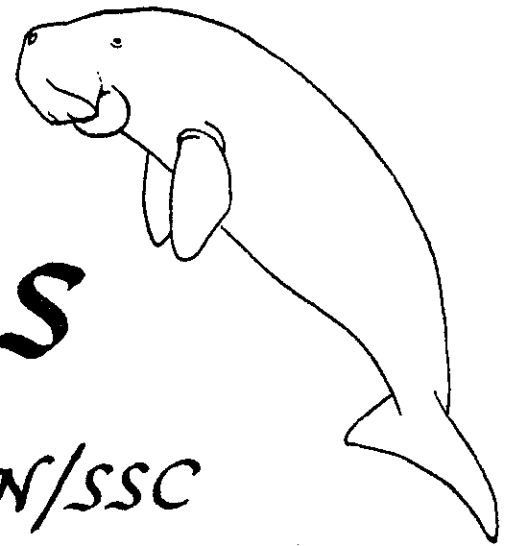


Sirenews



Newsletter of the IUCN/SSC Sirenia Specialist Group

NUMBER 14

OCTOBER 1990

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 - PROGRESS IN MANATEE AGE DETERMINATION (p. 15)

UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT
RIO DE JANEIRO, BRAZIL, 1992

A United Nations conference of potentially great significance to the environment will be held in Rio de Janeiro, June 1-12, 1992, coinciding with World Environment Day on June 5. This intergovernmental meeting, known as UNCED '92 or ECO '92, is being planned by an UNCED Preparatory Committee open to all member governments of the UN. Maurice Strong of Canada will serve as UNCED's Secretary-General. The UNCED Secretariat, with a staff of about 40, is located in Geneva with additional small units in New York and Nairobi.

The Preparatory Committee has two open-ended working groups, which seek to arrive in 1992 at "specific agreements and commitments by Governments and international organizations for defined activities on environment and development, specifying targets and timetables and providing the basis for concrete action plans." Issues to be dealt with by Working Group 1 include, among others, conservation of biological diversity; those of Working Group 2 include protection of seas and coastal areas and their living resources.



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.

The Preparatory Committee held its first substantive session in Nairobi in August 1990; three further substantive sessions are scheduled (in Geneva, Mar. 18-Apr. 5 and Aug. 12-30, 1991, and in New York in early 1992). Documents approved at these sessions can be obtained directly from UNCED's offices in Geneva or from the Centre for Our Common Future (Palais Wilson, 52 rue des Paquis, CH-1201 Geneva; tel. 022-732-7117, telex 27910 ch, FAX 022-738-5046). The UNCED Secretariat has also set up a series of read-only electronic "conferences" or databases where the most important documents in preparation for UNCED will be posted for reading and downloading. These are called EN.UNCED.UPDATE, EN.UNCED.GENERAL, and some related ones not yet on line. They are accessible through any of the Association for Progressive Communications electronic networks (Alternex, Econet/Peacenet, The Web, GreenNet, Nicarao, FredsNaetet, Pegasus).

National preparatory processes, resulting in the development of national reports, are also to occur in all countries under guidelines adopted by the Preparatory Committee. There is also a series of regional meetings: regional conferences for Africa, Europe, and Asia and the Pacific have already been held, a further Asia-Pacific meeting is planned for February 1991, and meetings for Latin America and the Caribbean and for Western Asia are also planned for early 1991. A fund has been established by the UN to help the least developed countries participate in the preparatory process.

A significant feature of the UNCED planning process is the provision for participation by "Independent Sectors." These include non-governmental organizations (NGOs) having consultative status with the UN, all environment and development NGOs, business and industry, trade unions, professional associations, scientific and academic institutions, women's organizations, youth groups, religious and spiritual groups, indigenous peoples' organizations, and other citizens' groups.

A parallel meeting of the "Independent Sectors" will be held in Rio at the same time as the main conference, and a series of other UN-sponsored events will take place throughout Brazil during 1992. These will include an official ceremony for heads of state and government in Manaus. The "Independent Sectors" also plan a wide range of preparatory, participatory, and follow-up activities.

