Sirenews

Newsletter of the IUCN/SSC Sirenia Specialist Group

NUMBER 30 OCTOBER 1998

EDITORIAL: DUGONGS AND DEBT

Among the many preparations for the calendrical rollover to the new millennium is a growing campaign to cancel the crushing international debt of many developing nations. This "Jubilee" movement draws its name and inspiration from the ancient Biblical injunction to liberate slaves and cancel debts at the end of a 50-year period (Leviticus 25:10ff.). The modern version seeks to liberate, by the year 2000, the many impoverished nations that are presently enslaved by debt to first-world lending institutions.

In many cases, these loans were ill-conceived to begin with, and produced little in the way of useful "development" (or actually did environmental harm); much of the money loaned was stolen by corrupt officials in the recipient countries; and the lenders have already recovered more than the principal of the loans. Yet the interest rates ensure that the loans remain "unpaid", and servicing of the debt continues to absorb the lion's share of the recipient governments' revenues. Though the benefits mostly go to the wealthy and powerful, the burden of repayment inevitably falls most heavily upon the

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 espèces—Species Survival Commission

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poorest members of these societies, because debt repayment siphons off funds that are desperately needed for health, education, and other services.

What does any of this have to do with conservation of sirenians? Plenty. When nations are not even able to educate their own people or give them basic medical care, serious expenditures for protecting endangered species are not to be expected. For example, Mario de Mello Dias calls attention in this issue to the inadequate protection of dugongs in Mozambique. According to the U.S. Jubilee 2000 Campaign, Mozambique has a gross national product of only US$80 per person, but a debt stock of $323 per person. Is it likely that dugongs will be on that government's agenda as long as that burden of debt remains?

The same is true in many of the developing nations which comprise most of the range of sirenians today. The Jubilee 2000 Campaign notes that in Nicaragua, debt payments absorb more than half the total government revenues; in Honduras, debt service obligations are double the combined budgets for health and education; in Africa, four times more is spent on interest than on health care. Examples could be multiplied.

It is time to acknowledge that the prevailing system of international finance, tied to a philosophy of neoliberal economics and "free trade" (*i.e.*, free of legal restraint), is designed to systematically transfer wealth from the poor to the rich. (According to the Jubilee 2000 Campaign's figures, the International Monetary Fund alone has transferred more than US$3 billion OUT of Africa since the mid-1980s.) This modern form of mercantilism cannot work to the advantage of most of the human race, let alone that of endangered species. It is a recipe for global economic, political, and environmental disaster in the next century (or even sooner, if the current world economic crisis is any indication). Reform of this system is urgently needed. A good way to start is with a resolution of the debt crisis that involves justice as well as responsibility on the part of both lenders and borrowers.

The Jubilee 2000 Campaign provides an apt rallying point. For more information, contact: Jubilee 2000/USA, 222 East Capitol St. NE, Washington, DC 20003-1036; phone: 1-202-783-3566, e-mail: **<coord@j2000usa.org>**, website: **<www.j2000usa.org/j2000>. - DPD**

HELENE MARSH WINS PEW FELLOWSHIP

Sirenia Specialist Group Chairperson Helene Marsh is one of ten recipients of the 1998 Fellowships in Marine Conservation awarded by the Pew Charitable Trusts. An initiative of the Philadelphia-based Pew Charitable Trusts in partnership with the New England Aquarium, The Pew Fellows Program annually awards ten $150,000 fellowships which contribute to advancing solutions in fisheries conservation, marine pollution, coastal management, and marine ecosystem conservation. In this International Year of the Ocean, the former Pew Fellows Program in Conservation has been renamed the Pew Fellows Program in Marine Conservation to reflect its new focus on the world's oceans.

The fellowships are highly competitive awards first given in 1990 and based on the applied conservation merit of the proposal, the applicant's professional achievement, and the potential impact of the project.

Dr. Marsh has been a Professor at James Cook University, Queensland, Australia, since 1988, working on marine wildlife ecology, coastal management, and indigenous resource management. Her Pew Fellowship project brings together government and indigenous community stakeholders to address sustainable co-management of endangered dugongs in Australia. Activities include development of new methods to estimate endangered populations, integration of traditional knowledge and practices with western science for sound management plans, and creation of culturally appropriate educational materials. The result will be a sustainable co-management plan that can serve as a model for negotiating marine protection in similar situations throughout the region.

Congratulations, Helene!

LETTER

To *Sirenews*:

I always look forward to reading *Sirenews* to keep myself posted on all the Sirenia developments around the world. But I am afraid that No. 29 (April 1998) was not a bringer of good tidings.

I am extremely sad and (why not say it) outraged with the Local News article written by Paul Dutton from South Africa, regarding the East African dugongs. It is unacceptable that the authorities in Mozambique are just sitting, doing nothing about the continuous plundering of the population of dugongs in the Bazaruto Archipelago! May I also say the current legislation of that country regarding the killing of dugongs is, to say the least, infantile.

In Brazil, some 30 to 50 years ago, the manatee (*Trichechus manatus*) was under a great threat of extinction. Thanks to effective environmental education work carried out by the Manatee Project, which I had the privilege to be part of, and by "strong" legislation, we were able to reverse the situation, and today we have a slow but certain recovery and increase in the population of our *T. manatus* as well as ineffective legislation and pathetic attitude of the Mozambican authorities.

I would also like to express my utmost regret regarding the frightfully sad situation of Florida's *T. inunguis*.

May I therefore register my utter disgust and immeasurable protest over the completely manatee mortality. The *Contingency Plan for Catastrophic Manatee Rescue and Mortality Events* prepared by the U.S. Fish and Wildlife Service should be praised. At least one can see somebody cares - unlike our East African fellows. I can only hope the next issue of *Sirenews* will bring good news from Paul Dutton and from the *Manatee News Quarterly.*

As a member of the IUCN Species Survival Commission and also of the IUCN Commission on Environmental Strategy and Planning, allow me to congratulate *Sirenews* on the wonderful job you are doing for the world's sirenian population.... - **Mario Antonio de Mello Dias** (Alagoas, Brazil)

MANATEE AND DUGONG ACTION PLANS

The draft IUCN Manatee Action Plan is currently being updated and completed by the Sirenia Project, U.S. Geological Survey - Biological Resources Division, with the

assistance of Antonio Mignucci-Giannoni of the Caribbean Stranding Network (Puerto Rico), Buddy Powell of the Florida Marine Research Institute, and Miriam Marmontel of the Sociedade Civil Mamirauá (Brazil). Plans are to have a final version in early 1999. If you are interested in contributing new information on the status of manatees in Mexico, Central and South America, or Africa, please contact Mr. Bob Bonde, Sirenia Project, USGS, 412 NE 16th Ave. Room 250, Gainesville, FL 32601 USA; phone: 1-352-372-2571; fax: 1-352-374-8080; e-mail: <**Robert_Bonde@usgs.gov**>. - **Lynn Lefebvre**

Thanks to the considerable efforts of Joanna Hugues and Amanda Hodgsen and the inputs of many people, a draft of the Dugong Action Plan should be ready for comment in a few weeks. Additional information on dugong distribution and abundance from throughout its range is still sought. If you can help, please contact me as follows: e-mail: <**helene.marsh@jcu.edu.au**>; fax: 61-747-815581; postal address: School of Tropical Environment Studies and Geography, James Cook University, Townsville, Australia 4811. - **Helene Marsh**

NEW SIRENIAN WEBSITE

I have established a new website entitled The Call of the Siren. It should be of interest to scientists, students, and the public as a most comprehensive and organized collection of sirenian resources and research links. It includes information on my research, and links to sirenian research around the world. It also includes links to online documents, e.g., *Sirenews*, the Marine Mammal Protection Act, the Endangered Species Protection Act, the Convention on International Trade in Endangered Species, and bibliographies; to societies and journals, e.g., the Society for Marine Mammalogy, the Acoustical Society of America, and the Society for Conservation Biology; and to stories and places of interest for the public. The URL is: <**http://members.aol.com/caryn1001/index.html/homepage.html**>. - **Caryn Self Sullivan**

"DOWNSIZING FLORIDA: AIMING FOR 7 MILLION"

This is the title of the Third Annual Fall Conference of Floridians for a Sustainable Population, to be held in cooperation with the Academy of Senior Professionals at Eckerd College, St. Petersburg, Florida. It will be held on Saturday, 24 Oct. 1998, from 9 AM to 5 PM, and will feature four speakers in addition to roundtable discussions on population growth and development in Florida. Registration costs $25 and includes lunch. Registrations should be mailed by 15 Oct. to: F. S. P. c/o Joyce Tarnow, 531 E. McNab Road, Pompano Beach, FL 33060. For information, call (954) 942-7278 or e-mail <**jtarnow@ worldnet.att.net**>.

LOCAL NEWS

AUSTRALIA

Extinction Risk and Conservation Priority: The Case of the Dugong in the Great Barrier Reef Region. - The recent controversy over the decline in dugongs in the southern Great Barrier Reef region in Queensland, Australia, and the resulting management actions has highlighted the complexity of assessing extinction risk over a variety of spatial and temporal scales. The associated confusion about extinction risk and conservation priority has been used effectively to polarize the debate.

The dugong is variously listed as follows:

Spatial Scale	Temporal Scale	Status	Agency
Global	3 generations (90 yr)	vulnerable	IUCN
Australia	25 yr	not listed	Australian government
Queens-land	3 generations (90 yr)	vulnerable	Queensland government

The temporal scales over which extinction risk is determined are defined by the criteria used.

