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IN THIS ISSUE:

- BRIDGING THE GAP BETWEEN CONSERVATION SCIENCE & REAL WORLD OUTCOMES (pg. 3)
- CAPTIVE MANATEES REINTRODUCED INTO THE WILD IN BRAZIL (pg. 12)

CAN THE EIA SAVE THE JAPANESE DUGONG?

Though the population of dugong in Japan is estimated at under 50, it may well be far smaller. At the moment a survey is underway, aimed at creating an EIA for the US Forces' "Futenma Replacement Facility (FRF)", which is to be built in the last habitat in Japan of the critically endangered dugong.

In Japan the procedure for an EIA starts with the compilation of a document containing details of the project and methods to be used to collect data and evaluate the environmental impact. The document comprises the complete plan for the EIA and, as such, requires that the suitability of survey procedures and impact assessment criteria is fully discussed.

However, the party responsible for the project (Japan's Ministry of Defense - MoD) has commenced the assessment without even a proposal for the document. The Defense Facilities Agency contested that "this is a preliminary survey, not related to the EIA", but the procedures being used are almost identical to those proposed for another (already cancelled) project to build on the outer reef, the results of which, it was later revealed in the newspapers, the MoD had planned to use in the EIA for that project. In addition, the MoD went to the extreme measure of dispatching a Japanese Maritime Self-defense Force minesweeper to intimidate citizens demonstrating to protest the illegality of the assessment.

The survey started with the placement of 14 underwater video cameras and 30 passive sonar devices. These were intended to collect video of dugongs and record their calls in order to assess the frequency and intensity of their use of the seagrass bed feeding grounds. The passive sonar devices are part of a system invented to prevent by-catch deaths in fishing nets and are sensitive up to 300 metres. However, as they only respond to dugong calls, it is questionable whether they are suitable for detecting seagrass bed use by such a small population. Moreover, it is conceivable that the very presence of all these devices in the restricted area available for feeding may itself make the dugong uneasy.

In October-November 2007, in a location where many grazing tracks have been found, a large number of nails linked by nylon ropes were driven in to the seabed. These may well have been markers for a crude



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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attempt to record the location and size of grazing trenches. We presented a request to have them removed (including opinions from sirenia researchers around the world) to the MoD's Okinawa Defense Facilities Agency (DFA), which is carrying out the survey. It is no exaggeration to say that this survey is actually degrading the dugongs' habitat. The DFA removed the nails, but were not forthcoming over the question of why they had chosen this method, merely repeating that they had "respected the environment".

Please remember that this survey is being carried out before the publication of the EIA implementation plan, which is to say, before the method has even been approved.

Further, since the proposal that the Okinawa DFA submitted did not contain details of the project and EIA methods, the members of the prefectural assessment committee that inspected it were enraged. How on earth can the possible environmental effects of the project be assessed when the military base construction and deployment plan is not described? When first presented, the proposal contained a mere seven pages, and in spite of repeated requests for more information, the DFA stalled until the eighth meeting of the committee at the end of January. Just before the matter would be presented to the Governor they presented a further 150 pages. In agreement with the committee's recommendation, the Governor requested that the proposal be revised, and at the beginning of February a further addition three times the size was presented. The topics included "Objectives and Contents of the Project" and "Items for the EIA and Methods for Surveying, Evaluation and Prediction".

Even after the revision, the proposal remains incomplete and ambiguous. The section for details of the methodology for predicting the effect on the dugongs' environment of the construction, existence and use of the FRF states simply, "Site surveys, documentary research and hearings will be carried out to determine the foreseeable effect on the dugong", with no mention of how such predictions will be made. It also states merely that "efforts will be made" to evaluate and estimate the effect of the FRF on the dugongs' use of the seagrass beds and on the maintenance of the population. Again there are no details of how this is to be done.

Can a survey like this produce the data required by an EIA? A large proportion of EIAs in Japan conclude that "the environmental effect is negligible", which in many cases has caused mistrust in the local populace. If the effect of the FRF on the dugong at Henoko is judged to have "negligible effect", the prospects for the dugong are grim.

In September 2003, a suit was filed on behalf of the Okinawa dugong and several conservation groups against the US Defense Secretary and DoD, stating that the FRF project at Henoko would violate the NHPA (National Historic Preservation Act). The court granted the motion, declaring that the dugong, as a Japanese National Monument and important part of Okinawa's history and culture, is entitled to the protection of the NHPA. In January the San Francisco court ordered the DoD to submit within 90 days documentation describing "what additional information is necessary to evaluate the impacts of the FRF on the dugong; from what sources, including relevant individuals, organizations, and government agencies the information will be derived; what is currently known or anticipated regarding the nature and scope of Japan's environmental assessment and whether that assessment will be sufficient for meeting defendants' obligations under the NHPA."

It is embarrassingly ironic that Japan cannot protect its own endangered species, and even now, as an inappropriate "assessment" is under way, the Okinawan dugongs have been passed a lifeline by the NHPA of the United States. —**Taiko Kudo** (Association to Protect the Northernmost Dugong, E-mail: rigel@mbf.nifty.com; translation by Simon Varnam)

BRIDGING THE GAP BETWEEN CONSERVATION SCIENCE AND REAL WORLD OUTCOMES: LESSONS FROM WORKING WITH INDIGENOUS COMMUNITIES

Watching Indigenous hunters butcher an endangered green turtle on a beach is disturbing for a person like me, a conservation scientist who has never visited an abattoir or a factory farm. I found it even more perturbing to learn that the hunters consider the act to be one of conservation. They believe that returning the turtle's blood and butchered remains to the sea guarantees that turtles will remain for their children to hunt.

Such huge cultural differences in perceptions increase the challenge of effective cross-cultural communication about conservation. I have been acutely aware of this challenge for more than 30 years. As a researcher, I am often asked to provide scientific input into discussions between Indigenous hunters and environmental managers about conserving green turtles and dugongs. Both are threatened species of high cultural value to Indigenous hunters in many countries.

Nonetheless, I was shocked to find that some key negotiators had effectively been speaking different languages despite using the same words. A member of my research group, Melissa Nursey-Bray, exposed this uncommon understanding. Melissa used discourse analysis to identify major themes in the transcripts of interviews with hunters and managers about *A Guugu-Yimmithirr Bama Yii*, the dugong and turtle hunting management plan developed by Hope Vale Aboriginal Community. This plan won the Australian Prime Ministers Award for Community Leadership and Sustainability in 2000. However, within a few years, all those involved in the plan considered it a failure because it had not been implemented effectively.

When the environmental managers discussed hunting, their priorities were biodiversity conservation, species protection, animal rights, and sustainability while the community's concerns were cultural survival, Indigenous rights, and community well-being. When discussing planning, the Hope Vale people wanted to know who would be affected, what the planning process would involve, and how the next hunting season would be managed. The managers, however, were much more interested in producing a product to be implemented over the long term against agreed performance indicators.

Each group was unaware of the others values and concerns despite 20 years of negotiation and a shared belief that the plan reflected mutually agreed outcomes. With such fundamental differences unrecognized and unresolved, it is unsurprising that the plan failed, especially as Hope Vales sea country is remote and effective enforcement prohibitively expensive unless driven by community peer pressure.

Colleagues and I followed up on Melissa's work with a simple exercise with a group of Indigenous turtle and dugong project officers from remote island communities in Torres Strait (between Australia and Papua New Guinea). We asked the project officers to brainstorm the features of an effective turtle and dugong hunting management plan from their perspective and then rank them. They prioritized (1) management driven by culture and Native Title rights, (2) respectful partnerships, and (3) employment and capacity building.

We independently repeated the exercise with a group of environmental managers, most of whom had considerable experience working with Indigenous peoples. The managers planning priorities were (1) ecologically, socially, culturally, and economically sustainable outcomes measured against agreed short and long term criteria and indicators, (2) commitment to capacity building, compliance, enforcement, and community education, and (3) capacity to be adaptive and independent, with initial but not necessarily ongoing support from government. The outcomes of this exercise clearly supported Melissa's findings.

Management interventions are unlikely to work unless the different priorities of the key stakeholders and landholders are identified, understood and considered by all parties. When negotiating a management intervention, processes are required to ensure all stakeholders understand each others priorities. In many cases, these differences in priorities are so profound that consensus will be impossible. But at the very least, the priorities of the various stakeholder groups can be combined in a checklist against which draft planning

documents can be evaluated. Such a checklist ensures that the proposed management interventions address the needs of as many key stakeholders as possible.

