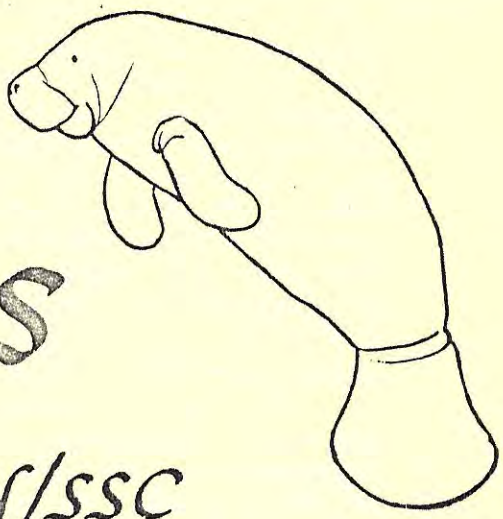

# Sirenews

## Newsletter of the IUCN/SSC Sirenia Specialist Group

NUMBER 2 OCTOBER 1984

### EDITORIAL: TO BREED OR NOT TO BREED?

Most readers of this newsletter are aware that several aquaria (at Miami, Amsterdam, Nürnberg, and Beijing) have in recent years successfully bred West Indian manatees in captivity. The Miami Seaquarium has even been able to release two captive-bred animals to a semi-wild environment (see news item in this issue). However, another byproduct of this success which has received much publicity over the last few months is a proposal to place 50 or more wild manatees in captivity for breeding purposes, with the eventual aim of restocking to offset mortality in the wild (see below, abstract by Cardeilhac et al. and cited articles by DiPerna and White).

All biologists applaud these breeding successes, and hope that such efforts will continue. And if there develops a surplus of captive-bred animals not needed for research or display, it is certainly desirable for them to be released into the wild. The suggestion at which biologists balk, however, is that large numbers of manatees should be removed from already-depleted wild populations for the purpose of captive breeding.

A variety of objections to such a project have been raised: the danger of death or injury to animals during capture and transport, the possibility of accidents during captivity (two fatal accidents have already befallen the Miami Seaquarium's captive-bred manatees), the potential dangers of inbreeding, the

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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

Sirenews is edited by Daryl P. Domning, Dept. of Anatomy, Howard University, Washington, D.C. 20059 USA. It is supported by the Species Survival Commission of IUCN, the U.S. Fish and Wildlife Service, and the U.S. Marine Mammal Commission.

question of captive-bred animals' ability to adapt to the wild, and the sheer cost of large-scale, labor-intensive captive maintenance. Still worse is the danger that some people, especially government officials with management responsibilities, may come to view wild manatees as expendable if they think they can be "replaced" easily from captive stock. Yet to my mind there are even more fundamental flaws in the idea. I would ask: what problem is such a program designed to solve, and what is the philosophical basis (and hence the wider implications) of the proposed solution? Only after answering these questions can we intelligently judge the likelihood of success.

To put breeding animals in "protective custody" might be a logical response to conditions which make breeding difficult or impossible in the wild. But Florida manatees are breeding perfectly well in the wild; faster, probably, than in captivity. Aerial and ground surveys report healthy numbers of calves. Florida manatees are threatened not by an insufficient birth rate but by excessive mortality. The proper response, therefore, would seem to be concentration of effort on reducing mortality, while allowing the population to reproduce naturally. Moreover, there is good evidence that natural winter mortality hits hardest the weaned but immature animals, which apparently lack the experience to find warm-water refugia in a timely manner. Captive-reared manatees might be expected to fare even worse, both at this task and at that of avoiding motorboats. If the environment is so dangerous for adults that protective custody is called for, will it not be equally dangerous for their newly released offspring? I conclude that captive breeding to restock wild manatee populations is a solution in search of a problem.

More bothersome still, in my opinion, is the philosophy that invariably the best remedy for ill effects of human activity is more human activity. When a species has become endangered through man's meddling with its environment, it is safer and wiser to back off as far as possible toward the natural situation, rather than move toward a still more artificial one. We know that the species can survive in its original environment; it has done so for millions of years. But experience should have taught us that the conditions we ourselves create are rarely stable, never provide all the benefits advertised, and always have unpredicted and unwelcome side effects. No well-informed species would choose to depend on man's care, however conscientious and well-intentioned. If we are honest we must admit that we lack the wit to guarantee even our own survival, let alone that of other species.