Commercial fishers have justified their objection to the establishment of Dugong Protection Areas in which gill-netting is banned by pointing out that the dugong is not listed under Australian legislation, and that this status has been upheld in a recent review. Another group argued that, as dugong numbers in the southern Great Barrier Reef comprised less than 2% of the estimated Australian total, management intervention was unwarranted. Their stance ignores several key issues:

- that the dugong is listed as vulnerable in Queensland waters;
- that one of the reasons for nominating the Great Barrier Reef as a World Heritage Area in 1981 was its importance as a feeding ground for large populations of dugongs; and
- that it is widely recognized that, despite its huge range, "the outlook for the dugong seems dim indeed, but for what Australia can do" (Bertram, 1981).

Indeed, the rationale for management intervention by the Australian Minister for the Environment was not extinction risk, but conservation priority, as required by the World Heritage Listing of the Great Barrier Reef region.

Similar confusion between extinction risk and conservation priority is likely for other sirenians, as their ranges are large relative to most of the terrestrial species for which the measures of extinction risk were largely developed. Equating extinction risk with conservation priority risks limiting conservation efforts to "basket cases", while ignoring international responsibilities and taxonomic uniqueness. We need to follow the example of Avery and his coworkers, who developed a sophisticated matrix for developing conservation priorities for British birds (*Ibis* 137: s232-s239). - **Helene Marsh**

Aerial Survey of the Gulf of Carpentaria. - The Queensland waters of the Gulf of Carpentaria comprise a large and generally remote region which is well known for its marine wildlife, including the dugong; three species of

coastal dolphins (bottlenose dolphin, Irrawaddy River dolphin, and Indo-Pacific humpback dolphin); and six species of sea turtles. Even though shoreline surveys were conducted in the 1970s, most of the region had not been surveyed using the quantitative aerial survey techniques that are now standard for dugongs in Australia.

These waters (33,026 km²) were surveyed between 2 and 6 December 1997 using two survey crews each of six people in two aircraft. Two aircraft enabled the survey to be completed in five days, and minimized the chance of the population estimates being confounded by local movements of dugongs within the survey period.

The total population estimate for dugongs in the survey area was 4266 ± s.e. 656.9 at an overall density of 0.1230 ± 0.0199 dugongs per km², of which 62% were in the Wellesley Island area and 45% in the inshore waters of this region within the 3 m depth contour. This confirms that the Wellesley Island region is the most important dugong habitat in Queensland apart from Torres Strait and Princess Charlotte Bay. A similar (but not identical) survey of the Wellesley Island region in 1991 resulted in a population estimate of 4066 ± s.e. 723 dugongs. The number of dugongs sighted in both 1991 and 1997 was sufficient for statistical comparisons in only three survey blocks within this area. There was no significant difference between the estimated numbers of dugongs in these blocks in 1991 and 1997. However, the interaction between time and block was different between the two surveys due to a change in the distribution of dugongs within the Wellesley Island region, which is under Native Title claim and is believed to support a significant Indigenous fishery for dugongs and green turtles.

I am presently negotiating with the commercial fishing industry about how they can achieve their aim of "minimizing the effects of fishing on protected wildlife" in this region. - **Helene Marsh**

BELIZE

Poachers Take More Manatees in Port Honduras. - Biologists in Belize recently reported an estimated population of about 500 manatees along its protected coastal shores. In a program supported by the Wildlife Conservation Society, Wildlife Preservation Trust International, and the Belize Coastal Zone Management Program, James Powell, Nicole Auil, and other local biologists are currently radio-tracking four manatees in central Belize in an effort to learn more about their biology and migratory behavior. Public knowledge and awareness are increasing, thanks to implementation of aggressive educational programs.

However, it was recently brought to our attention by Mr. Wil Maheia of the Toledo Institute for Development and Environment that these endangered marine mammals are still occasionally being hunted. On 31 August, Wil released some information about the additional slaughter of manatees in the Port Honduras area of southern Belize. This situation was first brought to the attention of *Sirenews* readers in the October 1995 issue (No. 24). In that issue, Bonde and Potter reported finding evidence of 35 manatee carcasses at 11 coastal butchering sites in Port Honduras. They theorized that poachers were killing manatees in southern Belize

and transporting the meat back to Guatemala for sale.

Wil received a report that manatee meat was recently available for sale in the markets in Livingston, Guatemala. He decided to go out into the Port Honduras area near Punta Gorda to see if he could find any evidence of a recent manatee slaughter. He quickly found a freshly butchered manatee carcass. Reports soon followed of two additional manatees that were killed. Apparently, the manatees are harpooned and taken to shore, where the meat is removed from the bones by the poachers and transported to Guatemala to be sold in the marketplace. As long as there is a demand for this meat, this activity will continue!

What measures are necessary to stop the senseless killing of this precious and protected marine mammal? Laws are on the books to protect manatees in both Belize and Guatemala. Yet, manatees are still being killed. The complexity of this situation is compounded by the fact that the poaching area is very large and isolated. Efforts to patrol this remote region by law enforcement are logistically difficult and financially taxing. The governments are aware of the problems and are working diligently to stop this unfortunate activity. Obviously, more Belizean officers should be conducting patrols in southern Belize, and Guatemalan officials should levy and enforce strict fines on merchants and fishermen that are caught selling endangered manatee meat in the open market. I urge you to express your support for the protection of the West Indian manatee in these areas by contacting the Honorable Daniel Silva, Minister of Agriculture and Fisheries, Belmopan, Belize, and the Honorable Mariano Ventura, Minister of Agriculture, Guatemala City, Guatemala. You should also contact the Guatemalan Ambassador to the United States, Peter Lamport (**<Embaguat@sysnet.net>**) and the Guatemalan Ambassador to Belize, Antonio R. Castellanos Lopez (**<guatemb.bz@btl.net>**). Additional information about the poaching incidents can be obtained by contacting Wil Maheia (**<pgwil@btl.net>**). - **Robert K. Bonde** (Sirenia Project)

BRAZIL

First Amazonian Manatee Conceived and Born in Captivity. - **Vera da Silva** of INPA in Manaus reports that on April 8, 1998, between 0700 and 0900, a captive female *Trichechus inunguis* gave birth to a male calf after 24 years in captivity. Both mother and baby are fine.

The mother, named Boo, arrived at INPA in July 1974 as an orphaned calf only 116.5 cm long and weighing 26 kg. Her mother had been killed by a hunter and Boo herself had been harpooned, but was in good general condition. Diana Magor obtained possession of her from a local aquarium that had gotten her from the hunter. Since Boo was already eating plants on arrival at INPA, she was maintained on solid food thereafter and never given milk formula. By the end of January 1998, she was up to 240 kg.

As only the second captive manatee to have been obtained by the INPA manatee project, Boo has participated in numerous research studies over the years - not always willingly, however. I remember her well from my years at INPA (1976-78): because she had never had the intensive human contact that goes with being nursed on a bottle, she was notoriously hard to handle (unlike most of our

captives, who were bottle-raised and very docile). It's good to know she is now a mother. - **DPD**

CALIFORNIA

Manatees on the Move: From Florida to California. - On 9 March 1998, five male Florida manatees in the rehabilitation program at SeaWorld Orlando were flown by chartered jet on a six-hour trip to a new manatee exhibit at SeaWorld San Diego. The transfer was authorized by the U.S. Fish and Wildlife Service (FWS), which holds the endangered species permit under which all manatee rescue, rehabilitation, and release activities in Florida are conducted. SeaWorld San Diego was added to the FWS-authorized list of facilities with the understanding that any of the five manatees could be returned to Florida for release upon six months' notice. Four of the manatees were hand-reared orphans, and the fifth was an animal that had severe damage to its tail resulting from a watercraft collision.

The indoor facility at SeaWorld San Diego holds 200,000 gallons of fresh water and has 112 feet of underwater viewing. Educational exhibits are adjacent to the underwater viewing area. The SWC Education Department has created programs for students that focus on the manatee and other endangered species.

The FWS authorized the transfer to increase the amount of manatee critical care space available at SeaWorld Orlando and to expand manatee education programs. This transfer is the first time in decades that Florida manatees have been held at a facility outside the State of Florida [see related news item below]. The new SeaWorld San Diego exhibit will introduce manatees to millions of guests each year. - **Dan Odell**

FLORIDA

Cooperative Manatee Rehabilitation and Reintroduction Efforts in Florida. - Currently, there are fewer than 3,000 Florida manatees *(Trichechus manatus latirostris)* remaining in the southeastern U.S., primarily in coastal (both marine and freshwater habitat) areas of Florida. As the rapid expansion of the human population in Florida continues (nearly 1,000 people per day move into the state), subsequent development and associated human-related threats to manatees and their habitats also grow. Historically, human activities have accounted for about one-third of the known manatee deaths in Florida each year. Boat-related mortalities comprise approximately 80 percent of these human-related deaths. In addition to those killed, many more manatees are injured or orphaned each year. Most adult manatees bear permanent scars from boat propeller strikes. Still others require temporary assistance to be freed from monofilament fishing line and crab pot line entanglement, or require treatment due to cold stress or illness.

As part of the manatee recovery effort, a model statewide partnership has evolved to rescue, rehabilitate and, whenever possible, release manatees back into the wild. Private citizens acting as volunteers, non-profit organizations, corporate, local, state, and Federal facilities and biologists all contribute to the rehabilitation effort, achieving collectively what no single party could manage alone.