In 1993, Australia's highest court recognized that turtle and dugong hunting is a Native Title Right for Traditional Owners in their sea country. Consequently, environmental managers now acknowledge that successful management must be community-based and the Australian government is underwriting turtle and dugong management plans in selected hunting communities.

Almost all communities that are developing turtle and dugong management plans have independently chosen to control hunting via a permit system. Indigenous Australians are all too familiar with permits; permits controlled their lives in less enlightened times and were (and in some cases still are) a source of considerable friction between Indigenous communities, the bureaucracy, and the wider community. Given this history, I find it fascinating that many community plans blend a permit system with traditional rules about hunting and butchering. Indigenous communities may accept western management methods if they are familiar with them and can incorporate them into existing frameworks. If scientists or managers propose management tools, they need to frame them in the language and cultural understandings of the key stakeholders.

Scientists and managers may negotiate soundly based alternative management tools with Indigenous communities. However, if these fail through poor implementation, communities will dismiss them and, potentially, the science behind the tools. In the mid 1980s, the Australian government established a large dugong sanctuary in western Torres Strait at my recommendation and after protracted negotiations with local Indigenous communities. But the dugong sanctuary has only been a paper park: never effectively enforced or even advertised outside official documents. Some Traditional Owners in Torres Strait now eschew spatial closures as a management tool even though western scientific knowledge of dugong distribution, hunting practices, and fisheries enforcement in the region indicates that large closures have considerable potential for reducing human impacts on dugongs. Closures could also be designed to reinforce traditional conservation practices. Managers should be wary of token interventions; management measures ineffectively implemented over the long-term may foreclose future options.

Conservation biologists are committed to making a difference. We want our science to inform real world outcomes. Unlike environmental managers, researchers are privileged to work on the same problems for long periods enabling us to garner a deep understanding of the factors leading to success or failure of various interventions. In my experience, such understanding is much less valued than technical knowledge, even within well-established advisory processes. Researchers need to document their experiences as well as their scientific findings in language accessible to all stakeholders. They also need to work with managers and key stakeholders to develop ways in which both technical and experiential knowledge can be incorporated into adaptive management. -**Helene Marsh** (helene.marsh@jcu.edu.au)

A NEW CMS OPERATIONAL INSTRUMENT ENTERS INTO FORCE TO CONSERVE DUGONGS

Dugong conservation was, for more than a decade, a major preoccupation of the Convention on Migratory Species (CMS). The Seventh and Eighth Conferences of Parties adopted Recommendation 7.5 Resolution 8.5 that encouraged Parties to continue to cooperate amongst themselves and with other non-Party Range States to develop and conclude an international instrument for that purpose. Therefore, two meetings on dugongs have been held in Bangkok respectively in 2005 and 2006, in collaboration with Thailand and with the support of Australia. A Memorandum of Understanding (MoU) and its related Conservation and Management Plan (CMP) were developed and agreed to by nearly 20 range states. In addition, and following the CMS meeting, UAE held a seminar in Abu Dhabi, in 2006, to discuss a

collaborative initiative of cooperation within the western Indian Ocean and Eastern African coast sub-region, to conserve dugongs and their habitats.

In 2007, on the kind invitation of the UAE, CMS agreed to co-organize workshops on dugong conservation with the Environment Agency of Abu Dhabi, based on two separate sub-regions, i.e. the Eastern Indian Ocean and Pacific (EIOP) and the Western Indian Ocean including the Eastern African Coast and Red Sea (WIO), followed by a meeting to sign the adopted operational instrument, which is an Article IV, paragraph 4 agreement, including the adopted CMP. The meeting and the workshops were attended by more than 50 delegates and experts that met in Abu Dhabi, UAE, from 28 to 31 October 2007.

The EIOP workshop based its program of work on considering the whole nine objectives of the CMP, reporting on progress in each country. The group, which included Australia, Myanmar, Papua New Guinea, New Caledonia and SPREP as a regional organization, and Pakistan, reported accurate new information on dugong presence using a special map for the region. On the other hand, the WIO workshop discussed a regional action plan, based on the CMP under CMS. The group included Arab countries and the Eastern African region: UAE, KSA, Qatar, Yemen, Bahrain, Tanzania, Kenya, Comoros, Madagascar, and Eritrea. On 30 October, an integrating workshop was held, including the two workshops where the main outcomes were reported to the audience in addition to a presentation on the biological basis of the MoU and CMP by Prof. Helene Marsh from Australia.

The meeting to sign the MoU was held on the 31 October 2007, under the chairmanship of Mr. Majid Al Mansouri, SG of the Environment Agency of Abu Dhabi (EAD). The MoU entered into force on 31 October 2007, following the signature of seven range states, namely Australia, Eritrea, France, Madagascar, Myanmar, United Arab Emirates, and United Republic of Tanzania.

More information, including the report and documents of the meeting, is available on the CMS website: www.cms.int/bodies/meetings/regional/dugong/dugong_3.htm.

-Lahcen El Kabiri (Deputy Executive Secretary, UNEP/CMS Secretariat, Convention on Migratory Species, E-mail: lclkabiri@cms.int, Website: www.cms.int)

INTERNATIONAL MARINE CONSERVATION CONGRESS 2009

The Marine Section of the Society for Conservation Biology is pleased to announce the International Marine Conservation Congress (IMCC) - Making Marine Science Matter.

Dates: May 20-24, 2009

Location: George Mason University, Washington DC

The IMCC will be an interdisciplinary meeting that will engage natural and social scientists, managers, policy-makers, and the public. The goal of the IMCC is to put conservation science into practice through public and media outreach and the development of science-based deliverables (e.g., policy briefs, blue ribbon position papers) that will be used to drive policy change and implementation.

Major themes that will be addressed include:

- Global climate change
- The land-sea interface
- Ecosystem-based management
- Poverty and globalization

This meeting will serve as the 2nd International Marine Protected Areas Congress (IMPAC2) and will maintain the scope and vision of IMPAC1 (held in Geelong, Australia in October 2005).

1st call for symposia, workshops, break-out sessions: 1 April - 1 June 2008

1st call for contributed papers and posters: 1 September - 15 October 2008

A call for proposals will be sent out after March 1 with detailed instructions for abstract submittal and descriptions of requirements for Symposia, Workgroups, and contributed papers and poster.

Please visit the conference website at www.conbio.org/imcc for more information.

REPORT FROM WORKSHOP ON CONSERVATION OF SIRENIANS IN DEVELOPING COUNTRIES AND INDIGENOUS COMMUNITIES CAPE TOWN, SOUTH AFRICA, NOVEMBER 2007

Manatees and dugongs occur in some 90 countries, all but three of which are classified as developing countries. Thus sirenian conservation is essentially a developing country challenge, despite most of the research designed to provide a basis for management being largely conducted in the United States and Australia or by the nationals of those countries working overseas. This dissonance was the rationale for the theme of the Sirenian Workshop held in association with the 17th Biennial Conference on the Biology of Marine Mammals held in Cape Town in November 2007. The Sirenian workshop was attended by almost 30 delegates from: Angola, Australia, Brazil, Canada, Comoros Islands, India, Ivory Coast, Kenyan Mayotte, Mexico, New Caledonia, United Arab Emirates and the United States.

The workshop featured nine spoken presentations and seven posters. The abstracts are presented below. The workshop concluded with a thought provoking exercise designed to promote discussion on 'Criteria for Effective Management' from a range of perspectives. Delegates were divided into three groups largely based on their countries of origin or experience and asked to brainstorm features of effective management. These features identified by each group were then combined into the list below and delegates were each asked to vote for the three criteria that they considered most important.

Criteria for Effective Management

- 1. Management leading to sustainable populations at biologically appropriate scales based on both science (indices of trends in population levels, distribution and anthropogenic mortality) and community aspirations.**
2. Compliance and monitoring
3. Assessment and mitigation of all threats
4. Community support and participation
5. Sustainable livelihoods
6. Changes in resource use
7. Cultural needs maintained
- 8. Sustainable implementation of management (enforcement, funding and compliance)**
- 9. Collaboration among local, national, international stakeholders (government, NGOs and communities).**

The three criteria in bold (#1, 8, 9) were overwhelmingly voted the most important by all three groups. Of course, these three features encapsulate many of the other features.

