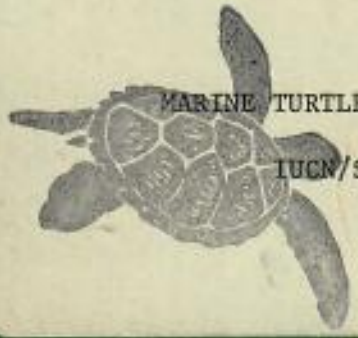

MARINE TURTLE NEWSLETTER

IUCN/SSC

Marine Turtle Newsletter

IUCN/SSC

No. 1. AUGUST 1976

Editor: N. Mrosovsky*

Editorial Advisor: Archie Carr

EDITORIAL

Efforts are going on all over the world to save marine turtles from extinction. Marine turtles are widely distributed and their migrations take them across international boundaries. These facts complicate both arriving at an understanding of their biology and devising the necessary measures for their conservation. Given this situation, the authorities at IUCN and the members of the IUCN Marine Turtle Specialist Group felt that better communication between workers in different parts of the world was needed.

The aim of this newsletter is:

1) to provide a forum for exchange of information about all aspects of marine turtle biology and conservation

2) to alert interested people to particular threats to marine turtles, as they arise.

The letter will appear at irregular intervals, depending on the amount of new information and any particular circumstances calling for action on the part of conservationists.

Recipients of this first newsletter can help by letting the editor know if he has their correct mailing address, and also who else should receive the newsletter. A yellow form has been provided for this at the end of the newsletter. In addition, any comments, suggestions or items for inclusion would be welcome. Please remember that people in other parts of the world may be interested to learn what you are doing and what the turtle situation is in your area. This letter is being sent to people in more than 30 different countries.

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*Address all correspondence to: N. Mrosovsky
Departments of Zoology and Psychology
University of Toronto
Toronto. M5S 1A1 Canada.

IUCN PRINCIPLES ON SEA TURTLES

After consulting with various people and organizations, the Survival Service Commission of the IUCN issued the Principles and Recommendations on trade in sea turtles printed below. You are strongly encouraged to bring these principles to the attention of any organization involved in trade in sea turtle products, government departments, consumers, manufacturers, local press carrying advertisements for turtle products, etc.

(Editor)

From the IUCN Bulletin, April 1975, Vol 6, No 4.

SSC issues 'Principles' on trade in sea turtles

In response to the concern expressed in a decision of the 42nd meeting of the Survival Service Commission regarding the rapidly expanding trade in sea turtles and their products, the Secretariat of IUCN, in consultation with the Co-Chairmen of the SSC Marine Turtle Specialist Group, convened an ad hoc meeting to "review the commercial exploitation of marine turtles with special reference to the state and implications of turtle farming and, if possible, to reduce the result of such review to a statement of principles".

This meeting took place at Miami, Florida, USA, on 21 - 23 November 1974. The resulting Statement was accepted by the 44th meeting of the Survival Service Commission on 7 - 8 March 1975, and is now issued as the Commission's 'Principles and Recommendations'.

PRINCIPLES AND RECOMMENDATIONS

1. Because the majority of the distinct populations of Chelonia (green turtles) are extinct, threatened or rapidly declining, the entire group should be considered endangered.

2. The reasons for the extinction and decline of populations include particularly exploitation for meat, hides, eggs and other products (including souvenirs), massive killing of turtles in the trawl nets of fishing fleets as well as increasing habitat destruction and disturbance.

3. The situation has become even more critical with the expansion of international commercial trade in sea turtles and their products.

4. As regards trawling, urgent attention should be given to encourage the use of nets designed to minimize undesirable catches of turtles, and research into this question whould be given funding priority.

5. As regards souvenirs, the taking and preparing of turtles and turtle products for the primary purpose of souvenirs should be strongly discouraged.

6. As regards primary exploitation (meat, hides, eggs), where it can be demonstrated that local turtle populations can tolerate exploitation, and the desire or necessity is present, this should be done only by peoples traditionally dependent on them, with methods ensuring minimal waste and for local utilization. The diversion of wild sea turtle resources from traditional use by local people, or the expansion of that use, to satisfy or extend the demands of international commerce, is condemned.

7. It is emphasized at this point that there is a distinction between turtle farming and turtle ranching; a turtle farm implies that the unit is completely independent of wild stocks; a turtle ranch is a unit dependent on wild populations for eggs or turtles with the animals kept in varying degrees of captivity (H. Hirth, FAO Fisheries Synopsis No. 85, "Synopsis of Biological Data on the Green Turtle", December 1971).

8. Further, in recognition of the deteriorating energy and food resources of the world, it is advocated that wherever possible any turtle culture be maintained at the lowest applicable trophic level.*

9. Farming objectives which lead to the expansion of existing markets resulting possibly in an increased exploitation of wild turtles are unacceptable. However, it would be consistent with the foregoing principles to accept turtle farming whose products will replace wild turtle products in existing traditional markets. The acceptability of any farm should be demonstrated by suitably designed and independently evaluated tests and data. Moreover, those ranching endeavours satisfying the above conditions and which can be shown not to harm wild turtle populations are also acceptable.

10. Funds should be provided for the preparation of informative pamphlets to promote the application of the foregoing principles and immediate measures should be taken to ensure the early implementation of such action as is necessary to conserve the marine turtle resource in accordance with these principles.

11. Nearly all the considerations stated for Chelonia may be applied with equal force to populations of the six other species of marine turtles.

* All organisms are classified as producers, primary consumers (herbivores), secondary consumers (carnivores), or decomposers according to the place they occupy in the food chain of an ecosystem. This placement is termed 'trophic level'. Therefore, hervivorous species should subsist on a diet based on plant protein and carnivorous species on animal protein.

THE TAG LOSS PROBLEM

(based on information provided by G.H. Balazs, G.R. Hughes, J.P. Schulz, G.S. de Silva and Siow K.T.)

A persistent problem in assessing turtle populations is that tags often come off or are shed by the turtles. Mostly people just do the best they can without ever addressing this important problem directly. In fact there are at least two practical questions here:

1) how to prevent tag loss, in particular what kind of tag is best?

2) how frequent is tag loss? This information is necessary for making population estimates based on tag returns.

On the first question, what type of tag is best, opinion seems to be divided. For instance, on a recent visit to Trengganu, Malaysia, Mr. Siow Kuan Tow (State Director for Fisheries, Kuala Trengganu, Malaysia) informed me that in the leatherback conservation programme plastic tags (Jumbo Rotatag, Dalton, Henley, England) had been substituted for monel tags because tag loss with the latter was too great. On the other hand, in S. Africa, plastic tags were given up sometime ago and monel metal substituted instead. More recently Dr. G.R. Hughes (P.O. Box 662, Pietermaritzburg, Natal, S. Africa) writes: "Regrettably a substantial number of loggerheads had lost their tags and the callusses appear to be those remaining after the loss of plastic tags although some callusses were clearly those resulting from the loss of monel tags. A not inconsiderable number of monel tags were removed and replaced with new ones because the originals were corroded, some very badly."

It is conceivable, of course, though not very likely, that one kind of tag would be better for one population and another kind for another. But without quantitative assessment of tag loss in these cases, it is not possible to tell whether this is the case, or whether either the monel metal or the plastic tag is superior.

There seem to be very few studies on tag loss. However, in Surinam Schulz (1975, Zoologische Verhandelingen, 143, p 61-62) marked 80 newly tagged green turtles with paint. Within one month 12 of these had been seen on the beach again with the paint mark still visible, but without the tag (metal tag). "The actual number of animals that lost their tag has been estimated at 15-20%, a figure based on a calculation which included the estimated number of turtles that had lost both paint mark and tag". In whatever way one does the calculations, at a minimum certainly 15% of the tags were lost ... within a month! Schulz points out that there are several reasons why tags are lost, including poor tagging and loss through corrosion.

Corrosion of tags has been documented recently by Mr. G.H. Balazs (Institute of Marine Biology, P.O. Box 1346. Kaneohe, Hawaii, U.S.A.). He has a collection of tags recovered from sea turtles; their disintegrating and battered state is a dismal sight for any turtle researcher. Correspondence between Mr. Balazs and the manufacturers of the monel metal tag indicated that working of the metal to and fro might cause cracks which would result in deterioration of the metal. On the positive side, this company (National Band and Tag Company, 721 York Street, Newport, Kentucky, USA) is looking into the possibility of producing a tag made from a more corrosion resistant material. This is known as Iconel, an alloy containing nickel. The cost of tags made from Iconel is higher than that of monel metal tags. The exact cost however depends on how many of these tags are ordered. Combined orders will reduce the prices. People interested should communicate direct with George Balazs. He also has information and views on what size of tag is best. However, it must be added that Iconel has not yet been given long-term trials on marine turtles, and some method of assessing the reliability of this kind of tag would surely be desirable.

How might reliability of tags be assessed then? Mr. Stanley de Silva (Office of Chief Game Warden, Peti Surat 311, Sabah, Malaysia) is launching on an experiment that should help resolve some of these issues. He has undertaken to double tag green turtles nesting near Sandakan, Sabah; on one flipper there will be a monel metal tag and on the other flipper a plastic tag. If this experiment can be carried out with large enough numbers of turtles and for long enough, it should not only establish which kind of tag is superior, at least for the Sabah turtle populations, but also provide estimates of the chances of loss occurring with each of these two kinds of tag. Such estimates will be valuable in helping to assess trends in turtle populations based on tag returns. Perhaps someone should try something along similar lines with the new Iconel tag.

Meanwhile, anyone with information or views on the tag loss problem is urged to share them with other biologists by writing to this newsletter. N. Mrosovsky.

TOM HARRISSON : OBITUARY

Professor Tom Harrisson, Co-Chairman of the Marine Turtle Group, and his wife Christina, were killed in a road accident in Bangkok last January.

Tom was an incredibly versatile individual who has left his mark in many fields. His contributions to sea turtle conservation were enormous. Before the Japanese occupation the turtle egg industry of the Sarawak Islands (Talang 2 Besar, Talang 2 Kechil and Satang), off the southwest coast of Borneo, had been in the hands of a few prominent Malay families. In 1941 the industry was placed under a Turtle Trust Ordinance to be administered by the Curator of the Sarawak Museum. In 1947, Tom Harrisson became Curator of the Museum. He took charge of the Turtle Islands, instigated regulation of the exploitation there, and established a tagging program. His adoption of a monel metal cow-ear tag as a fin-clip, replacing the unsatisfactory shell-tags previously used, was a milestone in sea turtle research procedure. On July 4, 1956, a turtle that had been tagged at one of the rookery islands three years before returned to nest. This was the first remigration of a tagged turtle; and since then, hundreds of similar returns recorded at the Sarawak rookery and elsewhere have shown that the three-year absence

represented the predominant intermigratory interval of the species. Tom's frequent short published accounts of his conservation problems and achievements at the islands attracted worldwide attention, which surely lengthened the survival-expectancy of Chelonia. When he died, the Turtle Group lost an irreplaceable officer, the green turtle a staunch benefactor, and the surviving Co-Chairman a valued friend.

Archie Carr

NOTES ON TURTLE CONSERVATION IN NATAL

Hatchling Taggings:

1974/75 season was quite successful in that 11635 loggerhead hatchlings were marked and released of which only one has been recovered on the Cape Peninsula 1200 miles south of the release area. The hatchling had taken at least 2 months and at most 3½ months to travel the distance. It is the 8th hatchling recovered out of 33,000 marked over 4 seasons.

Adult Populations:

The loggerhead population was of average size this past season (1974/75) and there has been only a slight increasing trend over 12 years of protection. However, 49.7% of the nesting females encountered had nested in either one, two or three seasons before this season.

The leatherback population during the 1974/75 season was the best ever. After an annual handling figure averaging 21 p.a. for 10 years the 1973/74 season saw the number go to 54 and 1974/75, 65 animals were handled. This was partly due to improved patrolling techniques but the number of nests recorded (a more dependable record) increased from 356 to 510, so this was indeed a promising increase.

George Hughes
Natal Parks, Game and Fish Preservation Board,
P.O. Box 662, Pietermaritzburg,
Natal, S. Africa.

TURTLE PROGRAMME IN BAJA CALIFORNIA, MEXICO

The "Tortuga Prieta" (Green Turtle, Chelonia mydas carrinegra) is the commonest turtle found on the S.W. coast of the peninsula and within the Gulf of California. This species is highly prized for its meat and the skin and flippers are included in stews made from it. The skin is not of very high quality and does not make good leather; it is therefore used almost entirely for food. The entire Peninsula has been surveyed but no nesting grounds have been found for this species. It is noteworthy that most of these dark coloured turtles caught within the Gulf of California are immature, small in size (60%) and that neither the adult males or adult females are in a reproductive state.

