

- IN THIS ISSUE: - AMAZONIAN MANATEE CATCH STATISTICS RE-EVALUATED (p. 3)
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DUGONG STATUS REVIEWED

Helene Marsh, Helen Penrose, and Carole Eros have recently published a comprehensive assessment of dugong “status, threats, and research and conservation actions in 37 countries and territories” throughout the species’ range, “based on published information and the expert opinions of about 100 scientists and managers. These people were contacted by email ... between 1997 and 2001 as part of the process leading to the development of a global status and action plan for the dugong...” The principal conclusions of this survey deserve repeating: “On the basis of the largely anecdotal information supplied to us ..., we have evaluated the prospects of the dugong[‘]s surviving throughout its range and tentatively conclude that:

- it is at risk of extinction in East Africa, India and Sri Lanka, Japan and Palau;
- its prospects are uncertain in the Arabian Gulf, East and South-east Asia and the Pacific Islands;
- its prospects are probably reasonable in the Red Sea;
- it is probably secure in Australia, except in the urban coastal waters of Queensland, and regions close to major Indigenous hunting communities.”

For the details, see: Marsh, H., H. Penrose, and C. Eros. 2003. A future for the dugong? In: N. Gales, M. Hindell, and R. Kirkwood (eds.), *Marine mammals: fisheries, tourism and management issues*. Collingwood, CSIRO Publishing: 383-399. (This well-produced, multi-authored hardback volume is available for AU\$145.00 from CSIRO Publishing, P. O. Box 1139, Collingwood, Victoria 3066, Australia; <publishing.sales@csiro.au>.)

SIRENIAN STATUS WORKSHOP IN 2005

The status assessments of the living sirenian species provided in the IUCN Red List are due for revision by 2006. A workshop to re-evaluate these species' status, and decide what changes in the assessments may be needed, will be convened by the IUCN Sirenia Specialist Group at the 9th International Mammalogical Congress (IMC9), Sapporo, Japan, 31 July-5 August 2005. Further details will be provided as plans for this meeting develop. For current information, contact Dr. John Reynolds <reynolds@mote.org>. For congress registration and other matters, visit <<http://www.imc9.jp>>.

TETHYTHERIA SYMPOSIUM IN 2005

Also at IMC9, synergistically with the above workshop, there will be a symposium on "Tethytheria: Recent Taxonomic and Natural History Findings", which will cover work on the Proboscidea, Sirenia, and Desmostylia, both living and extinct. If you are interested in participating in the Sirenia-Desmostylia portion of the symposium, please contact Dr. Norihisa INUZUKA <inuzuka@m.u-tokyo.ac.jp>.

ABSTRACTS OF 2003 MARINE MAMMAL CONFERENCE

As those who attended can attest, the 15th Biennial Conference on the Biology of Marine Mammals, held in Greensboro, North Carolina, USA, 14-19 Dec. 2003, was a great success. Several dozen (!) papers and posters were devoted to sirenians. Copies of the abstract volume are still available. The price of each copy is US\$20 and includes shipping and handling. An order form is available at <<http://www.marinemammalogy.org/abs15.pdf>>; it can be printed and mailed to: Marine Mammal Conference, P. O. Box 692042, Orlando, FL 32869-2042 USA. Payment can be made by Visa, MasterCard, American Express, Discover, or checks drawn on U.S. banks. Credit card orders may be faxed to 1-407-352-3459.

LOCAL NEWS

BRAZIL

New Amazonian Manatee Captive Birth. - A new baby manatee has been born at the Aquatic Mammal Lab of INPA, Manaus, Brazil. The mother is our 30-year-old female, Boo, in captivity since 1974 and mother of Erê, our first manatee born in captivity in 1998 (see *Sirenews* No. 30). This is the third successful birth in our lab, but the first with an induced and controlled pregnancy. Boo has been monitored in the last 3 years for hormone studies (Nascimento et al., in prep.). After she stopped nursing a pair of orphans for 2 years (see *Sirenews* No. 40), and started ovulating, we introduced the male Tupy into her tank. She was receptive between the 4th and 14th of February 2003. The pregnancy was monitored throughout gestation. On 3 February 2004, after about 6 hours of intense labor, a male calf (12 kg , 86.5 cm) was born. In contrast to all our other animals, this baby, in addition to the white spot on his belly characteristic of the species, also has white spots on his nostril and flippers.

The calf went straight to the surface to breathe; records of the sounds revealed that mother and calf were vocalizing all the time. He started feeding about 5 hours after birth. Both mother and baby are fine. - **Vera M. F. Da Silva**

How Many Manatees Really Were Killed in Brazil by Past Commercial Exploitation? - Domning (1982) assembled published statistics on the commercial exploitation of Brazilian manatees, ca. 1785-1973, and attempted to estimate the number of

dead manatees that the statistics represented. This attempt was seriously impaired by the lack of hard data on how much meat or other products an average manatee yielded. Nonetheless, his estimates have been quoted elsewhere in discussions of the historical impact of commercial hunting on manatee populations. Since these estimates ran as high as between 3,000 and 7,000 Amazonian manatees killed per year from the 1930s into the 1960s (not counting subsistence hunting), the implications are significant, and it is important to know how close to reality these estimates are.

The most recent and relevant period of commercial killing extended from 1954 to 1973, when the main manatee product in Amazonian commerce was fresh meat. For interpreting these statistics, Domning (1982) used a somewhat arbitrary conversion factor of 40 kg of usable meat per manatee carcass. This was a low estimate based on the statement of Carvalho (1967: 26-27) that a manatee normally furnished 40-60 kg of meat excluding fat. However, Carvalho cited no actual data to support this statement.

Recently, two of us (Kendall and Orozco), working in the Colombian Amazon, have collected relevant data in the course of interviewing manatee hunters. These data point to higher meat yields per carcass, and hence significantly smaller numbers of manatees killed in the past, than Domning (1982) estimated.