There was consensus in the group that future sirenian workshops should include group activities in addition to poster and spoken presentations. –**Helene Marsh** (helene.marsh@jcu.edu.au).

Oral Presentation Abstracts

Community Conservation of *Trichechus senegalensis* in Volta Lake, Ghana

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The West African manatee, the least studied sirenian species, is Red Listed as vulnerable by the IUCN Species Survival Commission Sirenian Specialist Group. Small, fragmented populations are widely distributed along the coastal regions, rivers, estuaries, and lagoons from southern Mauritania to southern Angola, and as far inland as 2,000 km, often trapped above dams. Indigenous hunting continues throughout the species range—at high rates in some regions due to human poverty levels, lack of awareness, and limited enforcement by local authorities. Volta Lake, Ghana, is home to a population of West African manatees isolated from con-specifics since the completion of the Akosombo Dam in 1964. Preliminary investigations indicate that this insular population may be severely threatened with extinction from anthropogenic activities. Direct impacts from indigenous hunting (poaching, opportunistic kills, incidental take) and indirect impacts from indigenous fishing, farming, cattle grazing, and pollution have increased exponentially since the dam was built. We suggest that a community-based conservation project can increase awareness and reduce human/manatee conflict in the shoreline fishing communities, enhance local and regional capacity building, and improve economic and social conditions in the Afram region of Volta Lake. As a charismatic species, the West African manatee could be central to the development of eco-tourism efforts at in the Afram region, offering economic benefits to the local communities while simultaneously meeting conservation objectives. In collaboration with the Earthwatch Institute and Sirenian International, the National Conservation Research Centre (NCRC—a local Ghanaian NGO) has begun a community-based conservation initiative focused on increasing economic benefits to local villages that protect manatees for long-term sustainable use. Results from preliminary investigations and the first field season (to be conducted with a team of African Fellows in November 2007) will be reported on at the Sirenian Workshop.

Success, limitations and a new action plan to develop stronger trans-border manatee conservation strategies between Mexico and Belize protected areas

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Chetumal-Corozal Bay (CHB/CZB), natural Mexico-Belize border, is a relevant site for manatees in the wider Caribbean Region. Governments protected this estuarine system in Mexico in 1996 (CHB) (only at State level), and the Belizean portion (CZB) in 1998, being manatee conservation the main conservation objective. Eleven years after its creation, CHB protected area faces several management shortcomings and indirect conservation threats for manatees: poor federal and state coordination and erratic state administration procedures, rapid changes in land ownership leading to mangrove deforestation, marine pollution from untreated urban sewage and farming areas discharges, lack of interest and public participation opportunities, and no bi-national coordination with Belize to tackle together shared problems in this large bay. In 1991, governments signed a bi-national agenda to attend environmental degradation problems, conservation of protected areas, and endangered species, over 50 km around their borders. This agenda never operated, principally by the lack of serious commitment by Mexican environmental authorities. In spite of this, research groups from Mexico and Belize and other countries have produced baseline information to inform manatee conservation strategies such as GPS tracking of manatees in CHB showing large coastal movements that use all of the CHB/CZB Bay. Scientific information has not been enough to promote operational bi-national conservation actions. In order to activate the Mexican reserve an action plan is under formulation that is expected to permeate the Belizean reserve in the short-term. It is based on community participation and involvement, emphasizing local stakeholders (ejidos and rural communities owners of coastal land), and of local governmental authorities and communities, in the following: participatory monitoring of water quality and changes in manatee habitat, larger public awareness campaign of the deteriorating environmental health of the CHB/CZB Bay, and public analysis of opportunities to work in solutions using a State, Federal and bi-national coordination approach.

Status and recovery of the Antillean manatee (*Trichechus manatus manatus*) in the Alvarado Lagoon System, Veracruz, Mexico.

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Since 1999 we have developed a conservation program for the Antillean manatee (*Trichechus manatus manatus*) in the Alvarado Lagoon System (ALS), in central Veracruz State. We focused on delivering educational courses and workshops to fishers and local communities with the objective of reducing poaching and habitat loss, the principal reasons this species is endangered. Historically, manatees were relatively common in the ALS, but studies in the 1980s documented their extirpation from this region. Nevertheless, recent rescues of three calves (between 2000 and 2004) and the continuous reporting of sightings have reemphasized the ALS as an important manatee area. Manatee and habitat surveys from 2000-2003 along the entire coast of Veracruz corroborated ALS as a critical wetland for the conservation and recovery of the species. Potential manatee habitat comprises 315,000 ha of low human-development areas including coastal lagoons, interior lagoons, estuaries, mangrove wetlands, rivers, and canals. In the ALS manatees are most commonly sighted in the Limon River and adjacent lagoons, and are rarely sighted in the Acula River and adjacent lagoons; the marine zone appears not to be utilized by manatees, except when moving locally between rivers along the coast. We have found that clam divers and river and lagoon fishers possess the greatest knowledge about manatees in the ALS because they are continuously working in manatee habitats. One of our most significant achievements was the designation of the ALS as Ramsar Site No. 1355, encompassing 267,010 ha of wetlands, including critical manatee habitats. With the potential for the release of rehabilitated manatees from the Veracruz Aquarium into the ALS, there is the need for continued educational and informational campaigns to educate the local communities about the need to protect and conserve manatees and their habitats.

Community-based catch-monitoring of a traditional fishery for dugongs in the Kaiwalagal traditional sea country of Torres Strait

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Torres Strait and northern Queensland have the largest population of dugongs in the world. This population supplies a large dugong harvest, which is endorsed by the Torres Strait treaty between Australia and Papua New Guinea but which is currently not managed. Successful management will need to involve Indigenous Torres Strait Islanders who use dugongs for cultural, social and economic purposes. The objective of this project was to develop community-based strategies for dugong catch-monitoring upon which communities can base management plans. We engaged two Torres Strait Island communities in a step-wise process by: (1) obtaining support from the Torres Strait Regional Authority, (2) engaging Traditional Owners and Community Councils in each community, (3) involving dugong hunters through participatory workshops/meetings; and (4) employing Indigenous counterparts to work directly with the hunters. Community members helped design a datasheet to collect the data about hunting behaviour and the catch needed for co-management. Hunters completed the datasheet after each hunting trip. The project's success was determined by evaluating the proportion of hunters in the community that participated and the quality of the information provided. Eighty-nine and 87% of hunters who signed-up at Hammond and Thursday Islands, respectively, consistently handed in datasheets. At Thursday Island, a larger community with a broad social structure, it was more difficult to involve community members in catch-monitoring than at Hammond Island, where there is strong community support for the project. We conclude that community-based catch monitoring is possible provided the community is involved in every aspect of the process but that it is expensive, very labour intensive and also requires scientific input.

Towards an interactive approach to evaluating options for managing dugong hunting that acknowledges the differing priorities of Indigenous peoples and governments

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Even though Indigenous hunting of dugongs occurs in at least 31 countries, it is largely unregulated. A 'National Partnership Approach' to the management of Indigenous hunting of dugongs in Australia is being implemented by national and state governments in partnership with Indigenous organisations. The approach includes four key components: community management plans, monitoring programs, catch sharing, and education and awareness-raising. We used Discourse Analysis to understand how the different views of Indigenous and government stakeholders affect decision making on the ground with respect to Hope Vale Aboriginal community's Dugong and Turtle Hunting Management Plan. This plan was never implemented despite its winning a national award. A major

problem in implementing the Plan was that the priorities of the Indigenous community and the government stakeholders were very different. The community was concerned about cultural survival, Indigenous rights and community well being; the management agencies were concerned about biodiversity protection, animal rights and sustainability. We propose an interactive approach to evaluating options for managing the hunting of dugongs. Our process aims to promote the development of solutions that satisfy the needs of multiple stakeholder groups with an associated increase in mutual understanding and trust. The process involves: (1) identifying a toolbox of management options; (2) defining mutually-acceptable criteria against which each option will be evaluated; (3) developing a scoring scheme to evaluate each criterion; (4) determining the relative importance (weighting) for each criterion separately for each group of stakeholders; (4); jointly scoring each management option against the criteria; (5) calculating the weighted scores for each management option reflecting (a) the management agency weightings and (b) the Indigenous weightings; (6) using both sets of scores to identify a short list of management options acceptable to both groups. This process has potential application for developing management options for addressing other impacts on sirenians.

