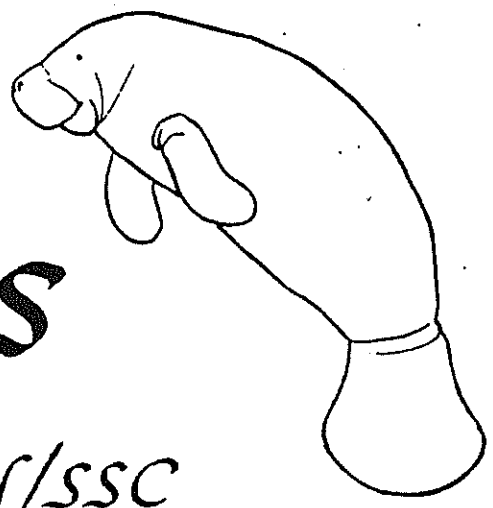

Sirenews

Newsletter of the IUCN/SSC Sirenia Specialist Group

NUMBER 31 APRIL 1999

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BULLETPROOFING SCIENCE AGAINST EXTREMISTS: ADVICE FOR SIRENIAN RESEARCHERS

It was a quiet Sunday morning. I decided to check the e-mail that had accumulated during my recent aerial survey work in remote Cape York, a region mercifully beyond the range of mobile phones, making Internet connection difficult for non-residents. Idly scrolling though my e-mails, most of which seemed to contain trivia that were already irrelevant, I came across a missive from the Director-General of IUCN, the World Conservation Union in Geneva, Switzerland. I assumed his e-mail contained uncontroversial information relevant to my responsibilities as Chair of the IUCN Sirenia Specialist Group. I was wrong.

The Director-General's office was querying a letter which they had received claiming that Tony Preen and I had *engaged in misconduct by falsely asserting a decline in the dugong population and disseminating misleading information.* We were also

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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accused of *willfully engineering an artificial emergency to milk the public purse.* This was the start of an unpleasant campaign of letters, media and internet releases, and documents produced by a self-proclaimed "wise-use group" attacking our science.

Controversy is no stranger to conservation matters, and sometimes misrepresents the science behind them. Pressure groups often draw conclusions that go beyond the evidence, and frequently quote the findings of scientific committees out of context. When recounting my experiences to scientists from other institutions, I was surprised at how many of them had been similarly misrepresented. Some had been vilified in attempts to "shoot the messenger".

A recent article in the *New Scientist* claimed that this selective use of science in the context of conservation is most prominent when large mammals are involved. I can identify with that. Our 25-years of dugong research initiated a battle between conservationists, fishers and government environmental management agencies in Queensland. Our research was misrepresented and sensationalized by protagonists on both sides of the debate. The "wise-use group" used the Internet to good effect, rapidly disseminating materials that had not gone through any sort of editorial or quality control process.

The status of the dugong in Queensland has been a hot issue for several years. By 1996, the Commonwealth government was under considerable public pressure over the issue. Subsequently, as reported in previous issues of *Sirenews*, the Commonwealth and Queensland governments decided to establish a series of "dugong protection areas" in which gill-netting by commercial fishers is limited or eliminated. This action was very controversial as it closed 38 fishing operations, with consequential job losses. In these circumstances, the people who lose their jobs are typically middle-aged, have little formal education and live in rural areas where unemployment is very high. No wonder that they get angry and upset.

The social impacts of the policy responses by governments to scientific findings such as ours mean that scientific controversies are no longer limited to footnote wars and other esoteric exchanges in professional journals. Scientific controversy now features in the electronic and print media and on the Internet. Scientists who provide the information that prompts controversial responses by governments should not be surprised when the public (through the media) takes an interest in their findings.

But mud sticks, and a damaged reputation is hard to repair. I believe that scientists need to be pro-active about minimizing the impact of such attacks on their integrity and competence. With the wisdom of hindsight, I recommend some actions that sirenian biologists can take to limit the impact of this exposure on their professional reputations.

It is important for you to be clear about your role, especially when an issue is controversial. I believe that the role of the scientist is to provide information collected using the scientific method, and to interpret that information so that it is accessible to decision-makers. Some scientists choose to extend this role to become advocates for a particular policy position. The line between information provider and advocate is a fine one. However, scientists who transgress this boundary should be aware of the attendant risks to their reputations as scientists, and of the increased probability that they will be excluded from advising those at the table where decisions are made. My advice is aimed at the scientist rather than the advocate.