Manatee rescues in Florida are coordinated by the Florida Department

of Environmental Protection (DEP) field stations located in five coastal areas, in cooperation with the Florida Marine Patrol (FMP), and 15 participating private and public organizations holding Letters of Authorization from the Service. Rescue program participants respond to hundreds of reports of manatees in distress annually, verifying manatee locations and assessing the circumstances involved. This results in some 20 to 30 manatees being rescued and treated annually. Seven Florida facilities are authorized to care for captive manatees, and work cooperatively with the Service in the rehabilitation effort. Sea World of Florida (Orlando), Miami Seaquarium (Miami), Lowry Park Zoo (Tampa), Homosassa Springs State Wildlife Park (Homosassa), Living Seas at EPCOT Center (Lake Buena Vista), Mote Marine Laboratory (Sarasota), and the South Florida Museum (Bradenton) are the current participants. Over 50 manatees are presently cared for at these facilities.

The Service's manatee recovery biologists work closely with the Interagency/Oceanaria Manatee Working Group, which represents agencies, rehabilitation facilities, and private organizations concerned with manatee rescue and rehabilitation. The Working Group meets periodically to review program needs and to plan transfers, releases, and research activities involving captive manatees. The Working Group also provides valuable input to the Service regarding captive husbandry, medical status, potential release and staging area candidate assessment, and evaluation of the rehabilitation and reintroduction program effort.

Many of the manatees that are brought in for rehabilitation recover relatively quickly and are routinely released in the general vicinity of their rescue. Even with a progressive release program, however, the number of manatees being held for rehabilitation in Florida facilities has continued to increase each year because more injured, orphaned, or sick animals are rescued than are released. In addition, some captive animals are currently categorized as "non-releasable" due to the extent of their injuries, their small size, or the fact that they have been in captivity for many years. As a result, the Service has decided to pursue the eventual transfer of appropriate manatees to facilities outside of Florida. For the first time, three out-of-state facilities (Sea World of California in San Diego; the Columbus Zoo in Columbus, Ohio; and the Cincinnati Zoo in Cincinnati, Ohio) have been issued Letters of Authorization to participate in the Service's manatee rehabilitation program.

Last March, five manatees being held for rehabilitation at Sea World in Florida were transferred to Sea World in San Diego, California to free up space in Florida for rescued manatees in need of critical care [see news item above]. Up to four manatees will be transferred to the Columbus Zoo this winter. A fire destroyed the manatee exhibit that was under construction at the Cincinnati Zoo last May. The $4 million exhibit was to open July 10. The zoo plans to rebuild, and should be ready for manatees early in 1999. - **Bob Turner** (U.S. Fish and Wildlife Service, Jacksonville, Florida)

FDEP Staff Changes. - Spring and summer 1998 have been an active time of change for the Florida Department of Environmental Protection's Endangered and Threatened Species Group, which includes manatee

researchers. Dr. James "Buddy" Powell has taken a job as the research administrator for the manatee and turtle research programs within the Florida Marine Research Institute. Monica Ross has moved on to take a job at the new Disney Wild Kingdom attraction in Orlando. In May, Mark Sweat started a Ph.D. program at the College of Veterinary Medicine of the University of Florida. Kari Clifton started her Ph.D. program at the University of Florida in July. Brad Weigle, with the distinction of being the senior member of the manatee research staff, is moving on to pursue the development of a company he helped found, Interface Airships. - **Scott Wright**

Support for Preservation of Indian River Lagoon. - The Nature Conservancy's Florida chapter is purchasing easements on undeveloped land along the Indian River Lagoon, an important manatee habitat area on Florida's Atlantic coast, and developing a related communications plan. The Orvis Company, a fly-fishing, tackle and clothing retailer based in Manchester, Vermont, and the National Fish and Wildlife Foundation (NFWF) will each match Orvis customer donations to the Conservancy's project up to $75,000.

The Indian River Lagoon project is just one of many Conservancy efforts that The Orvis Company has supported. Since 1992, Orvis and its customers have raised money to protect waterways in Idaho, Florida, and Alaska, as well as songbird habitat in Jamaica. NFWF matched the Orvis gifts to these projects as well, generating nearly $700,000. As a company, Orvis donates 5% of its pre-tax profits to the conservation of fish and wildlife habitats. - (Source: *Nature Conservancy* Magazine 48(3).)

GERMANY

Steller's Sea Cow on the Internet. - While maintaining my dugong web page, I frequently come across substantial information about the extinct Steller's sea cow (*Hydrodamalis gigas*). But nowhere have I found a plausible illustration showing the animal as it might have looked in life. I believe that such a picture is needed to create awareness that "Steller's sea cow" is not just a name, but was a living mammal which humans carelessly wiped out not long ago. Therefore I will try to elaborate such an image myself. The current result is posted at **<http://www.online.de/home/Rothauscher/steller.htm>**

Being a computer designer who knows a bit about the living seacows, but not a paleontologist, I need input from the sciences. Comments and suggestions for enhancement are hereby invited. - **Hans Rothauscher**

GUINEA-BISSAU

West African Manatee Conservation Plan in Guinea-Bissau. - In *Sirenews* No. 27 (April 1997) it was announced that the IUCN representation in Guinea-Bissau was preparing a study in order to develop a Manatee Conservation Plan. As one of the least populated and least developed countries of West Africa, Guinea-Bissau still has large areas of almost untouched mangroves, wetlands, and river systems. This is one reason why it has often been considered one of the last sanctuaries of the West African manatee. Unfortunately, this situation is rapidly changing as human pressure on many coastal areas is increasing. Consequently, the implementation of a

management program is urgently needed to prevent the predictable dramatic decrease of the manatee population.

Accordingly, in March 1998, IUCN Guinea-Bissau signed a protocol with several local and international institutions to elaborate and implement a National Plan for the Conservation of the West African Manatee. This project has established twelve objectives:

1. to produce a map of the current distribution of the species in the country;
2. to make a qualitative assessment of manatee abundance;
3. to identify manatee population trends;
4. to identify and evaluate major threats to the manatee population;
5. to assess the significance of manatees in the cultural and economic activities of local communities;
6. to obtain information on other biological and ecological parameters of the species;
7. to provide training for national biologists and technicians;
8. to develop and implement an appropriate methodology for a long-term manatee monitoring program;
9. to identify key areas to conduct further research;
10. to develop manatee management programs for areas of specific importance;
11. to propose measures for the protection and valorization of the manatee population;
12. to elaborate a National Plan for the Conservation of the West African Manatee in Guinea-Bissau.

During 1997, contacts with several international experts were initiated in order to gather literature on the biology, ecology and conservation of sirenians. These experts also provided some valuable comments on the methodology chosen for this preliminary study.

Information on the occurrence and distribution of the manatee in Guinea-Bissau is scarce, and it was decided to follow the IUCN/SSC Sirenia Specialist Group recommendation and adopt "a more fundamental, cost-effective approach" to conduct this preliminary study. On the other hand, most of the river systems in Guinea-Bissau have very turbid waters and plenty of emergent and floating vegetation. In this kind of environment, both aerial surveys and satellite or radio tracking are unlikely to produce good results. There are certain regions, however, where the water is clear enough to allow some aerial observations, and experimental flights in these areas are planned in order to assess the feasibility of this method.

For a few years now, the IUCN's office in Guinea-Bissau has been conducting studies based mainly on interviews of local people. Considering the excellent results obtained with well-known species, such as the hippopotamus and the chimpanzee, the same method was chosen for this project, as the manatee is also well known to everybody in the country. Local technicians and biologists previously involved in other manatee projects were asked to participate in the present study. With their collaboration, the interviews were elaborated and several local technicians received training in how to perform them.

In April 1998, two park rangers and one technician from the General Direction of Forestry and Hunting visited 241 villages and fishing camps in the islands, and in the north and south of the country, all along the coast. Up till now, 331 persons have been

interviewed, mostly fishermen, hunters, former manatee hunters, and farmers. The interviews will continue in the next few months, until the remaining regions in the eastern part of the country are surveyed. This survey will hopefully allow the identification of areas of greater importance to the species, where future research should be conducted and management programs implemented.

This survey is being developed in partnership with the General Direction of Forestry and Hunting of the Agriculture and Rural Development Ministry and the Fisheries Research Centre of the Fisheries Ministry of Guinea-Bissau, and with the Portuguese Nature Conservation Institute. It is mostly financed by the Swiss DDC and supported technically and logistically by the Protected Areas Component of the IUCN's program in Guinea-Bissau. Please feel free to send us any comments or suggestions regarding this subject.

NOTE: On 7 June 1998, a military rebellion broke out in Guinea-Bissau, leaving the country in a very unstable and perilous situation. Therefore, as happened with several other cooperation programs, the IUCN program in Guinea-Bissau has been temporarily interrupted. - **Mónica Almeida e Silva** (UICN, C.P. 23, 1031 Bissau Codex, Guiné-Bissau; e-mail: **<uicn.bi@sol.gtelecom.gw>**)

NICARAGUA

Logging Project Halted. - The last issue of *Sirenews* reported on the activities of the Solcarsa Company, whose illegal logging and wood processing operations were threatening the rainforest home of the Miskito and Rama Indians, who traditionally are manatee hunters. This activity has now been halted, thanks to an international outcry. In late February 1998, Nicaragua's Ministry of Natural Resources was finally forced by the Supreme Court to put a stop to these operations, which were ruled to be in violation of the Nicaraguan Constitution. The company, which is a subsidiary of the Korean logging company Kumkyung, was given two months to wind up its operations and leave the country.

