MARINE TURTLE NEWSLETTER

IUCN/SSC

Marine Turtle Newsletter

No. 17 FEBRUARY 1981

Editor: N. Mrosovsky

Departments of Zoology
and Psychology
University of Toronto
Toronto, Ontario
M5S 1A1 Canada

Editorial Advisors:

P.C.H. Pritchard
Harold F. Hirth

RECENT PAPERS

Bachère E. Undated. Recherches hématologiques chez la tortue marine, Chelonia mydas (L.) en élevage. Collection Travaux et Documents, No 3 UER Sciences, 179 pp. Centre Universitaire de la Réunion (in French). Order from: Centre Universitaire de la Réunion, Laboratoire de Physiologie animale, BP 5, 97490 St. Clotilde, France. Cost: 20,00 FF plus postage, surface 50,00 FF, air 83,00 FF. Make cheques payable to: Agent Comptable de Centre Universitaire de la Réunion, Account HHO OHO No 1, 97HOO St. Denis, France.

Balazs, G.H. 1980. Synopsis of biological data on the green turtle in the Hawaiian Islands. NOAA Technical Memorandum NMFS, 141 pp. G.H. Balazs, Hawaii Institute of Marine Biology, P.O.Box 1346, Kaneohe, Hawaii, 96744 U.S.A.

Bickham, J.W., Bjorndal, K.A., Haiduk, M.W. and Rainey, W.E. 1980. The karyotype and chromosomal banding patterns of the green turtle (Chelonia mydas). Copeia, 3, 540-543. J.W. Bickham, Department of Wildlife and Fisheries Sciences, Texas A & M University, College Station, Texas, U.S.A.

Bjorndal, K.A. 1980. Nutrition and grazing behavior of the green turtle Chelonia mydas. Marine Biology 56, 147-154. K.A. Bjorndal, Department of Zoology, University of Florida, Gainesville, Florida 32611 U.S.A.

Bjorndal, K.A. 1980. Demography of the breeding population of the green turtle, Chelonia mydas, at Tortuguero, Costa Rica. Copeia, 3, 525-530. K.A. Bjorndal, Department of Zoology, University of Florida, Gainesville, Florida 32611 U.S.A.

Brooks, D.R. and Frazier, J. 1980. New host and locality for Kathlania leptura (Rudolphi) (Nematoda: Oxyurata: Kathlanidae). Proc. Helminthol. Soc. Wash. 47, 267-268. (nematodes found in olive ridley) D.R. Brooks, Department of Zoology, University of British Columbia, 2075 Westbrook Mall, Vancouver, British Columbia, Canada V6T 1W5.

Fletemeyer, J. 1980. The leatherback; turtle without a shell. Sea Frontiers, Sept-Oct, 302-305. (Preliminary data on following hatchlings out to sea.) J. Fletemeyer, Ocean Sciences Department, Nova University, 8000 N. Ocean Drive, Dania, Florida, 33304 U.S.A.

Frazier, J.G. 1980. Sea-turtle faces extinction in India: Crying 'wolf' or saving sea-turtles? Environmental Conservation 7, 239-240. J.G. Frazier, Department of Zoological Research, National Zoological Park, Smithsonian Institution, Washington, D.C. 20008, U.S.A.

Kowarsky, J. and M. Capelle. 1979. Returns of pond-reared juvenile green turtles tagged and released in Torres Strait, Northern Australia. Biol. Conserv. 15, 207-214. J. Kowarsky, Dept. of Biology, Capricornia Institute of Advanced Education MS76, Rockhampton, Q. 4700 Australia.

Lebeau, A., G. Biais, J.L. Durand and B. Gobert. 1979. La tortue verte Chelonia mydas (LINNE) des Îles de Tromelin et d'Europa (Océan Indien): peuplement et reproduction. (in French, short English abstract) A. Lebeau, c/o S.O.M.D.I.A.A. 15 Rue Croix-des-Petits-Champs, 75021 Paris, Cedex 01, France.

Limpus, C.J. and J.D. Miller. 1980. Potential problems in artificial incubation of turtle eggs. Herpetofauna 12, 23-24. C.J. Limpus, National Parks and Wildlife Service, Pallarenda Townsville 4180, Australia.

N. Mrosovsky and C.L. Yntema. 1980. Temperature dependence of sexual differentiation in sea turtles: implications for conservation practices. Biol. Conserv. 18, 271-280. N. Mrosovsky, Department of Zoology, University of Toronto, M5S 1A1 Canada.

Pickett, J. and S. Townson. 1980. Political problems for the Cayman Turtle Farm: which way conservation? British Herpetological Society Bulletin, No 1 18-20. J. Pickett, c/o British Herpetological Society, Zoological Society of London, Regent's Park, London NW1, U.K.

Ross, J.P. 1980. Hawksbill turtle Eretomochelys imbricata in the Sultanate of Oman. Biol. Conserv. 19, 19-106. J.P. Ross, Museum of Comparative Zoology, Harvard University, Cambridge, Mass. 02138 U.S.A.

Stancyk, S.E., O.R. Talbert and J.M. Dean. 1980. Nesting activity of the loggerhead turtle Caretta caretta in South Carolina, II. Protection of nests from raccoon predation by transplantation. Biol. Conserv. 18, 289-298. S.E. Stancyk, Belle W. Baruch Institute for Marine Biology and Coastal Research, Columbia, South Carolina, 29208 U.S.A.

Townson, S. 1980. Observations and notes on the captive breeding of the green sea turtle (Chelonia mydas) on Grand Cayman, British West Indies. British Herpetological Society Bulletin, No 1, 11-17. S. Townson, c/o British Herpetological Society, Zoological Society of London, Regent's Park, London NW1, U.K.

IUCN MARINE TURTLE SPECIALIST GROUP

(The following list of members has been submitted to the newsletter by the Chairman and Agenda Officer of the group.)

Dr. Archie Carr (Chairman), Department of Zoology, University of Florida, Gainesville, Florida 32611, U.S.A.
Mr. George H. Balazs (Deputy Chairman), Hawaii Institute of Marine Biology, P.O.Box 1346, Kaneohe, Hawaii 96744 U.S.A.
Ms. Anne B. Meylan (Agenda Officer), Department of Zoology, University of Florida, Gainesville, Florida 32611 U.S.A.
Mr. S. Bhaskar, c/o S.C. Buch, A 1/3 3rd Main Road, Besant Nagar, Madras 600 090, India.
Dr. Karen Bjorndal, Department of Zoology, University of Florida, Gainesville, Florida 32611 U.S.A.
Dr. Leo D. Brongersma, Rijksmuseum van Natuurlijke Historie, Raamsteeg 2, Postbus 9517, 2300 RA Leiden, The Netherlands.
Dr. David Ehrenfeld, Cook College, Rutgers University, Department of Horticulture and Forestry, P.O.Box 231, New Brunswick, New Jersey 08903 U.S.A.
Dr. Jacques Fretey, Reptiles et Poissons, Museum National d'Historie Naturelle, 57 Rue Cuvier 75005, Paris, France.
Dr. Harold F. Hirth, Department of Biology, University of Utah, Salt Lake City, Utah 84112 U.S.A.
Dr. Huang Chu-chien, Peking Institute of Zoology, Academia Sinica, Peking, China.
Dr. George R. Hughes, Natal Parks Board, P.O. Box 662, Pietermaritzburg 3200, South Africa.
Mr. Colin J. Limpus, National Park & Wildlife Service, Pallarenda, Townsville QLD 4810, Australia.
Biol. Rene Marquez Millan, Instituto Nacional de Pesca, Apdo. Postal 79-052, Mexico 7 DF, Mexico.
Dr. Edward O. Moll, Department of Zoology, Eastern Illinois University, Charleston, Illinois 61920 U.S.A.
Ms. Jeanne A. Mortimer, Department of Zoology, University of Florida, Gainesville, Florida 32611 U.S.A.
Dr. Nicholas Mrosovsky, Department of Zoology, University of Toronto, Toronto, M5S 1A1 Canada. (Temporary address until 8/81: Department of Zoology (ABRG) S. Parks Road, University of Oxford, England OX1 3PS).
Mr. Larry Ogren, National Marine Fisheries Service, Panama City Laboratory, 3500 Delwood Beach Road, Panama City, Florida 32407 U.S.A.
Dr. John Parmenter, Department of Biology, Capricornia Institute of Advanced Education, Rockhampton, Queensland, 4700, Australia.
Dr. N.V.C. Polunin, The Zoological Laboratory, University of Cambridge, Downing Street, Cambridge CB2 3EJ, U.K.
Dr. Peter C.H. Pritchard, Florida Audubon Society, P.O. Drawer 7, Maitland, Florida 32751 U.S.A.
Dr. J.P. Ross, Division of Reptiles & Amphibians, Museum of Comparative Zoology, Cambridge, Massachusetts 02138 U.S.A.
Dr. Joop P. Schulz, WORP 3, 7419 AB, Deventer, Netherlands.
Mr. G.S. de Silva, Turtle Islands National Park, P.O. Box 768, Sandakan, Sabah, Malaysia.
Mr. Siow Kuan Tow, Pengarah Perikanan, Pejabat Pengarah, Kuala Trengganu, Malaysia.

Ms. Sylvia Spring, Department of Lands & Environment, P.O. Box 2585, Konedobu, Papua New Guinea.
Mr. Njoman Sumertha Nuitja, Faculty of Fisheries, Bogor Agricultural University, Bogor, West Java, Indonesia. (Temporary address until 3/81. c/o Dr. I. Uchida, Himeji City Aquarium, Tegarayama, Himeji City 670, Japan.)
Dr. Ismu Sutanto Suwelo, Universitas Nasional, Fakultas Biologi, Jalan Kalilio 17-19 Tilp. 364957, Jakarta, Indonesia.
Dr. Itaru Uchida, Director, Himeji City Aquarium, Tegarayama, Himeji City, 670, Japan.

PELAGIC FEEDING HABITS OF TURTLES IN THE EASTERN PACIFIC

In the course of analyzing field notes of J.R. Slevin made during the expedition of the California Academy of Sciences (CAS) to Galapagos 1905-1906, I discovered a reference to two specimens of loggerheads (later confirmed as Lepidochelys olivacea by examining specimens at CAS) captured in the vicinity of Galapagos which contained fish eggs in the stomachs. According to Slevin, a female captured 25nm south of Isla Espanola 11 June 1906 had the stomach and intestine filled with fish eggs which showed no sign of digestion. A female collected 175 nm south of Isla Espanola on 18 June 1906 was also found to have the stomach filled with fish eggs. Slevin provided no other description of the eggs.

On 8 March 1980 I was present when two Lepidochelys olivacea and one Chelonia mydas captured approximately 40nm offshore from Manta, Provincia Manabi, Ecuador were butchered. The stomachs and intestines of the Lepidochelys were nearly empty, except for a brown to greenish brown liquid and few clumps of medusae. The stomach of the Chelonia contained an estimated 0.75-1.0 liters of fish eggs. The eggs were approximately 1-2mm in diameter and in large clumps. Some clumps were attached to small pieces of sargassum, but the volume of the fish eggs exceeded that of the sargassum by 10:1. Although the eggs appeared to have been attached to the sargassum prior to ingestion, the sargassum appears to have been ingested incidental to the fish eggs rather than the opposite situation expected from a turtle considered to be predominately an herbivore. The green turtle was probably an immature female and had a curved carapace length of 71cm. The fisherman that caught these and other turtles captured them on hooks suspended near the surface and baited with a small fish locally known as gato. They reported that both species of marine turtle (Lepidochelys and Chelonia) were often caught on hooks at a distance of 1-2 hours from shore by outboard launch. According to the fisherman who butchered the turtles, the eggs were those of the aguja (needlefish). A sample of the eggs removed from the green turtles was examined by E. Peter H. Wilkens, National Marine Fisheries Service, Southeastern Fisheries Center, Galveston Laboratory. According to Wilkens the eggs are most likely those of halfbeaks (Exocoetidae) or needlefishes (Belonidae). The size of the eggs, the number and placement of the filaments most closely resemble descriptions of halfbeak eggs.

In December 1979 Ms. Coppelia Hays recounted having observed fish eggs in the stomach of an immature green turtle from Peruvian waters. Hays was informed by a local fisheries biologist that the eggs were from flying fish, a close relative of the halfbeak.

The significance of marine turtles feeding on clumps of fish eggs in pelagic situations is as yet unclear. However such a food item offers a potentially important nutritional source to immature or nonreproductive individuals.

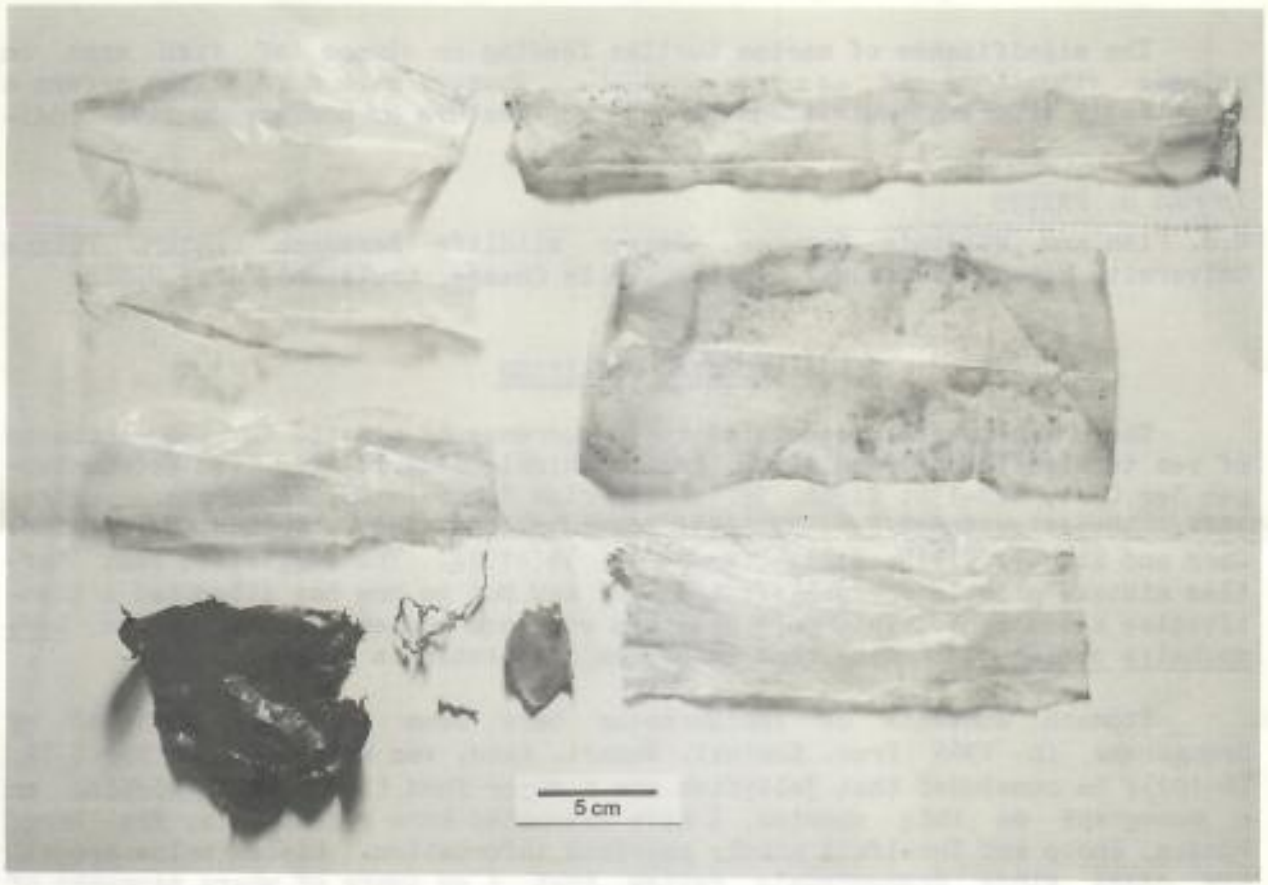
THOMAS H. FRITTS
U.S. Fish and Wildlife Service, Denver Wildlife Research Center, Tulane University Museum of Natural History, Belle Chasse, Louisiana 70037 U.S.A.

PLASTIC JELLYFISH

There are several reports of the occurrence of plastic in the stomachs of sea turtles (Brongersma, 1968, Proc. Koninkl. Nederl. Akad. van Wetenschappen Ser C 71, 128-136; Hirth, 1971, Fisheries Synopsis 85, FAO, Rome; Hughes, 1974, Investigational Rep. 35 & 36, Oceanogr. Res. Inst., Durban, S. Africa; Carr and Stancyk, 1975, Biol. Conserv. 8, 161-172). The suggestion that turtles mistake plastic for jellyfish is not new but no one has attempted a quantitative assessment. This note presents evidence on leatherback turtles, Dermochelys coriacea, showing that ingestion of plastic is common.

Stomach contents of leatherbacks have been admirably reviewed by Brongersma in 1969 (Proc. Koninkl. Nederl. Akad. van Wetenschappen Ser C 72, 76-102); he concluded that jellyfish are a major food item. While working on a monograph on this species, I have assembled more recent data; Drs. Marx, Rhodin, Shoop and Threlfall kindly provided information. Listed below are all the cases since Brongersma's review that I am aware of where stomachs of leatherbacks have been examined, excluding data from a juvenile (Brongersma, 1970, Proc. Koninkl. Nederl, Akad, van Wetenschappen, Ser C 73, 323-335) and from an adult found dead on the beach in French Guiana (Mrosovsky and Pritchard, unpublished). Of course some reports may have been missed and other dissections may have gone unreported. Nevertheless the sample is sufficient to show that the eating of plastic is not just a rarity: 7 out of 16 cases, that is 44% of the leatherbacks examined had plastic (or cellophane) in their stomachs.

With plastic, or cellophane (other stomach contents not listed here).
cellophane sandwich bag (Marx H. pers. comm. 1970)
plastic bags, specimen De 49bis (Brongersma, 1972, Zool. Verhand. 121)
heavy plastic sheet, 3 x 4 m (Hughes, 1974, op.cit.)
several pieces of plastic (Rhodin, A.G.J. pers. comm. 1980; see Figure 1)
plastic and plastic spoon (Rhodin, A.G.J. pers. comm. 1980; see Fig. 1)
small pieces of plastic (Rhodin, A.G.J. pers. comm. 1980)
pieces of plastic bags (Duguy et al. 1980, Ann. Soc. Sci. Nat. Charente-Maritime 6, 681-691)



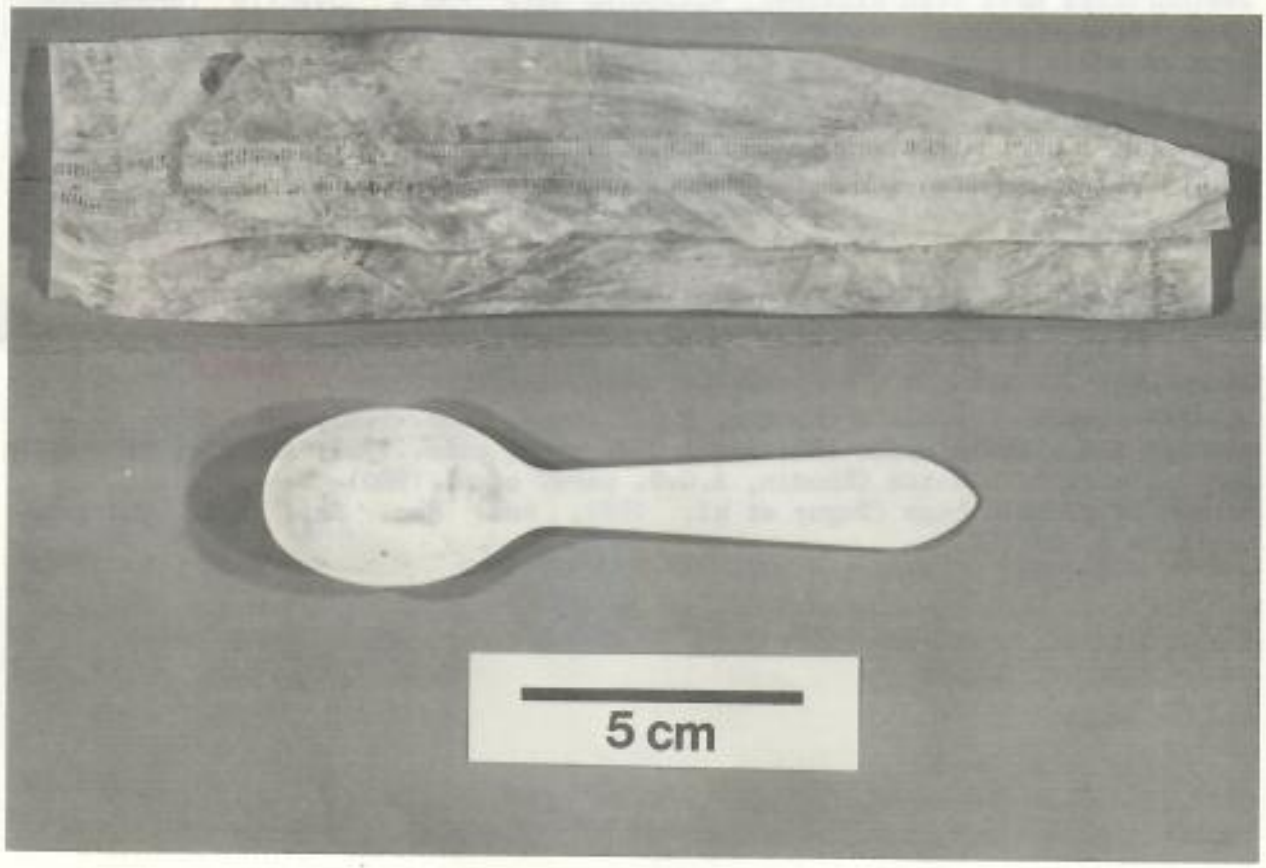


Figure 1: Plastic from stomachs of 2 leatherback turtles.

Without plastic (other stomach contents not listed here)
Montoya, A.E. (pers. comm. to Pritchard, 1971, IUCN Monogr. 1, Switzerland)
specimen De 63bis in Brongersma (1972, op. cit.)
2 cases, Glüsing (1973, Salamandra, 9, 77-80)
2 cases, Threlfall, W. (pers. comm. 1979)
2 cases, Shoop, C.R. (pers. comm. 1979, 1980)
Duguy et al. (1980, op. cit.)

For a number of animals the immediate cause of death was becoming entangled in fishing lines; death cannot be attributed directly to the plastic. However, in one case the plastic was so large, 3 x 4 m (Hughes, 1974, op. cit.) and in another (Duguy et al. 1980 op. cit.) the turtle was in such an emaciated state with stomach pathology consistent with an obstruction, that it seems highly probable that the plastic had been harmful. Even the smaller amounts of plastic in the other cases could have made the turtles less healthy by decreasing absorption from the gut.

On the basis of the data given, 44% of adult non-breeding leatherbacks have plastic in their stomachs. An animal that can gulp down a Portuguese man-of-war does not necessarily survive eating an inert plastic bag.

N. MROSOVSKY
Departments of Zoology and Psychology, University of Toronto, Toronto, M5S 1A1, Canada. (temporary address: Department of Zoology, ABRG, South Parks Road, Oxford, U.K.).

Note added in proof. A recent article reports that 7 out of 8 leatherbacks found in the summer months near La Rochelle, France, had swallowed plastic (Duron, M & Duron, P. 1980. Courrier de la Nature 69, 37-41).

KEMP'S RIDLEY: THE 1980 SEASON AT RANCHO NUEVO

(based on information presented by P.C.H. Pritchard and R. Marquez at a meeting of the Mexus Gulf Sea Turtle Working Group, 15-16 October 1980, Tampico, Mexico.)

Studies and patrols at Rancho Nuevo took place from April 16 to August 8, 1980. A few nests were made before the arrival of the Team in April; the last recorded nesting took place on July 24, and the largest single day's nesting (120 nests) was June 15. About 1,000 nests were laid, a significant percentage of them unusually far to the north where they were only discovered by aerial reconnaissance. About 100-130 nests were lost to poachers. Other difficulties this year included the extreme drought conditions that probably reduced the hatching percentage in the nest corral, and hurricane Allen, that flooded the hatchery late in the season and destroyed 80 nests. However, 37,378 hatchlings were successfully released at Rancho Nuevo, and an additional 3,000 eggs were flown to Padre Island for incubation. The hatching rate of the Padre Island eggs was, as usual, very high -- about 84%.

TURTLE PARK IN BALI

(from the Indonesian Nature and Science Newsletter, 1980,15,6-7)

A special Turtle Park is going to be developed this year and will be improved as a recreation site in that island. In order to develop the area, the local government there has set aside a special fund of about 7 million rupiahs. The Head of Fishery Research there, Ir. Anak Agung Gde Harmoni recently said that the improvement of the turtle park has two main aspects. Beside being a recreation site, the park will also be developed as a breeding site for animal protein in Bali. As is well-known the meat of the sea turtle is also eaten by the people here. Every year a number of turtles are caught and sold in the markets. They are caught in the West Nusa Tenggara waters, East Nusa Tenggara and Madura waters. Besides being a source of food the turtle meat is used in some traditional ceremonies there.

Support for this newsletter came from H.C. Mittag, Dr. J. Mittag, the University of Toronto and World Wildlife Fund Canada.

Marine Turtle Newsletter

No. 18 JULY 1981

Editor: N. Mrosovsky

Departments of Zoology
and Psychology
University of Toronto
Toronto, Ontario
M5S 1A1 Canada

Editorial Advisors:

P.C.H. Pritchard
Harold F. Hirth

EDITORIAL

With characteristic flair and good luck, Peter Pritchard and his colleagues have discovered vast aggregations of leatherbacks along the west coast of Mexico. Although it was known before that leatherbacks nested there (Marquez, R. 1976, Ser. Informacion INP/SI i83, Instituto Nacional de Pesca, Mexico; Marquez, R., Villanueva, A. and Peñaflores C., ms), the extent of this population was only revealed by Pritchard's aerial survey, Oct. 31-Nov. 1, 1980. According to his estimates (ms submitted) about 30,000 females come ashore each year between Maruata in Michoacan and Ixtepec in Oaxaca. These estimates involve guess work and should be debated when the details are available but even if revised downward, they still mean that more than double the number of leatherbacks exist in the world today than was thought previously.

This is wonderful news. But it has a darker side: many nesting leatherbacks are being killed. Some 50 carcasses were seen on the beach at Bahia Potosi alone. There were 18 at Piedra de Tlacoyunque. Killing leatherbacks there has been going on for some time: in 1978 I found 9 carcasses on part of the beach at Tlacoyunque and 4 were noted by Pritchard in 1971 (IUCN Monograph, No. 1, 1971). This slaughter is probably already making an impact because in the aerial survey track density was less on beaches where there were most carcasses.

Killing breeding female leatherbacks is poor biology and poor economics. The reason is simple: the leatherback takes a long time to mature but once mature lays many eggs. The value of the meat and eggs can be compared directly in monetary terms in places where they are both eaten. At Piedra de Tlacoyunque in 1978 I was told that meat sold for around 60 pesos per kilo and the eggs for 8 pesos each. From these figures one can calculate how many times a turtle must lay for the value of the eggs to exceed that of the meat:

Data	Basis for assumptions and comments.
Value of Meat	
Carapace length = 147 cm	Mean over the curve measure for Tierra Colorada (n = 13, Mrosovsky and Marquez, unpublished)
Weight = 295 kg	Pritchard (1971, IUCN Monograph No. 1) reported that a leatherback with a 149 cm carapace weighed 295 kg. Since his measure was straight line, it is not likely a 147 cm over the curve leatherback would weigh more.
Weight of meat = 103.2 kg	Rebel (1974, Sea Turtles, University of Miami Press) states that the "flesh of a green turtle, including the muscles, constitutes about 40% of the body weight." At the Cayman Turtle Farm a 100-150 kg green turtle yields about 20% steak (Wood, J. pers. comm.). The latter figure may be more accurate but a leatherback with a less bony carapace and plastron and on a less rich diet probably has more of its weight as meat -------- at a guess 35%.
Price of meat = 60 pesos/kg	As reported by people at Tlacoyunque, 1978.
Value of meat = 6192 pesos	
Value of Eggs	
Clutch size = 70	Mean for Tierra Colorada (n = 11, Mrosovsky, unpublished).
Cost per egg = 8 pesos	As reported by people at Tlacoyunque, 1978.
Value of 1 clutch = 560 pesos	
Number of times a leatherback has to lay for the value of the eggs to exceed the value of the meat	Assuming 1 clutch is collected when turtle is killed for meat.

$$= \frac{6192 + 560}{560} = 12.06$$

Number of breeding seasons a leatherback has to stay alive for the value of the eggs to exceed that of the meat

Assuming the average leatherback lays 6 times in a season. Even if it lays only 5 clutches/season, the figure is still close to 2.

= 2

There are reasons for thinking that most leatherbacks breed in more than one season. From 1970-1973 38.1-42.5% of females coming ashore at Trengganu, Malaysia, had been tagged in previous years (Hiew, W.P. ms. c. 1974). This figure is surely very conservative. It makes no allowance for shedding of tags, thought to be especially high by leatherbacks with their soft easily torn flippers. It does not do justice to multiple remigrations. Both the data from Trengganu, and the implausibility of an animal taking so many years to mature and then nesting in only one or two seasons, suggest that leatherbacks in Mexico would generate more revenue if left to lay their eggs rather than taken for their meat.

But for an individual on the beach a better strategy might be to take the meat while he can; he might not be the person who collected the eggs later on. For the community as a whole it would be better to harvest the eggs. Killing the adults is another case of the "tragedy of the commons" (Hardin, 1968, Science, 162, 1243), even more so when only a small part of the meat is taken as happens not infrequently (Pritchard, pers. comm.).

There are assumptions, of course, underlying these contentions. The calculations above should be refined in the light of additional data, redone in terms of protein values of meat and eggs, (cf. Hendrickson, 1958, Proc. Zol. Soc. Lond. 130, 455-535 for calculations for green turtles) adjusted to make allowances for interest earned if money from the meat was put into the bank and modified if the oil was used. Undoubtedly they can be improved. But what is remarkable is that such calculations are so seldom made, that so little thought is given to problems of resource use. Even some of the most basic facts are lacking. For instance, there are no figures on the amount of meat in a leatherback or its protein content. Such gaps in part reflect the preoccupation of conservationists with creating reserves rather than becoming involved in use of turtles as a valid conservation technique (Hughes, 1979, Marine Turtle Newsletter, No. 13, 13-14; Mrosovsky, 1979, Marine Turtle Newsletter, No. 13, 1-4; see also World Conservation Strategy, 1980, IUCN/WWF). It is not likely that 1000 kms of rugged coastline along the west of Mexico is about to become an effective sanctuary for the leatherback turtle. It is just conceivable that if people found they could earn more by collecting eggs than killing adults, and could be given a stake in the resource, then a community controlled harvesting scheme, combined with protection of the remaining eggs and tourism, might be feasible. Regulated but legal taking of leatherback eggs would be better than uncontrolled poaching of breeding females. Everyone, together, would be richer.

N.M.

OAXACA, 1980

From 10 September until 19 October 1980, I visited the turtle slaughter house in Oaxaca, Mexico, to collect material for an age determination study. PIOSA had been sold to PROPEMEX, a para-statal organization that processes and markets a variety of fishery products in Mexico (see Marine Turtle Newsletter 1978, No. 7, 1-4; 1979, No. 13, 10-13; and 1980, No. 16, 5 for discussions of PIOSA). The change in ownership did not evidently effect personnel, for the staff from the manager of the operation in Puerto Angel to the labourers in San Augustinillo were the same as the year before. Apparently the processing operation for turtles has had no major changes either. The packing plant in Puerto Angel has acquired some large shrimp sorting equipment, and there was talk that they would begin to branch out into other fishery products. The previous owner of PIOSA is said to be involved in tuna fishing, but it is not known if this is related.

Quotas for 1980, set by the Instituto Nacional de Pesca (INP) were 80% of those issued for 1979, and pertain only to Lepidochelys olivacea. No other species can be taken legally in Oaxaca. In 1980, on the recommendations of Dr. R. Marquez M. and the INP, a law was passed prohibiting the catch of turtles between Puerto Escondito and Puerto Angel, the main area of offshore concentration for the Escobilla arribada rookery. There were some delays and some misunderstandings in communication and implementing the law, but as of October several fishing cooperatives had been charged with infractions. The catch of turtles for leather and meat is thought by fishery personnel to be fairly well controlled.

As marine turtle meat can no longer be imported legally into the USA (Sr. Suarez, previous owner of PIOSA, has been charged by the U.S. Government with illegal importation), the meat is consumed within Mexico. It is exported from Puerto Angel to Mexico City and from there much of it is said to be distributed to Sonora where it is in great demand. Relatively little turtle meat seems to be eaten in Oaxaca. All of the skins are exported from Oaxaca. Egg poaching and black markets in turtle eggs continue to be a daunting national problem. In November the Departmento de Pesca apprehended a single consignment of some 60 thousand eggs. Concern for management and conservation is increasing in the public sector. An hour long television special devoted to problems of marine turtles in Mexico was shown in September, and despite some errors, it had considerable impact. There have also been several articles in local newspapers criticising the rate of exploitation.

Although the quota was lower than in 1979 and management practices are better controlled, the numbers slaughtered legally are still large. Oaxaca's October quota of 12,000 was filled to the last turtle. On many days 500 animals were killed, and although workers claimed that in earlier years two or three times this number were slaughtered daily, the sight of hundreds of dead turtles in a pile is dumbfounding. Considering that more than 90% of the catch is reproductive females, it is hard to understand how the population is maintaining itself. Indeed, whether or not the turtles are sustaining this level of exploitation is a moot point; it is common knowledge in the INP that at least three major populations of Lepidochelys olivacea from Pacific Mexico no longer produce arribadas, although there are no publications documenting this. Yet, arribadas still occur in Oaxaca, despite some totally inaccurate doomsday cries from the international media (e.g. IUCN Bulletin, June 1979,

p. 42). There were four arribadas at La Escobilla in 1980; unfortunately I did not arrive in Oaxaca until after the third, and although I waited for the last nesting, it did not occur until after I had left. Studies of Lic. C. Peñaflores S. indicated tens of thousands nesting in each of the arribadas in late July, late August, and early September. The fourth arribada occurred in early November, when the INP team was in Mexico at a meeting on turtles, so no estimates were made, but apparently this arribada was also large.

There is hope for more rigorous management of the Oaxaca population. The INP plans to increase its efficiency in monitoring populations, and major items of equipment (e.g., radios and vehicles) have been requisitioned. Senior personnel are hoping to spend more time in field work and research, and stricter fisheries regulations are being considered. Numerous university students are also involved in research on Lepidochelys including: temperature and sex determination, morphometrics, analysis of stomach contents, incubation boxes, and factors related to arribadas.

J. FRAZIER
Department of Zoological Research, National Zoological Park, Smithsonian Institution, Washington, D.C., 20008, USA.

STRANDED TURTLES: SOUTHERN USA HOTLINE NUMBERS

Information on stranded, beached, injured and marked turtles is wanted by various US government organizations. The following toll free telephone lines may be used:

Florida: 1-800-432-6404
Southeast US: 1-800-327-6545

For further information contact Daniel K. Odell, School of Marine and Atmospheric Science, University of Miami, 4600 Rickenbacker Causeway, Miami, Florida, 33149 USA.

LEATHERBACKS NESTING IN THE DOMINICAN REPUBLIC

Table 1 gives the results of a survey made in 1980 in the Dominican Republic (this should not be confused with Dominica, as was unfortunately done in a report of my survey in the Oryx, 1980, 15, 430-431). I estimate from interviews with inhabitants of the Dominican Republic that 300 leatherback turtles nest there each year.

Favoured beaches are those without offshore fringing reefs or human settlements. Nevertheless nearly all nesting adults and their eggs are taken for food.

Table 1. Estimated numbers of female leatherbacks nesting in the Dominican Republic.

Location	Informants' estimates: Nightly	Informants' estimates: Annual	Estimated Annual
Playa des Muertos	2-6	40-60*	40-120
Playa Macao	3-4	100	60-80
Playa San Luis	1-3	45	20-60
Playa des Aguilas	1-2	--	20-40
Miches - Cabo Engano (excluding concentrations above)	--	2-12*	20
Nagua - Cabo Samana	4	less than 100	80
			240
Dispersed other	--	--	60 (?)
TOTAL			300

* Range estimated by different informants.

J.P. ROSS
Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, 02138 USA.

TAMPA SYMPOSIUM PUBLISHED

The symposium on the "Behavioral and Reproductive Biology of Sea Turtles" held at Tampa, Florida, 27-30 December 1979, has been published in the American Zoologist, 1980 Vol. 2 No. 3. Copies may be obtained for $9 USA in the US and Canada and $10 USA for other countries from: The American Zoologist, Box 2739, California Lutheran College, Thousand Oaks, California, 91360 USA. There follows a list of contents and a comment.

1 Department of Biology, Texas A & M University, College Station, Texas, 77843 USA.

2 Departments of Zoology and Psychology, University of Toronto, Toronto M5S 1A1 Canada.

3 Department of Zoology, University of Florida, Gainesville, Florida, 32611 USA.

4 Cayman Turtle Farm Ltd., P.O. Box 645, Grand Cayman, B.W.I.

5 Department of Biology, University of Utah, Salt Lake City, Utah, 84112 USA.

6 Florida Department of Natural Resources, 100 Eighth Avenue SE, St. Petersburg, Florida, 33701 USA.

7 Department of Zoology, University of California, Berkeley, California, 94720 USA.

8 Physiological Research Laboratory, Scipps Institution of Oceanography, La Jolla, California, 92093 USA.

9 R.R. No. 4, Box 252 A, Rockville, Indiana, 47872 USA.

10 Department of Ecology and Evolutionary Biology, University of Arizona, Tuscon, Arizona, 85721 USA.

11 Florida Audubon Society, P.O. Drawer 7, Maitland, Florida, 32751 USA.

A VOICE FROM THE INDIAN OCEAN

I noted with satisfaction that the latest edition of the American Zoologist (1980, vol. 20(3)) is devoted to a symposium on the Behavioural and Reproductive Biology of Sea Turtles. This provides a satisfying illustration of how far the study of these important reptiles has come in the last twenty years, for despite the difficulties of studying animals that are only really available during their breeding season, we find a level of scientific expertise and originality that might be envied in those studying far more accessible creatures. In a world in which small groups of people are valiantly trying to persuade mankind that the conservation of natural resources should be our paramount concern, it is encouraging to find a wide ranging group of biologists whose work is in the forefront of this movement. Sadly the world conservation movement so often finds it difficult to reconcile emotional involvement with animals, with the equally urgent need to manage natural populations to the benefit of both man and other living organisms. In this connection it is interesting to note that some of the most interesting information on features like age at sexual maturity comes from a captive colony of green turtles (Chelonia mydas) located at the Cayman Turtle Farm Ltd.

Marine turtles are closely associated with oceanic islands of the West Indies, the Pacific and the Indian Ocean, and not surprisingly the greatest problem faced by these populations is increased hunting pressures from rapidly increasing human populations and the pressures on their breeding beaches from building developments aimed at tourism. It is interesting here to note that although endemic giant tortoise populations on the islands of the Indian Ocean were exterminated within one hundred years of their settlement, the sea turtle populations have not faced a similar fate in these regions until the present century, pressures on turtle stocks being far more closely related to human population increase than great advances in the technology employed in their capture.

Large land mammals with long generation times have been lost from all the major continents since the arrival or evolution of man. Their slow turnover times (expressed as the production/biomass ratio) are quite unable to cope with even low levels of harvesting. Giant tortoise species located on widely separated groups of oceanic islands have suffered a similar fate, and all these events may be shown to coincide with the arrival of human settlers. Indeed at the present time the only surviving populations are on the Galapagos Islands (c 10,000 animals) and Aldabra Atoll (c 150,000 animals) where thick vegetation overlying a coarse and eroded coral terrain in the latter has probably been the major factor in their survival.

Aldabra lies 150 miles slightly west of the northern tip of Madagascar. This large (35 km. long) and relatively undisturbed coral atoll has been the centre of a detailed scientific programme which was initiated in the late 1960's by the Royal Society in London, following the decision of the British Government to abandon plans to build a strategic air base on the atoll. A paramount theme of this research has been an investigation of the ecology of the giant tortoise (Geochelone gigantea) which has to date studied their population dynamics, movement, reproduction, feeding and tortoise vegetation interactions. Perhaps the most interesting discovery is that the tortoise population on Grande Terre is food limited, and that the shortage of nutrients results in the production of only 5 eggs per nest against up to 15 eggs per

nest on the nearby Isle Malabar where a population of only 2000 tortoises is located.

Although in terms of the total number of turtles nesting in the Indian Ocean, the estimate of 700 green turtles nesting between May 1975 and April 1976 on Aldabra is quite small compared with the huge numbers found on Europa and Tromelin, the undisturbed nature of Aldabra and its quite rigid protection means that these animals represent an important breeding reservoir for this part of the Indian Ocean. Aldabra comprises part of the Republic of the Seychelles and since 1980 the Royal Society's responsibility for administering the research station has been vested in the newly formed Seychelles Islands Foundation. This body is at present attempting, with limited success, to raise sufficient funds to ensure the effective continuation of this important research station. In order to guarantee the preservation of this unique environment it is necessary for the Foundation not only to raise funds for the Atoll's administration but also to interest scientific bodies throughout the world in sending groups of biologists to work there. Without the presence of a scientific community the very purpose for which the station was founded is likely to fail, and in consequence the atoll's unique biota lost to mankind. For the herpetologist the turtle, tortoise and lizard populations offer a wide range of exciting possibilities.

MALCOLM J. COE,
Department of Zoology, University of Oxford, OX1 3PS, U.K.

RECENT PAPERS

Brongersma, L.D. 1980. Turtle farming and ranching. British Herpetological Society Bulletin, 2, 15-19. L.D. Brongersma, Rijksmuseum Van Natuurlijke Historie, Postbus 9517, 2300 RA Leiden, Netherlands.

Carr, A. and Meylan, A.B. 1980. Evidence of passive migration of green turtle hatchlings in sargassum. Copeia, 2, 366-368. A. Carr, Department of Zoology, University of Florida, Gainesville, Florida, 32611 USA.

Carr, A. and Meylan, A.B. 1980. Extinction or Rescue for the Hawksbill? Oryx, 15, 449-450. A. Carr, Department of Zoology, University of Florida, Gainesville, Florida, 32611 USA.

Carr, A., Ogren, L. and McVea, C. 1980. Apparent hibernation by the Atlantic loggerhead turtle Caretta caretta off Cape Canaveral, Florida. Biological Conservation 19, 7-14. A. Carr, Department of Zoology, University of Florida, Gainesville, Florida, 32611 USA.

Chen, B-Y., Mao, S-H. and Ling, Y-H. 1980. Evolutionary relationships of turtles suggested by immunological cross-reactivity of albumins. Comp. Biochem. Physiol., 66B, 421-425. B-Y. Chen, Department of Biomorphics, National Defense Medical Center, Taipei (107), Taiwan, Republic of China.

Clark, D.R. and Krynitsky, A.J. 1980. Organochlorine residues in eggs of loggerhead and green sea turtles nesting at Merritt Island, Florida--July and August 1976. Pesticides Monitoring Journal 14, 7-10.

D.R. Clark, Fish and Wildlife Service, U.S. Department of the Interior, Patuxent Wildlife Research Center, Laurel, Md. 20811 USA.

Delikat, D.S. 1980. IXTOC 1 oil spill and Atlantic ridley survival. In: Coastal Zone '80, Vol. 1, B.L. Edge (ed.), Am. Soc. Civil Engineers, New York, 312-319. D.S. Delikat, National Response Center, U.S. Coast Guard Headquarters, Washington, D.C., USA.

Duron, M. and Duron, P. 1980. Des tortues luths dans le Pertuis Charentais. Courrier de la nature, 69, 37-41. M. Duron, Museum de la Rochelle, 28 rue Albert 1er, La Rochelle, 17000 la Rochelle, France.

Fletemeyer, J. 1980 Report, Sea turtle monitoring project, submitted to the Broward County Environmental Quality Control Board, 88 pp. J. Fletemeyer, Nova University Ocean Science Center, 8000 North Ocean Drive, Dania, Florida, 33004 USA.

Frazier, J. 1976 (issued 1980). Report on sea turtles in the Seychelles area. J. Mar. Biol. Assoc. India, 18, 179-241. J. Frazier, Zoological Park, Smithsonian Institution, Washington, D.C., 20008 USA.

Frazier, J. 1980. Exploitation of marine turtles in the Indian Ocean. Human Ecology, 8, 329-370. J. Frazier, National Zoological Park, Smithsonian Institution, Washington, D.C., 20008 USA.

Frazier, J.G. 1980. Marine turtles and problems in coastal management. In: Edge, B.L., (ed.) Coastal Zone '80 Volume III. Proceedings of the Second Symposium on Coastal and Ocean Management, 2395-2411. J.G. Frazier, National Zoological Park, Smithsonian Institution, Washington, D.C., 20008 USA.

Fretey, J. 1980. Les pontes de la Tortue luth Dermochelys coriacea en Guyane francaise. Rev. Ecol. (Terre Vie) 34, 649-654. J. Fretey, Laboratoire de Zoologie (Reptiles et Amphibiens) du Museum National d'Histoire Naturelle, 25, rue Cuvier, 75005 Paris, France.

Gambarotta, J.C. and Gudynas, E. 1979. A new record of the green turtle Chelonia mydas mydas from Uruguay. C.E.D. Orione Cont. Biol. 1, 9-10; Montevideo. J.C. Gambarotta, Cnel. Mora 411, Montevideo, Uruguay.

Gomes, E.D. 1980. A review of the literature on marine turtles in the Philippines. Philipp. J. Biol. 9, 95-99. D. Gomez, Marine Sciences Center, University of the Philippines, Diliman, Quezon City, The Philippines.

Heath, M.E. and McGinnis, S.M. 1980. Body temperature and heat transfer in the green sea turtle, Chelonia mydas. Copeia, 4, 767-773. M.E. Heath, Physiological Research Laboratory, Scripps Institute of Oceanography, La Jolla, California, 92093 USA.

Johnson, W.A. 1980. Cayman Turtle Farm Ltd. The crock of gold. British Herpetological Society Bulletin, 2, 20-22. W.A. Johnson, Cayman Turtle Farm Ltd., P.O. Box 645, Grand Cayman, British West Indies.

Kraus, D.R. and Jackson, D.C. 1980. Temperature effects on ventilation and acid-base balance of the green turtle. Am. J. Physiol. 239, R254-R258. D.R. Kraus, Division of Biology and Medicine, Brown University, Providence, Rhode Island, 02912 USA.

Lester, R.J.G., Blair, D. and Heald, D. 1980. Nematodes from scallops and turtles from Shark Bay, Western Australia. Aust. J. Mar. Freshwater Res., 31, 713-17. R.J.G. Lester, Department of Parasitology, University of Queensland, St. Lucia, Qld 4067, Australia.

Limpus, C.J. 1980. Observations on the hawksbill turtle (Eretmochelys imbricata) nesting along the great barrier reef. Herpetologica, 36, 265-271. C.J. Limpus, National Parks & Wildlife Service, Pallarenda, Townsville, Queensland 4810, Australia.

Limpus, C.J. and Walter, D.G. 1980. The growth of immature green turtles (Chelonia mydas) under natural conditions. Herpetologica, 36, 162-165. C.J. Limpus, National Parks & Wildlife Service, Pallarenda, Townsville, Queensland 4810, Australia.

O'Hara, J. 1980. Thermal influences on the swimming speed of loggerhead turtle hatchlings. Copeia, 4, 773-780. J. O'Hara, Applied Biology Inc., 641 De Kalb Industrial Way, Atlanta, Georgia, 30033 USA.

Pickett, J. and Townson, S. 1980. Are sea turtles threatened by some conservationists? British Herpetological Society Bulletin, 2, 12-14. J. Pickett, British Herpetological Society, c/o Zoological Society of London, Regent's Park, London, NW 1. U.K.

Raynaud, A., Fretey, J. and Clergue-Gazeua, M. 1980. Epithelial structures of temporary existence appended on branchial arches in the embryos of the leathery turtle, Dermochelys coriacea. Bulletin Biologique de la France et de la Belgique, 71-99. A. Raynaud, Laboratoire de Biologie, route de la Glevade, 81330 Vabre, France.

Rhodin, A.G.J., Spring, S. and Pritchard, P.C.H. 1980. Glossary of turtle vernacular names used in the New Guinea region. Journal of the Polynesian Society, Vol. 89, 105-117. A.G.J. Rhodin, Dept. of Surgery (Orthopaedics), Yale University, New Haven, Conn., 06510 USA.

Rhodin, A.G.J., Ogden, J.A. and Conlogue, G.J. 1981. Chondro-osseous morphology of Dermochelys coriacea, a marine reptile with mammalian skeletal features. Nature 290, 244-246. A.G.J. Rhodin, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, 02138 USA.

Rudloe, J. 1981. From the jaws of death. Sports Illustrated, 54, 60-70. (saving 1249 turtles from Port Canaveral channel prior to dredging). J. Rudloe, P.O. Box 237, Gulf Specifem Co., Panacea, Florida, 32346 USA.

Schwartz, F.J., Peterson, C., Passingham, H., Fridell, J. and Wooten, J. 1981. First successful nesting of the green sea turtle, Chelonia mydas in North Carolina and north of Georgia. ASB Bull. 28, 96. F.J. Schwartz, Institute of Marine Sciences, University of North Carolina, North Carolina, USA.

Smith, M.H., Hillestad, H.O., Manlove, M.N., Straney, D.O. and J.M. Dean. Management implications of genetic variability in loggerhead and green sea turtles. XIIIth Congress of Game Biologists, 302-312. M.H. Smith, Savannah River Ecology Laboratory, Aiken, South Carolina, USA.

