

Sirenews



Newsletter of the IUCN/SSC Sirenia Specialist Group

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IUCN RESOLUTION ON DUGONGS

Members of IUCN attending the World Conservation Congress in Montreal, Canada last October adopted the following resolution on Threats to Dugong. This resolution gives additional impetus to the preparation of a global action plan for the conservation of sirenians, which the Sirenia Specialist Group has been working on now for several years. - **Amie Bräutigam** (SSC Programme Officer)

Threats to Dugong

AWARE that the dugong (*Dugong dugon*) is listed as Vulnerable in the IUCN Red List of Threatened Animals;



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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NOTING that the largest populations of the species in the world are thought to reside in the waters of northern Australia and Papua New Guinea;

CONCERNED that there has been a rapid and catastrophic decline in numbers along the Queensland coastline from Cape Bedford to Hervey Bay, a distance of over 1200 km;

AWARE that researchers have attributed the decline in numbers to drowning in commercial fishing and shark protection nets, to traditional hunting and, at the southern end of the area, to decline in the seagrass beds essential for the species;

AWARE that increased tourist resort, marina development and other boating facilities that may increase the number of boats in and along the Great Barrier Reef and southern Queensland coast may threaten the dugong population;

ACKNOWLEDGING that along this coast groups of indigenous peoples have voluntarily ceased hunting of dugong until the population recovers;

ACKNOWLEDGING ALSO that commercial fishers have agreed to undertake a range of special measures to prevent continuing dugong mortality;

NOTING that the Australian Government has recently allocated special funds to undertake a dugong recovery plan consisting of a programme of management, education and research designed to prevent further decline in dugong numbers;

The World Conservation Congress at its 1st Session in Montreal, Canada, 14-23 October 1996:

1. CALLS UPON all States with dugong populations to undertake urgent measures to ensure that all steps are taken to prevent further decline of the species in their country;
2. CALLS UPON the Chair of the Species Survival Commission to request the Sirenia Specialist Group to complete and promote the implementation of the Sirenia Action Plan, with special reference to the status of the dugong;
3. CALLS UPON the Director General to write to all governments of States with dugong populations, including the Australian Government, expressing concern and:
 - a) urging that an ongoing programme of funding be provided for full implementation of Operative Paragraph 1;
 - b) urging that coastal tourist resorts and marina developments be restricted to locations that do not threaten the dugong populations along the Great Barrier Reef and southern Queensland coastline.

Note: The use of the term "indigenous peoples" in this Recommendation shall not be construed as having any implications as regards the rights which may attach to that term in international law.

WHY DO LOCAL PEOPLE CALL THE DUGONG "SEA PIG" AND NOT "SEA COW"?

In 1991 Dr. Paul K. Anderson proposed a revision of sirenian popular names and suggested introducing the name "sea pig" instead of "sea cow" for the dugong [see *Sirennews* No. 16]. He also referred to the fact that in Sri Lanka the dugong is called "cudalpandi" in

Sinhalese and "kadalpani" in Tamil, both of which translate as "sea pig". During my five years' fieldwork on dugongs in Indonesia I also came across the names "babi laout" in Malay and "sakoko ka koat" in the local language of the Siberut islanders, both of which mean "sea pig". In the Indonesian Dictionary *Purwadanuda* the dugong is called "babi duyung", which means "piggy dugong". Local fishermen in Thailand similarly use a word which translates as "sea pig". After Anderson's article, however, the discussion of this subject did not continue, and I found among members of the Sirenia Specialist Group little enthusiasm for debating the vernacular-name issue.

I do think that this issue deserves more attention than it has received so far, since it touches upon the heart of the feeding ecology of the dugong and its niche in the seagrass ecosystem. Even more important, a change in popular name may have a positive spinoff for dugong conservation, particularly in the regions where "pig meat" is a religious taboo. Apart from this we should pay some respect to the knowledge of local people; there is no place for arrogance here. It is remarkable that all these local fisherfolk in different countries and even different regions within countries all refer to the dugong as "the pig of the sea".

When giving a closer look to the feeding ecology of the dugong, their approach is not as strange as it seems at first sight:

- Anderson already mentioned that dugongs, like pigs, are "rooters" and not "grazers" and are referred to as rhizome specialists, which is also confirmed by my research findings in the Moluccas (De Iongh, 1996). The way they remove the substrate is more similar to the rooting behavior of pigs than the grazing behavior of cows and other grazers.
- Anderson mentions that dugongs are, like pigs, omnivorous; they both feed on macroinvertebrates. Dugongs are known (like pigs) to dig circular craters in search of burrowing mussels.
- I would like to add that dugongs, like pigs, are able to digest feed with a high fiber content. Murray (1981) suggests that dugongs are able to use up to 25% of the fiber fraction for energy, while pigs use 35% of the fiber fraction for energy (Van Wieren, 1996).

I think, therefore, that there are some very strong arguments for adopting the popular name "sea pig" for the dugong, with regard to both its feeding ecology and the expected positive conservation impact of such a name change. I would like to appeal to readers of *Sirenews* to write me at the address below if they agree or disagree and if they have found local names in their region (any local name is welcome, be it "pig" or "cow").

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- Hans De Iongh (Roghorst 343, 6708 KX Wageningen, Holland; fax/tel. 31-317-424599)

SAFETY RULES FOR MANATEE AERIAL SURVEYS

In *Sirenews* No. 24 (October 1995) we published a set of safety recommendations for personnel conducting aerial surveys. The following Spanish translation of these has been furnished by the Sirenia Project, Gainesville, Florida.

Reglas de Seguridad para Censos Aéreos de Manatíes

Los censos aéreos de manatíes presentan un peligro especial para los biólogos haciendo el censo debido a los aeroplanos pequeños que se usan normalmente (se pueden sobrecargar fácilmente), el nivel de vuelo relativamente bajo (generalmente 500 pies), los virajes cerrados que se hacen frecuentemente para contar manatíes (puede ocasionar stalling) y las rutas de vuelo sobre agua. A veces la dedicación de los biólogos puede tornarse en un peligro si la determinación para terminar una misión interviene con su juicio referente a las condiciones del tiempo, la capacidad de su piloto y las condiciones del aeroplano. A continuación se enumeran una serie de reglas de sentido común para el personal envuelto en censos aéreos de manatíes. Estas no pretenden abarcarlo todo sino destacar algunos aspectos de las regulaciones provistas por la Oficina de Servicios de Aeroplanos (OAS por sus siglas en inglés), las cuales deben ser acatadas por todos los empleados del Departamento de Interior (DOI por sus siglas en inglés) en los Estados Unidos cuando participan en un trabajo relacionado a la aviación.

Se le agradece a la Sra. Burma Campbell del Servicio de Pesca y Vida Silvestre de los E.U. por proveer la información utilizada para desarrollar estas reglas, por revisarlas y por su interés y apollo constante.

- El aeroplano Cessna 172 no tiene suficiente poder para un vuelo de bajo nivel (menos de 500 pies). Durante misiones de bajo nivel el aeroplano no puede funcionar legítimamente con una carga certificada mayor (aeroplano, pasajeros, combustible, cargamento) a la recomendada por el fabricante. Si se planifica llevar más de dos observadores se recomienda un Cessna 182, 185 6 206.
- Los censos nunca deben hacerse a una altitud menor de 500 pies. Muchos biólogos prefieren una altitud de 750 pies para dar vueltas y contar manatíes en grupos. Bajo la política de aviación del DOI la tripulación del aeroplano no debe volar bajo 500 pies sin un entrenamiento especial y equipo protector personal.
- Debe conocer la capacidad de su piloto. ¿Cuántas horas de vuelo tiene de experiencia el piloto, con el aeroplano en el que se estará como pasajero? Las regulaciones del OAS piden 1000 horas de tiempo de vuelo para certificar a un piloto.
- Debe conocer el registro de servicio de su aeroplano. La política de aviación del DOI exige que un aeroplano reciba servicio e inspección cada 100 horas de tiempo de vuelo.
- Prepare una lista de lo que Va/No va y revísela antes de cada vuelo. Recuerde que a pesar de que el piloto tiene la última palabra en la decisión de cancelar el vuelo. Si usted tiene alguna duda a cerca del tiempo, el piloto o el aeroplano, cancele el vuelo. Usted es mucho más importante que un censo que se pierda! Además, todos los censos se deben hacer bajo condiciones óptimas de tiempo para poder comparar con censos hechos en otras fechas; tiempo dudoso equivale a resultados de censo dudosos. Si ocurren cambios en el tiempo, el piloto o la condición física o mental del observador, el observador debe cancelar la misión y decir al piloto que regrese a la base o a tierra en el lugar más propicio, dependiendo de cuán drástico ha sido el cambio en las condiciones del vuelo.
- Prepare un plan de vuelo y dáselo al personal entierra que está en el aeropuerto de donde su vuelo despegas y termina. La(s) persona(s) a quien usted le dé el plan será responsable de seguir la trayectoria del vuelo y establecerá los procedimientos de búsqueda y rescate en caso de que su aeroplano no llegue a su destino luego de una hora del tiempo estimado de llegada.
- Sólo el cargamento y los pasajeros que sean esenciales para la misión deben ir en el aeroplano. Esto no sólo elimina la posibilidad de que se accidente algo que no debía

estar a bordo, sino que también mantiene el peso del aeroplano en el mínimo y por lo tanto usa menos combustible y reduce los costos. Los biólogos deben tener cuidado en asegurar los utensilios que se utilizan a menudo como: lápices, bolígrafos, lentes de cámara, cubiertas de lentes, roys de película, grabadoras, etc.