Three former manatee hunters, who have killed more than 120 animals among them, gave the following categories for size of the manatee

compared to meat yield (without fat or bone):

Length approx. 200 cm: 60-90 kg of meat (young adult)

Length approx. 250 cm: 100-130 kg of meat (full-grown adult)

Length approx. 280 cm or more: 120-180 kg of meat (large manatee)

They agreed that there could exceptionally be animals yielding up to 200 kg.

Some specific size/yield figures from hunter interviews done over the last 4 years are as follows:

190 cm – 35 kg

190 cm – 60 kg

200 cm – 90 kg

approx. 250 cm – 80 kg

250 cm – 110 kg

250 cm – 130 kg

300 cm – 120 kg

300 cm – 180 kg

300 cm – 200 kg

Clearly, these estimates vary a lot. The hunters say that this is typical; animals yield very different amounts of meat and fat according to their condition. (They say that an average adult will yield about one lata or one and a half latas of fat, maybe even two for a big animal. One “lata”, or can, traditionally holds about 20-25 kg.) Also, people are often not too accurate in their measurements. We have not had the opportunity ourselves to accurately measure the meat obtained from a carcass as it was being butchered. Our work (Kendall and Orozco) aims to reduce hunting, and we consider we would be delivering a contradictory message if we were present during or soon after a hunting event to solicit data. However, it would be useful for anyone in a position to do so to collect such data (from manatees or dugongs), in order to increase the accuracy of the

conversion factors used with old statistics.

As a rough guide to the size/age structure of 55 animals hunted, 23% were up to 150 cm in length, 51% from 150 cm to 250 cm; and 26% over 250 cm in length (Orozco, 2001). The size distribution of animals hunted has probably changed considerably in recent years because of the use in the Puerto Nariño area of fishing nets that are more likely to trap smaller animals. Also, fishermen say there are fewer really big animals than there used to be when they were young.

However, if we take 200 cm as roughly the length of an “average” Amazonian manatee taken by hunters, then even a conservative estimate places its expected meat yield closer to 80 than to 40 kg. This would cut approximately in half Domning’s (1982) estimates of many thousands of manatees killed between 1954 and 1973. Really large manatees, possibly more frequently taken in the past, could easily yield twice as much again, in the neighborhood of 160 kg.

In contrast, Domning’s (1982) estimates of comparably high numbers of manatees killed for their hides between 1935 and 1954 were based on a conversion factor of 20 kg/hide, derived from data in Pereira (1944) that included total numbers and weights of hides recorded in five consecutive years (1938-1942). These numbers would seem to be more firmly based than Carvalho’s (1967) estimate of meat yields.

If, then, we accept the figure of some 6,300 manatee hides exported from the State of Amazonas, Brazil, alone in the peak year of 1940, and halve the 1954-73 estimates based on meat, the resulting picture (cf.

Domning, 1982: fig. 1) more convincingly depicts a significant decline in the take after 1940, with some apparent recovery in the take around 1960 followed by still further decline. This pattern, no doubt, is at least partly an economic artifact, with the decline in hide production in the 1940s and early 1950s driven by demand and linked to the new availability of synthetic substitutes, and the sudden peak in meat exports in the late 1950s possibly due to newly available refrigerated transport. The subsequent decline may reflect real depletion of the population.

Whatever the correct interpretation, however, we now think the estimates of 6,000-7,000 Amazonian manatees killed for meat per year circa 1960 are erroneous and should be reduced by at least half. Likewise, Domning's (1982) estimate of commerce in meat from up to 25 Antillean manatees on the northeastern coast of Brazil in the same period should also be reduced, probably by considerably more than half since *T. manatus* grows larger than *T. inunguis*.

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- **Daryl Domning** (Howard University, Washington, D.C., USA), **Sarita Kendall**, and **Diana Luz Orozco** (Fundación Omacha, Bogotá, Colombia)

COMORO ISLANDS

A Preliminary Assessment of the Status and Conservation of the Dugong (Dugong dugon) in the Lagoon of Mayotte (Comoros Archipelago, Mozambique Channel, Indian Ocean). - The dugong is relatively poorly known in the western Indian Ocean. Around the island of Mayotte, the most eastern of the Comoros archipelago, there is no documented reference to dugongs before the late 1990s. Information on the status, distribution and threats to dugongs in the lagoon of Mayotte was gathered from opportunistic sightings and interviews with local fishermen (n=35), with ultra-light aircraft (n=1), and from dive operators (n=6).

Between 1999 and 2003, 12 opportunistic dugong sightings were recorded by the Service des Pêches et de l'Environnement Marin (SPEM) and the association *MEGAPTERA Océan Indien*. The largest group size was 3 individuals, last sighted in 2000. Dugongs were observed associating with Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) in 1999, and a mother-calf pair was observed in April 2000. The most recent incident was on 21 September 2003 when a dugong was

caught accidentally in a bottom-set gillnet.

74% of fishermen interviewed had observed a dugong at least once, 3% had heard of but had never seen one and 23% had never heard of a dugong. Respondents, especially elders, confirmed that before the early 1980s, one or two dugongs were sold at the market of Mamoudzou every week and dugongs were relatively abundant at that time. However, they were now said to have become increasingly rare. Observations were made most frequently inside the 1,100 km² lagoon. Other important areas highlighted by respondents included: Sada and adjacent areas; the bay of Bouéni; areas adjacent to Petite Terre (south and north); and the southern barrier reef area. Respondents cited incidental net captures as the greatest threat to this species.

Aerial surveys (focusing on turtles) were conducted during 2002 and 2003 from a micro-light aircraft. In 2002, dugongs were observed on 12 occasions between August and September. These included a group of 5-7 individuals and two mother-calf pairs which were observed off the west coast near the bay of Bouéni and in the north of Sada. In 2003, dugongs were seen on 4 occasions off the east coast of the island at Bouzi.

Between 2000 and 2003, divers observed dugongs on 8 occasions. All sightings were of single animals on the east of the island, where the main dive sites are located.