Interviews about dugongs and community conservation issues in the Myeik Archipelago of Myanmar

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During this research (December 28 2006 - January 18 2007) through the southern Myeik Archipelago we completed 34 interviews with Burmese and Karen settlers and Mawken (sea gypsies). Burmese and Karen settlers migrated here to escape from poverty and oppression. The Mawken are nomads who live and travel on small boats during the dry season, and build temporary structures for shelter in the rainy season. Their true origin is debated, but their language structure includes Malaysian, Melanesian, and Burman words. All groups only see the occasional dugong, the last reported 10 months ago. There is no directed hunting, but if a dugong is seen or stranded, it is killed and eaten. One person had heard of dugong medicine when young, but did not know what it was for, and had not heard of it since. There were no other medicinal or artifact uses reported. One common story told how when dolphins get older they walk into the seagrass and turn into dugongs. When dugongs get older they walk on land into the jungle and turn into pigs. While respondents had heard about conservation, realization of what it meant was low, and most answers about the importance of conserving endangered species or systems (i.e. seagrass, coral, mangroves) mentioned that it was fine to conserve what local people did not use. We found little seagrass, varying from the Thai Andaman coast to the south. The islands are mainly limestone or granite, with steep slopes nearshore. Nearshore areas are mostly shallow-water corals or rocky, with muddy fluvial run-off at gentle easterly-facing slopes and muddy mangrove swamps in sheltered areas where seagrass would be expected. The Myeik Archipelago is not an area which could support large (50-100) groups of foraging dugongs as in Thailand, or the Rakhine coast of Myanmar to the north.

The dugong in eastern Africa: balancing on the brink

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Dugongs (*Dugong dugon*) are threatened throughout their range from loss and degradation of their habitats and hunting. In eastern Africa, historical data indicate that dugongs occurred in the coastal waters throughout the region, and were relatively common in the past. However, recent investigations show that dugongs have declined dramatically in recent decades, especially during the 1970s and 1980s. A regional dugong assessment was conducted in Western Indian Ocean countries and islands between April 2004 and March 2005 (Mozambique, Tanzania, Kenya, Comoros, Mayotte, Seychelles and Madagascar) through a review of existing literature, questionnaire interview surveys and opportunistic sightings. Results indicate that dugongs still occur, but in very low numbers which may not be viable. The main contemporary threats identified are entanglement in inshore artisanal gillnets, seagrass destruction, disturbance by boat traffic and inadequate law enforcement. Populations are now small and isolated from one another. Several dugong initiatives have since been undertaken in some countries in eastern Africa including aerial surveys in Mozambique, Tanzania and Mayotte and comprehensive interview surveys in the Comoros archipelago. A regional dugong Memorandum of Understanding on their conservation has also been drawn up and a workshop convened on ways to mitigate the threat to endangered marine species, including dugongs, from incidental catches. Recommendations from these initiatives include : reducing dugong mortality levels by restricting threatening fishing gears in dugong habitat and providing alternative livelihoods ; initiating public awareness campaigns ; conducting population and habitat assessments ; training in research and conservation techniques; and establishing community-managed dugong sanctuaries. Regional cooperation is imperative to coordinate efforts, target resources and

encourage the development of a more robust scientific approach to dugong management and conservation. Regional projects are now under consideration to contribute to the recovery of dugongs in eastern Africa.

Poster Presentation Abstracts

Development of a blueprint for a western Indian Ocean regional dugong conservation strategy

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The dugong (*Dugong dugon*) is a marine mammal listed as vulnerable to extinction throughout its range. Little information exists for this species within the Western Indian Ocean region and it has already been exterminated through deliberate hunting in several small island developing states. This study combined local knowledge of fishers from interviews and incidental sighting cards with in-water seagrass surveys in order to identify this species' distribution, current threats and key habitat throughout the Union of the Comoros. The largest dugong population was found to exist on the island of Mohéli with smaller populations residing in seagrass habitats of Anjouan and Grande Comore. Findings are currently being used to develop a National Dugong Conservation Action Plan, to include the demarcation of Dugong Protection Areas (DPAs) to minimize threats such as incidental capture in gillnets and habitat degradation. A public awareness campaign has been initiated in order to promote understanding of this species and the need for its conservation in the Comoros. A collaborative long-term monitoring programme, implemented by local organizations and national government with the co-operation of village associations, will ensure that data continue to be recorded. The programme will document incidental sightings of dugong, encourage the necropsy of dead animals and monitor seagrass beds following internationally-recognized protocols. This approach will ensure that dugong conservation is centred on a participatory and inclusive approach in order to ensure sustainability and maintain the interest and support of local communities. This low-cost rapid assessment protocol is being promoted as a blueprint for dugong conservation work throughout the region, where technical capacity and financial resources are limited.

Countrywide West African Manatee surveys in Gabon

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Very little is known about the status, distribution, behavior or physiology of the West African Manatee (*Trichechus senegalensis*). There are no recent estimates of abundance and the impact of hunting and habitat destruction are poorly documented, but the trade in manatee bushmeat is well known in Gabon and elsewhere in West Africa. In 2006 we began a long-term, collaborative project comprising field research, interview, and market survey components to assess manatee status and distribution in Gabon. Objectives include determining current manatee distribution, habitat use and movement patterns for important use areas, preliminary genetic analysis, conducting market surveys and analyzing existing bushmeat data to assess the impact of hunting, training local biologists/resource managers in manatee research and conservation techniques, and developing recommendations for long-term conservation and management to government and other agencies. Over the past two years we have surveyed manatee habitat throughout Gabon, including inland freshwater systems and coastal estuarine environments, protected areas and areas where unregulated hunting still occurs. Interviews were conducted with current and former hunters, fishermen, park managers, scientists, NGOs and private citizens. The frequency of manatee sightings observed at several sites during these preliminary surveys is encouraging, and optimal locations for future GPS tagging work have been identified. Tissue and skeletal samples collected for genetic and individual age determination analysis will greatly contribute to scientific knowledge of the West African manatee due to the paucity of previous samples. Data collected for this project will not only improve our understanding of manatee status within Gabon, but will also contribute to a wider regional initiative for the species. In addition to increasing our knowledge of the general biology of these animals, we hope to address and resolve many of the impediments to our current knowledge on how best to conserve them.

Release Protocol of Manatees (*Trichechus manatus manatus*) in Brazil

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The release of manatees in Brazil had its beginning in 1994. The activity started with the identification of stranded live-orphaned calves as the main threat to the species in the northeastern coast Brazil, affecting their life cycle. Between 1989 and 2004, 39 live-orphaned calves had been rescued and transported to the Aquatic Mammals Center Rehabilitation Facility (CMA/IBAMA), where they were rehabilitated for latter release. In 10 years of work 13 animals have been reintroduced. The releases are being conducted

throughout Brazil with the following objectives: a) to increase the number of manatees in the wild, b) to reestablish the species' historical distribution in the Brazilian northeastern coast, c) to promote the coastal communities participation and d) to develop a radio tracking system for released manatees. A release protocol was established that follows a sequence of procedures, involving the following criteria and parameters: choice of animals (origin, time in captivity, feeding, morphometrics, genetics, medical status, behavior and individual marking), site for release (food and fresh water availability, logistic support, human occupation, presence of manatees, protected area, site of rescue), transport (distance, period, number of animals, monitoring, logistic), information campaign (public target, period, spreading material, public participation), temporary captivity in natural environment (period, dimensions, local, feeding, fresh water, monitoring, public visitation) and post-release monitoring (radio tag, tag assembly, time, team, health assessment, recaptures, data base, evaluation). Parameters have been established to evaluate the release success: foraging, habitat use, drinking, health status, behavior, human interaction and reproductive success. In 10 years of work the release protocol has been confirmed and is the basic process for permanent evaluation.