Sternberg, J. 1981. The worldwide distribution of sea turtle nesting beaches. Center for Environmental Education, Washington, D.C. (large maps plus references). Sea turtle Rescue Fund, Center for Environmental Education, 1925 K Street, N.W., Suite 206, Washington, D.C. 20006 USA.

Stoneburner, D.L. and Richardson, J.I. 1981. Observations on the role of temperature in loggerhead turtle nest site selection. Copeia, 1, 238-241. D.L. Stoneburner, Institute of Ecology, University of Georgia, Athens, Georgia, 30602 USA.

Talbert, O.R., Stancyk, S.E., Dean, J.M. and Will, J.M. 1980. Nesting activity of the loggerhead turtle (Caretta caretta) in South Carolina I: A rookery in transition. Copeia, 4, 709-718. O.R. Talbert, Belle W. Baruch Institute for Marine Biology, University of South Carolina Columbia, South Carolina, 29208 USA.

Uchida, I. 1980. The report of a feasible research on artificial hatchery and cultivation of Hawksbill turtle Eretmochelys imbricata in waters adjacent to Malaysia, Singapore and Indonesia. Japan Tortoise Shell Association, Nagasaki, Japan, 63 pp. I. Uchida, Himeji City Aquarium, Tegarayama, Himeji City 670, Japan.

1980. Management of Turtle Resources. Research Monograph No. 1, Applied Ecology, printed by James Cook University of North Queensland, 72 pp. Contains papers on: The green turtle in eastern Australia (C.J. Limpus), Environmental factors in turtle farming (J. Parmenter), Management of turtle resources (J. Parmenter), Nutritional problems in farmed turtles (S. Garnett), Diseases of farmed turtles (J. Glazebrook), Commercial prospects for turtle farming (J.T.V. Onions) and the Raine Island area: a prospective nature reference site in Queensland (H.J. Lavery, B.B. King and C.S. Sandercoe). Obtain from Applied Ecology Pty. Ltd., P.O. Box 26, Woden, A.C.T. 2606, Australia. Price: $Aus. 2.50.

PAKISTAN: SEA TURTLE STAMP

A postage stamp depicting a green turtle is to be issued in Pakistan sometime in June 1981 according to Khan Muhammad Khan (Sind Wildlife Management Board, Karachi, Pakistan) and G. Balazs (Hawaii Institute of Marine Biology, Kaneohe, Hawaii, USA).

TAG RECAPTURE OF OLIVE RIDLEY IN MEXICO

On 5 December 1980 an Olive Ridley was captured while nesting at Escobilla, Oaxaca. The front right flipper bore a (colour) plastic "roto-tag", number 1586. No other information was visible on the tag. Anyone with information about this tag please write.

CUAUHTÊMOC PEÑAFLORES S., Apartado Postal NÚm. 2., Pochutla, Oaxaca, Mexico.

PACIFIC COAST OF COSTA RICA: TAGGING PROGRAMME

The first year of what is intended to be a multi-year program of sea turtle research, conservation and management on the Pacific Coast of Costa Rica was completed in December 1980. We marked approximately 15,000 olive ridleys at two arribada nesting beaches, Playas Ostional and Nancite, using the bridge-less monel metal tag (National Band and Tag, Newport, Kentucky; style 1005, size 19, with special locking mechanism). Of these, approximately 5,000 turtles were double tagged with a pliable, self-piercing, plastic tag supplied by the Allflex Tag Co., Culver City, CA. The colored plastic tags, orange, yellow, and blue, may appear on any of the four limbs, while the monel tag was applied on the right front flipper. Both tags carry a number/letter identification on one side and the following inscription on the reverse: PREMIO REMITE/ESC. BIOLOGIA/UNIV. COSTA RICA. This work was funded by the U.S. Fish and Wildlife Service, Endangered Species Program.

S.E. CORNELIUS
P.O. Box 132, Willow Springs, MO., 65793, USA.

D.C. ROBINSON
Esc. Biologia, Universidad de Costa Rica, Ciudad Universitaria, Costa Rica.

STYROFOAM BOXES AND SEX RATIO

Following a previous paper (Mrosovsky & Yntema, 1980, Biol. Conserv. 18, 271-280) I have received many inquiries about the sex ratio of hatchlings from eggs incubated in styrofoam boxes. Recent empirical work has now shown that, at least in some circumstances, incubation in styrofoam boxes does increase the number of males compared to hatchlings from clutches left in the sand. A report will appear shortly (Mrosovsky, Biol. Conserv. in press). However, if information is urgently needed I can supply details earlier.

N.M.

Support for this newsletter came from H.C. Mittag, Dr. J. Mittag, the University of Toronto and World Wildlife Fund Canada. W. Frair made a small donation.

Marine Turtle Newsletter

No. 19 DECEMBER 1981

Editor: N. Mrosovsky

Departments of Zoology
and Psychology
University of Toronto
Toronto, Ontario
M5S 1A1 Canada

EDITORIAL

This issue presents articles on how head-starting turtles might be evaluated. The question asked in previous editorials (Marine Turtle Newsletter Nos. 15 & 16, 1980) was not whether head-starting was effective or undesirable but how it might be possible to learn the truth of the matter. We hope that the thoughtful replies given will interest those undertaking or contemplating head-starting.

Ideally, however, to be maximally valuable, debate should anticipate conservation experiments. Another experiment that might soon be tried ... and therefore merits scrutiny now ... is the warming up of eggs to produce more females. Since 1978, when the likelihood that artificial incubation methods affect sex ratio was aired in the Marine Turtle Newsletter (Editorial, 1978, No. 9, 1-2), much has been learnt. Methods of sexing hatchlings have been found, sexual differentiation of loggerhead and green turtles has been shown to be temperature dependent, the critical period within incubation has been determined; it has been demonstrated that styrofoam box incubation can bias sex ratio towards males, a team project on ridley and green turtles in Costa Rica is looking at many other variables and there has also been work on the subject in Australia, Surinam, Mexico, the USA and the Cayman Turtle Farm. Papers will be listed in the newsletter as they appear. Ongoing studies on more rapidly maturing reptiles will soon resolve the question of whether temperature effects on sexual differentiation last through to breeding. It will be much harder with sea turtles to learn if sex at hatching predicts sex in the adult but given the available data (see Bull, J.J. 1980, Quart. Rev. Biol. 55, 3-21; Mrosovsky, N., 1980, Amer. Zool. 20, 531-547), the onus of proof is on those who argue otherwise. Has anyone seen a turtle change sex?

Assuming then that having an ovary at hatching means laying eggs later on, there may be attractions in producing more females in places where turtles are exploited for their eggs, Malaysia and Surinam for example. Farms have more cows than bulls, more hens than roosters, so why not more female turtles?

One worry is our ignorance of population structure, of the biology of turtles in general. Who would have thought ten years ago that incubating eggs in styrofoam boxes affected sex ratio? Nevertheless head-starting has been

Marine Turtle Newsletter

No. 19 DECEMBER 1981

Editor: N. Mrosovsky

Editorial Advisors:

Departments of Zoology
and Psychology
University of Toronto
Toronto, Ontario
M5S 1A1 Canada

P.C.H. Pritchard
Harold F. Hirth

EDITORIAL

This issue presents articles on how head-starting turtles might be evaluated. The question asked in previous editorials (Marine Turtle Newsletter Nos. 15 & 16, 1980) was not whether head-starting was effective or undesirable but how it might be possible to learn the truth of the matter. We hope that the thoughtful replies given will interest those undertaking or contemplating head-starting.

Ideally, however, to be maximally valuable, debate should anticipate conservation experiments. Another experiment that might soon be tried ... and therefore merits scrutiny now ... is the warming up of eggs to produce more females. Since 1978, when the likelihood that artificial incubation methods affect sex ratio was aired in the Marine Turtle Newsletter (Editorial, 1978, No. 9, 1-2), much has been learnt. Methods of sexing hatchlings have been found, sexual differentiation of loggerhead and green turtles has been shown to be temperature dependent, the critical period within incubation has been determined; it has been demonstrated that styrofoam box incubation can bias sex ratio towards males, a team project on ridley and green turtles in Costa Rica is looking at many other variables and there has also been work on the subject in Australia, Surinam, Mexico, the USA and the Cayman Turtle Farm. Papers will be listed in the newsletter as they appear. Ongoing studies on more rapidly maturing reptiles will soon resolve the question of whether temperature effects on sexual differentiation last through to breeding. It will be much harder with sea turtles to learn if sex at hatching predicts sex in the adult but given the available data (see Bull, J.J. 1980, Quart. Rev. Biol. 55, 3-21; Mrosovsky, N., 1980, Amer. Zool. 20, 531-547), the onus of proof is on those who argue otherwise. Has anyone seen a turtle change sex?

Assuming then that having an ovary at hatching means laying eggs later on, there may be attractions in producing more females in places where turtles are exploited for their eggs, Malaysia and Surinam for example. Farms have more cows than bulls, more hens than roosters, so why not more female turtles?

One worry is our ignorance of population structure, of the biology of turtles in general. Who would have thought ten years ago that incubating eggs in styrofoam boxes affected sex ratio? Nevertheless head-starting has been

launched despite the many unknowns, so why not feminizing also? Before that is tried it might be useful not merely to insist on our ignorance of the consequences, but to have specific formulations of the unknowns and dangers. The aim should not be to stop legitimate experiment but to influence it to be as meaningful as possible. Would it be possible to design a limited experiment in an informative way? The Marine Turtle Newsletter would appreciate short articles and the views of readers on the question of deliberately feminizing turtles during incubation.

N.M.

HEAD-STARTING: THE PROBLEMS OF IMPRINTING AND TAGGING

The thought-provoking editorial (Marine Turtle Newsletter No. 15) has brought out some of the difficulties in head-starting. Doubts stem both from uncertainty as to the ability of head-started animals to survive in the wild, and from the question as to whether they would be able to carry out their breeding migrations successfully. At present we do not even know whether breeding turtles return to the beaches on which they hatched. It seems likely that they do since this would be the most efficient mechanism for ensuring that they did land up on a suitable beach. If this is the case, then the ability to find the native beach will depend upon some kind of imprinting, perhaps at the time when the hatchlings first enter the water. Head-started animals would not be released until well after this critical period and it's by no means certain that even release on their native beaches would enable them to find their way back there again. Clearly properly designed experiments on head-starting would have to include the release of animals at different ages, and at different places.

One of the principal problems would be to find means of marking the small and delicate hatchlings which would be retained for the long period until maturity is reached, and would also not be affected by the great increase in size during that time. The problem is similar but possibly not quite as severe as that encountered with salmon, since in some species of these the fish going to sea are considerably smaller than the smallest hatchlings. The problem in salmon has been overcome to a considerable extent in recent years by implanting a very small (about .05 cm long and .02 cm diameter) wire in the nasal cartilage. The tags carry etched binary numbers which enable large numbers to be distinguished. The tags are inserted by a special machine. Recovery presents the problem that tags cannot be seen from the exterior but this has been overcome by the use of metal detectors which show whether any possibly tagged animal does actually contain a tag, and locates its position so that it can be dissected out. The system has also been used successfully for other kinds of animals, including prawns in Australia. I believe it would be worthwhile for anyone considering a head-starting experiment to examine the possibility of using this technique. The tags and equipment are, I believe, being produced by Northwest Marine Technology, Shaw Island, Washington, 98286, U.S.A.

K. RADWAY ALLEN
192 Ewos Parade, Cronulla, N.S.W., Australia 2230

PERCENTAGE OF HEAD-STARTED TURTLES IN A POPULATION AS A CRITERION

Head-starting cannot be evaluated without having a large number of head-started tagged turtles of different species and raised in different ways. Theoretically then, a defined population would be monitored for several years during which a known number of the eggs would be taken for head-starting. After some years nesting turtles should include a certain percentage of head-started turtles. Migration and interchange between different populations would not present a major problem if most of the nesting beaches were monitored.

Head-starting under 'semi-natural' conditions is expensive but it is also a wonderful way to learn about turtles and tagged head-started turtles could provide many important data. However, as a conservation measure, head-starting programmes should be limited and perhaps only permitted with certain provisos, such as using eggs from non-viable nests or nests that have no other protection. Large scale programmes taking most of the viable eggs from major and well protected rookeries could be dangerous.

JOAQUIN BUITRAGO B.
Fundacion Cientifica Los Roques, Apartado No 1, Caracas 101, Venezuela
(Editor's note: the above is an edited version of Sr. Buitrago's article. Efforts to contact him recently failed, but it was felt best to include his contribution along with the others.)

CRITERIA FOR SCIENTIFIC EVALUATION OF HEAD-STARTING

A rigorous proof of the efficacy of "head-starting" for restoring sea turtle populations will require a demonstration that head-started turtles have a greater chance of becoming part of a breeding population than do hatchlings that were not head-started. Moreover, "proof" for one species cannot be assumed to extend to other species, or perhaps even other populations; and proof of preferential survival to reproductive age still does not demonstrate that head-starting is the most cost-effective way of restoring a population. Scientific demonstration of the desirability of head-starting will therefore require that both hatchlings and head-started animals be tagged in sufficient quantities for the breeding population derived from these animals to include a statistically valid sample of both. At present, of course, techniques for marking hatchlings have yet to be perfected, and there may be serious problems in devising a mark that will predictably persist to maturity and at the same time not alter the survival prospects of the animal. Current projections of the maturation time of the green turtle, at least, also suggest that such an experiment would take decades to complete.

The requirement for a foolproof method of tagging hatchlings could be obviated if a still longer-term experiment were devised. If a fixed proportion of hatchlings (the exact percentage is negotiable) is head-started each year for many seasons, the proportion of head-started animals showing up in the adult population should increase progressively once a sufficient interval has passed for the turtles to mature. Ultimately, the selective advantage conferred upon the head-started animals should result in the entire population being made up of head-started animals, though this equilibrium may take many generations to manifest itself.

In the real world, these experiments will probably never be done, or at least never be completed conclusively. We shall in the interim have to utilize more modest and less rigorous signs to determine whether we should recommend head-starting. If it could be shown, for example, that even one head-started turtle had survived to maturity and nested on an appropriate beach, producing fertile eggs, this would at least establish that survival instincts and homing mechanisms were not necessarily undermined. If data of this kind were combined with some sort of monitoring of a juvenile population derived from both head-started and natural hatchlings, a reasonable level of confidence that head-starting was a help to the population could be obtained.

Perhaps Kemp's ridley is the obvious species to use for studies of this kind; head-starting of a known percentage of hatchlings of this species has been practiced for four seasons now; and at the same time known numbers of natural hatchlings have been released on the nesting beach. There being only one significant nesting site for this species, the origin of a Kemp's ridley of any size and found at any location is reasonably assured. Once the head-started turtles have had sufficient time to mingle with the wild population, the ratio of tagged head-started animals to untagged turtles that had spent their entire lives in the natural environment could, theoretically, be evaluated by sampling.

Until such ambitious experiments can be completed, the success of head-starting can be monitored to a reasonable degree simply by evaluating the condition, location, size, and number of turtles from such a program that are caught with tags intact. If head-started turtles are found in places that seem appropriate for the population (and ideally in the company of non head-started animals), and if the turtles caught are healthy and have increased in size to an extent that seems appropriate and comparable to that of wild-hatched turtles, this would seem to be reason to be encouraged and to continue. On the other hand, if head-started turtles are never seen again, or if they show up runted, diseased, or geographically displaced from where they should be, the program should be drastically revised or terminated.

P.C.H. PRITCHARD
P.O. Drawer 7, Maitland, Florida, 32751 U.S.A.

HEAD-STARTING: EVALUATIONS AND ALTERNATIVES

The objectives of many conservation programs are rather loosely defined and often assumed to be maintenance of desirable population sizes of the species concerned. If this is the objective of head-starting, then the bottom line would seem to be whether a project produces a measurable increase in reproductively competent individuals, and further, whether these individuals produce offspring with similar competence. The difficulty, obviously, is the time required to establish these facts even if the problem of tagging is solved. Even actual observations of tagged head-started turtles laying eggs would constitute only presumptive evidence of success. Rigorous analysis of head-starting (or any turtle conservation measure for that matter) will require a commitment of close to twenty years, and a large capital investment. Unless money is truly no object, the scientific and economic aspects cannot be separated. A possible solution to the problem lies in developing local research/management capabilities. Since many of the exploited turtle

populations are associated with artisanal fisheries, attention to artisanal management may provide more mileage for each dollar spent. In view of the range of turtle problems and programs it would seem to make more sense to support a variety of possible approaches to conservation, rather than invest large sums in raising "a few turtles in tanks," especially when the latter activity can be done on a relatively inexpensive scale through the use of local projects and manpower at the artisanal level. More intensive local involvement may also permit regular monitoring of wild populations, which is the only alternative I can see to tagging hatchlings at present.

MELVIN H. GOODWIN
Environmental Research Projects, 105 Davenport Road, Toronto, M5R 1H6 Canada

HEAD-STARTING OF KEMP'S RIDLEY

It would be terribly premature for anyone to advocate head-starting as a panacea for sea turtles. The Galveston Laboratory of the USA National Marine Fisheries Service (NMFS) has head-started approximaty 1,500 to 2,000 L. kempi in each of the past four years. These animals are hatched on Padre Island after being brought from Mexico. The objectives are to establish a "new" nesting population on Padre Island, to learn more of the behavior, development and maintenance in captivity and to gain data on survival, movements, afterwards.

The chances of establishing a new nesting population are remote, and it will be many years before conclusions can be reached. The point to consider is the experience gained by personnel charged with care of the hatchlings. They have delved deeply into pathogens and other factors which depress survival in captivity and have not only identified the mortality agents, but have developed counter measures. I doubt that this has ever been done before with the level of expertise and effort instituted at Galveston. Survival of the '80 hatch was 95% and condition of the yearlings was excellent. Returns of those turtles released to date indicate they have remained in good condition and have adapted to their normal environment. What, if any, pathogens might be still present when captive stock is turned loose is most often not considered. This must be investigated and kept at the lowest levels possible.

Head-starting of L. kempi is experimental and is not regarded as a proven means to increase populations. Not only is it expensive, but it requires expertise that many countries can't afford, and even if they could, resources often would be better spent on other conservation activities. I suggest that limited experimental efforts be expended, preferably by one agency, like the NMFS Laboratory at Galveston, to maintain limited numbers of hatchlings of various species for a period of up to one year, the objective being to develop the techniques required for maximum survival. Once these techniques are developed, then the project should cease. If the initial work on captive rearing has already been done and documented, it will be less costly to both the species and the agency to care for "last stand" animals. When a species is at the bottom line for survival is not the time to develop techniques. Before any sound analysis can be made of head-starting financial support is vitally needed to overcome the tagging problem. Until this is possible, we will theorize with little or no evidence.

In summary, I agree with the thrust of the editorial (Marine Turtle Newsletter No. 15, 1980). Headstarting is not a panacea. I know of no hard evidence that it contributes to maintenance of wild populations. In too many cases attempts to maintain hatchlings result in unacceptable levels of mortality. I do support limited experimental efforts to develop methodology, but only with the appropriate physical plant and expertise. If head-starting cannot be done right, then stay away from it. It should not be condoned as a viable conservation tool until we know much more of the species' biology and life history. Head-starting is an expensive experimental and/or "last ditch" effort for sea turtles and should be done only by an extremely limited number of agencies and facilities. The thoughts do not necessarily constitute NMFS policy.

JACK B. WOODY
U.S. Fish & Wildlife Service, P.O. Box 1306, Albuquerque, New Mexico, 87103 U.S.A.

HEAD-STARTING IN SURINAM

I was unable to obtain an article on the green turtle head-staring programme in Surinam, but did have the chance to discuss it with J.P. Schulz. He made the following points. First, the aim of head-starting in Surinam is not to compare it as a method, in cost or otherwise, to other conservation methods. Other methods are already being used there. The aim is to discover whether head-starting of turtles could be used as a last-ditch approach if other methods failed. Once this was established, head-starting might perhaps be dropped in Surinam. Second, the criterion for evaluation they have in mind is not the nesting of head-started turtles, but whether head-started turtles show up in places frequented by green turtles of the Surinam population.

N.M.

A NEW METHOD FOR MARKING SEA TURTLES?

During the summer of 1980 we experimented of four groups of sea turtle hatchlings to explore the feasibility of producing permanent, recognizable identification marks by tissue modification. Two hundred or more individuals were treated in each group: Chelonia mydas in Grand Cayman island, Caretta caretta in Miami, Florida, Lepidochelys kempi in Galveston, Texas, and C. mydas in Honolulu, Hawaii. We also marked a group of yearling C. mydas in Grand Cayman and a group of 2-year-old L. kempi in Miami, brining the total of marked animals to approximately 950. Except for the animals marked in Grand Cayman, the work was done under contract to the U.S. Fish and Wildlife Service and the U.S. National Marine Fisheries.

The animals were divided into six experimental, or treatment, groups and five control groups. Four of the experimental groups were treated by surgical, autografting procedures and two were treated chemically with a melanin destroying substance, monobenzylether of hydroquinone (pellet implants in one group, subcutaneous injections in the other). The four grafting procedures utilized disks of epithelial tissue cut with a Keyes skin punch, irregular pieces of tissue gouged out with a Keyes punch, plastral disks placed in

pockets of carapace tissue prepared as nutrient sites and protective coverings, and plugs of marginal-scute shell reversed and replaced in their original sites. A special, waterproof surgical cement was used to seal all operation sites. In a number of timed series, the average total handling time per individual hatchling was less than three minutes. The control groups were designed to monitor the results of handling, surgical trauma, and chemical toxicity. One of the control groups was left without even a metal tag for individual recognition. The remaining four groups were treated as follows: 1) received only metal tags for identification of individuals; 2) received neutral-substance implants; 3) received neutral-substance injections; 4) "sham-operated" with a disk of carapace excised and replaced in situ. All animals were kept under observation for 10-11 months following treatment. Comparison of treated and control animals showed no significant differences in behavior, growth rate, or survival.

The results of this preliminary work are encouraging. Although the chemical treatments did not yield clear long-term results after a single application of the melanin-destroying substance, there were short-lived blanching effects. We think that experimentation with multiple applications of the chemical would be justified,although, in practice, this would necessitate holding the animals in captivity and would be applicable only to head-started turtles.

At 10-11 months post-operative, some groups of grafted animals show up to 90+% success depending on the method of graft implantation used. Distinct, unmistakably non-natural, recognizable areas of contrasting color (light on carapace, dark on plastron) were produced. These areas are irregular in shape and have grown, in most instances, in proportion with the rest of the scute. We hope to develop this technique further, and believe it may be appropriate for identification of population and year classes of animals in nature. If the marks prove permanent over the long run, this could be an important tool for "hard data" collection on the unproven hypothesis of imprinting and other aspects of sea turtle behavior and population dynamics. A full report on our techniques and results is being prepared for journal publication.

LUPE P. HENDRICKSON AND JOHN R. HENDRICKSON
National Park Service, CPSU/UA and Department of Ecology & Evolutionary Biology, University of Arizona, Tucson, Arizona, 85721, U.S.A.

EVIDENCE OF OLFACTORY IMPRINTING IN LOGGERHEAD TURTLES

Carr (1967) hypothesized that marine turtles use olfactory imprinting to migrate to their natal beach for nesting. Cooper et al. (1976) demonstrated that salmon smolts imprint to stream odors, and adults use these olfactory cues to locate their natal stream during migration to the spawning area. Using an electronic system designed to monitor aquatic animal behavior (Kleerekoper et al., 1977), we have found the first evidence that marine turtles might imprint to olfactory cues.

Loggerhead turtle (Caretta caretta) eggs were collected on Hutchinson Island, Florida, and brought to our laboratory at Texas A&M University. The eggs were divided and placed in 4 nests of approximately equal size. Two of the nests were kept moist with a solution of 0.9 percent Instant Ocean.

Another was kept moist with 5 x 10-5 M morpholine dissolved in 0.9 percent Instant ocean, and a fourth was kept moist with 5 x 10^{-5} M 2-phenylethanol in 0.9 percent Instant Ocean. Two to 5 days after the animals hatched, they were placed in tanks of artificial seawater (Instant Ocean). Turtles that hatched from morpholine-treated eggs were placed in a tank of 5 x 10^{-5} M morpholine (MPP turtles), and those that hatched from 2-phenylethanol-treated eggs were placed in a tank of 5 x 10^{-5} M 2-phenylethanol (PPP). One of the groups of turtles, untreated in the nest, was placed in a tank of 5 x 10^{-5} M morpholine (MPO) and the other group was placed in untreated water (CONTROL). Chemical treatments were continued until testing was completed. Testing began approximately 5 months after the turtles were placed in tanks and continued for the following 5 months.

In each experiment a single turtle was placed into the monitoring tank and presented with a simultaneous choice between 4 compartments; one contained 5 x 10^{-5} M morpholine, one contained 5 x 10^{-5} M 2-phenylethanol, and two did not contain a test chemical. The monitoring system measures an animal's response to a chemical environment by counting entries as well as time spent in each compartment. Each run lasted 4.5 hours. The combination of compartments that received infusions was varied to eliminate compartment bias. An analysis of variance followed by Duncan's multiple range procedure, was performed on the data (p .05 in all cases). In order to satisfy the assumptions of the ANOVA, all data were arcsin transformed prior to analysis.

Interestingly, MPP turtles showed a significant increase in percent entries to morpholine-treated water (Table 1) while CONTROL turtles, MPO turtles, and PPP turtles did not show significant responses (attraction?). This result supports the hypothesis that the chemical nature of the nest environment may affect the animal's orientation behavior later in life.

	Compartment Variable	X ± S.E.M. percent	Average Entries per turtle ± S.E.M. ±
CONTROL	morpholine	39.60 ± 11.02 *	
	2-phenylethanal	**15.45 ± 6.31**	**39.30 ± 12.39**
	untreated	**22.47 ± 6.73**	
MPO	**morpholine**	**17.71 ± 7.68**	
	2-phenylethanol	35.94 ± 11.18	55.0 ± 24.60
	untreated	23.18 ± 6.57	
MPP	morpholine	43.09 ± 11.22 **	
	2-phenylethanol	15.74 ± 3.62	43.70 ± 18.85
	untreated	20.59 ± 6.27	
PPP	morpholine	24.68 ± 9.11	
	2-phenylethanol	20.27 ± 5.40	45.90 ± 19.79
	untreated	27.52 ± 5.69	

Table 1. Mean ± S.E.M. entries of untreated CONTROL turtles, turtles treated with morpholine in their tank water only (MPO), with morpholine in the nest and tank water (MPP) and with 2-phenylethanol in the nest and tank water (PPP). N = 10 in MPP, MPO and PPP. since there were 2 untreated compartments, CONTROL N = 20.

* Significantly greater than 2-phenylethanol (Duncan's test, p .05).

** Significantly greater than 2-phenylethanol and untreated water.

+ There was no significant difference between treatment groups with respect to total entries.

Similar results were obtained with regard to time spent data (not shown). CONTROL animals showed a significantly greater response to morpholine than to 2-phenylethanol. However, their responses to the chemicals did not differ significantly from their responses to untreated compartments. Based on the mean responses of the MPO and PPP animals, it also appears that loggerhead turtles may orient to compartments containing novel solutions. Explanations for the lack of resonse by PPP turtles, treated in a manner analogous to MPP animals are speculative. Olfactory imprinting may be keyed on certain classes of compounds and not others. Or, different molecules may have different threshold concentrations below which imprinting does not take place. However, Manton et al. (1972) demonstrated in conditioning experiments that greet turtles (Chelonia mydas) detect and remember 2-phenylethanol. Also, in this study, in 3 out of 4 experiments mean responses to 2-phenylethanol were low, suggesting that turtles showed a slight avoidance to the chemical. In fact, the CONTROLS showed a significantly lower response to 2-phenylethanol than to morpholine.

Why would immature turtles orient toward a presumed "imprint" cue? Since the motivation is obviously not reproductive, we suggest that the attention shown to the morpholine by the turtles exposed in the nest may be due to a substituted motivation. Possibly food searching (turtles were unfed) or exploratory behaviors were elicited in place of the reproductive responses which would be associated with the stimulus in adults. Because the controls were not imprinted during the critical period in the nest, they would not be expected to exhibit a prolonged orientation to the stimulus. The same animals are now being used in additional studies. Although this experiment is preliminary, the intense effort being made to preserve turtles warrants consideration of these data. We welcome any comments and criticism. We thank Mr. Ross Witham for his help in collecting eggs and the Texas A&M University Sea Grant College Program for funding the research (Grant #NA79AA-D-00127).

Carr, A. 1967. So Excellent a Fishe. The Natural History Press. Garden City, New York.

Cooper, J.C., A.T. Scholz, R.M. Horral, A.D. Hasler and D.M. Madison. 1976. Experimental confirmation of the olfactory hypothesis with homing, artifically imprinted coho salmon (Oncorhynchus kisutch). J. Fish Res. Board Can. 33:703-710.

Kleerekoper, H. 1977. Some monitoring and analytical techniques for the study of locomoter responses of fish to environmental variables. Amer. Soc. Testing Materials. 1977:110-120.

Manton, M.L., A. Karr and D.W. Ehrenfeld. 1972. An operant method for the study of chemoreception in the green turtle, Chelonia mydas. Brain. Behav. Evol. 5:188-201.

MARK GRASSMAN & DAVID OWENS
Department of Biology, Texas A&M University, College Station, TX, 77843, U.S.A. (Tel: 713-845-8481 or -8482.)

PROBABLE LEATHERBACK NESTING ATTEMPT IN ECUADOR

Nesting records in Ecuador are sparse and there are few records of Dermochelys coriacea. On 16 January, 1980, at about 21 hrs. at Atacames, Provincia Esmeraldas, Ecuador, a leatherback, Dermochelys coriacea, was found chained to a post. The sand beach, backed by coconuts, was close to the village but generally quiet. Natives claimed that the turtle left the sea to nest, and they were planning to eat it. Being over 1.5 m long and having a short tail, it was assumed to be a female, and as no boats are launched from this beach, it is unlikely that it was dragged out of the sea here. After negotiations, it was released.

SUSANA SALAS
c/o J. Frazier, Dept. of Zoological Research, Smithsonian Institution, Washington, D.C. 20008 U.S.A.

BOOK REVIEW: TORTUES MARINES DE GUYANE

(By J. Fretey. 1981. pp 136, Editions du Léopard d'Or, 11 rue du Quatre Septembre, 75002 Paris, France, Price: 140 F).

The immediate and lasting impression of this book is that it is beautifully produced, a work of art. Written to answer the questions of the numerous tourists now visiting the French Guiana beaches, it is more an annotated photograph album than a monograph. Large photographs appear on nearly every page. There are also skillful line drawings by the author, maps and a few tables. There is no bibliography and the text contains some debatable statements, for instance that green turtles mature in around 6 years; the treatment of leatherback temperature is dated. These are of minor importance compared to the pictorial documentation of the ecology and behaviour of turtles in French Guiana; the section illustrating the causes of mortality is especially striking. The book reflects the author's continuing wonder and delight with his subject. Describing emergence of the hatchlings he says "...tout commence par une surprenante apparition des museaux. Les tetes coniques 'poussent' dans le sable comme de petits champignons sombres". Tourists and others will be delighted and informed by this book too.

N.M.

LIGHTS AND HATCHLING TURTLES: AN EDUCATION PROGRAM

Over recent years light from the tourist resorts and research station on Heron Island has increasingly attracted hatchling turtles out of the sea onto the island. This has meant increased mortality. In response, an education campaign was undertaken by the Queensland National Parks and Wildlife Service (Q.NPWS). In 1980 a sticker, depicting the misorientation of hatchlings by lights was produced (Fig. 1) and placed beside every light switch on the island which was likely to influence the light horizon of the turtles. A brochure using the same logo and explaining the problem was distributed to visitors, resort and research staff.

There was an immediate and continuing response by visitors to reduce the use of lights at their rooms, especially late at night. As a consequence, there was a substantial decrease in numbers of misoriented hatchlings being recovered from among the buildings and pathways during the 1981 hatchling season. In addition, the ever present decals made staff more conscious of problems resulting from the fixed lighting of their areas and they initiated discussion to further reduce the effects of this general lighting. In some instances lights were relocated so as to be completely shaded from the beach. Other options considered involved lights being lowered, shaded, reduced in intensity, placed on time switches or removed. We recommend the consideration of the use of a similar approach in other places where there is the problem of lights attracting hatchling turtles. We would be interested in learning of other successfully applied procedures in similar situations. A sample of the decal and brochure can be obtained by writing to us.

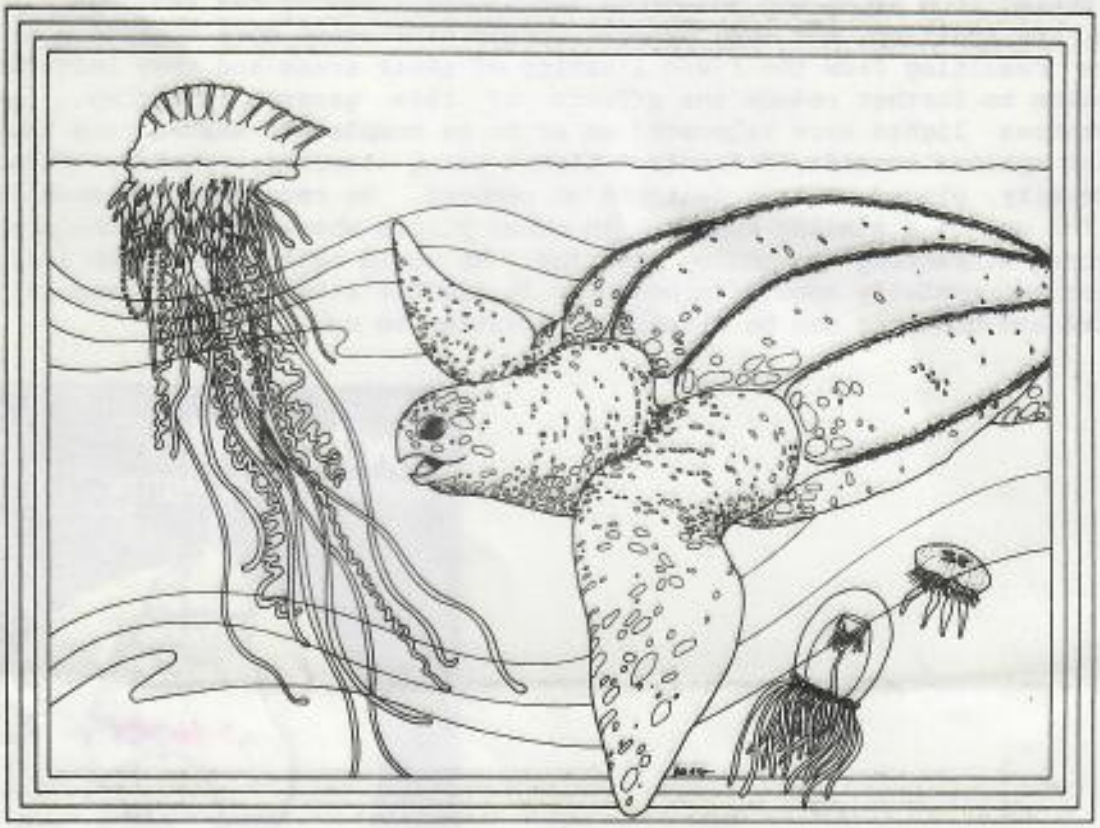
C.LIMPUS, CARTER,R.W. and McLEAN, S.
National Parks and Wildlife Service,
Pallarenda, 4810 Townsville,
Australia.

SEA TURTLE COLORING BOOK

(by Francine Jacobs, illustrated by Mary Beath, 1981. Obtain from the publishers: Center for Environmental Education, 1925 K Street, NW, Suite 206, Washington DC, 20006 USA. Cost $3.95 U.S.A. plus .75 postage & handling, or $2.75 each for 12 or more copies, plus .75 postage & handling.)

Reproduced here is one of 15 admirable drawings from this coloring book. These include pictures of conservation practices, predation on hatchlings and incidental catch, as well as of the various species. A short text in both English and Spanish accompanies each drawing.

N.M.



PAKISTAN TURTLE PROJECT

The Sind Wildlife Turtle Management Project in Karachi (Pakistan) would like to encourage visits by turtle experts in order to exchange information and to gain from international experience in turtle management related problems. Turtle experts who are interested in visiting the project site are kindly invited to contact: Mrs. Aban Marker Kabraji, Principal Investigator, Marine Turtle Conservation, Project 1451, Sind Wildlife Management Board, P.O. Box No. 3722, Karachi, Pakistan.

KEMP'S RIDLEY; PRELIMINARY 1981 NESTING INFORMATION

As of June 17, the Mexican and American Rancho Nuevo beach crew reported the following preliminary data:

Total eggs collected and protected: 85,813
Total number of nests collected: 836

The first arribada was April 17 consisting of 18 nests (1,801 eggs). Average incubation period for these was 55.7 days with a range of 54 to 57 days. Hatch success, for this group was 76.5%. Nesting peak has passed but there will be some additional nests. Final number of eggs will probably be in the 90,000 range, similar to recent years. At least 15 nests near term were lost as a result of a tropical depression and resultant high tides which inundated the nests. Again this year a relatively small number of eggs were moved to the U.S.A. and incubated in styrofoam boxes. Hatch rates were again excellent, around 95%.

JACK B. WOODY,
U.S. Fish and Wildlife Service, P.O. Box 1306, Albuquerque, New Mexico, USA 87103.

ON THE DISTRIBUTION OF SEA TURTLES IN GREEK WATERS

Sea turtles were common in the Agean Sea during Ancient Times. The first coin in the region, which was minted on the island of Aegina in the Saronik Gulf, bears the impression of a sea turtle and is known as "Cheloni" (Seaby, 1966). Nesting of sea turtles in Greece was first reported in 1977 (Marinos 1977). In subsequent years observations showed that some of the southern sandy beaches of the island of Zakynthos constitute important loggerhead turtle (Caretta caretta) rookeries (Marinos, unpublished). Nesting loggerheads were also observed during a survey of Western Peloponnesos, conducted by the author in August 1981. Specifically, loggerheads nest on the following stretches of beach: 1. from Romanos to Vromoneri. 2. from Kiparissia to Neochori. In 1977 the National Council for Physical Planning and the Environment (Athens, Greece) carried out a survey in order to obtain sea-turtle distribution data. Appropriate questionnaires were sent to port authorities throughout Greece and data were obtained from local fishermen. A second survey, using a slightly different questionnaire, was conducted in 1981. Given that the 1981 data are consistent, but not identical, with the 1977 data the following general conclusions can be drawn:

1. Dermochelys coriacea is very rarely encountered in Greek waters.

2. Cheloniidae are abundant and very widely distributed. Although no conclusions can be drawn about the distribution of particular species it is reasonable to assume that Chelonia mydas occurs in the Eastern Aegean because the green turtle nests on the Western coast of Turkey (Geldiay, 1980) and in Cyprus (Demetropoulos and Hadjichristophorou, 1981) and because only Caretta caretta has been observed in Western Greece.

3. Sea turtles are encountered all year around but mainly during the warmest months of the year (May-October). Based on Carr et al. (1980), who suggest

that in temperate-zone sections of its range the loggerhead may sometimes hibernate, this finding together with the fact that the average temperature of the Greek seas is 14°C, implies that Caretta caretta might hibernate in Greece.

4. Five nesting areas have been pinpointed: a. Southern part of the island of Cephalonia. b. Southern part of the island of Zakynthos. c. Western coast of Peloponnesos. d. Lakonikos Bay (south-eastern Peloponnesos). e. Island of Crete.

5. The survival of sea turtles is threatened by continuous coastal development (urbanisation, industrialisation, tourism). There is no commercial fishery and incidental killing is not important.

Although the above conclusions are general, it is believed that they give a good picture of the present status of sea-turtles in Greece. These conclusions are therefore being used to plan further research and conservation.

Carr, A., Ogren, L. and McVea, C. 1980. Apparent hibernation by the Atlantic Loggerhead Turtle Caretta caretta off Cape Canaveral, Florida. Biol. Conserv. 19:7-14.

Demetropoulos, A. and Hadjiichristophorou, M. 1981. Chelonians of Cyprus. Biol. Soc. of Cyprus Bull. No. 1:13-17.

Geldiay, R. 1980. On the status of sea turtle populations (Caretta caretta and Chelonia mydas) in the Northern Mediterranean Sea, Turkey, IUCN/WWF No. 1419, Final Report.

Marinos, P. 1977. Zakynthos - Tourism and Environment. MSc Dissertation, University of Salford, UK.

Seaby, H.A. 1966. Greek coins and their values. 2nd edition. Seaby's numismatic publications Ltd, London.

PENNY MARINOS
National Council for Physical Planning and the Environment, Ministry of Coordination, Zalocosta 1, Athens, Greece.

MANAGEMENT OF TURTLE RESOURCES MONOGRAPH NO. 1: DISTRIBUTION CHANGE

This monograph, listed in the Recent Papers section of the last Marine Turtle Newsletter (1981, 18, p 12) will now be distributed by the Australian National Parks & Wildlife Service, PO Box 636, Canberra City, ACT 2601, Australia. Interested researchers may be able to obtain it free of charge. The reason for the change is that, on account of cuts in government expenditure, Applied Ecology is to go out of business.

RECENT PAPERS

Armitage, P. and McCarthy, C. 1980. Turtle remains from a late 18th century well at Leadenhall Buildings. The London Archaeologist 4: 8-16. C. McCarthy, Department of Zoology, British Museum (Natural History), London SW7, UK.

Bustard, H.R. 1981. Turtle farming and conservation of green turtle (Chelonia mydas). Brit. Herp. Soc. Bull. 3, 36-40. H.R. Bustard, Central Crocodile Breeding and Management Training Institute, Rajendranager Road, Hyderabad, India.

Bustard, H.R. and Kar, C.S. 1980. Annual nesting of the Pacific Ridley sea turtle (Lepidochelys olivacea) in Orissa, India. Brit. J. Herp. 6, 139. H.R. Bustard, Central Crocodile Breeding and Management Training Institute, Rajendranager Road, Hyderabad, India.

Chen, B.-Y. and Mao, S.-H. 1980. Hemoglobin fingerprint correspondence and relationships of turtles. Comp. Biochem. Physiol. 68B: 497-503. B.-Y. Chen and S.-H. Mao, Department of Biomorphics, National Defense Medical Center, Taipei (107), Taiwan.

Duguy, R. and Duron, M. 1981. Observations de tortues luth (Dermochelys coriacea L.) sur les cotes de France en 1980. Ann. Soc. Sci. Nat. Charente-Maritime 6, 819-825. R. Duguy, Museum de la Rochelle, 28 rue Albert 1er, La Rochelle 17000, France.

den Hartog, J.C. 1980. Notes on the food of sea turtles: Eretmochelys imbricata (Linnaeus) and Dermochelys coriacea (Linnaeus). Netherlands Journal of Zoology 30: 595-610. J.C. den Hartog, Rijksmuseum van Natuurlijke Historie, Leiden, The Netherlands.

Flores-Villela, O.A. 1980. Reptiles de importancia ecónomica en México. Thesis, Universidad Nacional Autónoma de México, pp 1-278.

Fretey, J. and Frenay, D. 1980. Prédation des nids de tortues luth (Dermochelys coriacea) par les chiens des villages indiens galibi en guyane française. Revue Med. vet., 131, 12: 861-867. J. Fretey, Muséum National d'Histoire Naturelle (Reptiles et Amphibiens), 57, rue Cuvier, F-75005 Paris, France.

Fretey, J. and Lescure, J. 1981. Prédation des tortues marines par les oiseaux en Guyane française. L'Oiseau et Rev. Fr. Ornithol. 51, 139-145. J. Fretey, Laboratoire de Zoologie, Muséum National d'Histoire naturelle, 25 rue Cuvier, 75005 Pans, France.

Howlett, S. 1981. Pakistan's turtles nest on holiday beaches. Turtle & Tortoise Review 1: 5-8. S. Howlett, WWF/IUCH Gland, Switzerland.

Kurata, Y., Yoneyama, S., Tsutsumi, K., Kimura, J. & Hosokawa, S. 1978. Experiments to increase numbers of green turtles through the release of the young. Ogasawara Fishery Center, Tokyo Metropolitan Government, Research Report 3, pp 58-80. Translated from Japanese into English by Tamio Otsu, 1981. Translation No 56, National Marine Fisheries Service, SW Fisheries Center, P.O. Box 3830, Honolulu, Hawaii, 96812 USA.

Limpus, C.J., Miller, J.D. & Fleay, A. 1981. The Olive Ridley turtle, Lepidochelys olivacea, recorded from South Queensland. Herpetofauna 12, 2-3. C.J. Limpus, Queensland National Parks and Wildlife Service, Pallarenda, Townsville, 4180 Australia.

Márquez, R., Villanueva, A. and Peñaflores, C. 1981. Anidacion de la tortuga laud (Dermochelys coriacea schlegelii) en el Pacifico Mexicano. Ciencia Pesquera (Inst. Nat. Pesca, Mexico) 1:45-52. R. Márquez, M. Apdo Postal 79-052 Col. Doctores, Mexico 7, D.F.

Miller, J.D. and Limpus, C.J. 1981. Incubation period and sexual differentiation in the green turtle Chelonia mydas L. In Banks, C.B. and A.A. Martin (Eds.). proceedings of the Melbourne Herpetological Symposium. Zoological Board of Victoria, Parkville. 66-73. J.D. Miller, Department of Zoology, University of New England Armidale, N.S.W., 2351, Australia.

Mortimer, J.A. 1981. The feeding ecology of the West Caribbean green turtle (Chelonia mydas) in Nicaragua. Biotropica 13: 49-58. J.A. Mortimer, Department of Biology, University of Florida, Gainesville, Florida, 32611 U.S.A.

Ogden, J.A., Rhodin, A.G.J., Conlogue, G.J. and Light, T.R. 1981. Pathobiology of septic arthritis and contiguous osteomyelitis in a leatherback turtle (Dermochelys coriacea). Journal of Wildlife Diseases 17: 277-287. J.A. Ogden, Department of Surgery (Orthopaedics), Yale University School of Medicine, New Haven, Connecticut, 06510 U.S.A.

Rabalais, S.C. & Rabalais, N.N. 1980. The occurrence of sea turtles on the south Texas coast. Contributions in Marine Science, 23, 123-129. S.C. Rabalais, University of Texas Marine Science Institute, Port Aransas Marine Laboratory, Port Aransas, Texas 78373 USA.

Stoneburner, D.L. 1980. Body depth: an indicator of morphological variation among nesting groups of adult loggerhead sea turtles (Caretta caretta). J. Herpetol. 14: 205-206. D.L. Stoneburner, Institute of Ecology, University of Georgia, Athens, Georgia, 30602 U.S.A.

Stoneburner, D.L., Nicora, M.N. and Blood, E.R. 1980. Heavy metals in loggerhead sea turtle eggs (Caretta caretta): Evidence to support the hypothesis that demes exist in the Western Atlantic population. J. Herpetol. 14: 171-175. D.L. Stoneburner, M.N. Nicora and E.R. Blood, Institute of Ecology, University of Georgia, Athens, Georgia, 30602 USA.

Stoneburner, D.L. and Richardson, J.I. 1981. Observations on the role of temperature in loggerhead turtle nest site selection. Copeia, No. 1: 238-241. D.L. Stoneburner and J.I. Richardson, Institute of Ecology, University of Georgia, Athens, Georgia, 30602 USA.

MYSTERY HAWKSBILL TAG F2915

This tag has been sent to Archie Carr. The turtle it came from was apparently a hawksbill turtle caught near Hillsborough, Carriacou, Grenada, West Indies, but it is not known who tagged the animal and where. Will anyone with information please write to A. Carr (Dept. Zoology, University of Florida, Gainesville, Florida, 32611 U.S.A.) with a copy to the editor of this newsletter.

Support for this newsletter came from M.C. Mittag, Dr. J. Mittag, the University of Toronto and World Wildlife Fund Canada.

Marine Turtle Newsletter

No. 20 FEBRUARY 1982

Editor: N. Mrosovsky

Departments of Zoology
and Psychology
University of Toronto
Toronto, Ontario
M5S 1A1 Canada

Editorial Advisors:

P.C.H. Pritchard
Harold F. Hirth

EDITORIAL

This newsletter has circulated a number of requests for information on turtles bearing mystery tags or notches. Some mysteries have even been solved as a result. All this would be unnecessary if people put the details of their projects on record. This is especially needed when notches (or tags liable to loss of lettering) are used. In the western Atlantic alone, notched green turtles have been released from Surinam, Aves Island and the Cayman Island--and maybe elsewhere too, who knows. Without better documentation, there is a potential for confusion. Your editor is predisposed to print short factual accounts, such as the one appearing in this issue, to mitigate this problem. There are already mysteries enough about sea turtles without creating more.

N.M.

THE BAN ON THE EXPORTATION OF TURTLE SKIN FROM ECUADOR

In recent years a number of complex factors have been involved in the export of turtle skins from Ecuador and it is only possible to point out several of the more important of these. The National Legislation did not immediately adopt the resolution of the Convention on International Trade in Endangered Species (CITES). In September 1978, the first meeting between CITES, the Ministry of Agriculture and Livestock and the Ministry of Natural Resources was held in Ecuador. This meeting did not decide upon any definite action to stop the turtle exports. Meanwhile the export figures were increasing to 80,535 (minimum) to 89,483 (maximum) according to the data of Green and Ortiz (World Conference on Sea Turtle Conservation, Smithsonian Institution, in press). In 1978, the exports were despatched to Italy (53.13%), Japan (15.75%), Switzerland (12.66%) and Mexico (11.18%); see also Table 1. No further meetings were held between the relevant ministries in 1979. In the meantime the export figures were still climbing and reached a peak of 93,232 pieces and the production figures obtained during this year clearly show an excess of 14% over the official export figures of the Central Bank according to Green and Hurtado (1981, Marine Turtle Newsletter 16, 1-5). The turtle

skin exports in 1979 went principally to Japan (71.04%) and Italy (11.08%). (Table 1). A second meeting was held, in 1980, between the three parties which agreed upon a number of actions to be taken. Later meetings in 1980 decided on unified criteria based on studies of the trade produced by the Instituto Nacional de Pesca (INP). At the same time the Ministry of Agriculture ad Livestock enforced the legislation against the export of all wildlife and derived products. Export figures for marine turtles dropped in 1980 to 18,749 to 20,832 (Table 2). These exports went to Japan (55.3%) and Italy (44.0%). (Table 1).

