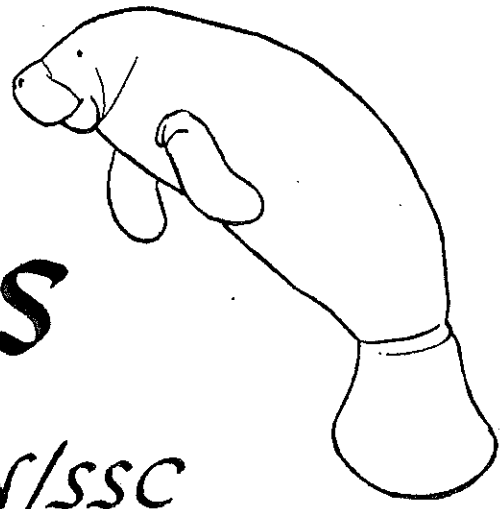

Sirenews

Newsletter of the IUCN/SSC Sirenia Specialist Group

NUMBER 7 APRIL 1987

DEATH REPORTED

Robin C. Best

17 December 1986, in Cambridge, England

It is with great sadness that we report the untimely death of Robin Best. Robin was the driving force behind research on the Amazonian manatee in Brazil for more than a decade. He managed to exploit his considerable skill at caring for manatees in captivity to maintain a captive colony specifically for research. These animals were used in experiments which provided the basis for most of the recent advances in our understanding of sirenian physiology.

Robin revived the IUCN Sirenia Specialist Group in 1983 and was its Chairman until 1985. In early 1986, he joined Professor Peter Jewell's research group at the University of Cambridge in order to complete his Ph.D. Professor Jewell has kindly allowed us to reproduce below his tribute to Robin. - Helene Marsh

Robin Best died in Cambridge on Wednesday, 17 December 1986. He had come here to take a Ph.D., although he already had a high standing in scientific research. It had so happened that

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.

Professor Richard Keynes was visiting the Amazon a year or so ago and met Robin and discussed his work with him. Robin felt that it would be advantageous to have a Ph.D. and so Professor Keynes suggested at once that he come and join our department to do this. I was delighted to have Robin join my group and it soon became clear that he was a person of outstanding accomplishments, with a great deal to offer in research and with enormous enthusiasm and love for his work. He had worked on polar bears and later went down to the Amazon to initiate exciting new work on the manatee. At the same time his wife, Vera da Silva, took up the study of the river dolphin. Robin was full of plans for the future and whilst he was here new research laboratories associated with the research station at Manaus had been completed. There Robin would have started new studies on the metabolism of the manatee and other Amazonian creatures. Robin arrived in Cambridge in October 1985 in robust health but shortly afterwards was taken ill and to our utter dismay we learnt that he had leukaemia. Nevertheless he responded well to intensive treatment and fought back with such determination that he was working again within a few months and achieved a remarkable amount during the year. Sadly, he had a relapse despite all his bravery. We have lost an outstanding young scientist. - Peter Jewell (Physiological Laboratory, Cambridge, England)

I would like to add a few things to what Drs. Marsh and Jewell have said above. My acquaintance with Robin began in the fall of 1976, when he arrived in Manaus, shortly after I myself did, to join the manatee research project that had been begun by Diana Magor. The son of a zookeeper in his native Canada, and a godson of Julian Huxley, he already had a lifelong association with biology and an unusual breadth of experience with animals and animal physiology. In addition to his master's degree work on polar bears at the University of Guelph, he was familiar with the capture, handling, and transport of beluga whales and pinnipeds. He was also a fine athlete, and brought the competitive drive and determination of a rower and rugby player to his scientific work.

Soon after his arrival in Manaus his initiative was making itself felt on the manatee project. His knowledge of animal nutrition was the key factor in increasing our success at hand-rearing manatee calves; he took the lead in many directions of physiological research; he arranged the participation in our manatee work of visiting researchers including Jim Gallivan, John Kanwisher, Gene Montgomery, and David Piggins; and eventually he organized and carried out an ambitious and logistically daunting manatee capture, transport, and radio-tracking project. Meanwhile he pursued lively interests in other aspects of mammalian biology, particularly the ectoparasite fauna of tree sloths, which he studied with Joachim Adis and others. An endless parade of sloths, tapirs, bush dogs, and other creatures enlivened our office and laboratory. Later he undertook faunal surveys of Brazilian national parks and, after my departure, studies of river dolphins and giant otters.

