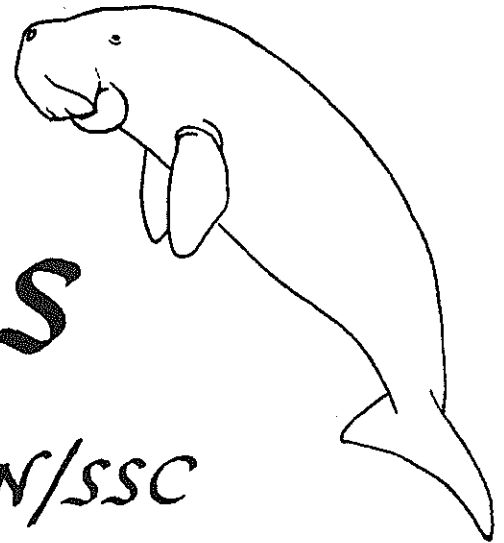


# Sirenews



## Newsletter of the IUCN/SSC Sirenia Specialist Group

NUMBER 24

OCTOBER 1995

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### DEATHS REPORTED

Tammy Dominguez and Amaury Villalba

Last January, Tammy Dominguez, her colleague, Amaury Villalba, and their pilot were killed when their plane went down during a manatee survey off Barahona on the southern coast of the Dominican Republic. A third colleague, José Ottenwalder, was injured but made a miraculous escape, and is doing fine. We first started to correspond with Tammy shortly before the 1994 First International Manatee and Dugong Research Conference, which she attended. She was also an active participant in the Manatee and Dugong Research Workshop which followed the conference. Tammy was very dedicated to the conservation of sea turtles and marine mammals, especially manatees. She is greatly missed by all of her colleagues.

- Lynn Lefebvre (Sirenia Project)



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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## MANATEE AERIAL SURVEY SAFETY RULES

Manatee aerial surveys present special hazards to survey biologists because of the small planes that are typically used (they can easily be overloaded), the relatively low flight level (generally 500 feet), the tight turns that are frequently made to count manatees (possibility of stalling), and flight paths over water. At times, the dedication of the surveyors may become a hazard, if their determination to complete a mission interferes with their judgment concerning weather conditions, the qualifications of their pilot, and the condition of the aircraft.

Listed below are some "common sense" rules for manatee aerial survey personnel. They are not intended to be all-inclusive, but represent the highlights of regulations provided by the Office of Aircraft Services (OAS), which all Department of Interior (DOI) employees in the U.S. must follow when participating in work-related aviation.

Ms. Burma Campbell, U.S. Fish and Wildlife Service, is gratefully acknowledged for providing information used to develop these rules, for reviewing them, and for her continued interest and encouragement.

- The Cessna 172 aircraft is underpowered for low-level flying (less than 500 feet). During low-level missions, aircraft cannot operate lawfully at a higher certified load (aircraft, passengers, fuel, cargo) than that recommended by the manufacturer. If more than two observers are planned, then a Cessna 182, 185, or 206 is recommended.
- Surveys should never be flown at an altitude lower than 500 feet. Many survey biologists prefer an altitude of about 750 feet for circling and counting of manatees in groups. Under DOI Aviation Policy, aircrew members may not fly below 500 feet without special training and personal protective equipment.
- Know your pilot's qualifications. How many hours of flight experience does he or she have in the aircraft in which you will be a passenger? OAS regulations require 1000 hours of flying time in order to certify a pilot.
- Know your plane's service record. DOI Aviation Policy requires servicing and inspection of a plane after every 100 hours of flying time.
- Prepare a GO/NO GO checklist that you go through before every flight. While the pilot has the final say in the decision to GO, remember YOU always have the final say in the decision to cancel a flight. If you have any doubts about the weather, the pilot, or the plane, cancel the flight. You are much more important than a missed survey! Also, all surveys should be conducted under optimal weather conditions to ensure some comparability across survey dates; questionable weather means questionable survey results. If changes occur in the weather or pilot or observer mental or physical condition, the observer should call off the mission and request the pilot to return to home base, or to land at the nearest suitable location, depending upon the severity of the change in flight conditions.
- Prepare a flight plan and give it to ground personnel at the airfield(s) where your flight originates and ends. The person(s) to whom you give it will be responsible for flight following and will institute search and rescue procedures if your aircraft does not reach its destination within one hour of its estimated time of arrival.
- Only cargo and passengers which are essential to a mission should be on the aircraft. Not only does this eliminate the possibility of an accident from something that should not have been onboard, but it keeps the weight of the aircraft at a minimum, thereby using less fuel and minimizing costs. Survey biologists should be careful to secure such routinely used objects as: pencils and pens; camera lenses, lens covers, film canisters, small tape recorders, palm counters, etc.