Many government agencies require the reports they commission to be peer-reviewed to ensure quality control. The Great Barrier Reef Marine Park Authority is normally scrupulous about this practice and was one of the first agencies in Australia to introduce this requirement. However, in response to strident demands for information, the Authority released without peer review a report by Tony Preen and Nina Morissette outlining boundaries for the proposed dugong sanctuaries. The fishing industry repeatedly pilloried the authors of the report for this omission, even though the decision not to wait for peer review was made by the Authority. To protect your reputation, I suggest that you should insist, as a contractual obligation, that your material should not be released prior to peer review.

In an environmental controversy, pressure groups are likely to hire their own scientists to review an influential report or paper. If your work is likely to be controversial, you cannot afford to damage your credibility by mixing valid points with ambiguous evidence. Equivocal material not central to the argument should be omitted from a potentially controversial report as it may distract attention from the main evidence.

I made this mistake in our original report to the Great Barrier Reef Marine Park Authority documenting the decline of the dugong in the Great Barrier Reef region. This report was peer-reviewed before release and our conclusion that dugong numbers have declined in this region has not been disputed. But we introduced unnecessary complications into the debate by stating that the rate of decline along the more than 1300 kilometers of coastline between Cooktown and Hervey Bay entitled the dugong to be considered as "critically endangered" in this region. Some members of the conservation lobby took this finding out of context, claiming that the dugong was "critically endangered" at a global scale, which of course is incorrect. The resultant controversy confused the debate and deflected attention from the salient issue - the decline in dugong numbers in a huge proportion of the Great Barrier Region World Heritage Area. This decline represents a threat to the World Heritage values of the Area. This is because the importance of the Great Barrier Reef region to dugongs was explicitly used as part of the justification for its inscription on the World Heritage List in 1981.

Environmental managers increasingly ask scientists to extrapolate from their data to provide expert opinion. In doing this, data must be explicitly separated from opinion, and from your own values. It is surprisingly easy to prompt an extreme response unwittingly, by making statements insensitive to the protagonists in a debate. For example, one of the reports I mentioned earlier stated that the proposed "dugong protection areas" would close only one-third of the relevant coastline to gillnetting, leaving the other two-thirds open to this form of commercial fishing. Unfortunately, the proposed closure areas were those most valued by fishers as well as dugongs, making this statistic unnecessarily provocative. A useful strategy is to produce a draft report for review by independent readers from a range of backgrounds. One must assume that lobby groups will hire their own scientists to critique your research once it is released, and it is as well to check your arguments and the wording first.

I consider that the role of a scientist is to provide and interpret information, rather than to make decisions based on that information. Steve Hall, Professor of Marine Biology at Flinders University in South Australia, describes the role of an environmental scientist as being a cross between those of a chef and a waiter. When you go to a

restaurant you are presented with a menu – a list of costed options – and the waiter informs your choice.

If a scientist provides decision-makers with a menu of policy options, each with its associated costs and benefits, rather than a doctrinaire recommendation, the distinction between information-provider and decision-maker is reinforced. Many scientists are reluctant to suggest options because they believe they "know" the optimum response to their information. The menu approach is much more powerful. It enables the consequences of the "do-nothing" option so beloved of decision-makers to be presented. It is also a protection from extremists. A range of options is a much less defined target than a single recommendation, and more independent of a scientist's personal values.

It is particularly valuable if the scientists and the decision-makers contracting the research develop a cooperative media strategy at the start of a study. If research is likely to be controversial, the media strategy should include regular information on the progress of the research as well as the findings (after they have been peer-reviewed, of course). The right of scientists to publish and comment on their work in the media is other matter that can usefully be covered in a research contract.

Scientists negotiating terms and conditions for conducting reviews of conflicting scientific studies should also aim to retain the right to publish and make media comment on their reports, especially if they have had limited input into the terms of reference of the review. Russell Reichelt, Director of the Australian Institute of Marine Science, was criticized by conservationists when his review of the science associated with a controversial development was limited to local-scale impacts as required by the terms-of-reference for the review. The fact that he did not develop these terms of reference was irrelevant to his critics.

Many scientists are uncomfortable when dealing with the media. However, reputable media training courses are enlightening and helpful. We scientists can't hide away and pretend that the public will understand our work, or that others will successfully - and fairly - present our studies. It is time that we rose to the challenge of visibly accounting for our research in a manner accessible to the lay public.