Independent sector organizations wishing to become involved in the '92 process can obtain information from the Centre for Our Common Future, which has (among many other initiatives) begun to publish a monthly review of independent sectors' activities called Network '92. NGOs and individuals are already actively organizing in many countries (including Brazil and the U.S.) in order to have an impact on the UNCED process and to modify the conference themes proposed by the UN. For example, the proposed themes are widely viewed as presenting a fragmented picture of ecological and social issues; as omitting some important issues; and as improperly addressing topics such as the eradication of poverty as isolated issues rather than as general principles for guidance of discussion on all themes.

It is important to realize that action must be taken in the next few weeks and months if it is to have any effect on the

final outcome of UNCED. By June 1992 the conclusions of the process will have long since been effectively set in concrete. There is a need to ensure that the national reports now being formulated address the issues as appropriately as possible, and this will not be easy to achieve - especially in the U.S., where Administration policy remains completely and determinedly out of step with the views of most other governments on many crucial environmental issues. Readers of this newsletter, especially those in developing countries, now have a short-lived window of opportunity to get involved in the UNCED process and affect its outcome. People from all nations and all walks of life need to mobilize on an unprecedented scale, and send their governments to Brazil with the weight of global public expectation on their shoulders. Only this will make the difference between holding just another indecisive, time-wasting intergovernmental ritual, or moving the world measurably toward a sustainable future. - DPD

NEW ADDRESS, PHONE, AND FAX NUMBERS

Please note the new addresses and numbers listed at the end of this issue - especially those for the manatee project in Manaus, Brazil, and for Sirenews.

Also note that, although most issues of Sirenews are mailed in franked envelopes generously provided by the U.S. Fish and Wildlife Service lab in Gainesville, Florida, they are produced in and mailed from Washington, D.C. All Sirenews correspondence should therefore be directed to Washington and not Gainesville.

RESEARCH FUNDS AVAILABLE

The Foundation for Field Research is looking for marine mammal field projects to support. Grants to researchers range from US\$1,000 to \$25,000, and are derived from share-of-cost contributions by volunteer participants on the research teams. Contact them at P.O. Box 2010, Alpine, Calif. 92001-0020 USA; telephone 619-445-9264.

LETTER

To Sirenews:

The editor of Sirenews has recently proposed the slogan, "Never underestimate a sirenian". I suggest something else, a reminder which could be tucked away for ready retrieval. My slogan is, "Never overestimate an artist." I'm stimulated to propose this bit of graffiti as a result of too-frequent encounters with misrepresentations (or worse) of sirenian morphology. To date I know of only one artist, a delightful Britisher named Hubert Pepper, who has produced a reasonably accurate dugong representation.

The latest in the many offenses that lie behind this complaint appears in The Pilot (the Newsletter of the UNEP Marine Mammal Action Plan) [No. 4, 1989, p. 13]. A reproduction of a

Vanuatu postage stamp purports to represent a dugong mother and calf. Mother dugong's muzzle and mouth are truly remarkable, strongly reminiscent of those of a St. Bernard dog. The partial view of junior's pectoral is quite manatee-like. The latter brings to mind two occasions when I have picked up coffee-table books of Australian mammals in which the impressive "dugong" closeup showed an unmistakable West Indian manatee.

Perhaps I'm oversensitive, having to routinely explain to laymen (and even fellow mammalogists) that dugongs and manatees are, taxonomically, as different as dogs and cats, or sheep and goats.

That brings up another pet peeve which is relevant here. Steller described the pectorals of Hydrodamalis gigas as terminating in hoof-like, bristle-covered pads with which the animals maintained position on surf-washed rocks while cropping kelp. I've yet to see an illustration portraying this feature (as opposed to manatee or dugong-like flippers). Rise up, sirenologists! Let's help them get things right!

Paul Anderson

[EDITOR'S COMMENT: A reconstruction of Hydrodamalis, done by artist Dugald Stermer under my direction, appeared in Oceans 13(5): 10-11, 1980. It attempted to show the flipper correctly. A new poster by Pieter Folkens, also with my advice, seeks to improve the depiction further. However, we'll probably never know if we've got it exactly right.]