- La política de DOI exige que el piloto esté presente para supervisar el tipo, cantidad y calidad del combustible utilizado en el aeroplano cuando se está repostando combustible. En EU han ocurrido desastres aéreos debido a reabastecimiento erróneo en donde combustible para jet se le ha puesto accidentalmente a un aeroplano de motor alterno.
- Si un aeroplano unimotor se va a utilizar a una distancia de la orilla más allá de la que se puede recorrer planeando sin necesidad del motor, el aeroplano debe tener equipo de flotación y todas las personas a bordo deben tener su propio equipo de flotación.
- Los biólogos que tienen misiones de vuelo regulares podrían beneficiarse de un curso de familiarización de vuelo que consiste de 4 horas de teoría y 4 horas de entranamiento aéreo (el conso es aproximadamente \$500.00). El mismo pretende darle a los pasajeros un conocimiento limitado de como manejar los controles, radios, etc...del aeroplano y de como aterrizar el aeroplano en caso de una emergencia en donde el piloto se encuentre incapacitado.

Comentarios sobre éstas regulaciones son bienvenidos. Si desea ayudar en traducirlas a algún otro idioma puede comunicarse conmigo. Si desea ejemplos de una lista Va/No va o de un plan de vuelo o información sobre de familiarización de vuelo por favor comuníquese con: Dr. Lynn Lefebvre, Sirenia Project, U.S. Geological Survey - Biological Resources Division, 412 NE 16th Avenue, Room 250, Gainesville, FL 32601 USA; teléfono: (352) 372-2571; fax: (352) 374-8080; Internet: sirenia@nervm.nerdc.ufl.edu

ZOO CONGRESS

The VII Congreso de la Asociación Latinoamericana de Zoólogos y Acuaristas will be held in the city of Puebla, Mexico, 16-21 April 1997. The theme of the congress is "La Nueva Gestión de los Zoólogos para la Conservación" (New Conservation Efforts by Zoos). For information, contact Fernando Pacheco M., 11 Oriente 2407, Col. Azcarate, Puebla, Puebla, CP 72007 Mexico (tel. 52-22-358713, 358718, 358700, fax 52-22-358607, e-mail cbsgmex@noc.pue.udlap.mx)

ANIMAL NUTRITION CONFERENCE

A joint meeting of The Nutrition Society, The Royal Zoological Society of Scotland, and the British Federation of Zoos will be held on 16-18 May 1997 at the Edinburgh Zoo, Scotland. The theme is "Nutrition of Wild and Captive Wild Animals." For further information, contact Mr. Rodney Warwick, The Nutrition Society, 10 Cambridge Court, 210 Shepherds Bush Road, London W6 7NJ, U.K.; tel.: +44 171 602 0228; fax: +44 171 602 1756; e-mail: 100672.2151@compuserve.com

COURSE IN ZOO ANIMAL BEHAVIOR AND WELFARE

The International Summer School in Zoo Animal Behaviour & Welfare will be held this year on 7-18 July 1997 at the Edinburgh Zoo, Scotland. This is a 10-day course in current scientific theory and its application to husbandry, management, and welfare of zoo animals. For further information, contact Hamish Macandrew, UnivEd Technologies Ltd, UnivEd

Training & Conference Centre, 11 South College Street, Edinburgh EH8 9AA, Scotland, UK
(fax +44(0) 131 650 9019, e-mail Hamish.Macandrew@ed.ac.uk)

MANATEE MANAGEMENT PLAN AVAILABLE

Copies of UNEP's Regional Management Plan for the West Indian Manatee (*Caribbean Environment Programme Technical Report No. 35*) are still available from UNEP at 14-20 Port Royal Street, Kingston, Jamaica (tel.: 809-922-9267 to 9; fax: 809-922-9292; e-mail: uneprcuja@toj.com). The report is available in English, French, and Spanish; please specify which language(s) you want.

MANATEE POPULATION BIOLOGY PUBLICATION AVAILABLE

The landmark multiauthored volume entitled "Population Biology of the Florida Manatee" (T.J. O'Shea, B.B. Ackerman, and H.F. Percival, eds., *National Biological Service Information and Technology Report 1*, 289 pp., 1995) is still available at no cost. For copies write: Sirenia Project, U.S. Geological Survey, Florida Caribbean Science Center, 412 NE 16th Ave.-Rm. 250, Gainesville, FL 32601 (e-mail: sirenia@nersp.nerdc.ufl.edu) OR Tom O'Shea, U.S. Geological Survey, Midcontinent Ecological Science Center, 4512 McMurry Ave., Fort Collins, CO 80525-3400 (e-mail: Tom_O'Shea@nbs.gov).

READ SIRENEWS ON THE INTERNET

Dan Odell has kindly posted the text of *Sirenews* No. 26 on the Society for Marine Mammalogy's web site, and will do so with the present and future issues as well. Go to <http://pegasus.cc.ucf.edu/~smm/>; the *Sirenews* link is near the bottom of the first page.

These posted versions of the newsletter will not include the illustrative material or most abstracts that appear in the hard-copy editions, since these items are printed from camera-ready copy rather than digitized. If you nonetheless find that the Internet versions are adequate for your needs and you no longer wish to receive the hard copies, please notify me so that I can delete you from the mailing list and save on printing and postage. - DPD

LOCAL NEWS

AUSTRALIA

"Emergency" Measures to Increase Dugong Protection in the Southern Great Barrier Reef? - Readers of *Sirenews* will be aware of the serious decline in dugong numbers along a 2000-km stretch of the east coast of Queensland. Aerial surveys of the more urbanized and intensively fished southern Great Barrier Reef indicate that dugong numbers declined by more than 50% between 1986/87 and 1994. Dugong numbers in Hervey Bay-Great Sandy Strait immediately south of the Great Barrier Reef region also declined by more than 50% after the loss of > 1000 km² of seagrass habitat in 1992.

Last November, the Great Barrier Reef Ministerial Council considered the issue. This council is composed of the national and Queensland (state) ministers of the Environment, Primary Industries, and Tourism. The Council confirmed that urgent action is required to ensure the recovery of the dugong population in the Great Barrier Reef and adjacent waters and agreed that a chain of interim "Dugong Protection Areas" should be established along this coast in key dugong habitats at approximately 200-km intervals. They also endorsed other measures for dugong recovery and conservation, including measures to reduce the likelihood of dugongs drowning in commercial fishing nets

or being injured by underwater explosives.

Little has changed. Mesh netting has so far been banned in only one area, Shoalwater Bay. This bay is the most important dugong habitat along this coast. It has been protected from many anthropogenic activities by its status as a Military Training Area; however, the use of underwater explosives is still permitted at one site in this bay. Last month, the large-scale US-Australian military exercise Tandem Thrust was held in the vicinity of this bay.

The effectiveness of these "Dugong Protection Areas" will depend on the political will to exclude mesh netting, control boating activity, reduce inputs from agriculture, and control coastal development, and the support of Indigenous groups to maintain their moratoria on traditional hunting in this region. So far, the Indigenous peoples have been by far the most cooperative stakeholder group. Given that their association with dugongs goes back thousands of years, they understandably consider they have the most to lose by the extinction of dugongs along this coast. - Helene Marsh

BELIZE

Manatee Poaching Continues in Belize. - We at the Belize Center for Environmental Studies (BCES) are in the process of writing a management plan for the proposed Port Honduras Marine Protected Area. To become more familiar with this area, in particular the banks between the Snake Cayes, I visited the area in October 1996.

I set out by boat for the banks off East Snake Caye with Larry Sauliner, our Peace Corps Environmental Educator, and his wife, a Rural Development Officer and also a Peace Corps volunteer. After about 40 minutes' travel north along the coast from Punta Gorda Town, we arrived in the Deep River area. I then said that if we saw vultures we should investigate what they were eating, because there was a rumor around town that the Guatemalans were over here killing manatees. By the time I finished saying this, Ms. Sauliner pointed out some vultures.