Heroic attempts at captive propagation have been resorted to with critically endangered species like whooping cranes and golden lion marmosets, but it is too soon to tell whether these efforts will succeed. Far better that manatees are never allowed to decline to the point where such massive intervention is needed. Responsible stewardship of nature must be based on the principle of nature's right to autonomy: we are obligated to set aside enough space and resources for wild populations to survive on their own, without coming to us for handouts of food or shelter. Aesthetics aside, we humans are neither wise enough nor trustworthy enough to meet their needs for centuries or millenia

to come. Let us, in this area at least, put aside our technologist mentality and stop tinkering. Let us respect nature's ability to get along without us, and in so doing let us learn a little humility. - DPD

## LETTER

To Sirenews:

Having been among the earliest modern workers on the Sirenia, we are specially glad to see the birth of Sirenews and congratulate its editor, Daryl Domning. When we started study on the Manatees in Guyana in 1962 and the Dugongs in Queensland in 1965, there was almost no knowledge about Sirenia (except of their anatomy), nor workers on them and little known even of local distribution let alone world distribution, growth or breeding rates. The need for conservation measures everywhere for them was little in the minds of scientists and not at all on the conscience of the informed public.

Progress has, by the diligence particularly of workers in Florida, Manaus and Queensland, been greatly encouraging. Yet sadly it should be recognized that during this little more than a score of years, probably the total of individual Seacows alive in the world has diminished. Concurrently quite certainly the total of our own species, their ultimate predators, has increased by 1000 million. That is the true measure of the need for conservation effort world over.

As we ourselves retire through age from direct effort on behalf of the Sirenia, we wish our friends and fellow workers full vigour and success.

Colin Bertram
Kate Ricardo Bertram

[EDITOR'S COMMENT: Newcomers to sirenian research and conservation may not realize how recent a phenomenon is the worldwide interest and activity reflected in this newsletter. Scarcely fifteen years have passed since Colin and Kate Bertram were virtually the only people on earth speaking out urgently and consistently for the study and protection of sirenians. The fact that so many hands have turned to this work in the ensuing years is a tribute to the effectiveness of their pleas. Their voices in the wilderness prepared the way for the present flowering of sirenian biology, and they are the spiritual parents of all of us who work in this field. We owe them our gratitude, and wish them long life and happiness in their retirement.]

## THE SIRENIA SPECIALIST GROUP AND ITS FUNCTION

The Sirenia Specialist Group should serve as a primary source of the scientific and technical information required for the conservation of the Sirenia, as well as recommending and promoting measures for their conservation.

Within this context, we must gather, review systematically, and assist in the dissemination of information on the status of each sirenian species, and identify which are endangered or vulnerable or are likely to become so.

We must ensure the accuracy of the species accounts in the Red Data Book.

As necessary, we must identify the causes of actual or potential threats to the survival of the species and devise ways to obtain information needed.

We must prepare, or advise on the desirability and practicality of, specific proposals for management that would reduce or eliminate threats to species survival.

We must identify regions and ecosystems where there are significant numbers of endangered species.

We must advise on controversial issues regarding the management of species.

We must identify situations where international cooperation is needed in the conservation of sirenians and other non-domesticated fauna, and recommend the form of cooperation that should be undertaken.

We must participate in the development of the World Conservation Strategy, the programme of IUCN, and, as necessary, in the development and screening of projects, and maintain a roster of experts from which individuals or groups can be selected to assist in those and other specific tasks.

We must facilitate communication within the professional community concerned with the role of the Species Survival Commission. - Robin Best

DEATH REPORTED

Dr. Masaharu NISHIWAKI

14 April 1984, in Tokyo, of a heart attack

at the age of 69.

## LOCAL NEWS

### AUSTRALIA

Mass Stranding of Dugongs. - On 23 March 1984, Cyclone Kathy crossed the coast of the Gulf of Carpentaria in northern Australia, severely damaging the isolated township of Borroloola, wrecking several trawlers and killing one fisherman. The accompanying storm surge swept across the vast complex of saline coastal flats and mangrove-lined channels that compose the McArthur River delta. The retreating water stranded hundreds of large sea turtles, numerous large fish and rays and at least 27 dugongs.