The results indicate that dugongs are present in small numbers within the lagoon waters of Mayotte. Since Mayotte is surrounded by deep water and is 115 km from Anjouan, the nearest Comorian island, it is likely that

these animals are resident or semi-resident. The most important habitats for dugongs are the shallow waters of the lagoon and the seagrass beds in the bay of Bouéni, Passe en S, off the southern coast of Petite Terre and at Saziley.

The main threats to dugongs in Mayotte are incidental capture in fish nets (mostly gillnets), habitat destruction, pollution, disturbance, and boat collisions. Systematic aerial surveys and an intensive research program are needed to determine population dynamics and movements, assess extent of habitat and minimize the threats. Conservation measures include creation of protected areas for dugongs (and marine turtles) where use of gillnets is regulated, awareness-raising among the general public, establishment of a Western Indian Ocean dugong research and conservation network, and development of an integrated land use and management plan for Mayotte.

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FLORIDA

(NOTE: For detailed coverage of manatee matters in Florida, read *Manatee News Quarterly*, published by the Florida Fish and Wildlife Conservation Commission.)

Marine Industries Manatee Symposium Transcripts Available. – On 31 January 2003, the Marine Industries Association of South Florida (MIASF) sponsored a scientific symposium, “Manatee 2020”, on manatee population and conservation. A full transcript of the symposium is now available at <www.miasf.org>. As some supporting documents are available as hard copy only, please call MIASF at 1-954-524-2733 to request this information, or send an e-mail to Martha Lord <martha@miasf.org> or Gordon Connell <gordon@miasf.org>.

The symposium participants included: Dr. Lemnuel Aragones, University of Miami; Lucy Keith, Florida Fish and Wildlife Conservation Commission (FWCC); Dr. Bruce Ackerman, FWCC; Dr. Edmund Gerstein, Florida Atlantic University; David Arnold, FWCC; Benji Brumberg, Florida Department of Environmental Protection; Mary Ann Gray, Manatee Survival Foundation; and Frank Herhold, MIASF. Audience members included county manatee protection plan authors, university professors, law enforcement agents, environmental groups, and marine-industry representatives. Among the topics covered in the day-long session were food resources and manatee-habitat interactions, avoidance technology, warm-water wintering sanctuaries, recruitment, catastrophic environmental occurrences, and interaction of manatees with boats. - (Source: PR

Newswire Association, Inc., Feb. 6, 2004)

Dissertation on Manatee Protection in Florida. – A doctoral dissertation by Theresa L. Goedeke, entitled “The Role of Science in the Creation of Endangered Species Law and Policy: The Case of the West Indian Manatee” (Department of Rural Sociology, University of Missouri – Columbia, 2003), provides an interesting and insightful analysis, by an “outside” observer, of Florida manatee conservation from its beginnings up to the present.

Based in part on extensive interviews with participants in these conservation efforts, this is a valuable contribution to the historical documentation and sociological understanding of events still unfolding, and the roles of some key individuals still active in the manatee science and protection communities. Of particularly contemporary relevance are Goedeke’s views on the decline of the spirit of interagency cooperation since the 1990s; the primacy of Federal over State regulation of manatee protection having been “irrevocably” regained as a result of the lawsuits in 2000; and the likelihood that the influence of scientists on manatee policy will continue to decline relative to that of managers.

Dr. Goedeke can be contacted at <tlg017@yahoo.com>.

Manatee Hotline Connects to Wrong Wildlife. - For years, the Florida Marine Patrol advertised a toll-free number so callers could report injured and dead manatees, boating violations, illegal dumping and other problems. When the patrol was absorbed into the

new Florida Fish and Wildlife Conservation Commission five years ago, the number changed. But the old 800 number lives on, posted throughout Florida on boater education signs, printed in park brochures and included on Web sites for everything from SeaWorld to the Humane Society. Recently, a newspaper ad for the Miami Seaquarium included the old number, not the new one. Trouble is, someone else owns that 800 number now. Someone with a different definition of wild life.

Starting in October, callers trying to report an injured manatee using the old 800 number were referred to another 800 number, which turned out to be a sex-talk line called Intimate Encounters. A woman's voice promised a chat with "fantasy girls" in exchange for a credit card.

"That's not the kind of wildlife violation they respond to," quipped Suzanne Tarr of the Save the Manatee Club, which is replacing its old signs with new ones showing the new number.

One irate caller eventually got hold of state wildlife biologist Penny Husted. "She was very upset," Husted said. "She said a lot of people are not going to go through the trouble she went through to report an injured manatee."

This is not the first time Intimate Encounters has turned a hotline into a party line. It has taken over old toll-free numbers from the conservative journal Policy Review, the World Wildlife Fund, Alltel's wireless customer service and rape crisis lines in Maine and Arizona. A spokesman for the Philadelphia company did not respond to calls seeking comment.

Tom Pitchford of the wildlife agency's Florida Marine Research Institute said he could not figure out how Intimate Encounters would attract paying sex-line customers from people reporting dead animals.

Agency biologists had urged their bosses to hang onto the old number because it was so well known, he said. Before the sex-line connection, callers to the number got no answer, which also prompted complaints, he said.

Being hooked up to a sex line "only adds to the levels of frustration felt by our field staff and FWC dispatchers, it's making us look really bad to the public," Elsa Haubold, in charge of the marine institute's manatee program, wrote in an e-mail to agency officials.

The agency kept the 800 number for four years after the demise of the Florida Marine Patrol, noted Major Kent Thompson of the wildlife agency's law enforcement division. Until July, callers to the line got a recording referring them to the new number. Then, the company that owns the 800 listings apparently sold it to Intimate Encounters, he said.

Now, Thompson said, "we want to see if we can get that number back again."

The situation had agency spokesman Henry Cabbage shaking his head. "You've got to admire the American spirit when it comes to figuring out a way to make a buck," he said. "We're just geniuses at that."

The correct toll-free number to report problems to the Florida Fish and Wildlife Conservation Commission is **1-888-404-FWCC**. - **Craig Pittman** (*St. Petersburg Times*, November 30,

2003. *Times* staff researcher Caryn Baird contributed to this report.)

