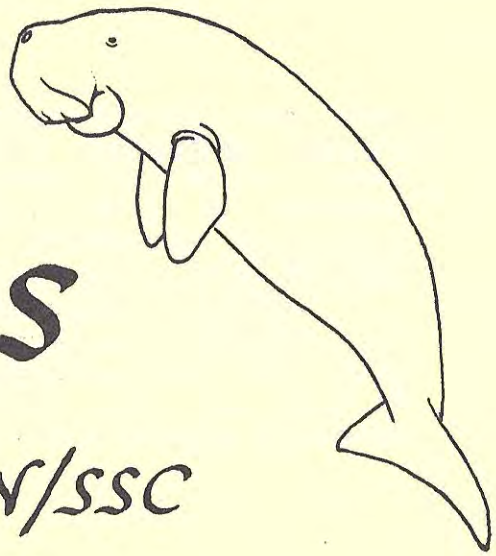

Sirenews

Newsletter of the IUCN/SSC Sirenia Specialist Group

NUMBER 10 OCTOBER 1988

IN THIS ISSUE:

SIRENEWS SUBSCRIPTIONS

We are pleased to announce that the subscription policy outlined in the last issue will not, for the time being at least, have to be implemented. The U.S. Marine Mammal Commission has generously offered to support publication of the next three issues of this newsletter. The Sirenia Specialist Group expresses its appreciation to the Commission and its Executive Director, John Twiss, for this timely assistance. We also thank the IUCN Species Survival Commission for its steady support over the last five years, which made possible the creation of Sirenews as well as several other Specialist Group newsletters. Both organizations have done and continue to do a great deal on behalf of the world's all-too-numerous endangered species.

However, we emphasize to our readers that the announced policy regarding our mailing list will be implemented. If you

---

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.

wish to continue receiving Sirenews, say so in a postcard or letter addressed to D. Domning at the address on the previous page, prior to APRIL 1, 1989. Those individuals who do not respond by that date will be dropped from the list. NOTE: Libraries currently receiving Sirenews will continue to do so automatically and need not reply.

Several readers were so eager to come to our aid that they sent payments in response to the notice in the last newsletter - even some from outside the U.S. who would not have been required to pay at all. We sincerely appreciate their support, and herewith return their checks with our thanks. - DPD

FAX COMMUNICATIONS

In hopes of rendering your communications with us and each other more efficient, we hereby announce that Sirenews can be reached via telephone facsimile transmission. We are also willing to publish your own FAX numbers if you wish to send them to Sirenews, for the benefit of those who may wish to send documents to you by this means. Those FAX numbers and addresses available at press time are as follows:

Sirenews
c/o Dr. Daryl Domning
Dept. of Anatomy
Howard University
Washington, D.C.
202-636-5960

Dr. Helene Marsh
Zoology Department
James Cook University
Townsville, Qld., Australia
(in Australia) (077) 79 6371
(international calls) 61 77 79 6371

SIRENIA SPECIALIST GROUP NEWS

The IUCN held its triennial General Assembly in Costa Rica in February of this year. As stated in the IUCN statutes, all appointments to the IUCN network including the Species Survival Commission are automatically dissolved at the time of each General Assembly. The Chairman of the Species Survival Commission wrote to me in June inviting me to continue as Chairman of the Sirenia Specialist Group, and to advise him of any suggested changes to the membership of this group. Dr. Rod Salm advised me that he did not wish to continue being a member of the group as he now has no professional contact with sirenians - there are none in Oman. Thanks, Rod, for your interest in and support of the Sirenia Specialist Group.

I have advised Dr. Lucas of Dr. Salm's resignation, and given him the names of other people who have been suggested as group members. The members of the reconvened group will be formally contacted by Gren Lucas in due course.

The Sirenia Specialist Group is an extremely scattered group, the members of which keep in contact mainly through this newsletter. It is, therefore, important that as many of you as possible provide copy for every issue.