The stranded animals were not observed until five days after

the cyclone. When officers of the Conservation Commission of the Northern Territory established that most of the dugongs and sea turtles were still alive, the Commission decided to mount a three-day rescue operation. Many Borroloola residents postponed their own post-cyclone cleanup to help. The Australian National Parks and WIldlife Service funded the travel expenses of dugong and turtle biologists so that they could offer specialist advice and collect data from the stranded animals.

In the area affected by the storm surge, enormous tracts of mangrove trees were bereft of leaves. The mudflats were very wet, making walking extremely difficult, but were criss-crossed with the tracks of hundreds of turtles going nowhere, and studded with the carcasses of dead fish and huge rays.

Most dugongs were in wallows about 3 m in diameter, containing water up to about 30 cm deep. Only the backs of these animals were protruding. Even this region was kept moist as the dugongs spun around their longitudinal axes occasionally. This is the same behavior which renders dugongs particularly susceptible to drowning in nets. We first thought that this wallow-making behavior was amazingly adaptive, but it soon became obvious that the wallows were the inevitable result of the animals' thrashing around in the mud. Some dugongs had moved up to about 20 m across the mudflats. Such movement seemed to be by rolling. We saw no evidence of dugong flipper marks.

The only practicable means of reaching the animals was by helicopter. The dugongs were very distressed by the engine noise and reacted by frantically pounding their tails.

We located seven dugongs on the first day of the rescue, one week after the cyclone. Five were in wallows; the other two were in drier areas but covered in mud. We were amazed at how good their condition was. There was little evidence of superficial skin damage apart from some slight cracking, but the undersides, especially of the larger animals, were extensively bruised. Large "dugong tears" dribbled from the eyes of animals once they were out of the water. Not surprisingly, some of the dugongs had apparently lost weight; the outlines of the spinal processes of two males were visible and the large females seemed to have lost condition around the belly area.

Most of the dugongs thrashed about vigorously on approach and were quite difficult to handle. At the suggestion of a local fisherman, we tied a rope around each dugong's tailstock prior to hauling it onto the helicopter cargo net, which we lined with a tarpaulin in an attempt to prevent rope burns. Getting the dugongs into the net was not easy, especially in the case of large animals, and I ended up with a spectacular black eye caused by a blow from the tail-fluke of one large female. Once cocooned in the cargo net, each animal was lifted off with the helicopter, carried to a nearby watercourse, lowered and released.

The first three dugongs were small (2 m long or less), and stranded relatively close together. The operation to rescue and release them took only 40 minutes. We then rescued a large (2.8 m) female and another young female. All swam off strongly and we began to feel quite blasé.

The fourth animal was an adult male. He was very strong and vigorous, and we were very wary of his tusks as he fought to stay

out of the cargo net. We finally managed to restrain him and he was lifted to the bank of a nearby creek. We were shocked to learn that he was dead on arrival.

A large female with long nipples and bulging vulval region was next. She became quite frantic when approached, spinning around and around, and whipping her tail. She quietened down in the net after wriggling into a head-down position so that her nostrils were covered for much of the five-minute journey. She too was dead on arrival.

We necropsied both animals soon afterwards, racing against the dusk. The male was fairly old, but not in breeding condition. The female was very fat, pregnant with a 30 cm foetus, and lactating: the first pregnant, lactating dugong I have seen. Neither animal showed any evidence of injury or disease. In both cases, the alimentary canal, including the stomach, was packed with seagrasses. Apparently the digestive system had shut down after the stranding. We collected a range of specimens for laboratory analysis.

The only other dugong necropsied was another lactating female which we found dead eight days after the cyclone. She had been dead for about two days. Again, there was no evidence of injury or disease and the alimentary canal was packed with seagrasses.

By day two of the rescue operation, we had evolved quite an efficient rescue technique. Once a dugong was located, the "capture team" of four or five people was landed by the Jetranger helicopter as close to the animal as possible. The "release team" of three was then landed adjacent to the nearest suitable watercourse. The "capture team" measured and sexed the animal, and manhandled it onto the cargo net. We would then go and wait away from the dugong for the helicopter to reappear. There seemed to be a lot of waiting, and we found that the dugong would lie much more quietly if we kept our distance. When the helicopter returned, one of the team would hook the net up as the helicopter hovered overhead, while I directed the pilot using hastily-learned standard signals. We would then watch nervously as the dugong was raised by the helicopter. Although the 2.8 m-square cargo net was fine for juveniles, it was barely adequate for the adults which ranged up to 2.9 m in length with an estimated weight of nearly 400 kg. Two animals wriggled so much that they nearly dropped out of the net. In one instance, I was so horrified at the prospect of a dugong falling from 50 feet that I put my hand over my mouth, much to the consternation of the helicopter pilot who couldn't understand this new hand signal.

