. This is the first study of manatee diet in México. Our main objective was to identify the plant species eaten by manatees in Chetumal Bay, and to establish if diet composition varied by climatic season, sex or age class. We compared plant epidermal fragments found in digestive contents with histological descriptions and permanent collections of suspected plants and algae. Thirty-six fecal samples and nine tract digestive content samples (mouth, stomach, and cecum) were examined. We found eight distinct plant items, including seagrasses, freshwater grasses, algae and vascular plants. Halodule wrightii and Thalassia testudinum were found in 41 samples (92%), and Ruppia sp. was present in 57.8%. Another common item was red mangrove (Rhizophora mangle), found in 66.7% of samples. Additionally, we report Chara sp. and Najas sp. as part of the West Indian manatee's diet outside of Florida. A multivariate analysis based on a presence/absence triangular matrix and a similarity analysis were used to test differences among samples. Season, sex or age class did not influence diet composition. All species identified are present in Chetumal Bay, suggesting that manatees do not move long distances at sea in search of food. We postulate that consumption of red mangrove by Chetumal Bay manatees may occur as compensation for the scarcity of submersed aquatic plants.

J. Denkinger. 2010. **Status of the Amazonian manatee (*Trichechus inunguis*) in the Cuyabeno Reserve, Ecuador**. Avances, Vol. 2, pp. B29-B34.

Amazonian manatees live in black water rivers and lakes in the Amazon basin. A study of Amazonian manatees in the Cuyabeno Reserve conducted by Timm et al. [1] in 1983 gave the first information on distribution of manatees in the Cuyabeno Reserve and they suggested a possible extinction of the Amazonian Manatee in the following decade. Here I present results of observations and interviews realized 13 years after the first study as complementary observations during a research project on Amazon River dolphins (*Inia geoffrensis*) from 1996 to 1999. We surveyed during more than 127 days covering about 6.175km in manatee habitat with more than 456 hours continuously observing black water rivers and lagoons and we carried out manatee surveys paddling in the Lagunas Grandes de Cuyabeno. Interviews with tour guides, park rangers and native Indians give a complete sighting list for the presence of manatees and insight into the current situation in the Reserve.

The relative abundance of manatees in the Cuyabeno River is 0.01 animals/h effort and even less in the Lagartococha River with 0.007 animals/h effort. Populations in the Lagartococha River seem to be severely reduced. Hunting in both rivers continued despite legal protection with 16 manatees killed from 1995 to 1998. Overall 40 to 49 animals were seen in the Cuyabeno Reserve from 1996 to 1998. Even though, predictions that manatees would be extinct by 1993 were not fulfilled, they are rare in the Reserve and living in a protected area

does not necessarily safeguard this species.
Keywords:. Amazonian manatee, *Trichechus inunguis*, status, Cuyabeno Reserve, Ecuador.

RECENT LITERATURE

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