- DOI Policy requires the pilot be present to supervise the type, quantity and quality of fuel used in the aircraft when refueling. There have been misfueling mishaps in the U.S., in which jet fuel has accidentally been put into reciprocating-engined aircraft.
- If a single-engine aircraft is to be used beyond power-off gliding distance to shore, the aircraft should be float-equipped and all persons onboard should have personal flotation devices.
- Biologists who fly regular missions can benefit from a flight familiarization course consisting of 4 hours of ground school and 4 hours of flight training (cost is approximately \$500). It is intended to give passengers limited knowledge of how to operate aircraft controls, radios, etc., and land the plane in the event of a pilot-incapacitated emergency.

Your comments on these rules are welcome. If you would like to help by translating them into Spanish or other languages, please contact me. If you would like examples of a GO/NO GO checklist or a flight plan, or information on the flight familiarization course, please contact: Dr. Lynn Lefebvre, Sirenia Project, National Biological Service, 412 NE 16th Ave., Rm 250, Gainesville, FL 32601 USA; phone: 904-372-2572; Fax: 904-374-8080; Internet: [sirenia@nervm.nerdc.ufl.edu](mailto:sirenia@nervm.nerdc.ufl.edu). - Lynn Lefebvre

**DEATH REPORTED**

Mauricio Prieto

A pioneer in field research and conservation of aquatic mammals in Colombia, Mauricio Prieto died from cancer in Bogotá on 1 April 1995, at age 39. He worked extensively with cetaceans, and in 1987 he launched a study of the ecology of the manatee in the Río San Jorge area, where he perfected his singular competence in environmental education at the community level. He later turned his attention to marine mammal-fisheries interactions on the Pacific coast. With his death, the South American aquatic mammal community has lost a spiritual leader and a genuine conservationist. (Excerpted from an obituary by **Koen Van Waerebeek** and **Daniel Palacios** in the *Marine Mammal Society Newsletter* 3(3): 3, Sept. 1995.)

**INTERNATIONAL DUGONG SYMPOSIUM**

An International Symposium on the Dugong will be held at the Toba Aquarium, Toba, Japan, 15-17 November 1995. Oral presentations (both submitted and invited) will be given on dugong biology, paleontology, conservation, rescue, and husbandry. Investigators, students, and other interested people are encouraged to attend. A proceedings volume will be distributed at the meeting. For further details, contact Mr. Hiroshi Maeda, Planning Office, Toba Aquarium, Toba 3-3-6, Mie Prefecture, 517 Japan; phone: 81-599-25-2801; fax: 81-599-26-3608; E-mail: [LDN03052@niftyserve.or.jp](mailto:LDN03052@niftyserve.or.jp); Compuserve: 100463,3176

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The following people have agreed to serve as members of the IUCN Sirenia Specialist Group for the 1994-1996 Triennium:

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## MANATEE RESEARCH OPPORTUNITY

The Save the Manatee Club (SMC) is issuing a request for proposals from researchers interested in conducting aerial surveys to determine manatee abundance and distribution in west Volusia and Brevard counties, Florida, over the next two years. Interested parties should call or e-mail Patti Thompson at SMC for further information. Phone: 1-800-432-5646; e-mail: manatee@america.com

THANKS, SEA WORLD!

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## LOCAL NEWS

### AUSTRALIA

**Hardening Evidence for Dugong Decline Along the More Developed Regions of the Coast of Queensland, Australia.** - The Great Barrier Reef stretches for some 2000 km along the eastern coast of Queensland. The northern region along the coast of Cape York Peninsula is a remote area with a very low human population density and little development. In contrast, much of the area south of Cape York Peninsula is undergoing very rapid coastal development. This southern region was surveyed for dugongs from the air in 1987 and 1992. The estimated number of dugongs present in the region in 1992 was  $1857 \pm \text{s.e. } 292$ , much less than the 1987 estimate of  $3479 \pm \text{s.e. } 459$  dugongs. When differences in survey conditions are taken into account in the analyses, the difference approaches significance ( $\alpha=0.06$ ), suggesting that dugong numbers have declined in this region.

The aerial survey was repeated in November 1994 with the aim of evaluating whether this observed decline was a real trend or an artifact of sighting conditions, which were slightly worse in 1992 than in 1987.

The population estimate resulting from the 1994 survey was  $1750 \pm 257$  dugongs, supporting the findings of the 1992 survey. Parallel declines were not recorded in the estimates of turtles or cetaceans which were recorded in the same surveys.

The reasons for this decline in dugong numbers are probably complex and may include habitat loss, traditional hunting, and incidental drowning of dugongs in commercial gillnets. Parallel declines have not been recorded in repeat surveys of more remote regions in the dugong's range in Australia where traditional hunting and incidental drowning in gillnets are the major anthropogenic impacts. - Helene Marsh

**Dugong Adopts Offshore Oil Platform as Focal Point for Activity.** - During March-April 1995, workers on the production platform *Vicksburg* (21°07' S, 115°06' E) on the South Pepper oilfield (North West Shelf of Western Australia), noticed the presence of a dugong which appeared to have adopted the platform as its home base.