Use of Argos-linked GPS tags to document specific habitat-use patterns of manatees in eastern Puerto Rico

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The population of manatees in Puerto Rico is the only group of Antillean manatees (*Trichechus manatus manatus*) under the jurisdiction of the United States. Unlike Florida manatees, which make extensive use of estuarine and freshwater habitats, Antillean manatees in Puerto Rico are found almost exclusively in marine habitats and are dependent on seagrasses for food. Increasing human activity and development in the coastal zone threaten the long-term existence of this protected species. Federal manatee recovery mandates for population management and habitat protection specify the need for data on manatee movements and habitat utilization. The US Navy, faced with the pending transfer of the former U.S. Naval Station Roosevelt Roads, identified a need for detailed information on current manatee activity patterns. To address these concerns, the U.S. Geological Survey initiated a study to document the movement and habitat use patterns of manatees in eastern Puerto Rico and assess the resources they depend on. In spring 2005, nine manatees were tagged in eastern Puerto Rico using satellite-linked Global Positioning System (GPS) tags. GPS receivers coupled with Argos satellite transmitters, encased in floating tethered housings, provided accurate locations and enabled us to remotely monitor the detailed movements of tagged individuals. GIS analysis of these data with digitized habitat maps allowed us to correlate their movements with habitat types, and to identify travel corridors, sources of fresh water for drinking, and feeding locations. Tagged manatees ranged from Fajardo to Humacao and Vieques Island, with the greatest documented use in shallow areas having extensive seagrass beds. They accessed fresh water at the mouths of rivers (Fajardo, Daguao, Blanco, and Humacao) and from wastewater treatment plant discharges (Capehart and Bundy). Detailed data from GPS tagged manatees have proven valuable in the development of effective measures for manatee and habitat protection.

Using genetic information to understand manatee dispersal

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Throughout their history, Trichechids have had an uncanny ability to translocate and establish new populations within their limited range. Their vicariance often limits movement, but through deliberate migration or stochastic events, displaced populations spread into adjoining habitats. This phenomenon has been described as "swarming" by Domning when the founding population is large and acts as a source. Though these adjacent habitats are not always biologically suitable, the Trichechines persist due to an ability to modify their behavior to better adjust to the new habitat. As a result, specific but subtle morphological characteristics have evolved within each population. Florida is an example of a more recently established population, and the northwest Florida population of manatees that overwinters at Crystal River is an example of a new, outlier population. The Crystal River manatee population is well established and has been able to increase over the last 30 years. Long-term data sets (over 35 years) using photo-identification of distinct individuals (n=417) from Crystal River exist for the well studied winter population of manatees; additionally, aerial survey counts have been amassed with the most recent recorded high count during 2006 of 438 manatees. Knowledge of the genetic make-up of this group may play a role in understanding the population structure by complementing efforts to model various life history strategies. Since 1989 we have employed a cattle ear notcher to obtain a small sample of skin from the manatee's tail margin for DNA analysis. This method affectively marks the manatee, whereby duplicate samples are avoided. To date more than 600 samples have been collected. Generally, most genetic studies of populations require only a 10% representation of the initial

estimated population size. This massive effort provides inference into Florida manatee life history and population structure, including reproductive potential, migratory potential and occurrence, and population size.

LOCAL NEWS

BRAZIL



Back Home – Captive Amazonian Manatees are Reintroduced into the Wild. In March two young male Amazonian manatees raised in captivity at INPA (National Institute of Amazonian Research), Manaus, Brazil, were placed in a floating mesh-tank in the Cuieiras river, a tributary of the Rio Negro, about 80km from the city of Manaus (Amazonas State, Brazil), as part of a project to reintroduce Amazonian manatees into the wild. One of the manatees, called Puru, arrived at INPA in 1995 and the other, called Anamã, in 1998, weighing less than 20kg and measuring about 90cm. They were bottle fed with an artificial milk formula for approximately one year and afterwards fed with several different vegetables and para-grass. They weighed 140kg and 150kg, respectively, when finally released in the Cuieiras river. On March 1 2008, the two manatees were transported by a pick-up van from INPA’s facility to Manaus harbour, lying on thick mattresses, during a short trip of 30 minutes. From the van, the manatees were transferred into a plastic pool inside a regional boat for a 7-hour trip. For the past two years, an intense environmental education program was conducted with the riverine communities in the releasing area in order to create an ecological awareness and to ensure the safety of the manatees in this area. The boat with the manatees arrived in the largest

community of the Cuieiras area on March 2 2008. A “regional breakfast” was organized to assemble all the inhabitants of the six communities to greet the manatees. For one week, Puru and Anamã were kept in the floating mesh-tank to become familiarized to the river waters and the surrounding environment, for the researchers to monitor the adaptation of the animals to the VHF radio-transmitter belts and the signals, and to record any vocalization or communication attempts with wild individuals. After this period, the mesh walls were submerged, thereby freeing the manatees. Since then each animal has been continuously radio-tracked. Soon after being freed, Anamã moved about 7km downriver, while Puru remained in the same place for several hours. However, at one o’clock the next morning, both manatees were together 6km downriver from the release site. This was the first time that Amazonian manatees raised in captivity for over 10 years were released into the wild. This is the beginning of a major project, which intends to release more manatees, with the aim of recovering natural populations and their conservation. This project is being conducted by INPA, IPÊ (Instituto de Pesquisas Ecológicas) and AMPA (Associação dos Amigos para a Proteção ao Peixe-boi da Amazônia), and has been supported by Petrobras S.A., Fundação O Boticário de Proteção à Natureza, Projeto Corredores Ecológicos, CNPq, and Wildlife Trust Alliance. –**Fernando C.W. Rosas and Vera Maria Ferreira da Silva** (Instituto Nacional de Pesquisas da Amazônia (INPA) Laboratório de Mamíferos Aquáticos (LMA), E-mail: Frosas@inpa.gov.br). Photos credit: Divulgação/INPA.



EAST AFRICA

Survival of dugongs around Moheli Island. Extinct in the Mascarene Islands (Mauritius and Rodrigues) since the 19th century, sporadic populations of dugongs still occur in other sites of the West Indian Ocean (WIO). Listed globally by IUCN as vulnerable to extinction, this low reproductive and herbivorous marine mammal has been a direct and indirect victim of intensive hunting and habitat destruction due to coastal degradation. Few individuals live in the Seychelles' atoll of Aldabra, in Mayotte, and in the north of Madagascar (WWF/UNEP, 2004). East Africa still shelters small sanctuaries like the Bazaruto reserve in Mozambique (WWF/UNEP, 2004). No precise assessments have occurred in the Comoros Union. Studies carried out by Kelonia (Reunion Island-France), an observatory of marine turtles and their habitats, revealed the presence of a residual population in the southern part of the Moheli Island, an observation maintained by the english NGO Community Centered Conservation - C3 (Alfthan and Davis, 2006). This synthesis aims to collect fieldwork data harvested by Kélonia in partnership with the Moheli Marine Park (MMP) and the Social and Economical Development Association of the Itsamia village (ADSEI). Using investigations, seagrass assessments and aerial surveys (2003-2007), the objective was to confirm dugong survival in this marine protected area.

Assessments : location and methods. Moheli, the smallest island of the Comoros archipelago situated in the north of the Mozambique Channel, shelters the first national protected area of the Comoros Union, involving 10 villages in participative management. With 211km² for 35,000 inhabitants, Moheli benefits from a humid tropical climate. The MMP includes all the southern area from Miringoni (W) to Itsamia (E), covering more than 40000 Ha. The fringing reef surrounding the MMP is well developed and between 250-1300m wide.

Assessments of shallow seagrass communities and foraging populations of the MMP have been conducted since 2003 by Kelonia in a close partnership with the ecoguards and local associations such as ADSEI in Itsamia, a village known for its regional interest in nesting green turtles. Linear transects on the whole fringing reef of the MMP allowed study of seagrass species composition and distribution in 2003. Investigations on previous and recent sightings of dugongs and perceptions on the evolution of their own environment by fishermen of the MMP were conducted in 2004. Studies on seagrass productivity through herbivorous activity in 2005 and aerial assessments using a powered paraglider (bi-place airfoil wing and a 21 HP engine) in 2007 focused on the Itsamia area and resulted in counts and in situ observations of foraging green turtles and dugongs.