Application of these suggestions should reduce the likelihood of public attacks on a potentially influential scientific report or paper. But remember, I found the cost of a letter from a defamation lawyer to the "wise-use group" an excellent investment. And some days, a career in a more esoteric discipline like taxonomy looks increasingly attractive. - **Helene Marsh**

SIRENIA IN THE MODERN MARKETPLACE

There is now conclusive proof that sirenians have won a permanent place in the American public consciousness: one of the newer colors in the palette of Crayola® crayons is a shade of bluish gray called (I'm not making this up) "manatee". By analogy with "teal", I suppose. Furthermore, Hallmark® greeting cards published a manatee Christmas card in 1998. Can other major product endorsements be far behind? Now, if only the manatees could collect royalties on the use of their name and image .... - **DPD**

FLORIDA POPULATION AWARENESS WEEK
17-23 October 1999
For information see: **<www.flsuspop.org>**
Also check out **<www.state.fl.us/edr/populati.htm>** and **<www.npg.org>**

LOCAL NEWS

AUSTRALIA

Raising dugong calves. - Although many orphaned manatee calves have been raised in captivity, success with rearing dugongs is much more limited. However, SeaWorld at Southport, Queensland, on the Gold Coast south of Brisbane, has succeeded in rearing a neonatal dugong calf for 18 weeks [see below]. During this period he has more than doubled his 19.7 kg arrival weight to 45 kg. He drinks milk formula and is experimenting with different foodstuffs including choy sum, an Asian vegetable. Staff at Underwater World in Singapore have been raising a slightly older calf since late August 1998. She has increased in weight from 60 to 90 kg during this time. She consumes 12 kg of seagrass and 400 ml of milk per day. - (Source: material supplied by **Wendy Blanchard** and newspaper reports)

On November 28, 1998, an emaciated dugong calf found ashore on the east coast of northern Queensland was transferred to Sea World on the Gold Coast for attempted hand-raising. First seen two days earlier, the calf had been returned to the sea by a member of the public. When notified of this action the following day, the Queensland Parks and Wildlife Service (QPWS) mounted a search for the animal, which was discovered ashore again 7 km from its original location. The calf was transported by road to Townsville, where it was held overnight before consignment by chartered light plane to Brisbane. QPWS and the Great Barrier Reef Marine Park Authority (GBRMPA) shared the costs of the charter flight.

The dugong calf was a newborn male 109 cm in length, and weighed 19.70 kg. Clues to his very recent birth included shreds of umbilical cord deep in his navel, very short bristles on his facial disc, absence of calluses on the tips of the palmar surfaces of his pectoral flippers, and unstained horny plates in upper and lower jaws.

Sea World has cared for two other neonatal dugongs briefly in the past - a 116 cm, 32.8 kg female (January 1996) and a 114 cm, 26.8 kg male (January 1997) - but unfortunately these survived for only 5 and 4 weeks, respectively. Invaluable advice on management of the current calf was generously given by Dr. Greg Bossart (University of Miami and Miami Seaquarium), Frederic Chua (Underwater World Singapore), and Takuya Mori (Nanki Karekinada Marine Biological Laboratory).

The dugong has been bottle-fed every two hours around the clock except at 4 AM, and also eats small quantities of seagrass and other solids, including lettuce and snow pea sprouts. Despite a shaky start beset by gastrointestinal problems, the calf is currently making steady progress. After the first 16 weeks the dugong's length had increased to 128

cm and its weight to 40.25 kg. On April 1, 1999 he weighed 44.45 kg. - **Wendy Blanchard** (Veterinarian, Sea World Enterprises, P.O. Box 190, Surfers Paradise, Queensland 4217 Australia; tel.: 61-7-5588-2222; fax: 61-7-5588-2266; e-mail: <**curator@seaworld.com.au**>)

COSTA RICA and NICARAGUA

Recent Conservation Activities. - My recently completed master's thesis on manatees in Costa Rica is summarized in the "Abstracts" section below. This work is part of a larger conservation project that is being carried out in Costa Rica and Nicaragua. Recently, I finished the Action Plan for the Conservation of the West Indian manatee in Costa Rica, funded by UNEP. Last August I also carried out surveys in southern Nicaragua to assess the conservation status of the species in that area, which harbors a binational population shared with northeastern Costa Rica. A short report came out of that survey.

In 1998 a comic book about manatees directed to Caribbean Central American children was also designed and published. Up to now there are 700 copies printed, which will cover all the schools in villages sited in manatee areas in Costa Rica, and probably half of Nicaragua. Chiquita Brands paid for it, and more editions should be printed as we get more money for it.