We approached the shoreline where the vultures were. Entering the mangroves, we found the remains of five recently-slaughtered manatees. The skulls were cracked, apparently with a hammer or other metal

tool. The persons responsible had cared only for the prime parts; there was lots of decayed meat on the bones, and the fins and skins were all there. Some of the skulls were of adult size and some were juveniles.

Continuing our journey, less than five minutes away we saw more vultures. This time there were four freshly slaughtered manatees. Again, the prime meat had been stripped off and the other meat left to rot.

I have no proof of the rumor that the meat from these manatees is going to Guatemala. However, I am in the field almost every day and have never seen or heard of manatee meat for sale in Belize; but I have had people confirm to me that they have bought the meat in Guatemala.

Ten minutes from the butchering site are some offshore cayes where fishermen camp. These fishermen are mostly Guatemalans who have valid Belizean fishing licenses. The fishermen at these cayes have no regard for Belizean laws or the environment. I have not seen them killing manatees but I have seen them setting their gillnets at the mouths of rivers and on some of our reefs, which is illegal in Belize.

As a concerned Belizean citizen and BCES employee, I have informed the appropriate government ministries, and am calling on them, on community groups, and on the NGO community to come together and discuss ways to resolve this problem. I also believe it is important to call upon our neighbors from Guatemala and ask them to assist us in dealing with this urgent situation.

About a year ago BCES facilitated the visits of two scientists from the USA, who found approximately 11 butchering sites and an estimated 35 manatee kills [see *Sirenews* No. 24]. The result was a press release; but to date nothing has been done except lots of promises from some donors and a few pamphlets received from the Florida Power and Light Company. Meanwhile, discussions have begun with the Punta Gorda Town Police Department and the Fisheries Department. In the near future we will meet with the Toledo Community College Environmental Club, local fishermen, Toledo Tour Guide Association, and other organizations to discuss the possibility of volunteer patrols in the area.

At this time BCES has no money for this kind of activity. However, BCES has volun-

teered to lend its boat for patrolling the waters. Before the patrols can take place, we need money for fuel, hand radios to call for support or help in case of emergencies, binoculars, spotlights, batteries, camping equipment (including tents, hammocks, or sleeping cots, portable stoves, etc.), and some rain gear. We believe that much of the poaching takes place on rainy nights. - **Wil Maheia** (Field Specialist, BCES, P. O. Box 150, corner of Front Street & Wahima Alley, Punta Gorda, Belize; e-mail: pgwil@bt1.net)

COLOMBIA

Manatee Poaching Deplored in Colombia. - Hans de Iongh sent an article from the Bogotá newspaper *El Tiempo* (9 Feb. 1997) that describes an instance of manatee poaching and discusses manatee status in the province of Santander. Excerpts follow:

"ANOTHER CRIME AGAINST THE MANATEE. A group of fishermen clubbed to death four of six manatees remaining in the El Llanito marsh, in Santander.... Sixteen fishermen corraled and killed [the] four manatees, including a cow and calf, to obtain two tons of meat, in what many regard as the worst ecological tragedy of recent times in this part of the country.

"According to the director of the Colombian Institute of Fisheries and Aquaculture (INPA) in Barrancabermeja, Pedro Julián Contreras, there were only six manatees in the marsh.

"The manatee was once abundant in the rivers, marshes, and mangroves of the warm parts of the country, principally on the Caribbean coast and the lower and middle Magdalena River. In the latter region, which supposedly had the largest natural concentration of manatees in Colombia, there are today only 35. There are also some in Magangué (Bolívar).

"These animals are hunted mainly for their meat, whose taste can be mistaken for that of bacon, turkey, cattle, chicken, or *bagre* [a freshwater fish], according to the part it comes from....

"According to witnesses, the fishermen ensnared the manatees with nets, which took them almost half a day. Then they killed them and held a manatee roast in the village that was attended by more than 100 people,

including the police inspector of the town, who is being investigated by the authorities. The leftover meat was sold to fishmongers.

"Paradoxically, in the opinion of the experts, the manatee is the fishermen's best friend, since it helps preserve the fauna of the places where it lives, including the fish. Its ecological and economic importance is directly proportional to its gluttony.... If the manatees are exterminated, [floating plants] grow to excess, impede the passage of light, and kill off microscopic algae that produce oxygen. This ... reduces fishery production, which harms the very fisherman who contributes to the manatee's demise.

"Public prosecutors and local environmental officials have begun an investigation of the poachers. The head of the Magdalena Valley Fishermen's Association, Pablo Emilio Tejada, pointed out that the killing of these animals serves to discredit the fishing community, which has benefited from programs to restock fish in the marshes. The Regional Autonomous Corporation of Santander (CAS) asked the El Llanito law-enforcement community to economically sanction the criminals and cancel their fishing licenses, [or even impose] a penal sanction, which could vary from fines to 1-5 years in prison, under the laws in force.

"While the few surviving manatees in El Llanito are being slaughtered, the inhabitants of ... Sabana de Torres and Puerto Wilches, in Santander, offer protection and food to 20 manatees that live in the Paredes marsh...."

FLORIDA

Disastrous Year for Florida Manatees.

- 1996 was the worst year on record for manatee mortality in Florida, even without the spring die-off on the west coast due to red tide. The total number of dead manatees recovered was 415 (nearly twice the previous record), of which 151 were attributed to the red tide outbreak. The remaining 264 exceeded the previous single-year (1990) mortality of 214 by almost 25%; the total 1995 mortality was 201. The 264 non-red tide deaths broke down by cause of death as follows: watercraft, 60; flood gates/canal locks, 10; perinatal, 55; cold stress, 17; other natural, 28; undetermined, 82; verified but unrecovered carcasses, 12. The 60 watercraft-related deaths also beat the previous

record of 53, set in 1991.

A February aerial survey of the state counted 2,639 manatees, the highest number recorded to date. Of these, 1,182 were on Florida's west coast; by the end of the year 283 (24%) of these had been confirmed dead. (Source: Florida Department of Environmental Protection)

Progress in Reintroduction of Captive Manatees, April 1996-March 1997. - Merritt Island National Wildlife Refuge Staging Area: The manatee acclimation pens in the upper Banana River were not used in 1996 because the submerged aquatic vegetation (SAV; seagrass and algae) disappeared from the pens during fall and winter, 1995-1996. The loss of vegetation was definitely not caused by the few manatees that were held in the pens during the summers of 1994 and 1995; the unused "control" pen also lost all vegetative cover. The dominant seagrasses in the Banana River for at least 10-15 years prior to 1995 have been *Halodule wrightii* (shoal grass) and *Syringodium filiforme* (manatee grass). A long-term decline in salinity, from about 28 ppt in summer 1994, to 18 ppt in summer 1995, to 10 ppt in summer 1996, apparently killed the *Syringodium* in the upper Banana River, as recent vegetation surveys indicate it is relatively scarce in areas it once dominated (J. Provancaha, Dynamac Corp., pers. comm.), including in the acclimation pens.

Sirenia Project and Dynamac Corp. personnel mapped SAV species composition and estimated SAV density in the acclimation pens and in a nearby reference plot during the summers of 1994-1996. This research documented the disappearance of *Syringodium* and most of the *Halodule wrightii* (shoal grass) both inside and outside the pens. It also documented the replacement of the latter species by *Ruppia maritima* (widgeon grass) outside the pens during the spring and summer of 1996.

The inability of *Ruppia* to establish itself inside the pens may be indicative of how this species spreads its seeds: by direct deposit in an established bed; by wildlife that eats *Ruppia*, such as manatees, coots, and ducks, which cannot or do not use the pens; and via drifting plants with seeds attached, which would also tend to be excluded from the pens. Seeds that do make it into a pen (some

were deliberately introduced by researchers) may not produce viable offspring in the fine, unconsolidated sediment layer that has accumulated in the absence of stabilizing seagrass rhizomes. Most of the pen fencing was removed in early January 1997 to encourage the regrowth of seagrasses. When vegetation again becomes established, the U.S. Fish & Wildlife Service plans to continue use of the acclimation pens as a temporary staging site for captive-reared manatees prior to their reintroduction to estuarine and marine environments.