Unfortunately, nobody recorded the exact date when this dugong arrived at the platform, but its continued presence warranted entry of a report in the operations log of the *Vicksburg* on 14 April 1995. No further log entries were made over the next four weeks, until platform worker Martin Rawlings was prompted to report the dugong's apparent extended stay to the Western Australian Museum. Dr. Ric How referred the report to R. I. T. Prince.

Daily log reports of further sightings of this dugong were entered from 12 through 26 May 1995. Photographic recording of the dugong was requested on 25 May, as none of the platform personnel were known to have previously attempted this. The prints subsequently obtained included portions of the platform supports, and numbers of large long-toms (needlefish, Family Belonidae), as well as the resident dugong.

The dugong apparently deserted the rig between 26 and 27 May. The last three relevant log entries, for 27 and 28 May and 1 June, record the absence of further sightings of the animal.

One dugong only was seen around the *Vicksburg* at all times from arrival until just before desertion. The observers believe that they saw the same animal each time. Noting the uncertain time of arrival, this dugong centered its activities around the *Vicksburg* structure for a minimum of 8-10 weeks, and possibly more than 12 weeks.

Circumstances of arrival and fixation of this dugong on the platform are not known, but several probably significant events preceded its disappearance. Another two or three dugongs appeared around the *Vicksburg* about this time, and a drop in ambient water temperature of ca. 2-3 °C is also reported to have occurred between 26 and 27 May. It is possible that an associated change in water circulation over the Barrow Islands Shoals to the north of the *Vicksburg* mobilized other dugongs in that area, and that the former platform resident subsequent-

ly followed its new-found associates as they moved on.

The photographs of the *Vicksburg* dugong suggest that it was a juvenile. The larger species of long-toms of the North West Shelf waters can grow to lengths of 1.3-1.5m, but most seen would average around 1m (Barry Hutchins, Western Australian Museum, pers. commun.). Scaling from the photographs, using this knowledge and that of the visible platform support dimensions, suggests that this dugong was most probably <1.5m in length. It certainly was not more than 2m. Sex could not be determined, because all observations were made from the platform deck (18m above water).

Apart from the photography mentioned above, some other more detailed observations of behavior patterns were planned for the dugong's later period of residence around the *Vicksburg*. Unfortunately, the animal's disappearance prevented this. However, it was noted to spend a lot of time suspended inactive below the surface in the upper water column. At other times it was seen rolling about; the observers considered this may have been "playing".

On other occasions it disappeared from the observers' view, during some of which times it could have drifted under the platform out of sight. It might also have been diving to feed, although the 17m water depth around the *Vicksburg* is at the deeper extreme of known dugong feeding range. Still, the observers did not think the dugong had lost body condition during its time at the platform.

One other lone Western Australian dugong is known to have associated for about 7 days in mid-January 1989 with a large (29.8m, 372-tonne) moored tugboat, the *Pilbara Sun*, in Dampier Harbour (20°39' S, 116°42' E). Water temperatures in Dampier Harbour during this period were reported to have varied between 26 and 31 °C.

The *Pilbara Sun* dugong was certainly a young, unweaned calf (photo estimate, ca. 1.1m in length). Its mother, which had apparently been feeding on a seagrass bed directly behind the boat pen, had been killed beforehand by the same tug when reversing from its mooring for work. The carcass was unsalvageable, being mutilated beyond recognition by the propeller impact.

Unfortunately, formal reporting of

this fatal collision, and the subsequent orphan calf/tug association, was not made until a week after the event. The movements that had been observed meanwhile of the orphan back and forth alongside the tug suggested it was seeking milk. Nothing further was learned from this association because the calf disappeared overnight almost immediately after the report was made. Starvation or shark attack may have caused its disappearance. - **Robert I. T. Prince** (Wildlife Research Centre, Dept. of Conservation and Land Management, P. O. Box 51, Wanneroo 6065), **Martin Rawlings** (c/o Atwood Oceanics Australia Pty. Ltd., 35 Peel Road, O'Connor 6163), and **Roberta Selleck** (Western Mining Corporation Ltd., P. O. Box 7660, Perth 6850, Western Australia).

## BELIZE

**Manatee Butchering Sites in Port Honduras.** - In the tranquil waters of southern Belize, there lies a serious threat to the existence of the manatee. Fishermen in Port Honduras are killing manatees at an alarming rate. This activity was recently made public through reports generated by the Belize Center for Environmental Studies. Last year four manatee skeletons were discovered in the area of Deep Creek, in the Toledo District of Belize. At that time it was suspected that some opportunistic butchering was taking place; however, the magnitude of the recent killing was not apparent until now.

With funding graciously provided by the Smithsonian Institution Biodiversity Program, we went to Belize in late August and early September 1995 to conduct dolphin and manatee research. While there, we were able to fly several aerial surveys and counted 109 manatees at selected survey sites. The total number of manatees in Belize is not known, but is assumed to be around 200 animals. During an aerial survey of Port Honduras we counted 4 manatees. There is excellent habitat for a local population in the protected cays, adjacent Deep Creek and Rio Hondo rivers, and Icos Lagoon. A large number of manatees were observed to the north in nearby Placencia Lagoon where 37 individuals were counted. The presence of this large group of manatees in the north could be responsible for migratory animals occasionally moving south into Port Hon-

duras. These animals could easily become victims of the illicit poaching operation.