Some problems remain unresolved, however. Solcarsa has not yet paid fines for destruction of property that were levied by the Ministry of Natural Resources, and workers' claims of unpaid wages have gone unanswered. The Human Rights Commission of the Organization of American States has announced its intention to investigate, but Nicaraguan President Arnoldo Aleman has refused to let the Commission enter the country. In addition, Solcarsa is reported to be continuing some logging in the region to which the Ministry of Natural Resources has turned a blind eye. - (Source: Rainforest Action Network *Action Alert* 137, May-June 1998)

SRI LANKA

More on Sea Pigs. - In the article in *Sirenews* No. 28, you did not mention that in Sri Lanka the Sinhala vernacular name for the dugong is *müdu ürа,* which means "sea pig" (*müdu* = sea, *ürа* = pig). I think the term *cudalpani* is actually a word derived from Tamil.

We at IUCN Sri Lanka initiated a Marine and Coastal Programme in 1997 and are in the process of identifying areas in which we can initiate some action, for instance conservation projects for threatened marine species. As far as

we know, there are no conservation programs being carried out in the country at present for the protection of dugongs. Does the IUCN Sirenia Specialist Group have any information on the status of dugongs in Sri Lanka, or do you know of any other organizations or individuals who do? Thanks very much. - **Sonali Senaratna** (Programme Officer, IUCN Sri Lanka; fax: (++941) 580202; e-mail: twcusl@sri.lanka.net)

THAILAND

Aerial Survey of Dugongs in Thailand. - Although Thailand has not made much progress in dugong conservation, we are doing the best we can given limitations of budget and staff. In April 1998, we monitored the number of dugongs in Trang Province, where the largest group of dugongs in Thailand was believed to exist. The Agriculture Aviation Division provided us with 3 days' use of a helicopter for flights along a 52 km route over the seagrass beds. The highest number of dugong counted by one observer at each side of the helicopter is 33. This number might have been affected by:

1. Habitat disturbance: During the survey, the channel that dugongs use as a resting area was being deepened by a huge dredge. Fishermen also reported that a lot of fish were killed. This may have caused some emigration of dugongs. Eight dugongs were observed in the northern area, where usually only 3-4 are found; this area was very little affected by the dredging.
2. Turbidity: During the survey, suspended sediment greatly reduced the visibility of submerged dugongs. In April, dugongs usually can be observed up to 5 m below the surface; but this year they could not be seen below 2 m.

A successful public awareness program has already been conducted in the survey area. However, in August, we found a mid-sized dugong carcass washed up on the beach, with four small holes in its head.

The Fishery Department is also interested in dugong survival. Last year a preliminary survey was conducted along the western (Andaman Sea) coast of Thailand, using a flying dinghy. This survey also included my study area in Trang Province. Forty-eight dugongs were found in an area of about 970 km^2. - **Suwan Pitaksintorn** (Forest Ecology Research and Development Division, Forest Technical Office, Royal Forest Dept., Phaholyotin Rd., Jatujak, Bangkok 10900, Thailand)

New Dugong Stamp. - To commemorate UNESCO's International Year of the Ocean (1998), Thailand has issued a set of four stamps, depicting three cetaceans and the dugong, respectively. The high-value (9-baht) stamp in the series shows a mother dugong and calf. The series is available as a very handsome souvenir sheet. A limited number of these are available from **Suwan Pitaksintorn** at the address above.

VANUATU

Dugong-Human Interactions in Vanuatu. - The Vanuatu archipelago forms the eastern limit of dugong distribution. The dugong population is distributed throughout the islands from Aneityum in the south to the Torres Islands in the north (see Fig. 1). Although dugongs are now protected in Vanuatu, they were previously hunted

throughout the year. Dugong hunting was not governed by custom or tradition, as many of the locals do not consider the dugong an important mammal in terms of either food or culture.

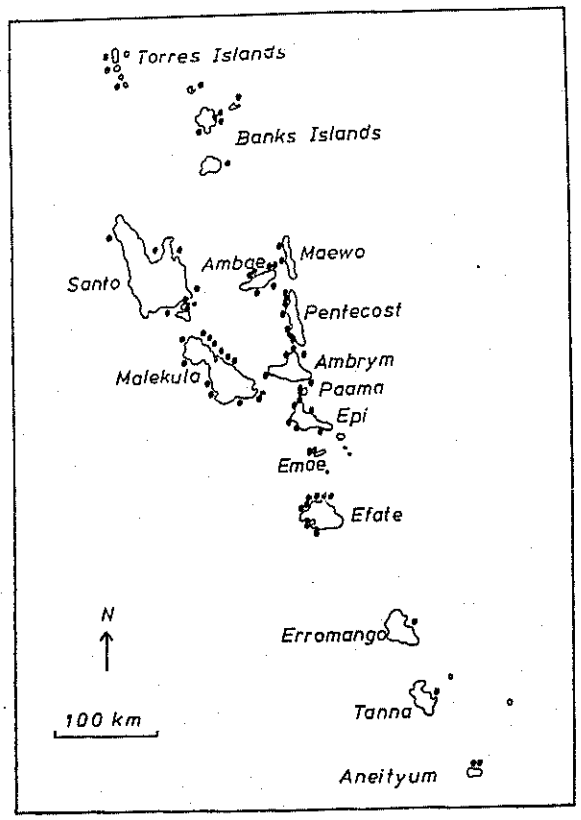

Fig. 1. Map of Vanuatu, with reported dugong localities (•).

Recently, exploitation of a single male dugong on the island of Tanna has proven to be an economic bonus for the villagers. This animal is a resident of Resolution Bay. Since little was known about recent changes in its habits, I visited the area and interviewed the villagers concerning this resident dugong.

Resolution Bay is about 2 km wide. Villagers claim that the dugong has frequented this area since 1970. It has done so alone since the loss of its mate in 1988. A report written in 1989 by the Department of Fisheries showed one dugong sighted in 1989; there were two in 1988, indicating that the female may have been killed early in 1988.

The World Wide Fund for Nature photographed the dugongs of Tanna in 1988, and in the same year Vanuatu issued a set of postage stamps depicting dugongs.

According to the villagers of Port Resolution, the female dugong was killed around 1988 to keep the male from leaving the bay. The villagers had come to rely on the tourist dollar by allowing divers and tourists to play with the dugong. My observations of the dugong and of wooden carvings of it made over a period of time indicate changes in the animal's condition, beginning with a weight loss followed by a significant weight gain. The village carver strongly believes that no other dugongs were in the area beside the male and the accompanying female. One of the carvings shows a pregnant female, which was authenticated by the villagers: an interview indicated that the female gave birth and was killed soon after. What happened to the calf is unknown.

Another theory is that the female went with her calf to Port Patrick, 65 km from Tanna, where dugong sightings have been recorded. Could the dugong at Tanna be territorial but visit Port Patrick to connect with other dugongs? This is disputed by the locals, as they are able to attract it on any given day by slapping a paddle on the water.

In recent years the dugong has become aggressive toward tourists and villagers alike (see *Sirenews* No. 26). Divers and tourists are partly responsible, as the animal is harassed. In recent months it has displayed unusual behavior by tossing turtles into the air.

Underwater photographer Ben Cropp spent a week on Tanna with this dugong. He witnessed the dugong bringing a turtle back to the village, where turtles are consumed.

The type of behavior displayed by the dugong when divers approached is described by A. A. Belcher in *Asian Diver*, January 1998, p. 33: "One moment I was taking photographs; suddenly I was shot out of the water in a head butting ram from the dugong. My partner came to my aid. She, too, was tossed over the head of the mammal." Physical harassment by young locals, including placing fingers in the dugong's nostrils and pulling its tail, has made this animal hostile. It should be noted that it shows no malice toward children, perhaps because it is larger than they are.

Why it remains in the area is unknown. It is not fed by the locals, as there is an abundance of seagrasses in the area (Chambers in 1990 found nine species: *Cymodocea rotundata, C. serrulata, Enhalus acoroides, Halodule pinifolia, H. uninervis, Halophila ovalis, Syringodium isoetifolium, Thalassia hemprichii,* and *Thalassodendron ciliatum*). The dugong continues to display aggression, and may injure a tourist to the point where the villagers may be prevented from "using" this animal. This would remove a valuable source of income for the village. This interaction should be regulated to ensure the safety of both humans and the dugong.

On the island of Epi, another male dugong has formed a relationship with the locals. This animal was first befriended by two Canadian women in the early 1980s, who swam with and stroked the dugong, which seemed to seek out human contact. Dr. Franz X. Schmolleri, from Air Club Vila and author of "Dugongs and Vanuatu" (in French only), was able to recount the story of this particular dugong to me.

Dr. Schmolleri confirmed that on one of his many visits to Epi, he was called at 7 A.M. to see a male dugong at Lamen Bay. The animal remained in the area for about 2 hours and then disappeared. It reappeared the following morning.

The villagers in the area are irked by the dugong's behavior. When they are spearfishing, it will act as a barrier between the fish and the fisherman. It also displays a type of mimicry. If a villager dives toward the sand below, the dugong will follow; if the head is shaken, the animal will mimic this behavior. Dolphins and porpoises are known to display this type of behavior, especially when a reward system is in place; however, food is not offered to this dugong.