Direct Release of Doc and Dakota in Biscayne Bay: On 20 August 1996, "Doc," a captive-born male manatee reared at Homosassa Springs State Park, and "Dakota," an orphaned male reared at Sea World, were released at the Cutler Power Plant in Deering Bay, on the west side of Biscayne Bay, Dade County, Florida. Both manatees were fitted at the release site with satellite-monitored transmitter assemblies by Bob Bonde, Sirenia Project. These 4-year old males are sexually mature, and were prepared for their release through staging at the Merritt Island National Wildlife Refuge staging area last summer. Following recommendations made at the March 1996 Interagency/Oceanaria meeting, Sea World personnel added seagrasses to the diet of these long-term captives from April 1996 up to their release in August. After his release, Dakota began almost immediately to explore his new surroundings, leaving behind Doc, who was reluctant to leave shallow water. These different responses to release mirrored Doc and Dakota's behavior in the staging area last summer: Dakota more quickly "took" to his new environment, which Doc initially preferred the shallow end of the pen, and took longer to feed on natural vegetation. Dakota made his first exploratory venture out of Deering Bay 2 days after his release, while Doc stayed in Deering Bay for over a week after his release.

Heather Smith, a Sirenia Project volunteer who helped with observations of manatees at the staging area in July-September 1995, and Kevin Mayo, a biologist with the Dade County Department of Environmental Resources Management, have radio-tracked and observed Doc and Dakota as they adjusted to their new environment.

Post-release Assessments: Dakota was

recaptured along with another adult male manatee on 29 October 1996 (2 months, 9 days after release), at Convoy Point in South Biscayne Bay. Sea World personnel, directed by Bob Wagoner, captured the manatees in shallow water using their 24-ft net boat. Drs. Mark Lowe (Homosassa Springs State Park), Sam Dover (Sea World), and Mike Renner (Miami Seaquarium) assessed Dakota's overall physical condition and took blood samples for further analysis. Bob Bonde took blubber thickness measurements using an ultrasonic scanner. Umbilical, anal, and peduncle blubber layers were reduced by 40%, 27%, and 5%, respectively. While these values seem high, the actual blubber values were at or above the average values for an independent male manatee. Long-term captive manatees typically have much more fat than wild ones, and dramatic fat and weight loss following release are to be expected. Dakota's abdomen was round, showing no sign of longitudinal folds, and feces passed looked normal. Some serous atrophy was indicated externally in his shoulder region. Dakota was released on site. Results of Dakota's blood sample analysis indicated elevated creatinine and BUN values. However, veterinarians consider these values acceptable due to expected fat layer reduction.

Doc was net-captured on 21 November 1996 (3 months after release), in Coral Gables Waterway off Biscayne Bay, Miami. Drs. Mark Lowe and Mike Renner assessed his general condition, and determined that he appeared to be in even better shape than Dakota, with little external sign of serous atrophy. Reductions in his dorsal blubber layer were 54% (umbilical), 31% (anal), and 35% (peduncle), and actual values were at or above average values for an independent male manatee. He was released on site. Doc's blood creatinine level was normal (2.3 mg/dl), and other routinely evaluated blood parameters were generally within normal ranges. Doc's total cholesterol level was high relative to other manatees (403 mg/dl), which is consistent with his values from 1995.

Sea World of Florida personnel, led by Bob Wagoner, recaptured Dakota and Doc on 24 and 25 March 1997, respectively. Dakota was captured just south of Black Point in Biscayne Bay, and Doc was caught in Indian

Camp Creek, Everglades National Park. Everglades National Park (ENP) and Dade County personnel assisted in the captures. Sirenia Project personnel made ultrasonic measurements of blubber thickness, took girth measurements and fecal samples, and fitted both manatees with new satellite-monitored transmitter assemblies. While both manatees have continued to lose fat, both have umbilical fat and girth measurements at least as great as their last assessment, both are clearly feeding, and both were determined to be in good overall condition by Sea World veterinarian Sam Dover. They were released on site less than an hour after capture. Another reassessment will probably not be necessary for another 6 months, the conservative life of the transmitter batteries.

Highlights of Field Observations:

While Dakota fell in quickly with other manatees that appear to travel routinely among various freshwater sources on Biscayne Bay between Homestead Bayfront Park and Coral Gables Waterway, Doc initially had a much smaller range in northern Biscayne Bay and typically was observed to be alone. Doc moved from the Coral Gables Waterway, on the southeast coast, to the southwest coast of Florida between the end of November and mid-December 1996. On 3 December, he was observed in two canals in the Homestead area of Biscayne Bay; on one of these occasions, he appeared to be traveling with another manatee. On 6 December he was seen in a canal at the south end of Manatee Bay, and by 13 December, his satellite-determined location was just off of Cape Sable. He then moved north to Indian Camp Creek, where he has been since mid-December. This almost-freshwater creek extends far inland, and contains abundant submerged vegetation, predominantly water celery (*Vallisneria* sp.). On the 8 occasions Doc has been closely observed between 15 January and 25 March, he has been by himself. Skip Snow, an ENP ecologist, noted that his aerial surveys have shown manatees to be common in this region of the Park, although the surveys do not include Indian Camp Creek. Skip plans to do some aerial tracking to determine if other manatees are using the creek.

Both of these captive-reared manatees have succeeded in finding suitable manatee habitat in very different locations. Kevin

Mayo, Dade County Environmental Resources Management, and Skip Snow, ENP, will assist the Sirenia Project in making periodic checks on Doc's and Dakota's progress. Heather Smith's excellent assistance was greatly appreciated; she completed her tour of duty with the Sirenia Project on 28 March and returned to Canada. She is currently seeking research experience opportunities with other marine mammals.

Florida Marine Research Institute Highlights: Leslie Ward and Beth Wright report that systematic recaptures of two long-term captive manatees, Graham and Valentine, provided an opportunity to monitor the success of manatee reintroduction into natural habitat. Graham, a 5-yr-old female, and Valentine, a 4-yr-old male, were released without staging into Whitewater Bay, Everglades National Park, in September 1995. Evaluation techniques included documentation of travel patterns and habitat use via telemetry, monitoring of blood parameters, and morphometric measurements including girths and the non-invasive measurement of blubber thickness using ultrasound. After a year and a half of monitoring, reintroduction seems to be successful based upon habitat use, observed association with other manatees, and gross body appearance. Blubber thickness measured at three standardized body sites decreased at each successive evaluation; however, the decrease in values was expected because captive manatees typically have thicker blubber than free-ranging ones. Graham has primarily stayed in Whitewater Bay, while Valentine has made extensive moves along the southwest coast to Everglades City, periodically returning to Whitewater Bay. Graham and Valentine will continue to be monitored until morphometric measurements stabilize.

Recommendations: 1) Other direct releases of captive-born and captive-reared manatees in South Florida should be considered.

2) The cost of constructing and managing a soft-release program should be compared with the cost of direct releases with follow-up monitoring.

3) A cooperative agreement should be developed among the cooperating agencies to better coordinate release decisions, post-release monitoring activities, and responsibilities for collecting, analyzing, and publishing

data related to the captive reintroduction program. - Lynn Lefebvre (Sirenia Project, Florida Caribbean Science Center, U.S. Geological Survey - Biological Resources Division, Gainesville, FL 32601)

It's Great to Have Friends! - In the October 1995 issue of *Sirennews*, a dramatic headline announced "U.S. SIRENIA PROJECT THREATENED WITH EXTINCTION." At the time, the situation seemed that dire, as our budget had been cut 24%, and the agency to which the Project belonged (the National Biological Service) really was becoming extinct. I am happy to report that not only did the Sirenia Project survive, but things are truly looking up since our transfer to the U.S. Geological Survey in October 1996. As of 1 October, the NBS was replaced by the Biological Resources Division (BRD), one of four USGS Divisions. The Project also became part of a new center, the Florida Caribbean Science Center, headquartered in Gainesville, Florida. Dr. Russ Hall became the Center's Director in January 1997. Dr. Denny Fenn is Director of the USGS-BRD, and Dr. Sue Haseltine is Director of the Southeast Region of the BRD. The USGS has a long history of collaborative research with other federal, state, and local partners. I strongly believe that the mission of the Sirenia Project, to provide information vital to the long-term recovery of the West Indian manatee, requires such collaborative efforts.

All of us at the Sirenia Project are extremely grateful to the many colleagues and partners who helped us through a traumatic year. We deeply appreciated the letters of support that came in from around the world. Special thanks go to the Save the Manatee Club and an anonymous donor for their generous and timely donations. Thank you!
- Lynn Lefebvre

[EDITOR'S NOTE: A long-term radio-tracking study of the Sirenia Project's movements through the bureaucracy of the U.S. Department of the Interior has so far traced it from the Fish and Wildlife Service through the National Biological Survey and National Biological Service to the Geological Survey. However, individual satellite tags attached to Lynn and her coworkers have revealed the curious fact that their home ranges have remained unaltered throughout

these administrative peregrinations; they can still be regularly observed in their same old offices in Gainesville. We are delighted to know that this free-ranging project is still in good overall condition despite its reduced blubber thickness and severe recent stress, and we hope that supplemental feedings will eventually bring it back up to its proper weight. Meanwhile, we trust that its new habitat in the Geological Survey will induce it to finally venture into sirenian paleontology!