Quite a good number of sirenian researchers managed to meet at the last International Theriological Congress in Edmonton in

1985 on the occasion of the first Sirenia Workshop. The next ITC is in Rome in August 1989, and once again this conference will be used as the occasion for a meeting of as many IUCN Specialist Group Chairmen as possible. If a significant number of Sirenia Group members are planning to attend, we could also use it for a meeting of our Group.

I am wondering, however, if this is the most appropriate venue for such a meeting. It may be better to plan to meet at the Eighth Biennial Conference on the Biology of Marine Mammals in Asilomar, California in December 1989. What do you think? I would like to hear from as many of you as possible about this. Would it be timely to have another Sirenia workshop either immediately before or after this meeting? We need to make a decision soon as members will need to generate travel funds. - Helene Marsh

DEATH REPORTED

Luis S. Varona

La Habana, Cuba

LOCAL NEWS

AUSTRALIA

Satellite Tagging Update. - Six PTTs and one VHF transmitter were deployed on dugongs in Moreton Bay near Brisbane in June. We had extraordinary luck with the weather and hoop-netted and tagged seven dugongs in three days. The animals comprised three cows with attendant calves, an adult-sized female without a calf, an adult male, an immature male, and an immature female.

Unfortunately, we had yet more problems with the transmitters staying on. We had replaced a nylon fitting in the tailstock belt with stainless steel, which altered the properties of the corrodible link so that it corroded much more rapidly than previously. Four of the PTTs came off after only one month; the best stayed on for only 10 weeks. We have now tested yet another arrangement and plan to catch more animals in early October to redeploy the transmitters.

We did, however, gain some important information on dugong movements and habitat usage at this southern limit of the range in eastern Australia. In winter at this latitude, dugongs make the 20-km journey from their feeding grounds out into the warm eastern Australian current several times each week to escape temperatures of as low as 16.5 degrees C.

This information is particularly relevant to the boundaries of a proposed marine park in this area and to the future of a proposed oil pipeline. We also obtained detailed information on the dugongs' use of their feeding grounds; they tended to favor areas of amazingly sparse seagrasses of delicate species such as Halophila. - Helene Marsh and Tony Preen

Are Dugongs Rare and Endangered in Australia? - As we have not confirmed whether any dugong population is increasing, decreasing, or stable, I do not know the answer to the second half of this question. However, the dugong population estimates obtained using standardized techniques certainly indicate that there are substantially more dugongs in Australian waters than previously supposed. This is very encouraging, as I consider all these estimates to be conservative because of the conservative correction factor used to compensate for the number of dugongs which are not visible due to water turbidity.

We are now in a position to integrate the results of several surveys. Peter Bayliss estimates that there are 13,800 dugongs along the northern coast of the Northern Territory, and 16,800 along the western coast of the Gulf of Carpentaria. I estimate that there are about 12,500 dugongs in Torres Strait and a further 12,000 in the Great Barrier Reef Marine Park. We have recently surveyed the remainder of the east coast of Queensland south of the GBRMP. The data are not yet analyzed, but the survey indicated that Hervey Bay is the best dugong area in Queensland south of Cape York. Still to be surveyed are the Queensland coast of the Gulf of Carpentaria, and the coast of Western Australia including Shark Bay. - Helene Marsh

Dugongs by Royal Appointment. - During their visit to the Great Barrier Reef Wonderland Aquarium in Townsville on October 4th, the Duke and Duchess of York were presented with a stuffed toy dugong for their baby daughter. "She'll love it", said the Duchess. - Helene Marsh

BRAZIL

Manatee Killing in Lake Tefé. - The upper Brazilian Amazon has experienced this year one of the driest years in at least three decades. The lowest water level, which occurred between 15 and 30 September, reached at least 1-2 meters below the average low water level. This variation in water level (amounting to some 14 meters over the course of the year) has exposed much of the aquatic fauna of the upper Amazon. Great numbers of the endangered fish Arapaima gigas, as well as many other fish species, were killed in the shallow varzea (floodplain) lakes in the area. The turtles (Podocnemis unifilis and P. sextuberculata) were trapped by the mud, making them an easy prey for fishermen. Caimans were also exposed to fishermen, but were not hunted because the abundance of fish in other areas of Amazonia at this season made their price low and unprofitable (in Brazilian Amazonia caimans are only hunted for their meat, not for their skins as in other areas of South America).