In June 1981, the Subsecretaria of the Department of Fisheries Resources and the Direccion General de Pesca (DGP) of the same Department, put a ban on the export of turtle skin from Ecuador. This decision was largely based on the resolutions made in the New Delhi meeting of CITES concerning the control of trade in species listed in the Appendices of the Convention. Before the ban on exports was applied, the DGP asked for stock figures from the major exporters (Expromar, Exporklore and Neptuno). These produced total figures of 26,761 turtles in the form of skins and other derived products (Table 3). However, DGP inspectors could only find 9,564 turtles in their warehouses. The remainder, it was stated by the companies, were those which were irrevocably in the pipe-line. Therefore at the time the ban on exports was made 9,564 turtles were allowed as remaining stock and permitted for export. The export figures for 1981 have been returning to the high level of 1978, with 56,851 (min.) to 63,867 (max.) turtles (Table 2) including the 9,564 (Table 3) counted by the Inspectors of the DGP. The turtle skin exports in 1981 are due to go to Italy (91.28%), Japan (4.12%) and Mexico (4.60%). (Table 3).

TABLE 1. PERCENTAGE OF SKINS OF MARINE TURTLES FROM ECUADOR GOING TO EACH COUNTRY IN THE PERIOD 1977-1981.

COUNTRY	ANNUAL EXPORT FIGURES OF TURTLE SKINS (IN PERCENTAGES)				
	1977	1978	1979	1980	1981*
JAPAN	57.89	15.75	71.04	55.30	4.12
ITALY	26.22	53.13	11.80	44.00	91.28
SWITZERLAND		12.66	8.04		
CHINA	1.11	6.05	7.51		
MEXICO		11.18	1.07		4.60
PANAMA	11.37				
USA	3.42				
FRANCE		1.24	0.54		
SPAIN				0.70	

* Not including 5,652 Kg of stock in the stores of the companies (June 3, 1981).

Source: Banco Central and Direccion General de Pesca.

TABLE 2. ANNUAL EXPORT OF SKINS OF MARINE TURTLES BY 3 COMPANIES (EXPROMAR, EXPORKLORE AND NEPTUNO), IN THE PERIOD 1978 TO 1981.

EXPORT OF SKINS				SOURCE
YEAR	WEIGHT	ESTIMATED NUMBER OF TURTLES INVOLVED Min.	Max.	
1978	161.070	80.535**	89.483**	INP and DGP Green & Ortiz (in press)
1978		86.916**		Banco Central Green & Hurtado (in press)
1979	266.465	133.233**	148.036**	Green & Ortiz (in press) Green (unpublished)
1979		93.232***		Banco Central Green & Hurtado (in press)
1980	37.498	18.749**	20.832**	DGP (this study)
1981	113.701*	56.851**	63.167**	DGP (this study)

* Estimated final exported in 1981.

** Numbers of turtles estimated on a basis of 1.8 to 2.0 Kg of skin from each turtle (Green & Ortiz, op.cit.) giving the maximum and minimum number respectively.

*** Number of turtles known not estimated (Green & Hurtado, 1981, op.cit.).

TABLE 3. STOCK OF TURTLE SKINS AND OTHER PRODUCTS DECLARED BY THREE EXPORTER COMPANIES FROM ECUADOR (EXPROMAR, EXPORKLORE AND NEPTUNO), ON 23rd JUNE, 1981.

	TOTAL STOCKS DECLARED BY THE COMPANIES	QUANTITIES OF* STOCK ORIGINALLY DECLARED BUT NOT SPECIFIED	STOCK EXISTING IN THE STORES (Verified by DGP)
SETS OF FLIPPERS	26.761 set **	17.197 set **	9.564 set **
MEAT	60.120 Kg.	39.236 Kg.	20.884 Kg.
OIL	15.000 Kg		

* In the pipeline.

** 1 set = 1 turtle.

According to many fishermen in the area of Boca de Lagarto, Esmeraldas, a large proportion of the turtles exported from Ecuador in 1981 would have come from the still active turtle fishery in the southern area of Colombian waters. In Colombia the turtle fishery is very similar to that which developed in Ecuador. This includes skinning of the animals aboard the boats and jettisoning the meat. Additionally in Colombia enclosures are used where the live animals are kept for processing at a later stage. It was stated that one dealer used to obtain salted skins in Puerto Tumaco (Colombia) and bring them to Ecuador via La Tola, Esmeraldas, where they were sold to other dealers used by the exporting companies, who subsequently transported the product to Guayaquil and Manta.

Finally, as a point of interest it is worth mentioning that in 1981 INP started a tagging programme on Lepidochelys olivacea (ridley's turtle) with base camps situated in Palo Verde, Santa Marianita and Isla de la Plata, Province of Manabi. This programme was manned partly by students of biology from the University of Guayaquil, who had previously been trained by working on a similar tagging programme on Chelonia mydas in the Galapagos Islands, that was directed by Derek Green until May 1980 and thereafter it has been continued by the author, who worked with Green from 1978.

MARIO HURTADO G.
Instituto Nacional de Pesca, Casilla 5918, Guayaquil, Ecuador.

ECUADOR CLOSES COMMERCIAL TURTLE FISHERY

There has been considerable concern over the commercial fishery of Lepidochelys olivacea in Ecuador. Cantos and Ortiz (1978) first documented the situation, and Green and Ortiz (in press) detailed the size of the trade. Green and Hurtado (1981) recently described a reduction in the fishery, indicating that there was a "ray of hope." The situation was frightening not only from the number of animals being caught, perhaps 150,000 in 1979, but also because tag returns indicated that the same population so intensely exploited on nesting grounds in Mexico was subjected to heavy exploitation in non-breeding areas in Ecuador. There seemed no respite for the turtles (Frazier 1980).

It was also incongruous, not only because Ecuador ratified CITES in 1975, and L. olivacea is listed on Appendix I, but this country is one of Latin America's more active conservationists - notably in Galapagos. The problem arose, as in any bureaucracy, through the lack of communication between two agencies: Departamento de Fauna y Forestal, of Ministerio de Agricultura y Ganaderia (MAG) - the CITES authority, and Departamento de Pesca, of Ministerio de Recursos Naturales (MRN) - responsible for marine resources. According to one CITES representative, the MAG did not issue export permission during 1980; although there were commercial exports. In December, 1980, representatives of these two ministries and other CITES authorities in Ecuador met and adopted a resolution to develop an annual quota for sea turtles, contingent on Mexico cooperating in a joint management program. Perhaps related to these negotiations, a naval officer stationed in Esmeraldas prohibited turtle fishing, so there was said to have been little commercial exploitation during much of 1980 and 1981 in that region. Apart from the governmental restrictions, the major turtle processing companies were closed from strikes for nearly eight months in 1980. The reduced catches reported by Green and Hurtado (1981) were a result of all these factors, especially the strikes.

In July, 1981, the commercial exploitation of sea turtles was prohibited by the MRN, and inventories of turtle products were obtained from each company. We visited the Manta area from 14 to 31 July, 1981, and were repeatedly told by fishermen, workers, and officers in the turtle plants that the fishery was closed. One final catch of a few hundred turtles was processed a day or so after the closure, but thereafter there was no evidence of large catches in San Mateo, Manta, or Jaramijo, although a few animals might be brought in some days. How long this situation will remain is not known. There is now considerable interest in both Ecuador and Peru in having turtles considered by the South Pacific Commission (including Chile, Peru, Ecuador, and recently, Colombia). Ecuador's actions raise the hopes that international cooperation can be developed before wide ranging populations are exterminated. Hopefully Ecuador's selfless, unilateral action, and desire for international cooperation will be followed.

Cantos, G. and F. Ortiz-Crespo 1978. El problema de la Captura y Comercializacion de Tortugas Marinas. Typescript (Universidad Central & Universidad Catolica, Quito) 20 pp.

Frazier, J. 1980. Marine Turtle Fisheries in Ecuador and Mexico: The last of the Pacific Ridley? MS (Smithsonian Institution) 38 pp, 21 Tables, 7 Figures + Appendix.

Green, D. and M. Hurtado G. 1981. Ridleys in Ecuador - A Ray of Hope?

Marine Turtle Newsletter No. 16: 1-5.

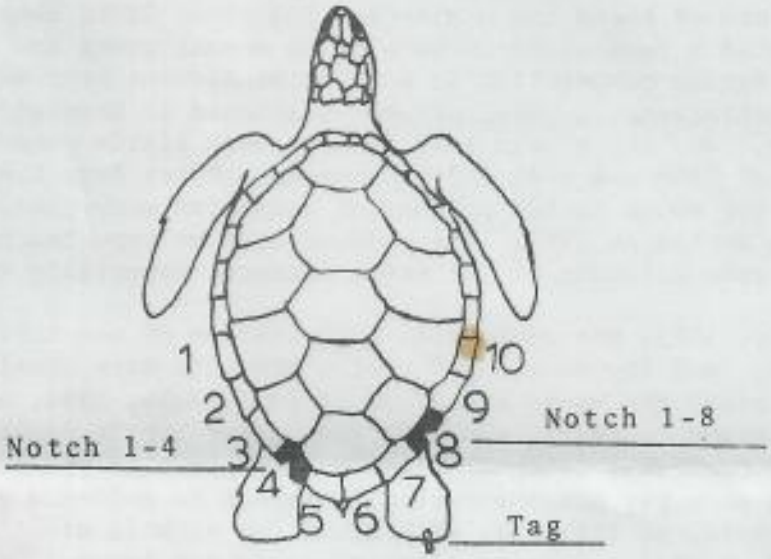
Green, P. and F. Ortiz-Crespo. In press. The Status of Sea Turtle Populations in the Central Eastern Pacific. In: Proceedings of the World Conference on Sea Turtle Conservation. Smithsonian Institution Press, Washington, D.C.

J. FRAZIER and S. SALAS, Department of Zoological Research, National Zoological Park, Smithsonian Institution, Washington, D.C. 20008, U.S.A.

(Note: The article above was requested by the Editor before he received an account of this matter from the Instituto Nacional de Pesca, Ecuador).

RELEASE OF CAPTIVE-BRED GREEN SEA TURTLES BY CAYMAN TURTLE FARM LTD.

In October 1980 Cayman Turtle Farm Ltd. (CTFL) began a program whereby local residents and visitors to the island could make a small donation and release a farm bred turtle into local waters. During the past 10 months 1,971 turtles have been released in this manner. Table I provides details as to numbers released, age, weight, notch code, and the series number of tags when used. Figure 1 shows the location of notches in the marginal scutes with notch code 1-4 indicating 1 notch in marginal scute number 4. Each year class has received a different notch code.



Numbered plastic tags made by Dalton (U.K.) have been attached to the right rear flipper. The majority of tagged turtles were individually weighed at the time of tagging. The October release was made in a single day from Rum Point on the north coast into North Sound, a large shallow bay containing turtle grass and virtually enclosed by a barrier-type reef. Releases since October have been almost all off the West Coast. The turtles released have been produced by the breeding herd maintained by CTFL.

TABLE 1. DATA ON TURTLES RELEASED BY CAYMAN TURTLE FARM LTD.

Month	# of Turtles	Age (months)	Average Weight (kg)	Notch	Tag
Oct	1,074	13	3.0	1-4	None
Nov	3	14	3.2	1-4	None
Dec	21	15	3.7	1-4	None
Jan	77	16	4.3	1-4	None
Feb	54	17	5.0	1-4	None
	2	6	0.8	1-8	None
Mar	87	7	0.8	1-8	None
Apr	43	8	1.2	1-8	Blue 1-50
May	38	9	2.2	1-8	Blue 51-100
Jun	151	10	2.4	1-8	Blue 101-400
					Red 1-82
Jul	421	11	2.4	1-8	Red 83-400
Total	1,971				

No quantitative data are available as to the survival of the released turtles, however, numerous reports by individuals indicate that a substantial number of turtles can now be seen in North Sound, particularly in shallow water near mangroves. Several of the turtles released in North Sound were reported in turtle grass beds off the west coast during November. The Cayman Islands Government is currently considering initiating a survey to obtain additional data on the success of the turtle release program.

J.R. WOOD
Cayman Turtle Farm Ltd., P.O. Box 645, Grand Cayman, British West Indies.

CAPTIVE REARING OF ATLANTIC RIDLEYS AT CAYMAN TURTLE FARM LTD.

On 4 July 1980 100 yearling Atlantic ridleys (Lepidochelys kempi), raised during their first year at the National Marine Fisheries Service laboratory in Galveston, Texas, and returned to the care of the Instituto Nacional de Pesca, were transported by air from CanCun, Mexico to Grand Cayman. The turtles, property of the Mexican government, were to be raised at the facilities of Cayman Turtle Farm Ltd. as part of a cooperative program between the Insitituto Nacional de Pesca and Cayman Turtle Farm Ltd. The ultimate objective of the project being the establishment of a captive breeding herd of this highly endangered species.

Tanks, water supply, and density: The turtles were maintained in concrete tanks 1.2m x 1.8m x .4m which were provided with approximately 15 litres/min of fresh, chlorinated (2ppm) sea water. During January through March the inflow water was heated to 30°C. Tank floors were covered with .3cm thick solid rubber matting to reduce plastron lesions. Initial stocking density was 20 turtles/tank. In April 1981 the ridleys were transferred to 2 fiberglass

tanks with a diameter of 3m and water depth of .4m. Water flow was 30 litres/min. Stocking density was 33 turtles/tank.

Weighing and feed: The turtles were either individually or collectively weighed the first of each month. Average weights and the amount and type of feed consumed each month are given by Table 1. Biodiet, Bioproducts Inc., Warrenton, Oregon, is a semi-moist ration containing as fed 38% protein, 11.5% fat, 2.0% fiber and 22.5% moisture. CS9349 is a 45% protein, floating pelleted ration specially formulated by Central Soya, Ft. Wayne, Indiana, for sea turtles. RP45 and RP35 are floating turtle chows produced by Ralston Purina, St. Louis, Missouri, containing 45% and 35% protein respectively.

Disease and mortality: Of the 38 mortalities which occurred during the year 17 were recorded during the first 10 days including 4 turtles which did not survive transport. Many of the turtles were found upon arrival to have carapace lesions consisting of brownish ulcerative pits particularly in association with the marginal scutes. Necropsy results indicated that other than carapace and skin lesions no gross abnormalities were associated with death. On 29 July 1980 treatment of these lesions was initiated by soaking the turtle overnight for 10 nights in a sea water solution containing approximately 82mg tetracycline/litre (Polyotic, American Cyanamid). This caused substantial healing. In February many of the turtles had skin lesions as a result of biting. These were treated by giving approximately 50mg tetracycline per kg of body weight. Feed was coated with a gelatin/tetracycline solution prior to feeding. A variety of bacteria were isolated from the carapace and skin lesions including Moraxella sp., Citrobacter freundi, Pseudomonas putrifaciens, Pseudomonas cepacia, and Plesiomonas shigelloides.

Sex ratio and tags: Necropsy results show the sex ratio of males to females to be 1.4:1 (N=22) indicating that the remaining stock contains a reasonable number of females. It is perhaps also worth noting that the metal tags attached by the National Marine Fisheries Service to the inside trailing edge of the right front flipper are, with a single exception, still firmly in place.

Discussion: Growth and feed conversion efficiency of the Atlantic ridley in captivity is considerably less than that of the green sea turtle suggesting that either the natural growth rate is less or that the optimum ration is not being offered. By far the major problem with rearing these turtles in captivity is their natural aggressiveness which produces severe and sometimes fatal skin and shell lesions. Following the transfer of the turtles to the fiberglass tanks in April the number of turtles with skin lesions has been greatly reduced. This may reflect decrease in aggressive behaviour as they grow.

TABLE 1. DATA ON ATLANTIC RIDLEYS MAINTAINED IN CAPTIVITY AT CTFL.

Date	Number of Turtles	Average Weight	Feed consumed (Kg)/Turtle/ Month	Type of Feed
7/7/80	96	0.9	1.0	Biodiet
1/8/80	82	1.1	1.7	Biodiet
1/9/80	82	1.4	2.2	Biodiet
			0.3	CS9349
1/10/80	82	2.0	1.7	CS9349
1/11/80	82	2.5	2.2	CS9349
3/12/80	67	2.6	2.7	RP45
2/1/81	67	3.3	3.1	RP45
2/2/81	67	3.3	0.3	RP45
			1.7	RP35
2/3/81	66	3.4	2.3	RP35
1/4/81	66	3.6	3.0	RP35
1/5/81	66	3.9	3.2	RP35
1/6/81	66	4.2	3.2	RP35
1/7/81	62	4.4		

J.R. WOOD
Cayman Turtle Farm Ltd., P.O. Box 645, Grand Cayman, British West Indies.

(Note: Because of the great interest in conservation of Kemp's ridley, the Editor encouraged the Cayman Farm to put the facts in the above article on record. It is hoped that a future issue of the Marine Turtle Newsletter will give fuller details of the Rancho Nuevo and Padre Island projects).

RECENT PAPERS

BLAIR, D. Undated. Parasitic flatworms (Platyhelminthes: classes digenea and aspidogastrea) of sea turtles, with emphasis on those of Australia. Ms, 19 pp + Figs (illustrated key to the fluke parasites of sea turtles, based mainly on material from Australia but covers all genera described for sea turtles, copies available). David Blair, Department of Zoology, University of Canterbury, Christchurch, New Zealand.

FRAZIER, J. 1981. Recaptures of marine turtles tagged in East Africa: evidence for a non-migratory green turtle population? Afr. J. Ecol. 19, 369-372. J. Frazier, National Zoological Park, Smithsonian Institution, Washington D.C., 20008 USA.

GLAZEBROOK, J.S., CAMPBELL, R.S.F. and BLAIR, D. 1981. Pathological changes associated with cardiovascular trematodes (Digenea: spirorchidae) in a green sea turtle Chelonia mydas (L). J. Comp. Path. 91, 361-368. J.S. Glazebrook, Department of Tropical Veterinary Science, James Cook University of North Queensland, Townsville, Queensland 4811, Australia.

GUDYNAS, E. 1980. Notes on the sea turtles of Uruguay. ASRA Journal 1, 69-76. E. Gudynas, Dept. Biologia, Centro Educativo Don Orione, Casilla Correo 13125, Montevideo, Uruguay.

MACKENZIE, D.S., LICHT, P. and PAPKOFF, H. 1981. Purification of thyrotropin from the pituitaries of two turtles: the green sea turtle and the snapping turtle. Gen. Comp. Endocrinol. 45, 39-48. D.S. MacKenzie, Department of Zoology, University of Alberta, Edmonton, Alberta T6G 2E9, Canada.

MORAN, R. and ENCISO, F. 1981. Estudio preliminar del desarrollo embrionario de la tortuga golfina Lepidochelys olivacea (Eschoscholtz 1829). Agronomia en Sinaloa, 1, 70-74. R. Moran A. Libertad 416 pte, Mazatlan, Sinaloa, Mexico.

SCHWARTZ, F.J. 1981. A long term internal tag for sea turtles. Northeast Gulf Science 5, 87-93. F.J. Schwartz, Institute of Marine Sciences, University of North Carolina, Morehead City, N.C. 28557 USA.

TRENGGANU MEETS COMPETITION: DOES IRIAN JAYA HARBOUR SOUTHEAST ASIA'S DENSEST LEATHERBACK NESTING BEACHES?

(reprinted from Conservation Indonesia, Newsletter of WWF Indonesia, 5, pp. 18-19, 1981).

The brown sand beaches between Sorong and Manokwari along the north Vogelkop coast of Irian Jaya are generally considered to have the largest concentrations of nesting Dermochelys coriacea, the leatherback turtle, in Indonesia. Densest nesting reputedly occurred at four sites: east of Nuni River and between the villages of Warbifor, Prafi and Masni in the Manokwari District, between Mar and Koor villages west of Kaap Goode Hoop and between Sausapor and Meja villages in Sorong District. Reserves to safeguard the nesting beaches and turtles have been proposed at all four sites. In August Dr. Ron Petocz, WWF Consultant in Irian Jaya, and I surveyed the four proposed leatherback reserves to count turtle nests, and to assess the extent of egg harvest. The nesting activity in the proposed reserves proved disappointing. In fact, the Nuni River area had no sign of nesting. People lived at or near the beaches in each of the proposed reserves and it is likely they collected all eggs laid there.

Elsewhere in Irian Jaya, at a site that will remain undisclosed until it is protected, we found previously unconfirmed nesting beaches where thousands of leatherback turtles nested. Here the nesting density was so great it was impossible to count the nests. We estimated about 4,000 nests on five main beaches totalling 14 km in length. There appeared to be not one square centimetre not covered by turtle tracks and the beach was pitted with the nests of two species: the enormous leatherback turtle nests about 3-5 m above high water mark and green turtle nests high up the beach at the edge of the vegetation. Wild boar had unearthed 50+% of the nests and left behind an excavated basin rimmed with white egg cases.

It would seem that the turtle stocks of the better known beaches, such as those named above, have been drastically depleted by egg and turtle collectors -- possibly even eliminated in the case of Nuni River. There is always the danger that nesting populations at new or poorly known areas will also face elimination once fishermen discover them. This must not be allowed to happen to the last of the dense leatherback nesting beaches in Indonesia, and what may prove to be the most important nesting beach for this species in SE

Asia. These beaches must be protected in a new reserve. At the same time there must be surveys to confirm which turtle species nest there, estimate their numbers, determine the loss of eggs to wild boar and people, identify other threats and the harvest methods, assess the cultural, nutritional and economic dependence of local communities on turtle and egg harvest. This should lead to a management plan directed at immediate conservation needs, such as wild boar control, but the survey must ultimately be backed up by studies to develop a programme of sustainable harvest that would be incorporated into a long term management plan.

RODNEY V. SALM
IUCN/WWF in Indonesia, c/o Directorate of Nature Conservation, P.O. Box 133, Bogor, Indonesia.

FACTORS AFFECTING THE RETENTION OF METAL TAGS ON SEA TURTLES

The identification of individuals with easy-to-read tags that remain in place for many years is the most fundamental tool that can be utilized to study sea turtles in the wild. Self-piercing Monel alloy flipper tags manufactured by the National Band and Tag Company (NBTC) of Newport, Kentucky USA have been extensively used for this purpose over the past 25 years. Although tag loss is known to occur, some impressive successes have been achieved in gathering data for certain populations. A reliance on these tags can therefore be expected to continue during the coming years. In view of this anticipated usage, it will be helpful to summarize the various interrelated problems, and offer suggestions for enhancing tag retention.

Locking-Mechanism Failure. There are two styles of locking mechanisms in the tags produced by NBTC. One consists of a "tamper-proof" design in which the piercing point bends over a bridge on the inside surface of the tag. In the other, the piercing point passes directly through a hole in the tag and bends over on the outside surface. The tamper-proof lock was originally designed for domestic livestock and is sold in NBTC tag sizes 49, 62, and 4 (Table 1). Size 49 has been the most popular tag for adult sea turtles.

Table 1. Specifications of NBTC's self-piercing Monel flipper tags

Style 4-1005 size No.	Length (mm)	Width (mm)	Mean width of gap (mm)	Locking mechanism
49	40	10	11	Bridge
19	40	10	11	Hole
62	35	10	10	Bridge
681	25	8	9	Hole
4	18	5	5	Semi-bridge
3	13	4	4	Hole
1	8	2.5	2.5	Hole

Until this past year, the through-the-hole lock has only been available in size 681 and the very small sizes 3 and 1. However, due to the greater strength of this lock, and periodic breakage of the bridge of the tamper-proof design, NBTC now manufactures size 49 tags with an optional through-the-hole lock. This improved version has been designated as size 19.

A disadvantage of the through-the-hole lock is that when the piercing point is not fully bent over, the tag may be more prone to snagging and loss should the turtle encounter nets. This problem can be avoided by making certain that the point has locked fully into place with the special applicators. If a complete bend of the point has not occurred, this should be carried out using standard pliers. Even if entanglement is not a concern to the researcher, tags with the through-the-hole lock should still be routinely inspected and the lock corrected as needed. In contrast, it is impossible to correct an improperly locked tag with the tamper-proof design. In such cases, the tag should be removed and replaced with a new one.

A spring-action effect that exists in the tag after attachment places stress on the locking mechanism. Tags that have been on for many years may still retain this property and pop open 5 mm or more if the lock fails. Such tension contributes to the failure of the lock, particularly when corrosion of the metal develops in this region. The spring action can be easily eliminated after attachment by using pliers to squeeze the two sides of the tag slightly together at a point about one-third from the folding end. Only a minimum of pressure is needed. When carried out properly, there will be no visible evidence that the tag sides were momentarily bent inward. It should be noted that even if the lock fails and the tag springs open, tag loss will not always result.

Tissue Necrosis. Attachment of the tag in a manner that compresses tissue to the point of blocking vascular circulation can result in necrosis. To avoid this situation, the distance from the piercing site to the trailing edge of the flipper should be the same, or slightly less, than the length, of the tag when locked. If the distance on the flipper exceeds the tag length, the tissue will be gathered together and constricted after the tag is attached. Necrosis can also develop when the two sides of the tag are crushed together after being attached to the turtle. Tags damaged in this manner have been seen in Hawaii, Australia and Nancite, Costa Rica. This problem is almost certainly the result of turtles nipping at each other, or at their own tags. It may also be caused by certain fish, such as common and spiny puffers (Tetradontidae and Diodontidae) biting at tags while the turtles are resting underwater. The shiny appearance of Monel tags may stimulate biting. However, certain algae and invertebrates often grow on the tag and mask this brilliance. Tags that corrode are less apt to host encrusting growth due to the antifouling toxic properties of copper and nickel released in the corrosion process. A method for possibly reducing biting would be to render the tag less noticeable by using the smallest tag practical. For example, the size 681 tag is less conspicuous and more appropriate for adults of several if not all sea turtle species. A further disadvantage of larger tags is that when they are applied to their full length, piercing can take place through thick and potentially important musculature. This is more likely to occur in the smaller species. For researchers contemplating a change to the 681 tag, it should be noted that an inscription of up to 35 letters can be accommodated. This is less than the 55 letters possible on the size 49 and 19 tag,

but is adequate for most addresses. Necrosis can also be caused by the release of chemicals that result from Monel corroding in contact with the piercing site.

Tearing. Tags can be torn out of the flipper by biting, snagging in nets and other objects, or by the slapping against the carapace that occurs during nesting. A tag is more likely to be torn out if it hangs loosely on the flipper. While prevention of tissue necrosis requires that the distance from the piercing site to the flipper's trailing edge be equal to or slightly less than the tag length, too short of a distance will make it liable to tear. For subadult turtles, some risk must be taken in order to ensure adequate space inside the tag to accommodate growth.

The location where the tag is attached can also influence tearing. A survey by the author of the exact location where various researchers attach flipper tags revealed a wide range of sites currently in use. Tags that pierce directly through keratinized scales on the flippers should be more resistant to being torn out than tags placed in the webbing between these scales, or in the flap of soft tissue where the front flipper joins the body. However, working of the tag back and forth due to swimming movements of the flippers, and slapping on the carapace during nesting, increases as the tagging site becomes more distal. Also, in the tagging of adult males, especially green turtles, a greater proportion of the nipping during mating activity is directed at the distal edges of the flipper.

Abrasion. Abrasion of tags can result from contact with substrate when turtles are feeding and resting underwater, and nesting. This action produces scratches on the tag and, over an extended period, may cause loss of metal and contribute to tag loss. However, unlike plastic tags, where the effects of abrasion (and susceptibility to breakage) can be severe, metal tags appear to be very resistant to this form of damage.

Corrosion. Corrosion of Monel tags appears to be common, but its degree varies significantly, even within the same population of turtles. In many instances, corrosion is responsible either directly, or indirectly, for tag loss. The appearance of corroded tags can range from only a greenish surface discoloration to one that is pitted and deteriorated with certain areas paper thin. The rate of corrosion is not always correlated with the time that the tag is attached. No clear reasons exist to account for these differences. Some possible factors may include the composition and temperature of the seawater, diet of the turtle, serum chemistry, and small but conceivably important differences in the composition of the alloy used and the manner in which the tags were manufactured. In captivity, corrosion may be accelerated by electrolysis created between metals present in the facility and the tag. Corrosion is often more severe around the locking mechanism and in the letters stamped on the tag. The metal in these areas is subjected to greater stress during the manufacturing process, a factor that reduces corrosion resistance. Accelerated corrosion is also frequently found in the tag area that passes through the piercing site and rests in direct contact with internal tissue. In such cases, the incision will not heal but rather show necrosis and fluid drainage. The area of the tag in contact with this wound will not necessarily be the piercing end because rotation can occur after attachment.

The basic problem of corrosion in Monel tags is the inability of this particular alloy to withstand extremely corrosive conditions. This was not realized when Monel was selected for tags. Some of the desirable attributes that contributed to the selection of Monel, and are responsible for its continued use, include availability, relative low cost, metallurgical properties that make it easy to fashion into tags, and successful use on some sea turtles.

Investigations undertaken, at the author's request, by NBTC and Huntington Alloys, Inc. (Huntington, West Virginia, USA) have resulted in the special production of size 681 tags made from the highly corrosion-resistant alloy, Inconel 625 (see Marine Turtle Newsletter 1976, 1:3-4 and 1977, 2:7-8). Although attached to Hawaiian green turtles for up to 5 years, tags have shown no evidence of the corrosion previously found in this population with Monel tags. Inconel tags are not commerically available at present, however, their production could be initiated if financial support was made available to NBTC.

Other Tagging Considerations. The use of two or more tags on each turtle is a simple method for promoting longer-term recognition and measuring tag loss. On adult Hawaiian green turtles, two size 681 tags can be attached to each front flipper without appearing to burden the animal. Another worthwhile practice is to replace all old tags that are not adequately attached or show signs of corrosion. The value of a turtle to a research program increases each time it is recovered. Every effort should therefore be made to improve an individual's chances for continued recognition. The cost of tags in most research programs constitutes only a small percentage of the total expenditures. If tag problems are thought to exist, both the researcher and the funding agency should be willing to spend more to rectify this critical deficiency.

GEORGE H. BALAZS
National Marine Fisheries Service, P.O. Box 3830, Honolulu, Hawaii, 96812, USA.

FRENCH VERSION OF "TURTLES IN DANGER" NOW AVAILABLE

A French text is now available to accompany WWF the audiovisual pack (No. 014/40) of 40 slides and supporting booklet entitled 1977 for further details). Write to WWF/IUCN International Education Project, Greenfield House, Guiting Power, Glos. GL54 5TZ, U.K. for information on costs etc.

MAURITANIA : TURTLE STAMPS ISSUED

A series of 3 postage stamps (leatherback, green and hawksbill, 1 UM, 3 UM and 4 UM respectively) has been issued in the Islamic Republic of Mauritania. They may be obtained from: Office des Postes et Telecommunications, Service Philatelique, Nouakchott, R.I. de Mauritanie.

Support for this newsletter came from H.C. Mittag, Dr. J. Mittag, the University of Toronto and World Wildlife Fund Canada.

Marine Turtle Newsletter

No. 21 MAY 1982

Editor: N. Mrosovsky

Departments of Zoology
and Psychology
University of Toronto
Toronto, Ontario
M5S 1A1 Canada

Editorial Advisors:

P.C.H. Pritchard
Harold F. Hirth

EDITORIAL

This issue presents articles documenting migrations of olive ridleys from Costa Rica to Mexico, Ecuador and other countries, together with renewed calls for international cooperation. The precedent for multinational agreements on sea turtles is weak. The treaty between Costa Rica and Nicaragua on green turtles was never ratified by Nicaragua, although later, independently, the processing plants there were closed down. But the need for international cooperation is as great as ever. For olive ridleys in the East Pacific the circumstances are now propitious. There are vigorous investigators in several countries there. The beach at Ostional in Costa Rica has just been given additional protection. Any agreement covering the difficult problem of turtles nesting in one country and residing elsewhere could not only help preserve this species but also be an example to other nation groups with shared turtle resources.

N.M.

NEED FOR A REGIONAL RIDLEY PROGRAM IN THE EAST PACIFIC

Research on Lepidochelys olivacea in Mexico and Costa Rica has been documented (Marquez, 1976; Cornelius and Robinson, 1980). Little is known, however, about the efforts of investigators in Nicaragua and Panama. In both these countries, although some tagging has taken place, there are insufficient funds to support regular tagging (R. Arostegui, pers. comm.; D. Tovar, pers. comm.). In Ecuador there have been recoveries of L. olivacea tagged in Mexico and Costa Rica (Green, 1978; Green and Ortiz, in press). This resulted in the National Fisheries Institute establishing a L. olivacea program in May 1980. Since then, there have been 10 tag recoveries from Costa Rica and 5 from Mexico (Hurtado, in press). In addition, it is possible that some ridleys in Ecuador may have come from Nicaraguan and Panamanian beaches.

There is a need to establish a regional L. olivacea program. With this in mind the author visited organizations responsible for research on L. olivacea in these 4 countries. The idea was received with great enthusiasm. It is now necessary to extend this to the other countries where the species occurs some of which were given in Marquez et al. (1976). Moreover, the National Fisheries Institute in Mexico has concrete plans to organize a turtle meeting for 1982 and plans for a regional program will be presented then. It will be possible to discuss: methodology, a center for collection and interchange of dates, training of assistants and especially obtaining funds for tags and rewards. It has to be noted, however, that establishment of a regional Lepidochelys olivacea program is only in the initial stages.

Green, D. and Ortiz, F. (in press). Proceedings of the World Conference on Sea Turtle Conservation, Smithsonian Institution Press, Washington D.C.

Green, D. Investigacion sobre las tortugas marinas en las costas del Ecuador Continental. Report to National Fisheries Institute (INP), Guayaquil, 66 pp.

Hurtado, M. (in press). Boletin Informativo INP - Ecuador.

Marquez, R., et al. (1976). Sinopsis de datos biologicos sobre la tortuga golfina INP. Sinop. Pesca, (2):61 pp.

MARIO HURTADO G.
Instituto Nacional de Pesca, Casilla 5918, Guayaquil, Ecuador.

PROTECTION FOR OLIVE RIDLEYS AT OSTIONAL

Costa Rican President Rodrigo Carazo and his Minister of Agriculture & Livestock, Dr. Hernan Fonseca Z., are to be commended for having decreed, on January 7th, 1982, the beach of Ostional, Guanacaste, Costa Rica, as an area protected for the reproduction of marine turtles. This, and the neighbouring beach of Nancite, at present adequately protected under the National Park System, were listed as second in importance in the list of 38 identified nesting areas by the World Conference on Sea Turtle Conservation, Washington, D.C., 1979. The official recognition of the importance of this beach should stimulate international agencies to cooperate with Costa Rica in the protection of the area. Studies by Cornelius and Robinson are revealing extensive migration patterns of the species concerned, Lepidochelys olivacea; these underscore the responsibility of other countries in helping to conserve this resource. Letters of congratulation are in order for President Carazo.

DOUGLAS C. ROBINSON
Escuelo de Biologia, Universidad de Costa Rica, Ciudad Universitaria, Rodrigo Facio, Costa Rica, Central America

TAG RECOVERIES FOR RIDLEYS NESTING IN COSTA RICA

During 1981, an additional 14,900 adult female olive ridleys were tagged with monel metal (National Band and Tag Co., style 4-1005, size 19, special locking mechanism) and plastic (Allflex Tag Co., medium size, color green) tags at Playas Nancite and Ostional, Costa Rica. This brings the tagged population to 30,100. The following is a summary of recoveries (recorded as of 1 December 1981) made away from the nesting beaches. This is further evidence

for the desirability of a cooperative regional program for the study and management of the east Pacific populations of ridleys.

Country Recovered	Number	Comments
Ecuador	13	Includes 2 from 1971-72 tagging.
Colombia	1	
Panama	1	
Costa Rica	28	Incidental catch in shrimp and shark fishery operations.
Nicaragua	1	Observed nesting.
El Salvador	3	
Guatemala	4	
Mexico	1	
Oceanic	2	Tuna boat recovery 900 and 2,000 km west of Costa Rica.

S.E. CORNELIUS
R.R. 3, Box 216, Mtn. View, MO 65548, U.S.A.
DOUGLAS C. ROBINSON
Escuelo de Biologia, Universidad de Costa Rica, Ciudad Universitaria, Rodrigo Facio, Costa Rica.

"TURNING TURTLES" -- IS IT SAFE?

An article by Rosskopf and Woerpelin (1982, T.E.A.M. Vo. 5, No. 5, 11-13, Published by T.E.A.M., 3245 Military Avenue, Los Angeles, California, 90034, U.S.A.) strikes a cautionary note for some of our handling techniques for sea turtles. The article described egg yolk peritonitis in an adult female desert tortoise (Gopherus agassizi). The animal, in captivity for 45 years, rather abruptly showed progressive deterioration and death, and on autopsy was found to have several ruptured egg yolks within the coelomic cavity; yolk material had leaked into the surrounding tissues. The authors did a histopathologic analysis, and concluded that "it is our experience that egg yolk peritonitis is a common condition in many chelonian species (e.g. Gopherus agassizi, Terrapene carolina carolina, etc.) and lizards. Its cause is unknown but it is thought to be induced by trauma to the delicate developing ova. It seems to be particularly common in heavy egg-laying tortoises ... The prognosis is poor because of the extremely caustic effect the foreign yolk material has on the delicate internal tissues ... Clients should be advised to carefully observe all female tortoises of egg-laying age and to avoid trauma to them, especially any activity that may lead to the tortoise turning over on its back."

Many turtle researchers immobilize post-nesting females by turning them on their backs, during which time they are tagged, weighed, measured, etc. The same researchers have also often wondered why such a small percentage of the turtles return to the nesting beach in subsequent years. Doubtless this is derived in part from tag loss, natural mortality, and missed turtles, but the possibility should be considered that some may suffer rupture of some of the yolks that will form the season's subsequent eggs, as a consequence of the combination of the turtle's struggles and the completely unnatural pressures within the viscera under such circumstances. This may result either in the

turtle undergoing ovarian or oviducal damage of sufficient severity to render the animal incapable of producing shelled eggs in future seasons, or even outright (though not immediate) mortality as a result of egg yolk peritonitis.

PETER. C.H. PRITCHARD
Florida Audubon Society, 1101 Audubon Way, Maitland, Florida 32751, U.S.A.

ATLANTIC RIDLEY PROJECT 1981

This was the 15th year of the Mexican effort for restoring this species and the 4th year of cooperation with the U.S. National Marine Fisheries Service. In 1981, 95% of the eggs laid at Rancho Nuevo were transplanted. But high tides were again a problem. In 1980 Hurricane Allen (Aug. 8-10) inundated 80 nests in the north beach corral from the June 27 arribada. Again in 1981 (15-19 June) strong NE winds, up to 18 m/sec, high seas and rainfall up to 58 mm/day flooded and killed embryos in 125 nests (13,130 eggs), representing 14% of the total laid that year. Around 40 nests were also lost to poachers or in other ways.

In 1981, 92,319 eggs from 898 nests were collected and 49,986 hatchlings from beach corrals were released and another 6562 from eggs incubated in styrofoam boxes. 2246 eggs were separated from the total collected and incubated in 22 styrofoam boxes for the Padre Island and Galveston head-starting project (see Woody, J. 1981, Marine Turtle Newsletter 19, p. 13). There was also one more nest of 60 eggs (54 hatchlings), incubated at Rancho Nuevo, that went to the head-starting project. Overall average hatch rate was 60.2%. For the beach corrals it was 58.8%, for the Rancho Nuevo styrofoam boxes 73.9% and for the Padre Island boxes 81.6%.

There were 44 emergences, solitary and grouped, between April 17 and July 4. There were 2 important arribadas: May 8, 227 nests, 213 transplanted, and June 2nd, 220 nests, 216 transplanted. Monel tags were applied to 228 turtles; of these 38 were also tagged with plastic on the front flipper. There were 37 turtles nesting twice and 3 nesting thrice. Also 55 turtles tagged in previous years nested; 20 of these were re-tagged.

Incidental catch by shrimp trawlers in the Gulf of Mexico is the most serious problem preventing restoration of this population and stronger action by the Mexican and U.S. governments is needed.

R. MARQUEZ M.
Apto Postal 79-052, Col. Doctores, Mexico 7, D.F.

for the desirability of a cooperative regional program for the study and management of the east Pacific populations of ridleys.

Country Recovered	Number	Comments
Ecuador	13	Includes 2 from 1971-72 tagging.
Colombia	1	
Panama	1	
Costa Rica	28	Incidental catch in shrimp and shark fishery operations.
Nicaragua	1	Observed nesting.
El Salvador	3	
Guatemala	4	
Mexico	1	
Oceanic	2	Tuna boat recovery 900 and 2,000 km west of Costa Rica.

S.E. CORNELIUS
R.R. 3, Box 216, Mtn. View, MO 65548, U.S.A.
DOUGLAS C. ROBINSON
Escuelo de Biologia, Universidad de Costa Rica, Ciudad Universitaria, Rodrigo Facio, Costa Rica.

"TURNING TURTLES" -- IS IT SAFE?

An article by Rosskopf and Woerpelin (1982, T.E.A.M. Vo. 5, No. 5, 11-13, Published by T.E.A.M., 3245 Military Avenue, Los Angeles, California, 90034, U.S.A.) strikes a cautionary note for some of our handling techniques for sea turtles. The article described egg yolk peritonitis in an adult female desert tortoise (Gopherus agassizi). The animal, in captivity for 45 years, rather abruptly showed progressive deterioration and death, and on autopsy was found to have several ruptured egg yolks within the coelomic cavity; yolk material had leaked into the surrounding tissues. The authors did a histopathologic analysis, and concluded that "it is our experience that egg yolk peritonitis is a common condition in many chelonian species (e.g. Gopherus agassizi, Terrapene carolina carolina, etc.) and lizards. Its cause is unknown but it is thought to be induced by trauma to the delicate developing ova. It seems to be particularly common in heavy egg-laying tortoises ... The prognosis is poor because of the extremely caustic effect the foreign yolk material has on the delicate internal tissues ... Clients should be advised to carefully observe all female tortoises of egg-laying age and to avoid trauma to them, especially any activity that may lead to the tortoise turning over on its back."

Many turtle researchers immobilize post-nesting females by turning them on their backs, during which time they are tagged, weighed, measured, etc. The same researchers have also often wondered why such a small percentage of the turtles return to the nesting beach in subsequent years. Doubtless this is derived in part from tag loss, natural mortality, and missed turtles, but the possibility should be considered that some may suffer rupture of some of the yolks that will form the season's subsequent eggs, as a consequence of the combination of the turtle's struggles and the completely unnatural pressures within the viscera under such circumstances. This may result either in the

MORE MYSTERY TAGS

On 16 July 1981, Mr. Eleuterio Ramos of San Andres, Departamento de Pisco, Peru, gave me several monel tags removed from Chelonia mydas that he had captured. One is enscribed with "ICA-S.A." and on the other side "1779". This tag is smaller than those used by the Universities of Costa Rica and Florida (3.5 rather than 4 cm long and 7 rather than 9 mm wide). Who is using these tags?

J. FRAZIER
Department of Zoological Research, National Zoological Park, Smithsonian Institution, Washington, D.C. 20008, U.S.A.

RESUSCITATION OF A LEATHERBACK TURTLE

On 6 October 1981, in Rhode Island, a leatherback sea turtle (Dermochelys coriacea) in apparent respiratory collapse after having been caught in a large fish trap (pound net) and then transported to shore was revived following electrical stimulation of the pectoral region. The electrodes were driven into the pectoral musculature and attached with "jumper cables" to an automobile spark plug wire (engine running) and grounded on the automobile. The animal recovered and was tagged, marked with orange paint, and released. Details of the event are available.

C. ROBERT SHOOP
Department of Zoology, University of Rhode Island, Kingston, R.I. 02881, U.S.A.

RECENT PAPERS

BALAZS, G. 1982. Sea turtles and their traditional usage in Tokelau. Report for WWF (USA) and Office of Tokelau Affairs. pp. 1-54. G. Balazs, Hawaii Institute of Marine Biology, P.O. Box 1346, Kaneohe, Hawaii, 96744, U.S.A.

BLANCK, C.E. and SAWYER, R.H. 1981. Hatchery practices in relation to early embryology of the loggerhead sea turtle, Caretta caretta (Linne). J. exp. mar. Biol. Ecol., 49: 163-177. C.E. Blanck and R.H. Sawyer, Department of Biology, University of South Carolina, Columbia, SC, 29208, U.S.A.

CORNELIUS, S.E. and ROBINSON, D.C. 1982. Abundance, distribution and movements of olive ridley sea turtles in Costa Rica, II. Report, U.S. Fish and Wildlife Service, pp. 40 + appendices and figures. S.E. Cornelius, R.R. 3, Box 216, Mountain View, MO, U.S.A. 65548

DUGUY, R. and DURON, M. 1982. Observations de tortues luth sur les cotes de France en 1981. Ann. Soc. Sci. Nat. Charente-Maritime, 6, 1015-1020. R. Duguy, Musee Oceanographique, 28 rue Albert Premier, 17000 la Rochelle, France.

EHRENFELD, D.W. 1980. Commercial breeding of captive sea turtles: status and prospects. In: Reproductive Biology and Diseases of Captive Reptiles (Murphy, J.B. and Collins, J.T. eds.), Society for the Study of Amphibians and Reptiles Contributions to Herpetology 1, 93-96.

FLETEMEYER, J.R. 1981. Sea turtle monitoring report. Broward County Environmental Quality Control Board, Florida. pp. 1-82. J. Fletemeyer, 620 S.E. Fifth Court, Fort Lauderdale, Florida, 33301, U.S.A.

FRITTS, T.H. 1981. Marine turtles of the Galapagos Islands and adjacent areas of the eastern pacific on the basis of observations made by J.R. Slevin 1905-1906. Journal of Herpetology 15: 293-301. T.H. Fritts, Denver Wildlife Research Center, Tulane University Museum of Natural History, Belle Chasse, Louisiana 70037, U.S.A.

HIRTH, H.F. 1982. Weight and length relationships of some adult marine turtles. Bulletin of Marine Science, 32:336-341. H.F. Hirth, Department of Biology, University of Utah, Salt Lake City, Utah 84112, U.S.A.

HOPKINS, S.R. and MURPHY, T.M. 1981. Reproductive ecology of Caretta caretta in South Carolina. Study Completion Report, South Carolina Wildlife and Marine Resources Department, pp. 1-97 (includes sections on: Sonic and radio tracking of nesting Caretta caretta; Abiotic and biotic factors affecting nest failure of Caretta caretta; Feasibility of racoon aversion therapy on Caretta caretta eggs). S.R. Hopkins, South Carolina Marine Resource Center, P.O. Box 12599, Charleston, S. Carolina 29412, U.S.A.

KLEESE, W.C. 1980. Environmental effects upon herpes virus infections in captive green sea turtles. In: Reproductive Biology and Diseases of Captive Reptiles (Murphy, J.B. and Collins, J.T. eds.), Society for the Study of Amphibians and Reptiles Contributions to Herpetology 1, 203-210.

MENDONCA, M.T. and EHRHART, L.M. 1982. Activity, population size and structure of immature Chelonia mydas and Caretta caretta in Mosquito Lagoon, Florida. Copeia, p. 161-167. M.T. Mendonca, Department of Zoology, University of California, Berkeley, CA 94720, U.S.A.

NIETSCHMANN, B. 1981. Following the underwater trail of a vanishing species--the hawksbill turtle. National Geographic Society Research Reports, Washington, D.C., 13, 459-480. B. Nietschmann, Department of Geography, University of California, Berkeley, California, U.S.A.

RAINEY, W.E. 1981. Guide to sea turtle visceral anatomy. NOAA Technical Memorandum NMFS-SEFC-82, USA Department of Commerce, 1-82. Obtain from: NMFS Southeast Fisheries Center, 3500 Delwood Beach Road, Panama City, Florida, 32407 U.S.A.

RHODIN, A.G.J. and SCHOELKOPF, R.C. 1982. Reproductive data on a female leatherback turtle, Dermochelys coriacea, stranded in New Jersey. COPEIA, 1:181-183. A.G.J. Rhodin, Department of Surgery (Orthopaedics) and Marine Mammal Stranding and Study Center, Yale University, New Haven, Connecticut 06510, U.S.A.

SCHWARTZ, F.J. 1982. Correlation of nest sand asymmetry and percent loggerhead sea turtle egg hatch in North Carolina determined by geological sorting analyses. ASB Bulletin 29:83. F.J. Schwartz, Institute of Marine Sciences, University of North Carolina, North Carolina, U.S.A.

SELLA, Y. 1982. Can sea turtles be tracked? Israel Land and Nature, 7, 97-99. Y. Sella, Bustan ha-Galil, Asherat Mobile Post, 25213, Israel.

STERNBERG, J. 1982. Sea Turtles (13 looseleaf sheets in a folder with facts about turtles and conservation). J. Sternberg, Center for Environmental Education, 1925 K Street, N.W., Suite 206, Washington DC, 20006, U.S.A.

STERNBERG, J. 1982. Directory of sea turtle conservation programs in the southeastern U.S. Sea Turtle Rescue Fund, Washington DC, pp. 1-71. J. Sternberg, Center for Environmental Education, 1925 K Street, N.W., Suite 206, Washington DC, 20006, U.S.A.

STERNBERG, J. 1982. Sea turtle hunts throughout the world (Introduction by J. Frazier). Center for Environmental Education, pp 1-16. J. Sternberg, Center for Environmental Education, 624 9th Street N.W., Washington, DC 20001, U.S.A.

WITZELL, W.N. and BANNER, A.C. 1980. The hawksbill turtle (Eretmochelys imbricata) in Western Samoa. Bulletin of Marine Science, 30:571-579. W.N. Witzell, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, FL 33149, U.S.A.