An Evaluation of Strip-transect Aerial Survey Methods for Monitoring Manatee Populations in Florida. - We evaluated the use of replicated strip-transect aerial surveys to estimate manatee population size in the Banana River, Florida, an important warm-season refuge for manatees. Our objectives were (1) to estimate manatee population size; (2) to correct for perception bias by applying a Petersen mark-recapture model to counts made by two independent observers; and (3) to evaluate the usefulness of this survey method for detecting trends in manatee population size over time.

Fifteen replicate surveys were conducted in August-September 1993 and August 1994. A total of 531 individuals belonging to 248 manatee groups was counted, for a mean group size of 2.14. Survey-specific correction factors for perception bias (the proportion of manatees that is visible within the strip-transect but is missed by observers) averaged 1.12. Compared with a conventional single-observer aerial survey, the doubled-observer technique increased the number of manatee groups by 22% due to the second observer and by 33% when the double counts were corrected by the Petersen model.

Corrected population estimates of the 160-km² strip-transect survey area ranged from 113 to 240 manatees. In estimating mean annual population size, we excluded the final survey of 1993 because it coincided with the first cold-front of the season. Mean population size differed between years (1993: 125 manatees; 1994: 179 manatees; $P < 0.024$). Precision of annual population estimates was high ($CV < 0.05$), indicating that the technique should be useful for monitoring purposes in the Banana River. Power analysis software for linear regression was used to demonstrate that with the stringent

assumptions of $CV = 0.05$ and power = 0.75, we should be able to detect an annual rate of change (r) = 0.05 within 4 years. This study represents the first attempt to use replicated strip-transect aerial surveys to estimate manatee population size. The survey technique presented here is an improvement over past attempts to estimate absolute manatee abundance, because it is a repeatable, standardized survey design that produces population estimates with known precision. However, application of the strip-transect survey technique to other areas in Florida during summer may be limited because of excessive water depths, water turbidity, and other environmental features typical of manatee habitats. Despite these limitations, we recommend that managers use warm-season transect surveys in the Banana River in conjunction with other datasets to determine if manatee population size on the east coast of Florida is increasing. - Karl E. Miller (Florida Cooperative Fish and Wildlife Research Unit, Univ. of Florida, Gainesville; current address: Dept. of Wildlife Ecology & Conservation, P.O. Box 110430, Univ. of Florida, Gainesville, FL 32611, USA), Bruce B. Ackerman (Florida Dept. of Environmental Protection, Florida Marine Research Institute, St. Petersburg, FL 33701), Lynn W. Lefebvre (Sirenia Project, U.S. Geological Survey-Biological Resources Division, Gainesville, FL 32601), and Kari B. Clifton (Florida Dept. of Environmental Protection, Florida Marine Research Institute, St. Petersburg, FL 33701)

Phylogeography of the West Indian Manatee: How Many Populations and How Many Taxa? - In order to resolve the genetic population structure and biogeography of the West Indian manatee (*Trichechus manatus*), mitochondrial (mt) DNA control region sequences were compared among eight locations across the western Atlantic region. Fifteen haplotypes were identified among 87 individuals from Florida, Puerto Rico, the Dominican Republic, Mexico, Colombia, Venezuela, Guyana and Brazil. Despite the demonstrated ability of manatees to move thousands of kms along continental margins, haplotype frequency comparisons demonstrate genetic separations of populations between most locations. These findings are consistent with tagging studies which indicate

that stretches of open water and unsuitable coastal habitats constitute substantial barriers to gene flow and colonization. Low levels of genetic diversity within Florida and Brazilian samples might be explained by recent colonization or bottleneck effects, respectively. Three distinctive mtDNA lineages were observed in *T. manatus*, corresponding approximately to Florida and the Greater Antilles, Mexico and Caribbean South America, and Atlantic South America sample sites. These lineages, which are not concordant with previous subspecies designations, are separated by sequence divergence estimates of $p=0.03-0.07$, approximately the same level of divergence observed between *T. manatus* and the Amazonian manatee (*T. inunguis*). - Angela I. Garcia-Rodriguez (Dept. of Fisheries & Aquatic Sciences, P.O. Box 110600, Univ. of Florida, Gainesville, FL 32611), B. W. Bowen, A. Mignucci-Giannoni, M. Marmontel, R. Montoya-Ospina, B. Morales-Vela, M. Rudin, D. P. Domning, and P. M. McGuire

GUINEA-BISSAU

Toba Aquarium Acquires West African Manatees. - In May 1996, two African manatees (*Trichechus senegalensis*) were captured by local fishermen in the Geba River in Guinea-Bissau, West Africa. We transported these animals to Japan under permits from both countries to study the behavior of this species in captivity at Toba Aquarium.

We have kept dugongs at Toba Aquarium since 1977, and have endeavored to do research on the captive care of the dugong as well as its behavior in captivity. We are proud that, as a result, a huge number of visitors have shown considerable interest in, as well as gained better understanding of, the dugong and other endangered species. Furthermore, our activities have not only brought about progress in conservation of dugongs, but also have proven to be educational for the peoples of the Philippines through our joint project with that country. Our purpose in keeping African manatees is to study their feeding and reproductive behavior in captivity.

In comparison with other species of sirenians, the African manatee is not yet well known among the general public or even

biologists. Evidently, judging from our research in Guinea-Bissau, the same can be said for the local peoples inhabiting the area where the manatees occur. It is therefore imperative for more people to get a better understanding of this species in order to develop activities for its conservation.

Our surveys of African manatees in Guinea-Bissau lasted respectively for a week in December 1994 and from March to June 1996. They covered a distance of 60 km, from the middle reaches of the Geba River to Contuboel [see H.-J. Schuhmann, 1995, *Natur und Museum* 125(12): 402-409].

This river meanders along with widths of 40-100 m. At the time of our surveys in the dry season, its depth was about 4 m. At the beginning of the dry season in December, floating water grass (*Trapa natans*) increased significantly and covered the water surface as far as the middle of the river, but decreased after March. However, in the upper reaches at Contuboel, these floating plants grew well, despite the dry season and low water levels. We assumed that the difference in quantity of the floating grass in these two areas was caused by feeding activities of the manatees.

Locating the manatees proved to be extremely hard, due to the muddy water as well as the species' behavior. The native fishermen, however, are able to locate the manatees by day or night. We could often confirm their location when they fled on hearing our outboard motors. In our survey of March 1996, 35 manatees were sighted.

In Guinea-Bissau, meat of captured manatees is often sold as food. According to local sources, there was an instance in February 1996 when seven manatees were caught at the same time in Bafata. In most cases, though, the manatees are not deliberately hunted, but rather get caught accidentally in fishing nets. During our survey, four were caught, two at a time. Although the native people usually kill them as soon as they are caught, we were fortunate to obtain from fishermen two live individuals which were caught near Geba on 8 May 1996. These were a male and a female, both 3 m long.

We kept them in Bafata from 8 to 30 May, and thereafter in the Guinea-Bissau National Zoo from 31 May to 12 June. A holding tank 6.6 m in diameter and 0.9 m deep was made from a tarpaulin and filled with water from the Geba River. Water

temperature ranged from 28.8-33.0 C. We tried to feed them 15 kinds of water plants, including *Neptunia oleracea*, *Trapa natans*, *Ludwigia decurrans* var., and *Pistia stratiotes*. We observed that they ate some species of Gramineae eagerly while at the zoo.

We transported them to Japan on 12 June 1996 by a chartered aircargo MD-11. The flight from Bissau to Nagoya took about 21 hours; about 32 hours in all were required including the transport from Nagoya Airport to Toba Aquarium. During transport the manatees were held in containers with water and some urethane foam matting for support. For handling and moving, a power crane and forklift were used. They tended to struggle on the stretcher if the air temperature in the plane compartment rose, so we set the cabin temperature to 19 C. It was kept between 18.4 and 21.8 C, with 52-91% humidity. We also took steps to keep their body temperature from rising by showering them continuously. At times they would pull themselves up and wag their tails; when they did so, we had no choice but to wait until they calmed down. A few hours after arrival at Toba Aquarium, we noticed that they eagerly consumed a quantity of Italian ryegrass (*Lolium multiflorum*).