LOCAL NEWS

AUSTRALIA

Changes to Fishing Regulations in Southern Queensland. - Ever since the introduction of monofilament nylon nets, there has been concern all over the world about the impact of gill nets on marine mammals, including dugongs. The only region in Australia where management measures have been specifically introduced to minimize this problem is the Great Barrier Reef Marine Park, where some important dugong areas have been closed to commercial fishing. This response is understandably very unpopular with fishermen.

In the last few years, there have been several well-publicized incidents of animals drowning in commercial gill nets set in Hervey Bay in southeast Queensland. This is the most important area for dugongs in Queensland south of Cape York, and the area where fisheries and dugongs are most likely to overlap. Most of the incidents have occurred in the winter, when seasonal concentrations of dugongs apparently occurred in the same areas as similar concentrations of commercial fish, particularly school mackerel. The numbers of dugongs drowned in some such incidents are high. For example, the local Fisheries Patrol Officer informed me that at least seven and up to 14 dugongs drowned in a net in August 1986. The toll from this incident is greater than the number of dugongs caught by many remote Aboriginal

communities in a year.

The impact of commercial gill netting on dugong stocks in southern Queensland is unknown. However, this mortality is of concern to urban Aborigines and Islanders, who understandably resent their hunting being restricted when little has been done about the problem of incidental capture of dugongs in gill nets. This mortality is also used by recreational fishermen opposed to commercial gill netting in an effort to close this fishery.

The commercial gill net fishermen who regularly operate in southwestern Hervey Bay have reacted to this public opposition by using their local knowledge to develop strategies to minimize the chances of dugongs tangling in their nets. These strategies have been supported by the Queensland Fish Management Authority, who have changed the regulations governing the fishery in key dugong areas in Hervey Bay: (1) the specifications of offshore set gill or drift nets have been changed to increase the chances of dugongs escaping from the nets if incidentally captured; (2) each master fisherman can set only one net and must remain at that net at all times to increase the chances of dugongs being released alive after accidental capture; (3) netting has been banned between 4pm and 4am in the months of July, August, and September to reduce the chances of incidental capture.

If successful, this approach may be a model for some other areas, especially those from which it is impracticable to ban commercial fishing. - Helene Marsh

Dugong Pelvic Bones are Sexually Dimorphic. - During a visit to Townsville this past summer, I had the opportunity to study the large collection of dugong skeletal material that has been assembled by the James Cook University dugong project and that is now kept at the Townsville branch of the Queensland Museum. Thanks to the voluminous and detailed data associated with this unparalleled collection, it was possible to demonstrate for the first time that dugong pelvic bones do vary systematically with sex and, to some degree, age. I studied pelvic bones of 70 dugongs (41 males, 29 females), most of which had previously been aged by Marsh and her coworkers using growth layers in tusks. I constructed a dichotomous key that was 93% accurate in placing a given specimen in a category consistent with what was known of its sex, age, and sexual maturity.

This information should prove useful to those needing to extract data on sex and sexual maturity from dugong carcasses, especially when condition of the carcass precludes use of more direct indicators. It may also prove useful, by analogy, in sexing skeletons of extinct dugongids. A paper reporting the results of this study has been submitted for publication in Marine Mammal Science. Data will be welcome on whether pelvic variation in other parts of the range of Dugong dugon conforms to the pattern here documented for Queensland. - DPD

Dugongs Do Not Use Their Tusks For Feeding. - Also in the course of my visit to Townsville, I was able to examine stomach content samples from many of the dugongs in the James Cook University collection, as well as ones collected by Brydget Hudson and her coworkers in Papua New Guinea. As far as I could

determine, there was no difference between males and females in the amounts of seagrass rhizomes ingested (as opposed to leaves), nor did adult males appear to have eaten larger rhizomes than females. This suggests that the erupted tusks of males are not used in feeding (specifically, to harvest rhizomes more effectively than can females), and hence that previous workers have been correct in assuming that the sexually dimorphic tusks of dugongs are used only in social interactions.