WITZELL, W.N. 1980. Growth of captive hawksbill turtles, Eretmochelys imbricata, in Western Samoa. Bulletin of Marine Science, 30:909-912. W.N. Witzell, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, FL 33149, U.S.A.

WITZELL, W.N. 1981. Predation on juvenile green sea turtles, Chelonia mydas, by a grouper, Promicrops lanceolatus (Pisces; serranidae) in the kingdom of Tonga, South Pacific. Bulletin of Marine Science, 31:935-936. W.N. Witzell, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, FL 33149, U.S.A.

WITZELL, W.N. 1982. Observations on the green sea turtle (Chelonia mydas in Western Samoa. Copeia, pp. 183-185. W.N. Witzell, Fisheries Division, Western Samoa. National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, FL 33149, U.S.A.

WOLKE, R.E. and GEORGE, A. 1981. Sea turtle necropsy manual. NOAA Technical Memorandum NMFS-SEFC-24, USA Department of Commerce, 1-20. Obtain from: NMFS Southeast Fisheries Center, 3500 Delwood Beach Road, Panama City, Florida, 32407 U.S.A.

WOOD, J.R. and WOOD, F.E. 1981. Growth and digestibility for the green turtle (Chelonia mydas) fed diets containing varying protein levels. Aquaculture, 25: 269-274. J.R. Wood and F.E. Wood, Cayman Turtle Farm Ltd., P.O. Box 645, Grand Cayman, British West Indies.

CRYING "WOLF" AT LA ESCOBILLA

There is still confusion over the situation at La Escobilla, Mexico's last major arribada (massed nesting) beach. In 1979 the IUCN Bulletin stated "There was no arribada in 1978," and my previous criticism of this statement (Frazier, J., 1981, Marine Turtle Newsletter, 18:4-5) was not sufficiently explicit, since some readers have asked for more details.

Apparently no Mexican specialist was consulted about arribadas in 1978 (Márquez, pers. comm.; Peñaflores, pers. comm.), and I have never seen corroboration of the IUCN's statement. To the contrary, there are data refuting the claim in the Bulletin. For example, Calderón and González (1981, Las Arribazones para Reproducción de la Tortuga Golfina--Lepidochelys olivacea--(Eschscholtz, 1829), en la Playa de la Escobilla, Oax., en el Pacífico, unpublished thesis, Universidad Nacional Autónoma de Mexico, Iztacala, 63 pp + 8 figs.) reported on Escobilla from 1970 to 1980 showing that despite intense exploitation, there has not been a diminution in arribadas, but an increase:

Year of 1900:	70	71	72	73	74	75	76	77	78	79	80	81
No. of Arribadas:	3	?	?	3	3	3	2	2	3	3	4	5

Peñaflores, who has been monitoring this beach since 1974, confirmed these data and added the 1981 value (pers. comm.). This however, says nothing about

the numbers of turtles nesting annually, and there is tremendous concern, among Mexicans and other nationals, that this last economically viable population is doomed to overexploitation.

The false statement in question not only discredits the article in which it appeared (which dealt with the critical issue of overexploitation), but leaves biologists, particularly in Mexico, doubting the credibility of the organization responsible for the statement. Dramatization is an effective motivator, but this tactic alienates local people and those knowledgeable about the issues and, in the long run, it is counterproductive. I have elsewhere commented on another false claim regarding sea turtles (Frazier, J., 1980, Environmental Conservation, 7:239-240), and this is a common and serious problem in conservation of natural resources, not just marine turtles (see also Simon, J.L., 1980, Science, 208:1431-1437). Rational management of natural resources is best served by accurate rational statements.

J. FRAZIER
Department of Zoological Research, National Zoological Park, Smithsonian Institution, Washington, D.C. 20008, U.S.A.

POSTER: SEA TURTLES OF THE WORLD

A beautifully produced poster (artwork by Marvin Bennett) showing the different species swimming or feeding in the sea has been sponsored by the Center of Environmental Education and the National Marine Fisheries Service, U.S.A. Obtain free from: C.A. Oravetz, NMFS Southeast Region, 9450 Koger Blvd., St. Petersburg, Florida 33702 U.S.A.

POSTER: DOMINICAN REPUBLIC

A black and white poster showing a leatherback and entitled "Camino a la Extincion?" has been produced by the National Museum of Natural History and other organizations in the Dominican Republic. For details write to: J.A. Ottenwalder P., Museo Nacional de Historia Natural, Plaza de la Cultura, Santo Domingo D.N., Republica Dominica.

TURTLE POSTCARDS

Quality color postcards showing the green turtle and hawksbill. 25 of each (50 total) for U.S. $10.00 includes air postage. U.S. currency or international bank draft only please. Order from G.H. Balazs, P.O. Box 1346, Kaneohe, Hawaii 96744, U.S.A.

Support for this newsletter came from H.C. Mittag, Dr. J. Mittag, the University of Toronto and World Wildlife Fund Canada.

Marine Turtle Newsletter

No. 22 OCTOBER 1982

Editor: N. Mrosovsky

Departments of Zoology
and Psychology
University of Toronto
Toronto, Ontario
M5S 1A1 Canada

Editorial Advisors:

P.C.H. Pritchard
Harold F. Hirth

EDITORIAL

There are so many problems in sea turtle conservation, uncertainty about head-starting, tag loss, lost data, endless wrangles over farming, that sometimes it seems as if little progress is being made. But there are also some notable advances and these should be celebrated. Among the most promising developments in the last few years are the turtle excluder device and the living tag.

Accidental catch of turtles by shrimping trawlers results in untold numbers of drowned animals, according to some estimates more than 10,000 a year for the southeastern USA alone. The turtle excluder device, affectionately known as TED, is now at a rate where the US National Marine Fisheries Service is confident enough to issue a pamphlet giving details of its construction (see Anon, Recent Papers section, below). The effectiveness of TED in reducing incidental catch has been evaluated by towing it along with a control standard net from the same vessel: 129 turtles were caught in the standard nets, only 3 in those incorporating the excluder device (W.R. Seidel, pers. comm. 12 July 1982). There may also be a greater probability of those turtles that are caught with the TED being still alive. As important, the catch of shrimp was if anything increased with the TED. Preliminary figures suggest around a 7% improvement. So TED will be re-christened as the Trawler Efficiency Device. There is still, of course, much work to be done. There are different types of trawlers and methods; adjustable or various TEDs may be needed. It may also be that errors were made in the initial stages of this project and it may take time before shrimpers are prepared to accept the excluder device (in some parts of the world the by-catch will be wanted). Nevertheless there is now at least a known way of reducing incidental catch without loss of shrimp and a start can be made. Indeed some shrimpers in the USA are already using TEDs.

A different but equally admirable development concerns the living tag method for marking young turtles, green turtles in particular. Conventional tags applied to hatchlings slough off as the animals grow. In the living tag method a sliver of white plastron is transplanted to the carapace (Hendrickson, L.P. and Hendrickson, J.R. 1982. Marine Turtle Newsletter 19, 6-7). Some of these transplants have survived for more than 2 years (Fig. 1).

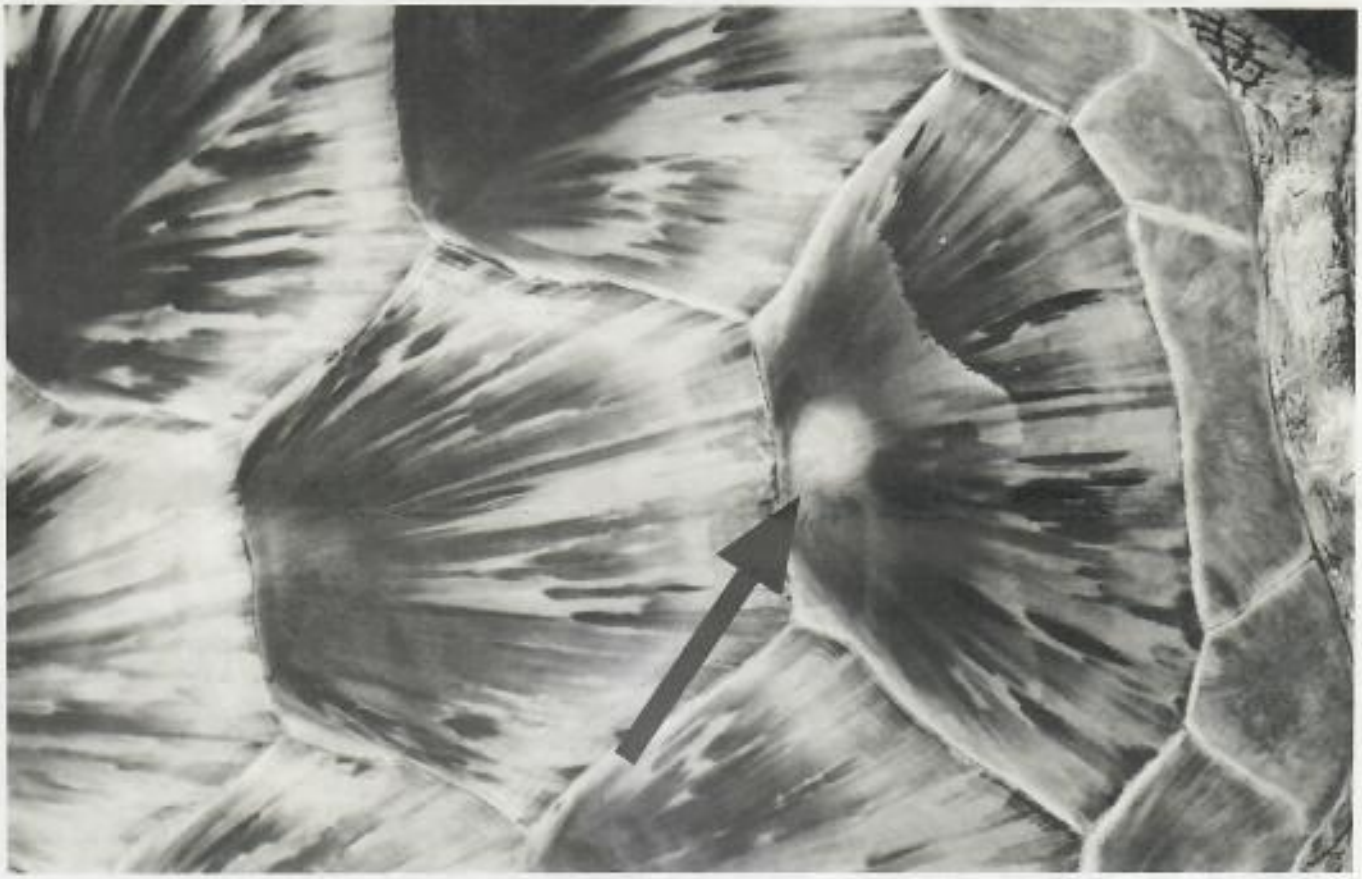


Fig. 1. Plastral tissue on a vertebral scute of a juvenile green turtle at the Cayman Turtle Farm. The photograph was taken 2 years after the transplant. There is some overgrowth of the transplant in this case, but the tissue is still clearly visible.

With this technique, also, there is much further work to be done. Sometimes the white patch becomes partly overgrown by carapace tissue. Perhaps larger or differently placed transplants will help. Nevertheless the method looks highly promising--so much so that people are already planning to release hatchling or head-started turtles with plastral transplants. If that occurs, it is important that the coding systems used are announced as soon as possible, preferably before the turtles have been released, or even before they have been marked. It is easy to imagine different groups selecting the same scutes as a site for transplants. Already with the notching of turtles confusion may arise because people fail to place on record what they have done (Editorial, 1982, Marine Turtle Newsletter 20, 1). The living tag system offers a chance of solving some of the hitherto most intractable problems of turtle biology such as the survivorship of the young and maturation time; it provides a way of proving that the females do indeed return to their natal beaches to lay. What a shame it would be if the potential of this clever idea were dissipated through lack of communication.

N.M.

SEA TURTLES IN THE MERU BETIRI WILDLIFE RESERVE

The Meru Betiri Wildlife Reserve is located on the Indian Ocean in East Java, Indonesia, and contains Sukamade Beach, the most important sea turtle nesting site remaining in Java. The reserve was established in 1972 and placed under the administration of the Indonesian Directorate of Nature Conservation (PPA), but most turtle eggs continued to be collected and sold up until 1979. In that year as part of a general improvement in reserve management policies the removal of eggs, hatchlings, and adult sea turtles was strictly prohibited.

Although records prior to 1980 are not totally reliable they serve to indicate that there is considerable annual variation in nesting activity (Table 1). Green turtles are by far the most common nesters but there are also small numbers of leatherbacks, olive ridleys, and hawksbills. It is interesting to note that after a three year absence from the beach, nesting leatherbacks returned to Sukamade in 1980 and again in 1981 and 1982, producing about 20 nests annually.

Table 1. Annual number of nests of four species of turtles at Sukamade Beach.

Year	No. of Nests	Year	No. of Nests
1970	2072	1976	647
1971	1525	1977	900
1972	1278	1978	1586
1973	1116	1979	1406
1974	1924	1980	625
1975	850	1981	1378

All nests are left where they were deposited and allowed to hatch naturally except that those laid below the high tide mark are moved up beyond the reach of the sea. Every morning PPA guards patrol the three kilometer beach and note the number and species of turtles that nested the previous night. All new nests are marked with numbered bamboo stakes and nests which have hatched are excavated to determine hatching success.

In 1981 there were 2201 visitors to Sukamade Beach, an increase of 88% over the previous year. Almost all came to view nesting sea turtles. Motor vehicles are parked at the PPA guardpost and visitors must walk the last 700 m to the beach where guards conduct them to a turtle which has begun to lay eggs. This system facilitates control of access and prevents undue disturbance to the nesting turtles. It is to be hoped that the management policies used at Sukamade Beach will be applied to other sea turtle nesting sites in Indonesia coming under PPA's administration.

RALEIGH A. BLOUCH
Leader, WWF Meru Betiri Project, P.O. Box 133, Bogor, Indonesia.

TURTLE HATCHERIES IN SRI LANKA

A new turtle hatchery has been set up at Kosgoda on the southwestern coast of Sri Lanka, where accurate records are being maintained and all the hatchlings are weighed and measured and the species identified. This is in

addition to the two other hatcheries set up earlier, namely at Bentota and Bermuda where speciation is not done. Kosgoda was chosen because it has been known for a long time by residents as a favourite rookery of marine turtles. In addition many beach dwellers have acquired an immense practical knowledge of turtle behaviour over the years. The first clutch of 141 leatherback eggs was buried on 10th December 1981 and by the 4th of January 1982, 11,159 eggs had been buried (Table 1).

Table 1 - From 10.12.81 to 4.4.82

Number of eggs buried	33,741
Eggs hatched and spoilt	24,280
Number of hatchlings released	5,219*
Percentage hatching rate	21.5%

*3,565 olive ridleys, 987 greens, 249 leatherbacks, 213 loggerheads, 205 hawksbills.

All five species nest at Kosgoda. Nesting starts about September, peaks in January and decreases by April. It is not unusual to have 7-8 turtles nesting at any given time, and once a member witnessed the beaching of 18 (leatherbacks and green turtles).

Taking all 3 hatcheries, the breakdown is as follows:

Total number of eggs buried	48,934
Total number of hatchlings released	12,428

Olive ridleys are by far the commonest turtles nesting on these beaches. The green turtle comes next; hawksbill and leatherbacks are found equally and loggerheads appear to be rare. No flatback hatchlings have been found.

R.S.B. WICKRAMSINGHE
Wildlife & Nature Protection Society of Sri Lanka, Chaitiya Road, Marine Drive, Fort, Sri Lanka.

BEACH DEVELOPMENT IN SRI LANKA

(Excerpts from a preliminary survey report on "The present status and distribution of sea turtles in southwest and southeastern Sri Lanka".)

Beaches with smooth slopes and large beach platforms ideal for most sea turtles are ironically also the most favoured by the fast expanding tourist industry. In recent times there has been a proliferation of tourist complexes in many areas such as Bentota and Hikkaduа to name a few. No doubt, these constructions will have an adverse effect on sea turtles.

The erection of fences and lights in the process of development is undoubtedly proving a major deterrent. The authors witnessed on a few occasions turtles dig in vain under the fences that impeded their mission and return to sea without laying, hurting themselves in the process. Besides, the resulting increase in human density in these areas may mean increase in human activity on the beaches at night during the peak hours of nesting (generally between 9 and 11 PM). This is another serious obstacle to nesting turtles

which are very sensitive to disturbances on the shore.

Reliable sources in Bentota and Hikkaduа affirmed that there had been a considerable decrease in nesting during the past few years. In Bentota for instance, body pits were conspicuously absent while much nesting activity was observed during the same period on Kosgoda, hardly five kilometres away. Near Bentota the authors were able to observe on several occasions green turtles come out of the sea, ascend the shore for a few feet and then return back to the sea without laying, apparently disturbed by the presence of bright lights on the shore. Beaches with lights have fewer turtles coming ashore and consequently fewer eggs, and those nests that occur and hatch will be subject to mass destruction through disorientation of emerging hatchlings.

The Wildlife and Nature Protection Society of Sri Lanka (WNPS) has established a turtle hatchery at a point between Indurawa and Ahungalla known as Kosgoda. The hatchery is progressing well and over 12,000 eggs have been collected from this stretch alone this year. The emerging hatchlings are released into the sea to grow and perpetuate the species. This is the first step towards the rehabilitation of endangered species and a commendable one indeed. The Society's efforts are in vain however, if further development is permitted along this stretch. It is learnt that a lot of land has already been sold for tourism development. Fences have been erected around these plots and are proving a hindrance to nesting turtles as has been observed on many occasions. Should resorts take over this stretch of beach, the result would be disastrous for nesting turtles.

We plead that the stretch between Indurawa and Ahungalla be declared a National Sea Turtle Sanctuary.

SHEKAR DATTATRI
Madras Snake Park Trust, Guindy Deer Sanctuary, Madras 600 022, India.
DHARMIN SAMARAJIVA
Sri Lanka

GROWTH AND AGE AT MATURITY OF LOGGERHEAD SEA TURTLES: REVIEW AND PROSPECTUS

Students of the life history of any species soon become interested in determining the mean age at maturity because demographic models are especially sensitive to fluctuations in this parameter (Lewontin, 1965). Obtaining such data for marine turtles is difficult. Although little is known about juveniles in the wild, survivorship of young sea turtles is probably low (Hirth and Schaffer, 1974; Frazer, 1982). Bustard (1979) suggested that one million or more hatchlings must be marked to ensure an adequate sample returning at maturity. To date, no one has followed marked hatchlings long enough to determine maturation time in nature. Although recent developments with internal tags are promising (Schwartz, 1981), at present we must rely on other means of estimating age at maturity.

Several investigators have measured growth of loggerheads during the first year of captivity (Fig. 1). The steadily increasing growth rates indicate the possibility for rapid growth in the wild.

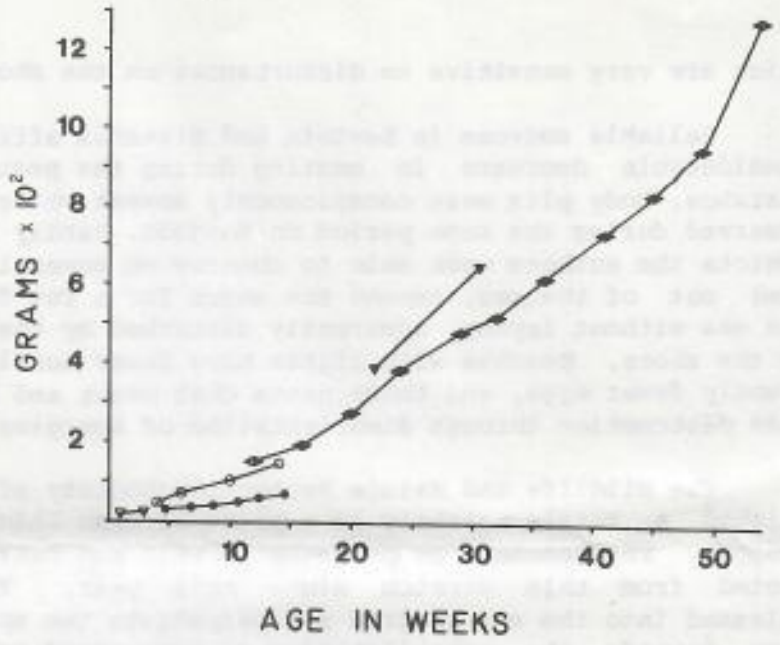


FIG. 1: GROWTH RATES FOR LOGGERHEAD TURTLES DURING THE FIRST YEAR IN CAPTIVITY.
▼ Mean from Kaufmann (1967);
▽ Mean from Caldwell, Carr, and Hellier (1955);
● Grand mean from Stickney, White, and Perlmutter (1973);
○ Mean from Rebel (1974);
◇ Mean from Witham and Futch (1977).

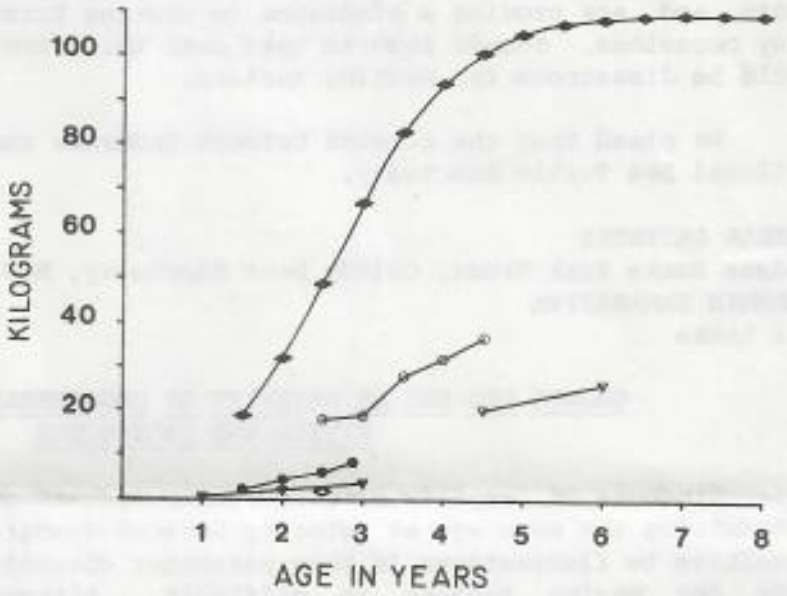


FIG. 2: GROWTH RATES FOR LOGGERHEAD TURTLES BEYOND THE FIRST YEAR IN CAPTIVITY.
◆ Calculated from Uchida (1967);
○ Data for Parker's (1929) fastest-growing turtle;
● Mean for 3 other of Parker's (1929) turtles;
▽ Mean from Hildebrand and Hatsell (1927);
◇ Mean from Hughes, Bass, and Mentiss (1967);
▼ Grand mean from Schwartz (1981).

However, rates differ depending upon the quality (Stickney, White, and Perlmutter, 1973) or quantity (Nuitja and Uchida, 1982) of food provided.

Few investigators have carried out long-term growth studies of Caretta (Fig. 2). Parker (1926) was the first to challenge assertions that such large creatures mature at very old ages. He reported on five loggerheads raised in captivity, one of which weighed 37 kg after only 4.5 yr (Parker, 1929). After plotting growth curves for his specimens, Parker recognized that the data "suggest the beginning of the typical sigmoid curve of growth."

Hildebrand and Hatsell (1927) reared two loggerheads to 6 years of age. These turtles did not grow as fast as Parker's (1929) fastest-growing specimen, perhaps because their enclosure was small and the turtles fought each

other frequently! Four loggerheads reared by Hughes, Bass, and Mentis (1967) for 2.5 yr attained a mean weight of only 1.95 kg. Schwartz (1981) reported mean weights of 5.999 kg, 3.140 kg, and 4.845 kg for three groups of hatchlings raised for 3 yr.

Although captive studies may have little relevance to ascertaining growth rates in natural situations, they may provide an indication of the underlying shape of growth curves. Uchida (1967) raised two loggerheads for 4.5 yr. For the larger, data fit the following formula:

$$\text{weight in grams} = \frac{110{,}000 \text{ gm}}{1 + e^{(3.543 - 1.331t)}}$$

Thus, Uchida predicted the turtle would reach an asymptotic weight of 110 kg, maturing in 6-7 years. Caldwell (1962) also predicted an age at maturity of 6-7 years for loggerheads in temperate waters. However, the assertion that loggerheads mature in 6-7 years should be taken as a minimum, as it is based upon presumably well-fed turtles. At any rate, Uchida's hypothetical asymptote of 110 kg is reasonable. A sample of 164 loggerheads on Little Cumberland Island, GA, showed a mean length of 99.63 cm (s.e. = 0.38) over the curve of the carapace. Ehrhart (1976) provided an equation relating over-the-curve carapace measurements to weight, where $\log_{10}$ weight (lbs) = -1.54541 + 2.47835 $\log_{10}$ carapace length (in). Hence, a length of 99.63 cm (39.22 in) is equivalent to a weight of 115.23 kg (254.04 lb), just slightly larger than Uchida's proposed asymptote of 110 kg.

Growth studies on loggerheads in nature are rare. Subadult loggerheads from 50-75 cm in length appear in off-shore fishing areas, as is evidenced by their capture in shrimp trawls (Hillestad, et al., 1977). Mendonca's (1981) recaptures of loggerheads in this size range indicated they mature in 10-15 years. Limpus's (1979) recaptures of sub-adult loggerheads of carapace length 76-88 cm showed they were growing at a slower rate than Mendonca's smaller turtles, supporting Parker's (1929) and Uchida's (1967) assertions of sigmoid growth.

For the immediate future, I suggest that growth data on individual captive turtles be used to ascertain whether loggerhead growth curves are best fit by logistic, Gompertz, or von Bertalanffy equations, using the method described by Ricklefs (1967) or Uchida (1967). Additional information from recaptures of wild juveniles should yield mean growth rates for particular size classes. Combining information from both types of studies, we should be able to estimate complete growth curves for juvenile turtles in the wild, assuming that shapes of curves for captive and wild turtles are similar. This will enable us to make the best estimate of mean age at maturity using data presently available.

Bustard, H.R. 1979. Population dynamics of sea turtles, pp. 523-540. In M. Harless and H. Morlock (eds.) Turtles: perspectives and research. Wiley Interscience, New York.

Caldwell, D.K. 1962. Growth measurements of young captive Atlantic sea turtles in temperate waters. Los Angeles County Mus., Contr. Sci. 50. 8pp.

Caldwell, D.K., A. Carr, and T.R. Hellier, Jr. 1955. Natural history notes on the Atlantic loggerhead turtles, Caretta caretta caretta. Quart. J. Florida Acad. Sci. 18(4): 292-302.

Ehrhart, L.M. 1976. Studies of marine turtles at Kennedy Space Center and an annotated list of amphibians and reptiles of Merritt Island. Final Report to NASA, Kennedy Space Center. NASA/KSC Grant NGRID 019-004. Office of Graduate Studies and Research, Florida Technological University, Orlando, Florida.

Frazer, N.B. 1982. The survival rate of juvenile loggerhead sea turtles (Caretta caretta) necessary to maintain a stable population size. ASB Bulletin 29(2):61.

Hildebrand, S.F. and C. Hatsell. 1927. On the growth, care and behavior of loggerhead turtles in captivity. Proc. Nat. Acad. Sci. 13(6):374-377.

Hillestad, H.O., J.I. Richardson, and G.K. Williamson. 1977. Incidental capture of sea turtles by shrimp trawlermen in Georgia, a report submitted to the National Marine Fisheries Service, Contract No. 03-7-042-35129, 1 December, 1977, 106 pp.

Hirth, H.F. and W. Schaffer. 1974. Survival rates of the green turtle, Chelonia mydas, necessary to maintain stable populations. Copeia 1974:544-546.

Hughes, G.A., A.J. Bass, and M.T. Mentis. 1967. Further studies on marine turtles in Tongaland, I. Lammergeyer 7:7-54.

Kaufmann, R. 1967. Wachstumsraten in Gefangenschaft gehaltener Meerschildkroten. Mitt. Inst. Colombo-Aleman Invest. Cient. 1:65-72.

Lewontin, R.C. 1965. Selection for colonizing ability. pp 79-91. In H.G. Baker and G.L. Stebbins (eds.) The genetics of colonizing species. Academic Press, New York.

Limpus, C. 1979. Notes on growth rates of wild turtles. Marine Turtle Newsletter 10:3-5.

Mendonca, M.T. 1981. Comparative growth rates of wild immature Chelonia mydas and Caretta caretta in Florida. Jour. of Herp. 15:447-451.

Nuitja, I.N.S., and I. Uchida. 1982. Preliminary studies on the growth and food consumption of the juvenile loggerhead turtls (Caretta caretta L.) in captivity. Aquaculture 27:157-160.

Parker, G.H. 1926. The growth of turtles. Proc. Nat. Acad. Sci. 12:422-424.

Parker, G.H. 1929. The growth of the loggerhead turtles. Am. Nat. 63:367-373.

Rebel, T.P. 1974. Sea turtles and the turtle industry of the West Indies, Florida, and the Gulf of Mexico. University of Miami Press, Coral Gables, Florida.

Ricklefs, R.E. 1967. A graphical method of fitting equations to growth curves. Ecology 48:978-983.

Schwartz, F.J. 1981. A long term internal tag for sea turtles. Northeast Gulf Science 5:87-93.

Stickney, R.D., D.B. White, and D. Perlmutter. 1973. Growth of green and loggerhead sea turtles in Georgia on natural and artificial diets. Bull. Georgia Acad. Sci. 31:37-44.

Uchida, I. 1967. On the growth of the loggerhead turtle, Caretta caretta, under rearing conditions. Bull. Jap. Soc. Scient. Fish. 33:497-506.

Witham, R. and C.R. Futch. 1977. Early growth and oceanic survival of pen-reared sea turtles. Herpetologica 33:404-409.

NAT B. FRAZER
Institute of Ecology, University of Georgia, Athens, GA 30602 USA.

RECENT PAPERS

ANON. Construction, installation, and handling procedure for the National Marine Fisheries Service's Sea Turtle Excluder Device. NOAA Technical Memorandum NMFS-SEFC-71, U.S. Department of Commerce. J.W. Watson, P.O. Drawer 1207, Pascagoula, MS 39567, USA.

BYLES, R. 1982. Radio-tracking of a Kemp's ridley off the Virginia coast. Report submitted to the U.S. Fish and Wildlife Service, Endangered Species Office, pp. 1-21. R. Byles, VA. Institute of Marine Science, Gloucester Point, VA 23062 U.S.A.

DIZON, A.E. and BALAZS, G.H. 1982. Radio telemetry of Hawaiian green turtles at their breeding colony. Marine Fisheries Review 44:13-20. A.E. Dizon, National Marine Fisheries Service, NOAA, Honolulu, HI 96812 USA.

DODD, C.K. Jr. 1982. U.S. Fish and Wildlife Service--Nesting of the green turtle, Chelonia mydas, in Florida - A hopeful trend? ASB Bull. 29:58. C.K. Dodd Jr., Office of Endangered Species, Washington, D.C. 20240 U.S.A.

EHRHART, L.M. 1979. Reproductive characteristics and management potential of the sea turtle rookery at Canaveral National Seashore, Florida. pp. 397-399 in R.M. Linn, ed. Proc. First Conference on Scientific Research in the National Parks, 9-12 November, 1976, New Orleans, La, U.S.A. NPS Trans. and Proc. Ser. No. 5. L.M. Ehrhart, Department of Biological Sciences, University of Central Florida, Box 25000, Orlando, Florida 32816 U.S.A.

FRAZER, N.A. 1982. The survival rate of juvenile loggerhead sea turtles (Caretta caretta) necessary to maintain a stable population size. ASB Bulletin 29. N.B. Frazer, Institute of Ecology, University of Georgia, Athens, GA 30602 USA.

FRETEY, J. 1981. Note sur les traumas observes chez des Tortues luths adultes Dermochelys coriacea (Vandelli) (Restudines, Dermochelyidae). Rev. fr. Aquariol. 8:119-128. J. Fretey, Laboratoire de Zoologie, Museum nationale d'Histoire naturelle, 57 rue Cuvier, 75005 Paris, France.

HURTADO, M. 1981. The ban on the exportation of turtle skin from Ecuador (also available in Spanish). Boletin Informativo, Instituto Nacional de Pesca, 2, 6-10 (also in Spanish in the same issue). M. Hurtado, Instituto Nacional de Pesca, Casilla 59 18, Guayaquil, Ecuador.

HURTADO, M. 1981. Marine turtles recapture in Eduadorian waters. Boletin Informativo, Instituto Nacional de Pesca, 2, 18-23 (also in Spanish in the same issue). M. Hurtado, address as above.

HURTADO, M., CORRALES, G. and MUENTES, K. 1981. The participation of Ecuadorian university students in the marine turtle programme. Boletin Informativo, Instituto Nacional de Pesca, 2, 30-35 (also in Spanish in the same issue). M. Hurtado, address as above.

KINGSMILL, S.F. and MROSOVSKY, N. 1982. Sea-finding behaviour of loggerhead hatchlings: the time course of transient circling following unilateral and asynchronous bilateral blindfolding. Brain Behav. Evol. 20:29-42. N. Mrosovsky, Department of Zoology, University of Toronto, Toronto, Ont. Canada M5S 1A1

MORREALE, S.J., RUIZ, G.J., SPOTILA, J.R. and STANDORA, E.A. 1982. Temperature-dependent sex determination: current practices threaten conservation of sea turtles. Science 216:1245-1247. S.J. Morreale, Department of Biology, State University College of Buffalo, Buffalo, New York 14222 USA.

MROSOVSKY, N. 1982. Sex ratio bias in hatchling sea turtles from artificially incubated eggs. Biol. Conserv. 23:309-314. N. Mrosovsky, Department of Zoology, University of Toronto, Toronto, Ont. Canada M5S 1A1.

NUITJA, I.N.S. and UCHIDA, I. 1982. Preliminary studies on the growth and food consumption of the juvenile loggerhead turtle (Caretta caretta L.) in captivity. Aquaculture, 27: 157-160. I.N.S. Nuitja, Ocean Research Institute, University of Tokyo, Minamidae, Nakano-ku, Tokyo 164, Japan.

OWENS, D.W., GRASSMAN, M.A. and HENDRICKSON, J.R. 1982. The imprinting hypothesis and sea turtle reproduction. Herpetologica 38:124-135. D.W. Owens, M.A.Grassman and J.R. Hendrickson, Department of Biology, Texas A&M University, College Station, TX 77843 USA.

STONEBURNER, D.L. and EHRHART, L.M. 1981. Observation on Caretta c. caretta: a record internesting migration in the Atlantic. Herp Review 12:66. D.L. Stoneburner, National Park Service Cooperative Research Institute of Ecology, University of Georgia, Athens, Georgia 30602 U.S.A.

THAYER, G.W., ENGEL, D.W. and BJORNDAL, K.A. 1982. Evidence for short-circuiting of the detritus cycle of seagrass beds by the green turtle, Chelonia mydas L. J. Exp. Mar. Biol. Ecol. 62:173-183. G.W. Thayer and D.W. Engel, National Marine Fisheries Service, Southeast Fisheries Center, Beaufort Laboratory, Beaufort, NC 28516 USA and K.A. Bjorndal, Department of Zoology, Universiy of Florida, Gainesville, FL 32611 USA.

THOMPSON, R.K. 1981. Nesting of the green sea turtle, Chelonia mydas (Linnaeus) 1758, in Mauritius. Revue Agricole et Sucriere de l'Ile Maurice 60:125-130. R.K. Thompson, Camarons Hatchery Co. Ltd., Union Vale, Mauritius, Indian Ocean.

TIMKO, R.E. and DeBLANC, D. 1981. Radio tracking juvenile marine turtles. Marine Fisheries Review 43:20-24. R.E. Timko, Mississippi Engineering Project, National Marine Fisheries Service, NOAA, NSTL Station, MS 39529, USA.

WOOD, E. and WOOD, J.R. 1982. Sex ratios in captive reared green turtles, Chelonia mydas. Copeia, 482-485. E. Wood and J.R. Wood, Cayman Turtle Farm Ltd., Box 645, Grand Cayman, British West Indies.

YNTEMA, C.L. and MROSOVSKY, N. 1982. Critical periods and pivotal temperatures for sexual differentiation in loggerhead sea turtles. Can. J. Zool. 60:1012-1016. N. Mrosovsky, Department of Zoology, University of Toronto, Toronto, Ont. Canada M5S 1A1.

SURINAME: TURTLE STAMPS

A series of 8 stamps depicting sea turtles and other turtles was issued in early 1982. One set costs 3.60 Surinam Guilders; one set on a day of issue envelope costs 4.60. Minimum order: 150 Surinam Guilders. Obtain from: Dienst der Posterijen, Filatelistische Dienst, Wanicaplein, Paramaribo-Zuid, Suriname, S. America.

PHILIPPINES: TURTLE STAMPS

On June 5 1982 the Philippines issued a green turtle ("Pawikan") stamp with a face value of 40 centavos. Stamps and first day covers are available from the Philatelic Section of the Manila Central Post Office, or collectors may obtain them on an exchange basis from Dr. E.D. Gomez, Marine Sciences Center, University of the Philippines, Diliman, Quezon City 3004, Philippines.

WHO IS PAINTING NUMBERS ON GREEN TURTLE CARAPACES?

A green turtle with a number 6 (or 9) was found in the Galapagos Islands in 1978. The digits were 15 cm high and the paint light blue or grey. I am interested in hearing from anyone with information on this. Further details

supplied upon request.

DEREK GREEN
Texas Memorial Museum, 2400 Trinity, Austin, TX 78705 USA.

WHAT DOUBLE TAGGING STUDIES CAN TELL US

Double tagging, as advocated in the first Marine Turtle Newsletter (1976), is not merely a way of obtaining more returns. It also enables estimates to be made of tag loss. This knowledge may be helpful in tackling other questions such as what are the chances of turtles remigrating in future years to their nesting beaches. What is it that is missing in the "lost majority" (Carr, 1980) of turtles tagged at Tortuguero? Is it the turtles or the tags?

Estimating tag loss. First we consider the case of dissimilar tags, or tags which are the same but may have a different probability of loss (e.g. one on the back and one on the front flipper, or one tag and a notch on a scute). All estimates apply only to a given time span. Also, if concerned with tag loss itself, one must assume that tags have an equal probability of being noticed. When a trained person systematically inspects a turtle on the beach, this may be a safe assumption. When a fisherman who is unaware of the tagging programme pulls a turtle out of his net, visibility of a tag may be important (Cornelius and Robinson, 1982). Where returns are predominantly from fishermen, it may be preferable to speak of tag irrecoverability rather than tag loss. This would encompass tag loss, tag visibility and the chances that a tag will be returned. Irrecoverability could be calculated in the same general way as given here for tag loss:

Let P_a be the probability of tag type-a being lost
Then $1-P_a$ is the probability of tag type-a remaining on
Let P_b be the probability of tag type-b being lost
Then $1-P_b$ is the probability of tag type-b remaining on.

Thus, for example, the probability of tag type-a remaining on while tag type-b is lost is $P_b(1-P_a)$.

Let T be the total number of turtles initially double-tagged
Let R (unknown) be the proportion of T returning
Let N_o be the number of returning turtles that have lost both tags
Let N_{1a} be the number of returning turtles with just tag type-a on
Let N_{1b} be the number of returning turtles with just tag type-b on
Let N_2 be the number of returning turtles with both tags on.

$$N_o = P_a P_b \times TR \qquad \text{eqn (1)}$$
$$N_{1a} = (1 - P_a) \times P_b \times TR \qquad \text{eqn (2)}$$
$$N_{1b} = (1 - P_b) \times P_a \times TR \qquad \text{eqn (3)}$$
$$N_2 = (1 - P_a)(1 - P_b) \times TR \qquad \text{eqn (4)}$$

From equations 3 and 4:

$$\frac{N_{1b}}{N_2} = \frac{P_a}{1 - P_a}$$

Rearranging: $$P_a = \frac{N_{1b}}{N_2 + N_{1b}}$$ eqn (5)

Similarly $$P_b = \frac{N_{1a}}{N_2 + N_{1a}}$$ eqn (6)

If the tags are the same and are assumed to have an equal probability of loss, then the expression may be simplified. If N_1 is the number of turtles with one tag, then $N_1/2$ may be substituted for either N_{1a} or N_{1b} in equations 5 or 6. And P (the probability of losing one tag) may be substituted for either P_a or P_b in the same equations:

$$P = \frac{\frac{N_1}{2}}{N_2 + \frac{N_1}{2}} \qquad \text{Rearranging: } P = \frac{N_1}{2N_2 + N_1} \quad \text{eqn (7)}$$

Examples of tag loss/irrecoverability. 1) Green (1979) gives data from a double tagging study on a population of green turtles resident around the Galapagos Islands. These were tagged with monel metal on the front flipper and plastic (Rototag) on the hind flipper. After 4 years, 63 turtles had been seen again with both tags, 45 with just the plastic tag and 4 with just the metal tag. From equations 5 and 6:

$$\text{Probability of losing the metal tag} = \frac{45}{63 + 45} = .42$$

$$\text{Probability of losing the plastic tag} = \frac{4}{63 + 4} = .06$$

These probabilities are for a time span of 101-1,000 days from the time of tagging. Fortunately Green also gives the time between tagging and recapture. Although the data are few for the longer intervals, they can be used to illustrate how probabilities of tag loss only refer to particular time spans:

	by 101-500 days	by 500-1,000 days
Probability of losing the metal tag	.38	.63
Probability of losing the plastic tag	.05	.14

2) Cornelius and Robinson (1981, 1982) double tagged 2415 olive ridleys on the west coast of Costa Rica. A metal tag was attached to one of the front right flippers and a plastic tag (Allflex) to any of the four limbs: 97 turtles were seen again with both tags on, 117 with just the plastic and 150 with just the metal. From equations 5 and 6:

$$\text{Probability of losing the metal tag} = \frac{117}{97 + 117} = .54$$

$$\text{Probability of losing the plastic tag} = \frac{150}{97 + 150} = .60$$

Comments on examples: Neither of these studies demonstrate the superiority of one type of tag material. It may have been that the hind-foot location rather than the plastic was the important factor in the Galapagos study. With leatherbacks, as first noted in the Marine Turtle Newsletter (Hughes, 1978, see also in press), switching tag location from the front to rear flipper was followed by a jump in recovery rates. With the double tagging of the olive ridleys in Costa Rica, the time span of the study needs to be made explicit and considered. Perhaps over several years one of the tags used will have superior staying power. Also both the location and the colour of the plastic tags varied. Yellow tags had very poor recovery rates (Cornelius and Robinson, 1982). Before drawing definite conclusions from this study it will be necessary to wait for further details on these variables and their interrelationships. What is asserted here is that expressing results in terms of the probability of tag loss is an easy, useful and standard way of describing and comparing tag loss as a function of material, colour, location and time after application. Also the surest progress will be made by studies that do not confound variables. Whether a tag is put on the left or right flipper might even make a difference. Leatherback turtles in French Guiana more often have injured left than right flippers (Fretey, 1981). All variables except the one under consideration should be equated.

But one substantive point is evident. In two separate studies, on different species in different parts of the world, there was a probability of about .5 that a monel metal tag on the front flipper would be lost. This is still the most commonly used tagging method in turtle research. Clearly if around 50% of the tags fall off, it is hardly satisfactory, as had been recognized qualitatively (Balazs, 1982).

Scar method: At Tortuguero tag loss of monel metal tags has been estimated at 26.4% from scars left by missing tags (Carr, 1980). Is the tagging method superior at Tortuguero, or do green turtles from that population live in an environment conducive to tag retention or are scars unreliable as a way of assessing tag loss? Many people have wondered if scars may heal over altogether. Validation of the tag scar method is needed. This could easily be done by double tagging. Any turtles found with no tags should either have two scars or none. The same general formulae as given above could be used to assess the chances of scars becoming unrecognizable. If single tagging had been done in the area previously, then one could look for scars on those turtles from the double tagging experiment that returned with only one tag. Richardson et al. (1978) have been both double tagging loggerheads for many

years and recording tag scars. They may well have relevant data.

Remigration Rates

By definition: $TR = N_o + N_{1a} + N_{1b} + N_2$

The number of turtles with no tags is composed of those that have lost both tags (N_o) and of neophytes. N_o cannot be measured directly. Therefore for N_o we substitute P_aP_bTR from equation (1).

$$TR = P_aP_bTR + N_{1a} + N_{1b} + N_2$$

Rearranging and cancelling:

$$R = \frac{N_{1a} + N_{1b} + N_2}{T(1-P_aP_b)} \qquad \text{eqn (8)}$$

In the case where the tags are the same and are assumed to have an equal probability of loss, calculations may be simplified by substituting P (the probability of losing one tag) for both P_a and P_b, and by substituting N_1 (the number of turtles with one tag) for $N_{1a} + N_{1b}$ in equation 8:

$$R = \frac{N_1 + N_2}{T(1 - P^2)} \qquad \text{eqn (9)}$$

These formulae look attractive but their application for calculating remigration rates is debatable. One problem is that turtles come back to the nesting beach after varying numbers of years. One cannot lump tag returns for a number of years (to ensure that each turtle has had a chance of coming back and being seen in one year or another) and still use equation 8 because the probability of tag loss is increasing over those years, P_a and P_b in equation 8 are not constant. Instead it would be necessary to treat each year separately, calculating both probability of tag loss and remigration rate for that year. Remigration rates for a number of separate years could then be summed. For this approach it might be simplest to tag intensively over a relatively short time span, but if not enough turtles could be tagged in one season, then the number of years since tagging could be used for assembling remigrant turtles into different groups for assessing tag loss and remigration rates.

Presumably calculations of the kind given in this note are to be found elsewhere. No claim to originality is made. We hope, however, with double tagging becoming widespread, that it may be useful for turtle researchers to have formulae for deriving tag loss readily available and that they may be stimulated to explore further how data from double tagging studies can be made instructive (see Seber, 1973 and Eberhardt et al., 1979 for further reading).

Balazs, G.H. 1982. Factors affecting the retention of metal tags on sea turtles. Marine Turtle Newsletter 20:11-14.

Carr, A. 1980. Some problems of sea turtle ecology. Amer. Zool. 20:489-498.
Cornelius, S.E. & Robinson, D.C. 1981. Pacific coast of Costa Rica:tagging programme. Marine Turtle Newsletter 18:13.
Cornelius, S.E. & Robinson, D.C. 1982. Abundance, distribution and movements of olive ridley sea turtles in Costa Rica, II. Report, U.S. Fish & Wildlife Service, Albuquerque, New Mexico, pp. 1-40 plus figs. and tables.
Eberhardt., L.L., Chapman, D.G. and Gilbert, J.R. 1979. A review of marine mammal census methods. Wildlife Monogr. 63, pp. 8-11.
Green, D. 1979. Double tagging of green turtles in the Galapagos Islands. Marine Turtle Newsletter 13:4-9.
Hughes, G. 1978. Tagging leatherbacks. Marine Turtle Newsletter 6:4.
Hughes, G.R. in press. Nesting cycles in sea turtles -- typical or atypical? In: Biology & Conservation of Sea Turtles (Bjorndal, K.A. editor), Smithsonian Institution Press, Washington D.C.
Mrosovsky, N. 1976. The tag loss problem. Marine Turtle Newsletter 1:3-4.
Richardson, J.I., Richardson, T.H. & Dix, M.W. 1978. Population estimates for nesting female loggerhead sea turtles (Caretta caretta) in the St. Andrew Sound area of southeastern Georgia, U.S.A. Florida Mar. Res. Publications 33:34-38 (Florida Department of Natural Resources).
Seber, G.A.F. 1973. The estimation of animal abundance and related parameters. Griffin: London, pp. 94-96.
Fretey, J. 1981. Note sur les traumas observes chez des tortues luths adultes Dermochelys coriacea (Vandelli) (Testudines, Dermochelyidae). Rev. fr. Aquariol. 8:119-128.

N. MROSOVSKY & SARA J. SHETTLEWORTH
Departments of Zoology and Psychology, University of Toronto, Toronto, Canada M5S 1A1.

DOES TURNING GREEN TURTLES ON THEIR BACKS AFFECT SUBSEQUENT REPRODUCTIVE PERFORMANCE?

In a recent issue of the Marine Turtle Newsletter it was suggested that turning turtles on their backs may be one cause of the widely observed low percentage of turtles that return to nest in later years (Pritchard, 1982, #21, 3-4). The research program directed by Dr. Archie Carr at Tortuguero, Costa Rica, provides data that allow us to evaluate the potential for danger in turning turtles. The northernmost 5 miles of the 22 mile Tortuguero beach are patrolled nightly. Until 1976, all turtles were turned on their backs after nesting so they could be tagged and measured shortly after dawn. In 1976, we experimented with tagging some of the nesting females at night without turning them. In 1977, we adopted this system for the northern 2.5 miles of the beach.

One approach to assessing the possible effect of turning turtles would be to compare the reproductive performance of turtles that were turned on the southern 2.5 miles with those that were not turned on the northern 2.5 miles in 1977. However, comparing the reproductive histories of turtles nesting on the northern half of the patrolled area with those of turtles nesting on the southern half is unsatisfactory, because turtles emerging on the southern half are more likely to return to nest south of our 5-mile patrolled study area, and thus not to be recorded. Therefore, I have compared the subsequent renestings and remigrations of turtles from the northern half of the study

area in 1975, when they were turned with those from the same region in 1977, when they were not turned. In order to exclude turtles that had been turned in earlier years, only recruits (turtles nesting for the first time) were considered; turtles with tags or with tag scars were omitted. Four variables were compared: percentage of turtles that remigrated within the next 4 years after nesting only on the northern 2.5 miles; length of remigration interval; percentage of turtles that renested within the same season after nesting first on the northern 2.5 miles; and the renesting interval between the first two recorded nestings within a season (Table). Both the percentage of remigrants and the remigrant intervals were limited to the 4 years after tagging so the 1977 cohort would have equal chance to remigrate as the 1975 cohort.