Two types of indoor pool, a display tank with 300 m³ of water volume (12.0 x 6.8 x 3.8 m) and a holding tank of 70 m³ (6.8 x 4.2 x 2.8 m), were provided for the manatees. The filtration and circulation systems are built into five filter tanks, equipped for 19 turnovers per 24 hours. Water and air temperatures are controlled at 25-30 C respectively. A skylight in the ceiling admits sunlight.

At Toba Aquarium the African manatees have mainly been fed Italian ryegrass and leaf lettuce, in addition to various foods such as Sorgo, orchard grass, seagrass, carrots and Chinese cabbage. Initially, daily food consumption of the two manatees had been 50-60 kg, which is estimated to be about 5% of their body weight/day/animal; now it has increased to 80-90 kg (8-9% of body weight). Their body weights were 386 kg (male) and 379 kg (female) on arrival at Toba, and had increased to 480 and 465 kg, respectively, by 21 August 1996. - Shiro Asano and Shinji Sakamoto (Toba Aquarium)

[EDITOR'S NOTE: This very large

reported weight gain of the animals in only two months was confirmed by Toba Aquarium personnel, who attribute it in part to the fact that during the time the animals were held in Guinea-Bissau, their digestive tracts became nearly empty, so that the initially recorded weights were artificially low. As of 23 March 1997, Toba's African manatees were doing well and had reached weights of around 500 kg or more. The pair of dugongs at Toba are also said to be doing well and sometimes mating; analysis of progesterone in the female's urine indicates an ovulation cycle of 50 days.]

Wildlife Conservation Meets Rational Utilization and Community Benefits: The Controversial Case of the African Manatee in Guinea-Bissau. - On 12 June 1996, a chartered jet left Bissau International Airport carrying two very special passengers on a 28-hour journey. The two manatees (*Trichechus senegalensis*) on board were en route for Toba Aquarium in Japan after having left in their trail a number of heated arguments between local conservationists, government departments, NGOs, and foreign professionals. Now that the dust has settled, it is possible to come back to the facts and report that the Toba Aquarium has gone to considerable expense and effort to acquire a pair of African manatees from Guinea-Bissau.

Guinea-Bissau is considered one of the poorest countries in the world, with an annual GDP of under US\$200 per capita and an external debt currently running at US\$850 million. It is also one of the countries that receive the most international aid. Saying that government departments lack funding, equipment, expertise, and motivation is only an understatement of the reality. Middle-level government staff receive in a very irregular manner a salary of around 500,000 Guinean pesos (US\$22) per month.

Although some authors indicate that Guinea-Bissau hosts the largest population of manatees in West Africa (Kelleher et al. [eds.]. 1995. *A Global Representative System of Marine Protected Areas, Volume II*. World Bank/IUCN), little is known locally about the status of the population. The most recent work, based on sample censuses, gives an estimate of around 10,000 animals for the country (Schuhmann, H.J.. 1995. "Der Manati, *Trichechus senegalensis*, im Rio

Geba, Guinea Bissau." *Natur und Museum* 125(12): 402-409).

Intentional killing of manatees is not rare. This is done by transgressors of traditional laws and beliefs for the purpose of sales of meat (considered as the finest available), and by peasant farmers in revenge for the destruction of rice fields in which the animals graze when the water levels rise. The main threat to the manatee comes from the disappearance of its natural and undisturbed habitat.

Manatees seem to occur in all water channels of the country (except the Rio Corubal; Anon. 1989. *Résultats de l'inventaire faunique au niveau national et propositions de modifications á la loi sur la chasse. MDRA/CECI/IUCN*) and in the shallow and turbid waters of the Bijagos Archipelago (recently classified as a Biosphere Reserve). The Bissau-Guinean manatee is listed on Appendix II of CITES. The Direcção Geral das Florestas e Caça (General Direction of Forestry and Hunting) is the management authority responsible for the issuing of CITES certificates. Locally, hunting and live captures are regulated by a rather antiquated law of 1980 that indicates that protected animals should not be killed or captured alive. The manatee is listed locally as an "Animal Protegido".

(NOTE: The following information was obtained from Mr. Schuhmann, who was acting as an intermediary between the Toba Aquarium and the local authorities. This information was cross-checked and completed with information from the staff of the Direction of Forestry and Hunting who were involved with the operation on the ground.)

In December 1993, the Toba Aquarium contacted a private entrepreneur in Bissau for the acquisition of two pairs of manatees. After discussions between the Ministry of Agriculture and Toba, two expeditions had to be organized to get a clearer picture of the status of the population before a decision was to be taken and the relevant national and CITES permits issued. After these expeditions were completed (December 1994 and March 1995), formal application was made by the intermediary for the capture of two pairs of animals. Toba sent appropriate staff to meet with the Ministry and finalize the agreement. In the meantime, the Japanese CITES authorities provided the necessary authorizations for import.

The capture was to take place in Rio Geba, where the largest concentrations of manatees were encountered during the surveys. Toba sent one veterinarian, two biologists, and three animal keepers to Guinea-Bissau for the event. They were accompanied by the local intermediary and staff of the Ministry of Agriculture. Soon after their arrival on the river, the team was offered a pair of manatees by the local fishermen. Unfortunately these had been killed.

After several days of fruitless capture attempts by the Japanese team it was decided to request the assistance of the local leader of the fishermen. Within a few days, two animals (male and female), each measuring 2.5 m long, were captured simultaneously and delivered to the team alive and in good condition. Minor skin wounds caused by the capture nets developed into localized mycotic infections and were treated (the red marks left by the antiseptic were interpreted later by some observers as open bleeding, leading to fears for the health and welfare of the animals). Twenty million Guinean pesos (around US\$850 at the time) were paid to the leader of the fishermen for the services of the community. In the meantime, the Ministry of Fisheries, alarmed by the unrecorded presence of a foreign party using fishing nets in a river, sent staff to investigate. After agreement over the non-fish nature of the manatee and the exhibition of the appropriate authorizations and certificates, staff of that ministry was reassured that no foul play was underway.

The animals were kept at the capture site for two weeks in a specially arranged pool (10 m in diameter and 1 m in depth). They were then transported by truck with police escort to the zoo in Bissau, a 9-hour journey. In Bissau, they were kept in a similar pool (a spare pool was kept filled at all times in case leakage would create an emergency situation). In a matter of days, the animals became familiar with the people and were accepting play. They were fed on cultured vegetables and water plants, and later accepted all types of vegetables. After a few days of seclusion to allow them to recuperate from the stress caused by the change of environment and transport, the Ministry of Agriculture authorized visitors to view the animals. It is reported that as many people came to see the manatees every day as there are visitors

to the zoo in one month in normal times. Entry fees are paid directly into the State's coffers.

Overall, the acquisition of one pair of manatees seems to have cost the Toba Aquarium around US\$1.8 million. This includes the conversion of one of their enclosures at the aquarium to meet the needs of the African manatees, the chartering of the aircraft, the Japanese staff's time and transport, the capture equipment, insurance costs, technical assistance in Guinea-Bissau, purchase of ten bicycles, six motorbikes, and six computers to be used by the Direction of Forestry and Hunting, etc.

So far, no problem has been reported by Toba concerning the health of the animals. The Japanese could be interested in acquiring another pair of African manatees in order to increase the chances of captive breeding. - Eric M. Feron (Chief Scientific and Technical Advisor, IUCN, Guinea-Bissau)

Manatee Conservation Plan for Guinea-Bissau. - IUCN Guinea-Bissau, together with the Direcção das Florestas e Caça (Forestry and Hunting Department), are preparing a first study to elaborate and implement a national manatee conservation action plan. This study should take place before July 1997 with the assistance of a Portuguese marine mammal specialist.

Given the fact that Guinea-Bissau is considered to host the largest population of manatees (*Trichechus senegalensis*) in Africa, the project is of major value for the conservation of biodiversity.

We would like to call for information from specialists in this subject in order to benefit from the wealth of expertise available through the IUCN Sirenia Specialist Group. Please contact: Eric M. Feron (Chief Scientific and Technical Advisor, IUCN Bissau, e-mail gbro@hq.iucn.org, fax +245 201168)

MEXICO

Manatee Sanctuary in Mexico. - One of the most important areas for manatees in Mexico is Chetumal Bay and the Hondo River, situated in the southeastern part of the Mexican state of Quintana Roo, on the border with Belize. On 25 October 1996, the President of Mexico declared Chetumal Bay to be a Manatee Sanctuary. As the first offi-

cially protected area for manatees in Mexico, this sanctuary shows that the people and government of Mexico are concerned with conservation of this endangered sirenian. In Quintana Roo, the manatee is a symbol of conservation of living resources.