The vitality and productivity of the manatee lab at INPA, even in the early months of his stay, were due largely to Robin; and when I left Brazil in 1978 I knew the project was in capable

hands. With his death I have lost a friend and loyal teammate of exciting days gone by. Sirenian research has lost one of its key players, and we can only hope that others will now pick up the ball that his tireless efforts carried so far. - DPD

CEE INITIATES MANATEE PROGRAM

The Center for Environmental Education (CEE) has recently begun a manatee conservation program. This program will include domestic and international projects, primarily focusing on the West Indian manatee.

The objectives of CEE's manatee program will be to implement projects that promote the management and protection of manatee populations in the United States and in the wider Caribbean, to increase citizen awareness and support for the conservation of the manatee, to assist other domestic and international conservation programs, and to support research necessary for the development of conservation programs.

CEE has supported two projects on the manatee's behalf in Florida and Mexico. The Florida project addresses collisions between manatees and boats. As part of a campaign to promote safe boating in manatee habitat, CEE efforts will complement projects already being carried out in Florida by producing and distributing a poster that has manatee protection as its message. This poster will be distributed at boat ramps and old marinas and will inform boaters of the danger they pose and how to avoid harm to the manatee. CEE's Mexico project involves a grant to the Instituto Nacional de Investigaciones sobre Recursos Bioticos to conduct manatee field research in the lower wetlands of the Usumacinta and Grijalva river system. The research will contribute to the development of a management plan for protecting the manatee and other wildlife in a proposed reserve in this area.

The Center is a non-profit conservation organization dedicated to protecting marine wildlife and their habitats, and to conserving coastal and ocean resources. To further these conservation goals, CEE conducts research, promotes public education, supports domestic and international conservation work, and advocates sound policies concerning the marine environment.

Interested parties may contact Jim Serfis, Center for Environmental Education, 1725 DeSales Street NW, Washington, D.C. 20036 USA. - Jim Serfis

LOCAL NEWS

AUSTRALIA

Tracking Dugongs by Satellite in Great Barrier Reef Waters. - The movements of a dugong in the Great Barrier Reef Marine Park have been monitored by satellite as part of a program which aims to establish a sound biological basis for the management of dugongs by the Marine Park Authority. The program is funded by the Australian Government's Marine Science and Technology Scheme

and the United Nations Environment Program.

The dugong was captured in Cleveland Bay near Townsville on 5 October 1986 by a team of volunteers including personnel from the Queensland National Parks and Wildlife Service, Seaworld Surfers Paradise and James Cook University. The dugong was herded into shallow water and then caught using a rodeo technique developed for catching sea turtles. The animal was supported by an inflatable stretcher during the tagging process.

Galen Rathbun of the U.S. Fish and Wildlife Service, who pioneered the use of similar technology to monitor the movements of the Florida manatee, supervised the tagging.

The belt used to attach the ARGOS PTT [platform transmitter terminal] to the dugong was developed by Rathbun and Jim Reid at Gainesville, using a cast of a dugong tail stock sent from James Cook University. The belt was subsequently modified during tests on captive dugongs last June at the Jaya Ancol Oceanarium in Jakarta, Indonesia, one of only two facilities in the world holding dugongs in captivity [see Sirenews No. 6].

Radio signals do not transmit through salt water. Hence the PTT must be at the surface for the signals to be received by the satellite. The PTT was connected to the dugong by a 3-meter nylon tether. The attachment had a weak link which was designed to break if the tether became entangled.

The PTT transmitted once every 45 seconds between the hours of 0100 and 0900 and 1300 and 2000 EST, and sent activity and PTT temperature data encoded as 16 bits following the PTT identifier. The activity data related to mercury switch closures when the PTT tipped more than 90 degrees. Transmissions included summaries of the number of seconds in which the PTT tipped more than 90 degrees from the vertical in the preceding minute and in the preceding 24 hours. Internal temperatures of the PTT were measured to the nearest 0.3 degree C. Service Argos in France calculated locations based on measurements of the Doppler effect on the carrier frequency when a minimum of four messages was received by polar-orbiting NOAA weather satellites travelling at 28,800 km per hour, 820 km above the earth. The data were accessed via a personal computer which linked up with the Service Argos computer via one of the James Cook University mainframe computers and the Midas and Transpac networks.