Unlike the dugong at Tanna, the one at Epi displays friendliness and not aggression. However, at this stage it has not been subjected to much harassment. It will not allow villagers near its tail. There are other locations on the island where dugongs reside; however, according to Dr. Schmolleri, the same dugong remains in Lamen Bay and is recognizable by its behavior, markings, and sex.

The other known solitary dugong lives in a chain of islands called the Banks Islands. Among these is a small but inhabited island called Loh. In 1989 the first dugong count here was conducted by a field officer from the Department of Fisheries, who had received a report of an injured dugong. On arrival, he found a dugong with a lasso rope around its tail and extensive injuries. He told me about the interaction he had witnessed between children and

the dugong. The animal was summoned using a paddle, as with the dugong on Tanna. It allowed children to mount its back and was gentle. The villagers have rescued several dugongs in the area, as they are often caught in shallow water, particularly when stranded in pools by the receding tide. - **Sylvia Adam** (Flat 12 - 34 Sturdee Parade, Dee Why, Sydney 2099, Australia)

ABSTRACTS

The following abstracts are of papers and posters presented at the XXIII Reunión Internacional para el Estudio de los Mamiferos Marinos, held at Xcaret, Quintana Roo, Mexico, 20-24 April 1998.

ANÁLISIS DE IMÁGENES SATELITALES PARA LA JERARQUIZACIÓN DE ÁREAS EN EL MONITOREO DE POBLACIONES DE MANATÍES EN LA COSTA DE YUCATÁN.

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En la costa de Yucatán se ubican tres grandes zonas donde es posible la presencia de grupos residentes de manatíes: las Rías de Celestún, Río Lagartos y Bocas de Dzilam; el monitoreo del total de las áreas demandaría un alto gasto de recursos por lo que se requieren estrategias de monitoreo para dedicar mayor esfuerzo donde las condiciones ambientales sean mas favorables para la especie. Con base en la información generada por trabajos realizados en estas zonas, se efectuó una clasificación no supervisada de imágenes satelitales (imágenes Landsat TM) de las áreas de estudio y se elaboraron mapas temáticos de profundidad, salinidad, y coberturas de pasto y algas. Los mapas obtenidos se conformaron en un sistema de información geográfico y se clasificaron en 5 categorías de calidad de hábitat, las cuales fueron jerarquizadas de mas favorable para la presencia de la especie (profundidad de 1-3 m, salinidad de 0-8 y cobertura de pastos de 20-30%), a menos favorable (profundidad <1 m y >3 m, salinidades >15 y cobertura de pastos <15), la categoría mas favorable registro menos del 20 % del total de las áreas y solo el 37% del fue considerado como favorable para la presencia de grupos residentes.

SATELITE IMAGIN ANALISIS TO HIERARCHYSIZE THE AREAS FOR MONITORING MANATI POPULATIONS IN THE YUCATÁN COASTS.

There are three great areas in the coast of Yucatan were it is possible to find resident groups of manatee: Rías de Celestún, Río Lagartos and Bocas de Dzilam. The monitoring of this large area will be very expensive, so different strategies of monitoring are required to dedicate the major effort were environmental conditions are favorable for the species. Based on the actual information gathered by several works done in this area, a non-supervised classification of satellite images (Landsat TM images) of the study areas, thematic maps were elaborated on depth, salinity, covered of grasses and algae. Maps were conformed in a geographic information system and were classified in 5 categories, based on the quality of the habitat, which were hierachisized from the most favorable for the presence of the specie (depth 1-3 m, salinity 0-8 and grass covered from 20-30%), to the less favorable (depth <1 m and >3 m, salinity >15 and grass covered <15). The category more favorable registered less than 20 % of the total areas and only the 37% of the area were considered as favorable for the presence of resident groups.

DISTRIBUCIÓN Y ABUNDANCIA DEL MANATÍ EN BELICE

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Belice se encuentra protegiendo a la especie más amenazada de manatí *Trichechus manatus manatus*, que cualquier otro país en su rango. Aquí los manatíes cuentan con abundante vegetación, rangos de temperatura acuática estable (25-33 °C), y agua fresca procedente de varios ríos, arroyos y lagunas costeras. Estas condiciones proporcionan un hábitat favorable para estos gentiles creaturas. Se realizaron cinco sobrevuelos en Belice entre 1979 y 1995, demostrando que Belice es una zona muy importante para el bienestar de la especie. En 1997 el PNUD/GEF Proyecto del Manejo de la Zona Costera llevó a cabo cuatro sobrevuelos estacionales adicionales. Los resultados obtenidos en 1997 apoyan los resultados anteriores de que el número de manatíes sigue siendo significativo en todo el país. Además, el porcentaje de crías observadas en el último muestreo poblacional de 1997 fue de 8.04%. Esto refleja una población saludable y creciente. Con el manejo y vigilancia contínua de los manatíes esta especie tendrá la oportunidad de sobrevivir y florecer como parte de la biodiversidad de Belice.

DISTRIBUTION AND ABUNDANCE OF MANATEES IN BELIZE

Belize shelters more of the threatened West Indian manatee *Trichechus manatus manatus* than any other country within its range. Here, manatees find an abundance of vegetation, stable water temperature ranges (25-33ºC), and fresh waters from numerous rivers, streams and lagoons. These provide favorable habitat for the gentle creatures. Five aerial-surveys conducted in Belize between 1979 and 1995 revealed that Belize is most important for the species well being. In 1997, the UNDP/GEF Coastal Zone Management Project carried out four additional surveys on a seasonal basis. The 1997 data supports past reports that the manatee numbers continue to be significant throughout the country. Furthermore, the calf percentage of 8.04% seen in the December 1997 population sample, indicates a healthy, growing manatee population (O'Shea 1991). To this end, with ongoing monitoring and management of manatees, they have high prospects for flourishing existence within Belize's biodiversity.

TÉCNICA DE CAPTURA, MANEJO Y TRANSPORTE DE DOS MANATÍES DONADOS A JAPÓN

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Del 16 al 18 de mayo de 1997 capturamos una pareja de manatíes adultos (*Trichechus manatus manatus*), en la bahía de Chetumal, Quintana Roo, para ser donados por el presidente de México al gobierno de Japón. Sus medidas fueron de 257 cm el macho y de 260 cm la hembra. Cuatro días después fueron transportados al Expo Acuario de Okinawa, Japón. Para su localización se usó helicóptero y avioneta, y para su captura se usaron lanchas y cuerdas de nylon. Los dos manatíes estuvieron en observación por cuatro días dentro de una pileta de nylon de 4 m de diámetro por 1.50 m de fondo. Se les tomó muestras de sangre, excretas y piel, y se llevó un control del ritmo respiratorio y la temperatura corporal. Se transportaron vía aérea en dos contenedores especiales de fibra de vidrio de 150 Kg (2.80 de largo x 1.20 de ancho y 1.05 cm de altura). Cada manatí se colocó sobre un colchón de hule espuma sostenido por una camilla de nylon y una cama húmeda formada por varios colchones de hule espuma. Los manatíes se mantuvieron húmedos con un sistema de botellas de plástico (tipo suero), colocadas en la parte superior del contenedor y cubiertos con tela de manta y cobertores de algodón. El tiempo total de transportación desde el lugar de captura hasta el acuario de Japón fue de 77 h.

CAPTURE TECHNIQUE, MANAGEMENT OF TWO MANATEES DONATED TO JAPAN

From May 16th to 18th, 1997, we capture a couple of adult manatees (*Trichechus manatus manatus*) in Chetumal bay, Quintana Roo, to be donated by the president of Mexico to the Government of Japan. Their length were 257 cm the male and 260 cm the female. Four days after the capture they were transported to the Expo Aquarium of Okinawa, in Japan. For their location was used an helicopter and a Cessna aircraft, and for their capture were used motorboats and ropes. The two manatees were in observation by four days within a pool of nylon of 4.0 m diameter and 1.50 m depth. Blood, feces and skin samples were taken, and the respiratory frequency and the corporal temperature were recorded. They were transported by air route in two special glass fiber containers of 150 Kg (280 cm length x 120 cm width and 105 cm height). Each manatee was put on a mattress supported by a nylon stretcher and a wet bed formed by several mattresses. The manatees were maintained wet with plastic bottles system put on the upper part of the containers and they were covered with blankets and sheets. Total transportation time from the place of capture to the Japan Aquarium was 77 hours.

SIRENIOS (DUGONGIDAE) FOSILES CERCA DE COLONIA YUCATAN, MÉXICO

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En el tiempo geológico pasado el Orden Sirenia presentó mayor diversidad que ahora. Algunos de los sirenios más antiguos conocidos hasta ahora provienen del Eoceno, vivieron en la región del Caribe, y desde hace al menos 23 millones de años (Ma), sirenios más derivados en la Familia Dugongidae habitaron también la costa del Pacífico Mexicano. Relativamente poco tiempo atrás miembros de la Familia Dugongidae habitaron también el Golfo de México, y después de su extinción en esta área fueron reemplazados por los manatíes (Familia Trichechidae). Esto ofrece un escenario evolutivo y paleobiogeográfico muy interesante (para ser estudiado en investigaciones futuras), en el cual una familia de sirenios se reemplazó por otra en una provincia geográfica entera. En la Formación Carrillo Puerto, de edad Mioceno más tardío ó Plioceno más temprano (cerca 5-6 Ma) en la península de Yucatán se encontraron dos especies de Dugongidae fósiles: *Xenosiren yucateca* Domning, 1989, en Noc Ac cerca de Mérida; y *Corystosiren varguezi* Domning, 1990, cerca de Colonia Yucatán. En abril de 1996 nosotros regresamos a Colonia Yucatán y descubrimos un cráneo de dugongo, identificado posiblemente como *C. varguezi*. El especimen incluye dientes y parte de la mandibula. En México entero hay solamente un cráneo fósil de sirenio que es más completo. En la localidad cerca de Colonia Yucatán existen muchos huesos más, asi como esqueletos parciales de dugongidos, y se encuentra la acumulación más densa de sirenios fósiles en México. Este sitio es tan significativo que amerita investigación y protección como parte importante del patrimonio de México.