The 'Tortuga Golfina' (Pacific or olive ridley, Lepidochelys olivacea) begins to become abundant in the S.W. part of the peninsula and within the gulf itself. There are nesting grounds on the South of Magdalena Bay and around the cape.

In addition to the work mentioned above, the abundance of turtles within the gulf has been determined, and a complete study made of the fishing industry and allowable catches specified.

Turtles are caught all along both coasts; nets with 90 cm mesh are used, or turtles are harpooned from boats (1 ton capacity) with outboard motors.

Translated from an account by : Biol. René Márquez M.
Programa de Tortugas Marinas
Instituto National de Pesca México
México, D.F.

Loggerhead Turtle Newsletter

A newsletter about loggerhead turtles in the United States has been started. The first loggerhead newsletter describes projects in various parts of the United States, and plans to develop a centralized data bank, computer programmes, and distribution of uniform data sheets.

Interested people should contact:

Charles R. LeBuff
Caretta Research
PO Drawer E, Sanibel Island
Florida, 33957, USA

RECENT PAPERS

Reference	Address of Author
Bacon, P.R. 1975. Review of research, exploitation and management of stocks of sea turtles in the Caribbean region. FAO Fisheries Circular, No. 334, FAO Rome. (useful compilation of facts on the current situation and a plea for more coordination and communication)	P.R. Bacon, Dept. of Biological Sciences, University of West Indies, Trinidad.
Balazs, G.H. 1976. Sea Turtle Conservation. 'Elepaio: Journal of the Hawaii Audubon Society, 36 # 7. (account of efforts to have green and loggerhead turtles put on the USA Federal register of endangered species, with the implication that USA government authorities are unduly delaying taking action on these matters)	G.R. Balazs Hawaii Institute of Marine Biology, P.O. Box 1346, Kaneohe Hawaii, USA 96744.
Balazs, G.H. 1976. Green turtle migrations in the Hawaiian Archipelago. Biological Conservation, 9, 125-140. (tagging of turtles, both at nesting and while basking away from their nesting area, indicates that that turtles from two widely separated locations converge for reproduction to a central site in the Hawaiian Archipelago)	G.R. Balazs Hawaii Institute of Marine Biology P.O. Box 1346, Kaneohe Hawaii, USA 96744.
Carr, A. 1975. The Ascension Island Green turtle colony. Copeia, 3, 547-555 (on tag recoveries, nest site fixity, internesting intervals, and discussion of nomenclature and whether different populations of green turtle are sub-species).	A. Carr, Dept. of Zoology, University of Florida Gainesville Florida, USA.
Carr, A. & Stancyk, S. 1975. Observations on the ecology and survival outlook of the hawksbill turtle. Biological Conservation, 8, 161-172.	A. Carr, Dept. of Zoology, University of Florida Gainesville Florida, USA.

(new data on stomach contents and an updated summary of information on the hawksbill collected at Tortuguero)

Cornelius, S.E. 1975. Marine Turtle mortalities along the Pacific Coast of Costa Rica, Copeia, 1, 186-187

Stephen E. Cornelius,
Dept. of Wildlife & Fisheries,
Texas A & M University,
College Station,
Texas 77843, USA.

(a report on massive die offs of turtles in 1972)

Felger, R.S., Cliffton, K. & Regal, P.J. 1976. Winter dormancy in Sea turtles: independent discovery and exploitation in the gulf of California by two local cultures. Science, 191, 283-285.

R.S. Felger,
Arizona-Sonora Desert Museum
P.O. Box 5607,
Tuscon, Arizona, 85703,
USA.

(remarkable discovery providing many possibilities for learning more about sea turtles - unfortunately dormant turtles are extremely vulnerable and large numbers are already being taken.)

Hirth, H.F. & Schaffer, W.M. 1974. Survival rate of the green turtle, Chelonia mydas, necessary to maintain stable populations. Copeia, 2, 544-546.

H.F. Hirth,
Dept. of Biology,
University of Utah,
Salt Lake City,
Utah, 84112, USA.

(contains calculations relevant to conservation programmes and turtle ranching operations)

Hughes, G.R. 1974. The Sea turtles of South-East Africa 1. Status, morphology and distributions. II. The biology of the Tongaland loggerhead turtle Caretta L. with comments on the leatherback Dermochelys coriacea L. and the green turtles Chelonia mydas L. in the study region. Oceanographical Research Institute (2 West Street, Durban, South Africa), Investigational Reports Nos. 35 and 36.

G.R. Hughes,
Natal Parks,
P.O.Box 662,
Pietermaritzburg,
Natal, South Africa.

(extensive data on many aspects of marine turtle biology, including work on populations in Europa Island; emphasis on role of temperature in ecology; presentation of information in great detail especially valuable)

Hughes, G.R. 1975. The Marine turtles of Tongaland, 8. The Lammergeyer 22, 9-18.

G.R. Hughes,
Natal Parks,
P.O. Box 662
Pietermaritzburg,
Natal, South Africa.

(recovery of notched hatchling loggerheads, cautions on assessing growth of adults by over-the curve measurement and data on numbers nesting)

Mrosovsky, N. & Shettleworth, S.J. 1975. On the orientation circle of the leatherback turtle, Dermochelys coriacea. Animal Behaviour, 23, 568-591.

N. Mrosovsky,
Dept. of Zoology,
University of Toronto,
Toronto M5S 1A1,
Ont. Canada.

(experiments comparing sea-finding behaviour in leatherbacks and green sea turtles)

Schulz, J.P. (1975) Sea turtles nesting in Surinam. Zoologische Verhandelingen, No. 143, 1-143, & 28 plates.

(account of 9-10 years work, full presentation of data in 26 tables, detailed description of populations, behaviour habitat, and geophysical factors; a major contribution and essential reading for anyone interested in sea turtles).

J.R. Schulz,
Surinam Forest Service,
P.O. Box 436,
Paramaribo,
Surinam.

Suwelo, I.T. 1975. Turtle breeding at Sukamade Banyuwangi. Oseanologi di Indonesia, 4, 13-20.

(an account of nesting of green turtles in the Meru Betiri Nature Reserve, including numbers, seasonality, and conservation problems. Text in Indonesian, English Abstract).

Ismu Sutanto Suwelo
Jurusan Biologi
Fakultas Ilmu Pasti
dan Abam
Universitas Indonesia
Jakarta, Indonesia.

Thayer, G.W., Wolfe, D.A., & Williams, R.B. 1975. The impact of man on seagrass systems. American Scientist, 63, 288-296.

(basic information on role of seagrass in food chains and estuarine ecology, values for productivity, and results of destruction of seagrass).

G.W. Thayer
Atlantic Estuarine
Fisheries Centre,
Beaufort, NC 28516
USA

Yoshie, S. & Honma, Y. 1976. Light and scanning electron microscopic studies on the esophageal spines in the Pacific ridley turtle, Lepidochelys olivacea. Archivum Histologicum Japonicum, 38, 339-346.

(suggests spines are used for breaking food into small pieces).

S. Yoshie
Nippon Dental College
(Dept. Oral Anatomy)
Hamaura-cho 1-8
NÜgata 951
Japan

Marine Turtle Newsletter

IUCN/SSC

No. 2. JANUARY 1977

Editor: N. Mrosovsky* Editorial Advisor: Archie Carr

IMPORTS OF HAWKSBILL TURTLE SHELL IN JAPAN

based on information provided by Dr. Itaru Uchida,
Director,
Himeji City Aquarium,
Tegarayama, Himeji City,
670, Japan

Dr. Uchida writes to us that the following amounts of hawksbill turtle shell were imported in Japan over a 5 year period:

1971	35,207 kg.
1972	41,747 kg.
1973	72,963 kg.
1974	34,283 kg.
1975	36,667 kg.

This information came from the "Japanese Tortoise Shell Association Newsletter", 1976, v. 7, p. 3, printed in Nagasaki City, Japan. The existence of such a newsletter will be of interest in itself to people outside Japan.

Another point of interest is the drop in imports after 1973. Dr. Uchida is of the opinion that this is related to the convention on international trade in endangered species of wild fauna and flora. However, Japan has not ratified this convention and it is likely that hawksbill shells will still be available from other countries that also have not ratified this convention.

In 1975 the greatest imports to Japan were from:

Panama	9,313 kg.
Cuba	6,100 kg.
Indonesia	4,328 kg.
Singapore	2,702 kg.

Other countries supplying over 1,000 kg. in 1975 were: The Philippines, Kenya, Tanzania, Nicaragua and the Cayman Islands. Fuller information is in the Japanese Tortoise Shell Association Newsletter mentioned above.

All the figures given here refer to registered imports. Dr. Uchida thinks that unregistered import of hawksbill shells to Japan is relatively minor.

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Toronto, M5S 1A1 Canada.

Returning to registered imports, a total of 220 metric tons of hawksbill shell were imported into Japan between 1971 and 1975. It is difficult to translate this into numbers of turtles, but one estimate is that about 240,000 hawksbills were involved. The price of the shells is known, and for the 220 metric tons mentioned, was 2,963,143,000 yen (approximately $9.87 million, USA).

In summary:

1) Imports of hawksbill shells to Japan are clearly many thousands of turtles each year. (Suppose a hawksbill provides on average .91 kg. of scutes, then for 1975 alone, more than 40,000 hawksbills were involved).

2) It is possible that the convention on international trade in endangered species has, at least temporarily, reduced this trade. Another interpretation is that heavy buying occurred in 1973 in anticipation of the convention. In either case efforts to stimulate more governments to ratify this convention could have beneficial effects on the outlook for hawksbills.

3) It would be of interest to hear from Dr. Uchida, in the future, what actions he thinks might be appropriate, especially any by people outside Japan.

NOTES ON TURTLE CONSERVATION IN MALAYSIA

based on information sent by Encik K.W. Scriven,
Director, World Wildlife Fund Malaysia,
P.O. Box 769, Kuala Lumpur, Malaysia.

At Rantau Abang 72,000 leatherback eggs have been placed in the hatchery this year. Two new sanctuary areas are planned and it is hoped these will be established and protected by next May. The Government is providing M$75,000 for the establishment of a laboratory-research station, and it is hoped also to have an information centre which will be outside the sanctuary area. Details of a film showing the nesting of the leatherback and the hatching of the eggs will be announced in a future newsletter.

OLIVE RIDLEY TURTLES AND LEATHERBACKS FOUND IN THE SOLOMONS

On February 8th a Fisheries Division training team surprised two Olive Ridley turtles (Lepidochelys olivacea) mating on the surface off Guadalcanal. The turtles were hand-captured and taken back to Honiara where they were measured, weighed, tagged and photographed before being released in the same area as captured.

The Fisheries Division of the Solomon Islands Ministry of Natural Resources have started a Turtle project which although aimed at fishery management of the relatively common green (Chelonia mydas) and Hawksbill (Eretmochelys imbricata) species is also investigating the rarer species of turtles found in this area. A substantial population of the Leatherback (Dermochelys) and nesting areas have been identified which indicates that in the Solomons these creatures are not as rare as was commonly supposed. The Olive Ridleys captured were however the first recorded specimens of that species captured in the area. The male weighed 80 lbs. and shell back measured 27" x 26½", the female weighed 85 lbs. and shell back measured 28" x 27".

Part of the turtle programme involves a tagging exercise and anyone finding any species of turtle bearing tags from the Solomon Islands is asked to return them with as much information as possible on weight, size, condition and place and time of capture to Fisheries Division, Ministry of Natural Resources, Honiara. A reward will be paid.

R.H. James,
Principal Fishery Officer,
Ministry of Natural Resources, Honiara,
Solomon Islands

INDONESIAN MARINE TURTLE SPECIALIST GROUP

An Indonesian Marine Turtle Specialist Group has been formed. Its Chairman is:

Mr. I.N. Sumertha,
Indonesian Marine Turtle Specialist Group,
D/A Bagian Biologi Perikanan, Faperikan,
Institut Pertanian Bogor,
Bogor, Indonesia.

Several reports of marine turtles in Indonesia have already been written (see RECENT PAPERS, below). Turtle biologists visiting this area are urged to contact Mr. Sumertha.