The most problematic situation, however, was that of the manatees (Trichechus inunguis), whose populations are known to be very low in Amazonia. With the abnormal decrease in the water level of Lake Tefé, the manatee population in this lake probably had to move to larger water bodies such as the Amazon, perhaps in search of food, and had to pass through a very narrow and shallow channel in front of the city of Tefé, where fishermen waited for their prey. During the three days we were in Tefé (23-25

September), at least eight manatees were killed in this way. The only IBDF [Brazilian Institute for Forestry Development, the agency responsible for manatee protection] agent in Tefé couldn´t do much, and police have been requested from the Manaus office to enforce the law against killing manatees. As of now, however [20 October], the water level has started to rise again. - José Márcio Ayres (Museu Paraense Emílio Goeldi, Belém, Brazil)

[EDITOR´S COMMENT: The manatee mortality described above has also presumably taken place in other Amazonian lakes, judging by reports of similar events in past dry years. It is quite possible that this season´s slaughter might have amounted to several hundred manatees.

In this connection, Buddy Powell suggests the idea of seeking a source of emergency funds to hire extra game wardens and defray other expenses of rescuing sirenians in similar situations in the future. Obviously a rapid response on very short notice would be required, and the logistical and administrative difficulties would be formidable. (In the case of the Amazon, for example, teams of several men each, with nets and boats, would need to be stationed at each of several major lakes for a period of several weeks or months.) But perhaps this is something the Sirenia Specialist Group should consider. Please share your thoughts and reactions with us.]

ECUADOR

Marine Mammal Foundation Formed. - Students and professionals in Guayaquil interested in marine mammal science and conservation have established the Fundacion Ecuatoriana para el Estudio de Mamiferos Marinos. The goals of the new organization are to promote scientific study and conservation of whales, dolphins, and manatees and to help develop awareness of marine mammal issues in Ecuador through educational activities. The foundation´s president, Ms. Mariuxi Prieto, can be contacted at FEMM, Casilla 6637, Guayaquil, Ecuador. (From Newsletter of the Cetacean Specialist Group, No. 4, Aug. 1988.)

FLORIDA

Mortality Update. - The most significant threat to Florida´s manatee population continues to be an apparent increase in mortality. Despite a decade of educational programs, public awareness campaigns, and law enforcement efforts, manatee mortality, particularly human-caused mortality, appears to be on the rise. In 1987, there were 117 verified manatee deaths in the southeastern United States, 48 of which were known to be human-related. Cause of death was not determinable in 23 cases. Collisions with boats and barges continues to be the greatest known cause; 39 manatees died from collisions in 1987, the highest yearly total ever. In 1988, there have been 114 verified deaths through September; 38 of these were killed by boats or barges.

Another mortality factor in Florida is crushing or drowning in flood gates or canal locks. Mortality from this source had

decreased in recent years as a result of changes made in the operation of the flood gates. However, the operational changes apparently were not sufficient in one case. A single flood gate in south Florida has been responsible for the deaths of seven manatees since November 1987. Further operational modifications have been made at this gate in hopes of alleviating the problem.

While the vast majority of human-related manatee deaths in Florida are accidental, occasional poaching still occurs. An adult manatee was shot and butchered near Everglades National Park in 1987, and the skinned hide of a subadult was found in the Little Manatee River in September 1988.