During boat surveys of Port Honduras with local fishermen, we discovered 11 separate butchering sites, which contained a minimum of 35 manatee carcasses. Twenty-four skeletons were classified as adults, and the remaining 11 were either juveniles or calves. Detailed studies of the skeletal material collected from each site will be conducted. Evidence of recent butchering was apparent, and we were watched by hungry John Crows (vultures) as they sat in the nearby trees. Some of the decaying flesh was still attached to the bones. One site was known to be two to three years old, while at least two of the sites were active and had been used within the last month.

Many of the skulls examined had large, deep cut marks in the cranial bones. It was apparent that the manatees were either shot, harpooned, or chased until exhausted, then brought close to the boat and dispatched with heavy machete blows to the head and nose. Carcasses would then be taken to the nearest dry land site, and under the cover of heavy vegetation or nightfall, the meat would be removed. It would then be taken to market and illegally sold.

No manatee meat was observed in markets in Belize; however, there are several rumors that the meat can occasionally be purchased in Guatemala. It is likely that fishermen from Guatemala are coming into Belize, killing the manatees, and taking the meat back to Guatemala to sell. Manatees are protected in both Belize and Guatemala, but there is little or no enforcement of existing laws. The direct impact that this poaching is having on the local population in south Belize is not known, but the magnitude of this activity clearly puts excessive pressure on this population. Immediate measures need to be taken to enforce existing laws protecting manatees, and ensure that all poaching activities are stopped as soon as possible.

Additional information regarding this investigation can be obtained by contacting either the Fisheries or Forestry Departments, Belize City, Belize, or the Sirenia Project, Gainesville, Florida, USA. - **Robert K. Bonde** (Sirenia Project) and **Charley Potter** (Smithsonian Institution)

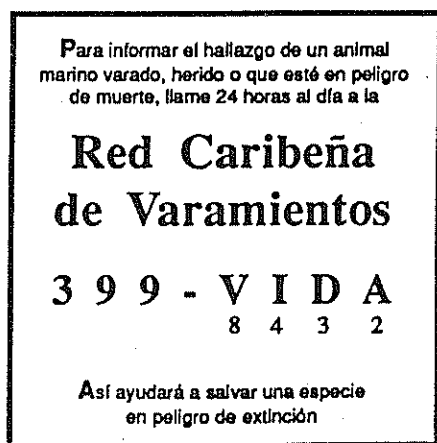
## DOMINICAN REPUBLIC

### Stranded Manatee Calf Rescued. -

In late March 1995, a manatee calf was stranded alive at Barahona, Dominican Republic, after fishermen killed its mother. The dehydrated and anemic 70-pound calf was discovered by Tropescar Sur, a nonprofit animal-welfare organization, and rescued by a team from the Acuario Nacional in Santo Domingo, led by Enrique Pugibet and Mónica Vega. Antonio Mignucci from the Caribbean Stranding Network in Puerto Rico was called in for expert advice, and the baby manatee is now doing well on a diet of goat's milk and soy milk.

The calf was christened Tamaury in memory of Tammy Dominguez and Amaury Villalba, who were recently killed in a plane crash during a manatee survey (see notice in this issue).

The fishermen who killed the mother were caught and fined, but the applicable law dates from 1960 and the amount of the fine was inconsequential. - (source: Alerta Neptuno [Caribbean Stranding Network] 2(2), June 1995.)



## EAST AFRICA AND MADAGASCAR

### Aerial Survey in Kenya Finds Few Dugongs. -

From 17-24 November, the Kenya Wildlife Service, in collaboration with UNEP OCA/PAC, IUCN's Regional Office for Eastern Africa, and Eden Wildlife Trust carried out an intensive aerial survey of 500 km of Kenya's shoreline to determine the

distribution of sea turtles, dugongs, whales, dolphins, and whale sharks. Five aircraft were used over a period of seven days. A total of 254 hours were spent in the air, doing 1 km-wide transects out to the 30 m depth contour.

Sea turtles, dolphins, and whale sharks were found to be evenly distributed along the coast within a depth of 20 m. Dugongs were found only in Ungwana Bay and Manda Bay in Lamu, however, and only 16 animals were sighted, indicating a very small population. Survey participant Vic Cockcroft estimates a population of about 50 dugongs for the whole of Kenya; and based mainly on anecdotal data from interviews, he doubts that there are more than 2000 dugongs in the western Indian Ocean, excluding the Arabian Gulf.

"Our results demonstrated that sea turtles and dugongs are the most vulnerable of the animals covered," reports George Wamukoya, a marine biologist with the Kenya Wildlife Service. "This is probably the result of habitat destruction and human activities such as poaching and disposal of plastic wastes. If we are to conserve these species, we need to protect key turtle nesting areas in Ras Tenewi and Shella, and the known dugong habitats in Ungwana and Manda bays."