This is what has been done in Costa Rica last year. Now I'm in St. Petersburg, Florida, learning from U.S. researchers and managers. - **Ignacio Jiménez Pérez** (Regional Wildlife Management Program for Mesoamerica and the Caribbean, Universidad Nacional, Apdo. 1350-3000, Heredia, Costa Rica; phone: 506-2377039; fax: 506-2377036; e-mail: <**ijimenez@una.ac.cr**>)

FLORIDA

1999 Florida Legislature Considers Reorganization Of Manatee Protection Program. - In the fall of 1998, Florida voters overwhelmingly supported an amendment to the state's constitution that would establish a Fish and Wildlife Commission to oversee all rulemaking related to both fresh and saltwater living resources. This concept was intended to consolidate fisheries and wildlife management into one agency, rather than have this function split between several separate departments and commissions. It was also believed that constitutional authority would provide some degree of insulation from complex procedures and frequent policy shifts instituted by the Florida Legislature.

The Florida Legislature currently in session is considering several bills that will establish by statute the general functions and organizational structure of the new Fish and Wildlife Agency and provide its funding. The proposed statutes as of April 1999 would move most of the Division of Marine Resources from the Florida Department of Environmental Protection (FDEP) to the new agency. This would include all of the Florida Marine Research Institute and the Bureau of Protected Species Management, which include staff and programs responsible for manatee protection management, planning, rulemaking, and scientific research. This comes only weeks after newly elected Governor Jeb Bush appointed David Struhs as the new Secretary of

FDEP. Struhs replaces Virginia Wetherell, who left the post last fall.

The reorganization may provide an opportunity to enhance the State's manatee and other wildlife protection efforts. However, language in some proposed legislation is of concern to manatee advocates and policy advisors. Amendments in the House version of the bill may constrain the new Fish and Wildlife Agency's ability to review and comment on FDEP permits and submerged land leases that could impact saltwater endangered and threatened species by limiting time frame and placing other conditions on interagency coordination. In particular, such constraints could complicate or interfere with manatee protection comments on projects such as marina construction, dredging, or other coastal development, which will still be regulated by FDEP. Since these types of permitting and state land leasing activities are critical to the conservation of essential manatee habitat (as well as that of other listed species), efficient communication and coordination between and within State resource agencies must be maintained, regardless of the organizational structure of the agencies. Some versions of the bills circulated earlier in the legislative session would have even fragmented manatee protection programs, dividing them between two separate agencies, a disruptive move which clearly could undermine effectiveness and continuity of the State's efforts.

In related legislative action, the Florida House and/or Senate budgets included several line item appropriations from the Save the Manatee Trust Fund to special interest projects. Of most concern is a House reduction in the Bureau of Protected Species Management budget of almost 25%, which would be turned over to local governments for their own manatee protection activities. Such a funding cut would devastate the Bureau's ability to continue its comprehensive manatee protection planning activities throughout the state. Since local governments may already use State funds derived from boat registration fees for manatee plan development, this proposed budget cut appears to be punitive toward the State agency. Additionally, the various budget bills contain more than **a half million dollars** for additional special interest projects in selected districts. More line item appropriations could be added. The only opportunity to reconsider these appropriations will be in the upcoming Conference Committee, where the House and Senate versions of the budget will be reconciled. The Governor may also veto line items in the final budget adopted by the Legislature.

The Manatee Technical Advisory Council (MTAC), a nine-member panel established by FDEP to provide policy guidance on science, legislative, and resource management issues related to protection of manatees and their habitat, has expressed growing concern in recent years over legislative appropriations from the Save the Manatee Trust Fund to special interests. Each year, there seem to be more special projects with larger dollar amounts. While some of these line item appropriations may be related to manatees, the diversion of funding away from priorities identified by State resource managers threatens the integrity of the Trust Fund and state research and management activities. Numerous enforcement, planning, education and research tasks identified by MTAC and others go unfunded, and there are dwindling or no reserves to address catastrophic mortality events, such as red

tide or cold stress, which could occur again in the future. Furthermore, research and education projects funded by legislative mandate are not subject to competitive peer review or bids, raising issues of equity and cost-effectiveness. In a recent program review, MTAC identified enhanced law enforcement, manatee protection planning and coordination with permitting programs as continuing priorities for the State's efforts, since the majority of rulemaking for vessel speed limits has been completed or is in its final stages. MTAC has urged agency heads and key legislators to address these issues as the reorganization proceeds. The future of MTAC itself is not entirely clear since FDEP's manatee protection functions will be largely transferred to the new Fish and Wildlife Agency later this year. - **Susan Markley** (Chair, MTAC)