Dugong sightings. Through interviews with 109 fishermen in the local language of the 10 villages of the MMP, the 2004 investigation aims to clarify indicators of the dugongs decline and their recent distribution. When dugongs were observed, 73% of fishermen questioned were fishing with a traditional boat (pirogue). All 109 fishermen knew that dugongs (called “Ngouva”) occurred in coastal waters and 12% had accidentally or deliberately harvested at least one individual, while 54% had consumed its meat. Cow-calf pairs had been observed by 7% of the fishermen, but this was generally after capture with nets. Concerning the dugong status in Moheli, at the time of the investigation 70% of fishermen were aware of its protection law and 77% confirmed its decline in Mohelian waters. Answers on dugong observation periods were balanced. Only the observations made by the 80 fishermen still active in 2003 and 2004 have been taken into account for recent dugong distribution in the MMP. In 2003 and 2004, 15 and 32 fishermen, respectively, observed at least one feces characteristic of a dugong, while 9 and 13 fishermen, respectively, observed at least one dugong. Areas from Miringoni to Ouallah 2 (SW) and from Hamavouna to Hagnamoida (E) represent most of the sightings. In situ observations of one dugong in this last area were conducted during the 2005 study on the impact of herbivorous species (green turtles and dugongs) on the productivity of the *Halodule uninervis* dominant meadow. In 2007, two aerial survey sessions were conducted in March (5 flights for 2.5 hours of survey) and September (6 flights for 3 hours of survey) in the Itsamia area. A constant altitude of 150m and a low speed (less than 30km.h⁻¹) were maintained. Eight observations were made during seven of the 11 flights, documenting the presence of at least two individuals a minimum of two meters in length (one is photo-identified).

Dugong survival. Decline of dugongs in Moheli waters is mostly explained by net utilization by fishermen. Few of them specialized in dugong hunting, and religious or traditional aspects of this legendary animal reduced harvesting. Investigation on dugongs in Moheli island conducted in 1994 (Tilot – IUCN), 2004 (Beudard - Kelonia) and 2006 (Alfthan and Davis - C3) through fisherman interviews indicated the presence of large populations of dugongs before the 1970's. Increasing human population on the island for the last half century has multiplied pressure on both terrestrial and marine ecosystems. Deforestation generating ground water inputs in the coastal waters played an important role on the seagrass ecosystem, coupled with impacts of global change. Seagrass assessments in 2003 revealed a global restructuring of seagrass meadows of the MMP. Although previous precise data does not exist, a dense seagrass bed composed of *Thalassodendron ciliatum* totally disappeared during the 1990's. Investigation results and in situ studies indicate that the cumulative effects of discharging groundwater and the 1994 and 1998 ENSO events are responsible. Only dead roots of this species can be seen on the reef flat. The 2003 and 2005 studies revealed that most of the MMP areas shelter plurispecific seagrasses, mostly bottom dependant and with *Halodule uninervis* being dominant. *Halophila ovalis* patches or *Cymodocea* sp., *Thalassia* and *Syringodium* meadows can also be seen, depending on substrate and local conditions. This restructuring allowed more or less pioneer species to settle. Many reviews reported that *Halodule uninervis* meadows are preferred forage for dugongs and turtles. Intensive feeding by both species tends to increase forage quality in terms of both species composition and nutritional

quality (Aragones *et al*, 2006), therefore we can speculate on the positive effects of this restructuring for dugong survival. The 2005 assessment also showed a seasonality of seagrasses in Itsamia. Density and productivity are dependant on weather fluctuations. Seagrasses are influenced during the wet season (Austral summer from November to March) by ground water discharges but zones are unlikely to be exposed. During austral summer, both extremities of the seagrass area are subject to these inputs, resulting in high sedimentation and turbidity. The middle zone remains a good area for foraging. During austral winter, currents and winds wash the reef flat of the mud. Local conditions, forage quality, and forage availability could explain the presence of a resident population of the dugong near Itsamia through the year.

Conclusion. Since the end of the 1990's, several research programs emerged in the Comoros Union from local and foreign NGO's, notably on marine turtles, whales and dugongs. Despite the knowledge accumulated, lots of indicators (population size, food availability, impacts of coastal development, etc.) remain unknown. In Itsamia, *Halodule uninervis* dominance and quietness of the area can justify that dugongs still occur. In this region nesting marine turtles and their habitats are strongly protected by each citizen, advancing ecotourism advantages. A regional Indian Ocean South-East Asia Memorandum of Understanding on their conservation emerged in November 2006. The Indian Ocean Commission created a cetacean-dugong network between marine protected areas in January 2008 to allow for conservation of these endangered species in the WIO. Awareness of environmental priorities, building capacities of local environmental associations such as ADSEI, and the MMP settlement at the end of the 1990's has educated the local populations, notably in their fishing practices. This has allowed or stopped harvesting, depending on the village. Hopes of the local population turned to ecotourism, but the dugong, as a 'K-selected' life history species, needs time to recover. Several observations suggest that breeding still occurs, such as in Tanzania and Mayotte (Muir and Kiska, 2007). In November 2007, a fisherman observed a cow-calf pair in the MMP (Pers. Com. Adifaon), showing the success of conservation efforts as supported by Mohelians themselves. **-François Beudard and Stephane Ciccione** (Educational and Scientific Assistant – Kelonia, The Observatory of Marine Turtles, BP40, 97436 Saint Leu, Reunion Island, France, E-mail: francoisbeudard@kelonia.org; Director - Kelonia, The Observatory of Marine Turtles, BP40, 97436 Saint Leu, Reunion Island, France, E-mail: stephaneciccione@kelonia.org)

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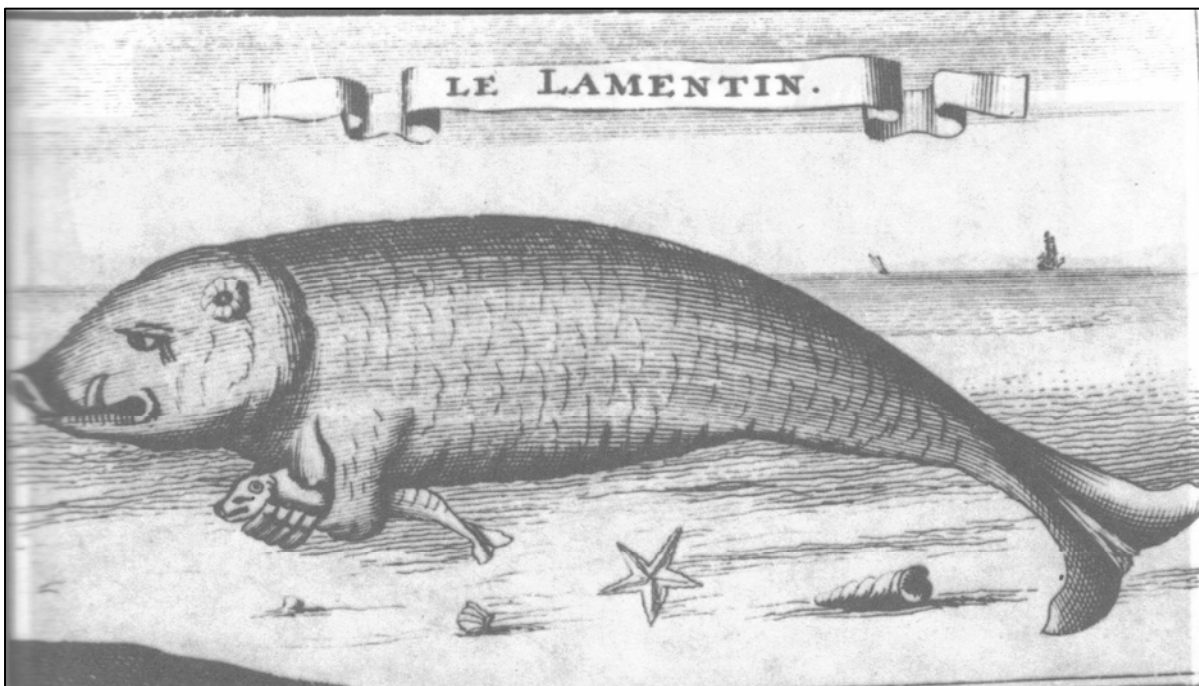
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Has the dugong gone the way of the Dodo? Mauritius is an island nation of volcanic origin that forms part of the Mascarene Islands and is situated approximately 900km east of Madagascar in the West Indian Ocean. Historical documents suggest that dugongs were once prevalent in this area and the earliest report of their occurrence was noted by Captain Cornelius Matelief in 1606 (in Stoddart, 1971). Seventeenth century reports illustrate the abundance of the species at the time, describing huge herds that were freely harvested (Leguat, 1708). Descriptions in the 18th century generally detail a reduction in numbers, although the species was still fairly numerous at Rodrigues; there are no further references from the 19th century onwards. However, this is also the case for many other islands where dugong populations persist in the 21st century in small numbers. Marine biology is a relatively new field which only emerged as a recognized discipline in the 20th century, and consequently, exploratory zoological expeditions and their associated literature focused predominantly on terrestrial fauna. The colonial administrations of Mauritius were uninterested in conducting research into marine fauna, a potential explanation of the absence of written material on dugongs since the 1800s.