There is, however, no evidence that extinct dugongids were similarly dimorphic, and I am in the process of testing the hypothesis that many of these forms did use their tusks to feed on seagrass rhizomes [see abstract in this issue]. As one such test, I used plastic casts of four different kinds of fossil dugongid tusks, plus an actual Dugong tusk, as digging tools to extract rhizomes by hand from seagrass beds at two sites in northern Queensland. With the help of Helene Marsh's statistical wizardry, I was able to demonstrate that, whereas size and shape of tusk are irrelevant to ability to excavate rhizomes of Cymodocea and Halodule, longer and more bladelike tusks are significantly better when the task is excavation of the larger, tougher, and more deeply buried Thalassia. This corroborates the hypothesis, and may help to explain how three, four, five, or even more species of dugongids were able to coexist sympatrically in the Caribbean region during the Miocene.

I also conferred with Tony Preen at James Cook University, and visited Janet Lanyon at Monash University in Melbourne. Both have gathered voluminous and diverse data on dugong feeding ecology for their nearly-completed doctoral dissertations, and I venture to predict that we are on the threshold of a significant new synthesis in our understanding of this topic. I thank Helene and Janet for their generous hospitality and help in making my Australian visit highly productive as well as enjoyable. - DPD

Dugong "Nose Valves". - In the letter above, I unburdened myself of my frustration with artists' dugong renditions. Here I'd like to point, more briefly, to a frequent misconception regarding dugong anatomy (one of which I suspect I've been guilty in the past). On the basis of superficial observation one can easily conclude that on submergence, dugong nostrils are closed by an anteriorly attached flap, and this erroneous impression has crept into the popular literature. The true situation is quite different. The openings are actually closed by means of cushion-like pads in the floors of the nostrils. It appears that in the relaxed position the floor of the passage is elevated so that this pad blocks the opening, and that exhalation and inhalation require muscular retraction of the floor to open the air passage (see Domning, 1978, Acta Amazonica 8, Supl. 1, p. 57). It's an eminently sensible sirenian invention. - Paul Anderson

COLOMBIA

New Amazonian Manatee Project Planned. - Antonio Villa L. reports that the Colombian natural resources service is planning a program for the conservation, research, and reproduction of the Amazonian manatee. They are also trying to interest local people

in the work and educate them about manatees. Some research facilities and related projects are already in existence at the Amacayacu National Park. This park, which comprises 3,000 square kilometers and was gazetted in 1975, is located in the most southern territory of Colombia, in close contact with human populations along the Amazonas and Putumayo rivers, where manatees were abundant in the past.

The project's planners are looking for help with references, suggestions, and comments. The contact address is: J. Antonio Villa L., Jefe, Parque Nacional Amacayacu, INDERENA, Apdo. Aereo 006, Leticia, Colombia.

FLORIDA

Creative Justice Dept. - A boater caught speeding in a manatee protection zone has been sentenced to 32 hours of shouting warnings to other boaters along the Withlacoochee River.

"It seemed a common-sense solution to a problem," Citrus County Judge Gary Graham said of the sentence he gave Al L. Porter on June 19, 1990. Porter, working his community service under the Florida Marine Patrol, will stand on the banks of the Withlacoochee and holler to speeding boaters to slow down. The judge waived a fine and withheld a finding of guilt for Porter, 19, of Sebastian Inlet on Florida's east coast, but ordered him to carry a personal message to boaters on the Withlacoochee in west-central Florida.

"If they have to come back for four or five weekends and work to solve the problem they are creating, it will stick in their minds," the judge added. "We've got manatee zones designed to protect the manatee and they are just not working. The manatees continue to be killed." - Associated Press

The following information is excerpted from a recent report of the Marine Mammals Section, Florida Department of Natural Resources.

Manatee Mortality. - As of the end of September, manatee mortality in Florida in 1990 has soared to 176, already exceeding the total mortality for all of last year by ten animals. Practically all of the increase over 1989, however, is due to last winter's heavy cold-related mortality; mortality from other causes is tracking about evenly with the 1989 rates. Nonetheless, it's getting much harder to be uplifting as we continue to experience new records in mortality.