	1975 Cohort (Turtles Turned)	1977 Cohort (Turtles Not Turned)	
% of turtles remigrating within 4 yrs	27.6% n = 134	24.3% n = 70	N.S.[1,2]
Remigration interval (yrs)	$\bar{x}$ = 3.00 SD = .24 Range = 2.4	$\bar{x}$ = 2.94 SD = .56 Range = 1-4	N.S.[3]
% of turtles renesting in same season	40.65% n = 155	41.77% n = 79	N.S.[2]
Renesting interval (days)	$\bar{x}$ = 20.44 SD = 9.88 Range = 2-41	$\bar{x}$ = 18.34 SD = 9.20 Range = 10-41	N.S.[3]

[1] N.S. = not significant at the .01 level

[2] Chi Square Two Sample Test

[3] t Test, two tailed

None of the four variables is significantly different in the two cohorts. These data indicate that turning turtles does not affect the future reproductive performance of the colony--at least insofar as their reproductive periodicity is concerned. Although it is clearly wise to minimize the disturbance of sea turtles on their nesting beaches, the data presented here support continuation of the practice of turning turtles if this is necessary for tagging projects.

KAREN A. BJORNDAL
Department of Zoology, University of Florida, Gainesville, FL 32611 U.S.A.

Support for this newsletter came from H.C. Mittag, Dr. J. Mittag, the University of Toronto and World Wildlife Fund Canada.

Marine Turtle Newsletter

No. 23 DECEMBER 1982

Editor: N. Mrosovsky

Departments of Zoology
and Psychology
University of Toronto
Toronto, Ontario
M5S 1A1 Canada

Editorial Advisors:

P.C.H. Pritchard
Harold F. Hirth

EDITORIAL

Readers of this newsletter receive it free; nothing is asked except an interest in the subject. This time, however, we ask readers not to give money but to write to Mrs. Ghandi about the slaughter of turtles in India.

Huge numbers of olive ridleys nest along the coast of Orissa and West Bengal. At Digha, West Bengal, thousands of animals are killed each year (Bobb, D. 1982, India Today, 31, 64-65) and this has been confirmed by reliable sources. Not only are the turtles being killed despite legislation against commercial use, but in some cases unnecessary suffering is caused by cutting up the turtles before killing them (Dilip, op. cit.; see also "Turtle Slaughter in India", below). Off Gahirmatha, Orissa, "annually about 500 Ridley carcasses, the flippers of most of which are securely tied by iron, plastic or nylon wires are being washed ashore within our study area. This of course, represents a tiny fraction of the actual offshore catch" (Kar, C.S., ms.).

However, the situation is not straightforward. Meat from these turtles, and eggs from the beaches also, find their way into the markets in Calcutta. Here they go to feed, if not the very poorest people, at least people who need better nutrition. The price of turtle meat and eggs is not especially high; they are not just luxury items. Moreover additional nesting beaches for olive ridleys in Orissa have recently been discovered (see article by Kar, below).

We have here a classic clash between the immediate needs of people and the conservation of resources. In the long run, of course, these are compatible. There will be less food available if these ridley arribadas go the way of those at Tlacoyunque and Mismaloya in Mexico.

What is needed is not total prohibition but rational, or at least controlled, utilization. For instance, it might be better to concentrate on harvesting quotas of eggs, and leave the adults alone. During arribadas turtles often dig up eggs of other turtles. Many eggs are also destroyed by predators. A combination of protecting some of the eggs while taking others could leave as many or more hatchlings entering the water as if no intervention had occurred.

Other people will doubtless have different views about what should be done. But we do not feel that because this issue is complex the Marine Turtle Newsletter should remain silent about it. So we urge you, whatever your conservation philosophy, to write to Mrs. Ghandi, even if it is just a short

letter asking her to look into the matter, and devote more research funds to devising ways of improving the situation. Nearly anything would be better than the present uncontrolled inhumane slaughter.

Letters should be respectfully worded for greatest impact, and should be addressed to:

Shrimati Indira Ghandi
Prime Minister of India
South Block
Central Secretariat
New Delhi 110011 India

There are still many olive ridleys left in the world. There is still great scope for conservation initiative and wise management to be effective now--before the species is reduced to a remnant. If you have found this newsletter useful, whatever your views, please write to Mrs. Ghandi. And please send a copy of your letter to the editor of this newsletter. Please write now. The next arribadas of olive ridleys will soon be arriving on the west coast of Bengal.

N.M.
P.C.H.P.
H.F.H.

TURTLE SLAUGHTER IN INDIA

During the winter months, fish markets in West Bengal become turtle slaughter houses. Both freshwater and marine turtles arrive by train, lorry and bicycle in the early morning by the hundreds. Turtle meat is relished by Bengalis: nowhere else in India (except at Tuticorin in the southern state of Tamil Nadu) is there such a scramble for turtles.

At 7am on a Thursday morning January, 1982 we arrived at a market in Calcutta, carrying out routine survey work for the Freshwater Chelonian Group of the IUCN. Several Pacific Ridleys were on their backs, eyes bulged from the pressure of being overturned for several days with flippers wired together. Three or four customers wanted sea turtle meat so a female was slid across the slippery, gouged concrete floor next to the scales. The young cutter drained his tea cup, and picked up the just sharpened knife. He bent over and deftly cut around the margin of the plastron, avoiding the flailing flippers and the sudden desperate attempts to reach and bite the knife hand. The dark blood overflowed onto the cement as the plastron was ripped off, all of the pulsating innards exposed. The flapping and biting action continued, but feebler now as the reptile was eviserated and the important meat carved out for weighing. The female ridley didn't die for 10 minutes. The mounds of fully formed but unshelled eggs were put in a basket for separate sale. Only the carapaces were thrown away. No one was concerned about the suffering, nor was there any worry about the Indian Wildlife Act, under which sea turtles receive the "highest" protection!

J. VIJAYA
Madras Snake Part Trust, Deer Sanctuary, Guindy, Madras 600022, India.

DISCOVERY OF SECOND MASS NESTING GROUND FOR PACIFIC RIDLEY SEA TURTLES IN ORISSA, INDIA

Bustard (1974, 1976) reported on an enormous Pacific ridley sea turtle rookery at Gahirmatha Orissa, where over 1,50,000 nesting females were estimated to have laid in the 1975-76 nesting season. Subsequent nesting figures for this beach for the years 1977-79 were provided by Kar (1980) and Kar and Bhaskar (in press). Bustard pointed out that this was only one of a number of potentially important nesting areas for the Pacific ridley in Orissa. A second mass nesting ground has now been discovered during the 1981 nesting season at the other end of Cuttack District of Orissa, between Nadiakhia muhana and Akasia muhana (lat. 19° 98' N - 20° 1' N and long. 86° 4' E - 86° 45' E) approximately about 100 km south of the Gahirmatha rookery. This nesting ground extends over about 3 to 4 km and about 1,00,000 female ridleys have been estimated to lay annually.

The addition of this nesting population to the area already discovered at Gahirmatha, which has been monitored by me since 1977 together with important areas of nesting beaches between Hukitola Island, Paradeep, Astaranga, Konark (Chandravaga beach), Puri, Paluru and Gopalpur on sea, brings the nesting population of this species in Orissa alone to 3,00,000 per annum, conservatively estimated. The Gahirmatha population is protected by its inclusion in the Bhitarkanika Wild Life Sanctuary declared by the Government of India/FAO/UNDP Project, Crocodile Breeding and Management in 1975.

Bustard, H.R. 1974. India: a preliminary survey of the prospects of Crocodile Farming (Based on the work of Dr. H.R. Bustard). F.A.O., Rome, 1-50.
Bustard, H.R. 1976. World's largest sea turtle rookery? Tigerpaper 3, 3.
Kar, C.S. 1980. The Gahirmatha turtle rookery along the coast of Orissa, India. Marine Turtle Newsletter 15: 2-3.
Kar, C.S. & S. Bhaskar. In press. The status of sea turtle in the eastern India Ocean. In: Biology and Conservation of Sea Turtles. Bjorndal, K. (Ed.) Smithsonian Institution Press, Washington, D.C.

CHANDRA SEKHAR KAR
Gahirmatha Marine Turtle Research and Conservation Centre, Forest Department, Government of Orissa, P.O.: Satabhaya-754 225, Via: Rajnagar Dist: Cuttack, Orissa, India.

ATLANTIC RIDLEY PROJECT, 1982: PRELIMINARY ACCOUNT

This was the 16th year of the Mexican project for restoring this species and the 5th year of cooperation with the U.S. Marine Fisheries Service. Out of a total of 874 nests, 753 were translocated; around 12.2% were lost to predators, poachers and in other ways. 67,571 eggs were transplanted to corrals and 10,332 to styrofoam boxes. This year there were no serious storms (see Marquez, R. 1982. Marine Turtle Newsletter 21, p. 3). Preliminary data on hatching success are: 63.5% from the corrals and 76% from the boxes at Rancho Nuevo, with an overall hatch rate of 69.5%. More than 47,000 hatchlings were released on the beach.

Twenty boxes with 2020 eggs were sent to Padre Island, and from there 1524 hatchlings went to the Galveston Laboratory, Texas, for head-starting. The hatching rate was 75.5%. Head-started turtles are released at around the

age of 9 months in the Gulf of Mexico. Up till now, over the past 4 years, 6694 turtles, less than a year old, have been released. About 190 have been kept as a potential breeding stock in several U.S. aquaria and at the Cayman Turtle Farm (Mexus-Gulf's Sea Turtle Working Group's Accomplishments and Plans for 1978-85, ms. Veracruz, Mexico, 1982).

This year between 2 April and 18 July there were 61 emergences of females for nesting, some grouped some solitary. An unusual thing in 1982 was that there was only one important arribazon with around 300 turtle tracks; 251 nests from these were located and reburied the same day. Monel tags were applied to 197 turtles and 15 of these were double tagged with blue plastic jumbo tags on the opposite front flipper; 44 of these turtles nested twice and 4 thrice. Also 44 turtles tagged in previous years laid eggs and 5 of these turtles nested twice. 66 turtles with what looked like tag scars were retagged.

Temperature was monitored in 6 corral and 7 box clutches for studies of effects on sex ratio.

The work in the turtle camp began in the 2nd week of April and lasted till the 2nd week in September. The first turtle was seen laying on 11th April and the last on 18th July. The U.S. team was on the beach from 10 May till 16 August. An airplane was invaluable for surveying nesting turtles. Also to support the goals of the Western Atlantic Turtle Symposium (scheduled for July 1983 in Costa Rica), aerial surveys of shoreline characteristics and nesting activity were made 28 June--2 July.

Again the incidental catch of turtles by shrimp trawlers is the most serious obstacle to increasing this population.

RENÉ MÁRQUEZ M.
C.I.P. Manzanillo, c/o Delegación Federal de Pesca, Manzanillo, Col. 28200 Mexico.

A LEATHERBACK HATCHERY IN FRENCH GUIANA

Study of Dermochelys coriacea in French Guiana has shown that two principal factors are responsible for egg destruction: erosion of the beaches by the sea and infiltration of water from the coastal marshes. In 1979, for example, 4410 leatherback nestings were counted in April and May at Les Hattes--Ya: lima: po. During the corresponding hatching time only 4.3% of the eggs produced hatchlings. With assistance from the French Ministry of the Environment, WWF, Greenpeace and the Guianese administration, a hatchery was established near the village of Les Hattes--Ya: lima: po. This hatchery was built from the ruins of an old penitentiary 70 m from the water. It has a living area and a large incubation room. A laboratory and a seawater tank will shortly complete the facility. The hatchery has been operating since 1981 and at present has the capacity for artificially incubating about 7000 eggs a season. The eggs are collected after laying from females who have nested too near the sea or have badly injured back flippers. Eggs are immediately put in polystyrene boxes between 2 layers of wet sand, following the techniques used by STINASU in Surinam. Even without control of temperature and humidity, the average hatch rate is almost 65%. Viable newborn turtles are placed on the beach at night in artificial sand tunnels from which they emerge. They are

watched to prevent attacks from predators.

Aided by the French Ministry of Overseas Departments and Territories, we are going to equip the hatcheries with precise temperature control. One of us (with Claude Pieau, University of Paris) is studying the influence of temperature on the sex of leatherback embryos and on the natural sex ratio. The optimal temperature for hatchery incubators will be based on results of these investigations. Humidity which is responsible for rotting of some of the eggs, is more difficult to control in a country as humid as French Guiana.

"L'Association pour la gestion des écloseries d'oeufs de Tortues marines de Guyane" has been formed to administer the hatchery. Among the administrators of this association are the Presidents of the World Widlife Fund--France, Greenpeace--France, the Société herpétologique de France, the Fédération française des Sociétés de Protection de la Nature and the director of the Reptile and Amphibians laboratory of the Museum of Paris.

JACQUES FRETEY AND JEAN LESCURE
Laboratoire de Zoologie (Reptiles et Amphibiens), Muséum national d'Histoire naturelle, 25, rue Cuvier 75005, Paris, France.

RECENT PAPERS

BLAIR, D. and LIMPUS, C.J. 1982. Some digeneans (platyhelminthes) parasitic in the loggerhead turtle, Caretta caretta (L.), in Australia. Aust. J. Zool., 30:653-80. D. Blair, Department of Zoology, University of Canterbury, Christchurch 1, New Zealand.

CARR, A., MEYLAN, A., MORTIMER, J., BJORNDAL, K. and CARR, T. 1982. Surveys of sea turtle populations and habitats in the Western Atlantic. NOAA Technical Memorandum NMFS-SEFC-91, U.S. Department of Commerce. A. Carr, Department of Zoology, University of Florida, Gainesville, Florida, 32611 U.S.A.

DODD, C.K. 1981. Nesting of the green turtle, Chelonia mydas (L.), in Florida: historic review and present trends. Brimleyana 7:39-54. C.K. Dodd, Office of Endangered Species, U.S. Fish and Wildlife Service, Washington, DC 20240, U.S.A.

FRAIR, W. 1982. Serum electrophoresis and sea turtle classification. Comp. Biochem. Physiol. 72B:1-4. W. Frair, Department of Biology, The King's College, Briarcliff, NY 10510, U.S.A.

NUITJA, N.S. and LAZELL, J.D. 1982. Marine turtle nesting in Indonesia. Copeia, 708-710. N.S. Nuitja, Department of Fisheries Management, Bogor Agricultural University, Bogor, Indonesia.

SHOOP, C.R. and RUCKDESCHEL, C. 1982. Increasing turtle strandings in the southeast United States: a complicating factor. Biological Conservation 23:213-215. C.R. Shoop, Department of Zoology, University of Rhode Island, Kingston, RI 02881, U.S.A.

WITKOWSKI, S.A. and FRAZIER, J.G. 1982. Heavy metals in sea turtles. Marine Pollution Bulletin, 13:254-255. J.G. Frazier, Department of Zoological Research, U.S. National Zoological Park, Smithsonian Institution, Washington DC 20008, U.S.A.

WOOD, F., PLATZ, C., CRITCHLEY, K. and WOOD, J. 1982. Semen collection by electroejaculation of the green turtle, Chelonia mydas. Brit. J. Herpetol. 6:200-202. F. Wood, Cayman Turtle Farm Ltd., Box 645, Grand Cayman, B.W.I.

PUBLICATIONS AVAILABLE FREE FROM THE CHELONIA INSTITUTE

1. Behavioral and Reproductive Biology of Sea Turtles. 1980. Amer. Zool. 20. (proceedings of the symposium held at Tampa, 1979).

2. Florida Marine Research Publications No. 33, 1978 (proceedings of the conference held at Jensen Beach, 1976).

3. For Spanish speaking readers: Cliffton, K. Podran salvarse ..? 1981, Technica Pesquera 167, 22-29 (with colour photos by G.H.H. Huey).

Obtain from Chelonia Institute, P.O. Box 9174, Arlington, Virginia 22209, U.S.A.

THE WESTERN ATLANTIC SEA TURTLE SYMPOSIUM (WATS)

This is scheduled in San Jose, Costa Rica, for 18-22 July 1983. For details write to Frederick H. Berry, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida, 33149 U.S.A.

NEW RED DATA BOOK PUBLISHED

The IUCN Amphibia-Reptilia Red Data Book Part 1, Testudines, Crocodylia, Rhynchocephalia, 1982, compiled by Brian Groombridge, has recently been published. It contains revised sheets for all the sea turtles, except the flatback which does not fulfil the critera for inclusion. The other sea turtles are listed as "endangered", except the loggerhead which is "vulnerable". The reference lists and information provided are far more extensive and valuable than in previous editions. For further information write to the IUCN Conservation Monitoring Centre, 219c Huntingdon Road, Cambridge CB3 ODl, U.K.

STOP PRESS: MORE FROM INDIA

An article by S. Biswas, entitled "A report on the olive ridley, *Lepidochelys olivacea* (Eschscholtz) (Testudines: Cheloniidae) of Bay of Bengal", has just appeared in Rec. Zool. Surv. India 79: 275-302 (1982). Among interesting points are that on the basis of stomach contents the adult is herbivorous and that many fully formed hatchlings are unable to get out of their nests on account of overcrowding and obstructions. The catch of adults from the Digha and the Sunderban coast of West Bengal is thought to exceed 20,000 per season. "There is a government ban for turtle catching which is not strictly enforced". But the author says that a total ban on exploitation for this species is not necessary as it is the most abundant sea turtle in the Bay of Bengal. He recommends annual quotas of turtle catch and egg collection, with the State Departments enforcing and supervising the exploitation. For reprints write to S. Biswas, Zoological Survey of India, 34 Chittaranjan Av., Calcutta 700 012, India.

Support for this newsletter came from H.C. Mittag, Dr. J. Mittag, the University of Toronto and World Wildlife Fund Canada.

Marine Turtle Newsletter

No. 24 MARCH 1983

Editor: N. Mrosovsky

Departments of Zoology
and Psychology
University of Toronto
Toronto, Ontario
M5S 1A1 Canada

Editorial Advisors:

P.C.H. Pritchard
Harold F. Hirth

EDITORIAL: NEW BOOKS

This issue draws attention to 2 new books on sea turtle conservation. The first, BIOLOGY AND CONSERVATION OF SEA TURTLES (K.A. Bjorndal, editor), is the long-awaited proceedings of the World Conference on Sea Turtle Conservation held in Washington in 1979. It is a large book, 583 pages long, 3.5 cm thick and weighing more than 1.5 kg. Undoubtedly it will be enormously useful. It includes an overview of turtle biology, extensive status reports of turtle populations in different regions of the world, a section on conservation theory, techniques and law, and a sea turtle conservation strategy. Every turtle programme should have this volume on hand for its workers.

Nevertheless, some cautions are in order. First, the volume is already dated in a number of ways, as the editor herself points out. To take a few examples, the outlook for the leatherback turtle has altered in the last few years with the realization that many thousands nest along the west coast of Mexico (see Pritchard, RECENT PAPERS, below). There have been important changes in design of devices to prevent turtles being caught in shrimping trawls. Suppositions about the effects of incubating eggs in styrofoam boxes have been replaced by facts. An updating of data on patterns of trade in turtle products is published below in this newsletter (see Mack).

Second, although people from many parts of the world contributed, this volume does not give adequate treatment to all the approaches to turtle conservation that there are in the world. Whether or not it was merely coincidence that the organizing committee was almost entirely from the United States, conservation through utilization fares badly. To be sure utilization is mentioned in a number of places, but there is little attention given to analysing specific options. Also at the meeting itself some of the best attended sessions were those when Sr. Antonio Suárez spoke, and when personnel from the Cayman Turtle Farm gave information and responded to questions. These presentations are excluded from the published volume. Sr. Suárez, who was then involved with the cooperatives in Mexico (see Cahill, RECENT PAPERS, below), challenged certain figures on the turtle situation in Mexico. He also insisted that given the need for fish meal and foreign exchange in Mexico, the

question was not whether but how to exploit turtles there. One does not have to agree with Sr. Suárez, or approve of the way he ran his business ventures, to feel that the proceedings of a world conference on sea turtles should have included such material and left readers to judge for themselves. Likewise one does not have to support turtle farming to regret that the important work on the reproductive biology of green turtles by Wood and Wood, who gave some of their data at the Washington meeting, was left for a later conference to pick up--and publish sooner (Am. J. Zool. 1980 20, 499-505). Such omissions detract from the completeness of this volume. An index also would have been useful.

Nevertheless, the book is a mass of information. The organizing committee, Smithsonian Institution and the sponsors also deserve congratulations for keeping the price so low. At $25.00 US it is a bargain and should be within the budgets of libraries and government departments in many parts of the world. Your editor is ordering 2 extra copies and banking them for future students.

It was not possible to extract a review copy or order forms from the publishers. Perhaps it will be possible for a future issue of this newsletter to include a fuller review by someone who was not associated with the proceedings in any way. Information about ordering is given at the end of this article.

The second book, CONSERVING SEA TURTLES by N. Mrosovsky, is very different. Only 176 pages and single author, it analyses a number of procedures and problems, such as tagging, head-starting, the Kemp's ridley programme, splitting sea turtles into sub-species, farming and utilization. It is hoped that a future issue of the newsletter will include a review by someone not particularly identified with any of the main factions in turtle conservation.

Has it not all been said before in editorials in the newsletter? By no means. In this newsletter I have tried to include material reflecting a variety of opinions. In this way it can serve better as a vessel of communication between different regions and different viewpoints. In striving for balance it is sometimes advisable for the editor to put things in a blander way than might be natural for him. In fact over the years I have become disquieted by a number of endeavours undertaken on behalf of sea turtles. If my criticisms can be rebutted, then these endeavours will emerge as all the more convincing and worthwhile. If they stand, then it is time that these matters were brought into the open. Meanwhile, while I continue as editor, I will try to keep this newsletter similar to past issues in style and scope. For these reasons I have felt it best to collect my own views in a separate volume. Only about 1000 copies of CONSERVING SEA TURTLES have been printed so buy now! Profits--if any--from these will go to the British Herpetological Society. An order form is included, as well as information below this article.

The almost simultaneous appearance of 2 books on turtle conservation, so different from each other and yet complementary in some ways, attests to the lively contemporary interest in this topic. Where these books disagree, perhaps a more comprehensive truth will emerge.

N.M.

BIOLOGY AND CONSERVATION OF SEA TURTLES

1982. K.A. Bjorndal, editor. Paperback, 583 pages. Order from Smithsonian Institution Press, P.O. Box 1579, Washington, D.C., 20013 U.S.A. Price $25.00 plus $1.50 postage and handling. Cheque or money order, or supply credit card number and expiry date.

CONSERVING SEA TURTLES

1983, by N. Mrosovsky. Paperback, 176 pages. Order from: Dr. S. Townson, British Herpetological Society, c/o Zoological Society of London, Regent's Park, London NW1 4RY, England. Price £5 + 50 pence postage, or USA $10 + $1.00 postage. International Money Orders for orders from outside the UK will speed processing.

TURTLE FARMING IN ECUADOR PROPOSED

Below is a translation of an article distributed by the Ecuadorian Press Agency (AEP). The article was taken from the daily newspaper the "EXTRA" in Guayaquil, dated 11th August 1982. I should like to point out that the Japanese delegation did meet with the Ecuadorian authorities and it was agreed that before any turtle farms were built it would be necessary to carry out a detailed study to ensure that the wild populations of marine turtles will not be endangered.

MARIO HURTADO
Casilla 59-18 Guayaquil, Ecuador.

Turtle farms to be set up in Manta

The Japanese government will construct a marine turtle farm in Manta--where conditions are ideal for this sort of enterprise which has produced good returns in other countries.

This pronouncement by Japan tends to amplify her radius of action in this part of the continent with regard to the exploitation of reptile skins and the possibility of establishing marine turtle farms in this port. Exploitation would be a joint activity between Japan and Ecuador.

In order to plan this work a delegation from Japan is expected which will be made up of representatives from Japanese firms, the Ministry of Commerce and Japanese Industries and form part of the All Japan Association of Reptile Skin and Leather Industries; those expected are Shigeto Ikegami, Akira Saikyo, Osamu Nato, Tyoichi Yoshihawa, Tadashi Kataoka, Masayoshi Takashima, Yoichi Takekara, Noboru Ishii and Yasuo Karamochi.

In the field of production of this port great interest has been shown in the proposed development project. So much so in fact, that throughout the press it has been announced that full support will be given to Japan. The national government will be asked to give impetus to the programme so that it may develop in such a way as to augment the levels of export from this country.

U.S. VIRGIN ISLANDS: LEATHERBACK PROJECT

The first leatherback nesting activity on Sandy Point, St. Croix, in 1982 was on March 20. Our all-night patrols commenced March 28 and continued through the last nesting attempt on July 11; thereafter, nests were monitored every evening for hatching through September 18. During the 16-week season 86 nests were laid on the 2.4 km beach by 19 females. The average number of nests per female was 4.4 (range 1-9). The average internesting interval was 10 days. All 19 females were double-tagged with Monel (metal) NMFS tags (AAG series); 16 of those females were also tagged with a single yellow plastic Riese tag (OA series), in addition to the two Monels, in an effort to eliminate carapace scarring and improve tag survivability. All tags were placed on the trailing edge of the front flippers. The average "over-the-curve" length was 152.2 cm (range 139.4-173.5). "Over-the-curve" lengths were obtained alongside the dorsal ridge. Carapace lengths were taken "straight-line" as well, in hopes of developing a regression curve later.

The average clutch size was 112.7; yolked eggs averaging 74 and yolkless 38. The average incubation time was 63.4 days. Of the 86 nests laid, 64% were known to hatch. The average success of those nests was 63.4% (range 9-92). Erosion presents a major problem for leatherbacks on Sandy Point. Although the eggs in 31% of the nests were deemed threatened by erosion and relocated immediately, an additional 30% of the nests were lost to erosion or wave wash. Nests were also threatened by mongoose, night herons, terrestrial crabs and vehicle traffic. Although egg poaching presents a very serious problem on St. Croix's beaches, our presence precluded even a single nest being poached on Sandy Point.

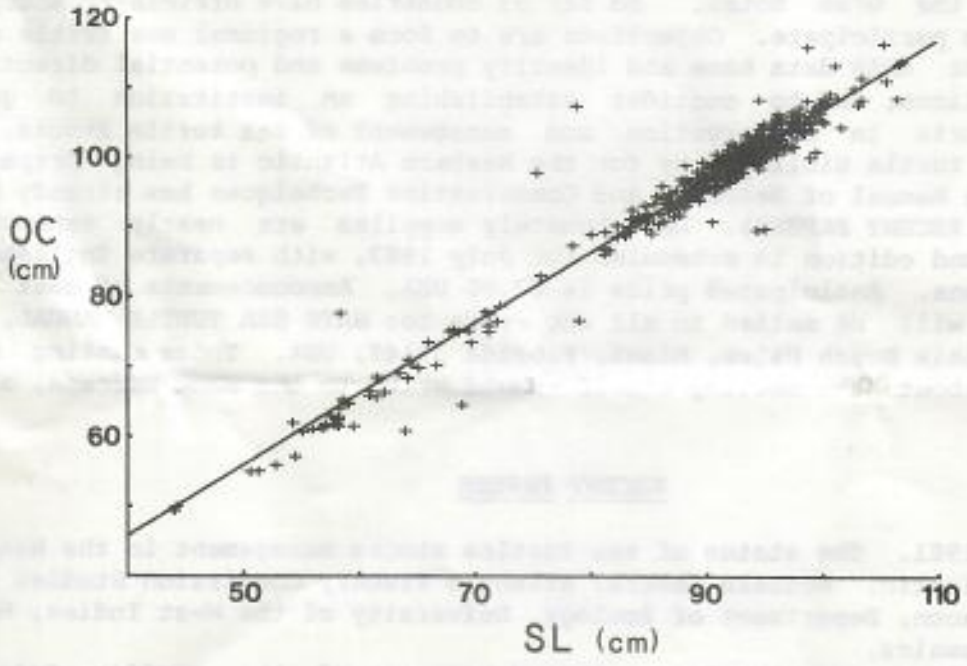
Additional data obtained included crawl widths, ectoparasite and injury notes, egg diameters, nest dimensions, nest site description, weather and the timing of behavioural sequences. The project was a great success, both educationally and scientifically. The U.S.V.I. Division of Fish and Wildlife and EARTHWATCH, Inc. are again co-sponsoring the research in 1983. We will return to St. Croix in March.

SCOTT ECKERT AND KAREN ECKERT
Institute of Ecology, University of Georgia, Athens, Georgia, 30602 U.S.A.

RELATING STRAIGHT-LINE TO OVER-THE-CURVE MEASUREMENTS FOR LOGGERHEADS

There is a need among marine turtle researchers to compare their findings with information gathered by others. Some investigators measure carapace lengths over-the-curve (OC) with meter tapes; others take straight-line measurements (SL) with calipers. Using data gathered on loggerheads at Kennedy Space Center, Florida, we computed an equation by which SL measurements can be converted to OC, and vice versa. Carapace lengths were measured to the nearest 0.1 cm with both meter tapes and calipers from the center of the nuchal (precentral) scute to the distal tip of the longest posterior marginal scute. Because both measurements are subject to error, Model I regression is inappropriate. We used Bartlett's 3-group method for Model II regression (Sokal and Rohlf 1969). In the figure below, the line represents the equation: $OC = a + b(SL) = 5.24 + 1.02(SL)$, ($N = 366$; $r = .9783$; $p < .01$). The

95% confidence limits for the slope, b, indicate that $0.986 \leq b \leq 1.045$.



For converting OC measurements to SL, the formula may be rearranged:

$$SL = \frac{(OC - 5.24)}{1.02} = 0.980(OC) - 5.14$$

Stoneburner (1980) found differences in body depth of loggerheads nesting in North Carolina, Georgia and Florida. Hence, our equations should be used with caution if applied to loggerheads from other areas. The equations should not be used for any other species or for loggerheads < 50 cm long (OC) or < 45 cm long (SL).

Sokal, R.R. and F.J. Rohlf. 1969. Biometry. W.H. Freeman & Co., San Francisco.

Stoneburner, D.L. 1980. Body depth: an indicator of morphological variation among nesting groups of adult loggerhead sea turtles (Caretta caretta). J. Herpetol. 14:205-206.

NAT B. FRAZER
Institute of Ecology, University of Georgia, Athens, GA. 30602, U.S.A.

LLEWELLYN M. EHRHART
Dept. of Biological Sciences, University of Central Florida, Orlando, FL. 32816, U.S.A.

WESTERN ATLANTIC TURTLE SYMPOSIUM (WATS)

This will be held 17-22 July 1983, in San Jose, Costa Rica, with headquarters in the Gran Hotel. So far 33 countries have officially accepted invitations to participate. Objectives are to form a regional sea turtle data base, evaluate this data base and identify problems and potential directions for future actions, and to consider establishing an institution to guide regional efforts in conservation and management of sea turtle stocks. An annotated sea turtle bibliography for the Western Atlantic is being prepared. A Sea Turtle Manual of Research and Conservation Techniques has already been prepared (see RECENT PAPERS). Unfortunately supplies are nearly exhausted. However a second edition is scheduled for July 1983, with separate English and Spanish versions. Anticipated price is $7.00 USA. Announcements of cost and availability will be mailed to all who write to: WATS SEA TURTLE MANUAL, c/o NMFS, 75 Virginia Beach Drive, Miami, Florida 33149, USA. Those wanting more information about the meeting itself should write to the same address, attn. Fred Berry.

RECENT PAPERS

BACON, P.R. 1981. The status of sea turtles stocks management in the Western Central Atlantic. Western Central Atlantic Fishery Commission Studies 7:1-38. P.R. Bacon, Department of Zoology, University of the West Indies, Mona, Kingston, Jamaica.

BALAZS, G.H. 1982. Sea turtles: a shared resource of the Pacific Islands. S. Pacific Commission Fisheries Newsletter 23:22-24. G.H. Balazs, NMFS, P.O. Box 3830, Honolulu, Hawaii, 96812, U.S.A.

BRATTSTROM, B.H. 1982. Breeding of the green sea turtle, Chelonia mydas, on the Islas Revillagigedo, Mexico. Herp. Rev. 13:71. B.H. Brattstrom, Dept. of Biological Science, California State University, Fullerton, CA 92634, U.S.A.

BROOKE, M. de L. and GARNETT, M.C. 1983. Survival and reproductive performance of hawksbill turtles Eretmochelys imbricata L. on Cousin Island, Seychelles. Biol. Conserv. 25:161-170. M. de L. Brooke, Edward Grey Institute, Zoology Department, South Parks Road, Oxford, OX1 3PS, U.K.

CAHILL, T. 1982. The Shame of Escobilla Part II. Outside Magazine Nov., pp. 43-45 & 81-84. T. Cahill, Outside Magazine, 625 3rd Street, San Francisco, CA 94107, U.S.A.

DEMETROPOULOS, A. and HADJICHRISTOPHOROU, M. 1982. Turtle conservation in Cyprus. Biol. Soc. Cyprus Bull. 2:23-26. A. Demetropoulos, Department of Fisheries, Nicosia, Cyprus.

ENCISO, F. 1982. Curso de verano. Sobre tortuga marina. Ciencias del Mar 1:13-15. F. Enciso, Carnaval 36 Sur, Mazatlan, Sinaloa, Mexico CP 82000.

FLETEMEYER, J. 1982. Sea turtle monitoring report. Broward County Environmental Quality Control Board, Florida, 95 pp. J.R. Fletemeyer, Oceanographic Center, Nova University, Dania, Florida, 33004, U.S.A.

FRAIR, W. and SHAH, B.K. 1982. Sea turtle blood serum protein concentrations correlated with carapace lengths. Comp. Biochem. Physiol. 73A:337-339. Wayne Frair, Dept. Biology, The King's College, Briarcliff Manor, NY 10510, U.S.A.

FRITTS, T.H. 1982. Plastic bags in the intestinal tracts of leatherback marine turtles. Herp. Rev. 13:72-73. T.H. Fritts, Denver Wildlife Research Center, Tulane University Museum of Natural History, Belle Chasse, Louisiana, 70037, U.S.A.

FRITTS, T.H., STINSON, M.L. and MARQUEZ, R. 1982. Status of sea turtle nesting in Southern Baja California, Mexico. Bull. Southern California Acad. Sci. 81:51-60. T.H. Fritts, Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico 87131, U.S.A.

GREINER, E.C., FORRESTER, D.J. and JACOBSON, E.R. 1980. Helminths of mariculture-reared green turtles (Chelonia mydas mydas) from Grand Cayman, British West Indies. Proc. Helminthol. Soc. Wash. 47:142-144. E.C. Greiner, College of Veterinary Medicine, University of Florida, Gainesville, Florida 32610, U.S.A.

HOFFMAN, W. and FRITTS, T.H. 1982. Sea turtle distribution along the boundary of the gulf stream current off Eastern Florida. Herpetologica, 38:405-409. W. Hoffman, Dept. Biology, University of South Florida, Tampa, Florida, 33620, U.S.A.

LICHT, P., OWENS, D.W., CLIFFTON, K. and PENAFLORES, C. 1982. Changes in LH and progesterone associated with the nesting cycle and ovulation in the olive ridley sea turtle, Lepidochelys olivacea. Gen. Comp. Endocrinol. 48:247-253. P. Licht, Department of Zoology, University of California, Berkeley, California, 94720, U.S.A.

LIMPUS, C.J., MILLER, J.D. and REED, P. 1982. Intersexuality in a loggerhead sea turtle, Caretta caretta. Herp. Rev. 13:32-33. C.J. Limpus, Queensland National Parks and Wildlife Service, Pallarenda, Townsville, 4810, Australia.

MARCOVALDI, G.M.F. and ALBUQUERQUE, J.C.B. 1982. Projeto tartaruga marinha. Boletim Fundação Brasileira para a Conservação da Natureza 17:70-74. (Author's address unknown.)

MARGARITOULIS, D. 1982. Observations on loggerhead sea turtle Caretta caretta activity during three nesting seasons (1977-1979) in Zakynthos, Greece. Biol. Conserv. 24:193-204. D. Margaritoulis, Herodotou 34, Politia, Athens, Greece.

McLELLAN, G.L. and LEONG, J.K. 1982. Radiologic evaluation of the differential absorption of diatrizoate in marine turtles. NOAA Technical Memorandum NMFS-SEFC-93, pp. 1-15. G.L. McLellan, U.S. Department of Commerce, Southeast Fisheries Center, Galveston Laboratory, Galveston, Texas, 77550, U.S.A.

PRITCHARD, P.C.H. 1982. Nesting of the leatherback turtle, Dermochelys coriacea in Pacific Mexico, with a new estimate of the world population status. Copeia, 741-747. P.C.H. Pritchard, Florida Audubon Society, 1101 Audubon Way, Maitland, Florida, 32751, U.S.A.

PRITCHARD, P.C.H. et al. 1982. Sea turtle manual of research and conservation techniques. Prepared for the Western Atlantic Turtle Symposium (1983), 94 pp. (text also available in Spanish). F. Berry, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida, 33149, U.S.A.

SHEEKEY, E.A. 1982. Green turtles basking on Tern Island, French Frigate Shoals. Elepaio, J. Hawaii Audubon Soc. 43:45-47. E.A. Sheekey, P.O. Box 568, Wailuku, Hawaii, 96793.

SMALL, V. 1982. Sea turtle nesting at Virgin Islands National Park and Buck Island Reef National Monument, 1980 and 1981. U.S. Dept. of the Interior Research/Resources Management Report SER-61, 54 pp. V. Small, Virgin Islands National Park, Box 110, Cruz Bay, St. John, U.S. Virgin Islands, 00830.

SPOTILA, J.R., STANDORA, E.J., MORREALE, S.J., RUIZ, G.J., and PUCCIA, C. 1983. Methodology for the study of temperature related phenomena affecting sea turtle eggs. Endangered Species Report 11, pp. 51, U.S. Fish & Wildlife Service, Albuquerque, New Mexico. J.R. Spotila, Dept. Biology, State

University College at Buffalo, 1300 Elmwood Ave., Buffalo, NY 14222, U.S.A.

WOOD, F.E., CRITCHLEY, K.H. and WOOD, J.R. 1982. Anesthesia in the green sea turtle, Chelonia mydas. Am. J. Vet. Res. 43:1882-1883. F.E. Wood, Cayman Turtle Farm Ltd., Grand Cayman, Cayman islands, British West Indies.

SAVING DOOMED EGGS IN SURINAME

An 8 month study was conducted from March-October 1982 on Krofajapasi, a 10 km stretch of beach providing a major nesting site for the leatherback and green turtle in Suriname. Work was carried out in collaboration with STINASU (Foundation for Nature Preservation in Suriname) and personnel from the Suriname Forest Service who patrolled the beach by foot daily, recording the nesting frequency of all species over the entire season. Clutches laid below the spring high tide level (SHTL), referred to as doomed clutches (Schulz 1975), were relocated either to hand-dug "nests" at a higher level on the beach or into styrofoam boxes placed in a central hatchery.

Not all clutches laid below SHTL were found and moved. In order to determine the number of clutches laid below SHTL, a separate survey was undertaken from 7 March-12 August 1982. The entire beach was patrolled in the morning, ca. 3 times per week, and the number of clutches laid below SHTL recorded. Only clutches laid during the night before the patrol were recorded. These included clutches laid below the flood cliff or tide mark left by the most recent spring high tides. Clutches that would only be covered by extreme high tides and wetted for brief periods were not considered doomed in this survey.

It is estimated that 21% of the total number of clutches laid by greens and 31.6% of those laid by leatherbacks were doomed clutches (Table 1). Using these percentages it is possible to estimate the total number of clutches laid below SHTL during the whole season from the nesting frequency data in Table 2. From the total of 567 clutches laid by greens, 119 (21%) are estimated to have been below SHTL and for leatherbacks from the total of 685 (Table 2), 216 clutches (31.6%) are estimated to have been doomed. The patrol team, working throughout the season, managed to relocate 111 green turtle clutches (Table 2), which is equivalent to 93.3% of all the clutches that were doomed. This figure may be marginally inaccurate since it includes a few well-sited clutches that were moved for convenience to styrofoam boxes. No specific record was kept of these, however it is believed to be no greater than 10 clutches. This would mean that at least 84% of the doomed green turtle clutches were relocated. For leatherbacks, 109 clutches were moved, which is 50.5% of the 216 estimated to have been below SHTL. All those relocated were from doomed clutches.

Knowledge of the number of doomed clutches, laid below the SHTL is essential in order to assess the relocation effort for any given nesting season. The % of green turtle clutches on Bigisanti beach (which later evolved to form Krofajapasi) is given in Schulz (1975) for 4 consecutive years from 1970 to 1973, and averages out to 25.8%. This is comparable to the 21% doomed on Krofajapasi in 1982. For leatherbacks, an average of 42.5% of clutches were doomed for the whole of Suriname during the seasons of 1971-1973 (Schulz 1975). This is greater than the 31.6% in 1982, suggesting a possible variation in numbers between different years or among the individual beaches.

Table 1. Summary of data from survey conducted 7 March-12 August 1982, showing number and percentage of clutches laid below SHTL on Krofajapasi.

	No. Nests Observed	No. Below SHTL	% Below SHTL
Green	204	43	21.0
Leatherback	196	62	31.6

Table 2. No. of clutches laid on Krofajapasi in 1982 and no. of clutches relocated.

	Leatherback				Green			
		Relocated Nests				Relocated Nests		
Month	Total No. Clutches Laid	To Hand-Dug Nests	To Styrofoam Boxes	Total	No. Clutches Laid	To Hand-Dug Nests	To Styrofoam Boxes	Total
February	5	0	0	0	47	0	0	0
March	7	1	0	1	149	18	23	41
April	99	11	0	11	147	45	0	45
May	177	19	5	24	147	14	0	14
June	264	45	6	51	59	3	8	11
July	120	19	0	19	15	0	0	0
August	13	3	0	3	3	0	0	0
Total	685	98	11	109	567	80	31	111

Mrosovsky (1983) estimated that 36% of leatherback clutches were sited below SHTL on Krofajapasi in 1980, a figure comparable to that for 1982.

Under ideal conditions one would aim to save all doomed clutches. However, it would be unrealistic to expect this, given that only 4 people were available in 1982 to patrol this 10 km stretch by foot at the beginning of the season and only 2 people from the end of June onwards. Indeed, it is remarkable that as many as 84% of all doomed green turtle eggs and 50.5% of leatherback eggs were relocated. This shows, that even with a limited personnel a great number of eggs can be saved. The different relocation figures for the 2 species reflect the fact that it is harder, even for an expert, to locate a leatherback clutch, while with experience, a green clutch can be found within seconds.

To improve on this record it would be necessary to hire extra workers. Ideally a team of 6 would patrol the beach each day, with 3 responsible for relocating all leatherback nests and 3 responsible for green nests. Alternatively, some form of motorized vehicle could be used. The beach could then be patrolled faster, allowing workers to spend more time and energy on digging out and moving the eggs.

We would like to acknowledge with thanks the help and contribution of H. Reichart, Director of STINASU and Luis Autar of the Suriname Forest Service. Also Erol Kiba, Jan Harold and Johnny Wene for their work on the beach.

Mrosovsky, N. (1983). Ecology and nest site selection of leatherback turtles. Biol. Cons. 25 (in press).
Schulz, J.P. (1975). Sea turtles nesting in Surinam. Zool. Verh., 143:1-143.

PETER DUTTON & CLARE WHITMORE
c/o Zoology Dept., University of Toronto, Toronto, Canada M5S 1A1

WORLDWIDE TRADE IN WILD SEA TURTLE PRODUCTS: AN UPDATE

Three years ago, TRAFFIC(U.S.A.) and the Wildlife Trade Monitoring Unit (formerly TRAFFIC (International)) analyzed the worldwide trade in sea turtle products for the World Conference on Sea Turtle Conservation (Mack, et al., 1982). Many attending the conference were surprised to learn the extent and volume of this trade. A statement in the Sea Turtle Conservation Strategy (STCS, 1979:5), best illustrates what was the general consensus of those who attended the conference: "As long as sea turtles remain endangered, the ending of commercial exploitation of all sea turtle products is a long-range goal or ideal of the conservation strategy." While people disagree about the need to farm or ranch sea turtles, almost everyone agrees that taking wild adult and juvenile turtles for commercial trade is unwarranted. Yet, the killing continues.

Commercial trade in tortoiseshell, stuffed turtles, sea turtle meat, and turtle skins has declined worldwide since CITES came into force in 1975. Since May 1977, the three major species exploited for trade--green, hawksbill, and olive ridley turtles--were listed on Appendix I which prohibits commercial trade under most circumstances. As of January 1983, 78 countries are party to CITES and all 7 species of marine turtles are on Appendix I. Unfortunately, 4 countries took "reservations" (Table 1) which allow them to commercially trade in wild sea turtle products.

Table 1. CITES Parties with Reservations on Sea Turtles

Country	Species
France	Green and Hawksbill
Japan	Green, Hawksbill, and Olive Ridley
Italy	Green
Suriname	Green and Leatherback

The trade problem, however, is not restricted to just these reserving countries. Several CITES party and non-party countries continue to trade in wild turtle products despite their Appendix I listing. And, turtle products are sold locally in many countries throughout the tropics. While the selling of turtle products in markets is not controlled under CITES, tourists purchase these souvenirs and bring them back to their homelands where they are often seized. Turtle products (stuffed turtles, turtle cream, tortoiseshell jewelry, polished shells) are by far the items most frequently seized from tourists returning to the United States.

Leather from turtles, a relatively new addition to the reptile-leather industry, has gained popularity in many parts of the world as more traditional leather sources such as crocodilian skins became more scarce. "The present leather trade constitutes an intolerable drain on the sea turtle populations, especially those of Lepidochelys olivacea and Chelonia mydas. Current world trade should be terminated and all measures taken to achieve this end" (STCS, 1979:5-6).

The two largest exporters of turtle skins during the 1970's were Mexico and Ecuador (Mack, et al., 1982), and perhaps the single most important event relating to this trade since the 1979 conference was Ecuador's ban on sea turtle product exports beginning in June of 1981. From 1970 to 1977, between 132,000 and 147,000 adult olive ridley turtles were killed in Ecuador for the skin trade (Green and Ortiz, 1982). During the next 4 years, 1978 to 1981, Ecuador exported 579,000 kg of skins, representing an additional 290,000 to 320,000 turtles. Most of these skins were exported to Japan and Italy (Hurtado, 1981).

Mexico has also taken large numbers of olive ridleys from the eastern Pacific coast for both skin and meat. According to Antonio Suarez, former owner of the largest sea turtle processing plants in Mexico, an estimated 1.4 million olive ridleys were killed on the beaches of Oaxaca, Michoacan, and Jalisco between 1966 and 1977 (Mack, et al., 1982). In 1981, Suarez sold his companies to Propemex, a government-owned company, and unfortunately the slaughter continues today (Cahill, 1982). During the 1981/82 season, the olive ridley quota in Oaxaca was increased 72% over the previous year allowing 69,000 turtles to be killed; by December 1981, 56,000 turtles had been killed which is the largest take in Oaxaca since 1978 (K. Cliffton, pers. comm.).

Since 1979, other countries have also traded in sea turtle skins. Based on their published government statistics, Japan appears to be the major importer, and many Asian countries are involved in the export of turtle skin and leather (Table 2). The Philippines, Singapore, Indonesia, and Pakistan are the major exporters of turtle skins and leather from Asia. It is likely that all turtle skins in trade are from sea turtles taken directly from the wild with the possible exception of those exported from the Cayman Islands which are probably from the Cayman Turtle Farm.

The demand for turtle leather is a relatively new trade, but the shell of the animal has been prized for centuries. For that reason, this trade needs to be addressed in a slightly different manner. "The trade in tortoise shell should cease in those countries where it has no special traditional cultural significance. Those countries where tortoise shell has a cultural value (e.g., in marriage ceremonies) should be encouraged to preserve and recycle antique supplies, to promote the use of synthetic substances, and with all dispatch to phase out the importation of new material" (STCS, 1979:6).

Based on published government statistics, worldwide trade in tortoiseshell totalled 249,000 kg in 1976; 318,000 kg in 1977; and 403,000 kg in 1978 (Mack, et al., 1982). At the time TRAFFIC produced its report on the sea turtle product trade, it was assumed that all tortoiseshell was from sea turtles, especially the hawksbill. It has recently been brought to our attention that shell from other turtles may also be included in the international customs category, "tortoiseshell" (C. Huxley, pers. comm.). The extent of this

Table 2. Japanese Imports of Turtle Skin and Leather

Country of Export	Quantity (in kilograms) 1979	1980	1981
(Skin)			
*Ecuador	121,399	16,313	8,456
Mexico	9,075	0	0
*Cayman Island	14,366	14,778	6,687
*Philippines	4,300	7,531	0
Singapore	12,261	8,660	0
*Indonesia	3,989	4,160	7,585
*Pakistan	3,248	2,100	2,400
Total Skin	168,638	53,542	25,137
(Leather)			
Mexico	22,774	11,506	10,536
Singapore	225	373	250
Other	875	168	19
Total leather	23,874	12,047	10,805

*CITES party or CITES party-dependent.

practice is unknown, and thus the total volume of raw tortoiseshell trade may be overestimated.

In Japan, however, it is probable that all imported tortoiseshell is indeed from sea turtles. Following discussions with various people, TRAFFIC (Japan) concludes that the specific international customs category Bekko (Japanese for tortoiseshell), "with very little exception, if at all, does represent hawksbill" (T. Milliken, in litt., 1982). Between 1960 and 1981, almost 820,000 kg of Bekko was imported by Japan alone. This represents between 410,000 to 820,000 hawksbill turtles based on minimum (1.0 kg) and maximum (2.0 kg) weight estimates of carapace, plastron, and marginal scales of individual hawksbills imported by Japan (E. Roet, in prep.). Japan joined CITES in 1980 and took a reservation on three Appendix I species of marine turtles (Table 1). It still imports large volumes of raw hawksbill tortoiseshell (Table 3), even though in 1980, Japan imposed an annual import quota of 30,000 kg (T. Milliken, in litt., 1982).