On related topics, Vic Cockcroft reports that he has just obtained funding from WWF International for a coastal zone assessment for Madagascar, including a comprehensive assessment of dugong status there. He is now seeking money for a comprehensive dugong research program in Mozambique. This has been accepted by WWF as a priority project, but funds to finance it are not presently available. He and his colleagues have also recently made two TV documentaries on dugongs in Mozambique, including one about an attempt to capture and satellite-tag a dugong. A third production for South African television is being planned, and Vic is seeking local musicians to record a dugong "pop-song" to generate further public interest. - (sources: The Pilot [Newsletter of the UNEP Marine Mammal Action Plan] No. 11, June 1995, and Vic Cockcroft)

Survey of Red Sea Dugongs. - Frédéric Speyser reported in early summer



that he was planning to begin in July and August 1995 a program of aerial surveys and other studies of dugongs along the East African coast from Suez to Djibouti. We look forward to hearing the results. He would welcome contacts with other sirenologists, and can be contacted at 21, rue du Château Rouge, 74100 Annemasse, France; phone: 50.92.03.55; fax: 50.37.29.03.

EASTERN U.S.A.

**Chessie's Most Excellent Adventure: The 1995 East Coast Tour.** - As you may have heard, Chessie the manatee became a media celebrity during the summer of 1995 by breaking scientific records for his species. He initially gained notoriety in October of 1994 when he was rescued from the cool waters of the Chesapeake Bay and returned to Florida (see *Sirennews* No. 22). As if he was competing for a personal best, this year he swam from Florida to Rhode Island. He was radiotagged and tracked by the National Biological Service's Sirenia Project, and details of this move were documented by satellite-determined locations and field observations. We believe this trek of nearly 2,000 miles includes the most northern locations in North America and the longest seasonal migration ever documented for these tropical marine mammals.

Late in the summer of 1994 and early in the fall, Chessie was repeatedly sighted in the upper Chesapeake Bay, normally considered to be outside the range of Florida manatees. The most northern documented manatee sighting prior to this was in the Potomac River near Washington, DC, during August 1980. In some years, sightings of manatees north of Georgia are followed by the recovery of a carcass during cold weather. Many of these are smaller individuals in poor health that are presumed to be younger and less experienced with migrating south prior to cold weather or with locating warm water sources. After Chessie's capture, however, he was found to be an adult male in good health, 10 feet (315 cm) long and weighing 1250 lb (568 kg), and possibly experienced with making annual long-distance migrations. We tagged him with the now-standardized Service Argos-monitored radio tag to track his movements, anticipating that he might give a repeat performance by

swimming north during the coming summer.

Two weeks after his release in Florida at the Merritt Island National Wildlife Refuge, he broke free of the floating transmitter. Luckily, he was sighted and retagged by Sirenia Project biologists on 12 January 1995, much further south, in the warm discharge waters of the Port Everglades power plant near Fort Lauderdale. He moved north to the upper Banana River by mid-February and to Cumberland Sound in Georgia by late April, both areas commonly used by other manatees. Thus, we knew he was familiar with seasonal migratory patterns and typical manatee-use areas along the east coast.

On 13 June, he began his long, almost uninterrupted trip north from the St. Johns River mouth in Florida. Details of his move, documented through Service Argos's satellite-based location processing, revealed a rapid and directed move north. He covered over 500 miles from Florida to Virginia in less than 19 days. Most days included significant moves of 25 to 30 miles, with only one stopover, about two days in the vicinity of Charleston, South Carolina.

After he arrived in Virginia on 3 July, we received locations in the Chesapeake Bay as far north as the Rappahannock River, but south of last year's capture location in the Chester River, Maryland. Surprisingly, Chessie left the bay by swimming south and around the southern tip of the Eastern Shore of Virginia. On 17 July 1995, while Chessie rested in a salt marsh creek along the seaside of the Eastern Shore, we replaced his radio transmitter, used since January to track his movements from Fort Lauderdale, with a new transmitter that improved the performance of the satellite-based location service. With his new tag, and its fresh battery pack, Chessie kept going and going.

Monitored by satellite-determined locations and direct field observations, his progress north along the coast included stops in Assateague Bay and Ocean City, Maryland; Delaware Bay; the salt marshes near Atlantic City, New Jersey; and near New York City's Statue of Liberty before entering Long Island Sound. Most travel routes followed the Intracoastal Waterway or were within shallow lagoons inshore of the barrier island beaches. Several portions of his trip, however, were between inlets along the ocean side of the beach. Water temperatures,

also monitored by Chessie's transmitter, remained within the known tolerance range of manatees.

By the time he passed through New York City, Chessie's journey had become the subject of numerous newspaper articles and interviews on radio and television news shows. Sirenia Project staff coordinated with the U.S. Fish and Wildlife Service's Endangered Species Offices and the Chesapeake Bay Field Office to provide the media with accurate information on his activities and on the biology of manatees in general. Numerous myths about manatees and erroneous information related to this "crazy" manatee were dispelled by detailing how his use of salt marsh habitats, food plants, and activity patterns were as expected for manatees migrating along the temperate coast. We also delayed the release of his most recent locations in order to prevent him from being harassed by an adoring public.