Not all increases in mortality can be directly attributed to man. Perinatal mortality, which comprises the deaths of all manatees less than 150 cm long that were not obviously killed by human factors, also has been increasing. Through September there have been 28 of these cases, approaching the record of 30 perinatal deaths in 1987. The cause of increases in this category is unclear, but is being studied. - R. Kipp Frohlich (Florida Dept. of Natural Resources)

New Document Available. - A new report by John E. Reynolds, III and Casey J. Gluckman entitled "Protection of West Indian Manatees (Trichechus manatus) in Florida" is now available from the U.S. Marine Mammal Commission. The Commission contracted for the report and provided terms of reference for the study to help chart the future direction of manatee recovery efforts in Florida. Among other things, the report reviews progress since 1980 in developing the cooperative Federal-state-private manatee recovery program, assesses the status of the program and the most critical issues, and recommends future research and management priorities. The report was intended, in part, to help the Fish and Wildlife Service with its current efforts to update the 1980 Recovery Plan for West Indian manatees (see next item).

The report underscores two critical, interrelated issues: protecting essential manatee habitat and reducing collisions between manatees and boats. Specific recommendations are made regarding: 1) future research needs; 2) steps to acquire and protect essential habitat; 3) improving the extent to which decisions on permits for marinas and other developments in manatee habitat consider manatee protection; 4) strengthening enforcement of manatee protection laws; 5) continuing and expanding public education and awareness programs; and 6) providing overall direction to cooperative federal/state/private manatee recovery activities. The report is well organized and thorough, and provides perhaps the best overview available of the manatee recovery program in Florida. The authors offer thoughtful advice on what must be done to protect the species in that area.

A limited number of copies are available at no cost on a first come, first served basis, by writing to the Marine Mammal Commission at 1625 I Street, N.W., Room 307, Washington, D.C. 20006 USA. - David Laist

Revised Recovery Plan Nearing Completion. - The current draft of the newly revised West Indian (Florida) Manatee Recovery Plan will be released for public/technical/agency review on or

about November 1. When completed, it will constitute the official plan of action to be taken by U.S. governmental and private entities in order to bring about the recovery of the species from endangered status. This revision is the product of several months' work by a recently reconstituted Recovery Team, which comprises 15 members under the chairmanship of Glenn Carowan (U.S. Fish and Wildlife Service). After comments are received from the approximately 200 persons and agencies involved in this round of review, the plan will be finalized and copies made available to the general public sometime next spring.

The original West Indian Manatee Recovery Plan was completed in 1980, and was supplemented in 1982 by a more detailed Comprehensive Work Plan. A separate Recovery Plan for the population of Antillean manatees in Puerto Rico was drawn up in 1986. The present effort is designed to supersede the badly outdated 1980 and 1982 plans for the Florida manatee.

The revised Recovery Plan probably sets a new record for the number of governmental and private agencies and organizations that cooperated in its creation. These include the U.S. Fish and Wildlife Service; the U.S. Army Corps of Engineers; the Florida Departments of Community Affairs, Environmental Regulation, and Natural Resources; the Georgia Department of Natural Resources; the Florida Power and Light Company; the Marine Industries Association; Sea World Enterprises, Inc.; the Sierra Club; and the Save the Manatee Club. All these have played important parts in manatee conservation and in the current revision of the plan; most recently, the heads of these agencies met with the Recovery Team in Orlando on August 24. This broad involvement of diverse entities and interests has, indeed, characterized the manatee recovery effort in Florida for many years and has accounted for much of the success it has achieved.

The Recovery Team is very pleased with the current draft and feels that the final product will be well received by all concerned. - Glenn Carowan and DPD

Save The Manatee Club. - We are buying a boat to be used by the Florida Department of Natural Resources and the U.S. Fish and Wildlife Service for the manatee tracking program. We raised the money for a boat and trailer by asking our members to send us their green stamps. We are hoping to collect these stamps and eventually buy a second boat. We are also trying to raise over $25,000 for the Chassahowitzka National Wildlife Refuge for their manatee protection and conservation efforts.