WEST JAVA TURTLES ALMOST EXTINCT

The turtle populations at the southern part of the west Java coast have almost become extinct. They are scattered along the coast of Ciamis, Tasiknalaya, Garut and Cianjur. A turtles' breeding site at the Sukabumi sea coast, for instance, is visited only by less than 100 turtles during the breeding season today. People stated that this is due to continuous illegal hunting for years. Hundreds of young turtles were released several years ago in order to keep the biological equilibrium of the population.

The west Java Fishery Service has released about 1,200 young turtles recently, at the Southern part of the west Java sea coast, in Ciamis, Garut, Cianjur, Cipatujah and Pangandaran.

Kidrat Ikrasaputra, a staff member of the fishery service reported that during the fiscal year of 1975/1976 the Government assisted with a special fund of about 4.2 million rupiahs to support the program.

extracted from the Indonesian Nature and
Science Newsletter No. 18, June 1976

TAHITI ?

Mr. D.J. Brandon, (Turtle Project Officer, Department of Fisheries, Box 96, Rarotonga, Cook Islands, South Pacific), would appreciate hearing from anyone who knows of biologists and fisheries officers concerned with marine turtles in Tahiti.

BOOK AND FILM REVIEWS

This newsletter will review books and films concerning marine turtles if copies are sent to the editor. The editor reserves the right not to review material that is considered inappropriate.

MORE ON THE TAG LOSS PROBLEM

A number of letters on tag loss have been received. The relevant excerpts of those letters are printed below with only minor editorial changes.

1. Tagging of Leathery Turtles (Dermochelys coriacea) in Trengganu, Malaysia.

Rantau Abang in the State of Trengganu, Malaysia is one of the two known major nesting beaches for the Leathery Turtle (Dermochelys coriacea). The 12 miles nesting beach is facing the South China Sea. Turtles start to come in early April, and by the end of September, they disappear completely.

Trial tagging was conducted by the late Dr. E. Balasingam of the University of Malaya in 1966. The work was reported in the Malayan Nature Journal vol. 25 (1972) by Balasingam and Tho Yow Pong as follows.

"During the trial tagging two types of tags were used to mark and identify the female turtles, namely Monel metal tags and plastic tags. The former was obtained from the National Band and Tag Company, U.S.A. The plastic tags which are ordinary cow tags were obtained from Dalton Supplies, United Kingdom. Both types of tags were fitted on to the animal with the aid of tag applicators. The tags are applied approximately half way down the fore flipper and about 1½-2 inches from the trailing edge of the flipper. The plastic tags were applied on the right flipper and the Monel metal tags on the left flipper.

Some initial difficulties were experienced in the application of the tags. This was particularly true of the Monel tags, some of which did not fit firmly into the flippers. This was possibly due to the fact that the flippers were too thick to accommodate the tag's clinching mechanism. Another common snag was that the turtle's flipper being rather fleshy, the Monel tags, especially when loosely applied, tended to enlarge the perforation and tear the flesh at the region of the application. A number of Monel tags were lost in this manner after tagging. The plastic tags on the other hand were far more satisfactory because they were easy to apply and fitted well into the flippers. Among turtles which returned to nest after tagging, no losses of the plastic tags were recorded.

The most satisfactory time for the application of tags was when the turtle had just finished egg-laying. The turtle then did not react adversely to the application of the tags."

Following the successful application of the plastic cow tag, full scale tagging was launched in 1967. Personnel engaged by the Fisheries Department patrolled the entire nesting beach throughout the night starting in April and ending in September, recording and tagging all turtles coming ashore. Up to the end of this year's season a total of 9,533 tags were applied. The return of tagged

turtles is satisfactory, and a number of reports on sighting of the tagged turtle were received from Japan, Philippines, and Indonesia. In 1973 orange coloured tags with the appeal "Please release this turtle and inform Fisheries Department Kuala Trengganu, Malaysia" were introduced to replace the original white tags with numbers only.

So far only a few turtles were found with enlarged holes on the right flipper indicating the loss of the plastic cow tag. However, these tags might have been removed by human beings as one report in 1972 informed us that the tag was removed and kept as a souvenir before the turtle was released.

On the whole, we found that the plastic cow tag or the "Jumbo Rototag" as the supplier calls it, is satisfactory for this tagging work, and it has the following advantages over the metal Monel tag:

1. It is easy to apply.
2. It secures firmly on the flipper.
3. It does not corrode.
4. It can have the colour wanted and with wording printed.

Siow Kuan Tow,
State Director of Fisheries,
Kuala Trengganu, Malaysia.

2. Tagging of Green Turtles in the Galápagos.

Between 1970 and 1975, Peter Pritchard, Miguel Cifuentes (now Intendente del Parque Nacional de Galápagos), and various assistants of Pritchard tagged about 800 green turtles. The tagging took place only during the nesting season and on selected nesting beaches, thus all animals, apart from a couple of males, were females. From Sept. '75, two beaches were studied for 5 1/2 months. At least 95% of the turtles nesting on Quinta Playa that season were tagged (315 tagged). Since the study started in September, we have used a double tagging system - the standard monel cattle ear tag on the right foreflipper and a coloured plastic tag (Jumbo Rototag, Dalton, Henley, England) on the trailing edge of the right hindflipper. In the latter case a hole is made first with a leather punch in order to prevent buckling during insertion. Results so far have showed advantages and disadvantages of both. For nesting females on Quinta Playa, 3 out of 315 lost their metal tags but none lost their plastic ones. On Baltra, it was the reverse - out of 165 tagged, 3 lost the plastic ones and yet no metal ones were lost. On two occasions a plastic tag has been found near a net, where an entangled tagged turtle managed to free itself from the net but having its tag wrenched off during the process. With some turtles tagged either at the nesting beaches or at the feeding grounds, the plastic tags became covered with a filamentous green alga within a month which in a couple of cases made the number (but not the colour) unreadable. This is perhaps indicative of a sedentary type of existence. The numbers on plastic tags could be read either on the beaches or whilst in the water without disturbing the turtles at all, whereas with the metal tags turtles either have to be caught in the water or disturbed while nesting in order to read the numbers. On the other hand, a turtle tagged in 1970 by Peter Pritchard was seen nesting again this year (1976) - its tag in perfect condition and easily readable. One important advantage that the plastic tag has over the metal one is that it is fixed outside the flipper and can be seen to be good or not, whereas the metal one joins inside the flesh and can only be tested by trying to pry it apart.

We will continue to use the double tagging system as it serves our purposes - VIZ plotting inter-island migration (a different colour for each nesting beach and feeding lagoon readily identifies the place tagged) and our efforts to determine the most suitable type of tag to use.

Derek Green,
Principal Field Investigator,
Galápagos Green Sea Turtle Ecology Study,
Estacion Biologica Charles Darwin,
Isla Santa Cruz,
Galápagos.

3. Tagging at Aves Island, Venezuela.

At Isla Aves, where I have been tagging since 1971, tag loss through failure of monel cattle ear tags is a major problem. For example, last year, we had two remigration returns with tags and twenty without. The latter were unquestionable tag losses which carried a callus with a central perforation in the area we normally position the tag. Additional possible tag losses with flippers torn or suspiciously scarred in that area were tallied separately.

This rate of loss does not reflect poor application techniques. Because of the small number of turtles handled each season (150-200), each tag is examined for proper clenching before an animal is released. As an aside, the number of tags damaged in application has been reduced by pre-punching a hole through the flipper with a modified vise grip welding clamp. This is a quick procedure and almost assures proper clenching.

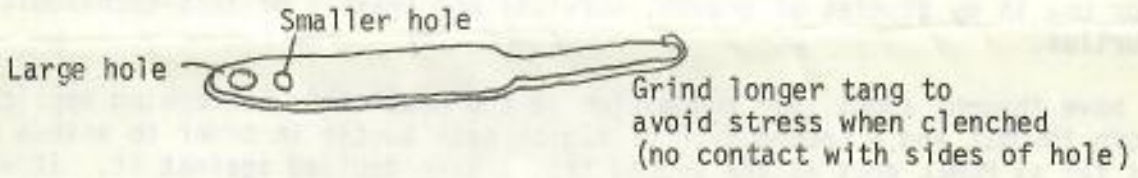
Based on the use of a fairly permanent secondary mark, the rate of tag loss during our brief tagging season at the nesting site (3-6 weeks) is almost nil, contrary to Schulz's experience. Since the tag loss problem became apparent two years ago, we have been cutting coded notches in the marginal bones using a simple system derived from my computer work, which permits individual recognition of animals independent of the monel tags. We had a number of remigration returns from two years ago. On all animals retaining tags from two years ago, the notches had healed partly but the numerical code remained readily and unambiguously readable. No animal which bore a tagging scar in the flipper, but no tag, was notched.

The sample of recovered tags I have examined is small, but at least one shows significant corrosion and in another the clenched tip appeared to have been gradually straightened out. A significant proportion of smaller tags (chicken-wing) of the same style which were applied to animals held in captivity for a year showed corrosion and some were ready to break in the portion of the tag embedded in the flipper tissue.

My overall impression is that in a corrosive environment like sea water the monel tags in common use today are designed to self destruct at the small retaining bar which holds the clenched tip of a closed tag. Corrosion is excited at sharp, deformed corners, such as are adjacent to the bar and will produce cracks, eventually causing it to break away. The implication in the IUCN Marine Turtle Newsletter (No. 1, 1976) that some sort of relative motion is necessary for crack formation is erroneous, but it would accelerate the process.

Cursory comparison of the tags I used this year with a few recovered examples suggests that the width of the retaining bar on the tags varies from year to year (presumably different dies) and I would be inclined to predict that survival of the tags used this year will be relatively poor because of more severe distortion at the end of the bar.

The form and mode of application of the present tag are convenient, but it needs to be redesigned so that there are no sharp corners in the closure. A minimum modification approach would be to lengthen the tang which is clenched and put round holes in the lower bar (see sketch).



A change of materials for the tag would be beneficial, but would not eliminate the need for tag redesign. Contrary to the statement of the Newsletter (no. 1, 1976) the present alloy, Monel, Inconel, and a third Chromel A (which was suggested to me as the most resistant) all contain substantial amounts of nickel:

	Fe	Mn	Cu	Ni	Cr
Monel	1.5	1.0	20	67	
Inconel	5			80	15
Chromel A				80	20

Inconel work hardens rapidly so probably some modifications of the current tag-making process would be required. I do not favor a shift to a plastic tag, because, despite the superior resistance of some plastics to sea water, they are vulnerable to abrasion long-term.

William E. Rainey,
Island Resources Foundation,
P.O. Box 4187, St. Thomas,
U.S. Virgin Islands 00801.

4. Comments on Inconel Tags.

I now have 3,000 specially produced INCONEL tags. The National Band and Tag Company gave me the product that I asked for. Now only time will tell if they are as corrosion resistant as the alloy specialist at Huntington Alloys, International Nickel, predicted they would be. Contrary to Mr. Rainey's

interpretation about relative motion being necessary for crack formation, the statement in the IUCN Marine Turtle Newsletter (no. 1, 1976) is in reference to "working" of the metal in the manufacturing process, that is, in the process of forming the metal into strips, and shaping and stamping in the tag production process. This "works" the metal and can cause microscopic cracks.

Again, corrosion doesn't always take place at the locking mechanism in MONEL tags. It most often takes place where the tag is in contact with the internal tissue. Granted, this is usually the locking mechanism end, but frequently the tag will move around to another site, sometimes intermediate between the locking end and the curved end. In such cases, the number or return address will become obliterated.

As you may recall, my main purpose in working so hard and long on this INCONEL project was to have an intermediate size (#681) tag of superior corrosion resistance for use in my studies of growth, survival and travels of less-than-adult size turtles.

I have thought about your suggestion in the newsletter concerning application of both INCONEL and a second type of tag on each turtle in order to assess performance. As far as MONEL goes as the second tag, I have decided against it. It would seem to me that by placing INCONEL and MONEL on the same turtle I might be creating a situation analogous to a storage battery. That is, dissimilar metals immersed in the body fluids. Perhaps I would be creating the conditions that would cause the alloys to deteriorate (though electrolysis). Perhaps I will try a plastic (chemically inert) tag as a second comparison.

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

RECENT PAPERS

Reference	Address of Author
Balazs, G.H. 1976. Hawaii's seabirds, turtles and seals. World Wide Distributors Ltd., Honolulu.	George H. Balazs Hawaii Institute of Marine Biology P.O. Box 1346, Kaneohe Hawaii 96744, U.S.A.
(pamphlet with popular text, mostly photographs including ones of basking green turtles)	
Christensen, R.M. 1976. Special Report: Green sea turtle farming. Chelonia, 3(2), 2-6.	R.M. Christensen "Chelonia" 772 Spruce Street California, 94118, U.S.A.
(an account of the turtle "farming" controversy and the battle over whether turtle products should be legalized or banned in California; gives names of those involved and includes criticism of actions by IUCN)	

Fretey, J. and Lescure, J. 1976. Guyane française: les infortunes de la turtue marine. La Recherche, 70, 778-781.