After New York, Chessie traveled east along the north shore of Long Island Sound, periodically stopping to feed and rest along the Connecticut and Rhode Island coasts. He arrived at Point Judith, Rhode Island, on 16 August 1995. Here he reversed his northern pattern of movement and began swimming back towards Florida. Water temperatures of 66° to 69° Fahrenheit along the Rhode Island coast were the coolest waters he had yet experienced in the northeast, which probably caused him to turn around. From Point Judith, biologists plotted his movement west as he returned to the warmer waters of Long Island Sound and the protected salt marsh habitats that he had frequented in Connecticut.

On 22 August, the tethered floating transmitter broke free of the manatee and was recovered in New Haven, Connecticut. The tether's weak link, designed to ensure the safety of the tagged manatee, functioned properly, releasing the manatee unharmed. Transmitter detachments are anticipated during long-term trackings of manatees. We are fortunate to have monitored him continuously for 222 days since he was retagged in Fort Lauderdale in January, and to document his 70-day trip along the coasts of eleven states.

Public sighting reports documented much of his return towards Florida. Manatee sightings were reported to local marine

mammal stranding networks along the coast and relayed to the Sirenia Project. Verified reports of Chessie were received near Echo Bay and Staten Island, New York, and Sea Bright, New Jersey. A surfer off Long Branch, NJ, was startled when Chessie, traveling south along the beach, surfaced next to him. After a sighting near Cape May, NJ, Chessie was seen on 21 September bottom-resting near the Norfolk Naval Station in southern Virginia and passing through the Intracoastal Waterway's Great Bridge locks on the morning of 23 September. Given his normal rate of travel, he could reach Florida by late October.

The successful monitoring of Chessie's travels has provided a better understanding of manatee migratory behavior. Chessie set records for Florida manatees in both sustained rate of movement during his three-month journey and overall distance travelled (nearly 2,000 miles from his southernmost location near Fort Lauderdale, Florida). However, his rate of travel and behavior en route were typical for manatees that migrate north during warm weather. Also, his persistent pattern of traveling north was reversed when he encountered cooler water temperatures. This appropriate behavioral response and his familiarity with over-wintering sites in southern Florida suggested that, given the opportunity, he would travel south to warmer waters with the approach of cold weather. As expected, he continued to behave as an adult experienced with migrating along the coast, although it is possible that he was exploring the coastal waters north of Virginia for the first time.

Chessie's move to Rhode Island was farther than any yet documented for a Florida manatee. Reports from previous centuries of manatees as far north as Greenland and Scotland are not substantiated by specimens. With the increased public attention to Chessie's northern adventure, some recent and historical accounts of manatees along the temperate coast as far north as New England have been reported and are worthy of further investigation. Having seen what an individual of this species can achieve, we now have reason to believe that moves such as Chessie's have been made by other manatees in the past, and may be made again in the future.

Although Chessie's movements far

exceed the normal range of the Florida manatee, recent habitat and environmental conditions in the northeast have been suitable for manatee use. This summer's extremely warm weather in the northeast increased water temperatures, perhaps allowing Chessie to comfortably travel into northern waters. Chessie used salt marsh and other estuarine habitats that are similar to those used by manatees in Florida and Georgia.

Interviews with people reporting manatee sightings, and ground surveys in selected areas, may continue to provide additional location information on Chessie's travels. Also, the Sirenia Project maintains a manatee identification catalog, based on photographs of more than 1000 uniquely scarred manatees, enabling resighting histories to be compiled on their movements and life histories. Sighting reports and photographs of scarred manatees along the Atlantic Coast and at aggregation sites in Florida will be scrutinized in an attempt to resight and thus monitor the long-term fate of this most excellent individual. - **Jim Reid** (Sirenia Project)

## FLORIDA

**Sirenia Project Facing Budget Cuts and Possible Elimination.** - Because of recent efforts in Congress to reduce deficit spending, federal budget proposals for the coming fiscal year target many government agencies for elimination or dramatic budget cuts. The National Biological Service (NBS), a nonregulatory research agency within the Department of the Interior, is slated to lose 15% of its budget. NBS was formed in 1993 by combining the research functions of several existing agencies, including the U.S. Fish and Wildlife Service, which previously administered the Sirenia Project. The pending budget cuts have resulted in proposed actions by NBS administrators in Washington to reduce or completely eliminate the Sirenia Project.

The Sirenia Project has conducted research on manatee life history, population dynamics, movements, and habitat use since 1978. This research is mandated by the U.S. Fish and Wildlife Service, as part of the Florida manatee recovery effort. The Sirenia Project works closely with its federal and state partners to achieve the recovery of this

endangered species, and with its colleagues in other countries to encourage research and conservation of sirenians throughout their range.