Manatee Salvage/Research. - The emphasis of the salvage program over the last several months has been to achieve a higher standard of performance. There have been several significant positive changes. We have capitalized on the initially inconvenient circumstance whereby the Kissimmee Diagnostic Laboratory abruptly discontinued its involvement in salvage. This necessitated planning for construction of a centrally located necropsy facility using funds from the U.S. Fish and Wildlife Service (USFWS). A site for this facility is being secured, and much of the scientific equipment for it has already been

purchased. Ground-breaking is expected later this fall. Also integral to the operation of a central necropsy facility is a network of refrigerated trailers to transport carcasses; these have been designed by Section staff and will be engineered and manufactured by a national company.

Research funding for collaborative projects on the pathogenesis of clostridial organisms and genetic relationships of captive manatees has been committed. A request for proposals on manatee acoustic research is in preparation. Dr. Scott Wright is supervising the research project of a student at the University of Central Florida concerning the microanatomy and dynamics of the manatee thyroid gland. He is collaborating with Dr. Greg Bossart (Miami Seaquarium) on the relationship of circulating levels of thyroxine and the immunohistochemical staining of the thyroid in manatees. Dr. Wright is working with Mote Marine Laboratory to establish the incidence of pulmonary anthracosis.

Geographic Information System. - The GIS has been extensively used to create maps that accurately represent the proposed manatee protection zone boundaries. Protection zone maps are used along with maps showing manatee distribution as observed during aerial surveys and locations of dead animals for display during public hearings. The maps are also used by management staff reviewing water-related projects to determine potential impacts to manatees.

In September, new digital base maps were received which bring GIS coverage to the entire Florida shoreline with the exception of Monroe County and Lake Okeechobee. These two missing pieces should be received from the National Ecology Research Center by late October. The available base maps have been provided to other governmental GIS users including the USFWS, Everglades National Park, Florida Department of Environmental Regulation, and numerous county governments. Digitized aerial survey data sets, along with mortality data through 1989, have also been distributed to agencies for their use in protection plans and permit reviews.

The Marine Resources GIS (MRGIS), of which the Marine Mammal Section GIS is a part, has purchased a new computer system which will replace the outdated system purchased in 1982. The SUN fileserver and associated workstations will run at speeds up to 15 million instructions per second, provide at least 4 billion bytes of on-line data, and have graphic resolution four times that of microcomputers currently used by Section personnel. The Section has purchased a workstation to act as the Marine Mammals node into the MRGIS via an Ethernet network. By the end of 1991, each marine mammals researcher and manager should have access to the MRGIS through a menu-driven system on the network. Until the network is complete, the Section's GIS personnel will continue to provide both researchers and managers with data and maps required to publish scientific papers and effect public presentations.

Population Assessment and Aerial Surveys. - Plans are underway for the Synoptic Survey, a statewide aerial survey of manatees to be conducted twice between December 15, 1990 and

March 15, 1991, after major cold fronts. These surveys must be conducted under specific weather conditions to be meaningful. Each survey will require about 25 airplane days and 50 observer days of effort.

Twice-monthly aerial surveys are currently being conducted to count manatees and dolphins in Tampa Bay and Collier County. Another aerial survey is set to begin in St. Lucie and Martin counties. Three cooperatively funded manatee aerial surveys are also ongoing or starting up in Cocoa Beach, Palm Beach County, and Everglades National Park. An aerial survey of endangered right whales on their calving grounds off northeast Florida will be conducted in the coming winter.

Plans are underway for an assessment of visibility bias in John Reynolds' winter aerial survey of manatees at power plants in cooperation with the USFWS and Eckerd College. The objectives of the research are to estimate the reliability of power plant aerial counts and to establish a population index that can be used to determine whether the population is rising or falling. The percentage of satellite- and radio-tagged animals seen during aerial surveys will be used to estimate what percent of all manatees present at the warm water discharges is observed.

USFWS satellite telemetry locations have been processed and added to our GIS system, for data obtained between December 1986 and June 1989. These data are being used as an additional indicator of manatee distribution for the development of manatee protection zones and to better predict what weather conditions will optimize aerial counts at power plants.