In the future, research proposals submitted to the Club for amounts over $10,000 must be received no later than January 15 of each year if they are to be considered for the following fiscal year. Proposals can be submitted throughout the year; however, funds may already have been allocated. - Judith Delaney Vallee

New Biologist Joins Manatee Program. - Bruce B. Ackerman started work in September at the Florida Marine Research Institute, Florida Department of Natural Resources, St. Petersburg.

Bruce recently completed his Ph.D. at the University of Idaho, where his dissertation involved research on improving

helicopter survey censuses for mule deer through the use of observability correction factors and stratified sampling techniques. Before that, he received his M.S. at Utah State University, where he studied mountain lion ecology and energetics. He also has done research on habitat use by deer, elk, and moose in Idaho and Montana, and ecology and food habits of wild boar in Tennessee.

Bruce will be doing research to improve manatee aerial surveys and population estimates. Promising activities include coordinating a statewide winter aerial survey (the first since 1976), improving statistical aspects of aerial surveys in general, and developing better correction factors for observability bias in aerial surveys. The goal is to improve manatee population estimates and develop population models, and thus help in conservation of the species. - Florida Dept. of Natural Resources

INDIA

Recommendations on Dugong Management. - At the Symposium on Tropical Marine Living Resources held at Cochin, India in January, a number of recommendations for marine mammal management were accepted for further action. These were proposed in a paper by R. S. Lal Mohan entitled "Research needs for the better management of dolphin and dugong resources of India". The recommended actions that would affect dugongs included augmentation of studies of marine mammals, stricter enforcement of protective legislation, and establishment of a national marine mammal data center. (From Newsletter of the Cetacean Specialist Group, No. 4, Aug. 1988.)

MEXICO

Dynamiting and Dredging in Quintana Roo. - As a follow-up to our article in the last issue, Luz Colmenero reports that the joint American-Mexican gravel mining project planned by Vulcan Materials of Alabama has in fact begun. She states that "the quarrying will be carried out on the coast itself", and that 2000 hectares of tropical dry forest will be cleared. A deep-water port will also be dredged to ship the gravel to the U.S. These activities could have significant impacts on manatee habitat.

PANAMA

West Indian Manatee Distribution and Status. - Panama has more coastline bordering the Caribbean than any other Central American country. Until last year, however, systematic manatee distribution and status surveys including replicate overflights had not been conducted along this part of the Central American coast. In 1987 the Fundacion de Parques Nacionales y Medio Ambiente (Fundacion Pa.Na.M.A.) undertook such work with training and technical advice provided by the Sirenia Project in Gainesville. The Fundacion is a unique consortium of Panamanian environmental groups acting together to achieve common goals. To our knowledge formal reports on the project are not yet

available; the purpose of this account is to acquaint readers of Sirenews with the study. The work in Panama was carried out by Luis Mou Sue and David Chen Houlston under the direction of Camilo Grandi M. and Carol Lively of the Fundacion Pa.Na.M.A.; we helped out with the planning and with some of the extensive surveys.

Approximately 25 overflights of various areas were conducted on 2-4 days each month beginning in May 1987. Special attention was given to replicating flights over rivers and coastal waters of Bocas del Toro Province, with extensive surveys of nearly the entire Caribbean coast and some of the Panama Canal made by a joint Fundacion Pa.Na.M.A.-Sirenia Project team in October. Interview surveys and boat and ground reconnaissance trips were also conducted. Small numbers of manatees were consistently observed in certain rivers and lagoons of Bocas del Toro Province. Total numbers seen were low (averaging 1-2 per flight hour, including time over highly turbid water) but the proportion of calves (about 14%) was consistent with or greater than that seen in other parts of the range of T. manatus, and indicates the existence of a reproducing population in Bocas del Toro. No aerial sightings were made elsewhere in coastal Panama, and interviews suggest that only occasional wanderers may occur along the Caribbean coast outside of Bocas del Toro. Sighting reports suggest the continued existence of an inestimable but small number of manatees in the Panama Canal and Gatun Lake, but no evidence of manatees having ultimately reached the Pacific was discovered (see Montgomery et al., 1982, Mammalia 46(2): 257-258, and Sirenews No. 2, 1984).