FRANCE

First Birth of Twin Sea Cows in Captivity. - A zoo in central France is now the proud home to a world first: the birth of twin sea cows in captivity.

The manatees came into the world on November 4, at the Beauval ZooParc in the town of Saint-Aignan. The director, Rodolphe Delord, said it was the first known birth of twin sea cows in a zoo or animal park.

He said each of the arrivals weighed around 20 kg (45 pounds) and were around a meter (three feet) long. One, a male, was named Quito. The other, a female, was called Luna.

In the wild, the sea cows they are descended from are found in brackish rivers in the southern United States and Central America. - (Source: *Agence France Presse*, December 3, 2003)

INDONESIA

Death of Dugong at Surabaya Zoo. - The single female dugong held at the Surabaya Zoo died in the fall of 2003. The cause of death was probably old age. This animal was caught in 1974 in the area of Banyuwangi, south coast of East Java. According to Mr. Bambang Suhardjito, Director of the Surabaya Zoo, this survival of a dugong in captivity for nearly 30 years is a new record. - **Ismu Sutanto Suwelo** (National Foundation for Ocean Development, Indonesia)

JAPAN

Dugong Workshop. - A workshop on “The Biology and Research Methods of Dugongs” was held on 26 March 2004 at the National Institute of Polar Research in Tokyo, Japan. The primary purposes of the workshop were to review the biology of dugongs and report on the research on dugongs that is being carried out in Japan and overseas, especially in Thailand and the Philippines, by Japanese researchers. There were three reports about the biology of dugongs, on “Stomach content analysis of dugongs from Okinawa, southern Japan,” “Contents of the gastrointestinal tract of dugong in Kumamoto, Japan”, and “Reproductive hormones of dugong in captivity”. Also presented were five reports about methods of dugong research, “The relationship between dugongs and seagrass beds - method of the feeding trails of dugongs”, “DNA analysis of dugongs”, and “Acoustical analysis of dugong voice”. Many proposals about future research on dugongs were offered by workshop participants, which included up to sixty people.

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Churaumi Aquarium Manatee Baby Named Yuma. - Churaumi Aquarium in Motobu Memorial Park, Okinawa, is now one of the very few in the world that has managed to have a baby manatee born in captivity. The happy event actually took place about two years ago when the American

manatee mother, Maya, produced a healthy manatee baby with father manatee, Yukatan. Both parents were originally captured in Mexico.

After the baby was born, the question of what to name it naturally arose. The management at the Aquarium finally decided to ask for help from the public and organized a vote among visitors to the facility.

A total of 5,247 people sent their suggestion by postcard, and the baby was finally named Yuma in a ceremony. Yuma comes from the first syllables of the names of its parents, and 137 people had sent the same suggestion.

Yuma also got an official godfather from among those 137 persons. Kenichi Tamura from Ibaraki Prefecture was selected by raffle at the ceremony and will get a certificate officially naming him with the honor. Meanwhile, Yuma didn't seem to get overly excited about the event, concentrating on munching on seaweed instead. And baby Yuma has grown indeed, being currently 193 cm long and weighing 220 kg. - (Source: *Japan Update*, November 28, 2003)

LOUISIANA

Lake Pontchartrain Attracting Manatees. - The West Indian manatee is being spotted more often in Lake Pontchartrain and other Louisiana waters, according to a biologist with the Louisiana Department of Wildlife and Fisheries.

There were 93 manatee sightings reported to the state between 1995 and 2003, compared with only 20 from 1929 to 1994, Louisiana Natural Heritage Program zoologist Ines Maxit said during an environmental law

seminar at Tulane Law School, New Orleans, on 3 April 2004.

The manatees, more likely to be seen in Florida's west coast waters, seem to be attracted to the lake's cleaner water and recovering seagrass beds, she said. The lake has seen an environmental revitalization during the past 15 years, the result of a state halt in dredging for clamshells, which left the water more clear, and a reduction in contaminants entering the lake from rainwater runoff and sewage-treatment plants on the lake's north and south shores.

Maxit said it's unclear whether the number of manatees is increasing, or whether people are simply becoming more aware of the unusual animals. However, officials say scientific surveys point to an increase in the population of manatees throughout the Gulf of Mexico. But that's not been enough to overcome the threats to the mammals from natural and human causes. The manatee's lack of speed and maneuverability makes it vulnerable to boat traffic, the cause of 25 percent of recorded manatee deaths since 1990.

Louisiana has begun posting signs saying "Manatee area, proceed with caution," with the phone numbers for reporting sightings -- -- (225) 765-2821 or (800) 442-2511 -- -- in marinas in the Lake Pontchartrain area, but many have been stolen, probably as souvenirs, Maxit said. Her office also has begun a program to educate boaters to avoid destroying seagrass, in part through the issuance of "Manatee Sea Grass Beds" certificates.

The state also has entered into a contract with the Audubon Aquarium of the Americas to conduct aerial surveys that will gauge how many manatees are in Louisiana, and to act as a

rehabilitation center for injured animals, Maxit said. - **Mark Schleifstein** (*The Times-Picayune*, New Orleans, LA, 4 April 2004)

MEXICO

Rehabilitation of a Manatee Calf (Trichechus manatus) in Chetumal, Quintana Roo, México. - On Sunday, 14 September 2003, staff of El Colegio de la Frontera Sur (ECOSUR) responded to a report of a manatee calf that was found alone in Guerrero Lagoon, which is located about 25 km from Chetumal city. As the calf could not swim very well and an adult manatee that could be its mother was not found, staff from ECOSUR decided to take care of it to avoid its death from starvation. It was kept in an inflatable kiddie's pool in Chetumal city, where it was examined. The male calf was in good condition. It was thought to be about 2 weeks old, measured 108 cm and weighed 20 kg. It was named "Daniel".