Passive Integrated Transponder (PIT) Tags. - A research project to investigate the potential to permanently mark manatees using PIT tags has recently been initiated. PIT tags are minute glass-encased microchips which have no power source of their own. An external power source called a scanner "reads" the tag's unique 12-digit identification code when passed close to the injection site. Tags will be injected under the dermis, at two sites on each animal. The first phase of the project is being conducted on fresh manatee carcasses to determine the best site and the best method of injection. Work on this phase began in late August. The second phase will be directed toward animals in captivity, with two animals being tagged initially at Homosassa Springs Nature World, Sea World, and Epcot. Epcot Living Seas contributed \$6,000 toward this research. Ultimately, this project should facilitate obtaining an accurate population estimate once it is applied to the wild population over several years.

Telemetry. - A three-year west coast telemetry project will be begun in February 1991 by tagging up to five manatees at the warm water discharges of power plants in Tampa Bay with assistance from the USFWS Sirenia Project. Up to 90 manatees have been counted at the Bay's thermal refuges in winter, but aerial survey counts indicate that more than half leave in the non-winter seasons. While aerial surveys have been used to map the distribution of animals throughout the Bay, the telemetry study should provide additional data on daily movements, migratory pathways, and reactions of tagged animals to boating traffic.

Staff for the telemetry project will be working with Sirenia Project personnel this fall to assemble transmitters and build belts necessary for tag attachment. Telemetry project staff and staff members from Tequesta and Jacksonville will also assist in tracking manatees tagged on the east coast by the Sirenia Project.

Manatee Protection Zones. - Manatee protection zones in Collier and Brevard counties were adopted in June by the Governor and Cabinet. Public hearings have been conducted on the zones in Palm Beach and Martin counties; these zones will be presented for adoption at the November 15 meeting of the Governor and Cabinet. The next rules to be drafted will contain the zones for Dade, Broward, and Duval counties.

Protection in the vicinity of the Ft. Pierce power plant has recently been increased to year-round status. Sign posting projects are planned or in progress in the Banana River and in Brevard, Palm Beach, and Martin counties. The Florida Inland Navigation District (FIND) was directed by the Legislature to take over from the Department of Natural Resources the sign-posting activities for the 13 key manatee counties. FIND's fiscal year started on October 1, with \$700,000 budgeted for the sign-posting projects.

INDONESIA

New Dugong Project in the Moluccas. - In April 1990 a project was initiated on dugong management and conservation in the Maluku Province, Indonesia. The project is a cooperative one between the Environmental Study Centre of the Pattimura University (UNPATTI) at Ambon and the Foundation Aid Environment at Amsterdam; it is financed by the Commission of the European Economic Community. Participating Dutch research institutions are the Centre for Environmental Studies of the Leiden University and the Research Institute for Nature Management at Texel.

The major objectives of the program are to implement a research and monitoring program on dugong populations and their habitat in selected project areas in the Maluku Province and to train UNPATTI staff in research methodology.

Since virtually no research on dugongs has been carried out in Indonesia, and very little information is available for the Maluku Province, the project had to start with a very meager data base.

Initially the eastern part of the Aru Archipelago had been selected as the major area for field studies. Nishiwaki and Marsh referred in 1985 to the Aru Islands as an area where "toward the end of 1979 dugongs were apparently still very numerous". This information was based on reports provided by Salm in 1984 and Compost in 1980, based in turn on a field survey during 1979.

However, since the visit by Compost in 1979 no more studies were reported from Aru. This lack of information is partly due to the remoteness of the Aru Archipelago and the logistical constraints on the implementation of major studies in such an area.

Compost, who spent two months on Aru, made mention of a

serious threat to dugong populations from the increasing use of shark nets in shallow coastal areas. Based on interviews with local informants, he estimated an annual catch of approximately 1,000 animals in the main fishing zones.

A project team visited eastern Aru during April 1990 and selected a suitable site for further research on the eastern side of Kobroor Island, near the village of Balatan. Based on interviews with local fishermen in seven villages and actual observations of dugong catches, the estimated catch for eastern Kobroor, in 1989, amounted to 20-40 dugongs. Compost estimated in 1979 an annual catch of 80-200 dugongs for the fishing zone of East Kobroor (Mairiri and surroundings), indicating a significant decline in the annual catches in this area.