FOSSIL DUGONGID SIRENIANS FROM NEAR COLONIA YUCATAN, MÉXICO

In the geologic past, the Order Sirenia was more diverse than now. Some of the most ancient known Sirenia, of Eocene age, lived in the Caribbean realm, and since at least 23 Mya, more derived sirenians of the Family Dugongidae also inhabited the Pacific coast of México. Until relatively recently, dugongids also occupied the Gulf of México, and following their extinction in this area, were replaced by the manatees (Family Trichechidae). This is an interesting evolutionary and paleobiogeographic scenario (to be studied in future investigations), in which one family of Sirenia was replaced by another in an entire geographic province. In the latest Miocene or earliest Pliocene (circa 5-6 Mya) Carrillo Puerto Formation on the Yucatán Peninsula there have been discovered two species of fossil Dugongidae: *Xenosiren yucateca* Domning, 1989, from Noc Ac near Merida; and *Corystosiren varguezi* Domning, 1990, from near Colonia Yucatán. In April 1996 we returned to Colonia Yucatán and collected a dugongid cranium, possibly identifiable as *C varguezi*. The specimen includes teeth and part of the mandible. This is the second most complete fossil sirenian skull collected in México. Many other bones and partial skeletons of dugongids remain exposed at the locality near Colonia Yucatán, and this is the most dense accumulation of fossil Sirenia in all of México. This site is so significant as to merit further investigation and protection as an important part of the patrimony of México.

REGISTRO DE VARAMIENTOS EN LA COSTA SURESTE DEL GOLFO DE MÉXICO (ESTADOS DE VERACRUZ, TABASCO, CAMPECHE, YUCATÁN Y QUINTANA ROO)

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A partir de 1989 se ha realizado un esfuerzo investigación de mamíferos marinos en la costa sureste del Golfo de México. Con al menos un recorrido por estación por año y cón la colaboración del Parque Xcaret y el Acuario de Veracruz. Se han recorrido las playas con èl fin de registrar y recuperar restos óseos de mamíferos marinos, los cuales han sido incorporados a la Colección Mastozoológica del Instituto de Biología, UNAM. Hasta diciembre de 1997 se registrado 18 eventos de varamiento involucrando cinco diferentes: Trichechidae (*Trichechus manatus*), Balaenopteridae (*Balaenoptera acutorostrata*), Kogidae (*Kogia simus, K. breviceps*), Ziphidae (*Ziphius cavirostris*) y Delphinidae (*Stenella frontalis, Tursiops truncatus, Feresa attenuata*). La proporción de varamientos de individuos por especie es la siguiente: 10 toninas (56 %, en Tabasco, Campeche y Quintana Roo), dos manatíes (11 %, en Quintana Roo), una tonina moteada (en Quintana Roo), un cachalote enano, un cachalote pigmeo y una orca pigmea (en Veracruz), una ballena picuda de Cuvier (en Campeche), y una cría de ballena Minke (en Yucatán) (5.5 % cada uno). Aunque no se pudo determinar en todos los casos el sexo de los animales, se registraron 8 machos y una hembra. Las toninas fueron encontradas a lo largo del año y los casos más relevantes como el cachalote enano, la orca pigmea, la ballena "Minke" y uno de los registros de manatí, ocurrieron en la temporada de "Nortes". Los dos cachalotes y la orca pigmea se vararon vivos en la costa de Veracruz y posteriormente murieron. Al menos 4 toninas mostraron evidencias de muerte por enmallamiento en redes agalleras o por ser arponeadas, otra tonina fue encontrada flotando en la Laguna de Términos con mordidas de tiburón en varias partes del cuerpo. Con estos registros se tiene al menos una idea de la diversidad de mamíferos marinos en la parte sureste del Golfo de México y de algunos factores que pudieron provocar el varamiento o la muerte como las interacciones con la actividad humana y los efectos del mal tiempo en la región.

STRANDING RECORD OF MARINE MAMMALS IN THE SOUTHEASTERN COAST OF THE GULF OF MEXICO (VERACRUZ, TABASCO, CAMPECHE AND QUINTANA ROO STATES).

Since 1989 we have been investigating the marine mammals of the southeastern coast of the Gulf of Mexico. We made one survey every season, doing it in cooperation with the Xcaret Park and Veracruz Aquarium in order to record and recover osteological marine mammal material that were deposited in the National Mammal Collection of Instituto de Biología, UNAM. Until December 1997 we have recorded 18 stranding with five families represented: Trichechidae (*Trichechus manatus*), Balaenopteridae (*Balaenoptera acutorostrata*), Kogiidae (*Kogia simus, K. breviceps*), Ziphidae (*Ziphius cavirostris*), and Delphinidae (*Stenella frontalis, Tursiops truncatus, Feresa attenuata*). These species proportion of the strandings were: 10 Bottlenose dolphins (56 %, in Tabasco, Campeche and Quintana Roo), one Atlantic spotted dolphin (in Quintana Roo), two Manatees (in Quintana Roo), one Dwarf sperm whale, one Pygmy sperm whale, one Pygmy killer whale (in Veracruz), one Cuvier's beaked whale (in Campeche) and one Minke whale calf (in Yucatan) (5 % every one). We can not determine the sex of all the stranded animals, but there were 8 males recorded and one female. The Bottlenose dolphins were recorded the year round and the most relevant strandings such as the Dwarf sperm whale, the Pygmy killer whale, the Minke whale and one of the Manatee occurring during the "Nortes" season. The sperm whales and the Pygmy killer whale were found alive on the Veracruz coast and died later. At least 4 of the Bottlenose dolphins shown evidence of entangled on the gill-nets or harpoon activity and other was found floating in the Términos Lagoon with shark bites on the body. With these records we have an idea of the marine mammal diversity on the southeastern part of the Gulf of Mexico and we have some information about the causes of the stranding events as well as the relationships with human activities and weather effects upon animals.

TOLERANCIA DEL MANATÍ A LA TÉCNICA DE CAPTURA Y MANEJO UTILIZADA EN QUINTANA ROO

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Doce manatíes (*Trichechus manatus manatus*) han sido capturados por medio de persecución en lancha, en la bahía de Chetumal de noviembre de 1994 a mayo de 1997, sin observar evidencia de alguna susceptibilidad inusual a la miopatía debido a su captura y manejo. De estos, siete fueron radio-marcados y seguidos en el campo después de su captura, por períodos que varían desde tres meses hasta tres años, sin mostrar evidencia de stress tardío por su manejo. Muestras de sangre de 10 manatíes capturados no señalan aumento anómalo en las variables bioquímicas analizadas. La persecución controlada es un elemento importante en nuestro método de captura usado en la bahía de Chetumal. La observación de que al parecer, el acoso es un factor significante en la susceptibilidad de los dugones (*Dugong dugon*) informada en sus capturas, aparentemente no se extiende al manatí.

TOLERANCE OF THE MANATEE TO CAPTURE AND HANDLING TECHNIQUE APPLIED IN QUINTANA ROO

Twelve Caribbean manatees (*Trichechus manatus manatus*) have been captured by motor boat pursuit in the Chetumal Bay, from November of 1994 to May of 1997 with no evidence of an unusual susceptibility to capture myopathy. Of these manatees, seven were radio-tracked or observed in the field after their capture during a period between three months and three years with no evidence of delayed capture stress. Blood samples obtained at the capture of 10 manatees showed no anomalous elevation in biochemical variables analyzed. Pursuit appears to be a significant factor in the reported susceptibility to capture myopathy of dugongs (*Dugong dugon*). The controlled pursuit is a significant element of our capture technique used in Chetumal Bay. The probable susceptibility of dugongs to capture stress apparently does not affect the Caribbean manatee.

BASE DE DATOS DE TELEMETRÍA EN MANATÍES DE LA BAHÍA DE CHETUMAL, QUINTANA ROO, MÉXICO

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En noviembre de 1994 inició con dos hembras el proyecto de seguimiento de manatíes radiomarcados en la Bahía de Chetumal, Quintana Roo, México, con el apoyo del personal del Sirenia Project, del U. S. Geological Survey. Por ser el manatí una especie en peligro de extinción y por ser este el primer proyecto de telemetría en esta especie que se realiza en México, los datos obtenidos son de gran importancia para el estudio y conservación de los manatíes. En octubre de 1995 se diseñó una base de datos relacional en Access 2.0, para el ordenamiento, captura y obtención de resultados de manera fácil y rápida de los datos sobre los animales marcados, su sistema de transmisión y sus seguimientos. Los datos en campo se toman en formatos especialmente diseñados para este propósito, los cuales están basados en los formatos utilizados en E. U. Posteriormente se transfieren a la base por medio de formas de captura que facilitan este proceso. Se muestra una propuesta de estructuración de los datos de 7 animales marcados y los seguimientos de estos a lo largo de 3 años, de censos aéreos, registros de mortandad de manatíes, genética e hidrología de la Bahía de Chetumal. Access facilita el diseño de tablas y formas de captura, las consultas, la obtención de estadísticas básicas y la importación y exportación de archivos en diferentes formatos.