General trends show that Asia and the New world account for most of the tortoiseshell imported by Japan. The largest exporters are the Philippines, Indonesia, Kenya, Tanzania, Panama, Cuba, Haiti, and the Cayman Islands. All are CITES parties with the exception of Cuba and Haiti. Today, the hawksbill probably is most heavily exploited in the Caribbean. The Caribbean accounted for about 25 percent of all tortoiseshell imported by Japan in the 1970's. This amount rose to almost 40% in 1980 and 1981 (Meylan and Mack, in press). Bekko imported by Japan from the Cayman Islands does not appear to be from the Cayman Turtle Farm as green turtle shell imports are listed in a separate category of Japan's published statistics (TRAFFIC (U.S.A.), unpublished data).

Table 3. Japanese Imports of Raw Bekko (Tortoiseshell)

Country of Export	Quantity (in kilograms) 1979	1980	1981
*Hong Kong	945	0	104
Singapore	2,417	364	522
*Philippines	3,539	2,514	1,439
*Indonesia	19,071	4,811	1,579
Maldives	1,266	167	355
Other Asian countries	2,896	1,161	498
*Kenya	2,051	463	1,404
*Tanzania	5,943	1,202	845
*Seychelles	1,027	618	423
Other African Countries	67	162	81
Honduras	9	1,132	481
*Nicaragua	949	7	475
*Costa Rica	89	0	234
*Panama	4,810	3,360	3,011
*Bahamas	1,886	767	29
Cuba	3,725	7,338	2,650
Haiti	1,689	1,020	892
*Cayman Islands	6,110	2,505	3,022
Other New World Countries	1,499	1,934	1,341
Netherlands	3,549	1,305	448
Other European countries	18	0	203
TOTAL	63,555	30,830	20,036

*CITES party or CITES party-dependent.

Populations of hawksbill may no longer exist in the Cayman Islands, but Cayman Island fishermen buy tortoiseshell from other countries (A. Carr, pers. comm.). Japanese tortoiseshell dealers claim that they import hawksbill shell from the Cayman Islands and Cuba; the hawksbill shell from Cuba is reportedly the most expensive in the region and sold by the Cuban government (T. Milliken, in litt., 1982).

Perhaps the most wasteful killing of turtles is for stuffed souvenirs. Juveniles, especially young hawksbills, are taken in large numbers. "This totally unnecessary luxury trade is having a serious impact on populations of Eretmochelys imbricata. It should cease and all measures should be taken to achieve this end" (STCS, 1979:6).

Stuffing of turtles for the tourist industry and commercial trade proliferates today. Japan's published government statistics show that they imported 598,000 kg of worked Bekko (includes mostly stuffed hawksbill

turtles) between 1962 and 1981 (T. Milliken, in litt., 1982). This represents between 604,000 and 777,000 juvenile hawksbill turtles based on a stuffed turtle weighing an average of .77 kg to .99 kg (E. Poet, in prep.). Indonesia has been the major exporter of worked tortoiseshell to Japan. Presently, there is no quota for imports of worked tortoiseshell (T. Milliken, in litt., 1982). Worked tortoiseshell imports by Japan from 1979 and 1981 are listed in Table 4.

Table 4. Japanese Imports of Worked Bekko (Tortoiseshell)

Country of Export	Quantity (in kilograms) 1979	1980	1981
Taiwan	2,434	794	0
Singapore	11,786	10,455	540
*Philippines	1,618	936	0
*Indonesia	59,457	41,167	30,803
Other countries	272	289	0
TOTAL	75,567	53,641	31,343

*CITES party or CITES party-dependent.

In addition to worked Bekko (mainly stuffed hawksbill), Japan also imports large volumes of stuffed green turtles (E. Roet, in prep.). Between 1979 and 1981, Japan imported an additional 253,000 kg of worked tortoiseshell (Japan's published statistics) from other species of marine turtles (TRAFFIC (U.S.A.), unpublished data). Three-fourths of the total came from Indonesia.

As mentioned earlier, several CITES parties who did not take reservations on sea turtles are still commercially trading in their products. Indonesia alone (a CITES member since March 1979), provides Japan with the largest volume of stuffed turtles (hawksbill and green) and with the second largest volume of skins. Along with the Philippines, Indonesia was also the major exporter of raw hawksbill shell from Asia in 1981. The Philippines joined CITES in 1981, and it may be too early to judge their implementation of the convention. The African countries of Kenya, Tanzania, and the Seychelles, all CITES parties since at least Feburary 1980, still appear to export large amounts of raw hawksbill shell to Japan. The shell may be leaving these countries without proper permits or the knowledge of the governments. The Caribbean countries of Panama, the Cayman Islands (a dependent of the United Kingdom), Nicaragua, Costa Rica, and the Bahamas, all CITES parties since at least September 1979, exported raw hawksbill shell to Japan in 1981.

Overall, CITES has helped reduce commercial trade in sea turtle products. Former major consumers and exporters such as the United States, West Germany, United Kingdom, Thailand, India, Malaysia, and Ecuador (Mack, et al., 1982), do not appear to be trading in wild turtle products. The next meeting of the CITES parties in Botswana in April 1983, will address sea turtle ranching, farming, and the souvenir trade. And, the continuing commercial trade in wild sea turtle products should also be addressed as CITES is committed to a strong

implementation of the convention with respect to Appendix I species.

TRAFFIC (U.S.A.), the trade monitoring program of the World Wildlife Fund-U.S., is interested in gathering further information on trade of wild sea turtle products and the number of animals taken for this trade. Please send information to TRAFFIC (U.S.A.), 1601 Connecticut Ave., NW, Washington D.C., 20009, U.S.A.

Cahill, T. 1982. The shame of Escobilla, part II: on the trail of Antonio Suárez. Outside Magazine. November 1982.

Green, D. and F. Ortiz-Crespo. 1982. Status of sea turtle populations in the Central Eastern Pacific. Biology and Conservation of Sea Turtles. K. Bjorndal (ed.), Smithsonian Institution Press, Washington D.C., 221-234.

Hurtado, M. 1981. The ban on the exportation of turtle skin from Ecuador. Instituto Nacional de Pesca Boletin Informativo, 2:6-10.

Mack, D., Duplaix, N. and Wells, S. 1982. Sea turtles, animals of divisible parts: international trade in sea turtle products. Biology and Conservation of Sea Turtles. K. Bjorndal (ed.). Smithsonian Institution Press, Washington, D.C., 545-563.

Meylan, A. and Mack, D. In press. Sea turtles of the West Indies--a vanishing resource. Trinidad Naturalist Magazine.

Roet, E. in prep. Trade in sea turtle products from Indonesia and Japan. to be published by the Center for Environmental Education, Washington D.C.

Sea Turtle Conservation Strategy. 1979. Drafted at the World Conference on Sea Turtle Conservation, November 1979.

DAVID MACK
TRAFFIC(U.S.A.), 1601 Connecticut Ave., NW, Washington D.C., 20009, U.S.A.

A TRANSATLANTIC MOVEMENT OF A HEADSTARTED KEMP'S RIDLEY

Kemp's ridley turtles are confined primarily to the Gulf of Mexico and the Atlantic coastal waters of the United States. However, a few individuals are periodically found along the Atlantic coast of Europe. These turtles are believed to be carried from the Atlantic coastal waters of the United States across the North Atlantic by the gulf Stream (Carr, 1955, 1980; Carr and Caldwell, 1957). Recently, the transatlantic movement of a Kemp's ridley has been documented. This turtle (tag NNN893) had been headstarted for 11 months by the Galveston Laboratory of the National Marine Fisheries Service (NMFS), under Mexican permit No. 1147 and U.S. Fish and Wildlife Service permit No. PRT-2-4481. On June 5, 1980 it was released into the Gulf of Mexico near Homosassa, Florida. On December 25, 1981 (569 days after its release) it was found on a beach near Biarritz, France. It was alive but inactive. During the time since its release, it had grown from a weight of 990 g and a carapace length of 18.4 cm to a weight of 2030 g and a carapace length of 23.0 cm. This represents a slow growth rate (1.8 g/day) compared to those of other headstarted Kemp's ridleys that have been recaptured in the Gulf of Mexico and along the Atlantic coast of the United States (mean = 5.8 g/day, n=14).

The NMFS project is only one facet of an international effort to protect Kemp's ridley. Other agencies involved include the Instituto Nacional de Pesca (Mexico), the U.S. Fish and Wildlife Service, the National Park Service, the Texas Parks and Wildlife Department, the U.S. Coast Guard, and the U.S.

Navy. We would especially like to acknowledge the efforts of the Instituto Nacional de Pesca.

Carr, A.F. 1955. The riddle of the ridley. Animal Kingdom 58 Sept.-Oct.:146-156.

Carr, A.F. 1980. Some problems of sea turtle ecology. Amer. Zool. 20:489-498.

Carr, A.F. and D.K. Caldwell. 1957. Notes on the zoogeography of the Atlantic sea turtles of the genus Lepidochelys. Rev. Biol. Trop. 5:45-61.

THANE WIBBELS
NMFS SEFC Galveston Laboratory, 4700 Avenue U, Galveston, Texas 77550, U.S.A.
Current Address: Department of Biology, Texas A&M University, College Station, Texas 77843, U.S.A.

RECAPTURE OF A "LIVING-TAGGED" KEMP'S RIDLEY

During 1980, John R. and Lupe P. Hendrickson used autografting and chemical procedures in an experimental attempt to produce permanent living tags on approximately 800 hatchling sea turtles (Hendrickson and Hendrickson, 1981a, 1981b; see Editorial, Marine Turtle Newsletter, 1982, 22, 1-2, for a photograph). After 10-11 months, the majority of these turtles were released. The recent recapture of one of these turtles furnished the rare opportunity to evaluate a living tag after a prolonged period in the wild. The recaptured turtle was a Kemp's ridley which had been headstarted by the Galveston Laboratory of the National Marine Fisheries Service (under Mexican permit No. 1147 and U.S. Fish and Wildlife permit No. PRT-2-4481) and was released on June 2, 1981 near Padre Island National Seashore, Texas. On March 17, 1982, during a period of strong onshore winds, it was found alive and in good condition on a beach ca. 23 km northeast of its release site. During the 289 days since its release into the Gulf of Mexico it had grown from a weight of 1037 g and a carapace length of 17.7 cm to a weight of 2746 g and a carapace leangth of 25.5 cm.

This turtle had acquired its living tag at an age of 7 weeks during August of 1980. The living tag consisted of a reciprocal tissue graft in which a disc of carapace tissue was exchanged with a disc of plastral tissue. This resulted in a white disk on the dark carapace and a dark disc on the white plastron. The graft on the carapace (located between the 2nd and 3rd costal scutes) had enlarged and darkened slightly. Additionally the border between the 2nd and 3rd costal scutes had darkened considerably. Nevertheless, the graft was still readily visible. The plastral graft, however, was not readily visible; either the graft had failed or the grafted tissue had not retained its melanistic properties. The turtle had its Monel tag intact, so there was no question of its identity.

The NMFS project is only one facet of an international effort to protect Kemp's ridley. Other agencies involved include the Instituto Nacional de Pesca (Mexico), the U.S. Fish and Wildlife Service, the National Park Service, the Texas Parks and Wildlife Department, the U.S. Coast Guard, and the U.S. Navy. We would especially like to acknowledge the efforts of the Instituto Nacional de Pesca.

Hendrickson, J.R. and L.P. Hendrickson. 1981a. "Living tags" for sea turtles. Final report to the U.S. Fish and Wildlife Service (Contract No. 14-16-0002-80-229), 25 pp.
Hendrickson, L.P. and J.R. Hendrickson. 1981b. A new method for marking sea turtles. Marine Turtle Newsletter 19:6-7.

THANE WIBBELS
NMFS SEFC Galveston Laboratory, 4700 Avenue U, Galveston, Texas 77550, U.S.A.
Current Address: Department of Biology, Texas A&M University, College Station, Texas 77843, U.S.A.

TWO TAGGING RECORDS FROM TRINIDAD

A leatherback turtle tagged "T 16" at Matura Beach on the East coast of Trinidad on 26th May, 1970, was recorded while nesting at Tacarib Bay on the North coast of Trinidad on 26th April, 1975. Two years later, on 23rd September, 1977, that is 7 years and 4 months after it had been tagged in Trinidad, this turtle "T 16" was found dead on Rockaway Beach, New York.

A leatherback turtle tagged "T 69" at Matura Beach on 5th May, 1972 was killed by poachers on the same beach on 11th May, 1979, that is 7 years after tagging. Matura Beach is the most accessible nesting beach used by at least 4 species of turtles but it is also the beach where poachers are most active. There are laws to protect turtles and their eggs, but unfortunately they are not enforced.

IAN LAMBIE
Trinidad and Tobago Field Naturalists' Club, 64 Roberts Street, Woodbrook, Port of Spain, Trinidad.

OLIVE RIDLEYS IN INDIA

A fair number of letters have been written to Prime Minister Gandhi expressing concern about the management of olive ridleys on the east coast of India (see Marine Turtle Newsletter No. 24, 1982). If there are readers of this newsletter who have not already written to Mrs Gandhi, they are asked again to write. With a Prime Minister favourable toward conservation, and still turtles there left to conserve, it is important that the authorities there be made aware of world-wide efforts to conserve sea turtles and of what has happened to the arribadas of olive and Kemp's ridleys in Mexico. Letters should be sent to Shrimati Indira Gandhi, Prime Minister of India, South Block, Central Secretariat, New Delhi 110011, India. Please write soon and send a copy of your letter to the editor of this newsletter.

N.M.

MARINE TURTLE NEWSLETTER

For recent readers, a few points may help answer questions arising. The newsletter does not appear regularly but only as often as possible within a context of financial and other constraints. Usually there are 3-5 issues a year. So far it has been possible to avoid charging. With around 80 different countries involved and floating currencies, charging in itself would entail considerable extra costs. However, we have received some helpful

unsolicited donations. We do not provide photocopies of papers listed; those needing reprints should write direct to the authors whose addresses are given. Nor can we provide copies of back issues; if you need these please obtain photocopies from whomever told you about the newsletter in the first place. We regret we cannot provide these extra services. Limited resources are devoted to production of further issues. The correct way of citing the newsletter in bibliographies is simply 'Marine Turtle Newsletter'.

DR. N. MROSOVSKY
DEPT. OF ZOOLOGY
UNIV. OF TORONTO
25 HARBORD ST.
TORONTO, ONTARIO

TORONTO ONT. CANADA .48

Mr. George H. Balazs
Hawaii Institute of Marine
Biology, P.O. Box 1346
Kaneohe, Hawaii 96744
U.S.A.

Support for this newsletter came from H.C. Mittag, Dr. J. Mittag, the University of Toronto and World Wildlife Fund Canada. T. Tucker made a donation and J. Frazier, J.I. Richardson and T.H. Richardson helped with reviewing papers.

Marine Turtle Newsletter

No. 25 JULY 1983

Editor: N. Mrosovsky

Editorial Advisors:

P.C.H. Pritchard
Harold F. Hirth

Departments of Zoology
and Psychology
University of Toronto
Toronto, Ontario
M5S 1A1 Canada

EDITORIAL

The mass nesting of olive ridleys along the east coast of India has been much in the news lately. Following reports of the slaughter of large numbers of turtles at Digha (Bobb, D. 1982, India Today, 31, 64-65), a letter-writing campaign was launched through the Marine Turtle Newsletter (1982, 23, 1-2). The matter was taken up in the N.Y. Times, the Times (London), the Times of India and the Toronto Globe and Mail; it has been discussed on BBC radio, a TV network in Belgium and probably elsewhere. In the Netherlands the journal Lacerta has carried the campaign forward. Your editor has received copies of 59 letters written to the Prime Minister of India, but far more than this number were sent. According to a reliable source 200-300 letters, definitely more than 200, were received in India.

Is all this doing any good? There is always the danger that outsiders may do more harm than good when they try to intervene in situations whose complexity they may not fully understand. Yet it is clear both from the replies received from Prime Minister Gandhi and government officials and from the articles from India printed below in this issue, that there is concern there about the situation. Although there seems little intention at present of instituting some controlled egg harvest, as suggested in many of the letters, protective measures have been taken, patrols strengthened, hatchery work supported and the state authorities asked to be vigilant. But correlation should not be confused with cause. Many of these measures were set in motion before the present publicity. So when I spoke recently with Mr. Samar Singh, Director of Wildlife Preservation, in the Department of Environment, India, I asked him directly, "Has the letter writing been helpful?". He replied thoughtfully, cautiously, "Yes", he said, "it has strengthened our hand". That seems a fair assessment.

We feel confident that the expression of international concern, offered in good faith by people familiar with the decline of turtles in other parts of the world, has been sympathetically received in India. The olive ridleys nesting in India are among the world's largest populations of sea turltes. We hope the Indian authorities will have more success in conserving their turtles than has been the case in the past in some other countries. There still remains much to be done.

N.M.

SOS FROM SEA TURTLES FROM ORISSA

It is estimated that every year turtles and eggs worth 4 crores of rupees (Rs. 40,000,000/-) were taken from Gahirmatha area, Orissa by poachers for consumption inside the country and export. During February of this year encouraged by the concern shown by Prime Minister Mrs. Indira Gandhi and Mr. J.B. Patnaik, Chief Minister of Orissa, in collaboration with the Forest Department of West Bengal the Chief Wild Life Warden of Orissa Mr. U.N. Sarangi, and Divisional Forest Officer Mr. L.N. Chaudhury with help from the Indian Navy, siezed 4 trawlers, 15 boats, several costly nets and arrested 66 people. Turtles in large numbers were released from these boats into the sea. The penalty for this offence can be from 6 months to 6 years of rigorous imprisonment.

P. MOHANTY-HEJMADI
Utkal University, Bhubaneswar-751004, India.

UPDATE ON THE OLIVE RIDLEY ON THE EAST COAST OF INDIA

Lepidochelys olivacea is listed on Schedule I (a totally protected species) of India's Wildlife Act, yet annually large numbers are landed at ports such as Digha in West Bengal (Bobb 1982) eventually finding their way to various markets especially Calcutta and even as far north as Siliguri over 300 miles from the sea (our own observations). Concern over the large scale illegal slaughter of olive ridleys along the eastern coast of India prompted a December 1982 editorial in the Marine Turtle Newsletter (No. 23, 1-2) calling for a letter writing campaign to urge the Prime Minister of India to take action on the problem. Over the last 2 years a number of positive steps have been taken by both state and federal agencies. However, funds and manpower that they can put toward conservation of a single species are limited. Recently while surveying freshwater turtles in India (an Indo-American Fellowship Project), we have been able to observe the ridley problem first-hand and to witness the efforts taken by the government to deal with it.

Gahirmatha, Cuttack District, Orissa: Following Daniel & Hussain's discovery of the nesting beach in 1973 (unpublished), Bustard (1974, 1976) reported the exceptionally large ridley nesting population in this region. The area has since been incorporated into the Bhitarkanika Wildlife Sanctuary. Our arrival here on 10 February 1983 was a few days too late to witness an especially large arribada. Chandra Sekar Kar a graduate student sponsored by the Orissa Forest Department estimated that some 160 to 175 thousand turtles had nested over a 2 day period (3 & 4 February). To protect the turtles from offshore poaching at this time, the Orissa Forest Department in cooperation with the Indian Navy patrolled the area by cruiser on 4 February. They arrested 66 poachers and seized 3 mechanized trawlers and 10 "country" boats (small wooden craft driven by sail and oars) containing a total of 186 ridleys. The turtles and confiscated equipment were taken to Chandbali where a court order allowing their release was issued on 10 February. By that time 30 of the captives had died but the remaining 156 were then released into the Baitarani River some 10 to 15 km from the sea. Mr. L.N. Choudhury Divisional Forest Officer at Chandbali told us that in past years poachers might take up to 50,000 turtles per year. He said that while those arrested this year were only a small percentage of the total, hopefully the arrests will serve to

discourage others.

Another problem of equal importance to poaching at Gahirmatha is the growing number of fishing nets and trawlers being used along the coast. C.S. Kar estimates that there are presently 100/150 trawlers moving along the coast each day. At the time of our visit, the 10 km of beach was littered with over 3000 dead ridleys which had either been drowned in nets or had their heads bashed in by owners of the nets. According to Kar this number is about 6 times the usual for this time because there are many more fishermen this year. Two cyclones last year destroyed most of the local crops forcing many people to turn to the sea for food.

On the brighter side, the nesting beach itself is reasonably well protected. A local home guard of 15 men regularly patrol some 17 to 20 km of beach by bicycle and on foot. In addition the Forest Department employs 25 personnel that regularly cover the most used 10 km of beach. The actions most needed for this region are the continued harassment of poachers and establishment of fishing controls near the nesting beach. A 3-5 mile limit for trawlers and a total ban of fishing nets during the mating and nesting seasons (October--April) should be legislated and enforced.

Digha, West Bengal and Vicinity: From Udaipur, Orissa (a small fishing village on the West Bengal border) along the coast to Digha, West Bengal (a small village catering to tourists) is where most of the sea turtles are landed before being shipped to the markets of West Bengal. In December 1981 when one of us (Vijaya) visited the area, the beaches near Digha were lined with rows of sea turtles that were being auctioned off in lots of a 100 or more. The operation was carried out in broad daylight and was very open.

This year when Vijaya again visited Digha (19-2-83) it appeared that while there had been no reduction of landings, the operation had become far more secretive indicating some pressure has been brought to bear on the trade. Turtles are unloaded now in late afternoon and evening and are moved to secluded holding tanks set about 400 metres back in cultivated fields. At the time of her visit, sea turtle landings were few and it required a week to 10 days to amass a truck load (ca. 200) for market. She was told by fishermen and a local official that the peak season had been from late October through December when 10 to 12 truckloads of turtles were being transported from Udaipur on most nights.

Madras and Vicinity, Tamil Nadu: This year the Forest Department of Tamil Nadu launched their "Save the Turtle Campaign" by taking over the ridley hatchery program first begun in 1973 by the Madras Snake Park Trust. From 1976 to this year the hatchery program was operated by the Central Marine Fisheries Institute. Under Forest Department supervision, five hatcheries have now been set up in the state. Two programs near Madras cover about 40 km of beach and three more farther south at Point Calimere, Arkottithurai and Vallipallam cover an additional 30 km. This proved to be an exceptionally good year for nesting. The former two hatcheries amassed 23 to 25 thousand eggs each, while the latter three had a total of 26 thousand eggs between them. Hatchlings are just now beginning to emerge and are being released upon emergence. Another positive action for the turtles of Tamil Nadu has been the restriction of trawling to 3 miles from the nesting beaches. According to Romulus Whitaker, Director of the Madras Snake Park Trust, dead ridleys now

only rarely wash up on the beach whereas prior to the trawling restriction hundreds were seen along the Coromandel Coast each season.

In summary, the governments of Orissa and Tamil Nadu are to be commended for their strong support of sea turtle conservation. Problems still exist particularly in Orissa but the wildlife officials are interested and dedicated to find solutions. West Bengal remains a key problem area. Greater enforcement of the Wildlife Act at Digha and at inland markets would greatly reduce poaching in the Bay of Bengal and correspondingly reduce Orissa's problem of safeguarding one of the world's largest rookeries of Olive ridley sea turtles.

Bobb, D. 1982. Slaughter at Digha. India Today 31:69-65.
Bustard, H.R. 1974. India: A preliminary survey of prospects for crocodile farming, F.A.O. Rome 1-50.
Bustard, H.R. 1976. World's largest sea turtle rookery. Tiger Paper 3,3.
Daniel, J.C. & S.A. Hussain, 1973. The crocodiles of Bhitar Kanika, Orissa. Unpublished report.

EDWARD O. MOLL
Department of Zoology, Eastern Illinois University, Charleston, Illinois 61920, U.S.A.

SATISH BHASKAR & J. VIJAYA
c/o Madras Snake Park Trust, Raj Bhavan P.O., Madras - 600 022, India.

NOTES ON MARINE TURTLES IN ANDHRA PRADESH COAST, INDIA

Shantharam (1975) stated that Indian marine turtles are "very seriously threatened with extinction" and exhorted the Government to develop conservation programmes. Following recommendations made by the Govt. of India/FAO/UNDP Project, crocodile Breeding and Management (FAO 1974, 1975), research and conservation programmes were initiated by the Forest Department, Orissa, for olive ridleys at Gahirmatha. So far Orissa is the only state where monitoring of turtles is being made on a round the year basis. Lazell (1980) mentioned that "there is a burgeoning and extremely timely increase in research activity with respect to marine turtles in India and adjacent Islands" and he discussed the possibility of developing a comprehensive programme for the coast of east India. While discussing the situation of turtles on the Andhra Pradesh coast with the state wildlife conservator, Mr. Pushp Kumar in April/May, 1982, he informed me that a state coastline survey is proposed for the winter of 1983 to confirm fragmentary reports of nesting.

The state of Andhra Pradesh is an area of 277,000 km^2 and the coastline is ca. 970 km. The bottom is mostly sandy except for a few muddy and rocky places. The average width of the continental shelf (200 m depth) on the eastern sea board of India is 43 km off the Tamil Nadu, 32 km off the Andhra Pradesh and 68 km off the Orissa-West Bengal (Silas et al. 1980).

At present only scattered information is available in Andhra Pradesh on the occurrence of the 5 species of sea turtles present in Indian waters. The common species, particularly in the northern half of the state, is the ridley (Kar and Bhaskar, 1982). While fishermen on catamarans catch ridleys incidentally from about October to February, the proliferation of mechanized trawlers

probably was responsible for the larger incidental catch of ridleys in 1978-79 than in past years (Kar and Bhaskar, 1982). Although not much is known about leatherback turtles in Andhra Pradesh a female was killed during May 1979, near the Visakhapatnam coast while attempting nesting (Dutt, 1979). The state owned Indira Gandhi Zoological Park at Visakhapatnam, Waltair, have been rearing stray specimens of green and hawksbill turtles collected from fishermen, and have also hatched eggs of the ridleys in captivity. During November 1979 when I was at Vishakhapatnam, Prof. S. Dutt of Andhra University informed me that a female hawksbill obtained from the fishermen was reared in a laboratory for a few days and then released. Personnel of the fisheries department and fishermen have also informed me of nestings by ridleys on the Orissa Andhra Pradesh border. Mr. B.C. Choudhury (Andhra Pradesh wildlife wing) has information on turtles nesting in the Godavari river mouth and the Godavari and Krishna delta of Andhra Pradesh coast and have also confirmed that nesting occurs on the Orissa Andhra Pradesh border. So far no systematic survey work has been undertaken on the Andhra Pradesh coast and there may be important arribada beaches particularly in the Godavari and Krishna delta, which holds the major mangrove areas in the state. This area was declared a sanctuary (Coringa wildlife sanctuary) in July, 1978, with the aim of rehabilitating the saltwater crocodile, Crocodylus porosus, believed to be extinct in Andhra Pradesh. Sightings of the Olive ridley sea turtles, Lepidochelys olivacea, during April/May, 1971, in shallow coastal waters near Durgarajupatnam beaches (Lat. $13^{o}4'$ N - 14^{o} 0'N and Long. 80^{o} 07'E - 80^{o} 10'E) and Yelatturdibba beaches near False Divi Point (Lat. 15^{o} 80'N - 15^{o} 85'N and Long. $80^{o}80'$E - $80^{o}90'$E) have recently been reported to me by Lt. Col. P.V. Francis of the Indian Navy.

In Andhra Pradesh (Telgu speaking state) there are also different names in the ontogeny of sea turtles. For example, eggs are commonly known as "gudlu" and the adult turtles are known as "Samudram Thabelu" (Samudram = Turtle: general name for all species of sea turtles).

Ridley nesting season in Andhra Pradesh coincides with the main season for the species in the neighbouring state of Orissa, i.e. from October to May. Year-round nesting of the ridleys in Gahirmatha have been reported by Kar (1980, 1982); and Kar and Bhaskar (1982). Nesting has also been reported during June in the Gulf of Kutch (Bhaskar, 1978); and from January to March in Orissa (Anon, 1979); and at Visakhapatnam (Butt, 1979). The author is thankful to the Forest Department Govt. of Orissa for sanctioning a tour in the Andhra Pradesh coast to investigate turtles.

Anon. 1979. News from the Madras Snake Park and Crocodile Bank. Hamadryad 4:1.

Bhaskar, S. 1978. Notes from the Gulf of Kutch. Hamadryad 3:9-10.

Dutt, S. 1976. The leatherback turtle. Sea Food Exp. J. 8:36.

Dutt, S. 1979. Sea turtle notes from Visakhapatnam. Hamadrayd 4:2-3.

FAO. 1974. India. A preliminary survey of the prospects of Crocodile Farming (based on the work of H.R. Bustard) FAO. Rome (FO:IND/71/033) Oct. 1974.

FAO. 1975. India-economic potential of Gharial and saltwater crocodile schemes in Orissa with notes on the sea turtle industry. (Based on the work of J.M. de Waard) FAO. Rome (FO:IND/71/033).

Kar, C.S. 1980. The Gahirmatha turtle rookery along the coast of Orissa, India. Marine Turtle Newsletter, 15:2-3.

Kar, C.S. 1982. The Gahirmatha sea turtle rookery, Orissa. Makara. III, 1:20-23.

Kar, C.S. 1982. Discovery of second mass nesting ground of the Pacific olive ridley sea turtles, Lepidochelys olivacea, in Orissa, India. Tiger Paper 9:6-7.

Kar, C.S. and Bhaskar, S. 1982. The status of sea turtles in the Eastern Indian Ocean. I: Bjorndal, K. (Ed.): The Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, D.C., 365-372.

Lazell, J.D. Jr. 1980. Marine turtles in India. Copeia 2:374-375.

Shantharam, B. 1975. The marine edible turtles. Sea Food Exp. J. 7:31-33.

Silas, E.G. et al. 1980. India: status paper on coastal fishery resources along the east coast. In: Report of the consultation on stock assessment for small-scale fisheries in the Bay of Bengal. Chittagong, Bangladesh 16-21 June 1980, 2:23-44.

CHANDRA SEKHAR KAR
Gahirmatha Marine Turtle Research and Conservation Centre, Forest Dept., Government of Orissa. Post: Satabhaya 754 225. Via: Rajnagar, Dist: Cuttack (Orissa), India.

CAYMAN TURTLE FARM SOLD

The Cayman Turtle Farm has been sold for about $1.5 million USA to the government of the Cayman Islands. It is believed that the main reason for the sale is that the previous owners, Dr Heinz Mittag and Dr Judith Mittag, wished to reduce their commitments and responsibilities. They were also disenchanted with the lack of support from the conservation community for what they considered an imaginative and valid combination of conservation and commerce.

N.M.

REPORT FROM BOTSWANA

Botswana is a nation without coastlines, without sea turtles. But decisions taken there at the 4th meeting of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), held in Gaborone 19-30 April, were important for the conservation of turtles. There were proposals from France and from Suriname to permit products from ranched turtles to enter into international trade; technically this can be done by moving a particular population of a species from Appendix I to Appendix II of the convention. There was also a resolution on the captive breeding of long-maturing species; this had implications for the Cayman Turtle Farm.

Ranching proposal from France for the Réunion turtle ranch. Many green turtles nest on Tromelin and Europa. These islands in the Indian ocean are part of France so that selling turtle products in Paris or Marseille is not a matter for CITES. However to export to other CITES countries it would first be necessary to have the ranching proposal approved.

At the Botswana meeting it was pointed out that only in the order of 2% of the hatchlings were taken for the ranch and that these were anyhow from

daylight emergences liable to heavy natural predation. Other hatchlings emerging by day were saved from predators and released at night. In addition adult females that had become wedged in among rocks as the tide receded were extracted and returned to the sea and so saved from overheating. Nevertheless the proposal ran into opposition: the hatchlings released at night might not survive and there might be an irresistable temptation to release only the weaker smaller turtles and retain the robust ones for the ranch. More telling was that the proposal was not well supported by the presentation of scientific data. Although population estimates in these areas had been made, the full results were not readily available for scrutiny. Also the reports of a scientific mission to Réunion Island, carried out by Servan, Fretey and Bonnet in 1982, had not been made available to the CITES secretariat. Evidently this report had been presented in 2 parts because members could not agree.

Taking note of these criticisms, France withdrew the proposal at the committee stage, so that it never went to the plenary sessions for a formal vote. It is expected that a revised proposal will be submitted at the next CITES meeting (1985). Members of the French delegation expressed the desire for cooperation with the international scientific and conservation community.

Suriname ranching proposal. This was better received than the French proposal. The number of turtle nests in Suriname has been monitored for 15 years, poaching over this period has been minimal, much data has been published, the population of green turtles is holding level or possibly increasing slightly, and the existence of doomed eggs (eggs destroyed by high tides) is accepted as a real phenomenon (see Dutton & Whitmore, 1983, Marine Turtle Newsletter 24, 8-10). However the proposal did not explain how products from the ranch were to be marked in a distinguishable way. Unfortunately the Suriname delegation was not present to clarify the matter. Recalling that Suriname had tried to have its turtle ranch sanctioned in 1979 at the Costa Rica CITES meeting, and had been partly responsible for the adoption of criteria for ranching operations at the 1981 New Delhi meeting, some people feared that repeatedly turning down the Surinamese might be detrimental to conservation of its sea turtles. A small country with need for foreign exchange should be able to benefit from conservation of its resources, otherwise its programme might collapse. There was some discussion of whether sale of eggs within Suriname was sufficient or not to support the costs of the turtle programme. Some present hoped that money could be found to assist the Surinamese till a more fully thought through marking system was proposed.

After this debate in the committee stage, the matter was referred to the plenary sessions for voting. The problem of a drain on the Surinames green turtles resulting from incidental catch by shrimping trawlers was raised. Others felt this was not relevant to CITES which was concerned with threats from trade. Only a small percentage of the eggs in Suriname went to the ranch. It was suggested that the Surinamese ranch should be considered in the context of the much larger trade in turtle products, some of it by CITES nations. Many nations praised the conservation achievements of Suriname. The UK introduced a motion that the Surinamese proposal be supported, except for the part on marking of the products. The UK recommended that Suriname should submit a full description of marking methods to the Technical Committee. They would comment on this and the complete proposal would then be submitted to a postal vote. The UK's suggestion was carried, 43 in favour, 3 against.

Ranching in general. Some further points on ranching emerged from the Botswana conference. Transfer of a population or species from Appendix I to II for ranching is harder than transfer for other reasons. This is because of the strict ranching criteria drawn up at the New Delhi meeting. It is somewhat paradoxical that if populations of a particular species become abundant in one area and are transferred from Appendix I to II for culling, a less extensive set of criteria have to be met than if the population is transferred for ranching. Nevertheless the Botswana CITES meeting broke new ground in that at least one ranching proposal was approved. The Zimbabwe crocodile ranching proposal was applauded by delegates. So there is now both a model and a precedent for ranching under CITES.

Captive breeding of long-maturing species. A U.K. draft resolution proposed that national CITES management authorities should be able to permit trade from captive breeding operations when the species concerned took 3 or more years to reach sexual maturity. Basically this proposal was a way of circumventing the resolution on the definition of "bred in captivity" that had been adopted in 1979. That resolution had said that trade would be acceptable only if the captive breeding stock was "managed in a manner which has been demonstrated to be capable of reliably producing second-generation offspring in a controlled environment". Although the Cayman Turtle Farm was not specifically mentioned in the 1979 recommendations, or in the Botswana draft resolution, it was widely recognized that the wording of both documents had been influenced by its existence. At Botswana delegates from many different nations opposed any changes in the definition of bred in captivity which had been so laboriously arrived at in Costa Rica. The Federal Republic of Germany's arguments on this point were partiularly cogent and greeted with applause. Nevertheless, Germany pointed out that there still was an unresolved problem about long-maturing species. The decision of the plenary session was to refer these problems to the Technical Committee for further discussions.

Afterwards "pro-farming" groups were despondent, and some felt that they had been ill-advised to adopt the strategy of trying to circumvent the "bred in captivity" definition. Rather it would have been better to stress the retrospective nature of the definition. The Cayman Turtle Farm, and its predecessor Mariculture Ltd., were established before CITES.

"Anti-farming" groups were pleased and there is no doubt that the decision poses difficulties for the Cayman Turtle Farm and its new owners, the Cayman Government (see above). The farm is a major tourist attraction; even if only a small percentage of the visitors stay an extra day on the Cayman Islands to visit the farm, it generates considerable income. However, without markets, and some surplus stock on hand, to keep the enterprise going is a financial strain. Various options are being considered. At one end of the continuum is bulldozing the tanks and selling the land for real estate. That would leave the problem of what to do with the present stock, including the Kemp's ridleys (see Wood, 1982, Marine Turtle Newsletter 20, 7-9). At the other end of the continuum would be to persist and take a long term view: although second generation animals have not been produced yet, given the long maturation period they could only be expected in the mid 1980s. Even if second generation turtles were produced, it is anticipated that a battle could develop over what is meant by "reliably producing" such offspring. Various in between options are being considered.

I have tried to report the main decisions and views expressed at the Botswana CITES meeting rather than to evaluate whether they assisted or set back conservation of sea turtles. In the case of the Suriname proposal, that would be especially difficult because of the evolving political situation there and the possibility that their conservation policies may alter. Flexibility by decision makers may be appropriate.

N.M.

AGE ESTIMATES OF CUMBERLAND ISLAND LOGGERHEAD SEA TURTLES

The ages of sea turtles at maturity remain critical, but elusive data (Frazer, 1982). Recent research has resulted in estimates ranging from 8 to 10 years for captive raised Chelonia (Wood and Wood, 1980) to nearly 60 years for wild Chelonia (Balazs, 1979). Diet--quality and quantity--are likely major factors in determining growth rates and, hence, age at sexual maturity.

The "Équipe de Recherche 'Formations squelettiques'" (e.g., Castanet et al., 1977) has been demonstrating the abiltiy to age reptiles by bone annuli and stimulated our examination of turtle bones. In 1978, one of us (G. Zug, assisted by M. Barber) examined sections of miscellaneous Caretta bones by scanning electron microscopy and histology. Annuli or lamellae were revealed by both techniques in the dentary, humerus, and ulna, but not in a cervical vertebra or peripheral bones of the carapace. Although annuli were evident by both techniques, the histological preparation provided a clearer record of incremental growth. Further, the limb bones showed the best annular patterns and the least remodelling. The humerus was selected for study, and the right forelimb and head were removed from each dead turtle stranded on the seaward beach of Cumberland Island, Georgia (the sample reported herein derives from only 1979 strandings). The head and limb were macerated and prepared as dry skeletal material. A 5-7 mm thick transverse section of the humerus was removed by bandsaw from the middle of the shaft just distal to the deltopectoral crest. The section was stored in 4% formalin for at least 24 hours prior to decalcification in a formic-hydrochloric acid solution. The decalcified bone was processed in a mechanical tissue processor, imbedded in paraffin, sectioned at 6 um, and stained in Harris hematoxylin and eosin (details of processing available on request). From the bone sections, we recorded the number of periosteal annuli or growth increments and measured the width of each annulus and the long and short diameters of the bone section. Since remodelling in the center of bone obliterates the earlier annuli, extrapolation is required to estimate the number of annuli lost. Our method is to subtract the average diameter (1.51 mm) of hatchling humeri from the radius of the bone section and then divide the remainder by the average annulus width of the bone section. While this formula lacks refinement, it does provide an estimate of the total number of annuli expected for each bone section based on the observed annuli of that section.

Assuming an annual formation of each annulus, the estimate of total number of annuli is also an estimate of age. We possess no evidence to substantiate the one year-one annulus assumption in Caretta caretta or in other sea turtles for that matter; however, verification of this assumption in other turtles (e.g., Chelydra, Hammer 1969; Testudo, Castanet and Cheylan, 1979) as well as in other reptiles argues for this assumption even in light of the uncertainty expressed by Frazier (1982) in his study of bone from known-aged,

captive-raised sea turtles. There are other difficulties associated with the use of bone annuli and these will be reported elsewhere; nonetheless, we believe our age estimates (based on the narrow axis of the humerus) are good first approximations of age for the Caretta stranded on Cumberland Island. We present our preliminary analysis of the 1979 sample (Table 1 and Fig. 1) for evaluation and for comments.

Table 1. Age Estimates, Carapace Lengths, and Humerus Lengths. Data for linear regression ($Y=A+BX$)* and power ($Y=AX^B$)# equations. Other abbreviations are: cCL, carapace length over the curve; HL, humerus length; N, sample size; r, correlation coefficient. Lengths in millimeters, age in years.

(X, Y)	N	A	B	r	X	Y
HL, cCL	78*	-26.759	0.230	0.97	105.5-200.8	565-1060
	78#	0.078	1.136	0.97		
HL,Age	76*	-45.738	0.416	0.75	105.5-200.8	3.0-80.9
	76#	8.8×10^{-7}	3.286	0.80		
cCL,Age	75*	-51.081	0.088	0.69	565-1060	3.0-80.9
	75#	1.0×10^{-9}	3.498	0.73		
cCL,Age	78*	-108.40	0.171	0.69	565-1060	3.0-175.3
	78#	0.6×10^{-11}	4.279	0.78		

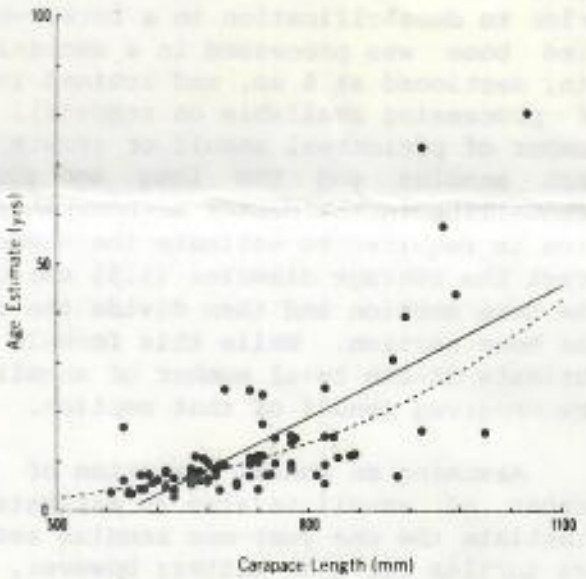


Figure 1. The relation of curved carapace length to age estimates derived from periosteal annuli in Caretta humeri. Both the straight (linear regression) and curved (power) lines are based on 75 individuals; the three individuals with age estimates greater than 50 years were excluded from the calculations for these lines.

The sample is dominated by large juvenile and subadult turtles (curved carapace length 600-800 mm) as is typical for Cumberland Island strandings (Ruckdeschel and Zug, 1982). Immature specimens are particularly useful for

estimating growth rates and age, because their growth has not been slowed or altered by the physiological attainment of maturity, which typically suppresses growth in turtles. For our purposes, a slowing of periosteal growth results in narrower annuli; hence, a reduced average annulus width and a higher age estimate. The age estimates of these subadults are mainly less than 10 years old (Fig. 1), and these estimates match Mendonca's estimates (1981) for immature Floridian loggerheads. Also the majority of the age estimates show a gradual upward inclination from 560 to 840 mm cCL, mimicking a constant growth rate for this size class. If 800 mm cCL is used as a minimal size at sexual maturity (Richardson and Hillstead, 1978), statistical analysis predicts an age of 19.3 years (linear regression) or 14.3 years (power equation). The latter value falls within Mendonça's (1981) estimate of 10-15 years for maturity in her loggerhead population. Although the former estimate is higher than hers, it is not outlandishly so, and relative to the sizes and ages at sexual maturity for fresh water turtles, this estimate could be considered low. However, the conclusion of this brief report is that reasonable age estimates can be obtained from the analysis of periosteal growth increments in the long bones of sea turtles.

Balazs, G.H. 1979. Growth, food sources and migration of immature Hawaiian Chelonia. Marine Turtle Newsletter 10:1-3.

Castanet, J. and M. Cheylan. 1979. Les marques de croissance des os et des écailles comme indicateur de l'age chez Testudo hermanni et Testudo graeca (Reptilia, Chelonia, Testudinidae). Can. J. Zool. 57:1649-1665.

Castanet, J., F.J. Meunier, and A. de Ricqles. 1977. L'enregistrement de la croissance cyclique par le tissu osseux chez les vertébrés poikilothermes: données comparatives et essai de synthèse. Bull. Biol. France Belgique 111:183-202.

Frazer, N.B. 1982. Growth and age at maturity of loggerhead sea turtles: review and prospectus. Marine Turtle Newsletter 22:5-8.

Frazier, J. 1982. Age determination studies in marine turtles. Report to NMFS Southeast Fisheries Center & FWS Region 2.

Hammer, D.A. 1969. Parameters of a marsh snapping turtle population, Lacreek Refuge, South Dakota. J. Wildl. Mgmt. 33:995-1005.

Mendonça, M.T. 1981. Comparative growth rates of wild immature Chelonia mydas and Caretta caretta in Florida. J. Herpetol. 15:444-447.

Richardson, J.I., and H.O. Hillestad. 1978. Ecology of a loggerhead sea turtle population in Georgia. Proc. Rare Endang. Wildl. Symp., Athens, Ga. pp. 22-37.

Ruckdeschel, C., and G.R. Zug. 1982. Mortality of sea turtles Caretta caretta in coastal waters of Georgia. Biol. Conserv. 22:5-9.

Wood, J.R., and F.J. Wood. 1980. Reproductive biology of captive green sea turtles Chelonia mydas. Amer. Zool. 20:499-505.

GEORGE R. ZUG, ADDISON WYNN
Department of Vertebrate Zoology, National Museum of Natural History Smithsonian Institution, Washington, D.C. 20560, U.S.A.

CAROL RUCKDESCHEL
P.O. Box 796, St. Marys, Georgia 31558, U.S.A.

PALAU HAWKSBILL HEADSTARTING

The government of Palau is presently sponsoring a headstarting programme for hawksbills at the Micronesian Mariculture Demonstration Center. The programme is modest in scale, with 3 technicians hatching about 1000 turtles per year and releasing them after 6 months. There are excellent facilities for research on hawksbills in Palau and anyone interested is encouraged to get in touch with G.A. Heslinga, MMDC Box 359, Koror, Palau, Caroline Islands 96940.

TAG LOCATIONS RESERVED

A recent note and editorials in the Marine Turtle Newsletter (1981, 19:6-7; 1982, 20: 1 & 22: 1-2) regarding use of living tags on sea turtles were read with much interest and support. Uncontrolled duplication could make the entire system worse than useless. I request your assistance in notifying your readers that the U.S. Fish and Wildlife Service, in cooperation with the Galveston Laboratory of the U.S. National Marine Fisheries Service (NMFS), Galveston, Texas, wishes to reserve the following series of scutes on the Kemp's ridleys for scute coding of headstarted hatchlings at the NMFS facility:

Year Class	Scute Code
1982	LC3*
1983	LC4
1984	LC5
1985	N4**

*LC = left costal and is followed by the scute number in the left costal series, and

**N4 = fourth neural scute.

The following scutes have been used in previous experiments with the living tag on Kemp's ridleys of the 1980 year class (note: In parentheses, n = the number of turtles marked):

Neural scute 2 - N2 (n = 4)
Neural scute 3 - N3 (n = 6)
*Left costal scute 2 - LC2 (n = 87)
*Right costal scute 2 - RC2 (n = 59, 45 of these also listed as RC3)
Right costal scute 3 - RC3 (n = 122, 45 of these also listed as RC2 and 1 listed as RC4)
*Right costal scute 4 - RC4 (n = 1, also listed as RC3)
*Left humeral scute - LHS (n = 98, 9 of these also listed as LPS)
Left pectoral scute - LPS (n = 94, 9 of these also listed as LHS and 28 listed as LAS)
*Left abdominal scute - LAS (n = 54, 28 of these also listed as LPS)

* Due to grafts spanning seams between scutes.

Anyone encountering a Kemp's ridley suspected of bearing a living tag is requested to contact me at the address below, or Mr. C.T. Fontaine, NMFS, 4700 Avenue U, Galveston, Texas 77550, or Mrs. Lupe Hendrickson, 4917 N. Camino Arenoso, Tucson, Arizona 85718.

The larger question of coordination among turtle investigators who may use living tags must also be addressed. Therefore, as suggested by Mrs. Hendrickson, we propose that the Office of Endangered Species, U.S. Fish and Wildlife Service, P.O. Box 1306, Albuquerque, New Mexico 87103, USA, should serve as the clearinghouse for all sea turtle living tag activities. Specifically, we propose that investigators planning to use living tags should notify this office of their intentions; we would then promptly reply with a designation of which carapace scutes should be tagged for that particular study. We would require the following information in order to designate the scutes to be coded and to maintain appropriate records:

1. person or institution proposing to do the marking;
2. species (one or more) of sea turtle to be marked;
3. location where marking will occur;
4. year class(es) to be marked;
5. date(s) and location(s) of proposed release(s) of marked turtles.

DAVID BOWMAN
U.S. Fish and Wildlife Service, P.O. Box 1306, Albuquerque, New Mexico, 87103, U.S.A.

RECENT PAPERS

BALAZS, G.H. 1982. Driftnets catch leatherback turtles. Oryx. G. Balazs, Hawaii Institute of Marine Biology, P.O. Box 1346, Kaneohe, Hawaii 96744, U.S.A.

BJORNDAL, K.A., MEYLAN, A.B. and TURNER, B.J. 1983. Sea turtles nesting at Melbourne Beach, Florida, I. Size, growth and reproductive biology. Biol. Conserv. 26:65-77. K.A. Bjorndal, Department of Zoology, University of Florida, Gainesville, Florida 32611, U.S.A.

de SILVA, G.S. 1982. The leathery turtle in Sabah. Borneo Research Bulletin, 14:87-88. G.S. de Silva, Turtle Islands National Park, P.O. Box 768, Sandakan, Sabah, Malaysia.

DUGUY, R. 1983. La Tortue luth (Dermochelys coriacea) sur les côtes de France. Annales de la Société des Sciences Naturelles de la Charente-Maritime, Supplément, 38 pp. R. Duguy, Muséum d'Histoire Naturelle, 28 rue Albert Premier, 17000, La Rochelle, France.