J. Fretey
Musée d'Histoire Naturelle
(Reptiles et Poissons)
25 rue Cuvier
75005 Paris, France

(22,000 hectares have been decreed nature reserves in French Guiana, including coastal areas that are perhaps the world's most important leatherback rookery, but the authors fear that the authorities will be slow to put this into effect; slow progress in turtle conservation in French Guiana is contrasted with the situation in adjacent Surinam; description of leatherback habitat, predators, etc. In French)

Ireland, L.C., Frick, J.A. and Wingate, D.B. 1976. Open sea orientation of the hatching green sea turtle, Chelonia mydas. Bulletin of the Psychonomic Society, programme of 17th Annual meeting, p. 245 (abstract only)

Leonard C. Ireland
Department of Psychology
Oakland University
Rochester, Mi.. 48063
U.S.A.

(hatchlings were equipped with transmitters and tracked by night; once out to sea they were not distracted by lights)

Lazell, J.D. 1976. This Broken Archipelago. Quadrangle, New York.

James D. Lazell, Jr.
Massachusetts Audubon Society
Lincoln, Mass. 01773
U.S.A.

(book on herpetofauna of Cape Cod and nearby islands; includes information on marine turtles)

Márquez M.R. 1976. Estado actual de la pesqueria tortugas marinas en México, 1974. Instituto Nacional de Pesca. Serie Information no. 146, 1-27.

René Márquez Millan
Instituto Nacional de Pesca
Apartado Postal 79-052
México 7, D.F.
México

(data on the extent of Mexican turtle fisheries from 1948-1973, showing declines in recent years; recommendations include making illegal the taking of turtles below minimum size; proposed legal carapace lengths in cms given for various species. In Spanish)

Márquez, M.R. 1976. Reservas naturales para la conservación de las tortugas marinas de México. Instituto Nacional de Pesca. Serie Informacion no. 183, 1-22.

René Márquez Millan
Instituto Nacional de Pesca
Apartado Postal 79-052
México 7, D.F.
México

(maps, estimated numbers nesting, seasons and present protection given for marine turtles nesting in Mexico; aims to be a basis for urgently needed changes in regulation.. In Spanish)

Milsom, W.K. and Johansen, K. 1975. The effect of buoyancy induced lung volume changes on respiratory frequency in a Chelonian (Caretta caretta). Journal of comparative physiology, 98, 157-160.

(when weights are added to turtles, lung volume changes and buoyancy is maintained)

William K. Milsom
Department of Zoology
University of British Columbia
Vancouver, B.C. V6T 1W5
Canada

Milsom, W.K. 1975. Development of buoyancy control in juvenile Atlantic loggerhead turtles, Caretta c. caretta. Copeia, no. 4, 758-762.

(ability to control buoyancy development over the first year; lung volumes also increase over this time)

William K. Milsom
Department of Zoology
University of British Columbia
Vancouver, B.C. V6T 1W5
Canada

Musquera, S., Massegú, J. and Planas, J. 1976. Blood proteins in turtles (Testudo hermanni, Emys orbicularis and Caretta caretta. Comparative Biochemistry and Physiology, 55 3a, 225-230.

S. Musquera
Departmento de Fisiología Animal
Facultad de Biología
Universidad de Barcelona
Spain

Prange, H.D. 1976. Energetics of swimming of a sea turtle. Journal of experimental biology, 64, 1-12.

(swimming speeds, oxygen consumption and drag measurements on juvenile green turtles; estimates that Brazil-Ascension Island round trip by an adult would require 21% of body mass in fat stores)

H.D. Prange
Department of Zoology
Gainesville, Florida 32611
U.S.A.

Sumertha, I.N. et al. 1976. Study of the marine turtle habitat in Pangumbahan Island, Sukabumi. Report from the Institut Pertanian, Bogor. 57 pp.

(lists both terrestrial and marine vegetation in the area, shows graphs of egg production related to rainfall; gives sand particle size on beaches used by different turtle species. Text in Indonesian)

I.N. Sumertha
Fakultas Perikanan
Institut Pertanian Bogor
Bogor, Java, Indonesia

Witham, P.R. 1976. Evidence for ocean-current mediated dispersal in young green turtles, Chelonia mydas (Linnaeus). M.Sc. Thesis, University of Oklahoma, Norman, Oklahoma.

(tag returns of "head started" turtles; data on growth rates of hatchlings on different diets)

P.R. Witham
Florida Department of Natural Resources
P.O. Box 941, Jensen Beach
Florida 33457
U.S.A.

Worth, D.F. and Smith, J.B. 1976. Marine turtles nesting on Hutchinson Island, Florida, in 1973. Florida Marine Research Publications no. 18, 1-17.

(nesting patterns and numbers of turtles surveyed in order to evaluate possible effects of the operation of a nuclear power plant in this area; data on predation on nests included)

Dewey F. Worth
Marine Turtle Studies
P.O. Box 974
Jensen Beach, Fla. 33457
U.S.A.

FLORIDA INTERREGIONAL CONFERENCE ON SEA TURTLES

A conference on marine turtles was held at the Florida Institute of Technology, Jensen Beach Campus, Florida, on July 24 - 25, 1976. This was sponsored by the Florida Department of Natural Resources, Marine Research Laboratory. Although it had been expected originally that the conference would be quite small, there were 119 registered participants at the meeting, attesting to the great interest in this topic. The proceedings of this meeting will probably be published later. Meanwhile here is a list of papers presented.

C.H. Dodge
Congressional Research Service
Library of Congress
Washington, D.C. 20540 U.S.A.

Effect of temperature on incubation time of box turtle (Terrapene carolina carolina - Linne) eggs and post-natal development: applicability to sea turtle conservation and mariculture.

Hilton Bruch
Department of Zoology
University of Georgia
Athens, Georgia 30602 U.S.A.

An analysis of hatchery results from twelve years of loggerhead conservation efforts.

P. Ross Witham
P.O. Box 941
Jensen Beach, Fla. 33457 U.S.A.

Methods and facilities for pen-rearing the green sea turtle, Chelonia mydas.

H.G. Haines and G. Rebell
Department of Dermatology
University of Miami
School of Medicine
P.O. Box 520875
Biscayne, Annes
Miami, Fla. 33152 U.S.A.

Review of infectious diseases of mariculture green turtles.

D.W. Owens and J.R. Hendrickson
Department of Zoology
Colorado State University
Fort Collins, Colorado 80523 U.S.A.

Endocrine studies on the green sea turtle, Chelonia mydas.

R.E. Isaacks, D.R. Harkness and P.R. Witham
1201 N.W. 16th Street
Miami, Fla. 33125 U.S.A.

Relationship between the major phosphorylated metabolic intermediates and oxygen affinity of whole blood in the loggerhead (Caretta caretta) and the green turtle (Chelonia mydas) during development.

T.H. Richardson
LCI Loggerhead Turtle Research
University of Georgia
Athens, Georgia 30602 U.S.A.

Variations in nesting behavior of loggerheads: studies of individual turtles.

H.O. Hillestad, M.H. Smith and D.O. Straney
University of Georgia
203 Forestry Building
Athens, Georgia 30602 U.S.A.

Genetic variability in loggerhead and green sea turtles.

O.R. Talbert, J.M. Will and J.M. Dean
Belle W. Baruch Institute
University of South Carolina
Columbia, S.C. 29208 U.S.A.

Nesting beach orientation in adult and hatchling loggerhead sea turtles (Caretta caretta).

J.I. Richardson, H.O. Hillestad and C. Ruchdeschal
Department of Zoology
University of Georgia
Athens, Georgia 30602 U.S.A.

Site specificity of loggerheads in the St. Andrews Sound area of Georgia.

R. Bell
Box 3127
Jekyll Island, Georgia 31520 U.S.A.

Thirteen years of tag recoveries from the Little Cumberland Island loggerhead turtle project.

E.J. Schwartz
Institute of Marine Sciences
University of North Carolina
Moorehead City, N.C. 28557 U.S.A.

Behavioral and tolerance responses to natural cold winter water temperatures by three species of sea turtles in North Carolina.

J. Bennett and K. Kleerekoper
Biology Department
Texas A&M University
College Station, Texas 77843 U.S.A.

Some laboratory observations on locomotor responses of the hatchling and juvenile green turtle, Chelonia mydas, to chemical stimulation.

P.C.H. Pritchard
Florida Audubon Society
P.O. Drawer 7
Maitland, Fla. 32751 U.S.A.

Marine turtles of the U.S. Pacific Trust Territories (Micronesia): Distribution, survival status, and conservation needs.

L.M. Ehrhart and R.G. Yoder
Florida Technological University
P.O. Box 25000, Orlando,
FLA 32816, U.S.A.

The marine turtles of the Merritt Island National Wildlife Refuge, Kennedy Space Center, Florida.

Lt. Col. Joe Brown
Florida Marine Patrol
202 Blount Street
Tallahassee, Fla. 32304 U.S.A.

Florida's enforcement of marine turtle conservation laws.

H.R. Bullis, Jr., and S. Drummond
75 Virginia Beach Drive
Miami, Fla. 33149 U.S.A.

Sea turtle captures off south-eastern United States by exploratory fishing vessels, 1950-1976.

J.I. Richardson
Department of Zoology
University of Georgia
Athens, Georgia 30602 U.S.A.

Population estimates for nesting loggerheads in the St. Andrews Sound area of Georgia.

René Marquez M.
INP, Apartado Postal 79-052
México 7, D.F. México

Natural reserves for the conservation of marine turtles of Mexico.

Kavanaugh Francis
P.O. Box 2067
South Padre Island
Texas 78578 U.S.A.

The atlantic ridley sea turtle conservation programs at South Padre Island, Texas, and Rancho Nuevo, Tamaulipas, Mexico.

T.M. Mann
3763 N.W. Fourth Ave.
Apt. 1
Boca Raton, Fla. 33431 U.S.A.

The impact of developed coastline on nesting and hatching sea turtles in south-east Florida.

L.H. Ogren and D.R. Ekberg
N.M.F.S., Gulf Fisheries Center
P.O. Box 4218
Panama City, Fla. 32401 U.S.A.

National sea turtle program.

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Marine Turtle Newsletter

IUCN/SSC

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Editor: N. Mrosovsky* Editorial Advisor: Archie Carr

EDITORIAL

Many readers will already know that last November an important event for the conservation of marine turtles took place. At a meeting in Berne, Switzerland, all species of marine turtle, except the flatback (Chelonia depressa) were listed on Appendix 1 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora. However, it is only now that the impact of this should begin to be felt because countries party to the convention had 90 days in which to have rules about the new agreements in force, that is till Feb. 4th, 1977. It has not been possible to meet this date in all cases but at least by now the necessary administrative and legal steps should be in progress. Input from a concerned public to the relevant authorities, given below, could have important effects in insuring that new regulations on marine turtle products are going to be effective and taken seriously. For those unfamiliar with the convention further details, together with some suggestions for action, are given below.

Looking much further ahead, if more and more nations ratify the convention, and if those that already have abide by the spirit as well as the letter of the convention, then efforts to conserve sea turtles could change direction. Rather than worrying about the threat from expanding markets in luxury items and souvenirs, much more emphasis can be put on devising rational management policies for the use of this resource at a local level. This side of conservation is often even harder and more complex. For sea turtles it requires long-term programmes with careful monitoring of populations, and controlled experiments to assess how much can be harvested to give maximum sustainable yields. All this takes years of work because of the long life cycle of sea turtles and because populations even of the same species differ so much. And in some areas the numbers are so low that anything other than absolute protection threatens their survival. Many years must be allowed for numbers to build up, and quick answers on how to manage sea turtles should not be expected. But the present listing on Appendix 1 on the convention places the emphasis where IUCN thinks it should be, on the use of this resource for local peoples (see Principles, IUCN Marine Turtle Newsletter No. 1, 1976). If international trade in turtle products declines, most countries will only have themselves to blame if they lose their marine turtles.

INFORMATION ON THE CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES

All trade in species on Appendix 1 of the convention requires both an export permit from the country of origin and an import permit from the country of destination. However, countries that have ratified the convention have agreed not to grant import permits, unless they are satisfied that the species on Appendix 1 are not to be used for commercial purposes.