Areas in Bocas del Toro where sightings were repeatedly made on replicate surveys were centered around large rivers and associated lagoons where very little human settlement exists. In Panama manatees seem to rely heavily on true grasses and freshwater macrophytes for food. Sightings in marine habitats were rare. Occasional illegal hunting may still occur, but did not seem to be widespread. Importantly, regulations intended for management of fisheries prohibit gill-netting in these rivers, and the incidental take of manatees in nets commonly noted in other countries was not reported. This may be a key to the persistence of the small surviving population of manatees in Bocas del Toro Province. Habitat utilized there is mostly undeveloped, but large increases in settlement are likely soon. Conservation plans limiting development and hunting along lower reaches of rivers in Bocas del Toro, and continued enforcement of net regulations, might allow this population to provide the nucleus for future recolonization of other suitable habitat in Panama and adjacent countries. - Tom O'Shea and Bob Bonde

The following abstract is of a paper presented at the annual meeting of the Society for Neuroscience, New Orleans, Louisiana, Nov. 16-21, 1987.

CORTICAL STRUCTURE IN FRONTAL REGIONS OF THE WEST INDIAN MANATEE (Trichechus manatus) R.L. Reep, J.I. Johnson, R.C. Switzer, W.I. Welker. Department of Neuroscience, University of Florida, Gainesville, FL 32610; Anatomy Department, Michigan State University, East Lansing, MI 48824; Department of Pathology, University of Tennessee, Knoxville, TN 37920; Department of Neurophysiology, University of Wisconsin, Madison, WI 53706.

Cortical architecture was examined in Nissl, myelin, AChE and cytochrome oxidase material from four brains. In general, the cortex exhibits a high degree of organization, with well defined laminae, robust cell densities, and a markedly striated layer VI.

In the pregenual region, the medial wall and ventromedial cortex are characterized by a prominent layer II that is compact and continuous, broad layer III, no granular layer IV, and large celled layer V with clear layer Vb. Proceeding from the midline onto the dorsolateral surface, layer II becomes progressively less distinct; layer V is thinner, contains smaller cells which are more sparsely distributed, and a less distinct Vb. There appears to be a granular layer IV which merges with the small pyramidal cells of layer III.

Ventrolaterally, the medial wall structure continues until the junction of the olfactory peduncle with the basal cortex. Dorsal to the shallow rhinal fissure, layer II becomes more irregular and a lamina dissecans is seen between poorly defined layers III and V. There is no visible claustrum or extreme capsule. Instead, distinct cell clusters (150-500um dia) become visible in layer VI, and extend dorsally into in an otherwise typical dorsolateral cortex. These clusters are spaced at fairly regular 500-1000um intervals. Likewise, a deeply situated AChE-positive band extends dorsally from the rhinal fissure, becoming fragmented and coextensive with the cell clusters seen in layer VI. Proceeding caudally, layer VI clusters are distributed continuously into progressively more dorsal cortical areas, until a prominent fissure is reached.

Dexler (1913, Gegenbaus morphol. Jahrbuch 45:97) first noted these cell clusters in the brains of the other extant Sirenian genus, Dugong, and termed them Rindenkern, or cortical nuclei. They may represent a fragmented claustrum or specializations peculiar to somatic sensory cortex.

Supported by Grant BSR-03687 from the National Science Foundation, and the cooperation of the Florida Department of Natural Resources, US Fish and Wildlife Service, and Sea World of Florida, Inc.

The following abstract is of a paper presented at the III. Reunion de Trabajo de Especialistas en Mamiferos Acuaticos de America del Sur, Montevideo, Uruguay, 25-30 July, 1988. It is here translated from the Portuguese.