In the first six days after the tagging, the subadult male dugong moved southeast, first to Bowling Green Bay and then to Upstart Bay, a straight-line distance of 140 km. He spent the next six weeks in the vicinity of an inshore seagrass bed in Upstart Bay. Up to five locations per day were received during this period.

Coincident with an unseasonal cold snap during which inshore surface sea temperatures monitored by the PTT fell about 2 degrees C, the dugong travelled back to the area where he had been caught, completing the journey in two days at an average speed of at least 3 km per hour. After two days in Cleveland Bay, the dugong journeyed back to its old haunts in Upstart Bay where it remained until the PTT came off due to mechanical failure of the tether attachment just nine weeks after the tagging. On all three of its trips between Cleveland and Upstart Bays, the dugong stopped off in the same general area in Bowling Green Bay. To

refuel, perhaps?

This is the first time that the movements of an individual dugong have been documented.

Results from the PTT are being compared with those from a VHF transmitter to determine the most cost-effective method of studying dugong movements. To this end, a second male dugong was tagged with a conventional radio-tag on 12 October 1986. The position of this animal has been monitored by observers equipped with receivers and antennae. This animal has been tracked from the land, small boats and light aircraft. So far it has remained in Cleveland Bay near where it was tagged.

Analysis of these preliminary results suggests that conventional radio-tags are superior to PTTs if the object of the tagging is to be able to relocate dugongs repeatedly for behavioral work. However, when the major aim of the study is to track movements per se, the PTT offers substantial advantages, including increased accuracy and number of locations, and a major saving in labor costs. In the remote areas that characterize most of the dugong's range in northern Australia, a PTT is the only logistically feasible method of tracking dugongs. - Helene Marsh and Galen Rathbun

Record of a Dugong on the South Coast of New South Wales. - On 1 December 1986, J.C. McIlroy of CSIRO Division of Wildlife and Rangelands Research observed a dead dugong on a sandbar at the mouth of Wallagoot Lake (36° 47'30" S; 149° 57'30" E), approximately 8 km south of Tathra, New South Wales. The decomposing carcass was examined on 10 December 1986 by J.C. Wombey, and collected for preservation as a skeleton. The specimen is now lodged in the Australian National Wildlife Collection (Registration No. CM 16222), in the custody of the Division. The animal was a young female of a total length of 2060 mm, and a snout-vent length of approximately 1380 mm. There were bullet holes in the body.

A local newspaper, the Imlay Magnet, carried a report in its issue of 18 November 1986 that a dugong had been sighted off Eden in Twofold Bay during the previous week. This town is approximately 30 km south of where the present carcass was found. Providing that the identification was correct, it is possible that it was the same animal in both cases.

This record is the most southerly known for the species. There are two reports in the literature of dugongs south of Sydney. An anonymous note in the Australian Museum Magazine for June 1959 states that an adult male was washed up on a sandbank at Port Hacking (lat. 34°05' S) on 12 February 1959 and died soon after. It is stated that photographs were taken. Unfortunately neither the specimen nor the photographs reached the Australian Museum (Linda Gibson, pers. comm.). In an article on marine mammals of the Illawarra region, Robinson (Victorian Naturalist 101: 157, 1984) gave a second-hand anecdotal report of a dugong found dead at Port Kembla (lat. 34°30" S) in December 1960. - John Wombey (CSIRO, Div. of Wildlife and Rangelands Research, P.O. Box 84, Lyneham ACT 2602, Australia)

[EDITOR'S NOTE: The Port Hacking stranding was also reported by B.J. Marlow, J. Mammal. 43(3): 433, 1962.]