Another Captive-Released Manatee Rescued At Sea. - In July 1998, a manatee named Mo that had been radio tagged and released from captivity spent several weeks drifting far offshore of Florida in the Gulf of Mexico (USGS/ BRD News Release, 18 Aug. 1998; **<http://www.nbs.gov/pr/newsrelease/ 1998/8-18.html>**). When he was rescued in deep water off the Dry Tortugas, Florida, many thought that such a fortunate rescue could not happen again. However, on 29 March 1999, another captive-released manatee, Xoshi, became lost at sea and was rescued from the Gulf Stream, 36 miles east of Cape Canaveral.

Like Mo, Xoshi's saga began when she was rescued as a very young orphan. After adapting to captivity at Miami Seaquarium for over 4 years, Xoshi was radio-tagged by the U.S. Geological Survey's Sirenia Project (USGS) and released in Biscayne Bay on 4 March 1999. The U.S. Fish and Wildlife Service's Endangered Species Office (USFWS) in Jacksonville, Florida, the agency responsible for managing captive manatees, has directed the release of over 70 rescued or captive-born manatees since 1992. Researchers with the USGS's Sirenia Project and the Florida Department of Environmental Protection's Florida Marine Research Institute (FDEP) have used radio-tracking technologies to determine the success of these individuals in adapting to life in the wild. Radio transmitters, monitored by the satellite-based Service Argos Inc., provide locations remotely and also enable researchers to locate and observe the manatees.

Initially, Xoshi used the shallow, near-shore waters of Biscayne Bay south of Miami near where she was released, an area of abundant seagrass and access to fresh water that is frequented by wild manatees. Brian, a manatee released from captivity with Xoshi, continued to use this general area. Xoshi, however, became very active in the week following her release, eventually swimming six miles across the bay to Elliot Key. Although away from fresh water, Xoshi was in good health and behaving normally when observed by radio-trackers Kit Curtin with the Save the Manatee Club (SMC) and Skip Snow with Everglades National Park.

She began to move again on 23 March, giving researchers hope she would find suitable habitat. Concern for a need to rescue her mounted as she moved north towards Key Biscayne by 26 March. The next Argos locations, received on 28 March, plotted 15 to 25 miles offshore of Stuart and Vero Beach, Florida. Apparently Xoshi had left the shallow waters of Biscayne Bay and was

drifting north in the swift current of the Gulf Stream. Jim Reid, a USGS biologist with the Sirenia Project, immediately initiated the arrangements necessary for attempting a rescue at sea.

Good fortune and cooperation from numerous agencies was needed for this difficult rescue. Ann Spellman, FDEP rescue coordinator for the central East Coast Florida region, arranged for assistance from SeaWorld Orlando, the Florida Marine Patrol (FMP), and the U.S. Coast Guard.

Fortunately, seas on the morning of 29 March were flat calm as rescuers left Port Canaveral in a well-equipped 25-foot patrol boat. SMC manatee researcher Sharon Tyson remained at Port Canaveral to coordinate the SeaWorld capture crew and arrange for a vessel to transport the manatee.

Xoshi was drifting north in the Gulf Stream current at a rate of over 100 miles per day, or just over 4 miles per hour. Her early morning location on 29 March was 35 miles offshore of Satellite Beach, Brevard County. The USGS Sirenia Project headquarters in Gainesville plotted Xoshi's satellite-determined locations in a computer-based mapping program and predicted her likely position for late Monday morning. The rescue crew navigated 36 miles due east by Global Positioning System to this position. There, radio signals from Xoshi's transmitter directed them 10 miles further north, where they found her alone in waters 250 feet deep. Unharmed and curious, she stayed with the boat and permitted swimmers to approach her. She was eventually restrained and secured in a stretcher to the side of the FMP boat for the slow trip back to shore. Xoshi remained calm for two hours while she was transported 12 miles back towards shore and out of the Gulf Stream.

The Coast Guard and Marine Patrol were unable to provide a second rescue vessel, but many individuals at Port Canaveral pitched in to help obtain a vessel and to assist with communications. A marina helped locate a 32-foot charter fishing boat suitable for the mission.