Food Preferences of the Amazonian Manatee (Trichechus inunguis) in Captivity (I.G. Colares). - The manatee feeds on aquatic and semiaquatic plants. We studied the food preferences of captive Amazonian manatees. Four males and three females, marked on their heads with different colors, were used. They were offered 11 species of aquatic macrophytes, in equal quantities (3 kg wet weight each), placed in individual containers. They were fed in the morning and observed for 60 minutes each day for 16 days. The percentages of time (in minutes) spent feeding on each species were: Paspalum repens, 28.56%; Phaseolus pilosus, 12.18%; Echinochloa polystachya, 11.39%; Oryza grandiglumis, 9.93%; Pistia stratiotes, 9.17%; Salvinia auriculata, 8.10%; Neptunia oleracea, 3.32%; Ludwigia helminthorriza, 3.32%; Eichhornia crassipes, 3.07%; Utricularia foliosa, 1.45%; Scirpus cubensis, 0.54%. We observed a marked preference for P. repens. Analyzed by sex, males preferred P. repens and females did not show a clear preference. E. crassipes, cited by many authors as an occasional food of the manatee in its natural environment, was not significantly preferred by captive animals.

RECENT LITERATURE

Anonymous. 1988. Dugongs. Reef Note (Great Barrier Reef Marine Park Authority, Townsville): 1-4.

Assis, M.F.L., R.C. Best, R.M.S. Barros, and Y. Yonenaga-Yassuda. 1988. Cytogenetic study of Trichechus inunguis (Amazonian manatee). Rev. Brasil. Gen. 11(1): 41-50.

Beck, C., and D.J. Forrester. 1988. Helminths of the Florida manatee, Trichechus manatus latirostris, with a discussion and summary of the parasites of sirenians. Jour. Parasitology 74(4): 628-637.

Dailey, M.D., W. Vogelbein, and D.J. Forrester. 1988. Moniligerum blairi, new genus new species and Nudacotyle undicola, new species (Trematoda: Digenea) from the West Indian manatee, Trichechus manatus L. Syst. Parasitol. 11(2): 159-163.

Doig, F., and S. Dyson. 1988. Satellite tracking: a new direction for research. Austral. Nat. Hist. 22(10): 436-441.

Estes, J.A., and P.D. Steinberg. 1988. Predation, herbivory, and kelp evolution. Paleobiology 14(1): 19-36.

Flannery, T. 1988. Stuffed & pickled: treasures from the historic Australian Museum mammal collection. Austral. Nat. Hist. 22(10): 458-462. [Calls attention to a partial skeleton of Steller's sea cow which the Australian Museum obtained by exchange from Sweden in the last century.]

Hilmy, A.M., N.A. El-Domiaty, and M. Said. 1979. Measurements of some physiological parameters in the herbivorous dugong and the carnivorous common dolphin of the Red Sea. Bull. Inst. Oceanogr. Fish. Cairo 6: 197-203.

Janis, C.M., and M. Fortelius. 1988. On the means whereby mammals achieve increased functional durability of their dentitions, with special reference to limiting factors. Biol. Rev. 63: 197-230.

Johnson, J.I., W. Welker, and R.L. Reep. 1987. The motor nuclei of the cranial nerves in manatees, Trichechus manatus. [Abstr.] Anat. Rec. 218: 68A.

Kuroki, S., C.D. Schteingart, L.R. Hagley, B.I. Cohen, E.H. Mosbach, S.S. Rossi, A.F. Hofmann, N. Matoba, M. Une, T. Hoshita, and D.K. Odell. 1988. Bile salts of the West Indian manatee, Trichechus manatus latirostris: novel bile alcohol sulfates and absence of bile acids. Jour. Lipid Research 29: 509-522.