Next day the calf was taken to Dolphin Discovery, an aquatic park in Puerto Aventuras, Quintana Roo, where the staff has experience with marine mammals in captivity. He was assessed and fed by Dr. Roberto Sánchez, and blood samples were taken. On 16 September the calf was taken back to ECOSUR in Chetumal, where he has been kept since then in a 3 m circular pool with a filter system and a boiler to maintain the water clean and warm.

A group of volunteers feed the calf with milk every 3 hours. Every week Daniel is taken out of the pool to take measurements and samples for clinical analysis. He is growing well and is beginning to bite lettuce. At 6

months old in March 2004, his length is 130 cm and he weighs 50 kg.

Local people, groups of children, students and tourists visit Daniel every day to learn about the manatees which inhabit Chetumal Bay.

Daniel will be in ECOSUR facilities until April 2004, when the cold north wind season ends. In agreement with local government, it is intended to keep him in a pen in Guerrero Lagoon about 8 months at least, rearing him in a natural environment and introducing him to aquatic vegetation. Then, when Daniel is released, he will be tagged with a radio-transmitter to monitor his movements in his natural habitat. This will be part of the manatee project research activities of ECOSUR.

People in charge of Daniel are: Benjamín Morales (manatee researcher at ECOSUR), Marco Benítez (vet of African Safari), Rafael Estrada, Daniel Rovelo and Janneth Padilla (manatee research assistants at ECOSUR). The advisory group are: Roberto Sánchez, Fabián Vanoye, Antonio Mignucci, Greg Bossart, and Robert K. Bonde.

This is the first manatee calf rehabilitation venture for B. Morales and his group. Save the Manatee Club has been the main provider of funding. Patty Thompson helped to get us these funds. For further information or to contribute towards this rehabilitation program, contact Janneth Padilla <janet@ecosur-qroo.mx>, or visit <<http://www.ecosur-qroo.mx/manati/index.htm>>. - **Janneth Padilla-Saldívar** and **Benjamín Morales-Vela** (El Colegio de la Frontera Sur, Av. Centenario km 5.5. CP 77900, Chetumal, Quintana Roo, México)

MOZAMBIQUE

Dugong (Dugong dugon)
Population Trends in the Bazaruto Archipelago National Park, Mozambique, 1990-2003. - From 1969 until 2003 there have been several reports of dugong sightings in the vicinity of the Bazaruto Archipelago (Hughes, 1969; Tinley, 1969; Santos Dias, 1971; Dutton and Zolho, 1990; Dutton, Cockcroft, and Guissamelo, 1990; Cumming, Mackie, Magane, and Dutton, 1995; Cockcroft and Guissamelo, 1997; P. Dutton and S. Dutton, 1997; Guissamelo and Cockcroft, 1997; Dutton, Correia, and L. Zivane, 1998; Mackie, Correia, Magane, and Zivane, 1999; Mackie, Guissamelo, Nhantumbo, and Bento, 2001; Dutton and C. Zivane, 2002; Marsh, 2002; Cockcroft and Young, 1998; Dutton, Muchenne, Niels, and Margett, 2003).

The intensification of large-mesh gill-netting from 1976, coupled with lack of law enforcement, has been the principal cause of the decline of dugongs in Mozambique. The southernmost population of Africa's dugong at Inhaca, once numbering about 20 (Rod Salm, pers. comm.), is now extinct, with small numbers being reported at Inhambane. The situation further north at Angoche, where Hughes (1969) witnessed daily sales of dugong meat at the local market, is not known. However, my own enquiries and visits indicate that the dugong is now extinct on Mozambique's northern coast.

Current reports from Tanzania and Kenya are no less alarming. It is evident that the ENEP, WWF and most scientists have thrown in the towel in trying to save the beleaguered dugong

in the western Indian Ocean. This is borne out by Dr. Amini Ngurasu, dugong research coordinator for WWF, saying that donors and universities are reluctant to fund research on dugongs because there are so few of them left (George Mwangi, Associated Press, 31 July 2003).

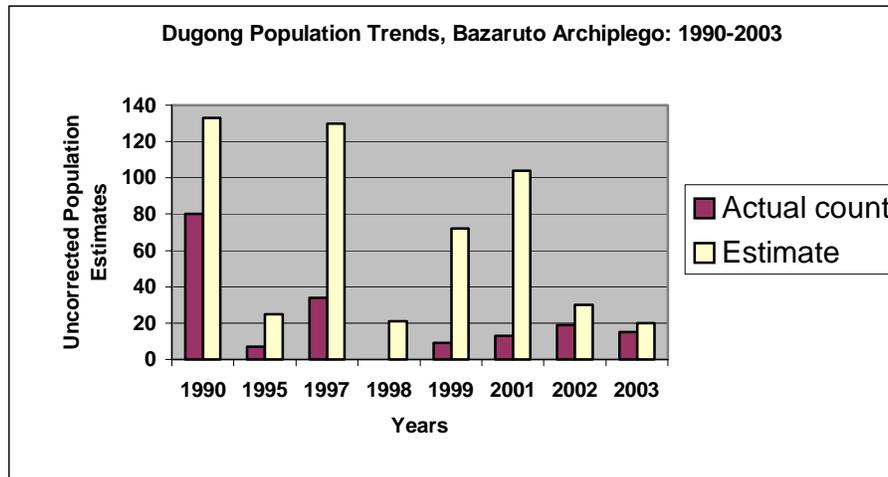
Bazaruto's population of dugong, once estimated at 133 from a sample of 80 in 1990 (Dutton & Zolho 1990), is now less than 23 according to air surveys carried out by Dutton and cetacean specialist Dr. Almeida Guissamelo in 2003. Of this population only two had juveniles. Although it is illegal to kill dugongs in Mozambique, carrying a fine of 50,000,000 Meticaís (US\$ 5,000) (Decreto No. 12/2002 de 6 de Junho), no convictions are on record to date.