BRAZIL

Mônica Borobia reports that the West Indian manatee project recently begun in Paraiba (see Sirenews No. 6) has had to be terminated due to budget cuts at IBDF. She has left Brazil for McGill University in Canada, where she will be pursuing a master's degree under Dr. D. E. Sergeant, studying skulls of Sotalia. We wish her the best of luck in her studies, and hope to see her return someday to the sirenological fold.

JAPAN

Teruo Kataoka reports that the Toba Aquarium has acquired a young dugong (named "Serena") to replace the member of its captive pair that recently died. The new dugong was captured in the Philippines and donated to the Toba Aquarium by Philippines President Aquino.

NIGERIA AND SIERRA LEONE

I visited Sierra Leone and Nigeria in late November and early December 1986 to investigate the distribution and exploitation of manatees. The work in Sierra Leone, where I spent two weeks, was especially productive. I had been in correspondence with Daphne Tuboku-Metzger of the Sierra Leone Environment and Nature Conservation Association for a number of years, and we had been hoping to launch a manatee survey there for some time. A survey of sorts was finally accomplished, albeit on a much-reduced scale, with support from the United Nations Environment Programme and the People's Trust for Endangered Species. We had the full cooperation of the Sierra Leone Ministry of Agriculture, Natural Resources and Forestry, whose Fisheries Division supplied a guide, interpreter and boat.

With Richard Kapindi, the Fisheries Division biologist assigned to the manatee project, I traveled along about 80 km of the Malen and Waanje Rivers, mainly in Pujehun District. Though we saw no living manatees, we did see plenty of evidence for their presence in this area. We counted eight specially designed manatee traps which had been operative during the 1986 flood season (generally about June through September). Two were still armed and set. We also saw two manatee nets in the water and one out.

The Mende people who occupy the Pujehun District and much of the Bonthe District have a long tradition of manatee trapping. Direct netting of manatees seems to be a more recent introduction. The accidental catching of manatees in fish nets probably has increased with the spread of synthetic-fiber netting there during the last ten years or so. At least two manatees were taken in fish nets near Gbondapi in 1986.

No village has more than one manatee trapper or netter. Many have none. It seems to be a highly specialized endeavour. When one of the villages without its own trapper or netter decides manatees are becoming abundant locally, they will often invite a trapper to set his traps in their area.

Manatee meat is loved by all the villagers, and carcasses quickly disappear after being brought ashore. My constant requests to see some tangible evidence of manatees in the villages amused the people. They insisted that every shred had been devoured or pulverized - except the ribs. Most villages, when pressed, could produce a manatee rib or two. The meat is distributed according to customary patterns; the successful captor can sell only that which remains after the shares have been apportioned.

We managed to interview five manatee trappers and one netter, but we learned of the activities of one or two additional trappers and two other netters. The trappers each set from four to seven traps per season, while each netter owns but one net. Catches of as many as 15 manatees in one year and 25 in a five-year period were reported by individual trappers for the 1980s. One netter claimed to have taken four in one year; another, five in two years. The total catch in the region where we conducted interviews seems to have averaged 10-20 manatees per year during 1980-86. It is important to emphasize that these figures apply to only a part of the area where manatees are exploited in southern Sierra Leone.

We have reason to believe manatees are present and exploited in many parts of the Bonthe District (which our survey barely penetrated). Also, there are some confirmed catch records from rivers north of Freetown. Just prior to my departure, Tuboku-Metzger, Kapindi and I laid plans for extending our survey to the Sierra Leone River, which they will do in my absence.

Manatees are regarded as pests by the Mende people, who are predominantly rice farmers and fishermen. They claim manatees leave the rivers and raid the swamp rice during the rainy season. Also, manatees are accused of damaging gillnets and even of robbing caught fish from the nets. Some of the people said they would be glad to be rid of manatees altogether, and that they would happily forego the pleasure of an occasional feast to see these pests eliminated. At the same time, they insisted that manatees are very abundant and that it probably would be impossible to extirpate them from the region.