Amazingly, we had no more deaths. The "release team" found it best for the dugongs to be lowered directly into the water by the helicopter. On one occasion, they had to scare a crocodile away before the dugong was lowered. Most dugongs swam off strongly. One large female seemed disoriented and lay quietly for a few minutes before swimming away. The two smallest animals, calves just a few months old, swam around aimlessly as if looking for their mothers. Their survival prospects seemed very slim.

We sighted a total of 27 stranded dugongs. Only two of these were already dead. Twenty-three of the remainder were successfully released over three days. By the end of the third

day the general condition of the dugongs had markedly deteriorated. Their skin was cracking and peeling. Some animals were almost moribund in the wallows, which were rapidly drying up. I measured the water temperature in one wallow; it was 35 Centigrade at 11 A.M. Even if we had had the funds for another day's helicopter time, I doubt that we would have found many more dugongs alive. The total number of dugongs stranded by the surge is unknown as we were unable to search the whole area. We found dugongs scattered over about 200 square km and up to 8 km from the sea. One large female was behind a clump of mangroves about 3 m high.

Of the 25 stranded dugongs sexed, 12 were male. All but two of these were juveniles, including one animal only a few months old. I find it amazing that such a young dugong could survive for more than a week without food. It is also interesting that the only three dugongs that we heard calling were all young calves who made soft bird-like chirping noises. Six of the stranded females were also juveniles. Of the seven adult females examined, three were probably both pregnant and lactating, while another three were probably lactating. Thus it seems that a high proportion of the animals stranded were mothers and calves.

One of the most rewarding aspects of the whole exercise was that it provided the opportunity for people from very diverse backgrounds to work together. Fishermen, native hunters, other Borroloola residents, wildlife rangers and scientists, all learned a great deal about each others' points of view. We also gained valuable information about dugongs and sea turtles. -- Helene Marsh

BRAZIL

The First South American Workshop on Marine and Freshwater Mammals, held in Buenos Aires in June and organized by Lic. Hugo P. Castello, was well attended by aquatic mammal biologists from Argentina, Brazil, Chile, Peru, and Uruguay as well as from non-South American countries. In terms of manatees, the contribution was completely Brazilian, and a total of four papers was presented: on aging techniques using X-ray analysis of the flipper, radio-tracking techniques, the physiological ecology of the Amazonian manatee, and a survey of the population status of and current research on manatees in Latin America. On the last day of the meeting a round-table discussion was held to decide research and conservation priorities for both manatees and otters in South America. It is hoped that a proceedings volume will result from this first meeting and that it will become a biennial event.

As for [the manatee project in] Manaus, we're bigger than we were in the old days but the financial problems and instability are taking their toll.... We have 20 manatees at present and no funding whatsoever to do research. Our [support] for the Curuá-Una [weed control and radio-tracking] project has run out and there are no prospects of restarting it again. We have applications with the Brazilian government for major financing of the manatee project which is starting to seem a bit more positive, but nothing is guaranteed; also with WWF and OAS -

again the same picture. We are also waiting for some action from the FAO/UNEP Global Plan of Action for Marine Mammals, but to date nothing concrete has happened. It is quite disappointing to be sitting on such potential [for] research and not be able to use it.

Ironically, we are doing more dolphin than manatee work, as we frequently receive accidentally-killed animals, and also behavioural observations can be made within a few minutes' canoe trip from Manaus. In between bouts of writing new proposals or defending old ones, we are trying to get the osteological collection completely documented and organized and to finish as many of the unfinished projects in hand [as possible] so that if we are forced to abandon ship we will not lose everything! ... Essentially our status is endangered whereas the manatee is vulnerable! - Robin Best

[EDITOR'S COMMENT: Those responsible for funding and implementing the FAO/UNEP Global Plan please take note of the above. The 73-page compendium of Research Proposals for Sirenians, drawn up by sirenian specialists a year ago under UNEP auspices, emphasized (on pp. 7-8) the vital importance of maintaining the three existing centers of sirenian research. If the Manaus project is allowed to fold, we will lose one-third of the world's present sirenian research capacity, as well as a facility with unique research capabilities and opportunities - and, incidentally, the only one located in a Third World country. This is not the sort of signal that conservation workers in the Third World need to receive from international agencies. The time to do something about it is NOW.]