Methodology: Since 1990, systematic dugong surveys within the Bazaruto area have regularly been carried out by various researchers using different methodologies and search intensities, with aircraft flying at altitudes varying between 100 m to 150 m along selected transect lines with sample strip widths varying from 368 to 500 m. Low tide and calm periods were preferred for counting. The average flight time covering the study area varied from 3 to 5 hours. Despite these varying methodologies, a useful indication of dugong population trends nevertheless emerges.

Whereas it was possible during the earlier surveys to derive reasonable estimates using statistical analysis, the current sparse and unevenly distributed population makes this impractical. For this reason the most recent survey (March 2003) involved increased search intensity (survey lines 4 km apart and

5-hour flight) in an attempt to do a total count.

Results: The following graph illustrates the trend in dugong populations since 1990.



Recommendations: The seriousness of the dugong situation in the Bazaruto Archipelago area calls for urgent and drastic measures to prevent the loss of this, probably the last remnant population for the entire East African Indian Ocean region. For this to succeed it will require coordinated and cooperative input from all relevant Mozambique government agencies, NGOs, local tourism enterprises and local people. Immediate measures should follow a three-pronged coordinated approach to prevent further decline of the dugong: extension and education; vigilance and law enforcement; and civil society involvement.

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PHILIPPINES

Newspaper Story Helps Stop Slaughter of Dugongs. - An *Inquirer* story on the possible extinction of sea cows in the 21,000-hectare Pujada Bay at Mati, Davao Oriental, has fortunately led to a stop in the killing of the mammals. The story, which reported the hunting and slaughtering of the animals and the dangers they face from garbage dumping, came out in the *Inquirer Mindanao* in 2002.

David Pajarillaga, Mati community environment resources officer (CENRO), said local fishermen realized that massive hunting was decimating the already low dugong population. Fishermen also found out that hunting the animals for their meat was illegal. Catching and slaughtering dugongs are punishable by imprisonment of six months and a fine ranging from P1,000 to P2,000.

Since the massive information campaign triggered by the *Inquirer* story, Pajarillaga said residents of Barangays Lawigan, Mamali and Bad-as stopped hunting and slaughtering the animals. The slaughter of dugongs was common in these villages.

"There is no more massive catching and slaughtering of the endangered dugong in Pujada Bay since the *Inquirer* came out with a story on the massive catching and slaughtering of dugongs here. They realized that dugongs, which are endangered marine mammals, must be preserved," said Pajarillaga.

Former President Fidel Ramos declared Pujada Bay a protected seascape and landscape in 1994. Alfeo Piloton, chief of the Bureau of Fisheries and Aquatic Resources here, said Pujada Bay is the dugong's sanctuary.

Pajarillaga said what complicates the dugong preservation program is the locals' liking for its meat. "Dugong meat tastes very much like that of cow but sells much cheaper," he said. At local wet markets in the province, dugong meat sells for P50 to P100 a kilo compared to about P130 for lean beef.

Garbage is also threatening the animals. Pajarillaga said after the story came out, Mayor Francisco Rabat banned the dumping of garbage in the bay. - **Ferdinand O. Zuasola** (PDI Mindanao Bureau. Source: *Philippine Daily Inquirer*, November 25, 2003)

THAILAND

Second Stranding of a Dugong Calf in Phuket, Thailand. - A female dugong calf (107 cm long) stranded in a river mouth north of Phuket Island,

Thailand, on the afternoon of 6 February 2004. She was released back into the sea on the same day. We had hoped that she could find her mother soon after being released. Unfortunately, she came into a shallow area again at the beginning of March. She was found very weak and thin, and had a large wound on her muzzle. Obviously orphaned at this stage, she could have gotten lost from her mother or her mother may have died. We don't believe she had had any food since 6 February. We currently have her in rehabilitation, where we are treating the wound and feeding her a milk formula prepared in consultation with a veterinarian. - **Kanjana Adulyanukosol** (Phuket Marine Biological Center, Phuket, Thailand; e-mail: <k_adulyanukosol@hotmail.com>)

ABSTRACTS

The following abstract is of a paper given at the 2003 International Papillomavirus Workshop in Mexico City:

Isolation of a Novel Close-to-root Papillomavirus Using Degenerate Primer PCR and Multiply-primed Rolling Circle Amplification: the Florida manatee (*Trichechus manatus latirostris*) Papillomavirus or TmPV-1.

Rector, A., Ghim, S-J., Bossart, G.D., Jenson, A.B., and Van Ranst, M.

(GDB: Harbor Branch Oceanographic Institution, 5600 U.S. 1 North, Ft. Pierce, Florida 34946 and Rosenstiel School of Marine and Atmospheric Sciences, University of Miami, Miami, FL 33149; phone: (772) 465-2400 ext. 556; fax: (772) 466-4853; e-mail: <gbossart@hboi.edu>)

A skin lesion biopsy from a Florida manatee (*Trichechus manatus latirostris*) was examined for the presence of papillomavirus DNA using a combination of degenerate primer PCR and multiply-primed rolling circle amplification (RCA). Degenerate cutaneous papillomavirus-specific primers were developed based on an alignment of the L1 and E1 nucleotide sequences of selected animal and human benign cutaneous papillomaviruses. Primers were chosen in the most conserved parts of these sequences and degenerate positions were incorporated where necessary. Using these degenerate primersets, we obtained partial L1 and E1 sequences of a novel papillomavirus from the manatee sample. We used a novel multiply-primed RCA protocol to amplify the complete papillomaviral DNA. Whereas no papillomaviral DNA could be detected by restriction enzyme digestion of the original sample, SalI digestion of the RCA product showed a single band of approximately 8kb. The complete genome of this papillomavirus was determined via direct primer-walking sequencing on the RCA product, starting from the partial E1 and L1 sequences that were determined with the degenerate primers. The *Trichechus manatus latirostris* PV (TmPV-1) contains 7722 basepairs, and shows the classical PV genome organization with the 7 major open

reading frames, and one upstream regulatory region. The phylogenetic position of TmPV-1 was examined by constructing a neighbor-joining phylogenetic tree, based on an amino acid alignment of the L1 sequence of TmPV-1 and 55 other animal and human PVs. The TmPV-1 genome shows only distant relationship to other PV sequences in GenBank, and appears in our phylogenetic tree as a close-to-root papillomavirus.