Following a meeting in November 1976 in Berne, all species of marine turtle, except the flatback, Chelonia depressa, were placed on Appendix 1.

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Toronto, Ontario M5S 1A1, Canada

However, it is still possible for a country to enter a special reservation exempting itself from the provisions of the treaty as applied to a particular species. For instance, there have been fears that West Germany, a centre of the turtle soup industry, might decide to do this. At the November meeting in Berne the West German delegate vigorously opposed the move to protect green turtles from which most of the soup is made. Exceptions for animals bred in captivity are also possible in certain circumstances.

Each country that ratifies the convention must name a Management Authority and must take the necessary legal and administrative steps to implement the convention. Below are listed the countries that have already ratified the convention, together with the address of the Management Authorities, if known.

Brazil. Instituto Brasileiro de Desenvolvimento, Florestal (IBDF) do Ministerio da Agricultura. Palacio do Desenvolvimento, Setor Bancario Norte, 13° andar, 70000 Brazilia - DF Brazil.

Canada. The Administrator, Convention on International Trade in Endangered Species, Canadian Wildlife Service, Department of the Environment, Ottawa, K1A OH3, Canada.

Chile. Servico Agricola y Ganadero (SAG), Ministerio de Agricultura, Santiago, Chile.

Costa Rica. Departmento de Pesca Continental y Vida Silvestre, Ministerio de Agricultura y Ganaderia, San Jose, Costa Rica.

Cyprus. Ministry of Agriculture and Natural Resources, Nicosia, Cyprus.

Ecuador. Ministerio de Agricultura y Ganaderia, Quito, Ecuador.

Federal Republic of Germany. Bundesminister für Ernäbrung Landwirtschaft und Forsten, Rochusstrasse 1, 5300 Bonn-Duisdorf, Federal Republic of Germany.

Finland. Maa - ja Metsatalousministerio,Ministry of Agriculture and Forestry, Bureau of Natural Resources, Hallituskatu 3 A, 00170 Helsinki 3 A, Finland.

German Democratic Republic. Ministerium für Land, Forst und Nahrungsgüterwirtschaft, der Deutschen Demokratischen Republik, DDR-1157 Berlin, German Democratic Republic.

Ghana. Department of Game and Wildlife, P.O. Box M 239, Accra, Ghana.

India. The Director of Wildlife Preservation, Government of India, Ministry of Agriculture and Irrigation, Department of Agriculture, Krishi Bhaven, New Delhi - 110001, India.

Iran. Department of the Environment, P.O. Box 1430, Tehran, Iran.

Malagasy Republic. Direction des Eaux et Forets et de la Conservation des Sols, B.P. 243, Tananarive.

Mauritius. The Conservator of Forests, Forest Service, Curepipe, Mauritius.

Morocco. Comite National de l'Environment, Direction de l'Environment, Ministere de l'Urbanisme, de l'Habitat, du Tourisme et de l'Environment, Rabat, Morocco.

Nepal. Not available.

Niger. Ministere de l'Economie rurale et du Climat, Niamey, Niger.

Nigeria. Not available.

Norway. The Royal Ministry of Environment, Myntgaten 2, P.O.Box 8012, Oslo-Dep., N - Oslo 1, Norway.

Pakistan. Mr. A. M. Khattak, Inspector General of Forests/Member Secretary, Government of Pakistan, Ministry of Food, Agriculture, Cooperatives, Under-Developed Areas and Land Reforms (Food and Agriculture Division). National Council for Conservation of Wildlife, Bungalow No. 4-G, St.No.: 51, F.6/Islamabad, Pakistan.

Papua New Guinea. The Conservator of Fauna, Department of Natural Resources, P.O. Box 2585, Konedobu, Papua, New Guinea.

Paraguay. Not available.

Peru. Direecion General Forestal y de Fauna, Natalio Sanches 220, 3er. piso, Jesus Maria, Lima, Peru.

South Africa. The Secretary, Department of Planning and the Environment, Private Bag X 213, Pretoria 0001, South Africa.

Sweden. Lantbruksstyrelsen, Vallgatan 6, S-551 33 Jonkoping, Sweden.

Switzerland. Office veterinaire federal, Thunstrasse 17, 3005 Berne 6, Switzerland.

Tunisia. Direction des Forets, 36, rue Alain Savary, Tunis, Tunisia.

Union of Soviet Socialist Republics. Not available.

United Arab Emirates. Not available.

United Kingdom of Great Britain and Northern Ireland. Department of the Environment, 17/10 Rochester Row, London SW1P 1LN, England.

United States of America. Chief, Federal Wildlife Permit Office, U.S. Fish and Wildlife Service, U.S. Department of the Interior, 18th and C Streets N.W., Washington, D.C. 20240, U.S.A.

Uruguay. Presidente del Insituto Nacional para le Preservacion del Medio Amblente, Ministerio de Education y Cultura, Sarandi 444, Montevideo, Uruguay.

Zaire. Le Commissaire d'Etat a l'Environment, Conservation de la Nature et Tourisme Boite Postale 12348, Kinshasa/Gombe, Zaire.

SUGGESTIONS FOR ACTION

1. If turtle products are still being sold in countries that have ratified the convention, check with Management Authorities that they are satisfied that the products come from stocks imported prior to the convention.

2. Ask Management Authorities what steps they are taking to enforce the provisions of the convention with respect to sea turtles.

3. Make the provisions of the convention known to retailers and to the general public through local media; encourage the customs authorities to publicize these provisions. For example, travellers to Canada are often given a pamphlet by the customs. As well as covering the usual things like how many cigarettes and bottles of alcohol can be imported, it also refers to the convention on trade in endangered species. This pamphlet is also widely distributed by local travel agents.

N. M.

RECENT PAPERS

Reference	Address of Author
Cornelius, S.E. 1976. Marine turtle nesting activity at Playa Naranjo, Costa Rica. Brenesia, 8, 1-27. (documentation of nest site preferences, long nesting season and unusually small size of green turtles, olive ridleys and leatherbacks on this beach).	Stephen E. Cornelius Department of Wildlife & Fisheries Texas A&M University College Station Texas 77843, U.S.A.
Frick, J. 1976. Orientation and behaviour of hatchling green turtles (Chelonia mydas) in the sea. Animal Behaviour, 24, 849-857. (hatchling turtles tracked for several kms.; non-random headings maintained even when turtles out of sight of land, but one group of turtles taken out to sea in a boat and then released showed poor orientation).	J. Frick P.O. Box 293, Lincoln Massachusetts 01773 U.S.A.
Hughes, G.R. 1976. Irregular reproductive cycles in the Tongaland loggerhead sea-turtle, Caretta caretta L. (Cryptodira: Chelonidae) Zoologica Africana, 11, 285-291. (plastic tags "useless", increase in recovery rates following switch to monel tags; author concludes that 40-50% of loggerheads in Tongaland nest only once in their life time).	G. R. Hughes Natal Parks, Game and Fish Preservation Board P.O. Box 662, Pietermaritzburg South Africa
Kooistra, T.A. and Evans, D.H. 1976. Sodium balance in the green turtle, Chelonia mydas, in seawater and freshwater. Journal of comparative Physiology, 107, 229-240. (salt gland does not become functional until about 16 days after transfer from fresh to sea-water).	Thomas A. Kooistra Department of Biology University of Miami Coral Gables, Fla. 33124 U.S.A.

Márquez, M.R., Villanueva, O.A. and Peñaflores, S.C. 1976. Sinopsis de datos biologicos sobre la tortuga golfina (Lepidochelys olivacea (Eschscholtz, 1829). Instituto Nacional de Pesca. Sinopsis Sobre la Pesca no.2, 1-61.

(compilation of data on the olive ridly, following format of Hirth's 1971 FAO paper on the green turtle, with emphasis on populations nesting in Mexico. In Spanish).

Réne Márquez Millan
Instituto Nacional de Pesca
Apartado Postal 79-052
México 7, D.F.
México

Owens, D.W. 1976. Endocrine control of reproduction and growth in the green sea turtle Chelonia mydas. Ph.D. Thesis. 109 p. University of Arizona. Dissertation Abstracts International, 37 No.4.

(data on effects of hormones on turtles raised in captivity on Grand Cayman Island, sexing of turtles gave skewed sex ratios, possibility of temperature sensitive gonadal differentiation mechanisms raised).

David W. Owens
Colorado State University
Department of Zoology
Fort Collins, Colorado 80523
U.S.A.

Philibosian, R. 1976. Disorientation of hawksbill turtle hatchlings, Eretmochelys imbricata, by stadium lights. Copeia, no.4, 824.

Richard Philibosian
Bureau of Fish and Wildlife
Box 1878, Frederiksted
St. Coix, Virgin Islands 00840
U.S.A.

Pritchard, P.C.H. 1976. Post-nesting movements of marine turtles (Cheloniidae and Dermochelyidae) tagged in the Guianas. Copeia, no.4, 749-754.

(documents the longest recorded migrations for turtles of any kind, discusses relation of currents and migratory routes; tag loss in leatherbacks a serious problem).

Peter C.H. Pritchard
Florida Audubon Society
P.O. Drawer 7
Maitland, Fla. 32751
U.S.A.

Zwinenberg, A.J. 1976. The olive ridley, Lepidochelys olivacea (Eschscholtz, 1829): probably the most numerous marine turtle today. Bulletin of the Maryland Herpetological Society, 12: 75-95.

(general account of biology of this species, with table giving nesting periods all over the world).

A.J. Zwinenberg
Borneostraat 23
Vlaardingen
Holland

DERMOCHELYS CORIACEA IN CAPTIVITY

Sea turtle researchers have long been interested in studying the leatherback turtle in the laboratory but most efforts have been unsuccessful. Until recently, the most successful worker had been Deraniyagala (1939) who raised one to a maximum weight of 7.265 kg in 624 days. His turtle died on the 662nd day without, apparently, having gained more weight.

Deraniyagala fed his turtles a diet "... of fish, eggs, bread, the fleshy green *Caulerpa* alga found in 16 to 34 metres, and live young octopus." My observations of the feeding habits of young leatherbacks suggested that their natural diet must consist mainly of soft-bodied marine animals.

In captivity this species never learns the limits of its aquarium and, at least during daylight hours, swims incessantly into the sides. Protection, in the form of polyurethane foam padding or fine mesh netting suspended near the aquarium sides, is necessary to reduce the severity of skin abrasions which result from repeated contact with the aquarium sides. Because of the accumulation of organic material in polyurethane foam, netting is the more desirable material for this purpose.

On June 28, 1973, seven two-day old leatherback hatchlings were taken to Wometco Miami Seaquarium for growth studies. They were fed a diet of one species of jellyfish, *Cassiopea xamachana*, fortified with water soluble multi-vitamins. Four of the turtles died during the first month from undetermined causes. Another died after twenty-seven weeks when an attempt was made to change its diet from jellyfish to fish. After two days on the fish diet the turtle died and postmortem examination revealed undigested fish blocking the digestive tract. The next to the last turtle died at the end of thirty-seven weeks of undetermined causes but it had lost weight continuously during the last four weeks of its life. The remaining turtle lived for 642 days and its death was attributed to septicemia. The septicemia may have developed from an inadequately treated lesion on the head. Diligent treatment with potassium permanganate (Witham 1973) might well have controlled this problem.

Weekly weights were recorded during the first forty-six weeks of the study but suitable scales were not available for regularly weighing them after that time. Only two weights were recorded from that time until the death of the last turtle. Weights, in kilograms, for three of the turtles are given in Table I.

Table I

Age in days	Turtle A	Turtle B	Turtle C
35	0.900	0.700	0.450
70	1.685	1.485	1.160
105	3.150	3.150	2.315
140	6.100	5.585	3.730
175	10.045	9.350	6.300
189	- - -	- - -	7.315 Dead
210	14.000	12.160	
231	17.300	16.300	
259	16.000	12.300 Dead	
287	17.450		
322	17.525		
515	23.170		
642	27.670 Dead		

Ross Witham
Florida Department of Natural Resources
Marine Research Laboratory
100 Eighth Avenue, S.E.
St. Petersburg, Florida 33701, U.S.A.

OBSERVATIONS ON THE EXPLOITATION OF TURTLES IN THE PHILIPPINES

I was on a study tour sponsored by the South China Sea Fisheries Development and Coordinating Programme of FAO on 18.10.76 to 6.11.76. Among other things, I made study on the exploitation of marine turtles in the Philippines. Below are my observations.

Of the four species recorded only the green turtle (*Chelonia mydas*) and the hawksbill turtle (*Eretmochelys imbricata*) nest in great number in the southern islands. Not much information was obtainable concerning other turtles. But it is established that the leathery turtle (*Dermochelys coriacea*) does not nest in the Philippines.