CALIFORNIA

Galen Rathbun reports the sad news that Butterball, the Amazonian manatee long resident at the Steinhart Aquarium in San Francisco, died on 22 September 1984 after just over 17 years in captivity. Details of the circumstances of death are not available at this writing, but postmortem examination is said to have indicated lung and liver pathology.

In addition to entertaining and edifying a generation of Steinhart visitors, Butterball provided data for at least four scientific papers - on veterinary care, karyotype, vocalizations, and feeding behavior. In death, he may make his most valuable contribution yet: he was by far the world's oldest tetracycline-marked sirenian of known age. After his arrival at Steinhart in 1967, he was treated for a harpoon wound with tetracycline antibiotics. Examination of his skeleton for tetracycline marks should furnish data of great use in the effort to develop age-determination techniques for manatees.

He will be missed.

FLORIDA

The following items were contributed by the Gainesville lab:

1984 Manatee Mortality in Florida. - A record high number of

dead manatees have been reported for the first eight months of 1984. One hundred and two animals have been recovered from the southeastern United States: 100 from Florida, one from North Carolina, and one from Puerto Rico.

The causes-of-death categories for January through August 1984 and the number of cases for each factor were: boat or barge collision, 26; crushed or drowned in a floodgate or canal lock, 2 (one in floodgate, one in canal lock); dependent calf, 17; natural, 25 (cold stress accounted for 20, and one each of peritonitis, aborted fetus, old age, pneumonia, and mycotic disease); and undetermined, 32 (mostly too decomposed for thorough examination).

Salvage Highlights. - Another pair of twin fetuses was recovered from a salvaged carcass in June. A Blue Spring manatee (Walter, BS-47, M-386) was found dead, from wounds inflicted by a boat propeller, in the St. Johns River in May, adding another tetracycline-marked animal to the collection. At least one animal was butchered in May; however, the case is still in litigation and the animal has not been included in the 1984 figures at this time. Six animals have been rescued this year; however, only two have survived and are undergoing rehabilitation in captivity.

Aerial Surveys. - Bimonthly aerial surveys to assess the distribution and movements of manatees in Lee County, Florida were begun in December 1983. The manatee population in southwest Florida, thought to be one of the largest in the state, is receiving increased attention from U.S. Fish and Wildlife Service researchers. A total of 819 manatee sightings have been made through August 1984, averaging 45.5 manatees each survey (SD=23.3). Counts ranged from 105 (5 January) to 19 (16 April). Calves made up an average of 12.6% (SD=4.1) of the manatees seen on each survey.

It was previously known that large numbers of manatees gather in the Orange and Caloosahatchee Rivers during the winter months, using the warm-water discharge of the Fort Myers Power Plant as a thermal refuge. The ongoing aerial surveys indicate that the Caloosahatchee River is used by manatees during warm months to a greater extent than expected. Manatees have been sighted in the Caloosahatchee on every survey, and on 13 of the 18 surveys more manatees were sighted in the rivers than in the surrounding coastal areas. Of the coastal areas surveyed, Matlacha Pass appears to show greater manatee use than Pine Island Sound, San Carlos Bay, or Estero Bay.

Annual Update of the Manatee Identification Catalog. - Photographs of distinctively scarred manatees taken during the winter of 1983-84 have been used by the staff of the Sirenia Project to update the statewide manatee identification catalog. Seven of the nine areas covered by the catalog were visited (Blue Spring, Jacksonville, Brevard County, Port Everglades, Miami, Fort Myers, and Crystal River); Riviera Beach and Tampa Bay were not covered. Ninety-eight manatees not previously identified have been added to the catalog, which now includes 746 individuals. Forty-one cataloged manatees were resighted during the 1983-84

winter season. Resightings compiled during the three years of the catalog's operation provide information on the movements and site fidelity of manatees in Florida.