In Nigeria I had time to visit only one manatee area: Lake Kainji on the Niger River. This large lake began to form in 1968 at the completion of Kainji Dam, built principally to supply southern Nigeria with hydroelectric power. With members of the Kainji Lake Research Institute's staff, I visited two small villages on the western shore of the lake. When asked about manatees, the villagers were eager to share their stories of hunting. They produced an interesting array of devices used to catch manatees, including many of the harpoon/float arrangements described and illustrated by Sylvia Sikes for the Benue-Plateau State in central Nigeria (Oryx 12: 465-470, 1974). I saw eight of these and was told many more were available in these two villages. In addition, they showed me a long line with several hundred large hooks hanging along its length. In the days before the dam, the Niger became narrow enough during the dry season for such lines to be stretched across its entire width. Staked at either end and set so the hooks hung just a few centimeters above the river bottom, this line supposedly was capable of "snagging"

manatees as they swam along the bottom. A large, deep set net, with about 18-cm mesh, is used to catch large fish (Lates niloticus), crocodiles and manatees. A fourth device is a trap made from tree roots. It is shaped like an elongated basket, with a tangle of netting at the mouth arranged as a kind of funnel. The manatee is supposed to swim headfirst into this funnel and get its head and flippers hopelessly ensnared. Since the "basket" is firmly staked to a tree or post, the animal is effectively tethered. It seemed improbable to me that a manatee would be caught in this kind of a trap, but the fishermen were adamant that it works.

The people from these villages on the west side of the lake complained that manatees have become hard to find and catch since the lake filled. The only time they have a chance to see them now is during draw-downs when the water level decreases. They did take me to a spot near the mouth of the Doro River where signs of manatees (grazed stems of Echinochloa stagnina) had been noticed recently. The water was too high at the time, according to the fishermen, for me to see this evidence myself.

Manatees are still hunted with success in the northeast corner of the lake where the channel narrows. One village is said to take 3-4 per year, apparently with harpoons.

There is some confusion about the status of manatees in Kainji Lake National Park. This park is the one mentioned as the "proposed Ibi National Park" in the 1976 Red Data Book. In spite of its name, the park abuts only a short stretch (ca. 15 km) of the lake's western shore. The former Borgu Game Reserve forms the nucleus of Kainji Lake National Park (it is now called the Borgu Sector of the park). There is no evidence that manatees inhabit any of the rivers traversing the Borgu sector. Thus John Howell's (Nigerian Field 33: 147-165, 1968) prediction that a "resident manatee community" might become established in the Doro River Forest Reserve (=Borgu Game Reserve) seems to have been a pipedream. There are manatees in Lake Kainji, but technically they are outside the national park. The National Electric Power Authority exercises nominal control over use of the lake and its resources. However, there is no effective protection of manatees, apart from their own secretive behavior. It is possible that the creation of Lake Kainji has benefitted manatees by providing extensive shallow grassy areas year-round, and at the same time making the animals more difficult to catch. Whatever the possible benefits from impoundment, it has become all but impossible for manatees above the Kainji Dam to move downstream, or for manatees from farther down the Niger to move up into Lake Kainji. With the completion of the Jebba Dam in 1986, the animals in the Kainji-Jebba stretch of the river (assuming there still are some) have also become isolated. - Randall R. Reeves

WASHINGTON, D.C.

Invasion of the Rhizome-Snatchers. - For the past couple of years, fossil evidence has been accumulating to support the validity of assigning the Early Miocene dugongid Rytiodus to its own subfamily Rytiodontinae - something I had previously questioned. What is surprising is the form this evidence has

taken. Rytiodus was a dugongid with huge, flat, bladelike tusks, and so far it has been found only in France and Libya. It was thought to be an isolated, aberrant offshoot of Old World sirenians like Halitherium. But it turns out that (a) it was only one (and not the most peculiar) member of a substantial adaptive radiation comprising at least four or five genera, and (b) the origin of this group, as well as all its other members, seem to have occurred not in the Old World but in America! The rytiodontine clade now seems to include, besides Rytiodus itself, the North American and Caribbean dugongids "Halitherium" olseni (to be placed in a new genus); Dioplotherium; an undescribed genus which I discovered in Yucatan last summer; and possibly another new genus from the southeastern U.S. still represented only by tantalizing fragments. In just the last few days, a tusk fragment has turned up in Florida that is almost indistinguishable from Rytiodus; it may be referable to one of these undescribed animals. Since the most primitive known forms, as well as the greatest diversity, of rytiodontines are found in the New World, it seems clear that this Late Oligocene and Miocene group was really native to the Americas, and only Rytiodus happened to disperse to Europe.