Traditionally, turtle meat and eggs are eaten and scutes from the hawksbill turtle are used to make ornamental items in the Philippines. The full scale cottage industry of processing turtles by stuffing was started in 1970, and since then the export market for stuffed turtles was established resulting in big increases in the number of turtles being killed every year. Cebu City, where I visited, is one of the two major turtle processing centres in the Philippines (the other being in Mindoro). There are about 50 processers each processing on an average 400 hawksbill and 100 green turtles each a year. This means in Cebu City alone 25,000 turtles are processed annually. Taking into account Mindoro and other small processing centres, the total number of marine turtles killed for this purpose can be put at 75,000 annually. This figure is frightening.

Though there exists a law governing the collecting, gathering and disposing of marine turtles, turtle eggs and its byproducts (Bureau of Forest Development Administrative Order No. 1 dated July 10, 1974) the enforcement is evidently lacking and sometimes difficult. For example, I saw plenty of stuffed hawksbills of less than 10 inches carapace length whereas the law prohibits the taking of anything smaller than 12 inches plastron (why plastron?) length. Secondly, the law requires that 100 eggs be retained in every nest by the egg collector and this is obviously impossible to enforce. Besides prohibiting the collection of turtles from a group of small islands (The Turtle Islands) in the Sulu Sea, no other conservation measure is been taken at the present moment.

There is an urgent need that the existing legislation there be revised and tightened to give better protection to marine turtles. Hatcheries should be set up to replenish the stock. Otherwise marine turtles will soon disappear in the Philippines, the people associated with the turtle trade will soon be out of job, the Filipinos will no longer enjoy this cheap and good protein food, let alone the benefits that can be derived from the tourism associated with turtle watching.

Pejabat Perikanan Negeri
Trengganu
Kuala Trengganu

Siow Kuan Tow
State Director of Fisheries
Kuala Trengganu
Malayasia

ERRATUM

The following paper, given at the Jensen Beach conference, was omitted in error from the list of papers given in the last Newsletter:

Patrick Hagan and Charles R. LeBuff
Caretta Research
P.O. Drawer E
Sanibel Island
Florida 33957, U.S.A.

The role of aerial surveys in estimating nesting populations of the loggerhead turtle.

TURTLE HATCHERIES IN SRI LANKA

The wide sandy beaches that exist round the island of Sri Lanka are utilised by several of the marine turtles for laying their eggs. The commonest of these are the Loggerheads and the Leathery turtle while the green turtle is a less common visitor.

Turtle eggs and its flesh are considered a delicacy in certain parts of the Island. With the intention of protecting the eggs that are devoured illicitly, in thousands, the Wildlife and Nature Protection Society of Ceylon set up turtle hatcheries in localities where turtle nesting is predominant.

Our 'modus-operandi' is to purchase those eggs that have already been dug out from the nests and would be otherwise devoured. These eggs are reburied in hatcheries, enclosed specially for this purpose. Records are maintained regarding the number of eggs reburied in each nest and the dates of hatching, etc. Once the eggs are hatched out the newly hatched turtles are collected from the hatchery and set free in the adjacent sea. The hatcheries are situated on the beach itself so that conditions for nesting in the artificial nests remain optimum.

During the nesting season of 1975-76, 3280 eggs were buried and 2705 young turtles set free from one of the hatcheries. It has been noticed that any delay in introducing the baby turtles to sea, after they hatch out, increases their mortality.

Ranjen Fernando
No.292 Galle Road
Pandura
Sri Lanka (Ceylon)

MORE ON THE TAG LOSS PROBLEM

In the course of an experiment being conducted at Cayman Turtle Farm, Ltd., 120 green turtles were tagged with monel steel tags from National Band and Tag Co. The 4.5 year old animals were then maintained in a cement tank of approximately 275 m^3 capacity. The tags were affixed to the trailing edge of the rear flipper. During the first four weeks of the experiment approximately 5% of the tags were lost due to tearing out. Suddenly, during the fifth week, we noticed that a large number of animals were losing their tags. The tank was immediately drained revealing that only 35 of the original 120 were still tagged. In nearly all of these 35 the tags were corroded and falling off. Many of the lost tags were found on the bottom of the tank. The cross pieces on which the point of the tag hooks were all corroded away. In five other experiments in which plastic tags were used we never had a tag loss of more than 5%. It should be emphasized that these observations apply to high density tank situations and may not be indicative of what would occur in the wild. We could not however arrive at a reasonable explanation of this high corrosion rate that would have been caused by the confined tank situation.

David Owens
Department of Zoology and Entomology
Colorado State University
Fort Collins, Colorado 80523
U.S.A.

GAME CALLED ON ACCOUNT OF TURTLE

Night baseball can have its exciting moments. The moment was a clear night in the Virgin Islands, bases and a few spectators loaded. Suddenly a rival team, the St. Croix Hawksbills, upset by the scheduling arrangements, came thundering out of the darkness and moved boldly onto the diamond. They quickly blocked the infield and a few teammates raced to strategic outfield posts. They demanded a halt to the game and their grievances heard. Their main complaint was this night game schedule, because at night they were unable to obtain sufficient taxis from the stadium and were stranded.

"This tactic will ruin us; day games only," they demanded.

As yet the problem is unresolved, and the Hawksbills, formerly considered the jewel team on the island, is finding itself uncustomarily in a soup.

Richard Philibosian
Bureau of Fish and Wildlife
Frederiskted
St.Croix, Virgin Islands 00840
U.S.A.

(another account by the same author of this event appears in Copeia 1976 - see RECENT PAPERS this newsletter)

CARETTA RESEARCH

Copies of the 1976 annual report of *Caretta* Research, a marine turtle conservation project being carried out in parts of Florida, are available on a short-term loan basis from:

Charles R. LeBuff
Caretta Research
P.O. Drawer E
Sanibel Island
Florida, 33957
U.S.A.

Support for this Newsletter came from World Wildlife Fund Canada and the University of Toronto.

WORLD WILDLIFE FUND AUDIO-VISUAL PRESENTATION
THE LEATHERY TURTLES OF TRENGGANU
AVP 004/40

As part of their marine conservation education programme, WWF is preparing a number of audio-visual presentations. There will be two concerning marine turtles. One is entitled "Turtles in Danger" and is still in preparation and will be reviewed later. The other, "The Leathery Turtles of Trengganu" is completed and available now. This contains 40 colour slides showing a complete sequences of nesting and egg-laying, tagging, eggs being sold in the market, eggs being reburied and hatchery procedures and young emerging from the sand and being released. Along with the slides there is a booklet with a few lines explaining what each slide shows and the rationale for reburying the eggs and the conservation programme. The text is in English. There will also be available shortly a prerecorded casette with a commentary by Sir Peter Scott; this includes sound effects recorded on the beach at Trengganu, Malaysia.

This audio-visual presentation would make a useful aid for public lectures. The colour values for the pictures taken at night are good. It would be ideal for use in schools and the accompanying booklet would make it easy for a teacher with no special knowledge of marine turtles to put across. Trengganu beach is one of the earliest studied turtle beaches and the programme is a good representative of many turtle conservation programmes. Hopefully this excellent audio-visual presentation will find wide use and will help give the general public an idea of what conservationists are trying to do about marine turtles. Detailed information on ordering these slides is given below.

N.M.

Audio visual presentations prepared by the World Wildlife Fund are usually available in three different forms:

Type FSD *programme comprises a filmstrip (double-frame) supplied in a plastic can (or transparent sleeve) with script (English). Programmes purchased in this form may be cut and mounted into ordinary 35mm slide mounts by the user.*

Type SPM *programme comprises slides mounted in plastic 35mm slide mounts and supplied in clear-view plastic wallet with a script (English).*

Type SGM *programme comprises slides mounted in glass-protected 35mm slide mounts and supplied in clear-view plastic wallet with a script (English).*

Each programme has a code number (prefix AVP) and the number following this indicates the number of pictures used in the presentation

Code PRC *pre-recorded casette (with inaudible control pulses for operating automatic slide tape equipment meeting the USPEC standards). Such casettes may usually also be used with non automatic projector systems providing the commentary is followed carefully.*

For use by the World Wildlife Fund and/or organizations and projects approved by WWF, the following scale of charges applies:

		£UK	$US
Programmes coded	FSD 40	1.50	3.00
	SPM 40	3.25	6.50
	SGM 40	4.25	8.50
	PRC	1.75	3.50

When ordering please specify exactly the nature of the programme you require preferably using the code system established above.

For convenience the exchange rate of 1 £U.K. = 2 $U.S. has been adopted.

Postal charges (programmes are normally sent by second class airmail unless otherwise requested) will be added at cost.

The order form below is provided for your convenience. New distribution procedures are being established but for the time being orders may be sent to:

The National Appeals Co-ordinator
World Wildlife Fund
1110 Morges
Switzerland

or to

WWF Education Project 1180
Brocklebank, Butts Lane, Woodmancote
Cheltenham, Glos. GL52 4QH
England

.....

FROM .....

.....

.....

Please supply the following audio visual presentations in the form I have indicated (please ensure you tick the appropriate columns):

	FSD	SPM	SGM	PRC	other
AVP 004 Leathery Turtles	( )	( )	( )	( )	

FURTHER FILMSTRIP/SLIDE TAPE PROGRAMMES

Anyone involved in turtle research or conservation who would be interested in preparing further audiovisual programmes to aid particular species or particular nesting beaches and coastlines invited to write to:

Mark Boulton
Coordinator WWF Education Project 1180
Brocklebank, Butts Lane
Woodmancote, Cheltenham
Glos. U.K.

The turtle specialists would provide original colour slides and a draft text and WWF would organize the material into a finished draft suitable for public information and educational purposes.

Marine Turtle Newsletter

IUCN/SSC

No.4

May 1977

Editor: N. Mrosovsky*

Editorial Advisor: Archie Carr

EDITORIAL

Below we print a copy of a letter from Professor Archie Carr to Sir Peter Scott on the current status of the Atlantic ridley, Lepidochelys kempi. With a mere 1200 turtles nesting at Rancho Nuevo, the only rookery in the world of any importance for this species, a crisis has been reached. Short of complete protection of the nesting areas and offshore water there is little that can be done. It might well help, however, if everyone receiving this newsletter could write to one or both of the Mexican officials concerned (see item 5 below), expressing their concern, telling him of their own efforts in marine turtle conservation, and supporting any action they could take.

In writing letters the following points may be helpful:

1) Letters should be informed, respectful and not too long.

2) Letters from countries other than the U.S.A. would be particularly valuable. It is important that the authorities in Mexico are reminded about the turtle conservation programmes going on in many parts of the world, and how their actions could complement these efforts.

3) Ideally, letters should be in Spanish, but if this is not readily done, then it is much preferable to send a letter now in any language rather than waiting for translation.

4) A model letter, similar to one sent by Professor Carr, is printed below; if basing your letter on this one, please rephrase it to avoid the appearance of a stereotyped tract.

5) Send letters to:

Dr. Jorge Carranza F.
Director
Instituto Nacional de Pesca
Chiapas 121
Mexico D.F., Mexico

Lic. Fernando Rafful
Department de Pesca
Av. Alvaro Obregon 286
Mexico 7 D.F.
Mexico

6) It will be helpful if you could send a copy of your letter to the editor of this newsletter so that we can form some impression of the message the authorities in Mexico are receiving.

Please read what Archie Carr has written and please take time to write a letter. The sum of many small individual efforts can sometimes be enormously important. Without action there may soon be one less species of marine turtle.

---

*Address all correspondence to: N. Mrosovsky
Departments of Zoology and Psychology
University of Toronto
Toronto, Ontario M5S 1A1
Canada

CRISIS FOR THE ATLANTIC RIDLEY

Letter from Professor A. Carr, Co-Chairman, IUCN Marine Turtle Group
Department of Zoology
University of Florida, Gainesville
Gainesville, Florida 32611
U.S.A.

to Sir Peter Scott
Chairman, SSC
Slimbridge, Glos.
England

"Dear Peter:

This is not the first time I have written you a panicky letter about the plight of *Lepidochelys kempi*, the Atlantic ridley, but it seems likely that it may be the last time. Since the IUCN last made representations to the Mexican government in respect to the plight of *kempi*, the situation has degenerated so badly that I must again beg you to bring the circumstances to the attention of the Survival Service Commission, at its April meetings. I deeply regret that I can't be there to say more on the subject, because it is a grave and complicated one.