The declaration of the sanctuary is consistent with specific recommendations for proactive conservation of the West Indian manatee, as stipulated in 1994-1995 by the United Nations Environment Programme's SPAW (Specially Protected Areas and Wildlife) Regional Programme. Because Chetumal Bay waters are under the jurisdiction of both Mexico and Belize, the government of Mexico has encouraged the Belizean government to implement protection in those parts of the Bay that belong to Belize. If this happens, the two governments will have protected one of the most important manatee habitats in the Caribbean.

The Chetumal Bay Manatee Sanctuary contains 281,320 ha, including over 101,000 ha of mangroves, wetlands, and hydrological basins adjacent to the Bay. The characteristics of the Bay that make it attractive to a population of about 130 manatees include shallow and protected waters, a temperature range of 25-30°C, and salinities of 0-18 ppt. The main aquatic vegetation includes *Batophora* sp., *Chara* sp., *Najas marina*, *Ruppia maritima*, *Halodule wrightii*, and *Thalassia testudinum*.

Creation of the Sanctuary is the product of several years of research, public education, and negotiations by the marine mammals staff of El Colegio de la Frontera Sur (ECOSUR), together with important activities of citizens concerned with conservation of this aquatic mammal in Mexico. During 1997, ECOSUR will work with the Government of Quintana Roo and the Ministry of Natural Resources in Mexico City to develop a management plan for the Sanctuary. Special attention will be paid to conservation of areas most frequently used by manatees, protection of streams and lagoons that drain into the Bay, regulating use of pesticides and herbicides along the Hondo River, and regulating use of fishing nets that have incidentally taken manatees in the past six years. Efforts will be made to strengthen bilateral cooperation between Mexico and Belize to conserve manatees; the foci will include additional collaborative research,

education, and public awareness.

Another important component of manatee conservation in Mexico was the creation of the NGO Amigos del Manati, A.C., in September 1996 in Chetumal City (P.O. Box 334, C.P. 77000). Benjamín Morales is the President of the NGO (e-mail: bmorales@xaway.cigro.conacyt.mx), whose main goal is to assist development of manatee education activities, especially in Quintana Roo and Belize. Any support or educational materials in English or Spanish are welcome. - Benjamín Morales Vela (ECOSUR, Apdo. Postal 424, C.P. 77000, Chetumal, Q. Roo, Mexico)

Impounded Manatees in Tabasco Threatened. - A group of West Indian manatees is impounded in a large pond located in a park in the city of Jonuta in the state of Tabasco, southern Mexico. Five years ago this population consisted of 12 individuals. Because of fluctuating water availability as well as pollution, the population has been reduced to five or six individuals. Two years ago a brook that leaves the pond was blocked to try to alleviate the pollution problem, which was mainly caused by sewage discharge, but at the same time this created another problem: during the dry season the water supply was scarce, leaving the animals in a very shallow environment. This problem has been taken care of with the installation of a pump that supplies water from the nearby Usumacinta River.

I am concerned about this population and have been trying to start a project with a group of classmates. Unfortunately, there are political issues involved as well as economic limitations and this has made it difficult to get started. Nonetheless, I managed to get a permit to exhume bones (vertebrae and ribs) of an individual that died one year ago.

I would like to have the suggestions of other sirenian researchers and conservationists about how to proceed. - Diego Santiago Alarcón (c/Marte #107, Fracc. Galaxia, C.P. 86035, Villahermosa, Tabasco 2000, Mexico)

UNITED ARAB EMIRATES

Dugong Postage Stamp. - On January 25, 1996, the United Arab Emirates postal service issued a set of three marine

mammal postage stamps promoting environmental protection. The 50f denomination depicts a group of dugongs; the 2d and 3d stamps portray the common dolphin and humpback whale, respectively. These three stamps, which bear Scott catalog numbers 506-508, were also issued as a souvenir sheet.

VIETNAM

New Record of Dugong in Con Dao Waters, Southeast Vietnam. - There has been very little research and information on sea animals of Vietnam in general and dugongs in particular. Up to now, the dugong has been recorded several times. In July 1960, a dugong was caught in a fishing net about 20 km south of Nha Trang (Tran Ngoc Loi, 1962). Van Bree and Gallagher (1977) published information on seven specimens from the Con Dao Islands, which are housed in the Museum of Bordeaux, France, and one specimen from Ha Coi (Tonkin Gulf, North Vietnam) housed in the Muséum National d'Histoire Naturelle (Paris). Smith et al. (1995) reported dugong skulls from Van Gia, Khai Luong, Ba Ha 1, Cua Be, and Ninh Hai (around Nha Trang).

During an expedition to the Con Dao Islands by scientists from the Haiphong Institute of Oceanology in March-April 1996, we were informed that a dugong had been caught in a fishing net in Con Son Bay in July 1993. This dugong was reportedly 1.2-1.4 m long and weighed 40-45 kg. Because no scientists or fixatives were available on the island, photographs of the dugong were made by a tourist and the dugong was then given to a fisherman for food. We have only two photos of this dugong given us by Mr. Le Xuan Ai, Director of Con Dao National Park.

Fishermen from Hong Kong who were culturing coral reef fishes in Con Son Bay informed us that they often saw a group of 7-10 dugongs there during the period June-October, when the seagrass beds are better developed. Four species of seagrass are present at Con Dao: *Thalassia hemprichi*, *Halophila ovalis*, *Halodule tridentata*, and *Syringodium isoetifolium*.

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ABSTRACTS

The following abstracts are of papers and posters presented at the VII Reunión de Trabajo de Especialistas en Mamíferos Acuáticos de América del Sur, Vina del Mar, Chile, 22-25 October 1996.

OBSERVAÇÕES DA ESTRUTURA DA PELE DO PEIXE-BOI DA AMAZÔNIA *Trichechus inunguis* (MAMMALIA, SIRENIA)

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O peixe-boi da Amazônia caracteriza-se por apresentar uma pele coréacea e resistente, porém, de textura lisa e pêlos esparsamente distribuídos pelo corpo. Dentre os sirênios, é o que apresenta coloração mais escura e dorsalmente uniforme. Há 5 anos atrás, dois peixes-bois adultos do Laboratório de Mamíferos Aquáticos do INPA-AM foram expostos diretamente a luz solar e sofreram queimaduras profundas na região dorsal. A princípio, essas lesões causaram descamação da pele surgindo marcas despigmentadas. Entretanto, tais marcas vem diminuindo de intensidade progressivamente. Este processo está ocorrendo com o aparecimento de manchas arredondadas de cor escura que surgem no centro da área atingida. Desta forma, o presente estudo analisou a variação da estrutura da pele entre as áreas pigmentadas e despigmentadas de *Trichechus inunguis*. Pequenas porções da área superficial do tegumento foram removidas e fixadas para análise histológica convencional. O *estratum spinosum* e *granulosum* da área pigmentada apresentaram queratócitos com melanina dispostos ao redor do núcleo, estrato córneo delgado e uma reduzida vascularização na região das papilas dérmicas. A área despigmentada caracterizou-se pela ausência de melanina, um estrato córneo espesso e alta vascularização. A transição da área pigmentada para a despigmentada foi gradativa em relação aos diferentes estratos. As características do epitélio descritas em cada área parecem estar relacionadas com a necessidade de evitar danos ao núcleo celular, bem como auxiliar na homeostase tecidual.

TAXA DE CONSUMO ALIMENTAR DO PEIXE-BOI DA AMAZÔNIA, *Trichechus inunguis*, EM CATIVEIRO.

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O peixe-boi da Amazônia é um mamífero herbívoro, não ruminante, que embora venha sendo mantido com relativo sucesso em cativeiro, pouco se conhece sobre seus requerimentos nutricionais. Para a realização deste estudo foram utilizados peixes-bois cativos no INPA Manaus-AM), incluindo um casal de filhotes órfãos alimentados com dieta láctea artificial, e três peixes-bois adultos (2 machos e 1 fêmea), de diferentes idades, comprimentos e pesos, os quais foram submetidos à três dietas distintas: repolho (*Brassica oleracea*), capim colônia (*Brachiaria mutica*) e alface (*Lactuca sativa*). A quantidade de alimento oferecida foi "ad libitum" sendo o consumo diário calculado pela diferença entre o peso do alimento oferecido e o peso da sobra após 24 horas, obtendo-se o percentual do consumo por peso corporal de cada indivíduo. Observou-se uma correlação negativa entre o consumo percentual diário e o peso corporal dos filhotes, a qual sugere-se que esteja relacionada com a taxa de crescimento exponencial muito elevada durante a lactação. O maior consumo foi observado no peixe-boi com dieta de alface (23.7%), seguido pela dieta de repolho (9.8%), dieta láctea no filhote fêmea (7.0%), dieta láctea no filhote macho (4.7%) e dieta de capim colônia (2.2%). Os resultados obtidos sugerem que o consumo alimentar pelo peixe-boi da Amazônia esteja diretamente relacionado com o valor nutritivo e palatabilidade da dieta, com a fisiologia digestiva e com a taxa metabólica da espécie.