What may be of interest to students of living sirenians is the fact that most rytiodontines were distinguished by strongly downturned snouts and by large, knifelike tusks whose medial sides were covered by a paper-thin layer of enamel. This enamel layer created a self-sharpening edge during wear. It seems obvious that the tusks were used as cutting instruments, probably by means of downward and backward movements of the snout against a substrate. Possibly the jaw muscles were used to produce these movements, by closing the mouth with the lower jaw fixed against the substrate. My guess is that they were cutting, and eating, the tough rhizomes of seagrasses like Thalassia. These "super-rhizivores" were sympatric (in both Old and New Worlds) with Metaxytherium, a dugongid with small, weak tusks that may have been unable to uproot the more robust seagrasses, at least from harder bottoms.

Whether other parts of the world ever supported comparable kinds or diversities of rhizome-cutting sea cows is an open question. I suspect that Dugong, with its overgrown tusks still partly enameled on their medial sides, may once have started down this evolutionary road before allowing the tusks to become sexually dimorphic (which none of the rytiodontines seem to have done). Those with an opportunity to watch wild dugongs feeding underwater might find it rewarding to watch for signs of the behavior described above. - DPD

REQUEST

A group of investigators studying brain anatomy and DNA of Trichechus manatus (see Sirenews No. 3, pp. 6-7) would like to obtain specimens representing other sirenian species. Specifically, they would like whole brains (with as much spinal cord as possible) fixed with formalin, and liver and/or spleen samples cut into small pieces and collected fresh into 70% - 90%

ethanol. Optimal brain fixation is achieved by perfusing the fresh head within 12 hours after death; a detailed protocol for doing this may be obtained by writing to Dr. Roger L. Reep, Dept. of Physiological Sciences, College of Veterinary Medicine, University of Florida, Gainesville, Fla. 32610 USA; phone (904) 392-0921. Dr. Reep should also be contacted for further details.

PUBLICATIONS ON ZOOLOGICAL NOMENCLATURE

The International Trust for Zoological Nomenclature is publishing a revised and updated edition of the Official Lists and Indexes of Names and Works in Zoology. Copies will be available in the United States from the American Association for Zoological Nomenclature (NHB Stop 163, Smithsonian Institution, Washington, D.C. 20560), at a cost of US$100 to members, $110 to non-members. Order forms will be mailed in March.

The Bulletin of Zoological Nomenclature has been completely redesigned for 1987, and the first issue in the new format is due out in March. The new Bulletin will contain general articles on nomenclature and its relevance to systematics. The first issue will include a short note on the AAZN. Brochures describing the new Bulletin will be mailed in March.

ABSTRACTS

The Status and Distribution of the West Indian Manatee (Trichechus manatus) in Jamaica, with an Evaluation of the Aquatic Vegetation of Alligator Hole River (Lawrence A. Hurst). - The West Indian manatee (Trichechus manatus) is considered endangered and vulnerable to extinction in Jamaica. Recently Jamaica's Natural Resources Conservation Department (NRCD) began a manatee research and conservation program by impounding several manatees in the Alligator Hole River (AHR) in Manchester Parish. The major objectives of this thesis were to review the status and distribution of the manatee in Jamaica, to document the dominant flora and fauna of the AHR, to estimate the carrying capacity of the upper AHR, and to evaluate the consequences of impounding manatees in the upper AHR.

Replicate flight-surveys by the NRCD indicate the majority of manatees observed in Jamaica occur along the southern coast between St. Andrew Parish to the east and Westmoreland Parish to the west. The greatest densities of manatee sightings per km coastline were, in decreasing magnitude, in Manchester, St. Elizabeth, St. Catherine, and Clarendon Parishes.

Fishing activities are assumed to be the major cause of human-related manatee mortality in Jamaica, with incidental entanglement in beach seines and gill nets the probable chief cause of death. The four parishes calculated to have the most vulnerable manatees are St. Elizabeth, Clarendon, Manchester and St. Catherine.

Comparison of aerial survey data from the Caribbean region indicates the manatee population of Jamaica is less dense than the manatee population of Puerto Rico.