Last week, while preparing to write a popular article on the ridley for the magazine *Sports Illustrated*, I carefully went over all available records of breeding population levels at Rancho Nuevo, the only nesting ground of the species, and I realized that we really do have a crisis on our hands. Accordingly, I went to Brownsville, Texas, for four days to gather more information. I discussed the current status of the nesting *arribada* with Dearl Adams, Kavanaugh Francis, and others of the corporation that has been formed on South Padre Island to save the ridley. I spent two afternoons with the Port Isabel shrimp fleet, the biggest shrimping exercise in the world. Going from trawler to trawler, I plied every shrimper who was willing to talk with exactly the same set of questions that I had asked at the same docks 16 years earlier, back in the days when the trawlers, their nets, and the periods for which the trawls stayed down, were all half what they are now; when the price of shrimp was one-eighth its current price; and when ridleys were being abundantly caught not just in Texas and Mexico but in Florida waters and northward all along the Atlantic coast.

On that first visit to the shrimp docks, there was evidence of incidentally caught ridleys everywhere. Every crewman I spoke with knew the ridley well. They said it was the only abundant sea turtle in the area, and they deplored the damage it did to the shrimp in their trawls. Last week, almost none of the shrimpers I spoke with even knew of the existence of ridleys. I was careful to indicate that my only interest was in collecting tags and paying rewards for them, and for the most part I was able to dispel apprehension that I might be an enforcement officer of some kind. I am thus quite sure that the contrast in catch frequencies that I saw is real; and it is just the same all along the ridley migration route in Florida and beyond. Few ridleys are caught anywhere now, simply because few remain.

Besides the hours I spent on the shrimp boats, I attended the convention of the Texas Shrimp Association, to try to soak up an impression of their attitude toward the incidental catch problem. Then I spent a long time conversing with Rene Marquez and others in Mexico City agencies, to get all existing figures on the size of the 1976 nesting aggregation.

What has happened to *kempi* can be graphically shown by comparing successive sizes of the Rancho Nuevo breeding population, as indicated by counts or estimates of *arribada* size during past decades. I'll list only three of these here, but the figures are

representative, and we are working up a more complete record. *Arribada* sizes, and calculated total mature breeding population for the successive periods since the nesting ground was discovered, are as shown below (I'll explain our method of converting *arribadas* to total mature population later, if desired):

Year	Estimated Nesting Arrival	Total Mature Population
1947	40,000	162,400
1970	2,500	10,150
1974	1,200	4,872

The figures speak for themselves. The species is clearly on the skids, and if present conditions continue it will shortly - in two years perhaps, or three, or five - be gone. The dramatic drop during the 1950's was caused by overexploitation combined with very heavy natural predation pressures. The terminal decline now in progress has been brought about by incidental trawler catch. When ridleys were many and shrimping was less intensive this factor was negligible. Today it is wiping out the species.

Lepidochelys kempi can possibly be saved, but it will surely disappear unless drastic action is taken. I hope therefore that the Survival Service Commission will be willing to write the new Mexican president, explaining the crisis and imploring him to take the only steps that could possibly save the Atlantic ridley from early extinction. I also hope you will solicit similar letters from other groups or individuals who might be willing to write. I enclose notes for the sort of letter that might be written.

Sincerely

Archie Carr
Graduate Research Professor "

MODEL LETTER

Address either of these officials: Estimado Dr. Carranza, or Lic. Rafful

I am writing to express profound concern over what appears to be the approaching extinction of a species of marine turtle, the Atlantic ridley, Lepidochelys kempi.

As you may know, L. kempi breeds only in the vicinity of Rancho Nuevo on the Gulf Coast of the State of Tamaulipas, about ninety miles north of Tampico. For some years your government has provided vigorous protection for the species on the nesting beach; but despite this attention, the decline has continued and stronger measures now are necessary. We respectfully urge that additional steps be taken to avert the impending loss of this species. Two moves that appear particularly urgent are:

(1) To designate the Rancho Nuevo shore, a 20-mile strip of beach extending north and south of Rancho Nuevo village, as a National Sanctuary to be kept wholly free of human exploitation.

(2) To exclude all shrimp trawlers from a zone 10 miles seaward from that coastal strip during the months from April through July.

We want to emphasize that the Atlantic ridley is a distinct, strongly differentiated species, and not merely a local race or breeding colony of the wide-ranging Pacific ridley; and that except for occasional scattered nestings by individuals elsewhere, Rancho Nuevo is its sole breeding place. If L. kempi disappears from Rancho Nuevo it will almost certainly disappear from the face of the earth.

An important factor in the terminal decline the Atlantic ridley is undergoing is incidental catch in the nets of shrimp boats. You may be aware that strong efforts are now being made to perfect nets that will exclude turtles without hindering the capture of

shrimp. This is a severe technical problem, however. The equipment will probably not be perfected in time to save the Atlantic ridley. Thus, the fate of this unique and irreplaceable form of life is in the balance. Only a wholehearted effort by your government can save it. We beg you, therefore, to do all that you possibly can to exclude all human depredations at the nesting ground of the species and in adjacent inshore waters. You may be sure that everything possible will be done to insure protection of the ridley in the parts of its range outside Mexico, and that your intervention in this crisis will bring you the gratitude of people all over the world.

Sincerely yours

SALE OF TURTLE PRODUCTS PROMOTED IN HAWAII

The survival outlook of the Hawaiian *Chelonia* population was enhanced in 1974 with the adoption of a State regulation which prohibits commercial usage of turtles taken from local waters. Prior to this ban the tourist restaurant trade provided a strong cash incentive to kill an increasingly alarming number of green turtles. Although it is difficult to assess the extent of damage inflicted during the years of uncontrolled exploitation, there is little doubt that continuation of previous trends would have reduced the population to a nonviable level.

In spite of the present improved situation, conservation problems in Hawaii persist for both Hawaiian turtles, as well as turtles from populations distinct to other areas. Hawaii's regulation legally prohibits commercialization of Hawaiian turtles, but it does not stop commerce in turtle products derived from outside the State. This has resulted in the continued sale of such items as whole "stuffed" turtle curios from Southeast Asia, turtle leather purses from Europe, and canned turtle soup from New Jersey. Additionally, products from the commercial culture operation on Cayman Island are now being actively marketed under the exemption. In this latter case, the authorized Hawaii distributor for the Cayman company has clearly embarked on a promotional campaign to popularize turtle products and expand markets. In a recent article (March, 1977, Pacific Business News) which outlines the marketing plan, the distributor is quoted as saying that "... the first step is to get people accustomed to eating turtle." In addition to lauding the supposed benefits of commercial culture, the article notes that a number of restaurants are now offering turtle meat from Cayman, and that immediate plans for market expansion include stocking Hawaii's grocery stores with three kinds of turtle soup (chowder, bisque and bouillon), and selling turtle filet over the counter.

Along with others, it is my conviction that any promotional campaign aimed at encouraging people to eat turtles is clearly unacceptable in terms of conservation. Such campaigns, which strive to bring turtle products into vogue, form the basis for one of several major objections frequently raised by opponents of commercial turtle culture. In addition, such promotional practices are contrary to the IUCN Principles and Recommendations on trade in sea turtles (see Marine Turtle Newsletter 1976, No.1). Serious unanswered questions exist as to the ability of mariculture operations to fill the newly created markets, or indeed to compete with the far less expensive products obtained from turtles taken either legally, or illegally, from natural populations. Also, the identification of processed products as to source, either natural or cultured, is virtually impossible for trained herpetologists, let alone for wildlife enforcement personnel. The likelihood of illegal substitution is therefore considerable, particularly in view of an incentive for increased profits.

The logical course of action is for readers of the Newsletter to vigorously oppose, in their respective areas, all commercial trade in sea turtle products that is not consistent with the IUCN Principles and Recommendations.

G. H. Balazs
Hawaii Institute of Marine Biology
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Kaneohe, Hawaii 96744

Support for this newsletter came from World Wildlife Fund Canada and the University of Toronto

Marine Turtle Newsletter

IUCN/SSC

No. 5. DECEMBER 1977

Editor: N. Mrosovsky*

Editorial Advisor: Archie Carr

EDITORIAL

This issue of our newsletter goes out to close to 450 people. Starting with about 100 for the first newsletter, the circulation has climbed rapidly, despite an economy measure of discontinuing mailing to about 50 people who had not confirmed that they wanted the newsletter. Put another way, some 400 people from all over the world indicated that they wanted to receive the newsletter. Evidently there is an international community actively concerned with marine turtle conservation.

This community can be influential both by acting as informed opinion leaders in individual actions (for example, see the article by J. Mortimer in this issue) and by joint actions. For instance it has already demonstrated its concern over the deteriorating prospects for the Atlantic ridley, Lepidochelys kempi. In response to information in the last newsletter the Mexican authorities have been sent to date at least 63 letters from individuals and organizations and a petition from Prodena, Peru, with about 40 signatures; in addition the Dutch Herpetological Society presented the Mexican ambassador to the Netherlands with a petition signed by 212 of their members. Letters have come from: Ascension Island, Bermuda, Britain, Canada, Costa Rica, Ecuador, El Salvador, India, Israel, Italy, Kenya, Maldives, Mexico, Netherlands, New Caledonia, Papua New Guinea, Peru, S. Africa, Sri Lanka, Sudan, Sweden, Tanzania, Thailand, United States and the U.S. Virgin Islands. These tabulations refer only to letters for which copies, or equivalent information, have been received by your editor. Presumably others were also sent.

We hope this response has demonstrated the widespread interest in the Atlantic ridley and encouraged the Mexican authorities in the positive steps they are taking in a difficult situation. These steps include additional regulations, starting July 1977, banning all commercial fishing from April to August up to the 50 yards isobar ("isobata de las 50 brazas") offshore Ranchuo Nuevo, and further measures onshore. Nevertheless the situation for the Atlantic ridley remains critical, not only because legislation is often easier than enforcement, but also because it may already be too late.

We will try to keep readers informed of further developments. We apologize for not sending out this issue earlier; delays have been caused by difficulties in obtaining funds.

*Address all correspondence to: N. Mrosovsky
Departments of Zoology and Psychology
University of Toronto
Toronto, Ontario M5S 1A1, Canada

MORE ON THE TAG LOSS PROBLEM

In a recent number of Wildlife Monographs (No. 52, February 1977), I came across some information that is pertinent to the tag loss problem. In this study, conducted by T.L. Riggert (Department of Fisheries and Wildlife, Western Australia Wildlife Research Center, P.O. Box 5, Mullaloo Drive, Wanneroo, Western Australia 6065) considerable difficulty was encountered with corrosion of monel metal bands in hypersaline marshes. The average time the bands were legible was less than one year. Dr. Riggert was subsequently advised that titanium was the most suitable metal for saline waters of the concentrations on Rottnest Island.

In correspondence with Dr. Riggert I learned that these marshes contain saline solutions which range up to 320,000 ppm and are high in sulphides from the breaking down of organic matter. He refered me to a paper by Uhlig, H.H. 1963, Corrosion and Corrosion Control: An Introduction to Corrosion Science and Engineering, John Whitley & Sons Incorp., New York, London, p. 371, which described monel metal as being most unsuitable in saline waters that are stagnant or contain sulphides.

According to Dr. Riggert, titanium bands have been used on Mountain Ducks now for over 70 months with no sign of wear. A paper presenting these data on band loss through wear and abrasion will be published this year. Chemical analyzation of the bands determined them to be essentially commercially pure titanium with impurities consisting of cobalt, copper, iron, nickel, and potassium each in amounts considerably lower than 1%. Further information is available from Mr. Ken Varcoe, I.M.I. Australia Ltd., Metals Technology Division, 148 Lonsdale Street, Melbourne, Victoria 3000, Australia.

It should be noted that the marshes where this study took place have a chemistry quite different than that of the ocean. Be that as it may, it appears that titanium, with its extreme hardness, yet light weight relative to other metals and resistance to abrasion and corrosion, should be considered a possible candidate to replace monel metal as the most suitable tag in marine turtle research.

Stephen E. Cornelius
The University of Texas
Marine Science Institute
Port Aransas Marine Laboratory
Port Aransas, Texas 78373
U.S.A.

NOTCHED RIDLEY FOUND

A 27 cm female ridley (Lepidochelys kempi) was found dead at Sesuit Harbor, Dennis, Barnstable Co., Massachusetts, U.S.A., on 13 November 1976, and salvaged by Bob Prescott, Cape Cod Museum of Natural History. He passed it on to me, and it is now Museum of Comparative Zoology (MCZ) A-89661. A rather fresh V notch had been sawed in marginal L 11 (third from tail). Sesuit is a standard ridley locality in Massachusetts waters; the specimen was very fresh, apparently in good shape, and seems to have been caught by an unseasonal cold spell, though mid-November is late for this species. Who shell-notches ridleys and where?