The following abstracts are of presentations at the 83rd Annual Meeting of the American Society of Mammalogists, Texas Tech University, Lubbock, Texas, 21-25 June 2003:

Definition of Endangered: The Florida Manatee (*Trichechus manatus latirostris*), a Case Study

Holly H. Edwards, Elsa M. Haubold, Charles J. Deutsch, Richard O. Flamm, Bruce B. Ackerman, Meghan E. Pitchford, Cheri A. Keller, and Sentiel A. Rommel (*Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute, 100 8th Ave SE, St. Petersburg, FL 33701, USA*)

The process of designating species as endangered can be controversial. In the case of the manatee and other species in the state of Florida, this controversy is confounded by the fact that independent endangered species lists and criteria for them are maintained at both the federal and the state levels. Recently, a biological status review of the Florida manatee was conducted to reassess its status at the state level. To make the listing process objective, the state of Florida adopted criteria in 1999 for designating species as endangered, threatened, or of special concern. These criteria are identical to the IUCN designations of critically endangered, endangered, and vulnerable species, respectively. An eleven-member Stakeholder Working Group compiled generic, quantifiable criteria for classifying at-risk species in the state of Florida. The Florida manatee was grandfathered onto the state list, having been originally classified as endangered in 1967. The recent status review revealed that the manatee does not meet the state's criteria for classification as endangered. It does meet the criterion for a threatened species, however, based on a 20% probability of a population decline of at least 50% over the next 45 years (3 generations). Conversely, the most recent federal manatee recovery plan (2001) defines measurable biological benchmarks for down-listing. The manatee has not yet met those goals, indicating that the manatee will remain on the federal endangered list. Although state and federal wildlife agencies share the goal of recovery of the species, the fact that the designations and listing criteria are different may confuse the public. It is yet to be determined what impact a change of status at the state level will have on the future of manatee protection in Florida, but it will likely highlight problems that can ensue when separate government agencies have different criteria for designation of endangered species.

Florida Manatees (*Trichechus manatus latirostris*) and the Caloosahatchee River, Lee County, Florida: A Regional Assessment

Sara L. McDonald and Richard O. Flamm (*Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute, 100 8th Ave. SE, St. Petersburg, FL 33701*)

We used a "weight-of-evidence" approach to provide environmental managers with a comprehensive analysis of Florida manatee use of the Caloosahatchee River, Florida, eastward to the W.P. Franklin Lock and Dam. We examined human use of the river, habitat features, large- and fine-scale manatee movements (from telemetry data), manatee distribution and relative abundance (from aerial surveys), and manatee deaths (from FWC carcass recovery data). The section of the river between Shell Point and the Edison Bridge (mid region) constitutes an important travel corridor. It connects a secondary warm-water site and important feeding areas at the mouth (west region) to the feeding and resting areas and a primary warm-water refuge east of the Edison Bridge (east region). The importance of each region changes seasonally, but manatee use of the east region is highest during winter (December–February). While traveling upriver or downriver, manatees appear to use shallow areas near seawalls in urbanized locations for feeding, drinking, resting, or thermoregulation. Data indicate that manatees travel relatively close to the shoreline and cross the river in the narrow areas of Redfish Point and Shell Point. While en route, manatees sometimes stop at secondary aggregation areas. There is high overlap of manatees and vessel traffic at the mouth of the river. Based on 13 years of carcass recovery location data (1989–2001), watercraft-related manatee mortality has increased at a faster rate in the Caloosahatchee River than in either southwest Florida or the state as a whole. Evidence suggests the following: in winter the east region may

be a sink for fatally injured manatees, and manatees are more likely to be harmed by motorboats at the mouth of the river, San Carlos Bay, Redfish Point, and Matlacha Pass than in other waters of Lee County.

Copies of the full report can be downloaded from <www.floridamarine.org>.

The following two papers were given at the 12th Annual Conference of South East Asian Zoos and Aquaria Association (SEAZA), held at the Indonesia Safari Park, Cisarua, Bogor, 8-11 December 2003:

Seagrass, the Dugong Food

Moh. Husni Azkab* and Ismu Sutanto Suwelo** (**Research Centre for Oceanography, Indonesian Institute of Sciences*; ***Indonesian National Foundation for Ocean Development*)

Seagrasses are the main food of dugongs, although marine algae are occasionally eaten, particularly when seagrasses are not available. In captivity, dugongs do not have a feeding time; they may feed any time, whenever food is available.

Feeding experiments with an adult female dugong in the Surabaya Zoo showed that the animal preferred *Halophila uninervis* over *Cymodocea rotundata*, *Syringodium isoetifolium*, and *Thalassia hemprichii*. At Sea World Indonesia, a dugong consumes 18-20 kg wet weight of *Syringodium isoetifolium* and is fed four times daily.

Throughout the world, seagrasses are recognized as an important component of coastal productivity. Studies indicate that approximately 60 species of this flowering plant have colonized the sea. The leaves are most often straplike (turtle grass), but may be cylindrical or oval (manatee grass).

Seagrasses occur in the lower intertidal zone down to about 30 m depth in tropical to subpolar seas. Their greatest species diversity occurs in the Indo-West Pacific. This paper will discuss the diversity of seagrass (lamun ar rumput laut) in Indonesia's seas.

Blunt Trauma Recovery, Gastrointestinal Disorder and Medical Management of a Captive Adolescent Male Dugong (*Dugong dugon*) at Sea World Indonesia

Linda Tjin* and Sumitro** (**Sea World Indonesia*; ***Jaya Ancol Oceanarium, Jakarta*)

An adolescent male dugong about 150 cm long, assumed to be about a half to one year old, was found along the Bojonegara coast, Serang, 120 km west of Jakarta, on 7 Oct. 1999. Initial physical examination revealed that the animal had several net scars along its dorsal skin surface, and a hematoma in its right pubic area. Impact against a hard object was thought to be the cause of the lesion. The dugong was lethargic, presumably caused by heatstroke following exposure to direct sunlight while housed in a shallow pond for several hours prior to the initial examination. The animal was then placed in an 8 m-diameter and 2 m-deep concrete pool, owned by the Installation of Agricultural Technology Development, a government institution situated on Bojonegara, Serang.