An artist's impression of Leguat's description of the dugong

The IUCN Red List states that the dugong is questionably extinct in Mauritius. However, the species is considered declining or of an unknown

status in much of its range and the little information available is based predominantly on anecdotal evidence. Opportunistic sightings have led to the discovery of dugongs in areas where they had been previously declared extinct, such as the discovery of two individuals at Aldabra Atoll, Seychelles in 2001 (Marsh et al., 2002), which was followed in 2003 by the sighting of a juvenile. The species was thought to be extinct in the locality since the early 20th century and its reappearance alludes to the animal's ability to undertake large-scale migration within its range because the atoll is at least 300km from the nearest extant populations of the Comoros and Madagascar. Further evidence of long-distance migration was provided in 2002 when a dugong arrived at the Cocos (Keeling) Islands which are separated from the nearest shallow water coastal habitat (Java,

Indonesia to the northeast) by 1000km and depths of up to 4000m (Hobbs et al., 2007). This has been acknowledged as the longest recorded dugong movement and is again indicative of this species' capacity for long distance oceanic movements to colonize new locations.

Given that historical records indicate that thousands of dugongs were once present around the islands of Mauritius and Rodrigues (600km east of Mauritius), in combination with the species' ability to undertake large-scale migrations, there is a chance that they still exist in Mauritius in small numbers or, following local extinction, have immigrated from neighbouring Madagascar. Indeed, an unconfirmed sighting in 1999 by the late marine mammalogist, Delphine Legay, further supports the possibility of dugongs in Mauritian waters and the need for further studies.

An investigation to confirm or contest the species' extinction in Mauritius will be implemented in Mauritius by Community Centred Conservation (C3) in collaboration with the Ministry of Agro Industry and Fisheries (Fisheries Division). Fishers from the islands of Mauritius and Rodrigues will be invited to meetings at which presentations will be given about the dugong, its endangered status throughout the western Indian Ocean, threats, and conservation priorities, providing an opportunity to increase awareness to encourage reporting of dugong sightings in the future. Anecdotal information will be gathered from fishers who have seen dugongs or who have heard historical accounts from their predecessors. Copies of sighting cards will be distributed to fishers' associations, marine research institutions and dive operators throughout the islands to record historical accounts or future sightings. In addition, crew of vessels and pilots operating in Mauritian waters will be approached, informed and questioned about dugongs.

C3 has conducted research into dugongs in the western Pacific (Palau) and western Indian Ocean (Comoros) using aerial surveys, seagrass mapping, long-term incidental sighting programmes and semi-structured fisher interviews. A number of relevant publications are available for download from <http://www.c-3.org.uk/English/General/reports.htm>. -**Gary Haskins** and **Patricia Davis** (Community Centred Conservation (C3), www.c-3.org.uk, info@c-3.org.uk)

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GHANA

Capacity Building Program to Benefit West African Manatees. The West African Manatee Project in Ghana is specifically focused on improving the conservation status of West African manatees through research, community conservation, and capacity building. In collaboration with Nature Conservation and Research Centre (NCRC), the University of Ghana (UG), Sirenian International (SI), Wildlife Trust (WT), and the Sirenia

Project (USGS), Earthwatch Europe (EW) funded a 2-week West African Manatee Research and Capacity Building Expedition in November 2007. This was the first of several EW funded West African Manatee Expeditions planned for the Afram Arm of Volta Lake, Ghana over the next 3 years (see Sirenews No. 47 for background information).

During the workshop portion of the expedition, seven EW Fellows presented papers on the status of manatee research and conservation in their home countries. Additionally, they participated in presentations, training, and discussions focused on: (1) evolution, behavior, biology, and ecology of the Order Sirenia; (2) methods for the study and conservation of extant sirenian populations; (3) establishment of systematic protocols for localized research projects; (4) identifying sources for funding; (5) methods for water quality analyses; (6) identification of aquatic vegetation; (7) collection and analysis of manatee sighting and environmental data; (8) measurement and analysis of manatee skulls; (9) and an introduction to genetic research, including training on the collection of manatee tissue, blood, and bone samples for genetic analysis.

During the research portion of the expedition, Dr. Ofori-Danson (UG) and the EW Fellows developed and tested manatee survey and habitat sampling methods and then established protocols to be followed by future teams. Boat based point surveys resulted in 2 manatee sightings, rare events for scientists working on Volta Lake. Local manatee hunters provided manatee skulls for measurement and allowed bone samples to be taken for genetic analysis. Additional skull and bone samples were provided by Dr. Ofori-Danson.

Previous objectives set during the planning phase of this project were to: (1) increase awareness and reduce human/manatee conflict in the shoreline fishing communities along the Afram Arm of Volta Lake; (2) enhance local capacity and expertise with regards to the species; and (3) improve economic and social conditions in the project communities (Sheppard 2007, Sirenews No. 47). Our efforts to date have resulted in: (1) at least one former manatee hunter has been converted to a manatee guide for the project and no longer hunts manatees; (2) another hunter is showing interest in the research and the potential for an alternative livelihood; (3) 7 West African Fellows have been formally trained in manatee biology, research and conservation; (4) local fishermen and boat operators were employed as boat captains, spotters, and field assistants; (5) local villagers were employed to build and run the research camp and provide services, such as food preparation, to the research team. Additionally, most food and supplies were purchased in Ekye-Amanfrom, the nearest village with the capacity to provide such products.

The results of this first EW/NCRC Capacity Building and Research Expedition supports the proposal by NCRC that the Upper Aram Arm of Volta Lake should be set aside as a West African Manatee Sanctuary before the insular Volta Lake population becomes extinct. If provided with such a sanctuary, the West African manatee could become a central focus for research, education, tourism, and community conservation efforts along the shores of Volta Lake, offering economic benefits to the local inhabitants while simultaneously meeting conservation objectives.

Acknowledgements and Credits: We are grateful to the leaders and villagers of Simon Kwae, also known as Gavorkope, who blessed our research team during a welcoming ceremony, entertained us with traditional music and dance, and allowed us to win a football match against their much superior team. We also thank Assembly Timotay Gborglah of Ekye-Amanfrom who has been our local host and translator since 2004. Principal Investigator for this project is P. K. Ofori-Danson of the University of Ghana. The research team was fielded with West African Fellows, seven young scientists from Nigeria, Ghana, Sierra Leon, Senegal, and Cameroon, who received funding for the expedition through the EW Capacity Building Program. NCRC project coordinator, Martin Yelibora, was assisted by additional NCRC staff. Katie Wilson (EW-Europe) provided logistical and moral support; Bob Bonde (USGS) and Lucy Keith (WT) sent us genetics training tools, datasheets, and presentations; Daryl Domning of Howard University advised on development of the skull

measurement training workshop and graciously posed for training photographs; Caryn Self-Sullivan (SI) joined the expedition to advise on sampling methods, data collection, and to facilitate the capacity building workshops.

For more information on this project, please contact Caryn Self-Sullivan (caryn@sirenian.org) or John Mason (JohnMason@ncrc-ghana.org). To view video from the expedition, visit Earthwatch Europe's Capacity Building Webpages at: http://www.earthwatch.org/europe/our_work/capacity_building/cbp_casestudies/cbp_manatee
-Caryn Self-Sullivan

INDONESIA

Progress of the National Dugong Conservation Strategy and Action Plan for Indonesia. The project to develop a National Dugong Conservation Strategy and Action Plan (NDCSAP) for Indonesia was launched in April 2007. Herewith we intend to report on the first results of this collaborative project achieved during 2007, with special reference to the results of a Steering Committee (SC) meeting and consultative workshop organized 16 and 17 November 2007 in Bali, Indonesia. We will also report on the planned activities for 2008. In summary it is the intention to transfer the National Dugong Data Base (developed by the Institute of Environmental Sciences (CML) Leiden University, the Netherlands) to the Research Centre for Oceanography (RCO) and an NGO (Yayasan Terangi), Indonesia during 2008 and to finalize and present the final NDCSAP for Indonesia to the Steering Committee and stakeholders during a meeting in Manado at the end of 2008.