TEMPO DE PASSAGEM DO ALIMENTO NO TRATO DIGESTIVO DO PEIXE-BOI DA AMAZÔNIA, *Trichechus inunguis*, EM CATIVEIRO.

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Três dietas foram utilizadas para a determinação do tempo de passagem em animais adultos, alface (*Lactuca sativa*), repolho (*Brassica oleracea*) e capim colônia (*Brachiaria mutica*) oferecidas à 3 peixes-bois cativos no INPA (Manaus-AM), individualmente isolados e aclimatados cada um com uma das 3 dietas por um período de 8 dias. O tempo de passagem foi também determinado em um casal de filhotes órfãos lactentes alimentados com leite artificial. Após o período de aclimação, foi oferecido o alimento marcado com fitas plásticas coloridas, registrando-se o dia e hora da ingestão. As fezes foram coletadas continuamente em intervalos de 2 h até que as marcas fossem encontradas. A média do tempo de passagem do capim colônia foi de 114 h, do alface 126 h, do repolho 161 h e da dieta láctea 110 h. O menor tempo de passagem do capim colônia se deve provavelmente ao maior teor de fibra deste vegetal. O maior tempo de passagem do repolho em relação ao alface pode estar associado a uma constipação apresentada pelo animal durante o experimento, já que ambas dietas não apresentam diferenças significativas nos teores de fibras. Como a dieta láctea não necessita passar pelo processo de fermentação para quebra de celulose, era de se esperar que o tempo de passagem fosse reduzido. A considerável passagem lenta da dieta láctea pode ser atribuída à baixa taxa metabólica do peixe-boi. Os dados indicam que o tempo de passagem do alimento no trato digestivo do peixe-boi da Amazônia é influenciado pela fisiologia digestiva e taxa metabólica da espécie, pela microbiota associada e principalmente pela composição nutricional das plantas consumidas.

OCORRÊNCIA E ECOLOGIA DO PEIXE-BOI MARINHO *Trichechus manatus manatus* NA REGIÃO COSTEIRA DO SAGI, PB / RN, BRASIL.

Danielle Paludo

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Como parte do trabalho de monitoramento e proteção dos peixes-bois do litoral do nordeste brasileiro é realizado uma contagem e observação dos indivíduos que frequentam a região costeira do Sagi, em saídas de campo ao longo de todo o ano, abrangendo uma extensão de 30 km de costa entre Barra de Camaratuba, no Estado da Paraíba e Baía Formosa, no Rio Grande do Norte, no litoral NE do Brasil. O processamento dos dados de 1989 a 1995 mostra uma marcada sazonalidade de ocorrência do peixe-boi marinho nessa costa, sendo observados um maior número total de animais, e em grupos maiores a partir do mês de setembro, e até o mês de março, coincidindo com os meses de verão. Os peixes-bois foram vistos entre distâncias de 5 a 15 metros da linha de praia, junto e sobre os arrecifes costeiros submersos alimentando-se de algas marinhas, abundantes nestes arrecifes e que foram identificadas. Foram avistados animais adultos acompanhados de filhotes recém-nascidos, pequenos e escuros, principalmente nos meses de verão, havendo inclusive o resgate de dois filhotes recém-nascidos encalhados neste trecho da costa e resgatados pelo Centro Peixe-Boi/IBAMA durante este período. Ao longo dos anos, e mantendo-se o mesmo esforço de observação, observou-se que o número total de animais avistados por ano entre 1989 e 1995 manteve-se aproximadamente o mesmo (média de 190 avistagens por ano), o que indica uma estabilidade no número destes animais nesta região. Os peixes-bois não são caçados ou mortos propositalmente na região, que devido às condições oceanográficas também não apresenta comumente embarcações motorizadas junto à costa, o que favorece a permanência dos animais na área. Poderia representar uma ameaça aos peixes-bois a presença de redes do tipo caçoeira colocadas junto aos arrecifes, porém durante estes anos não foi registrada nenhuma morte acidental neste tipo de rede para a região.

ESTUDIO PRELIMINAR DEL COMPORTAMIENTO DEL MANATI EN CAUTIVERIO EN EL LABORATORIO DE MAMIFEROS ACUATICOS DEL INSTITUTO NACIONAL DE PESQUISAS DA AMAZÔNIA (INPA), MANAUS, BRASIL

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El presente trabajo se realizó en los estanques del Laboratorio de Mamíferos Acuáticos del INPA con el objeto de registrar el comportamiento y actividades del manatí en cautiverio. Se usó la observación directa y registro de cada comportamiento en una ficha padronizada. El estudio se realizó en 3 estanques de 10 m de diámetro por 2.5 m de profundidad y en 2 recameras de aislamiento y/o manejo de manatíes adultos con una dimensión de 3.5 x 2.5 x 1.5 m. El estanque 1 (T1) contaba con 3 hembras y 1 macho adultos, el estanque 2 (T2) 2 machos adultos y una cámara (T4) que contenía 2 crías (macho y hembra). El número de horas empleadas en cada estanque durante los periodos de observación fué: T1=40 horas, T2= 39 h y T4=41 h. Las principales categorías de comportamientos observados fueron los de locomoción, alimentación, contactos, sexualidad y comportamiento individual y social. Los manatíes son más activos durante la mañana y tarde que durante la noche y madrugada. Los comportamientos de mayor frecuencia fueron los de alimentación y descanso. Los adultos prefieren alimentos como lechuga *Lectuga sativa* y repollo *Brasica oleracea f. capitata* y las crías prefieren cabomba *Cbomba sp.* y hojas tiernas de grama *Brachiaria mutica*. Las crías presentan mucha actividad y mayores tipos de acrobacias que los adultos. Los intentos de cópula y cortejo por el macho del T1 fueron escasos aunque es común entre ellos los contactos y mordisqucos. El manatí amazónico es extremadamente asustadizo y nervioso cuando es sometido al intenso contacto con humanos y exceso de ruidos. Esto quizás influye en la carencia de actos de comportamiento reproductivo observados durante el estudio.

CONSUMO DE PLANTAS AQUÁTICAS CULTIVADAS, PELOS FILHOTES ÓRFÃOS DE PEIXE-BOI DA AMAZÔNIA *Trichechus inunguis* (MAMMALIA, SIRENIA) CRIADOS EM CATIVEIRO.

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O peixe-boi da Amazônia é um mamífero aquático herbívoro, não ruminante, endêmico da bacia Amazônica. No INPA (Instituto Nacional de Pesquisas da Amazônia), Manaus - Brasil, são criados filhotes órfãos de peixe-boi, sendo de grande importância o cultivo de plantas aquáticas e a avaliação do crescimento e consumo destas plantas, as quais na fase adulta serão a principal fonte alimentar destes animais. Para determinar o consumo destas plantas pelos filhotes de peixe-boi, foram utilizados 4 filhotes, dos quais um macho e uma fêmea (grupo A) com peso médio de 35,4 Kg, em fase de lactação e também um macho e uma fêmea (grupo B) com peso médio de 62,05 Kg, em fase de desmame (restrição láctea). As plantas aquáticas *Pistia stratiotes* e *Salvinia sp.* foram cultivadas em lagos artificiais no INPA, e distribuídas *ad libitum* para todos os animais durante um período de 5 meses, sendo que o grupo A consumiu em média $36,09 \pm 7,84$ Kg de plantas/mês, no entanto o grupo B consumiu em média $303,14 \pm 43,4$ Kg de plantas/mês. A relação consumo *pistia*:*salvinia* em ambos os grupos foi 3:1. Determinou-se que 1 m^2 de *Pistia sp.* possui em média 6,44 Kg, e 1 m^2 de *Salvinia sp.* possui em média 1,36 kg, assim, a partir da taxa de crescimento mensal destas plantas cultivadas, foi possível avaliar que para alimentar cada filhote do grupo A, foi necessário cultivar uma área de $2,10 \text{ m}^2$ com *Pistia sp.* e uma área de $3,30 \text{ m}^2$ com *Salvinia sp.*, já para cada filhote do grupo B, foi necessário cultivar uma área de $17,63 \text{ m}^2$ com *Pistia sp.* e uma área de $27,75 \text{ m}^2$ com *Salvinia sp.* O consumo de plantas pelo grupo B foi 840% superior ao grupo A, confirmando a maior necessidade de plantas com o início da restrição láctea. Para se manter peixes-bois em cativeiro é fundamental a avaliação do consumo de plantas aquáticas por animal, em relação a taxa de crescimento destas plantas cultivadas.

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