At sunset, and still about 26 miles offshore, the FMP boat was met by SeaWorld's Animal Care staff aboard the charter boat. Attempts to load the 1165 lb. manatee by hand into the charter boat were unsuccessful. Xoshi was then transferred to a larger stretcher and secured to the charter boat's side. However, she could not be safely transported over four miles per hour. At the request of the FMP, the U.S. Coast Guard authorized the assistance of the 110-foot cutter "Key Largo". At about 10 PM, the cutter met the rescue team and used its hoist to lift Xoshi onto the deck of the charter boat. With Xoshi on board and the continued calm weather, the trip to shore was quick, and both rescue boats arrived in Port Canaveral just before midnight. The marina staff provided after-hours support and used their forklift to load Xoshi into the SeaWorld rescue van. By 2 AM, she was safe in a pool at SeaWorld, interacting with other manatees. Although somewhat dehydrated, Xoshi was eating lettuce within two days and is expected to make a full recovery.

In one more day the weather would have deteriorated and Xoshi would have been too far offshore to save; but luck, and professional cooperation among agencies, made her rescue possible. - **Jim Reid** (USGS Sirenia Project), **Ann Spellman** (FDEP), and **Sharon Tyson** (SMC)

JAPAN

Dugongs in Okinawa. - Japanese dugongs have been studied off Okinawa Island, Ryukyu Islands. Only about 10% of the coastline retains seagrass beds, but the historical changes are unknown (Environment Agency, 1996). The majority of the seagrass beds occur in the central and northern parts of the east coast of Okinawa at depths of 0.4-6.4m. Feeding trails are found in seagrass beds close to dugong sightings, and no depth preference in feeding has been identified. All seven seagrass species confirmed to exist in this depth range are grazed by dugongs.

Since 1965, six dugongs have been taken incidentally in trap nets, two in bottom gill nets and one in a fish driving operation; and an additional four carcasses were stranded along the coast of the Ryukyu Islands. Some of the strandings could represent mortality in fishing gear. Two of the animals taken in trap nets were released alive and one was moved to Okinawa Aquarium (Uchida, 1998).

Ten dugongs were encountered (all singletons) during 18 hours of flight over an area of 500 square kilometers selected for systematic aerial survey in April 1998. They were at water depths of 4-85m, and outside of the coral reef along the central and northern parts of the east coast of Okinawa Island. About 50 additional incidental sightings, including a school of three, were collected in the same area, in every month from January to November 1998. Estimation of abundance is not available.

Two incidental records are available from the northwestern coast of Okinawa Island, but the species is not confirmed by the aerial survey, possibly due to small sighting effort.

Seagrass beds of significant size exist off Miyako, Ishigaki and Iriomote Islands (southern part of Ryukyu Islands), where no surveys have been conducted and only one incidental mortality has been reported (Miyako Is. in 1965).

Dugongs are listed as a natural monument, and intended killing is prohibited by the government. A paper plan of the Japanese government discuses construction of a U.S. air base in the middle of dugong habitat off the east coast of Okinawa Island. The construction will either block diurnal migration of dugongs between daytime refuges outside the reef and nighttime inshore feeding areas, or totally destroy the habitat, at least in the vicinity. The "Okinawa Dugong Network" collects incidental sighting records and conducts a public awareness program.

S. Uchida (Okinawa Aquarium) examined carcasses from incidental mortalities. A team led by T. Kasuya (Mie University) aerially surveyed the Okinawa coast and studied seagrass beds near dugong habitat in 1998. He plans similar surveys, but on a reduced scale, in the southern Ryukyu Islands (Miyako, Ishigaki and Iriomote) in 1999.

Recommendations:

Management: 1) Security in the daytime refuges, nighttime feeding areas and passages connecting them must be insured for the survival of Ryukyuan dugongs.

2) Past incidental mortalities (0.4 dugongs/year) may be critical for the small local population. Gillnet operation near the habitat should be banned, and gear modification or closure of operation should be considered for trap nets that have recorded entrapments of dugongs.

3) Although entanglement of dugongs has not been reported, nets for seaweed culture are often set over seagrass beds and are likely to destroy dugong habitat. Seagrass beds should be kept free from such nets.

4) Public awareness programs and collection of incidental sightings should be continued.

Research: 1) Aerial surveys should be expanded to the entire range of possible dugong habitats in the Ryukyu Islands.

2) In some focal areas, aerial surveys should be repeated several times a year for better understanding of abundance and habitat use of dugongs.

3) Individual identification using photographs should be attempted. Capture of wild animals for experimental purposes should be done with caution because of some risk of mortality and expected small population size.

4) Use of carcasses in private scientific collections or museums should be encouraged for genetic and food habit studies.