Although Compost reported in 1980 that harpooning of dugongs by specialized dugong hunters was still common in the area, the team observed in 1990 that this method had been abolished. Local villagers stated that the major reasons for this were depleted dugong stocks and the increasing importance of pearl oyster diving and shark netting as major sources of income.

Dugongs were mainly reported as an accidental side catch in the shark nets. However, dugong meat was still a favored commodity, and dugong tusks and ribs were still traded for the manufacture of cigarette holders, as reported by Compost in 1980.

A detailed analysis of dugong catches in the village of Balatan from 1975 onwards revealed that harpooning was a major cause of dugong mortality until 1981; thereafter shark nets contributed almost exclusively to dugong catches. Incidentally, dugong catches were reported in tidal traps (sero) made from wooden fences and placed close to the mangrove fringe.

Based on this analysis, it is concluded that shark netting is the major cause of dugong mortality in the project area of eastern Kobroor.

Within the framework of the project, a plan was drafted for further studies in the project area. It was, however, decided that, due to the archipelago's remoteness, only part of the program would be implemented in Aru. Since the project team found feeding tracks of dugongs in several intertidal seagrass meadows of Halodule uninervis and Cymodocea rotundata during an additional field survey in coastal areas of Ambon, Saparua, Hairuku, and Nusa Laut, it was decided to focus part of the program on the area of Ambon and adjacent islands.

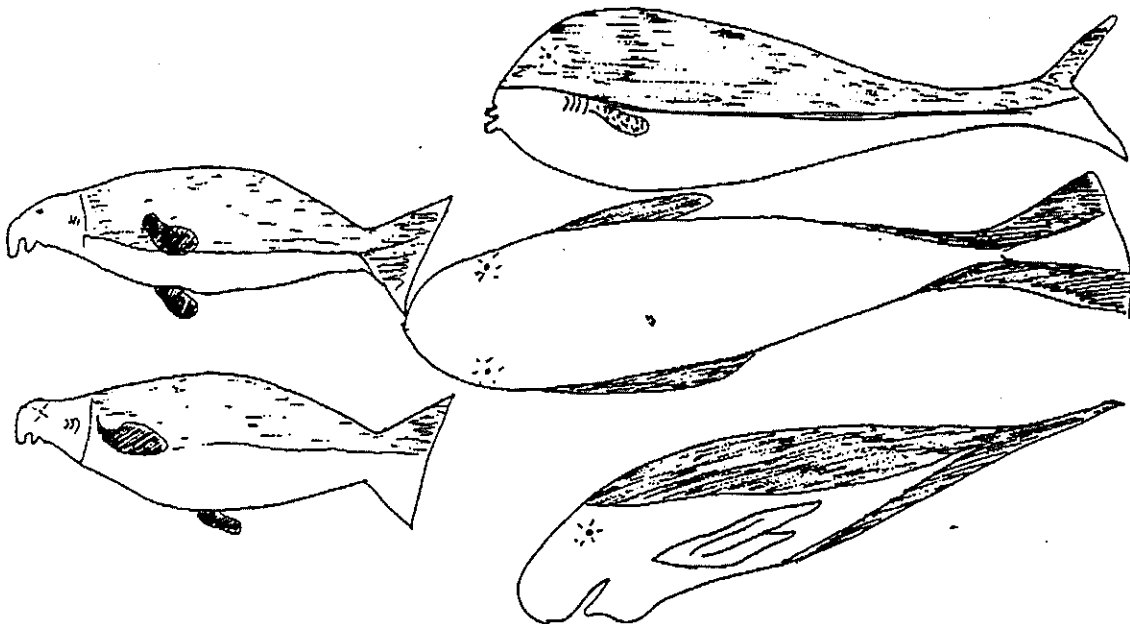
Since April 1990, a field station in Aru has been permanently staffed by scientists and students of UNPATTI, whereas Dutch students and scientists of the Leiden University and the Research Institute for Nature Management participate in the research programs in both Ambon and Aru.