Three manatees were impounded in the AHR during this study. Fecal analysis indicates the manatees in the AHR eat the Ceratophyllum, Potamogeton and Phragmites present in the river. An adult manatee's average daily consumption rate of Ceratophyllum was estimated to be 45 kg (wet weight). With this consumption rate, the estimated productivity of Ceratophyllum in the upper AHR could support 1 to 2.4 manatees on an annual basis.

I recommend concentrating protection and public education efforts for manatee conservation in Jamaica along the Long Bay area of Manchester Parish. I conclude that the long-term preservation of the AHR and surrounding Canoe Valley wetlands requires formal status of the area as a National Park. Finally, the requirements necessary for the successful management of the AHR as a natural manatee exhibit are given. [Abstract of a master's thesis in Latin American Studies submitted to the University of Florida, Gainesville, in January 1987 and supervised by Charles A. Woods.]

Food habits of the West Indian manatee, Trichechus manatus latirostris, in south Florida (Diane A. Ledder). - Gut contents were collected from 84 animals over a five-year period, from 1977 to 1981, in order to describe the diet of Trichechus manatus latirostris in South Florida.

Microhistological analysis was used to identify plant species sampled from the stomach, duodenum, and cecum. A gross analysis was also carried out to estimate the ratio of surface to subsurface portions of the plants consumed.

The manatees sampled fed in both fresh and salt water. The seagrass Halodule wrightii composed the largest portion of the diet (24.4% by percent composition), followed by the freshwater species Hydrilla verticillata (12.7%). Significant contributions were also made by the seagrass Syringodium filiforme (9.1%) and the euryhaline species Ruppia maritima (7.4%). Algae were found in large amounts in five of the animals, resulting in a total contribution of 6.0% to the diet of the sample population.

The most common plant species in the diet were equally represented in males and females. Adult and juvenile animals differed only with respect to the consumption of Syringodium filiforme, Panicum hemitomon, and algae.

Seagrass made large contributions to the diets of animals on the coasts, while Hydrilla verticillata and Panicum hemitomon made the largest contributions to the diets of animals in Central Florida.

Halodule wrightii contributed the greatest percentage to the diet by percent composition in summer and winter, while Syringodium filiforme and Thalassia testudinum values were highest in the winter and spring, and spring respectively. The terrestrial grass Panicum hemitomon and freshwater plant species contributed the most to the diets of the animals during the fall.

Subsurface portions of plants contributed more to the diet for saltwater species (mean ratio of surface/subsurface portions = 46/54) than for freshwater species (86/14).

Ratios of surface/subsurface portions of plants were essentially equal for males and females, and for juveniles and adults. Manatees collected on the coasts consumed more subsurface

portions of plants than those collected from Central Florida. More subsurface portions of plants were consumed in winter and summer than in the spring and fall. [Abstract of a master's thesis in Biological Oceanography submitted to the University of Miami, Florida, in December 1986 and supervised by Daniel K. Odell.]

Observations of the manatee, Trichechus manatus, in the midregion of the Usumacinta River, Tabasco (Carlos Alvarez Flores, Anelio Aguayo Lobo, and Lisa D. Johnson Mujica). - The purpose of this paper was to select the most suitable methods which would contribute to the sparse knowledge of the Mexican manatee's distribution throughout the State of Tabasco, as well as its population size.

The results of 16 direct observations and tagging of 9 individuals from the Chacamax and Chable Rivers for the 1984-1985 season are given and discussed.

From the techniques applied, it was concluded that the capture-recapture method, combined with tagging, was the most practical, in order to begin with field studies in this particular aquatic system.

The former method makes possible the direct handling of live organisms and obtaining their morphometric data, as well as applying statistical models to approach real population size, sex ratio and relative age of manatees.

Emphasis is placed on the importance of continuing such kinds of work, to establish a basis for correct management and conservation strategies for such an important natural resource. [Abstract of a paper presented at a recent Symposium on the Ecology and Conservation of the Usumacinta and Grijalva Delta, held in the State of Tabasco.]

The following abstracts are of papers presented at the annual meeting of the Society for Neuroscience, Washington, D.C., Nov. 9-14, 1986.