For the NDCSAP for Indonesia the Research Centre for Oceanography (RCO) Jakarta, Indonesia and the Institute of Environmental Sciences (CML) Leiden University Leiden, the Netherlands signed a Memorandum of Understanding (MOU) in April 2007. Under this MOU a Joint SC has been established, which will give guidance and technical advice to the coordinators of the project. Two coordinators and one assistant coordinator have been appointed to execute the project; Wawan Kiswara, MSc, for the Research Centre for Oceanography (RCO) and Dr. Hans de Iongh for the Institute of Environmental Sciences (CML), as coordinators and Marloes Moraal, MSc, for CML as assistant coordinator.

The main objective of this program is to use the available scientific data on dugong distribution and ecology in Indonesia to draft a NDCSAP for the remaining dugong populations in Indonesia. This program has been implemented under the umbrella of the UNEP Regional Seas Programme and the UNEP Convention on Migratory Species (CMS) as an Indonesian-Dutch collaboration. For the development of the strategy a phased approach was followed, covering 2007 and 2008. Major outputs of the first year (2007) have been defined as a) a draft table of contents of the NDCSAP b) a draft National Dugong Data Base, c) a work plan for 2008, d) educational material such as pamphlets and posters and e) a first mailing list of NGOs in Indonesia interested in contributing to the National Dugong Data Base. Main activities organized have been two SC meetings and one NGO workshop in Bali. In addition a first staff exchange between RCO and CML has taken place, in order to train staff at RCO and Yayasan Terangi in data management skills.

Sub-objectives of the proposed program have been defined and have been realized as follows:

1) Identification of the most recent conservation status of dugong populations in Indonesia, including an update of the main dugong distribution and population size. This sub-objective has been met by a review of the available scientific literature, supplemented by incidental field surveys to fill in the gaps;

2) Identification of available seagrass habitat and associated dugong grazing swards, to estimate maximum sustained population size. This sub-objective has been met by a review of the available scientific literature, supplemented by incidental field surveys to fill in the gaps;

3) Identification of the main threats to dugong survival. This sub-objective has been met by an analysis of the available scientific literature, supplemented by incidental field surveys (Balikpapan Bay, Banten Bay) to fill in the gaps. Conclusions have been formulated by the coordinators in close consultation with the Joint SC (see meeting reports of SC in the annexes);

4) Definition of strategic objectives and priority actions for dugong conservation and management. This sub-objective has been met by an analysis of the available scientific literature, supplemented by incidental field surveys to fill in the gaps. Conclusions have been formulated by the coordinators in close consultation with the Joint SC (see meeting reports of SC in the annex IA and IB).

During the first SC meeting on 2 April 2007, expatriates (CML Leiden, The Netherlands), Indonesian researchers and students (UNMUL and the Research Institute for Oceanography in Jakarta) discussed the NDCSAP for Indonesia during 2007.

The SC members commented on a first draft table of contents and outlined a number of important recommendations for the coordinators. They also commented on a draft terms of reference for the SC. It was agreed that the anticipated outputs at the end of 2007 would be a) a first draft NDCSAP, including an identification of major gaps in information, b) a draft National Dugong Data Base, and c) a work plan for 2008 with the intention to finalize the NDCSAP for Indonesia during 2008.

The SC supported the intention to implement additional (aerial or ground) surveys and to update our knowledge of dugong distribution during 2007 and 2008 if additional funds were received. In addition the SC agreed to organize an NGO workshop on 17 November 2007. A first draft communication plan was proposed, to be implemented if additional fundraising was successful. Initial information material such as posters and pamphlets were produced and distributed with funding from IUCN –EGP and Sea World Ancol Jakarta.

Thanks to financial support by the IUCN Netherlands Committee Ecosystem Grand Programme (EGP) a second SC meeting was organized on 16 November 2007 in Sanur, Bali and an NGO workshop was organized on 17 November 2007 in hotel Ari Putri in Bali. The SC members and several national NGO representatives were present at the workshop on 17 November 2007: representatives from Bunaken National Park; “Forum Masyarakat Peduli Bunaken” WWF Bunaken; WWF Alor Region; WWF Solor; Conservation International for Kaimana and Triton Bay, Papua; WWF-Berau; WWF Bali; Walhi; Yayasan Nazareth; Yadfong Association; The Nature Conservancy; James Cook University, Phd student; Cendrawasih Bay National Park; and the University of Papua, Manokwari. Main objectives of the Bali workshop were to establish a national NGO network (dugong network) with NGO members active in all relevant Indonesian provinces where dugongs occur. During the workshop topics such as the need to develop a NDSCAP, the implementation of participatory surveys on dugong occurrence, and awareness campaigns were discussed. Also experiences between NGO network members were shared. We hope that more capacity building will lead to, amongst other things, stronger NGO advocacy towards provincial governments and regional institutions for the formulation and implementation of NDCSAP.

During the last SC meeting on 16 November 2007 it was decided to prepare both a technical backup document as well as the main NDCSAP document. Finally it was also decided to transfer the National Dugong Data Base developed at the Institute of Environmental Sciences to the Research Center for Oceanography in Jakarta and Yayasan Terangi, including training of staff on the use of this data base. The final results of the project will be presented during a SC meeting and workshop organized in Manado (North Sulawesi) at the end of 2008. -**Hans de Iongh**¹, **Wawan Kiswara**² and **Marloes Moraal**¹ (¹Institute of Environmental Sciences, POB 9518, 2300 RA Leiden, the Netherlands, E-mail: Iongh@cml.leidenuniv.nl; ²Research Centre for Oceanography, Jl Pasir Putih I, Ancol Timur, Jakarta Indonesia 14430, E-mail: wkiswara@indo.net.id)

ABSTRACTS

CONSERVATION NEEDS OF THE DUGONG (*Dugong dugon*) IN CAMBODIA AND PHU QUOC ISLAND, VIETNAM

Ellen Hines, Kanjana Adulyanukosol, Phay Somany, Leng Sam Ath, Nick Cox, Potchana Boonyanate and Nguyen Xuan Hoa. 2008. *Oryx* 42(1):113-121.

This research was conducted to assess the location of population groups and conservation issues affecting dugongs (*Dugong dugon*) along the eastern Gulf of Thailand off Cambodia and Phu Quoc Island, Vietnam. Interviews in fishing communities in 2002 and 2004 along the Cambodian coast revealed that dugongs are sporadically found in fishing nets and their body parts are sold for a relatively large profit. During 4 days of aerial surveys in Cambodia in 2004 we saw no dugongs. We interviewed villagers in Phu Quoc Island, Vietnam, in 2002 and learned that dugongs are regularly found and hunted, again for high profits. In both countries we recommend that legislation addressing threatened species be strengthened and enforced. In collaboration with the Cambodian and Vietnamese governments and NGOs, we propose the exploration of alternative nondestructive fishing methods and the initiation of an education campaign based on conservation of marine wildlife and the nearshore environment. National and transboundary management and community-based conservation are required in conjunction with strategies to address overfishing and poverty.

DISTRIBUTION AND ABUNDANCE OF THE DUGONG IN NEW CALEDONIA, SOUTHWEST PACIFIC.

Garrigue, C.; Patenaude, N. and Marsh, H. 2008. *Marine Mammal Science* 24(1):81-90.

New Caledonia is at the eastern limit of the dugong's range. In June 2003 standardized dugong aerial survey methodology was used to estimate the abundance and distribution of dugongs in the coastal waters of New Caledonia, resulting in a population estimate of 1,814 \pm 3/4 SE 332. This represents the largest concentration of dugongs in Melanesia and one of the largest populations in the world, outside Australia and the Arabian region. Calves comprised 7.2% of the population. The observed density of dugongs was highest in the center and southern part of the west coast of the island but not significantly different from the density on the northwest and northeast. In the central west region, sightings were associated with a pass in the barrier reef and up to a third of the on-survey sightings were outside of the barrier reef. The dugong distribution we observed during June 2003 differs from the reported locations of historical hunts in several respects.

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