A perforation of the hematoma was found during the second observation a couple weeks later. Ischemia followed by dermal necrosis was suspected to be the aetiology of the perforation. A long-acting oxytetracycline (20%) injection was administered intramuscularly at the dose of 20 mg/kg BW, Q 3 days for 4 treatments to prevent a secondary bacterial infection. Hydrogen peroxide (3%) topical rinses, and topical applications of levertrans +1% twice a week for the next 7 weeks. Wound healing was evident by the third week, and dermal reformation took place by the 10th week. The trauma resulted in an asymmetrical body wall when observed dorsally and caudally from the trunk axis. (See *Sirenews* No. 34.)

The dugong was transported to the Sea World Indonesia (SWI) facility 7 months later. It weighed 78 kg and had a 94 cm pectoral girth, 114 cm abdominal girth, and 163 cm length. Its temporary exhibit tank is an acrylic cylinder 4.5 m in diameter and 2.5 m deep. The animal was fed seagrasses 4 times daily. In the wild, dugongs spend much of their waking time grazing. One dietary study on another captive dugong in Indonesia (De Iongh, Kiswara, and Bauer, 1996, in *Plant-herbivore interactions between seagrasses and dugongs in a tropical small island ecosystem*: 19-34) revealed that *Halodule uninervis* and *Halophila ovalis* were the preferred species for that individual. Our dugong was fed *Syringodium isoetifolium* since it is abundant, easier to collect, and can be stored for longer periods of time. Routine procedures included total tank water replacement twice weekly along with the administration of multivitamins, iron and other trace minerals. Oxfendazole (450 mg) was also given every 8 weeks to

prevent gastrointestinal nematodiasis. As a result of this regime, the animal's hemoglobin concentration improved from 30% to 80-90% on Talqvist hemoglobin measurement.

Several bouts of gastrointestinal disorders (bloat, diarrhea, constipation) occurred during the first year and a half that this animal was in captivity. The dugong, when fed ad libitum, consumed up to 20 kg seagrass daily. Limiting the quantity of *Syringodium isoetifolium* fed daily to 13-15 kg wet weight reduced the incidence of the gastrointestinal disorders.

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SIRENIAN WEBSITE DIRECTORY

(NOTE: Not all of these sites have been visited recently by your Editor, and some may no longer be active, or their addresses may have changed.)

Belize Coastal Zone Management Authority & Institute's Manatee Research Program:
<http://www.coastalzonebelize.org/pr_manatee.html>

The Call of the Siren (Caryn Self Sullivan): <<http://www.sirenian.org/caryn.html>>

Caribbean Environment Programme, Regional Management Plan for the West Indian Manatee: <<http://www.cep.unep.org/pubs/techreports/tr35/ct35indx.htm>>

Caribbean Stranding Network: <<http://netdial.caribe.net/~mignucci/>>

Columbus (Ohio) Zoo manatee exhibit: <http://www.colszoo.org/animalareas/shores/manatee_coast/index.html>

Dugongs: <<http://home.t-online.de/home/rothauscher/dugong/dugong.htm>>

Dugong necropsy manual (available for downloading): <http://www.gbrmpa.gov.au/corp_site/info_services/publications/research_publications/rp64/index.html>

Florida Fish and Wildlife Conservation Commission, Bureau of Protected Species Management: <<http://www.floridaconservation.org/psm/>>

Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute (Florida manatee mortality data): <<http://www.floridamarine.org/manatees/>>

Friends of the Manatee Association, Manaus & Balbina, Brazil: <http://www.amigosdopeixe-boi.org.br/english/Ing_index2.htm> [Includes a bibliography of INPA aquatic mammal project publications and abstracts]

Fundación Salvemos al Manatí de Costa Rica: <www.fundacionmanati.org>

Great Barrier Reef dugongs: <http://www.gbrmpa.gov.au/corp_site/info_services/publications/dugong/index.html>

IBAMA manatee project, Brazil: <www.projetopeixe-boi.com.br>

Jacksonville University (Florida) Manatee Research Center Online: <www.ju.edu/juconnect/research/marco>

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

"Manatee Watchers" Internet discussion list: <<http://www.listbot.com/archive/MANATEE>>

News clippings on Florida manatees: <<http://www.n-jcenter.com/menus/enmanate.htm>>

Philippines Dugong Research and Conservation Project: <<http://www.wwf-phil.com.ph>>

Save the Manatee Club: <<http://www.savethemanatee.org>>

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

SEMARNAP, Secretaria de Medio Ambiente, Recursos Naturales y Pesca, Mexico:
<<http://www.semarnap.gob.mx/naturaleza/especies/manati/descrip.htm>>

Sirenews (texts of current and recent issues): <<http://www.marinemammalogy.org/snews.htm>>; <<http://www.sirenian.org/sirenews.html>> (for archive of most older issues)

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

Sirenian International, Inc.: <<http://www.sirenian.org/>> [Includes a bibliography of sirenian literature, and an archive of *Sirenews* issues.]

Smithsonian Institution sirenian bibliography: <<http://www.si.edu/resource/faq/nmnh/sirenia.htm>> [This is a relatively short bibliography, compiled by Joy Gold, that provides a very good introduction to both the technical and the popular literature.]

Steller's sea cow: <<http://home.t-online.de/home/rothauscher/steller/steller.htm>>; also the website [in Finnish] of Dr. Ari Lampinen, University of Jyvaskyla, Finland: <<http://www.jyu.fi/~ala/ilmasto/steller.htm>>

West African manatee in Chad (Jonathan H. Salkind): <<http://members.aol.com/needii/manatee-index.html>>

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