Please write to the Secretary of the Interior and the Director of the National Biological Service at the addresses below to let them know that manatees and dugongs are key species in understanding and protecting aquatic ecosystems. Given the increased human population in coastal regions, and its impact on water supply and quality, the Sirenia Project's research is needed now more than ever.

Secretary Bruce Babbitt  
U.S. Department of the Interior  
1849 C St., NW  
Washington, D.C. 20240

Dr. Ron Pulliam, Director  
National Biological Service  
U.S. Department of the Interior  
1849 C St., NW  
Mail Stop Arlington Square 725  
Washington, D.C. 20240

## UNITED ARAB EMIRATES

**Is the world's second-largest population of dugongs safe?** - In 1986, a survey conducted by the Saudi Arabian Meteorological and Environmental Protection Administration (MEPA) established an estimated population of dugongs in the Arabian Gulf of  $7,307 \pm SE 1,302$  (Preen, 1989). Larger populations are known only from Australia (Preen, 1989). The MEPA report concluded that the Arabian Gulf must be viewed as the most important dugong habitat in the western half of the dugong's range. The occurrence of accidental net capture and direct hunting of dugongs was noted during the survey and the issue was included in management recommendations for the conservation of dugongs in the area. However, no attempt was made at estimating the impact of fisheries on dugongs. During this survey, which included a large portion of the coast of the United Arab Emirates (UAE), a total of 24 dugong carcasses was recorded.

Formerly, dugongs of the Arabian Gulf were hunted for their meat, considered a delicacy in many parts of the region, but this

practice has been outlawed in the UAE in recent years. No evidence of continuation of this practice was found. However, it is unlikely that any dugongs found alive in nets are released, as dugong meat is still prized and eaten or sold. The number of animals caught by direct hunting methods has never been documented, but it is likely that incidental net captures equal or exceed this number. Increasing gillnet fisheries and the market for shark fins may be leading causes of dugong mortality.

On 11 and 12 March 1995, the islands of Murawah and Fiyyah, off the coast of the UAE, approximately 150 km west of Abu Dhabi, were surveyed by boat, four-wheel-drive vehicles and on foot. The larger of the two islands, Murawah, is approximately 10 km in length by 2 km wide. Fiyyah is less than one quarter this size. Selected beaches and fishing villages were searched for dugong remains, in the latter instance, contained in the accumulated remains of fishermen's catches.

In two days of searching, the remains of a total of 28 dugongs were found in, or in close proximity to, four fishing villages. Five of the 28 dugongs found were judged to have died more than two years previously and were excluded from mortality estimates (see below). Estimates of the age of the remains were based upon the amount of weathering of bone and skin; for example, not one of the bones included in the calculations showed signs of degradation and many still had tissue attached. Older bones, judged to be more than two years of age, showed clearly the weathering effects of the intense sun and heat. The number of dugongs was estimated based on the number of pairs of lower jaws discovered and can be considered a conservative estimate.

The remains included several complete skeletons, bones and fragments of bone, skin and drying meat. Relatively few large tusks were found and many adult skulls retained small tusks, indicating that females constituted the majority of dead animals. Interviews with local fishermen also suggested that females were caught most often. Fishermen apparently value the tusks of the males. One almost complete skull of a male, estimated to have died no more than two weeks previously, retained the left tusk, though the right had clearly been removed.

At least five other skulls had both tusks removed. Though most remains were of adults, skeletal remains of three very young animals were also found. Measurements of the complete skeletons of two of these suggested that the animals were approximately one meter in length, while the third animal was probably less than one meter.

There was no indication of the exact cause of death in any instance, other than the fact that most animals were found in fish dumps along with a catch of numerous sharks, batoids and other fishes, turtles and cetaceans. Interviews with local fishermen suggested that all dugongs were accidentally caught in fishing nets, most often 14-18 cm gillnets, sometimes 60 m or more in length, set for "kingfish" and sharks. In the majority of cases, the dugong remains were charred; the burning was clearly limited to the remains of dugongs and turtles, and may have been an attempt to hide the evidence. Drying meat, no more than two weeks old, and barrels of what appeared to be dugong oil, were found at two sites. The meat was suspended and drying in strips, alongside shark fins. Anecdotal evidence obtained from a fishermen on Murawah Island suggested that dry dugong meat can be sold to neighboring villages, or in fish markets, for the equivalent of US\$7.50 per kilogram. An entire, freshly caught dugong apparently sells for US\$210. This is comparable to figures quoted by MEPA that vary between US\$0.30 and US\$2.70 per kilogram (Preen, 1989).