A major theme in the study is the seagrass-dugong relationship. The team investigates in particular the carrying capacity of littoral seagrass meadows, recolonization of feeding tracks, biomass and growth of rhizomes and shoots, and dugong distribution. However, since scientific information on dugongs is very scarce in Indonesia, the project also covers dugong catch statistics, dugong aerial surveys, processing of recovered dugong carcasses, dugong field observations (an observation tower was constructed at Aru), dugong behavior, and habitat mapping. Apart

from biological and ecological aspects, the program gives particular attention to the socioeconomic aspects. Project funds have been allocated to give support for an improved community water supply and school facilities in the village of Balatan.

A public awareness and information campaign is in preparation, to inform local villagers about the importance of dugong conservation. So far in Indonesia, no particular conservation measures have been proposed or implemented with respect to dugong populations. The team concluded in this respect that the recently established Aru Tenggara National Marine Park does include limited areas suitable as dugong habitat. The project should, therefore, eventually lead to recommendations on the designation of appropriate conservation zones. - Hans de Iongh

School Children and Dugongs. - In order to obtain more information about the dugong, but from another angle, the pupils in a number of classes in Koijabi (Aru) were asked to make drawings of the animal, which could also be used as an interesting basis for a discussion with them. We expected that the drawings would give an indication of the familiarity of the children with the animal. (On Aru there are no pictures, books or posters showing the animal.) The teacher, a man from Kei, though clearly instructed about the aim of the exercise, wanted his pupils to make a good impression. He presented his image of the animal to the children first, though it was obvious that he had never clearly observed the dugong. He drew one like a fish. Some of the drawings of the pupils, however, clearly show a good image of the animal. Interesting in particular were some drawings showing a kind of "evolution" from the teacher's fish to the real animal [see illustration below].



All children had seen dugongs a number of times, even though in Koijabi some animals might be caught, dragged ashore and consumed without being noticed. About 15 children (out of 48) informed us that their father had ever caught a dugong, while all of them (except for the boys of the Chinese shopkeeper) had eaten dugong meat. Attempts to learn frequencies of dugong catches or consumption from the children proved to be very difficult and did not result in very clear answers. - Gerard Persoon

MADAGASCAR

Madagascar has signed a treaty with Japan which opens several sensitive dugong habitats to the Japanese [fishing] nets. It may spell the end for an already severely depleted [dugong] stock in the Antongil and Ile Ste. Marie areas of eastern Madagascar. - Pieter Folkens

PUERTO RICO

Stranding Network Established. - Antonio A. Mignucci Giannoni reports that a Red Caribena de Varamientos (Caribbean Stranding Network) has been created in Puerto Rico to assess mortality of and to rescue and rehabilitate stranded, sick or injured manatees, dolphins, whales, and sea turtles. Participants in the Network are found so far in six Caribbean countries (Puerto Rico, U.S. Virgin Islands, British Virgin Islands, Dominican Republic, Colombia, and Venezuela), and more will be added as the organizers approach other countries for traineeship and cooperative agreements. The Network's address is: Red Caribena de Varamientos, c/o Departamento de Ciencias Marinas, Universidad de Puerto Rico, RUM, Apartado 908, Lajas, Puerto Rico 00667-0908.

In order to attend emergency cases of sick or injured animals, a 24-hour-a-day phone pager has been established. The number is (809) 782-8686, pager unit 124-3565.

WEST AFRICA

Manatee Surveys. - Buddy Powell, now based in Cameroon, reports that he conducted some brief manatee surveys this past spring in Guinea-Bissau and Senegal, where the governments are hoping to set up some reserves and management programs for manatees.

"The most interesting area", says Buddy, "was the Bijagos Archipelago, which lies off the coast of Guinea-Bissau. There are about 50 islands and only 19 are inhabited. The outermost is about 40 miles offshore. It appears that all of the larger islands have manatees. Orango Island seems to have the largest population. On Orango there is very little hunting pressure. However, on Formosa Island, where there also appear to be quite a few manatees, Senegalese fishermen build platforms near freshwater seeps where they can harpoon the manatees when they come to drink from the springs. On a 2 km stretch of river I counted six platforms. It was at the end of the dry season, so only one seep was still flowing. I tested it with a salinity

RECENT LITERATURE

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