DUGUY, R. et DURON, M. 1983. Observations de Tortues luth (Dermochelys coriacea) sur les côtes de France en 1982. Annales de la Société des Sciences Naturelles de la Charente-Maritime 7:153-157. R. Duguy, Muséum d'Histoire Naturelle, 28 rue Albert Premier, 17000, La Rochelle, France.

GRASSMAN, M.A. and OWENS, D.W. 1982. Development and extinction of food preferences in the loggerhead sea turtle, Caretta caretta. Copeia, 4:965-969. M.A. Grassman, Department of Biology, Texas A&M University, College Station, Texas 77843, U.S.A.

GUPTA, N.K. and MEHROTRA, V. 1979, publ. 1981. A detailed account of Neoadenogaster glanduaris Mehrotra, 1973 (Trematoda: Pronocephalidae) from the intestine of Chelone mydas (Linn.) in India. Research Bulletin of the Panjab University 30:87-91. N.K. Gupta, Department of Zoology, Panjab University, Chandigarh, India.

GUPTA, N.K. and MEHROTRA, V. 1981. On two blood flukes (Trematoda) of the family Spirorchidae Stunkard, 1921 from Indian marine turtles. Acta Parasitologica Polonica 28:11-20. N.K. Gupta, Department of Zoology, Panjab

University, Chandigarh, 160014, India.

MEYLAN, A.B., BJORNDAL, K.A. and TURNER, B.J. 1983. Sea turtles nesting at Melbourne Beach, Florida, II. Post-nesting movements of Caretta caretta. Biol. Conserv. 26:79-90. A.B. Meylan, Department of Zoology, University of Florida, Gainesville, Florida 32611, U.S.A.

MROSOVSKY, N. 1983. Ecology and nest-site selection of leatherback turtles Dermochelys coriacea. Biol. Conserv. 26:47-56. N. Mrosovsky, Department of Zoology, University of Toronto, Toronto M5S 1A1, Canada.

WOLKE, R.E., BROOKS, D.R. and GEORGE, A. 1982. Spirorchidiasis in loggerhead sea turtles (Caretta caretta): pathology. Journal of Wildlife Diseases 18:175-185. R.E. Wolke, Marine Pathology Laboratory, University of Rhode Island, Kingston, Rhode Island 02881, U.S.A.

DR. N. MROSOVSKY
DEPT. OF ZOOLOGY
UNIV. OF TORONTO
25 HARBORD ST.
TORONTO, ONTARIO

PRINTED MATTER

Mr. George H. Balazs
Hawaii Institute of Marine
Biology, P.O. Box 1346
Kaneohe, Hawaii 96744
U.S.A.

Support for this newsletter came from H.C. Mittag, Dr. J. Mittag, the University of Toronto and World Wildlife Fund Canada. Contributions from F.C. Coleman, K. Eckert, J. Hanken, G.A. Heslinga and an anonymous donor are gratefully acknowledged.

Marine Turtle Newsletter

No. 26 DECEMBER 1983

Editor: N. Mrosovsky

Departments of Zoology
and Psychology
University of Toronto
Toronto, Ontario
M5S 1A1 Canada

Editorial Advisors:

P.C.H. Pritchard
Harold F. Hirth
Nat B. Frazer

EDITORIAL

Por fin algo para nuestros amigos! Plans are afoot to publish a Spanish version of Marine Turtle Newsletter. The Spanish version will contain translations of all the items in the English version but may in addition have extra items of special regional interest to Latin America. The Spanish edition is to be made possible through the goodwill and support of the Instituto Nacional de Pesca in Ecuador. The advantages of this plan are several: 1) More readers will be able to obtain the newsletter in their first language. 2) Regional initiatives, such as those arising at WATS (see below and also Marine Turtle Newsletter 1982, 21, 1-3) can be supported. 3) Some costs can be reduced. Funds for preparing and mailing the newsletter are running perilously low and no major donor is on the horizon. However those involved are still optimistic that some solution can be found, so that readers who want to receive this newsletter in Spanish should write immediately to: Biol. Mario Hurtado G., Instituto Nacional de Pesca, Casilla 5918, Guayaquil, Ecuador. A form is enclosed.

N.M.

WESTERN ATLANTIC TURTLE SYMPOSIUM (WATS)

WATS took place 17-23 July 1983 in San Jose, Costa Rica. It was attended by more than 300 people, with representatives from 33 nations and 5 additional reports presented on behalf of others. As well as being a major forum for information exchange, it emerged during the meeting that the process of requesting national reports for WATS had stimulated considerable interest in turtles and that various investigations in a number of nations had resulted. Two publications are arising from the meeting:

1. A Manual of Sea Turtle Research and Conservation Techniques, Edition II

   Authors: P.C.H. Pritchard, P.R. Bacon, F.H. Berry, J. Fletemeyer, A. Carr, R.M. Gallagher, R.R. Lankford, R. Márquez M., L.H. Ogren, W.G. Pringle, H.A. Reichart, and R. Witham.
   Editors: K. Bjorndal and G. Balazs
   Cost $10.00 US. Specify if English or Spanish edition required.

2. Proceedings of the Western Atlantic Sea Turtle Symposium

Publication should occur during late 1983. The Proceedings will include Rapporteur Reports, Glossary, Sea Turtle Annotated Bibliography, and updated Computerized Data Base. Free to all Registered Attendees at the Symposium. For sale to others at $20.00 U.S. per copy. Specify if English or Spanish edition required.

Order both from: F.H. Berry, WATS,
National Marine Fisheries Service
75 Virginia Beach Drive
Miami, Florida 33149, USA.

TURTLE FLOTILLA IN GALLEON HARBOUR, JAMAICA

Once a month for a year the Natural Resources Conservation Department (NRCD) of Jamaica conducted aerial surveys of the island's entire coastline, primarily to help determine the distribution and abundance of the West Indian Manatee. A record of sea turtle sightings was also compiled.

To the general pattern of widely scattered individual turtles occurring at favoured spots along the coast with little change in seasonal abundance, there was one exception. On 4th March 1982, at 10:15 h, over 200 uniformly small, round-shelled, greyish-white to light green turtles were observed in Galleon Harbour, St. Catherine, a shallow (2-5 m) bay just west of the Hellshire Hills and immediately north of the Goat Islands. They mostly remained at or near the surface, despite several fairly close passes by the 'plane.

At 14:30 h, Galleon Harbour was checked again and not a single turtle was observed. At 14:30 h the following day, again no turtles were observed there. On 31st March 1982 at 9:15 h more than 200 turtles of the same kind were seen at or near the surface in Galleon Harbour. No return flight over the area was made that day. On the following day, however, about 25 were observed on a flyover made at 13:30 h. Despite a three-hour search by boat on 6th April 1982 no turtles were seen, nor were fishermen who were questioned at nearby Old Harbour Bay aware of any unusual species or numbers. Four weeks later, no turtles were seen in Galleon Harbour in two separate flyovers. Again, there were no sightings during two more flyovers made 14th June 1982.

Galleon Harbour is completely lined with mangroves. Approximately 25 km^2 in area, it is enclosed by land except for two broad channels to the southeast and northwest. The bottom is well supplied with plant food attractive to manatees. The turtles occupied a large portion of the total area, spaced quite evenly over its surface. Their periodic mass appearance and disappearance suggest considerable synchronization of behaviour. In shape and colour they appeared unlike all other turtles observed during the preceding year. These were the only turtles ever sighted in Galleon Harbour. Their appearance from the air most nearly fits descriptions that have been given for the Atlantic ridley. The NRCD would appreciate hearing from anyone who may be able to offer an interpretation. Subsequent aerial surveys by NRCD have produced no further records of this kind.

PATRICK FAIRBAIRN
NRCD, P.O. Box 305, Kingston 10, Jamaica.

I would prefer to receive the Marine Turtle Newsletter in the Spanish version when that becomes available.

Name _____

Full Address _____

_____

_____

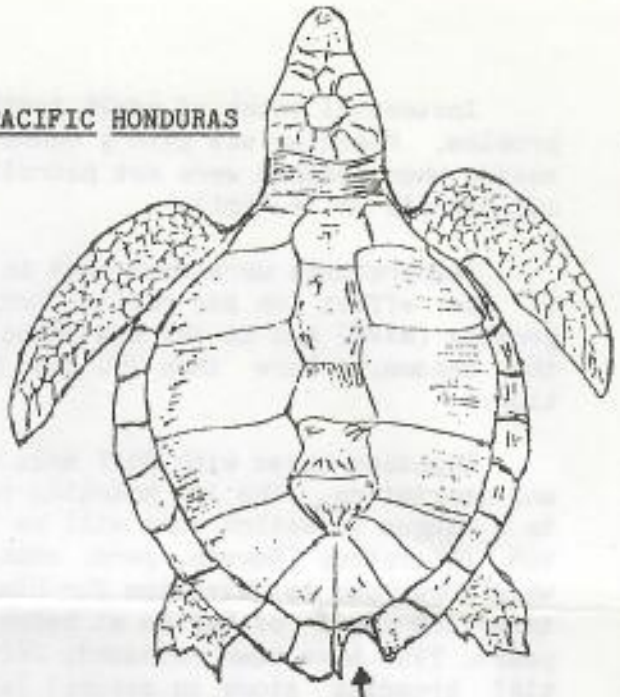
Postal Code _____

Country _____

Mail this form to: Mario Hurtado
Instituto Nacional de Pesca
Casilla 5918
Guayaquil
Ecuador

MUTILATION TAGGING IN PACIFIC HONDURAS

During 1975 a project was initiated in the area of Punta Raton, Gulf of Fonseca. About 14,000 Lepidochelys olivacea were produced from a hatchery, 11,000 of which were marked by cutting out the right post central scute of the carapace, with a paper puncher (Fig. 1). In 1981, during the closed season (15 days), ca. 6 nesting females were found with missing or broken right post central scute and another 15 were found in 1982. We are continuing this work and tagging nesting females with metal tags. For the turtles born in 1975 we plan to tag them with two metalic tags,



in order to obtain better knowledge of the life cycle of these populations. Please report recoveries of turtle with mutilated right postcentral scute to one of us.

ENOC BURGOS and GUSTAVO CRUZ,
Dirección General de Recursos Naturales Renovables, Barrio Guacerique No. 1534, Comayaguela, Honduras, C.A.

ATLANTIC RIDLEY PROJECT, 1983: PRELIMINARY ACCOUNT

This was the 17th year of the Mexican project at Rancho Nuevo and the 6th year of cooperative work with the U.S. National Marine Fisheries Service. Work in the turtle camp began on 8 April and continued until the first week of September; the U.S. team was present from 13 April to 14 August. The first turtle was seen laying on 11 April and the last on 2 July. Out of a total of 879 nests, 757 were translocated; 74,228 eggs were transferred to corrals and 4,429 to styrofoam boxes. Only around 5.7% of the eggs were lost to predation. Preliminary estimates of hatching success are 50.5% for corrals and 24.9% for the boxes, for an overall rate of 49%. The low hatching rate is due to stormy weather early in the season that destroyed 83% of the eggs in one corral holding 296 nests (see Márquez, 1982. Marine Turtle Newsletter 21:4). Thus, it will be necessary to move one of the corrals to a safer location in the future. More than 36,500 hatchlings were released on the beach.

Between 11 April and 2 July there were 45 solitary or group nesting emergences, including several "arribazones." The largest "arribazon" included 143 turtle tracks and resulted in 133 nests being located and reburied the same day. Monel tags were applied to 129 turtles and 102 others received Titanium tags. Ten turtles were double-tagged on opposite front flippers; 5 received two plastic tags and 5 received both Monel and Titanium tags. Sixty-one turtles nested twice and two turtles nested three times. Tag scars were detected on 49 turtles, which were retagged; 93 turtles tagged in previous years returned this year and three of them nested twice.

Incidental catch of adult turtles by shrimp trawlers continues to be a problem. Poaching was also a concern this year. Eggs were taken early in the season when beaches were not patrolled, and 17 clutches were taken from one of our corrals on 14 April.

Temperatures were monitored in 24 corral and 43 box clutches for studies of the effect on sex ratio. Temperature probes were placed along the beach profile (N=48) and in the egg house (N=4) and weather was monitored throughout the season. More than 250 dead hatchlings were retained for sex determination.

Eighteen boxes with 2017 eggs were shipped to Padre Island for incubation and imprinting. The low hatching rate for these eggs (11.4%) was probably due to a fungus infection that will be the subject of further study at the Galveston Laboratory (Bowman, pers. comm.). Imprinted hatchlings from Padre Island were forwarded to Galveston for head-starting, where they will be released into the Gulf of Mexico at between 9 and 12 months old. Over the past five years, 7990 have been released, 262 have been retained for study as a potential breeding stock in several laboratories and U.S. aquaria and another 100 have been sent to the Cayman Island Turtle Farm for the same purpose (Mexus-Gulf's Sea Turtle Working Group's Accomplishments and Plans for 1978-1985 ms. Veracruz, Mexico, 1982).

An aerial survey was made of the entire Mexican coastline from the U.S. border to the Belize border in support of the goals of the Western Atlantic Turtle Symposium. During this survey, we reconfirmed the existence of a small ridley nesting beach near Tecolutla, Veracruz and a somewhat larger nesting site for hawksbills between the Islands of Carmen and Aguada in Campeche.

RENÉ MÁRQUEZ M.
C.I.P. Manzanillo, c/o Delegación Federal de Pesca, Manzanillo, Col. 28200 Mexico.

RECENT PAPERS

Anon. 1983. Environmental assessment of a program to reduce the incidental take of sea turtles by the commercial shrimp fishery in the southeast United States. NMFS report, 11 pp. W.G. Gordon, NMFS/NOAA, 3800 Whitehaven Street N.W., Washington D.C., 20235 USA.

BALAZS, G.H. 1983. Recovery records of adult green turtles observed or originally tagged at French Frigate Shoals, Northwestern Hawaiian Islands. NOAA Technical Memorandum, Southwest Fisheries Center, 36, 1-42. G.H. Balazs, NMFS, P.O. Box 3830, Honolulu, Hawaii, 96812 USA.

CARR, A.F. and DODD, C.K. 1983. Sea turtles and the problem of hybridization. In: Genetics and Conservation (C.M. Schonewald-Cox et al., eds), Benjamin/Cummings, Menlo Park, California, 277-287. C.K. Dodd, Dept. of Interior, Fish and Wild Life Service, Washington DC, 20240 USA.

CORNELIUS, S.E. and ROBINSON, D.C. 1983. Abundance, distribution and movements of olive ridley sea turtles in Costa Rica, III. Endangered Species Report 13, U.S. Fish & Wildlife Service, Albuquerque, New Mexico, USA. S.E. Cornelius, R.R. 3, Box 216, Mountain View, MO, 65548 USA.

COSTON-CLEMENTS, L. and HOSS, D.E. 1983. Synopsis of data on the impact of habitat alteration on sea turtles around the southeastern United States.

NOAA Technical Memorandum, Southeast Fisheries Center, 117, 1-57. L. Coston-Clements, Southeast Fisheries Center, Beaufort Laboratory, Beaufort, N. Carolina 28516, USA.

CRATZ, F. 1982. Embryological stages of the marine turtle Lepidochelys olivacea (Eschscholtz). Rev. Biol. Trop., 30:113-120. F. Cratz, Circulo Herpetológico de Panamá. Apdo. 10762, Estafeta Universitaria, Panamá.

FRAZER, N.B. 1983. Effect of tidal cycles on loggerhead sea turtles (Caretta caretta) emerging from the sea. N.B. Frazer, Oceanographic Institute, Woods Hole, Mass., 02543 USA.

KILLINGLEY, J.S. and LUTCAVAGE, M. 1983. Loggerhead turtle movements reconstructed from ^{18}O and ^{13}C profiles from commensal barnacle shells. Estuarine, Coastal and Shelf Science 16:345-349. J.S. Killingley, Scripps Institution of Oceanography, La Jolla, California 92093 USA.

LIMPUS, C.J. and FLEAY, A. 1983. Management and turtles. In: Proceedings Inaugural Great Barrier Reef Conference (Baker, J.T. et al., eds), James Cook University Press, 83-88. C.J. Limpus, Queensland National Parks and Wildlife Service, Pallarenda, Townsville, Queensland 4810, Australia.

LIMPUS, C.J., MILLER, J.D., BAKER, V. and McLACHLAN, E. 1983. The hawksbill turtle, Eretmochelys imbricata (L.), in north-eastern Australia: the Campbell Island rookery. Aust. Wildl. Res. 10:185-97. C.J. Limpus, address as above.

LIMPUS, C.J., PARMENTER, C.J., BAKER, V. and FLEAY, A. 1983. The Crab Island sea turtle rookery in the north-eastern Gulf of Carpentaria. Aust. Wildl. Res. 10:173-84. C.J. Limpus, address as above.

LIMPUS, C.J., REED, P. and MILLER, J.D. 1983. Islands and turtles: the influence of choice of nesting beach on sex ratio. In: Proceedings Inaugural Great Barrier Reef Conference (Baker, J.T. et al., eds), James Cook University Press, 397-402. C.J. Limpus, address as above.

MÁRQUEZ M., R. and VAN DISSEL, H.G. 1982. A method for evaluating the number of massed nesting olive ridley sea turtles, Lepidochelys olivacea during an arribazon, with comments on arribazon behaviour. Netherlands J. Zool. 32:419-425. H.G. van Dissel, Hoge der A 37 9712 AE Groningen Netherlands.

MEYLAN, A. and MACK, D. 1983. Sea turtles of the West Indies a vanishing resource. Naturalist 4:5-6, 45. A. Meylan, Department of Zoology, University of Florida, Gainesville, Florida 32611, USA.

MOLL, D. 1983. A proposed origin of nesting location divergence and a shared feeding range in Brazilian green turtle populations. Copeia, 1:121-125. D. Moll, Department of Biology, Southwest Missouri State University, Springfield, Missouri, 65802 USA.

MORA, J.M. and ROBINSON, D.C. 1982. Discovery of a blind olive ridley turtle (Lepidochelys olivacea) nesting at Playa Ostional, Costa Rica. Rev. Biol. Trop., 30:178-179. J.M. Mora, Escuela de Biología, Universidad de Costa Rica.

MORÁN, R.E., ENCISO F., and TREVINO P. 1983. La Tortuga Golfina (Lepidochelys olivacea): ecuación de crecimiento del desarrollo embrionario. Ciencias del Mar, Universidad de Sinaloa, 2 (No. 5), 12-16. F. Enciso S., A.P. 1421, Mazatlan, Sinaloa, Mexico, C.P. 82000.

PARMENTER, C.J. 1983. Reproductive migration in the hawksbill turtle (Eretmochelys imbricata). Copeia, 271-273. C.J. Parmenter, Department of Biology, Capricornia Institute of Advanced Education, Rockhampton, Qld, 4700, Australia.

RHODIN, G.J. and MIYATA, K. (Editors). 1983. Advances in Herpetology and Evolutionary Biology, 745 pages, Museum of Comparative Zoology, Harvard

University. Contains scattered information on sea turtles. Order from Museum of Comparative Zoology, Harvard University, Cambridge, Mass. 02138, USA. $69 + $2 USA or $3 other for postage.

RUCKDESCHEL, C., ELLIS, L. and SHOOP, C.R. 1982. Dermochelys coriacea (leatherback sea turtle) nesting. Herp Review 13:126. C. Ruckdeschel, Box 796, St. Marys, GA 31558 USA.

SHOOP, C.R. and RUCKDESCHEL, C. 1982. Increasing turtle strandings in the southeast United States: a complicating factor. Biological Conservation 23:213-215. C.R. Shoop, Department of Zoology, University of Rhode Island, Kingston, RI 02881 USA.

VAN DISSEL, H.G. and VAN SCHRAVENDIJK, A.E. 1981. Zeeschildpadden in Mexico. Een aflopende zaak? Vakblad voor Biologen 61:374-381. H.G. van Dissel, Hoge der A 37 9712 AE Groningen Netherlands.

VAN RHIJN, F.A. and VAN GORKOM, J.C. 1983. Optic orientation in hatchlings of the sea turtle, Chelonia mydas. III. Sea-finding behaviour: the role of photic and visual orientation in animals walking on the spot under laboratory conditions. Mar. Behav. Physiol. 9:211-228. F.A. Van Rhijn, Laboratory of Comparative Physiology, University of Utrecht, Jan van Galenstraat, 40, 3572 LA Utrecht, Netherlands.

WATTS, D.A., ANGELIDES, T. and BROWN, W.D. 1983. The primary structure of myoglobin from Pacific green sea turtle (Chelonia mydas caranigra). Biochimica et Biophysica Acta 742:310-317. W.D. Brown, Institute of Marine Resources, University of California, Davis, CA 95616 USA.

WHITTOW, G.C. and BALAZS, G.H. 1982. Basking behavior of the Hawaiian green turtle (Chelonia mydas). Pacific Science 36:129-139. G.C. Whittow, University of Hawaii, Department of Physiology, Honolulu, Hawaii 96822 USA.

WITZELL, W.N. 1983. Synopsis of biological data on the hawksbill turtle, Eretmochelys imbricata (Linnaeus, 1766). FAO Fish. Synop. 137, 78 p. W.N. Witzell, NMFS, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida 33149 USA.

MARINE TURTLE NEWSLETTER: BACK ISSUES

We do not provide back issues; if you need photocopies, please obtain these from whomever told you about this newsletter in the first place. Complete sets of the Marine Turtle Newsletter are in the Library of Congress, Washington, and the British Museum (Natural History).

RECENT DEVELOPMENTS IN THE ANESTHESIA OF SEA TURTLES

Anesthesia of the green turtle with the injectable anesthetics sodium pentobarbital, ketamine hydrochloride, and sodium thiopental shows considerable variability among individuals as to induction, duration and recovery with the anesthetic used (Wood et al., 1982). Investigations suggest that a lower administered rate of sodium pentobarbital be used in loggerhead turtles than in green turtles. Recent work suggests that electroanesthesia of the green turtle may be used more effectively and with less stress to the turtle than the injectable anesthetics.

Seven loggerhead turtles were anesthetized for laparoscopic examination for sex determination as part of a turtle project conducted by the National

Marine Fisheries Service off the eastern coast of Florida. The turtles weighed 27-64kg. Three turtles received dosages of 20mg/kg body weight (sodium thiopental, pentothal, Abbott Laboratories); one turtle, 15mg/kg; and three turtles, 10mg/kg. One turtle receiving 20mg/kg and the one turtle receiving 15 mg/kg died within one hour following anesthesia. An administered rate of 20 mg/kg was recommended for the green turtle (Wood et al., 1982). The five other turtles recovered within 2 1/2-10 hours following anesthesia. However, the three turtles receiving 10 mg/kg failed to achieve deep anesthesia and laparoscopic entry was necessarily rapid and extensive examination of the turtle for other than sex determination would have been impossible. The two turtles receiving 20 mg/kg, and recovering from anesthesia, achieved deep anesthesia within 10 minutes and maintained surgical anesthesia for ca. 20 minutes. The use of sodium thiopental as an anesthetic in sea turtles should be used with caution. The dosage necessary for anesthesia depends upon the intended examination and may vary considerably among individuals.

Three green turtles (19, 25 and 100 kg) were recently electroanesthetized using a Feenis Stockstill Mark I electroanesthesia unit (Feenix International Pty. Ltd., Tarlee, South Australia). Electro-leads were inserted under the skin in the shoulder near the neck and at the base of the rear flipper. A current of .25ma was sufficient to achieve and maintain surgical anesthesia. Examination time (laparoscopic entry for sex determination) was 5 to 10 minutes and recovery of the turtle was immediate following suspension of current. The electroanesthesia unit is portable and offers an efficient method of anesthesia with the advantage of a minimal recovery time.

Wood, F.E., K.H. Critchley, and J.R. Wood, 1982. Anesthesia in the green sea turtle Chelonia mydas. Am. J. Vet. Res. 43:1882-1883.

JAMES R. WOOD AND FERN E. WOOD,
Cayman Turtle Farm (1983) Ltd., Box 645, Grand Cayman, British West Indies.

INFORMATION WANTED

Information and observations on the subject of aborted sea turtle eggs seen in the water. Please give location, date, species, number of eggs observed and marine habitat type (i.e. sandy bottom, fringing reef, etc.). Please write to John Fletemeyer, Oceanographic Center, Nova University, 8000 N. Ocean Drive, Dania, Florida, 33004 USA.

A COMPARISON OF THREE METHODS FOR INCUBATING TURTLE EGGS

During the summer of 1983 green turtle eggs from 3 clutches were incubated in Freas Precision incubators in Toronto. The eggs came from Suriname. Eggs from clutches 1 and 2 were collected at laying, washed in rain water and then put into styrofoam boxes for transport; eggs from clutch 3 had been in a styrofoam box for a day prior to transfer to the transport box. Clutches 1 and 2 arrived in Toronto about 24 h after laying, clutch 3 arrived about 48 h after laying. Most of the eggs were spotted on arrival indicating fertility; the white spots on eggs from clutch 3 were larger than the spots on the eggs from the younger clutches, 1 and 2. The eggs were incubated singly in plastic

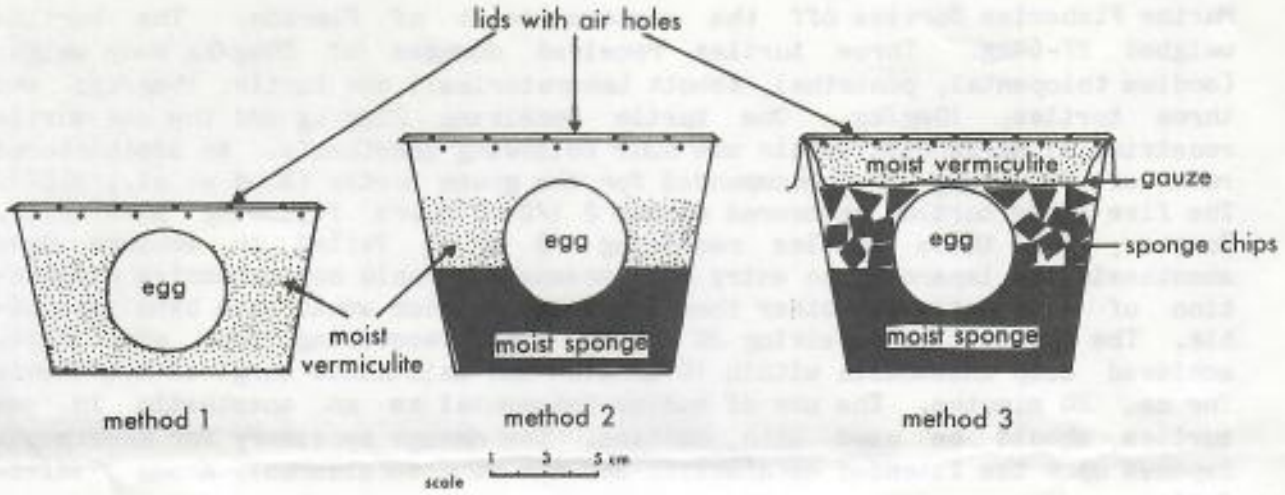


TABLE 1

HATCH RATES OF GREEN TURTLE EGGS
ARTIFICIALLY INCUBATED IN DIFFERENT WAYS

hatched / set (% hatched)

Temp (°C)	Clutch	INCUBATION METHOD 1 Vermiculite		2 Sponge Base + Vermiculite		3 Sponge Base Sponge Chips + Gauze Vermiculite		Total	
27.75	1	9/12	(75%)	2/3	(67%)	0/2	(0%)	11/17	(65%)
	2	4/7	(57%)	3/5	(60%)	2/2	(100%)	9/14	(64%)
	3	2/3	(67%)	2/2	(100%)	1/2	(50%)	5/7	(71%)
TOTAL		15/22	(68%)	7/10	(70%)	3/6	(50%)	25/38	(66%)
28.1	1	8/10	(80%)	3/3	(100%)	0/3	(0%)	11/16	(69%)
	2	7/8	(88%)	4/4	(100%)	1/2	(50%)	12/14	(86%)
	3	2/3	(67%)	2/2	(100%)	1/2	(50%)	5/7	(71%)
TOTAL		17/21	(81%)	9/9	(100%)	2/7	(29%)	28/37	(76%)
29.25	1	10/12	(83%)	4/4	(100%)	0/1	(0%)	14/17	(82%)
	2	6/7	(86%)	3/3	(100%)	2/4	(50%)	11/14	(79%)
	3	3/4	(75%)	1/1	(100%)	2/2	(100%)	6/7	(86%)
TOTAL		19/23	(83%)	8/8	(100%)	4/7	(57%)	31/38	(82%)
30.0	1	7/11	(64%)	1/1	(100%)	0/5	(0%)	8/17	(47%)
	2	5/9	(56%)	1/1	(100%)	1/4	(25%)	7/14	(50%)
	3	0/3	(0%)	1/1	(100%)	1/2	(50%)	2/6	(33%)
TOTAL		12/23	(52%)	3/3	(100%)	2/11	(18%)	17/37	(46%)
OVERALL TOTALS		63/89	(71%)	27/30	(90%)	11/31	(35%)	101/150	(67%)

tubs using one of three methods at random. 1, moist vermiculite; 2, moist sponge topped by vermiculite or 3, moist sponge base, sponge chips beside the egg and a top layer of gauze with moist vermiculite (Fig. 1). Snugly fitting lids with air holes punched in them were used on top of all the tubs, but the gauze layer in method 3 prevented the lids from fitting as snugly for this group.

Temperatures in the 4 incubators after a -0.3°C correction for evaporative cooling, were 30.0±0.75, 29.25±0.25, 28.1±0.5 and 27.75±0.25°C. Containers of water were kept in each incubator, and these were used to moisten the vermiculite and sponges. During the first three weeks of incubation water was added approximately every 4 days, and about once a week for the remainder of the incubation period.

The 3 clutches had similar hatching success rates: clutch 1, 67% hatched; clutch 2, 70% hatched; clutch 3, 67% hatched. But there were dramatic differences in the hatch rates using the 3 incubation methods. Of those eggs incubated using vermiculite alone 71% hatched; with the sponge and vermiculite 90% hatched; with the sponge, chips, gauze and vermiculite, only 35% of the eggs set hatched (Table 1). Although overall mortality was higher in the warmest (30.0°C) incubator there were no deaths using the sponge/vermiculite method. This method worked equally well at all the temperatures used. The sponge/chips/gauze/vermiculite method performed poorly at all temperatures, and vermiculite alone worked well at most temperatures, but there was 48% mortality at 30°C.

We can only speculate about why the sponge/vermiculite gave better hatch rates. Possibly it allows sufficient aeration while at the same time keeping the eggs moist. The gauze/chips tended to become drier as was evident from the drying of the vermiculite layer on top of the gauze, while the vermiculite alone perhaps packed the egg too closely with moist material. In the incubators used the air is circulated to maintain constant temperature. Whether the sponge/vermiculite would be appropriate for other conditions cannot be asserted, but clearly it is highly suitable for laboratory studies requiring incubation of turtle eggs at controlled temperatures.

It is noteworthy that hatch rates were good in the third clutch, despite its having been en route during the second day post laying. This confirms that with care--and considerable care was taken to keep the eggs upright and unjuddered--transport of eggs is compatible with survival even beyond the immediate few hours post laying.

This work is part of a larger project supported by the Natural Sciences and Engineering Research Council. We thank H.A. Reichart and the Foundation for Nature Preservation in Suriname for assistance.

KIRSTEEN McLEAN, PETER DUTTON, CLARE WHITMORE, & N. MROSOVSKY
Departments of Zoology and Psychology, University of Toronto, Canada, M5S 1A1

A METHOD FOR REDUCING MOVEMENT-INDUCED MORTALITY IN TURTLE EGGS

The problem of movement-induced mortality (Limpus et al., 1979) must be considered in any conservation effort in which eggs are moved. Eggs can be moved immediately after oviposition (or within 3 h) without danger, but movement after about 10 h reduces hatching success (Limpus et al., 1979). The more severe the handling or the longer the interval between oviposition and movement, the greater the egg mortality. Because low temperatures slow or suspend development in turtles, loggerhead turtle eggs were subjected to artificially low temperatures to test the hypothesis that short-term cold exposure could be used to reduce movement-induced mortality.

Eggs were grouped into treatments (low temperatures 10°, 14°C; warm temperatures 24.5°, 27.5°, 29°C), within 1 h of oviposition at Mon Repos beach (25°S, 152°E) Queensland, Australia. The methods of incubation followed those used by Miller and Limpus (1981). Groups of 10 eggs from each treatment were inverted axially 180° at 24 h intervals (24, 48, 72, 96 h) and placed at 29°C until hatching. Other groups of 10 eggs were subjected to 10°C for the same intervals then moved to 29°C but were not inverted. The 29°C incubation temperature was chosen because it approximates the temperature about which sand temperatures at nest depth at Mon Repos fluctuate through most of the nesting season. In addition, 29°C is within the range that gives high hatching success in constant temperature incubation experiments (Limpus et al., 1983). Hatching success (sensu Miller and Limpus, 1981) of undisturbed clutches laid on Mon Repos was 83.8% (Limpus et al., 1979). Experimental hatching results were compared against this value using Chi-squared tests with Yates correction for continuity.

Eggs incubated at the warmer temperatures (29°, 27.5°, 24.5°C) prior to inversion exhibited significantly lower hatching success than those incubated at 14 and 10°C prior to inversion (Table 1).

Table 1. Percent hatching success of eggs incubated at 29°C following initial cooling and inversion at specific time intervals (control group not inverted). Number of eggs in trial in brackets. X^2 test: * = significant P 0.05, NS = not significant.

Hours of Incubation before setting at 29°C	Incubation temperature prior to setting at 29°C					
	inverted					not inverted (control)
	29°C	27.5°C	24.5°C	14°C	10°C	10°C
24	0% (10) *	40% (20) *	50% (20) *	100% (20) NS	60% (10) NS	80% (10) NS
48	0% (10) *	0% (20) *	10% (20) *	55% (20) *	80% (10) NS	100% (10) NS
72	0% (10) *	0% (20) *	0% (20) *	55% (20) *	70% (10) NS	80% (10) NS
96	0% (10) *	0% (20) *	0% (20) *	55% (20) *	10% (10) *	70% (10) NS

At 24 h, the effect of inversion on survival was reduced with each decrease in temperature until no significant difference occurred between the observed and expected values. Inversion of eggs at 48 h killed all but 2 eggs among those incubated at 29°, 27.5° and 24.5°C and no eggs survived inversion after 72 h at these warm temperatures. Although hatching success of eggs incubated at 14°C prior to inversion was higher than that of eggs incubated at the warmer temperatures for the same interval, the results were significantly different from the control value. Rotation of the eggs incubated at 10°C for 24, 48 and 72 h did not cause significant mortality, however the hatching success of eggs incubated at 10°C for 96 h before inversion was signficiantly different from the expected success of 83.8%. The hatching success of eggs incubated under the same conditions but not inverted was consistently high. Taken together, these results strongly indicate that movement-induced mortality during the first 72 h of incubation can be reduced by decreasing the temperature to 10-14°C.

By using low temperatures to inhibit movement-induced mortality, it is possible to move a clutch of turtle eggs from a remote rookery to distant laboratories with relative impunity. This should allow more sophisticated studies of the biology of the eggs than is usually possible at many beaches. The large scale movement of turtle eggs to hatcheries for conservation is a common practice even though rough handling or delay reduced hatching success. The cooling of eggs immediately following laying to 10-14°C may have some application towards increasing hatching success in those conservation efforts in which the eggs cannot be reburied into the hatchery within 2 h of being laid.

Limpus, C.J., Baker, V. and Miller, J.D. (1979). Movement induced mortality of loggerhead eggs. Herpetologica 35(4), 335-338.

Limpus, C.J., Reed, P. and Miller, J.D. (1983). Islands and turtles. The influence of choice of nesting beach on sex ratio. In "Proceedings: Inaugural Great Barrier Reef Conference." (J.T. Baker, R.M. Carter, P.W. Sammarco and K.P. Stark, eds). James Cook University Press Townsville, Aust., 397-402.

Miller, J.D. and Limpus, C.J. (1981). Incubation period and sexual differentiation in the green turtle, Chelonia mydas L. In Proc. of Melbourne Herp. Symp. (C. Banks and A. Martin, eds). The Royal Melbourne Zoological Gardens, Melbourne, 66-77.

J.D. MILLER
Department of Zoology, University of New England, Armidale, N.S.W., 2351 Australia.
C.J. LIMPUS
Queensland National Parks and Wildlife Service, Pallarenda, Townsville, QLD, 4810 Australia.

LOUISIANA SHRIMPERS USING TEDs

Officials from the U.S. National Marine Fisheries Service have been pleasantly surprised to find that some form of TED (Turtle Excluder Device/Trawling Efficiency Device, see Marine Turtle Newsletter 1982, 22, 1-2 and RECENT PAPERS, this issue) is already being widely used by shrimpers in the Cameron area, Lousiana. Although efforts continue to improve further the efficiency of TED, acceptance of the principle of using excluders is considered an important step in reducing incidental catch of sea turtles. For more information, contact W.R. Seidel, NMFS Southeast Fisheries Center, P.O. Drawer, Pascagoula, MS, 39567 USA.

DR. N. MROSOVSKY
DEPT. OF ZOOLOGY
UNIV. OF TORONTO
25 HARBORD ST.
TORONTO, ONTARIO

PRINTED MATTER

Mr. George H. Balazs
Hawaii Institute of Marine
Biology, P.O. Box 1346
Kaneohe, Hawaii 96744
U.S.A.

INDIA: TURTLE GROUP FORMED

(based on information in the Indian Express, Delhi Edition, 21 September 1983)

The Government of India has established a group of experts to advise it on its protection of sea turtles. There is still considerable poaching along the east coast. However, there are also some turtle hatcheries; in Tamil Nadu in 1981-82 about 93,000 eggs were collected and 76,000 hatchlings released. There are anti-poacher patrols in Orissa and checks are being made in the markets in West Bengal where turtles are sold.

Support for this newsletter came from H.C. Mittag, Dr. J. Mittag, the University of Toronto and World Wildlife Fund Canada. Contributions from Steven Price, the BBC Natural History Unit and an anonymous donor are gratefully acknowledged.

Marine Turtle Newsletter

No. 27 MARCH 1984

Editor: N. Mrosovsky

Departments of Zoology
and Psychology
University of Toronto
Toronto, Ontario
M5S 1A1 Canada

GUEST EDITORIAL

Last July, the IUCN Marine Turtle Specialist Group met at Tortuguero, Costa Rica. The meetings held in that idyllic spot achieved a great deal, and decisions were made that are already resulting in action. But I had one disappointment. The decisions taken were almost all on "motherhood issues," in which it was clear to anyone acquainted with the facts what should be done, and where the Group was lending its prestige rather than its brainpower to the issue under consideration. One item I had suggested for discussion, however, was of a different nature. The question was that of the best management plan for the olive ridley nesting colony at Ostional, Costa Rica. For those unacquainted with this case, there are two sites in Pacific Costa Rica where ridleys nest in groups numbering tens of thousands--Nancite, inside the Santa Rosa National Park, and Ostional, outside the Park. The numbers of turtles nesting are so great that they dig up each others' eggs while nesting, and for various reasons, most of which seem associated with the extraordinary density of eggs in the beach, hatching rates are extremely low. Generally less than one hatchling enters the sea, on average, from each nest, and large numbers of nests show no development at all even if not actually destroyed. The eggs are safe from human disturbance at Nancite, but at Ostional the villagers lead their pigs down to the beach to fatten on turtle eggs, and exploit the resource in an intensive but uncontrolled fashion.

It was my hope that the assembled brainpower at Tortuguero could decide what to do in this difficult situation. I hoped that the Group, with its blend of purists, moderates, and controlled-exploitation advocates, could achieve a wise consensus. I specifically asked about Ostional, since Nancite is within a National Park, and the turtle population there should be allowed to play out its own fate, unaffected by man, however strange that fate may be. However, Ostional is adjacent to a village of impoverished individuals who benefit from the turtle resource, even though technically such exploitation is illegal.

Management plans for Ostional might run the gamut from strict enforcement of existing law, keeping the local people away by means of guards, to large-scale utilization of the turtle for international commerce. Some summary thoughts are as follows.

i) Complete protection offers the advantage of uniform law enforcement, which generally is an important principle. The disadvantages, however, include alienation of the local people and denial of an important and traditional resource; loss of credibility when we argue that a population so clearly abundant is threatened and needs protection; and the difficulty of fielding an adequate enforcement crew in a country with severe financial problems. Ironically, this option, because of density-dependent nest destruction, could result in fewer hatchlings produced than, say, option ii).

ii) If a controlled egg take were permitted, this would make good biological sense and would probably be acceptable to the local people if presented sensitively. It would allow the turtle population to enjoy adequate and possibly even enhanced levels of recruitment. For example, if eggs from some arribadas could be collected in their entirety, and subsequent ones protected completely, the latter would be nesting in a cleaner, egg-free beach and might have much better hatching success. On the other hand, there is a danger that a law allowing some turtle eggs to be legal and others illegal is much harder to enforce than a general ban, and current utilization procedures (i.e. for fattening pigs) present little possibility of tight control. Permitting controlled egg exploitation would need to address the fate of those eggs--would they be entirely for local, non-commercial consumption, would they be legally marketable throughout the country, or would they be accessible to someone wanting to start a turtle ranch?

iii) Uncontrolled utilization of the eggs, as occurs at present, would be the easiest, laissez-faire attitude to take, but seems to be wasteful (though nature also seems to be wasteful of turtle eggs at Nancite!) and could lead to lack of respect for conservation laws generally if permitted to continue. It could also ultimately exterminate the nesting colony. iv) Utilization of the turtles for international commerce (presumably for their skins rather than the meat, which is hard to sell) would generate relatively large levels of income, including hard currency earnings. It could be managed so that the population as a whole was not threatened. However, it would complicate the effort to eliminate the turtle skin trade internationally, which is felt by many to be the only effective way of saving the Mexican and other ridley populations from extinction. It would also require a significant enforcement effort to insure that quotas were respected; and the earnings would very probably not accrue to the local people, but rather to the businessmen who invested the necessary capital for the venture.

I would like to solicit opinions as to which option should be adopted. I would regard the ideal solution as one that would somehow allow the demonstrable surplus of turtles or eggs at Ostional to work as leverage to stop the capture of green turtles on the Caribbean coast of Costa Rica, where the population, though abundant, still needs protection. However, the logistic problems would be formidable, since the turtles are a different species, in a different ocean.

PETER C.H. PRITCHARD
Florida Audubon Society, 1101 Audubon Way, Maitland, Florida 32751, USA.

TAGGING TURTLES IN GREECE

This note is to inform you that the Ministry of the Environment in Greece has started a sea turtle tagging project. Part of the project is to investigate the migrations of sea turtles in the Mediterranean. For this reason, approximately 600 sea turtles (Caretta caretta) have been tagged and released. Tagging is done on the flippers by metallic or/and plastic tags which are numbered and bear the address of the Hellenic Society for the Protection of Nature in Greece. It is evident that fishermen and other people working in the sea in your country can contribute greatly to our project by providing the necessary information in case they meet a tagged animal. The information needed, i.e. number and type of tag, locality and date, should be forwarded either directly to us or to the Hellenic Society for the Protection of Nature. Therefore any effort from your part to distribute this note to individual fishermen, cooperatives and other agencies associated with the marine environment in your country, is gratefully appreciated. Thank you for your cooperation.

D.N. MARGARITOULIS
Ministry of Physical Planning Housing and the Environment, P.E.R.P.A., Patission 147, GR-112 51, Athens, Greece.

THREAT TO LOGGERHEADS NESTING IN GREECE

There is a possibility that there will be intensive development along the shore of Lagnas Bay, Zakinthos (Zante) Island, Greece. This could disrupt the nesting of loggerhead turtles there. The area is one of the largest known rookeries for this species in the Mediterranean (see also Marinos, P., 1981, Marine Turtle Newsletter 19, 13-14). Professor Carr, Chairman of the IUCN Marine Turtle Specialist Group, has written to Mr. Tritsis, Minister of the Environment, Athens, urging him to intervene.

N.M.

TURTLES IN INDIA: SPECIAL ISSUE ON MANAGEMENT AND CONSERVATION

The Central Marine Fisheries Research Institute, Post Bag 1912, Cochin 682018, India, has published a special issue on Sea Turtles (1983, Marine Fisheries Information Service, Technical Information and Extension Series No. 50, pp. 41). It contains numerous photographs of habitat, turtles and utilization, and articles by E.G. Silas, M. Rajagopalan, A.B. Fernando and S.S. Dan.

Contents: 1. Sea turtles of India--Need for a crash programme on conservation and effective management of the resource. 2. Marine turtle conservation and management: A survey of the situation in Orissa 1981/82 and 1982/83. 3. Marine turtle conservation and management: A survey of the situation in West Bengal 1981/82 and 1982/83. 4. Nesting site and hatching of the Hawksbill turtle along Tirunelveli coast of Tamil Nadu. 5. Leatherback turtle Dermochelys coriacea washed ashore at Kovalam, Madras. 6. Conservation of fresh water turtles of India. 7. Central Marine Fisheries Research Institute turtle hatchery programme, Kovalam, Madras.

BIOCHEMICAL CONSTITUENTS OF SERUM OF YOUNG FEMALE HATCHLINGS OF OLIVE RIDLEY LEPIDOCHELYS OLIVACEA.

Although some data concerning biochemical and pysiological changes in reptiles exist (Bennet and Dawson, 1976; Dessauer, 1970) such types of data are not available for hatchlings of sea turtles in general. Therefore, the serum constituents of the hatchlings of the Olive Ridley L. olivacea were determined. Eggs of L. olivacea were collected from Gaheermatha area of Orissa during the last week of February. They were incubated at 31-32°C and all the resulting hatchlings were females. Their serum constituents were determined by using a visible-range spectrophotometer "SICOSPEC-100". In this study 8 day old and 13 day old hatchlings were used. There was no difference between the data obtained from these two groups. Blood was collected by heart puncture in heparinised hematocrit tubes. After determining hematocrit, serum was extracted and protein (Lowry et al., 1951), inorganic phosphorus (Fiske and Subba Row, 1925) Phospholipid phosphorus (Connerty et al., 1951) and total cholesterol (Sackett, 1925) were estimated (Table 1).

In reptiles, proteins make up about 5% of the blood plasma (Dessauer, 1970). Chelonia plasma contains an average of 4.4 gm/100 ml protein with a range of 2.9 gm/100 ml to 6.1 gm/100 ml (Dessauer, 1970). Serum protein of the hatchlings of L. olivacea approaches the value in adult chelonians (Table 1).

TABLE 1

Serum Constituents of the female hatchlings of L. olivacea.

BODY WEIGHT (Gm.)	HEMATOCRIT VALUE (%)	PROTEIN (gm/100 ml)	INORGANIC PHOSPHORUS (mg/100 ml)	PHOSPHOLIPID PHOSPHORUS (mg/100 ml)	TOTAL CHOLESTEROL (mg/100 ml)
15.54±0.317	24.5±0.223	4.31±0.026	20.38±0.303	19.27±0.303	437.87±8.805

Adults of L. olivacea contain 3.5 mM inorganic phosphorous (34.3 mg%) in 1000 ml of serum (Dessauer, 1970). The hatchlings have 20.384 mg% inorganic phosphorus in their serum (Table 1). Total cholesterol averages from 69 mg% to 480% in the serum of different species of emydine turtles (Chaikoff and Enteman, 1946; Jackson and Legendre, 1967; Stenroos and Bowman, 1968). In the hatchlings the value is well within the average however, it is close to the higher level. Frair (1977) has reported that the average hematocrit value in adult L. olivacea is 31% with a range of 23% to 38%. In the hatchlings, the average was within but towards the lower level of the range.

This study shows that the values of the serum constituents in the hatchling in general are well within the range of those reported for the adult sometimes occupying the higher and at other times occupying the lower limit of the range. We are grateful to Goverment of Orissa and Wild Life Warden Sri U.N. Sarangi for the permit and collection of eggs.

Bennet, A.F., and W.R. Dawson. 1976. Metabolism, pp. 127-223 In C. Gans (ed.) Biology of the Reptilia. Vol. 5. Academic Press, London & N.Y.

Connerty, H.V., A.R. Brigs; and E.H. Eaton Jr. 1961. Clin Chem 7, (37):589 In H. Varley (ed.) Practical Clinical Biochemistry, Indian Edition (1969).

Dessauer, H.C. 1970. Blood Chemistry of reptiles: Physiological and evolutionary aspects. pp. 1-72 In C. Gans (ed.) Biology of the Reptilia. Vol. 3. Academic Press, London & N.Y.

Fiske, C.H. and Y. Subba Row. 1925. J. Biol. Chem 73: 627. In H. Varley (ed.) Practical Clinical Biochemistry, Indian Edition. (1969).

Frair, W. 1977. Turtle Red Blood cell packed volumes, sizes and numbers. Herpetologica. 33:167-190.

Jackson, C.G. Jr., and R.C. Legendre, 1967. Blood serum cholesterol levels in turtles. Comp. Biochem. Physiol. 20:311-312.

Lowry, O.H., N.J. Rostbrough, A.L. Farr and R.J. Randal. 1951. Protein Measurement with the Folin-Phenol reagent. J. Biol. Chem 193:265-275.

Sackett, G.E. 1925. J. Biol. Chem 64:203. In H. Varley (ed.) Practical Clinical Biochemistry, Indian edition. (1969).

Stenroos, O.O. and W.M. Bowman. 1968. Turtle Blood I. Concentrations of various constituents. Comp. Biochem. Physiol. 25:219-222.

P. MOHANTY-HEJMADI, M.T. DIMOND* and J. KANUNGO,
Department of Zoology, Utkal University, Vani Vihar, Bhubaneswar-751004, India.
*Trinity College, Washington D.C. 20017, U.S.A.

RECENT PAPERS

BUXTON, C.D. and W.R. BRANCH. 1983. Octopus predation on the Hawksbill turtle, Eretmochelys imbricata (Cryptodira: cheloniidae). Journal of the Herpetological Association of Africa. C.D. Buxton and W.R. Branch, Port Elizabeth Museum, P.O. Box 13147, Humewood 6013, South Africa.