Little is known of the population dynamics of unexploited dugong populations, though the reproductive biology of the species indicates that, as for other long-lived and slow-reproducing large mammals, adult female and calf mortalities need to be low for population maintenance (Marsh, Heinsohn & Marsh, 1984). However, if the reproductive rates of dugongs are similar to those of cetaceans of similar life history, then even annual mortality rates of as little as 2% may not be sustainable (Anon., 1994). Yet, the estimated annual dugong mortality in only four fishing villages of the UAE approximates 0.16% (11.5 of 7000) of the total estimated Arabian Gulf population (Preen, 1989). Assuming that catch levels of dugongs at other fishing villages in the Gulf are similar to those surveyed, then the catches by fishermen at as few as 50 villages would be

unsustainable. Though the number of fishing villages in the Arabian Gulf is unknown, the extent of the catch in the UAE alone is cause for concern, especially since: the estimated number of dugongs harvested annually is conservative; fishermen obviously attempt to hide evidence of dugong catches; and female dugongs appear to account for the majority of those harvested. However, the islands surveyed are located within an area of high dugong density (Preen, 1989) and, as a result, catches of dugongs in this area may be higher than in others.

Nevertheless, studies on the distribution and status of dugongs in the waters of the Arabian Gulf, especially those in previously identified "high-density" areas, are needed. These should include mapping and assessment of dugong habitat and the study of dugong movements and behavior. Particular attention should be given to the impact of fisheries activities on dugongs and the formulation of coastal zone management recommendations with reference to dugongs.

An awareness campaign highlighting the conservation requirements of dugongs in the region has already begun in the hope of attracting the attention of both local and international support for essential research and management-oriented action. Skin and muscle samples for genetic analyses have been collected for comparison with animals in Australia and, pending results, from samples taken in southern and East Africa. Hopefully, comparative analyses may provide insight into the world-wide taxonomic status of dugongs.

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- R. Baldwin (P.O. Box 3865, Abu Dhabi, United Arab Emirates) and V.G. Cockcroft (Centre for Dolphin Studies, Port Elizabeth Museum, P.O. Box 13147, Humewood, South Africa)

WASHINGTON, D.C.

**Publication of Sirenian Bibliography Imminent.** - Following an unanticipated delay over the summer due to personnel shortage at the Smithsonian Press, page proofs of my *Bibliography and Index of the Sirenia and Desmostylia* were finally delivered to me in early September and have now been corrected and returned. I am now assured that the work will be available sometime in spring 1996 (yeah, I know, promises, promises, but this time it looks real!).

This work will appear as Number 80 in the series *Smithsonian Contributions to Paleobiology*, and will consist of a single sewn, paperbound volume (about 8" x 10" format) of over 610 pages. It is an exhaustive, annotated and indexed compilation of 500 years of scientific and popular literature on the biology, paleobiology, and ethnobiology of sirenians and desmostylians. Since, for arcane bureaucratic reasons, the Smithsonian does not retail its series publications to the general public, arrangements have been made for the Save the Manatee Club to obtain a limited supply of copies for sale to individuals. The retail price has been tentatively set at around US\$25.00 per copy - a rare bargain as book prices now go. If you wish to acquire a copy for personal use, please contact the Save the Manatee Club, 500 N. Maitland Ave., Maitland, Florida 32751, USA (phone: 1-800-432-5646), as soon as possible to reserve a copy and obtain up-to-date information on price and handling costs (if there is a large enough number of early orders it may be possible to increase the press run). To repeat, copies are not available for shipment at this time, but will be ready sometime in the spring. - DPD

## ABSTRACT

Morphological aspects of the stomach of the Amazonian manatee *Trichechus inunguis* (Mammalia: Sirenia) (Francisco Antonio Pinto Colares). - Stomachs from seven specimens of *T. inunguis* were studied in order to describe their irrigation and macro- and microscopical aspects, emphasizing the gastric mucosa. The abdominal portion of the esophagus and the first portion of the duodenum were also studied to improve the knowledge of the stomach. The abdominal esophagus in the Amazonian manatee is narrow and muscular (striated) with a well-developed cardiac sphincter where it enters the stomach. The stomach is relatively small, situated to the right of the median plane and sharply curved, which keeps the cardia and pylorus close together. On the left dorsal stomach wall was found the cardiac gland, a feature apparently found only in sirenians. The spleen, consisting of from one to four separate portions, was situated caudal to the base of the cardiac gland. The duodenum can be subdivided into one ampulla and two diverticula. Unlike the stomach irrigation of most mammals studied, no celiac artery was found, and the course of the splenic artery depends on the number of spleens. The gastric artery arises directly from the abdominal aorta, while the hepatic artery emerges from the hepatomesenteric trunk. The abdominal esophagus is lined with a keratinous stratified epithelium, having no glands in the wall. The surface and pit epithelium of the stomach are composed of columnar cells with a mucous aspect. No chief or parietal cells were found in the stomach mucosa. Tubular coiled gastric glands, with mucous aspect, were identified in communication with the gastric pits. The cardiac gland is composed of a set of ramified ducts that empty into a central collecting cavity, which opens into the lumen of the stomach. In the walls of these ducts were found gastric pits and gastric glands lined by columnar, mucous neck, chief and parietal cells. [Abstract of a thesis for the degree of *Mestre em Zootecnia* in Animal Nutrition, submitted to the Veterinary School of the Federal University of Minas Gerais, Belo Horizonte, Brazil, in 1994.]

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