Langer, P. 1988. The mammalian herbivore stomach: comparative anatomy, function and evolution. Stuttgart & New York,

Gustav Fischer: xvii + 557. [Price US$175.00! The Sirenia are treated mainly on pp. 210-245, largely on the basis of original studies of T. manatus.]

McClenaghan, L.R., Jr., and T.J. O'Shea. 1988. Genetic variability in the Florida manatee (Trichechus manatus). J. Mamm. 69(3): 481-488.

McKenna, M.C. 1987. Molecular and morphological analysis of high-level mammalian interrelationships. In: C. Patterson (ed.), Molecules and morphology in evolution: conflict or compromise? Cambridge Univ. Press: 55-93.

Marsh, H. 1988. An ecological basis for dugong conservation in Australia. In: M.L. Augee (ed.), Marine mammals of Australasia: field biology and captive management. Sydney, Royal Zool. Soc. of New South Wales: 9-21.

Moncharmont Zei, M., and U. Moncharmont. 1987. Il Metaxytherium medium (Desmarest) 1822 (Sirenia, Mammalia) delle arenarie tortoniane (Miocene sup.) di S. Domenica di Ricardi (Catanzaro, Italia). Mem. Sci. Geol. (Univ. Padova) 39: 285-341.

O'Shea, T.J. 1988. The past, present, and future of manatees in the southeastern United States: realities, misunderstandings, and enigmas. In: R.R. Odom, K.A. Riddleberger, and J.C. Ozier (eds.), Proc. Third Southeastern Nongame and Endangered Wildlife Symposium. Georgia Dept. Natural Resources: 184-204.

Provancha, J.A., and M.J. Provancha. 1988. Long-term trends in abundance and distribution of manatees (Trichechus manatus) in the northern Banana River, Brevard County, Florida. Mar. Mamm. Sci. 4(4): 323-338.

Qiu Y.-x. 1985. [On management of the manatee.] Chinese Wildlife 1985(5): 35-36. [In Chinese.]

Qiu Y.-x. 1988. [The growth of a calf of the manatee (Trichechus manatus).] Chinese Jour. Zool. 23(2): 36-37. [In Chinese.]

Rathbun, G.B., R.L. Brownell, Jr., K. Ralls, and J. Engbring. 1988. Status of dugongs in waters around Palau. Mar. Mamm. Sci. 4(3): 265-270.

Reynolds, J.E., III, and C.J. Gluckman. 1988. Protection of West Indian manatees (Trichechus manatus) in Florida. Contract report to the U.S. Marine Mammal Commission: xii + 85. [See news item in this issue under Florida.]

Thenius, E., G.B. Rathbun, F. Kurt, and B. Grzimek. 1987. Seekühe. In: Grzimeks Enzyklopädie: Säugetiere. Munich, Kindler Verlag: 522-535.

Whitten, A.J., M. Mustafa, and G.S. Henderson. 1987. The ecology of Sulawesi. Yogyakarta (Indonesia), Gadjah Mada University Press: xxi + 777. [Dugongs mentioned principally on pp. 207-210.]

CHANGES OF ADDRESS

Glenn A. Carowan, Jr., Manatee Coordinator, U.S. Fish & Wildlife Service, Jacksonville Field Station, 3100 University Blvd. South, Suite 120, Jacksonville, Fla. 32216 USA

Jose A. Ottenwalder, Director, Dept. of Zoology, Research & Conservation, Parque Zoologico Nacional, Apartado Postal 2449, Santo Domingo, DOMINICAN REPUBLIC

Earl Possardt, U.S. Fish & Wildlife Service, Jacksonville Field Station, 3100 University Blvd. South, Suite 120, Jacksonville, Fla. 32216 USA

Tony Preen, CSIRO Marine Laboratory, Cleveland, 4163, AUSTRALIA

Judith Delaney Vallee, Save the Manatee Club, 500 N. Maitland Ave., Suite #210, Maitland, Fla. 32751 USA

>>> COPY DEADLINE FOR NEXT ISSUE: APRIL 1, 1989 <<<