DIMOND, M.T. and P. MOHANTY-HEJMADI. 1983. Incubation temperature and sex differentiation in a sea turtle. American Zoologist 23:1017. M.T. Dimond and P. Mohanty-Hejmadi, Trinity College, Washington, D.C. and Utkal University, Bhubaneswar, India.

FRAZER, N.B. 1983. Survivorship of adult female loggerhead sea turtles, Caretta caretta, nesting on Little Cumberland island, Georgia, USA. Herpetologica 39:436-447. N.B. Frazer, Woods Hole, Oceanographic Institution, Woods Hole, MA 02543, U.S.A.

FRITTS, T.H., A.B. IRVINE, R.D. JENNINGS, L.A. COLLUM, W. HOFFMAN, and M.A. McGEHEE. 1983. Turtles, birds, and mammals in the northern Gulf of Mexico and nearby Atlantic waters. U.S. Fish and Wildlife Service, Division of Biological Services, Washington, D.C. FWS/OBS-82/65. 455 pp. T.H. Fritts, Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico 87131, U.S.A.

GAVILÁN, F.M. and G.N. ANDREU. 1983. Informe nacional sobre la actividad desarrollada por Cuba en el estudio y conservación de las Tortugas Marinas. ms., 4 pp., G.N. Andreu, Centro de investigaciones pesqueras, Departamento Cría Experimental, Edificio 70 M del Este, La Habana, Cuba.

MARGARITOULIS, D. 1983. The inter-nesting interval of Zakynthos loggerheads. In N.S. Margaris, M. Arianoutsou-Faraggitaki and R.J. Reiter (eds.). Adaptations to Terrestrial Environments. Plenum Press, New York and London. D. Margaritoulis, Ministry of Physical Planning, Housing and

Environment, Patission 147, GR-112 51, Athens, Greece.

MENDONCA, M.T. 1983. Movements and feeding ecology of immature green turtles (Chelonia mydas) in a Florida lagoon. Copeia: 1013-1023. M.T. Mendonca, Department of Zoology, University of California, Berkeley, California 94720, U.S.A.

MEYLAN, A.B. and A. CARR. 1983. Oil terminal puts Caribbean hawksbill at risk. WWF Monthly Report:629-631.

OWENS, D. et al., editors. 1983. Western Gulf of Mexico Sea Turtle Workshop Proceedings. Texas A&M University, Sea Grant, Report 84-105, 74 pp. Contents include: Priorities for research and conservation. Current status of the Kemp's ridley population (R. Marquez). Historical background of the international conservation program for Kemp's ridley (J.B. Woody). Padre Island hatchery research (R. King). Headstarting Kemp's ridleys, 1982 (C. Fontaine, J. Leong and C. Caillouet). Experimental marking of sea turtles by tissue modification (L. Hendrickson and J. Hendrickson). Random notes on sea turtles in the Western Gulf of Mexico (H. Hildebrand). Sea turtle stranding and salvage research (S. Rabalais). Turtle excluder device (W. Seidel). Oil and gas impacts on marine turtles in the Gulf of Mexico (T.H. Fritts). D. Owens, Department of Biology, Texas A&M University, College Station, Texas 77843, U.S.A. For copies ($3.00 U.S.) write: Marine Information Service, Sea Grant College Program, Texas A&M University, College Station, Texas 77843, U.S.A.

WOOD, J.R., F.E. WOOD, and K. CRITCHLEY. 1983. Hybridization of Chelonia mydas and Eretmochelys imbricata. Copeia: 839-842. J.R. Wood, Cayman Turtle Farm Ltd., P.O. Box 645, Grand Cayman, Cayman Islands, British West Indies.

TRAWLING EFFICIENCY DEVICE (TED) TECHNOLOGY TRANSFER PROGRAM

The National Marine Fisheries Service (NMFS) has a program to encourage the voluntary use of the Trawling Efficiency Device or TED by the shrimp fishery in the SE United States (see Marine Turtle Newsletter 1982, 22:1-2). The TED is a cage-like device that fits into the back end of a shrimp trawl. Inadvertently captured sea turtles are released through a trap door in the top of the TED; shrimp and small fish pass through diagonal bars in the TED and into the back end of the trawl. Other large objects such as jelly balls, sponges, logs, sharks, and rays which are a nuisance to shrimpers, are also released. Modifications can be made to the TED and the surrounding netting to release small fish which are a problem because of sorting and handling time. Shrimp trawling would be a more efficient operation if the bycatch, frequently comprising 90% of the total catch, could be reduced. At the same time, this would decrease mortality of some valuable finfish, making them available later to other fisheries.

Because of the benefits of using the TED, the NMFS program has a three-fold goal of: (1) decreasing incidental catch of turtles; (2) improving shrimp trawling efficiency; and (3) reducing mortality of valuable species in the bycatch. NMFS hopes to achieve this goal by promoting TED through meetings with shrimpers, on-site demonstrations, media publicity, distribution of materials, and one-on-one contacts. NMFS is receiving valuable assistance with the TED program from Sea Grant. Sea Grant which is a part of the U.S. National Oceanic and Atmospheric Administration (NOAA), as is the NMFS, has a network of marine extension specialists in many major fishing ports throughout the country. These specialists work with fishermen informing them of

developments in technology, ecology, resource use, and other elements affecting their livelihood. The program includes obtaining information from shrimpers and modifying the TED based on this feedback. The NMFS program began in 1981 when it became apparent there was a good chance for voluntary acceptance of the TED because of its multiple benefits. If the TED is accepted voluntarily, it will eliminate any need for burdensome regulations for the shrimp industry and save the government $1 million annually in enforcement costs. The program has been successful so far, and NMFS estimates that between 100-200 shrimpers are using the TED on at least a part-time basis.

Foreign interest in the TED has in some cases exceeded that in the U.S. The goverment of Indonesia, because of severe depletion of groundfish resources, requires Japanese shrimpers fishing its waters to use TEDs. Testing of the TED is planned in Australia and the goverment of Honduras has asked for U.S. assistance in introducing the TED to its shrimp fishery. A TED demonstration is planned for Mexico and inquiries have been received from the Netherlands, Japan, and South Africa.

NMFS plans to continue its promotional program until the majority of SE shrimpers are using TEDs. Based on historical adoption of new fising gear technolgy, NMFS estimates between 3 and 5 years will be required before TEDs are in widespread use.

More information on the TED can be obtained from Charles A. Oravetz, NMFS, 9450 Koger Boulevard, St. Petersburg, FL, USA 33702 (tel: 813 893-3366) or John W. Watson, P.O. Drawer 1207, Pascagoula, MS, USA 39567 (tel: 601 762-4272). The name and location of local Sea Grant marine advisory agents can be obtained from office of Sea Grant, NOAA, 6010 Executive Boulevard, Rockville, MD, USA 20852 (tel: 301 443-8886).

CHARLES A. ORAVETZ
NMFS, 9450 Koger Boulevard, St. Petersburg, Florida, 33702 USA.

RUBBER FLIPPERS

(Based in information in the Toronto Star, 18 Jan 1984 and various issues of the Miami Herald.)

A loggerhead turtle that lost its own front flippers to a shark was fitted with flexible rubber flippers. The lengthy surgical operation took place at Islamorada, in the Florida Keys. It had initially been hoped to release the turtle fairly soon afterwards. However, one of the artificial flippers fell off, the bone of this side being too brittle to permit a strong attachment. Attempts to reattach the flipper failed. Evidently the turtle is able to swim with the one front prosthesis.

Support for this newsletter came from H.C. Mittag, Dr. J. Mittag, the University of Toronto and World Wildlife Fund Canada. Opinions expressed in this newsletter are those of the writers and do not necessarily reflect those of the sponsors or editorial staff.

WANTED: HAWKSBILL EGGS!

For a research project on the effects of temperature on sex ratio in turtles, I would like to learn about the pivotal temperatures (temperatures giving 50% of each sex) of hawksbill turtles. It would be necessary to fly the eggs to Toronto as soon after laying as possible. Is there anyone in the Caribbean, in an area with reasonable air connections to Toronto, who would be interested in collaborating? Around 100 eggs would be needed. It is appreciated that hawksbills are not usually abundant in any one area. On the other hand there are particular reasons for obtaining information about the pivotal temperature on this species. Please write to N. Mrosovsky at the address on this page.

DR. N. MROSOVSKY
DEPT. OF ZOOLOGY
UNIV. OF TORONTO
25 HARBORD ST.
TORONTO, ONTARIO

PRINTED MATTER

Mr. George H. Balazs
Hawaii Institute of Marine
Biology, P.O. Box 1346
Kaneohe, Hawaii 96744
U.S.A.

Marine Turtle Newsletter

No. 28 APRIL 1984

Editor: N. Mrosovsky

Departments of Zoology
and Psychology
University of Toronto
Toronto, Ontario
M5S 1A1 Canada

Editorial Advisors:

P.C.H. Pritchard
Harold F. Hirth
Nat B. Frazer

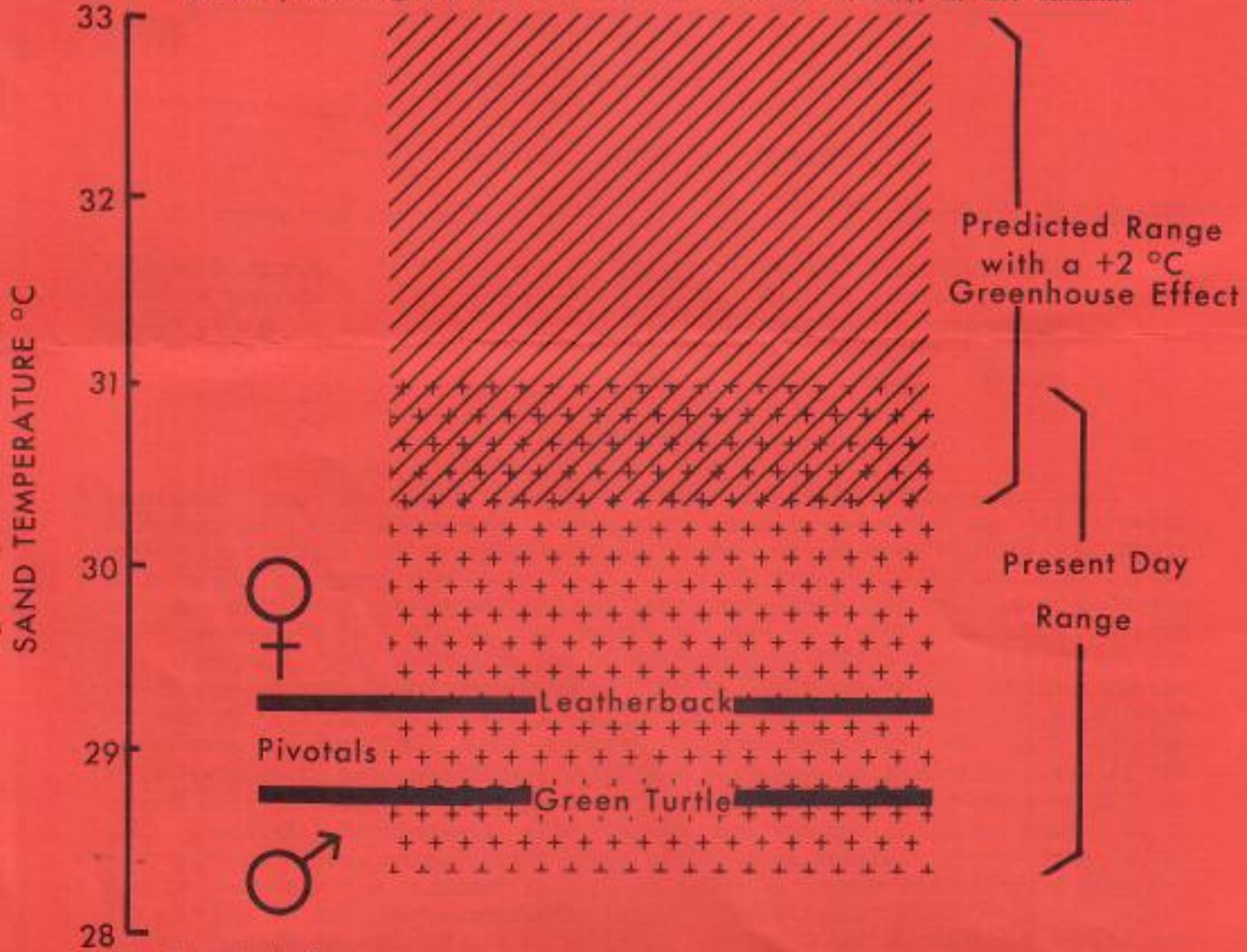
EDITORIAL

Every conservationist has a favourite threat. There are many immediate threats to sea turtles: excessive slaughter, incidental catch, habitat destruction. Whether turtles are classified as endangered or vulnerable, there are urgent tasks for conservationists. There is also a danger of becoming so absorbed in putting out brush fires that the conflagration gathering on the horizon goes unnoticed. Fires, conflagration? Isn't that overdramatizing? But the idea of destruction through heat is not altogether far fetched. Two recent reports estimate that global temperatures could rise by about 2°C, maybe more, in the course of the next century (1983, Environmental Protection Agency, USA; 1983, National Research Council, USA). That may not seem much, but it would be enough to result in a massive feminizing bias in species whose sex is determined by the temperature prevailing during incubation (see Figure p. 2). What would the sea turtles do--in this greenhouse? Assuming that there were sandy beaches left, would their physiologies evolve so that they produced a reasonable number of males as well as females at the new higher temperatures? Would they move? Would loggerheads haul out of the sea for nesting in New England and Tasmania, in Hokkaido and the Bay of Biscay? Would turtles nest at different times of year? Or would a rigidity of behaviour and body doom them to stick to their old ways till the last unrequited female crawled ashore to lay its last unfertilized eggs? We cannot predict, partly because we do not really know what the turtles are doing now. If the world is to warm up, then such topics as the heritability of pivotal temperature (the temperature at which 50% of each sex is produced) and the factors underlying nest-site fixity (the tendency to return to the same place for renesting) become of more than academic interest. And the possibilities of sperm storage and artificial insemination of unmated females become of more than commercial consequence. The cry for immediacy, for 'conservation content' by the relevant granting agencies is all very well, but we also need more--much more--of what is erroneously labelled pure research.

N.M.

See Figure on Page 2

Sand Temperatures (60 cm) in Suriname and Pivotal Temperature
(those producing 50% of each sex) for Turtles Nesting in the Guianas



Based on data from:
1. Mrosovsky, Dutton & Whitmore (ms)
2. Rimblot , Fretey, Mrosovsky, Lescure & Pieau (ms)

WIDECAST MEETS IN PUERTO RICO

The Wider Caribbean Sea Turtle (WIDECAST) Recovery Team held its third meeting at the Universidad del Turabo in Caguas, Puerto Rico, January 24-26, 1984, hosted by the University's Depto. Ciencias y Tecnologia and the Chelonia Society. The Team is composed of 11 non-governmental sea turtle scientists and conservationists representing countries throughout the Caribbean basin. In their attempt to write a Caribbean-wide Action Plan for the conservation of sea turtles, the Team is supported by a WIDECAST Network of over 100 individuals and organizations (both governmental and non-governmental) from the region.

The WIDECAST effort represents a new approach to the conservation of endangered species by building a cooperative Network of governmental and non-governmental human resources on a regional basis. Initial indications are quite promising and plans are already underway to develop similar efforts for sea turtles in the Eastern Pacific and for manatees in the Caribbean. For additional information on WIDECAST activities and organization, please contact: Dr. Jim Richardson, Director Secretariat, WIDECAST, Institute of Ecology, University of Georgia, Athens, GA 30602, USA.

N.F.

RESEARCHER SEEKS INFORMATION ON HAWKSBILL POISONING

Following a recent case of poisoning from eating hawksbill turtle in Tonga in which 18 people became sick and 2 died, information on other known or suspected cases of turtle poisoning in the Pacific is wanted. Please write to G. Balazs, S.W. Fisheries Center, P.O. Box 3830, Honolulu, Hawaii.

RECENT PAPERS

BLAIR, D. 1983. Paramphistomes (Digenea:Paramphistomidae) Parasitic in marine turtles (Reptilia:Chelonia). Aust. J. Zool. 31:851-67. D. Blair, Department of Zoology, University of Canterbury, Christchurch 1, New Zealand.

BRONGERSMA, L.D. and CARR, A.F. 1983. Lepidochelys kempi (Garman) from Malta. Proceedings of the Koninklijke Nederlandse Akademie van Wetenschappen. Ser. C, 86:445. L.D. Brongersma, Rijksmuseum (Natural History), Leiden, Netherlands.

FRITTS, T.H., HOFFMAN, W. and McGEHEE, M.A. 1983. The distribution and abundance of marine turtles in the Gulf of Mexico and nearby Atlantic waters. Journal of Herpetology 17:327-344. T.H. Fritts, U.S. Fish and Wildlife Service, Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico 87131, U.S.A.

McCOY, C.J., VOGT, R.C. and CENSKY, E.J. 1983. Temperature-controlled sex determination in the sea turtle Lepidochelys olivacea Journal of Herpetology, 17:404-406. C.J. McCoy, Section of Amphibians and Reptiles, Carnegie Museum of Natural History, Pittsburgh, Pennsylvania 15213, U.S.A.

STANDORA, E.A., SPOTILA, J.R. and FOLEY, R.E. 1982. Regional endothermy in the sea turtle Chelonia mydas. J. therm. Biol. 7:159-165. E.A. Standora, Department of Biology, State University College at Buffalo, 1300 Elmwood Avenue, Buffalo, NY 14222, U.S.A.

Support for this newsletter came from H.C. Mittag, Dr. J. Mittag, the University of Toronto and World Wildlife Fund Canada. Opinions expressed in this newsletter are those of the writers and do not necessarily reflect those of the sponsors or editorial staff.

FUTURE OF THE MARINE TURTLE NEWSLETTER

Since no major donor has yet been found, the Marine Turtle Newsletter is liable to cease publication shortly. It is, however, hoped that it will be possible to produce one more issue, and it is planned to have this include an index of past issues. Attempts to raise funds are continuing, so it is suggested that interested readers may wish to keep the current editor informed of any changes in address. Should the situation brighten, they will then receive future issues at their correct addresses. Copies of past issues are available in the Library of Congress, Washington DC, and in the British Museum of Natural History.

DR. N. MROSOVSKY
DEPT. OF ZOOLOGY
UNIV. OF TORONTO
25 HARBORD ST.
TORONTO, ONTARIO

PRINTED MATTER

Marine Turtle Newsletter

No. 29 JULY 1984

Editor: N. Mrosovsky

Departments of Zoology
and Psychology
University of Toronto
Toronto, Ontario
M5S 1A1 Canada

EDITORIAL

France has some of the world's major turtle populations under its jurisdiction, and its scientists are active in research on their biology. Some of these investigations are taking place in Metropolitan France itself. Off La Rochelle, Duguy and Duron are studying the behaviour of leatherback turtles. In Paris, Pieau (who discovered the effects of temperature on sexual differentiation in freshwater turtles some 15 years ago) has become interested in sea turtles also. Further from home, Fretey has worked extensively in French Guiana, and published an elegant book on the sea turtles there (see Marine Turtle Newsletter, 1981, 19, 10). He now sends news of a large hitherto unknown aggregation of leatherbacks in Gabon (see below, this issue). There has also been extensive research at the green turtle rookeries on the islands of Europa and Tromelin in the southern Indian Ocean. The effective conservation policy of the French, aided by the remoteness of these places has insured that there still remain considerable numbers of turtles there to protect. Most outsiders have little knowledge of this work. The French territories in the Indian Ocean lie off the more frequented air routes. Also, partly on account of the synthetic nature of the French intellectual tradition, the actual data base for the work on these populations has not been readily accessible. So we are pleased to publish below an article by Le Gall, Lebeau & Kopp that will make at least some of this information more widely known. These data will of course have to be taken into account when the contentious issue of turtle ranching comes up again at CITES. They are also of intrinsic scientific interest. They provide another striking example of fluctuation in numbers nesting from year to year. The green turtles of Europa and Tromelin also exhibit some fascinating differences when compared to those in Costa Rica and Suriname, but to go into these would be trespassing on other information which we hope will be forthcoming from this team soon.

N.M.

MONITORING GREEN TURTLES AT TROMELIN AND EUROPA (Indian Ocean) 1970-1984

An evaluation of research conducted over the last 15 years on populations of green turtles nesting on Tromelin and Europa islands (S.W. Indian Ocean) has been completed. The first observations by Hughes (November 1970, published 1974) were followed up by year-round work in 1973-74 on Europa by Servan (1977) and by Batori (1974) for Tromelin. Systematic surveys during the nesting season have been conducted since 1978-1979 on Europa and since 1981-1982 on Tromelin (Table 1). Each season a 2 to 4 month (November to February) project is set up on both islands in order to assess the number and size of the adult females and the production of hatchlings. This long-term research programme is partially motivated by the development of the turtle ranch on La Reunion. Work by scientists at the nesting beaches includes census of tracks, tagging and intra-season recapture analysis, measurement of females, counting of clutch size and estimating survival rates of hatchlings emerging by day and total survival rates.

Daily counts were made early each morning of tracks of turtles returning to the sea; these are summed over 10 day periods for Tromelin (all beaches) and the Meteorological Station Beach as a long-term reference site for Europa (Table 2). These data demonstrate the inter-annual variation of nesting populations but show no very obvious trends. It is to be noted that the number of tracks recorded on Station Beach, Europa (roughly 50 tracks a night) for the last season (1983-1984), is close to the level observed by Hughes in November/December 1970. A preliminary estimate of the total number of adult females nesting on Europa, derived from data for the last four months of the 1983/84 nesting season, is roughly 8000 females. This is an estimate for the number of individuals nesting in a single year, for the whole island of Europa.

For Tromelin island similar records of tracks over 10 or 30 day periods demonstrate inter-annual fluctuations without clear trends. The numbers of tracks for the 1983/84 season (ca. 80 per night) are about the same as those seen by Batori (1974). Population size estimates for 1982/83 and 1983/84 nesting seasons (October to February) are approximately 1000 nesting females each year.

The number of females tagged (Monel tags) by season and inter-annual recaptures by site (Tables 3 and 4) can be summarized as follows:

Nesting site	Period of tagging	Number of tags	Inter-annual recaptures	% recaptured
Europa	1970-1979	1 125	41	3.64
	1970-1984	4 493	54	
Tromelin	1971-1978	1 058	23	2.17
	1971-1984	3 766	24	

Recapture rates of 2.1 to 3.6% are in the same order of magnitude as those in other intensive tagging studies. The distribution of time-intervals between two recaptures demonstrate a bimodal distribution (4 and 8 years). As quoted by Hughes (1982), for Caribbean green turtles, females return for nesting after two, three (more freqently) and some in four years, or even more.

This monitoring programme (along with extensive data analysis) is to be continued at this level for 1984-1985 nesting season. A programme involving less frequent but carefully selected sampling times will be set up over the following five year period; more intensive studies are anticipated at times associated with the collection of hatchlings for the turtle ranch on La Réunion.

Table 1: Dates of scientific studies, biologists present, and number of tags applied.

	Year	Investigator	Dates	Number Tagged
Tromelin	1971	Hughes	17-10/ 5-11	35
	1973	Batori	19-07/12-09	66
			17-10/10-01	
	1974	Batori	15-06/21-07	409
	1977	Lebeau et al	21-06/12-07	40
			02-12/23-12	508
	1981-82	Kopp et al	06-11/27-01	876
	1982-83	Kopp et al	28-10/24-02	771
	1983-84	Le Gall et al	02-11/06-03	1061
	1984-85	Le Gall et al		
Europa	1970	Hughes	5-11/20-12	383
	1971	Hughes	16-11/17-11	13
	1973-74	Servan	10-02/16-06	
			11-08/20-10	107
			15-12/16-02	
	1977-78	Lebeau et al	06-02/14-06	88
	1978-79	Lebeau et al	07-11/11-02	534
	1979-80	Kopp et al	07-11/11-01	250
	1980-81	Kopp et al	04-11/05-02	604
	1981-82	Kopp et al	05-11/04-02	704
	1982-83	Kopp et al	06-11/02-03	779
	1983-84	Le Gall et al	02-11/28-02	1031
	1984-85	Le Gall et al		

Table 2: Numbers of tracks at Tromelin and Europa Islands.

Tromelin (all beaching sites)

season	1973 1974	1977 1978	1981 1982	1982 1983	1983 1984
months					
11/1-10			370	264	234
11-20	640		327	285	468
21-30	981		413	395	670
12/1-10	890		750	433	728
11-20	894	507	504	625	814
21-31	1 026	790	774	565	782
01/1-10	1 302		876	826	717
11-20			1 088	799	640
21-31				979	650
02/1-10				963	674
11-20				725	587
21-28				659	467

Europa (Meteorological Station Beach)

season	1970 1971	1973 1974	1977 1978	1978 1979	1979 1980	1980 1981	1981 1982	1982 1983	1983 1984
months									
11/1-10	404							169	98
11-20	528			190	43	57	41	169	317
21-30	562			299	58	80	90	190	397
TOTAL		192							
12/1-10				314	42	107	123	207	599
11-20				338	57	159	132	232	362
21-31				163	24	144	120	260	398
TOTAL		263							
01/1-10				209	46	111	210	278	290
11-20				142	46	170	186	293	404
21-31				174	46	163	146	246	340
TOTAL		266							
02/1-10				116	12	116	111	218	356
11-20					10			160	252
21-28								72	144
TOTAL		163							

Table 3: Numbers of turtles tagged and inter-annual recaptures on Tromelin.

Recaptured	70	71	72	73	74	75	76	77	78	79	80	81	82	83
	71	72	73	74	75	76	77	78	79	80	81	82	83	84
Tagged														
1970-71	35													
1971-72														
1972-73														
1973-74				475				5					5	
1974-75														
1075-76														
1976-77														
1977-78								548				9	3	1
1978-79														
1979-80														
1980-81														
1981-82												876		1
1982-83													771	
1983-84														1061

Table 4: Numbers of turtles tagged and inter-annual recaptures on Europa.

Recaptured	70	71	72	73	74	75	76	77	78	79	80	81	82	83
	71	72	73	74	75	76	77	78	79	80	81	82	83	84
Tagged														
1970-71	383								2		1			
1971-72		13												
1972-73														
1973-74				107							1			1
1974-75														
1075-76														
1976-77														
1977-78								88						
1978-79									534		1	5	16	14
1979-80										250			3	3
1980-81											604			6
1981-82												704		1
1982-83													779	
1983-84														1031

Batori. G. 1974. Rapport d'activité. Ile Tromelin. note ronéotypée, 15 pages. Service Meteorologique de la Réunion.

Hughes, G.R. 1974. The sea turtles of South East Africa (I,II). Oceanographic Reseach Institute, Durban, Investigational Reports 35 and 36.

Hughes, G.R. 1982. Nesting cycles in sea turtles, In: Biology and Conservation of Sea Turtles. Bjorndal, K., ed., Smithsonian Institution Press, Washington, D.C., pp. 397-404.

Servan, J. 1977. Ecologie de la tortue verte à l'Ile Europa. Canal du Mozambique--La Terre et la Vie, 16: 421-464.

J.-Y. LE GALL, A. LEBEAU and J. KOPP.
Institut Scientifique et Technique des Pêches Maritimes, B.P. 60 - 97420 Le Port - Ile de la Réunion.

DISCOVERY OF A LEATHERBACK NESTING AREA IN GABON

The information we have concerning the breeding of the Dermochelys coriacea (Vandelli, 1761) on the coasts of Africa is still very sketchy. Several authors have reported the presence of the species in the Gulf of Guinea. Loveridge & Williams (1957) report the nesting of the leatherback in the Mahfa River estuary in Liberia in November, and Pritchard (1971) points out that hatchlings are captured in the Ivory Coast in May. Brongersma (1982) tells of breeding in Ghana (Tema), in Togo and Zaire (at the mouth of the River Congo). Huntley (1974) and Hughes (1982) report the existence of nesting beaches in Angola (in the South of Luanda; Rio Denole; Parque Nacional da Quicama) in December. As far as Senegal is concerned we know, thanks to the research done by Cadenat (1949), Villiers (1957) and more recently by Maigret (1977, 1978, 1983), that breeding is possible between St Louis and Dakar. Yet, we still know very little about this 200-kilometer-long sandy beach. Breeding might also take place between the border and Cape Timiris in Mauritania (Maigret, 1983), another region insufficiently explored. That is why it is extremely interesting to point out a nesting area of the Dermochelys coriacea in Gabon, on the beaches near Libreville, and if we believe the fishermen, on many beaches in the South down to the border of the Congo from October to May. My local informant has seen in the proximity of Libreville about 50 tracks over 4 kilometers. The nests are systematically plundered by the people of Gabon and the eggs are sold at 1,000 Francs CFA to the dozen in Libreville.

Brongersma, L.D. 1982. Marine turtles of the Eastern Atlantic. In, Bjorndal, K. (Ed.), Biology and Conservation of Sea Turtles. Smithsonian Inst. Press, 407-416.

Cadenat, J. 1949. Notes sur les Tortues marines des côtes du Sénégal. Bull. IFAN, 11:16-35.

Hughes, G.R. 1982. Conservation of sea turtles in the Southern African region. In, Bjorndal, K. (Ed.), Biology and Conservation of Sea Turtles. Smithsonian Inst. Press, 397-404.

Huntley, B.J. 1974. Outlines of wildlife conservation in Angola. J. S. Afr. Wildlife Manag. Assoc. 4:157-166.

Loveridge, A. and Williams, E.E. 1957. Revision of the African tortoises and turtles of the suborder Cryptodira. Bull. Mus. Comp. Zool., 115:163-557.

Maigret, J. 1977. Les tortues de mer du Sénégal. Bull. Ass. Avanc. Sc. Nat. Sénég., 59:7-14.

Maigret, J. 1978. Sea turtles nesting on the coast of Senegal. Marine Turtle Newsletter, 8:4.

Maigret, J. 1983. Répartition des tortues de mer sur les côtes ouest africaines. Bull. Soc. Herp. Fr., 28:22-34.

Pritchard, P.C.H. 1971. The Leatherback or Leathery Turtle Dermochelys coriacea. IUCN Monograph 1:1-39.

Villiers, A. 1957. Tortues marines du Sénégal. Science et Nature, 21:17-23.

JACQUES FRETEY,
Laboratoire de Zoologie (Reptiles & Amphibiens), Muséum national d'Histoire naturelle, 25 rue Cuvier, 75005 Paris, France.

REFUGES FOR SEA TURTLES ON THE WEST COAST OF MEXICO

The Intituto Nacional de la Pesca in Mexico has approved the creation of reserves for marine turtles at:

Playa de la Escobilla (Oaxaca)
Morro Ayuta (Oaxaca)
Piedra de Tlacoyunque (Guerrero)
Colola (Michoacán)
Maruata (Michoacán)

Details of methods of implementation are not yet available.

SAVE SEA TURTLES CAMPAIGN: INDONESIA & JAPAN

A pamphlet in Japanese, also available in English, has been produced by the Green Indonesia Foundation (with aid from the Franfurt Zoological Society). Because of the flow of turtle products from Indonesia to Japan, this pamphlet aims to discourage consumption of turtle products in Japan. To obtain copies, or further information, write to: Green Indonesia Foundation, P.O. Box 208, Bogor, West Java, Indonesia; WWF/FAO Conservation Programme, P.O. Box 133, Bogor, West Java, Indonesia; or the Indonesia Directorate of Nature Conservation, (PPA), Jl. Juanda 9, Bogor, West Java, Indonesia.

RECENT PAPERS

BEAN, M. 1983. Turtle trouble on Grand Cayman. Defenders Magazine, Feb/Mar/Apr, pp. 14-19. M. Bean, Defenders of Wildlife, 1244-19th Street, N.W., Washington, D.C. 20036, USA.

BOUR, R. and DUBOIS, A. 1983. Nomenclatural availability of Testudo coriacea Vandelli, 1761: a case against a rigid application of the rules to old, well-known zoological works. J. Herpetol., 17:356-361. R. Bour, Laboratoire des Reptiles et Amphibiens, Muséum national d'Histoire naturelle, 25 rue Cuvier, 75005 paris, France.

BRANDNER, R.L. 1983. A sea turtle nesting at Island Beach State Park, Ocean County, New Jersey. Herp Review 14:110. R.L. Brandner, Department of Herpetology, Bronx Zoo, Bronx, NY 10460, USA.

BURCHFIELD, P.M., FOLEY, F.J. and NOYES, P.T. 1983. Report on Republic of Mexico/United States of America conservation effort on behalf of Kemp's ridley sea turtle at Playa de Rancho Nuevo, Tamaulipas, Mexico, 1983. Report for Instituto Nacional de la Pesca, Mexico, and the U.S. Fish and Wildlife Service, 38 pp. P.M. Burchfield, Gladys Porter Zoo, 500 Ringgold Street, Brownsville, Texas 78520, USA.

CORNELIUS, S.E. and ROBINSON, D.C. 1984. Abundance, distribution and movements of Olive ridley sea turtles in Costa Rica, IV. Report for U.S. Fish and Wildlife Service (Contract 14-16-0002-81-225) 43 pp. plus tables and figures. S.E. Cornelius, R.R. 3, Box 216, Mountain View, MO 65548, USA.

DAVENPORT, J., MUNKS, S.A. and OXFORD, P.J. 1984. A comparison of the swimming of marine and freshwater turtles. Proc. R. Soc. Lond. B220, 447-475. J. Davenport, Marine Science Laboratories, Menai Bridge, Gwynedd, North Wales, U.K.

FLETEMEYER, L. 1983. Sea turtle monitoring project, 1983 Report, Broward County Environmental Quality Control Board. pp 57. J. Fletemeyer, 500 S.W. 14th Court, Fort Lauderdale, Florida, USA 33315.

FORSYTH, A. 1984. On the beach. Equinox magazine 14, 29-48. A. Forsyth, RR 1, Elgin, Ontario, K0G 1E0, Canada.

GOMEZ, E.D. and BALAZS, G.H. 1983. Marine turtle stamps. Chelonian Documentation Center Newsletter 2:15-22. E.D. Gomez, Marine Sciences Center, University of the Philippines, Diliman, Quezon City 3004, Philippines.

GRASSMAN, M.A., OWENS, D.W., McVEY, J.P. and MARQUEZ M., R. 1984. Olfactory-based orientation in artificially imprinted sea turtles. Science 224:83-84. M.A. Grassman, Department of Biology, Texas A&M University, College Station 77843, USA.

KING, R., ANDERSON, A., SHAVER, D. and PLOTKIN, P. 1983 Report. Kemp's ridley sea turtle restoration and enhancement project incubation and imprinting phase. R. King, Padre Island National Seashore, Padre Island, Texas, USA. 32 pp.

MAIGRET, J. 1983. Répartition des tortues de mer sur les Côtes Ouest Africaines. Bull. Soc. Herp. Fr., 28:22-34. J. Maigret, Musée Océanographique, Avenue Saint-Martin, MC 98000 Monaco.

PETER, B. and PETER, G. 1983. Campaign to save the turtles. Chelonian Documentation Center Newsletter 2:29-32. B. and G. Peter, Romerstrasse 2, 7515 Korntal-Munchingen 2, W. Germany.

RAYNAUD, A., FRETEY, J., BRABET, J. and CLERGUE-GAZEAU, M. 1983. Animal Morphogenesis--A scanning electron microscopic study of the epithelial structures appended to visceral arches of the embryos of the leathery turtle (Dermochelys coriacea V.). C.R. Acad. Sc. Paris, t. 296:297-302. A. Raynaud, Laboratoire de Biologie, route de la Glévade, 81330 Vabre, France.

RHODIN, A.G.J. and SMITH, H.M. 1982. The original authorship and type specimen of Dermochelys coriacea. J. Herpetol., 16:316-317. A.G.J. Rhodin, Department of Surgery (Orthopaedics), Yale University School of Medicine, New Haven, Connecticut 06510, USA; and Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, USA.

SCHWARTZ, F.J. and CARTER, D.S. 1984. Pipefish, Syngnathus louisianae, rejected as food by loggerhead turtles, Caretta caretta. ASB Bulletin 31(2):80-81. F.J. Schwartz, Institute of Marine Sciences, University of North Carolina, Morehead City, NC 28557 USA.

SCHWARTZ, F.J. and FRAZER, N.B. 1984. Growth in weight for loggerhead turtles, Caretta caretta, reared in captivity for 14 years in North Carolina. ASB Bulletin 31:81-1. F.J. Schwartz, Institute of Marine Sciences, University of North Carolina, Morehead City, North Carolina 28557, USA.

SCHWARTZ, F.J. and PETERSON, C. 1984. Color and teratological abnormalities of green turtle, Chelonia mydas, hatchlings from North Carolina. Florida Sci. 47:65-68 F.J. Schwartz, Institute of Marine Sciences, University of

North Carolina, Morehead City, North Carolina 28557, USA.

SOLOMON, S.E. 1984. The characterisation and distribution of cells lining the axillary gland of the adult green turtle (Chelonia mydas L.). J. Anat. 138:267-279. S.E. Solomon, Department of Veterinary Anatomy, University of Glasgow Veterinary School, Bearsden Road, Bearsden, Glasgow, G61 1QH, Scotland, U.K.

STANDORA, E.A., SPOTILA, J.R., KEINATH, J.A. and SHOOP, C.R. 1984. Body temperatures, diving cycles, and movement of a subadult leatherback turtle, Dermochelys coriacea. Herpetologica 40:169-176. E.A. Standora, Dept. of Biology, State University College, 1300 Elmwood Ave., Buffalo N.Y. 14222 U.S.A.

WHITAKER, R. and CHANDRA SHEKAR KAR. 1984. Arribada. Sanctuary Asia, 4(2):140-149. R. Whitaker, Madras Snake Park, Deer Sanctuary, Guindy Madras 600 002, India.

WOOD, J.R., WOOD, F.E., CRITCHLEY, K.H., WILDT, D.E. and BUSH, M. 1983. Laparoscopy of the green sea turtle, Chelonia mydas. Brit. J. Herpetol., 6:323-327. J.R. Wood, Cayman Turtle Farm, Ltd, Box 645, Grand Cayman, Cayman islands, B.W.I.

SPECIAL PUBLICATION FROM COCHIN, INDIA

Sea Turtle Research and Conservation, 1984, Bulletin 35, pp. 1-82, of the Central Marine Fisheries Research Institute (P.B. 1912, Cochin 682 018, India) was published in February. It contains papers by E.G. Silas, M. Rajagopalau, M. Vijayakumaran, A.B. Fernando and S.S. Dan. Titles of papers are 1. Sea turtle research and conservation--some problem areas 2. Recovery programme for olive ridley Lepidochelys olivacea (Eschscholtz, 1829) along Madras Coast 3. Yolk utilization in the egg of the olive ridley Lepidochelys olivacea 4. Are turtle eggs cleidoic or non-cleidoic? 5. Food intake and conversion in hatchlings of olive ridley Lepidochelys olivacea fed animal and plant food 6. Studies on the growth of olive ridley Lepidochelys olivacea in captivity 7. Some health problems observed in the hatchlings and juveniles of sea turtles in captivity 8. Observations on turtles at sea and in the Lakshadweep 9. Turtle poisoning 10. Observations on the mass nesting and immediate post-mass nesting influxes of the olive ridley Lepidochelys olivacea at Gahirmatha, Orissa--1984 Season.

COCHIN SYMPOSIUM: ANNOUNCEMENT

A symposium on Endangered Marine Animals and Marine Parks will be held in Cochin, India, 12-16 Jan 1985. Sea turtles will be considered along with other species. People wanting to contribute papers or further information, write to: The Convener, Symposium on Endangered Marine Animals and Marine Parks, Marine Biological Association of India, Post Box No. 1244, Ernakulam, COCHIN - 682 011, Kerala, India.

A NOTE ON THE RIDLEYS OF HOPE ISLAND (ANDHRA PRADESH, INDIA)

On the east coast of India, one of the marine turtles, Lepidochelys olivacea, a Schedule I species (a totally protected species) under India's Wildlife Protection Act, 1972, breeds annually (Bustard, 1976). There is no

systematic survey on the nesting of olive ridleys on the Andhra Pradesh coast (Kar, 1983).

To save these turtles from illegal slaughter and incidental catch, protective measures were taken by different state authorities after the letter-writing campaign (Marine Turtle Newsletter, 1983, 25, 1-2) to the Prime Minister of India. However, still there are reports on the illegal slaughter and incidental catch from about October to February along the Andhra coast. During a preliminary survey (Feb. 11-18, 1984) of Kakinada, Andhra Pradesh ($16^{o}57'N$, $77^{o}12'E$), I found many carcases of ridleys. These were reported to be incidentally caught by mechanised trawlers along this coast where 1207 registered trawlers were moving every day. The possibility of their having drifted ashore from elsewhere also cannot be ruled out. Mating turtles in the sea and females on the shore are habitually caught by the fishermen of this coast for food.

During a survey (Feb. 17-18) on Hope Island ($16^{o}49'$ - $16^{o}59'15"N$, $81^{o}19'36"$ - $81^{o}22'36"E$), 7 nautical miles east to Kakinada, I found 25 carcases of recently dead olive ridleys in a 10 kms stretch. Average measurements were: carapace length - 69 cms; carapace width - 65 cms and plastron length - 53 cms. 15 old ridley skulls were also found.

According to fishermen, this island is a good nesting site for ridleys. However, beside fishermen, jackals are the primary predators of the eggs. A total of 9 predated nests were found. No undisturbed nests were found. Fishermen reported that if they happen to see turtle tracks they will dig the nests to take away the eggs for food. On 18th February at 5.30 a.m., I saw two fishermen on the island searching for eggs.

I strongly suggest the following conservation measures to be taken in Andhra Pradesh.

1) Surveys should be conducted during October to May (nesting season) to locate the nesting sites and make counts.

2) Poaching should be controlled by patrols during nesting season.

3) Port and Fisheries departments should be instructed to ban inshore use of trawlers and fishing nets during mating and nesting seasons. This can be better achieved if this island is declared a Marine turtle sanctuary of the state of Andhra Pradesh.

4) Turtle excluder devices (TED--Marine Turtle Newsletter, 1982, 12, 1-2), should be used to control the incidental catch by mechanised trawlers.

5) A hatchery should be set up on Hope Island to incubate eggs under protected conditions.

The above work was conducted during the tenure of a Senior Research Fellowship sanctioned by Council of Scientific and Industrial Research, New Delhi.

Bustard, H.R. 1976. World's largest sea turtle rookery, Tiger paper, 3, 3.

Kar, C.S. 1983. Notes on Marine turtles in Andhra Pradesh Coast, India. Marine Turtle Newsletter, 25, 4-6

R.J. RAO
Department of Zoology, Saifia College, Bhopal (M.P.) India 462 001.

SEA TURTLE WORKSHOP HELD IN INDIA
(from Hamadryad, May 1984, 9(2) p. 14)

The Central Marine Fisheries Research Institute (CMFRI), the Madras Crocodile Bank and the Indian Sea Turtle Specialist Group jointly organized a sea-turtle workshop from 27 to 29 February in Madras, as a first step toward coordinating sea turtle conservation and research in India. The workshop was inaugurated by Mr. S.A. Subramani, Secretary, Forests and Fisheries, Tamil Nadu and attended by about 40 representatives from the CMFRI, MSPT, MCBT, various State Forest Departments, universities, non-governmental organizations and naturalists. The afternoon sessions of the last day were devoted exclusively to hearing State Status Reports from participants and recommendations for future research and conservation strategies for India. The proceedings of the workshop will be published as a special bulletin by the CMFRI, Post Bag 1912, Cochin 682 018, India. (The Recommendations from this workshop have already been published in a separate pamphlet, 11 pp.--editor.)

HONOLULU WORKSHOP ON MARINE DEBRIS

This will be held 26-29 Nov 1984. Abstracts of papers are requested by 1 August. The fate and impact of marine debris will be discussed. For details write to: Richard S. Shomura, Honolulu Laboratory, Southwest Fisheries Center, National Marine Fisheries Service, P.O. Box 3830, Honolulu, Hawaii 96812, USA.

GULF OIL CONSERVATION AWARD FOR JACK WOODY

Jack B. Woody of the US Fish and Wildlife Service will receive a bronze plaque, citation and $500 in recognition of his efforts on behalf of sea turtles. The award from Gulf Oil also honours his work on the whooping crane, American alligator, and other species. Some information about his work with Kemp's ridley appeared in the Marine Turtle Newsletter, 1981, 19:5-6 and 13.

CAPTIVE BREEDING OF THE KEMP'S RIDLEY

For the past four years Cayman Turtle Farm has reared a number of Kemp's ridleys (J.R. Wood, Marine Turtle Newsletter 20, 6-7). As of 1 April this group consisted of 39 five-year-old and 4 four-year-old animals. Sex ratio is 1.00:1.05 (M:F), with four animals of undetermined sex. In April occasional mating was observed. On 14 May, following the discovery of eggs in one of the four fiberglass tanks in which the ridleys were housed, all 43 ridleys were weighed, re-tagged, measured, and transferred to the large breeding pond. During the transfer procedure, eggs were found in the cloaca of one female (wt. 24.5 kg, curved carapace length 53.3 cm). At 0010 hr 20 May, 62 eggs were laid on the artificial beach by a different female weighing 20.0 kg and with a curved carapace length of 48.3 cm. Nesting behaviour was as previously described for the species. The majority of the eggs within the clutch have begun development. A full report of the reproductive success of this captive population of Kemp's ridley will be forthcoming at the close of the season.

JAMES R. WOOD and FERN E. WOOD
Cayman Turtle Farm (1983) Ltd., P.O. Box 645, Grand Cayman, B.W.I.

Stop press. Three ridleys hatched but died soon after - editor.

SO EXCELLENT A FISHE: REVISED EDITION (by A. CARR)

From the cover: "First published in 1967, So Excellent a Fishe is a lively and authoritative account of sea turtles written by one of the world experts in the field of marine turtle ecology. It has been brought up to date with an epilogue that highlights important developments of the last seventeen years, and many new photos."

Charles Scribner's Sons (P.O. Box 310, Riverside, New Jersey, 08370 USA) 280 pages, $19.95.

Support for this newsletter came from H.C. Mittag, Dr. J. Mittag, the University of Toronto and World Wildlife Fund Canada. Contributions from M. Camhi, J. Cardinali, G.R. Hamilton, D. McMahon, I. Naylor, J. O'Hara, W.E. de Ruyter F.J. Schwartz, I. Westbrook, R. Witham and an anonymous donor are gratefully acknowledged. Opinions expressed in this newsletter are those of the writers and do not necessarily reflect those of the sponsors or editorial staff.

Marine Turtle Newsletter

No. 30 AUGUST 1984

Editor: N. Mrosovsky

Departments of Zoology
and Psychology
University of Toronto
Toronto, Ontario
M5S 1A1 Canada

Editorial Advisors:

P.C.H. Pritchard
Harold F. Hirth
Nat B. Frazer

EDITORIAL

This is the last issue of the Marine Turtle Newsletter to be produced by your present editor. At the same time he is happy to announce that it has been possible to find not only a new editor but also funds to enable him to start off in good financial health. Dr. Nat Frazer will be taking over the editorship. He has already contributed by preparing the index which rounds out this issue. The Fish and Wildlife Service (USA) have been very supportive and helpful, and have encouraged the continuation of the newsletter. Some funds have been promised by the Cayman Turtle Farm (1983), with contributions coming without any conditions about editorial policy. Other money from a conservation organization had strings attached and was sent back by an intermediary. Your editor certainly hopes his successor will introduce changes and improvements, but he is also confident that the newsletter will continue to reflect a variety of approaches to conservation.

A change in editorship is a good time to look back as well as forward. Starting with a distribution of less than 100 in 1976, the circulation of the Marine Turtle Newsletter climbed rapidly to around 800, spread over some 80 different nations. In some of these places conservationists, game wardens, biologists and government officials lack access to good libraries and work on meagre budgets. By sending out the newsletter free of charge it has been possible to provide up to date information to some of those who most need it but are least likely to be able to afford it. This has been largely possible because of donations from Dr Judith Mittag and her family. World Wildlife Canada have provided considerable support on various occasions. It is also a pleasure to acknowledge useful unsolicited contributions from a number of individuals.

Many of our readers have also helped by responding to calls for letter writing. Through such campaigns the Marine Turtle Newsletter has supported conservation initiatives in Mexico, India and Ascension Island. Its items have been taken up by other media. The editorial advisors have played a significant part in all these activities.

In the rush to keep up with everything, there have been some regrettable typographical and other errors. The other side of this has been that lists of new papers have been circulated very soon after they appeared. And the newsletter itself has provided accounts of important findings. That sea turtles take many years to mature, that their sex ratio is influenced by temperature, that they contain magnetisable material, and that slices of plastron can be transplanted to form living tags--these were all first published in the Marine Turtle Newsletter (Nos. 10, 11, 15, 19).

All this has been as educational and exhilirating for the editor as for anyone else. Then why give it up? One reason is to devote more time to scientific work. Another is disillusion with the amount of conservation politics involved. Not being editor may make it easier to become engaged in the problem solving side of particular turtle issues, and to speak out on others, without creating difficulties in running the newsletter. Beyond these personal reasons, there are merits, in principle, of rotating people through jobs and offering opportunities for new approaches. Turtle conservation may be weaker if it is dominated by too narrow a set of ideas. We should welcome turnover in committees, thinking, editorships. So welcome to our new editor, and please address further correspondence and contributions to him: Nat Frazer, Woods Hole Oceanographic Institute, Woods Hole, Mass. 02543 USA.

N.M.

Support for this newsletter came from H.C. Mittag, Dr. J. Mittag, the University of Toronto and World Wildlife Fund Canada. Opinions expressed in this newsletter are those of the writers and do not necessarily reflect those of the sponsors or editorial staff.

INDEX TO THE MARINE TURTLE NEWSLETTER, Nos. 1-30

AUTHOR INDEX

SUBJECT INDEX

NAT B. FRAZER
Woods Hole Oceanographic Institution
Woods Hole, MA 02543 USA