DATABASE OF TELEMETRY IN MANATEES FROM CHETUMAL BAY, QUINTANA ROO, MEXICO

In November 1994, the radio-tagged manatees project started in Chetumal Bay, Quintana Roo, Mexico, with two females, with assistance of the staff of the Sirenia Project, U. S. Geological Survey. The data of the project are very important for studying and conservation of manatees due to the facts that this species is at risk of extinction and that this is the first telemetry project carried out in Mexico. In October 1995, a relational database was designed using Access 2.0 for Windows, for data sorting and capturing and for easy and quick obtaining of results from data of radio-tagged animals, transmission system and manatees searching. Field data are written down on especially designed formats, which are based in the formats used in USA. Later, the data are transferred to the database through capture forms, which are easy to manage. A data structure is proposed, which contains data of the 7 radio-tagged manatees, the searching throughout 3 years, aerial surveys, manatee mortality records, Chetumal Bay hydrology and genetic. "Access" makes easy the tables and capture forms design, queries, obtaining basic statistics and files importing and exporting in different formats.

DISTRIBUCIÓN ESPACIO TEMPORAL DEL MANATÍ EN EL SISTEMA LAGUNAR GUERRERO, BAHÍA DE CHETUMAL, MÉXICO.

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El Sistema Lagunar Guerrero (SLG), se ubica en la región noroeste de la bahía de Chetumal. La distribución y presencia de manatíes fue monitoreada de junio de 1994 a julio de 1995. El área se dividió en cuatro zonas: Laguna Guerrero, Canales, Río Cacayuc y la Barra: se usaron tres métodos: censos aéreos, recorridos en lancha y observaciones desde una torre. Se registraron un total de 91 avistamientos sumando 214 manatíes. El mayor número de manatíes que se lograron diferenciar durante un mismo censo fue de 12 animales, coincidiendo tanto para los censos aéreos como los de lancha. El número promedio de manatíes existentes en el SLG por censo aéreo fue de 7.6 animales (censo= 3) y desde lancha fue 3.6 (n= 50). La frecuencia y ubicación de los avistamientos, el número de animales y la presencia de crías demuestran que el Río Cacayuc, la Barra y Laguna Guerrero son las zonas de mayor uso por los manatíes. Durante las temporadas de lluvias y secas los manatíes utilizan todo el Sistema Lagunar, pero en Nortes se producen cambios en su distribución debidos a la vaciante de agua en el Sistema, propiciada por la presencia de fuertes vientos fríos del norte. Las variaciones temporales de salinidad y temperatura no muestran una correlación entre estas variables y la presencia o ausencia de manatíes (Spearman, rs= -0.593, $p < 0.50$; rs= 0.095, $p < 0.50$ r).

SPATIAL AND SEASONAL DISTRIBUTION OF MANATEES WITHIN LAGUNA GUERRERO LAGOON SYSTEM, CHETUMAL BAY, MEXICO.

This study was conducted within Laguna Guerrero System, northern region of Chetumal Bay, from June 1994 to July 1995. The study area was divided in four zones: Laguna Guerrero, Channels, Cacayuc River y Barra; these zones were studied through surveys by plane, boat and from a tower. A total of 91 sightings were recorded adding a total of 214 animals. For both boat and aerial surveys, the number of different manatees sighted during single census was 12 animals. The mean number of manatees by aerial survey was 7.6 (census= 3) and by boat was 3.6 (n= 50). The frequency and locations of the sightings, total number of animals and presence of calves determined that Cacayuc river, Barra and Laguna Guerrero were the zones more used by the manatees. The manatees used the whole lagoon system during the rainy and dry seasons while during the winter the manatees' distribution was influenced by a decrease of the water level as a result of cold fronts with northern winds. Despite the seasonal variation of water temperature and salinity these variables did not have strong influence on the manatees' presence (Spearman, rs= -0.593, $p < 0.50$; rs= 0.095, $p < 0.50$ r).

CONCENTRACIÓN DE METALES EN HUESO Y SANGRE DE MANATÍES (*Trichechus manatus manatus*) EN LA BAHÍA DE CHETUMAL, QUINTANA ROO, MÉXICO

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Se determinaron 14 elementos (Ca, K, Na, Mg, Fe, Zn, Ni, Cr, Cu, Cd, Mn, Hg, Pb y Se) por espectrofotometría de absorción atómica en 18 muestras de tejido óseo de manatíes procedentes de la Bahía de Chetumal y una muestra de Isla Holbox, Quintana Roo, México. Los elementos Fe y Hg presentaron la mayor variación en las muestras, con un coeficiente de variación de 62.0 % en Fe y de 115.1% en el Hg. El Hg presentó valores (1.01 a 3.2 µg g-1 en peso seco de tejido óseo) muy altos comparados con lo reportado en la literatura en hígado de manatí y dugong. Las muestras de sangre de manatíes tuvieron una tendencia a altas concentraciones en Ca (10-28 mg/dl) y Na (135-286 mEq/l) pero en el caso del K las concentraciones fueron bajas (1.52-4.88 mEq/l). Las muestras de pastos y algas marinas de la Bahía de Chetumal presentaron amplia variación en la concentración de metales: Fe en *Thalassia testidium* fue de 30 µg/g-1 comparado con *Najas marina* 298 µg/g-1. Las concentraciones obtenidas en Ca, Ni, Cu, Mn, Cd, Pb y Hg en los huesos de manatí, fueron mayores que en otros mamíferos marinos. Al comparar las concentraciones entre adultos y crías, sólo se obtuvo diferencia significativa en K y Na en el tejido óseo.

CONCENTRATION OF METALS IN BONE AND BLOOD OF MANATEES (*Trichechus manatus manatus*) FROM CHETUMAL BAY, QUINTANA ROO, MEXICO

Fourteen elements were found (Ca, K, Na, Mg, Fe, Zn, Ni, Cr, Cu, Cd, Mn, Hg, Pb and Se) by atomic absorption spectrophotometry in 18 samples of bone tissue of manatees from Chetumal Bay and one sample from Holbox Island. Fe and Hg had the greatest variation in the samples. The variation coefficient was 62.0 % Fe and 115.1 % Hg. The values for Hg (from 1.01 to 3.2 µg g-1 in bone tissue) are higher than the reported concentrations in references and research about liver tissue of manatee and dugong. The manatees' blood samples had a high concentration tendency in Ca (10-28 mg/dl) and Na (135-286 mEq/l) but K had a low concentration (1.52-4.88 mEq/l). The samples of seagrass and seaweed from Chetumal Bay had a high variation in the concentration of metals: Fe in *Thalassia testudinum* was 30 µg g-1 but in *Najas marina* was 298 µg g-1. The concentrations of Ca, Ni, Cu, Mn, Cd, Pb and Hg in manatee's bones were higher than in other marine mammals. This result has already been reported in the soft tissues of sirenians. Between adults and calves there was a significant difference only in K and Na in bone tissue.

The following abstracts are of papers and posters presented at the American Society of Mammalogists Annual Meeting, held in Blacksburg, Virginia, 6-10 June 1998.

CHARACTERIZATION OF LIPIDS IN THE ZYGOMATIC PROCESS OF THE FLORIDA MANATEE, TRICHECHUS MANATUS LATIROSTRIS.

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The lipid composition of the zygomatic bone and fat from the head region of the Florida manatee, Trichechus manatus latirostris, was determined. The position, porosity and oil-filled nature of the bone suggest it may have a similar sound conduction function to the intramandibular fat body (IMBF) of the bottlenose dolphin, Tursiops truncatus; thus, the lipid composition of the IMFB was also analyzed for comparison. Lipids from the manatee zygomatic bone and head fat were composed almost entirely of triacylglycerols. The major fatty acids of the zygomatic bone were 18:1, 16:0, 14:0 and 16:1. The major fatty acids of the fat were the four mentioned above, along with 12:0 and 18:0. Manatee samples did not contain isovaleric acid, which was found in the bottlenose dolphin and has been implicated in echolocation. However, the triacylglycerols and fatty acids found in the manatees were similar to those in two other families of marine mammals (Platanistidae and Physeteridae) which also possess echolocation ability.

SIRENIAN NICHES: IS THE DUGONG A RHIZOVORE?

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Among recent mammals only sirenians are both herbivorous and fully aquatic. Within that broad niche trichechids (manatees) are generalists in both fresh and salt water. Dugongids (Steller's sea cow and dugong) are specialists and exclusively marine. The sea cow was an algavore, apparently unable to submerge and grazing primarily on the kelp canopy or kelps attached to rock faces. The dugong forages on the sea bottom on seagrasses and on sessile or burrowing invertebrates. The dugong has been viewed both as a consumer of whole plants, selecting vegetation primarily on the basis of protein content and plant fragility and as a rhizovore, selecting underground plant parts rich in carbohydrate.

Dugongs in Shark Bay migrate seasonally between habitats in which they may be folivorous, and those in which they root into the bottom for seagrass rhizomes. I review sirenian, body form and foraging apparatus in the context of field observations and present the case for the dugong as a specialist adapted to foraging on the carbohydrate-rich underground storage organs of tropical seagrasses.