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- **Toshio Kasuya**

MALAYSIA

News from Sabah, Malaysia. - The dugong population has not been formally censused in the Sabah area. Dugongs are still sighted by fishermen, who believe them to be decreasing in abundance. Although dugongs are totally protected by law, sometimes they are accidentally captured in fishing nets or killed by illegal fishing using explosives. Meat is illegally sold in the market. - **Edward Tangon** (Sabah Wildlife Department, Kota Kinabalu)

Dugongs Hit the News in Peninsular Malaysia. - Dugongs used to be common in the Johor Straits, but numbers have been reduced since the 1980s and they were considered locally extinct by some Malaysians. However, they have featured in the news in peninsula Malaysia since late January, when a dugong calf was caught in a fishing net in Johor. The calf was maintained in a kepong or fish trap for nearly six weeks, and became a star attraction during this period. Its carcass was recovered within 48 hours of its being released, causing further controversy. Since then another four dugong carcasses have been recovered in the area, two of them from an abandoned kepong. No food was reportedly found in the stomachs of these animals at necropsy. Two more dugongs were captured by a fisherman and released. At least three live dugongs have been seen off Tanjung Pengeleigh during dedicated aerial surveys, and authorities are talking of gazetting a marine park to provide protection. Meanwhile, fishers have been asked to demolish disused kepongs and to monitor active kepongs regularly. I have been invited to go to Malaysia in May to help design a research program. - (Compiled by **Helene Marsh** from reports in Malaysian newspapers)

PHILIPPINES

First National Dugong Seminar-Workshop Held in the Philippines. - WWF-Philippines, with the Protected

Areas and Wildlife Bureau and University of the Philippines, organized a national seminar-workshop on dugong conservation in the Philippines from November 6 to 8, 1998. The goal of the workshop was to review the status of dugongs in the Philippines and to develop an action plan to help conserve the dugong in the country for the next 5 years.

There was a good turn-out of participants. The workshop was led by Dr. Helene Marsh of James Cook University (Australia), Director Wilfrido Pollisco of the Protected Areas and Wildlife Bureau, Director Arsenio Camacho of the Bureau of Fisheries and Aquatic Resources, and Vice President Romeo Trono of WWF-Philippines. Around 55 participants representing academe, research institutes, government and non-government agencies involved in dugong work in the Philippines attended. Representatives from Japan, Malaysia, Indonesia, and the USA were also present.

Presentations on the biology, conservation, distribution, status, ecological role, rescue, rehabilitation, and captivity of dugongs were given by invited speakers. The status of and threats to seagrass, policies on wildlife management and conservation affecting the dugong, and information and education campaign programs focusing on dugongs were also presented.

Five major objectives were identified during the workshop to attain a vision of "an ecologically viable and stable population of dugongs throughout the Philippines for the benefit of present and future generations." These objectives are:

1) To fill in information gaps on the dugong and its habitats;

2) To reduce habitat destruction and human-induced mortality of dugongs to the lowest possible level;

3) To increase the level of awareness and appreciation for dugong conservation;

4) To develop and increase the capacity of the government, academe, people's organizations, non-governmental organizations, and local governments in implementing dugong conservation programs; and

5) To generate resources to support dugong conservation in the Philippines.

Actions to be taken for a five-year strategic plan cover research; protection; law enforcement and monitoring; information, education and communication programs; linkages and networking; sustainable development; training and capacity building; and fund sourcing. Immediate concerns include the establishment of protected areas in critical areas, studies on the socioeconomic impediments to conservation, employment of community-based resource management, and the conduct of a symposium-workshop for the Asian region.

The seminar-workshop was held at the Century Inslar Hotel in Davao City, Mindanao. Davao has been recently identified as one of the important habitats for dugongs in the Philippines verified through reports and interview and aerial surveys. Dugongs occur in low numbers in the island-province of Palawan, the eastern coast of Luzon (from Isabela to Quezon), the southern Mindanao coast, the Sulu archipelago, and a few islands in the central Visayas. They are still threatened with extinction in the Philippines due to incidental takes and unmanaged coastal development. It is hoped that the goal to conserve dugongs and their habitats

throughout the Philippines will be realized with the implementation of activities identified at the workshop. - **A. A. Yaptinchay** (Project Manager, WWF-Philippines) (For more information, contact: Dugong Research and Conservation Project, WWF-Philippines, 23 Maalinog St., UP Village, Diliman, Quezon City, 1101 Philippines; tel.: +63-2-433-3220 to 22; fax: +63-2-426-3927; e-mail: <**kkp@mozcom.com**>; Internet: <**http://www.wwf-phil.com.ph**>)

ABSTRACTS

The following three abstracts are of sections of a M.Sc thesis in Wildlife Management and Conservation, submitted in 1998 to the Regional Wildlife Management Program for Mesoamerica and the Caribbean, Universidad Nacional, Costa Rica, and entitled "Ecology and Conservation of the West Indian manatee in Northeastern Costa Rica".