Resightings of cataloged manatees in different years at the same aggregation sites have documented site fidelity for 80 individuals. The greatest site fidelity has been demonstrated for Riviera Beach, Fort Myers, Crystal River, and Blue Spring during winter months and Brevard County during the summer. Nine manatees are known to have used the same sites in four or more years, with one individual, BC-09, resighted at Riviera Beach in six different years. Thirteen manatees, however, changed winter aggregation sites between winter seasons and three changed within a single winter season. A total of 36 manatees have been resighted at different aggregation sites, with the greatest movements, in both number and distance, occurring on the east coast. Movements have been documented between Jacksonville and all major aggregation areas on the east coast except Miami. Three individuals are known to have travelled nearly 600 km between Jacksonville and Port Everglades over one-, two-, and three-year periods, respectively, indicating that long-distance movements by manatees are not uncommon. Seasonal north-south migrations have been documented for eight individuals travelling from Riviera Beach or Port Everglades to Brevard County, including one animal, BC-09, known to have seasonally migrated from Riviera Beach to Brevard County in four consecutive years. The only movement documented along the west coast has been that of a manatee, TB-22, known to have migrated from Tampa Bay to the mouth of the Suwannee River between the winter and summer of 1983.

The technique of photographic documentation of scar patterns to identify individuals has proved to be an effective tool for long-term studies of manatees. The viability of the identification catalog is demonstrated by BC-04, photographed initially on 5 April 1978 and reidentified on 29 February 1984.

Future Plans. - The Fish and Wildlife Service will be reducing its manatee research effort due to cutbacks in funding. A nine-month program of transferring carcass salvage activities, including funding, coordination, and fieldwork, to the Florida Department of Natural Resources will begin on 1 October 1984. The Service will continue its research on manatee life history and biology, which currently includes developing radio tracking technology and gathering information on movement patterns, distribution, reproduction, cow-calf relationships, and acoustical communication.

Manatee Release. - The July/August 1984 issue of Marine Mammal News reports that Dr. Jesse White of the Miami Seaquarium has carried out the first release of manatees born and raised in captivity. A male-female pair of two-year-old, 600-pound manatees, named "Sunrise" and "Savannah", were released into the Homosassa River on Florida's Gulf Coast in August. Dr. White, the chief veterinarian at the Seaquarium, said that they will remain in a two-acre area at Homosassa Springs Nature World for two years, "while they master the eating and mating habits of their wild cousins." They are part of a colony of seven manatees bred

at the Seaquarium. Dr. Paul Cardeilhac, a University of Florida specialist in aquatic animal reproduction, is a medical consultant in the program. One of his objectives is to speed up the manatee's slow reproduction rate through captive breeding.

PANAMA

Manatee Range Extension. - Gene Montgomery writes, under date of 11 May 1984: "I learned last week of a manatee which has been seen several times below the 1st lock [of the Panama Canal] before the Pacific (Miraflores locks), thus manatee have entered the eastern Pacific!!! I have not had the time or resources to do the survey necessary to know how many individuals have done so, how far they have moved from the mouth of the canal, etc. I am in the process of trying to find funding to support such a survey, including the possibility of including such a survey in a new study which would precede construction of a sea-level canal."

## SIRENIA WORKSHOP - ITC IV
## (13-20 August 1985)

There was an encouraging response to the first circular advertising this Workshop, with over 50 replies. The second circular, which has been mailed to those who responded positively to the first, calls for titles for poster presentations by 30 September.

The Workshop will emphasize poster presentations because they allow a larger number of presentations and greater opportunity for one-to-one contact. Spoken presentations will be limited to a keynote address by Daryl Domning and a series of six invited review papers which will provide the background for a round-table discussion.

Interested persons not on the mailing list and those with queries should contact one of the convenors:

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## OPINION SURVEY

As noted above, I have been asked to address the sirenian workshop at ITC IV. I have been giving some thought to what I might say, and there is one subject I want to discuss on which I would like some prior input from the sirenian research community.

Science is a process of seeking answers to questions, and the science done will be no better than the quality of the questions asked. I believe we are entering an era when the basic, obvious questions about sirenians (distribution, status, gross anatomy, reproductive and life history parameters, etc.) have been or soon will have been answered. Will biologists then lose what little interest in sirenians they now have, or will larger and more interesting questions emerge to attract their attention?