DISTRIBUTION AND CHARACTERIZATION OF DUGONG PERIORAL BRISTLES AND BRISTLE-LIKE HAIRS

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Sirenians (manatees and dugongs) exploit an unusual niche of aquatic herbivory. They are unique among mammals in their motoric use of mystacial vibrissae to manipulate aquatic vegetation. The distribution, characterization and behavioral uses of perioral bristles of Florida manatees (*Trichechus manatus latirostris*) has been previously reported. Dugongs (*Dugong dugon*) are specialized herbivores. Their benthic foraging habits are reflected in morphological differences of the oral disk; the dugong rostrum is expanded and deflected more ventrally compared to manatees. Dugong oral disk morphology and perioral bristle distribution were examined in two captive dugongs (Toba Aquarium, Japan) during experimental feeding trials. Distribution data was also collected from necropsy specimens (James Cook University, North Queensland Australia) and two specimens in the Smithsonian Institution Museum of Natural History collection. Characterization of dugong perioral bristles and bristle-like hairs were obtained from a single specimen (immature female) in the Smithsonian Institution Museum of Natural History collection (USNM 307611). Dugong perioral bristles are located is six discrete bilateral fields and their distributions are similar to that found in Florida manatees. Four bristle fields are located on the upper lip and two bristle fields on the lower lip. Due to the similarities of manatee and dugong bristles, dugong bristle field names are consistent with those of Florida manatees. These bristle fields are expanded compared to Florida manatees and each contains a greater number of bristles (with the exception of the L1 field). Mean counts (left and right) for individual dugong bristle fields are as follows: U1 = 33 (S.D. $\pm$ 2.25), U2 = 51 (S.D. $\pm$ 2.16), U3 = 119 (S.D. $\pm$ 2.19), U4 = 27 (S.D. $\pm$ 0.67), L1 = 20 (S.D. $\pm$ 0.224), L2 = 26 (S.D. $\pm$ 0.946). The total number of dugong bristles was 522 (S.D. $\pm$ 5.29), 40% greater than in Florida manatees. Bristle-like hairs (located on the oral disk) were also characterized so that further comparisons between the feeding apparatus of dugongs and manatees can be made.

TACTILE HAIRS ON THE BODY AND FACE OF THE FLORIDA MANATEE: A MAMMALIAN LATERAL LINE?

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The early report of Dosch (1915) suggested that all the bristles and hairs on the face and body of Sirenia may be modified sinus type tactile hairs. Because of the sensitivity of tactile hairs to displacement, such a three dimensional array could function as an effective detector of the intensity and direction of water currents generated by tidal flows, approaching conspecifics or boats. In order to begin a systematic investigation of this hypothesis, we have mapped the distribution of bristles and hairs and have examined variations in follicle structure and innervation using histological techniques.

In order to conduct hair counts and examine spatial variations in hair length and density, the postcranial body was divided by a rectilinear grid into 12 regions: 5 dorsal, 5 ventral, and 2 on either surface of the tail. Total postcranial hair count was 1332 per side, with a significant change in density from 0.9 hairs/4cm^2 dorsally to 0.3 hairs/4cm^2 ventrally, but no rostrocaudal gradient was evident. Hair length ranged from 1-11mm and exhibted some regional variation. Our mapping of facial bristles and hairs has been reported previously. There is a mean total of 971 bristles and hairs per side of the face.

Hairs from all 12 body regions and the bristles and hairs on the face are associated with an encapsulated follicle containing a blood-filled ring sinus. Each follicle is densely innervated by several nerves which penetrate the capsule basally then ascend along the outer root sheath. Most axons appear to terminate near the level of maximal diameter of the ring sinus. Larger follicles tend to have larger sinuses and appear to be more densely innervated, but some hairs appear to possess disproportionately dense innervation. Facial bristles involved in feeding are exceptionally large and densely innervated.

These findings provide a preliminary indication that the evolutionary history of Sirenia involved a unique expansion of the territory containing tactile hairs from the face to the entire body. This system may be adaptive in the context of a slow moving lifestyle of aquatic herbivory and the absence of predation.

REPRODUCTIVE BIOLOGY OF THE FLORIDA MANATEE (*TRICHECHUS MANATUS LATIROSTRIS*)

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Sexually mature manatees may form mating or escort herds when a female is receptive to breeding, consisting of a focal female and several males. This may last 2-4 weeks and occur at any time of the year, however, reproductive activity may be reduced during the winter months. The female is promisuous in her breeding habits and will mate with several males, however, there is typically only one calf born. Gestation is 12-14 months. Calves will remain with their mother for 1.5-2 yr. and mothers may have a calf about every 3-5 years. It is not yet known how often estrus occurs in female manatees, how long it lasts, or what levels the hormonal parameters reach during a female's estrus cycle. Furthermore, it is not yet known if there are any seasonal fluctuations in hormonal concentrations in either male or female manatees. The objectives of this study were to utilize fecal radioimmunoassays in order to: 1) Document the hormonal parameters of the female manatee estrus cycle, concentrations of estrogens and progesterone throughout the cycle, the cycle's length and frequency, and what factors may influence the cycle. 2) Determine if seasonal variations exist in the estrus cycle of females and the testosterone concentrations in males. 3) Examine possible correlations between physiological hormone concentrations and observed behaviors of female manatees in captivity. 4) Determine whether light cycle dynamics or water temperature influence seasonal changes in captive manatee hormonal concentrations. Preliminary findings indicate that the average testosterone immuno reactivity for adult males is 53.3 ng/g and females at various stages of estrus is <16.0 ng/g. The average progesterone immuno reactivity for pregnant female manatees is 29.5 ng/g, non-pregnant, cycling females 22.8 ng/g, lactating females 13.9 ng/g, and males 12.4 ng/g. Hormone profiles measuring concentrations of estrogens from 2 captive females indicate that there may be a seasonal increase in estrogens from winter months into spring. Information gathered from fecal radioimmunoassays will help supplement our basic understanding of manatee biology, thereby suggesting management policies which will better protect this endangered species.

A PHYSIOLOGICAL AND BEHAVIORAL PROFILE OF A FREE-RANGING FLORIDA MANATEE WITH A CHRONIC LUNG INFECTION.

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Clinical and behavioral information is needed to assess whether free-ranging manatees (Trichechus manatus latirostris) require care, evaluate rehabilitation treatments, and suggest whether rehabilitated captives have adjusted to reintroduction to the wild. In February, 1997, an apparently healthy 258 cm male was captured as part of a telemetry study. He was recaptured in April and June of that year. In June he was transported to a rehabilitation facility (Sea World of Florida) because he was lethargic, thin, and had a distended right thorax. There was a decrease in blubber thickness that ranged from 56% (umbilical site) to 62% (peduncle site) when compared with values measured in February. There was also a decrease in girth measurements that ranged from 12% (peduncle site) to 22% (anal site) when compared with values measured in February. These decreases reflect a weight loss of 100 kg between February and June. Blood chemistry showed fluctuations in parameters including the albumin/globulin ratio, BUN, cholesterol, glucose, iron, and WBC. Changes in habitat utilization and movement patterns were recorded. This case history provides rare insights into behavioral and physiological changes that occurred in a free-ranging manatee with a progressively debilitating illness.

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Florida Department of Environmental Protection, Florida Marine Research Institute (Florida manatee mortality data): <**http://www.fmri.usf.edu**>

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

Save the Manatee Club: <**http://www.objectlinks.com/manatee**>

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

Sirenews: <**http://pegasus.cc.ucf.edu/~smm/**>

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

Steller's sea cow: <**http://www.online.de/home/Rothauscher/steller.htm**>

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LETTER

To *Sirenews*:

I always look forward to reading *Sirenews* to keep myself posted on all the Sirenia developments around the world. But I am afraid that No. 29 (April 1998) was not a bringer of good tidings.

I am extremely sad and (why not say it) outraged with the Local News article written by Paul Dutton from South Africa, regarding the East African dugongs. It is unacceptable that the authorities in Mozambique are just sitting, doing nothing about the continuous plundering of the population of dugongs in the Bazaruto Archipelago! May I also say the current legislation of that country regarding the killing of dugongs is, to say the least, infantile.

In Brazil, some 30 to 50 years ago, the manatee (*Trichechus manatus*) was under a great threat of extinction. Thanks to effective environmental education work carried out by the Manatee Project, which I had the privilege to be part of, and by "strong" legislation, we were able to reverse the situation, and today we have a slow but certain recovery and increase in the population of our *T. manatus* as well as *T. inunguis*.

May I therefore register my utter disgust and immeasurable protest over the completely ineffective legislation and pathetic attitude of the Mozambican authorities.

I would also like to express my utmost regret regarding the frightfully sad situation of Florida's manatee mortality. The *Contingency Plan for Catastrophic Manatee Rescue and Mortality Events* prepared by the U.S. Fish and Wildlife Service should be praised. At least one can see somebody cares - unlike our East African fellows. I can only hope the next issue of *Sirenews* will bring good news from Paul Dutton and from the *Manatee News Quarterly*.

As a member of the IUCN Species Survival Commission and also of the IUCN Commission on Environmental Strategy and Planning, allow me to congratulate *Sirenews* on the wonderful job you are doing for the world's sirenian population.... - **Mario Antonio de Mello Dias** (Alagoas, Brazil)