Conservation status, ecology and popular knowledge of the West Indian manatee in Northeastern Costa Rica (**Ignacio Jiménez Pérez**). - The West Indian manatee is considered endangered in Costa Rica, and its conservation status is little known because previous studies were based on short-term surveys or inappropriate methods. This study was carried out in northeastern Costa Rica. where the largest population in the country is found. The objectives were: 1) to determine present and historical distribution of the largest population of manatees in Costa Rica, 2) to identify high-use areas for manatees, 3) to compile local knowledge about manatees, and 4) to identify and assess the impact of possible threats to the manatee population. To do so I carried out interviews, stalks after manatees and feeding sign surveys. The species is more common than previously reported, with an almost continuous distribution within the study area that coincides with reports from the mid-century. Local manatees feed as generalists and they are most active at dawn, twilight and night and when the tide is rising. Hunting of the species has decreased during the last years, though there is still some, while the illegal use of gillnets is rising. Though boat traffic has seen a spectacular rise in the last ten years, it doesn't seem to be one of the main causes of mortality. Deforestation, use of pesticides, alteration of river basins and mining activities occur upstream from the wetlands used by manatees and could be threatening their survival. Although the conservation status of manatees in northeastern Costa Rica is better than previously assessed, it is in a delicate balance and measures should be taken to secure their long-term survival.

Habitat variables that explain the use of watercourses by the West Indian manatee in Northeastern Costa Rica and Southern Nicaragua (**Ignacio Jiménez Pérez**). - **1.** The relationship between habitat variables and the use of watercourses by the West Indian manatee (*Trichechus manatus*) was studied through general lineal models in 87 watercourses in northeastern Costa Rica and southern Nicaragua.

2. Presence of manatees in watercourses was assessed through direct and reported sightings of individuals and signs of feeding on aquatic vegetation.

3. Water temperature, visibility, and depth; floating vegetation and forest cover are inversely correlated to current velocity in the study area.

4. Watercourses used by manatees have abundant aquatic vegetation; warm, deep and slow waters; high forest cover, and are wider than those where the species is absent. Though habitat variables that explain habitat use of manatees differ for the two sectors of the study area, manatees use lagoons more than any other watercourse in both areas.

5. This study highlights the possible impact of deforestation on manatee conservation in watercourses surrounded by rainforest, and offers a tool that helps classify potential manatee habitat in these ecosystems.

Development of a population viability analysis to highlight research and management priorities for the West Indian manatee in Northeastern Costa Rica (**Ignacio Jiménez Pérez**). - Northeastern Costa Rica harbors the main population of the West Indian manatee in the country, and the species is endangered in the area. I developed a population viability analysis (PVA) for the West Indian manatee in northeastern Costa Rica using the software VORTEX to: 1) identify management and research priorities in the area, 2) assess the temporal margin left to local managers to conserve the species, and 3) identify sources and sinks in the local metapopulation. The PVA detected hunting and migration rates and the carrying capacity of the southern subpopulations as the factors most relevant to population survival. It also showed that survival of manatees in Costa Rica depends on conservation activities carried out in southern Nicaragua. Southern subpopulations in the study area act as sources, while the northernmost subpopulation behaves as a sink for the whole metapopulation. Research activities to conserve manatees should focus on the animals' movements and on gaining a more precise estimate of hunting rates on both sides of the border. Management activities highlighted by the PVA as most needed are: 1) enforcement of laws against poaching and illegal gillnetting in local watercourses, 2) habitat conservation focused in the southern area, and 3) development of binational conservation activities between Nicaragua and Costa Rica. Measures to conserve the species should be taken before it falls into a critical situation, which could be much more difficult to reverse.

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

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

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

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

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

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

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

Sirenews (texts of current and recent issues): **<http://pegasus.cc.ucf.edu/~smm/>**

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

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

Steller's sea cow: **<http://www.online.de/home/Rothauscher/steller.htm>**; also the website [in Finnish] of Dr. Ari Lampinen, University of Jyvaskyla, Finland: **<http://www.jyu.fi/~ala/ilmasto/steller.htm>**

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