To gauge the likelihood of the latter outcome, I am hereby soliciting responses to the following question: WHAT DO YOU THINK ARE THE MOST IMPORTANT UNANSWERED QUESTIONS THAT WE AS SCIENTISTS CAN ASK ABOUT SIRENIANS? Suggest as many questions as you like. No prizes will be awarded (and you need not be present to win!), but I will summarize the results in a future issue. - DPD

## MARINE ANIMAL SYMPOSIUM

A Symposium on Endangered Marine Animals and Marine Parks will be held at Cochin, South India from 12-16 January 1985. The focal theme is conservation, management and habitat protection in the form of reserves, national parks or sanctuaries for endangered or vulnerable marine animals. The symposium will review the present status of research and development efforts, resources, conservation programs, future strategies, and national policies in the Indian Ocean region. A call for papers has already gone out and final manuscripts are due by 1 October 1984, in order that the papers can be published at the time of the symposium. For further details, contact The Convener, Symposium on Endangered Marine Animals and Marine Parks, Marine Biological Association of India, Post Box No. 1244, Ernakulam, Cochin-682 011, Kerala, India.

## DUGONG VOLUME REPRINTED

The Dugong: Proceedings of a Seminar/Workshop held at James Cook University 8-13 May 1979 (H. Marsh, ed.).

James Cook University has reprinted this volume in order to meet a steady demand for copies. Copies can be ordered from: The Bookshop, James Cook University of North Queensland, Townsville, Qld. 4811, Australia. Cost: $10 Australian plus postage per copy.

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## REQUEST

Information on the status of the West African manatee and the dugong populations on the east coast of Africa is needed for inclusion in the IUCN Mammal Red Data Book, Part 2 - Africa. Please send any relevant data to Jane Thornback, Compiler, Mammal Red Data Book, IUCN Conservation Monitoring Centre, 219(c) Huntingdon Road, Cambridge CB3 0DL, United Kingdom.

## ABSTRACTS

Hemopoiesis in the West Indian Manatee, Trichechus manatus (M.D. Bazzini, J.E. Reynolds III, and R. Essman). - West Indian manatees (Trichechus manatus) and other members of the order Sirenia, unlike most mammals, possess amedullary long bones. Histological examinations of the visceral organs, sternum and vertebral bodies showed that the primary site of hemopoiesis in the manatee is the vertebral bodies. The vertebrae contained the bone marrow and several diagnostic cell types including megakaryocytes, erythroblasts and myelocytes. [From Florida Scientist 47 (Suppl. 1), p. 19, 1984.]

Reproductive Potential of a Captive Breeding Colony of Florida Manatees (P.T. Cardeilhac, J.R. White, and R. Francis-Floyd). - Recent interest in saving the manatee has encouraged the ongoing program of captive breeding at the Miami Seaquarium. This colony has ranged in size from two to nine manatees. Studies were made on reproductive parameters of the colony in order to project reproductive potential of a captive manatee colony.

Age at puberty was found not to occur before approximately 7.5 years based on colony history and serum progesterone concentrations determined in two subadult females. The youngest age at conception found for 2 animals was 7.5 years. The second female became pregnant at approximately 8 years. A range for the gestation period has been determined by establishing minimum and maximum values. A minimum period (12 months) was determined by establishing the beginning of pregnancy, using physical signs confirmed by significant elevation in serum progesterone concentration, followed by a date for the observed birth. A maximum value for gestation period was the shortest determined calving interval (14 months). A range for gestation period was thus determined to be 13 ($\pm$1) months.

The postpartum period of infertility for five captive births ranged from 2 to 77 months with a mean value of 29 months. Calving intervals for five captive births ranged from 15 to 91 months with a mean value of 42. Using these values, the average adult female in this colony should produce 6 calves by thirty years of age with an annual reproduction efficiency for females of 0.2 (calves/year/female). Calf production would be about 120 per acre per year using high intensity production techniques as practiced with this colony.

A sixty-fold increase in the size of the system used at Miami Seaquarium would approximately replace the current annual

losses suffered by the wild population of manatees in Florida. A 10 to 20 fold increase in the size of the Seaquarium system would probably insure that the manatee population of Florida remained in positive reproductive balance, provided experimental release of captive-produced animals is feasible. The experimental release into the wild of 2 subadult manatees is planned for the summer of 1984. [From abstracts of the 15th Annual Conference and Workshop, International Association for Aquatic Animal Medicine, Tampa, Fla., Apr. 30-May 2, 1984.]

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## ERRATUM

In the last issue, Kanwisher's name was inadvertently omitted from the authorship of the following paper:

Gallivan, G.J., R.C. Best, and J.W. Kanwisher. 1983. Temperature regulation in the Amazonian manatee Trichechus inunguis. Physiol. Zool. 56(2): 255-262.

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