Morphology and Cytoarchitecture of the Brains of Florida Manatees (Trichechus manatus) (W. Welker, J. I. Johnson, and R. L. Reep). - The objectives of our studies are to describe and delineate in manatees all the nuclear groups and cytoarchitectonically distinct regions of the brains known in other mammals in order to evaluate the comparative systematic status and neurobehavioral correlates in these unique marine mammals. Formalin perfused or immersed whole brains, brainstems and spinal cords have been obtained from 8 manatees (7 adults, 1 infant), mortally injured by motorboats, disease, or died of natural causes. Three whole brain specimens were embedded in celloidin, sectioned, and alternate series stained for cell bodies or myelin sheaths, are being prepared in horizontal, coronal and sagittal planes. Brainstem and thalamic blocks have also been prepared. The brain of the manatee has several atypical external morphological features: a relatively unfissured cerebral cortex, a foreshortened telencephalon and pronounced midcerebral fissure, relatively small olfactory, optic, oculomotor, trochlear, and abducens nerves, and relatively large trigeminal,

facial, acoustic, vagal and hypoglossal nerves - which are associated with similarly differentially developed cerebrocortical, basal forebrain, thalamic and brainstem nuclei. Coronal, horizontal and sagittal sections show that all basic thalamic, midbrain, medullary and cerebellar nuclei are clearly defined. Frontal, parietal, cingulate, motor and sensory cortical areas are distinguishable by classical cytoarchitectonic criteria. Cerebellar lobules are clearly identifiable. Particularly large are the multifoliated dorsal and ventral paraflocculi. Photomicrographs of representative sections of the aforementioned salient neuroanatomical features will be displayed. More detailed descriptive and quantitative neuroanatomical features of these rare protected mammals are forthcoming, and should extend and qualify generalizations regarding brain evolution.

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Dorsal Column Nuclei of the Aquatic Herbivorous Manatee (Trichechus manatus) (J. I. Johnson, W. I. Welker, R. L. Reep, and R. C. Switzer III). - The dorsal column nuclei vary in size, shape and internal differentiation with the mechanosensory capabilities and life styles of their owners. We examined Nissl- and myelin-stained section series through the brainstems of two Florida manatees (Trichechus manatus) to see what morphological features of these nuclei correlate with the unusual bodily and behavioral specializations of these strictly aquatic herbivores. Caudally there is a broad median nucleus of Bischoff at the midline, which divides at the obex into nuclei resembling the gracile nuclei; these animals have no hindlimbs so no gracile nuclei are to be expected, the median nuclei presumably mediate tactile sensibility from the large and well-developed tail. The cuneate nuclei are relatively large and exhibit prominent bands as well as numerous clumped aggregates of somata-filled neuropil. The main cuneate nucleus is largest midway through its rostrocaudal extent, and here it is closely apposed to and resembles (in lobulated and cytoarchitectonic appearance) the adjacent trigeminal sensory subnucleus.

What we judge to be the external cuneate nucleus consists of sparsely distributed clusters of large neurons scattered rostrocaudally (but more prominent rostrally) within the dorsal funiculi, both dorsal and dorsolateral to the main cuneate nucleus. If we are correct, the external cuneate does not constitute a distinctly separate nuclear formation in manatees. This is more interesting, since the large size and internal differentiation of the main cuneate nucleus suggests a well-developed cutaneous mechanosensory capability for the forelimb, while the absence of a clear external cuneate implies a poorly developed kinesthetic or deep-tissue sensibility for the same limb.

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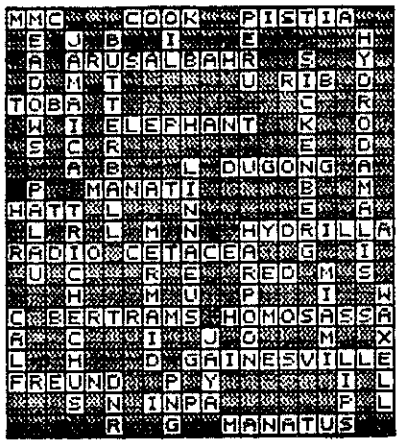

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