J.D. Lazell, Jr.
Massachusetts Audubon Society
Lincoln, Mass., 01773
U.S.A.

SEA-WATER RESISTANT PAINT WANTED

J.P. Schulz (Forest Service, P.O. Box 436, Paramaribo, Surinam, S. America) is trying to obtain information on new types of sea-water resistant paint suitable for marking turtles. If this can be found it will be used to check on the extent of tag loss and establish how many times leatherbacks nest in a season. If anyone has any suggestions please send them direct to Dr. Schulz.

RECORDS OF DEAD SEA TURTLES

Robert G. Whistler (Chief Naturalist, National Park Service, Padre Island, National Seashore, 9405 S. Padre Island Drive, Corpus Christi, Texas, 78418, U.S.A.) wishes to know if other researchers have any interest in data on strandings of dead sea turtles. If so he would like to hear from them with a view to standardizing data collection and exchanging information. Ms. Shirley Manor, of the Scientific Event Alert Network (Room 9, Mail Stop 103 A, Smithsonian Institution, Washington, D.C. 20560, U.S.A.), has raised the possibility that their organization might be able to serve as centre of records of stranded sea turtles.

REPRINTS OF PAPERS ON SEA TURTLES NEEDED

Research on populations of olive ridleys nesting north of Mazatlan, Mexico, together with a hatchery programme has been initiated recently. The library at the marine station there needs more information on marine turtles. If anyone has spare reprints, please send them to: A. Ramirez Flores, Chief Scientist, Centro de Ciencias del Mar y Limnologia, Estacion Mazatlan, Explanada de la Azada, Apdo. Postal 811, Mazatlan, Sinaloa, Mexico. Visiting scientists travelling in this area are welcome to visit this project.

NOTES ON TURTLE CONSERVATION IN INDIA

Orissa: The government of Orissa is still in the planning stage for management of the huge rookery of olive ridleys there. Meanwhile protective measures are in operation and many turtles have been tagged. Some commercial use of this resource is anticipated. Along the Puri coast of Orissa green turtles are also found, about 40-50 being caught everyday by local fishermen who do not go out especially to catch turtles. These green turtles are sold mainly in West Bengal. based on information sent by: Lala A.K. Singh
Gharial Research and Conservation Unit
Tikerpada 759122
Orissa, India

Madras: For the past 4 years the staff of the Madras Snake park and volunteers have been collecting turtle eggs (mostly olive ridleys), incubating them in a hatchery and releasing the young. The Madras Snake park is located at the residence of Mr. and Mrs. Jean Delouche at Thiruvanmiyur, Madras-41. About 10-15 kms of beach are covered each night for egg collecting. Along 50 kms of beach between Madras and Kalpakkam 90% of the nests are taken by humans, dogs, and jackals, in that order. Professional egg collectors and villagers sell the eggs for about 5-10 paise each; in 1977 the Central Marine Fisheries Research station in Madras and the Madras Snake Park cooperated in a programme of paying egg collectors to bring eggs to the hatchery: 4,546 eggs were collected for the hatchery in 1977. based on information sent by: R. Whitaker
Madras Snake Park
Madras 600022
India

WWF AUDIO-VISUAL PRESENTATION 014/40: TURTLES IN DANGER

This audio-visual presentation consists of 40 colour slides, together with booklet containing a script (in English) for each slide. The script was prepared by P.C.H. Pritchard, Vice-President of the Florida Audubon Society. (By the time this newsletter reaches readers a pre-recorded cassette containing further commentary should also be available). The script describes exploitation and conservation of sea turtles for a general audience, together with a brief life history of sea turtles. The slides illustrate the following: 1. Hawksbill turtle 2. Title slide "Turtles in danger", baby turtles 3. Nesting ridley turtles, Costa Rica 4. Leatherback turtle bones, Peru 5. Green turtle 6. Atlantic loggerhead turtles, mating 7. Australian flatback turtle 8. Pacific ridley turtle, Costa Rica 9. Leatherback turtle, Tongaland 10. Leatherback turtle laying eggs, Guyana 11. Green turtle, Galapagos

12. Green turtle, hatching 13. Green turtle hatchlings, Bermuda 14. Green turtle hatchlings, Bermuda 15. Baby green turtle, Galapagos 16. Baby leatherback turtle swimming, Tongaland 17. Hawksbill turtle, swimming 18. Micronesians playing with green turtle shells 19. Harpooned green turtle 20. Preparing turtle meat, Gambia 21. Impaled leatherback turtle, French Guiana 22. Eroding leatherback nesting beach, French Guiana 23. Collecting turtle eggs, Surinam 24. Turtle eggs for sale in market 25. Stuffed hawksbill turtle 26. Stuffed green turtles, Bali 27. Turtle on menu, French Guiana 28. Ghost crab eating young green turtle 29. Hawksbill turtle swimming 30. Green turtle 31. Leatherback turtle 32. Olive ridley turtle, Surinam 33. Loggerhead turtle 34. Flatback turtle, Australia 35. Kemp's ridley turtle 36. Turtle egg hatchery, Surinam 37. Olive ridley turtles on nesting beach, Costa Rica 38. End title, flatback turtle.

ORDER FORM

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Please supply "Turtles in Danger" (AVP 014/40) as indicated below.

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SGM comprises slides mounted in glass-protected 35mm slide mounts and supplied in clear-view plastic wallet with script.

NEW WWF FILM - "GIANT TURTLES OF TRENGGANU"

Sequences filmed at night show leatherback turtles emerging from the sea and laying their eggs. Reburying of eggs and other conservation measures are also shown:

Details of Film

Production By: Peter Beaumont - Leo Burnett Kuala Lumpur
Duration : 13 minutes 16 mm colour
Copyright : World Wildlife Fund Malaysia
Price : US$225 including sea postage and packing
Profits from the film entirely to World Wildlife Fund Malaysia

ORDERS

National Appeals of WWF and other Conservation and Educational Organisations may purchase copies for non-theatrical showing.
The film may be leased or purchased by Television organisations.
Apply to: World Wildlife Fund Malaysia, P.O. Box 769, Kuala Lumpur, Malaysia.

INDIAN OCEAN TOURISTS WIPING OUT SEA TURTLES

(news release from the Defenders of Wildlife, 1244 19th Street N.W. Washington D.C. 20036, U.S.A.).

Five years ago the sun-washed Maldive Islands were a well-kept secret; today their booming tourist industry threatens to wipe out the Indian Ocean sea turtles, which are one of their attractions. The chain of tiny Islands that make up the Republic of Maldives is a tourist delight, with beaches, endless seas, and colorful underwater reefs for diving.

Now, Maldivians are cashing in on the tourist potential of their islands, in an effort to diversify their economy, once dependent on fishing. This year 15,000 tourists from Europe, the Americas, Japan, and elsewhere will visit the Maldives. With the influx has come a large-scale revival of the ancient trade in sea turtles and tortoise-shell, according to Defenders, the magazine of Defenders of Wildlife.

Tortoise shell, traditionally obtained from the hawksbill sea turtle, has ranked among the world's luxury goods since earliest recorded times. In the 12th century, tortoise shell was the major export of the Maldives, writes anthropologist Elizabeth Overton Colton in the June Defenders. Ms. Colton is in the Maldives to study the impact of tourism on the islands' economy.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora ranks sea turtles as endangered species, threatened with extinction. Yet the Maldivian laws protect the tourist industry, not the turtles, Defenders points out. The shopfronts of Male, capital of the Republic of Maldives, are filled with stuffed and empty turtle shells--many less than legal length. Island merchants say they are helpless intermediaries, caught between poor fishermen who earn up to $60 for a single empty turtle shell, and wealthy tourists, who are eager to buy a souvenir that will last longer than their new winter suntans.

Existing curbs on the turtle trade don't seem to work very well. Many of the tourists come from nations that have signed the treaty protecting endangered species. Yet few tourists are made aware of the endangered status of sea turtles. And, while nearly one hundred airlines signed a 1974 World Wildlife Fund resolution against transporting endangered wildlife or wildlife products, many of the same airlines bear the shell-bearing tourists to and from the islands. For people of the Maldives, the tourist boom generates much-needed foreign exchange. But it can only be a short term venture, since the industry contains the seeds of its own destruction: it is the primary contributor to the extinction of some of the earth's oldest animals.

FINAL APPROACH TO BALI AIRPORT

Last year I was a participant in a short tour of the Orient. Flying at an altitude of 20,000 feet, our jet which contained 250 passengers, made its final approach to the airport at Bali, Indonesia, and our tour guide was describing the glories of the island below, over the intercom system. She explained that everywhere we went people would be trying to sell us wood carving and tortoise-shell jewelry. "You should keep in mind", she said, "that it is illegal to bring tortoise-shell products into the United States. However, you could probably sneak in one or two little bracelets if you are careful". As a graduate student of Archie Carr, having been personally involved during the past few years in sea turtle conservation, I took this as an almost personal affront. I jumped out of my seat and headed for the fron of the airplane, with my mother calling to me from her seat, "Jeanne, dear, please be tactful".

I explained to the tour guide that her comment had upset me. She suggested I get on the intercom myself, and explain my position. This I did. "My name is Jeanne Mortimer", I said. "I am a fellow tourist, and also a zoologist who has spent the past few years studying the ecology of sea turtles. I would like to urge you please, please not to buy any tortoise-shell products. There is a good reason why it is illegal to import these items. The hawksbill turtle, whose shell is used for this jewelry, is on the verge of extinction in every part of its range, simply because it is being killed for its shell and sold to tourists like yourselves. I would be the first to admit that tortoise-shell jewelry is beautiful, but it is something we just have to do without. Please try to control yourself when someone offers to sell you some. Thank you".

There was applause in the airplane. On the way back to my seat several people called me over to thank me for making such a statement. During each of the remaining seven days of the tour, I was approached by people who said they were glad I had spoken as I had, that they hadn't realized that the situation was so serious, and that they really liked animals and didn't want to do anything to cause them to become extinct. I personally saw no one with any tortoise-shell purchases.

This incident set me to wondering whether, when an endangered species is likely to appear in the tourist shops of a region to be visited, tour agencies the world over might not be willing to have the guides themselves make the same sort of plea I made.

Jeanne Mortimer
Department of Zoology
University of Florida
Gainseville, Florida
U.S.A.

SABAH TURTLE ISLANDS NATIONAL PARK

On October 1st. 1977, the Sabah Turtle Islands were officially designated as a National Park. Comprising 4300 acres, this area is an important rookery for green turtles. Complete protection will also be given to the coral reefs and sea surrounding the islands. A particularly progressive move is the banning of trawler fishing in the area so that the nesting turtles will not be threatened by 'incidental catch'. The Sabah Turtle Islands are interesting in that turtles nest all year round there. They are also an area of great natural beauty.

TONGALAND, NATAL, S. AFRICA: NOTES ON THE 1976/1977 SEASON

hatchling marking: Between 3 January and 10 March 1977, 13,463 loggerhead hatchlings were marked and released. Viewed dorsally from the rear the 4th marginal scale on the right was excised during the past season.

During 6 seasons some 61,833 loggerhead hatchlings have now been released from which 9 marked hatchlings have been recovered down the east and south coasts of South Africa, 1 sub-adult from Durban area and 2 adult females renesting in Tongaland.

Hatchery project: Another round of experimental hatchings will be carried out next season using different numbers of eggs as it has been reported by workers elsewhere that in coolboxes the ideal number per box is 50.

Tags: The Kentucky Band and Tag Company has been forced to abandon the production of INCONEL Tags and I regret that we have had to order MONEL Tags. The tag loss problem is one that we shall have to live with.

Numbers of turtles nesting and tag recoveries for this season have been tabulated; details can be obtained on request.

George Hughes
Natal Parks,
P.O. Box 662
Pietermaritzburg
Natal, South Africa

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Marine Turtle Newsletter

IUCN/SSC

No. 6. FEB. 1978

Editor: N. Mrosovsky*

Editorial Advisor: Archie Carr

EDITORIAL

This newsletter brings you up to date on recent publications on marine turtles.

The editor apologizes for any undue delays in replying to the many interesting letters and inquiries he has been receiving. He regrets that back issues of the newsletter are no longer available and also that it is not possible to print it in more than one language. Several people from French-speaking areas have requested the French edition of this newsletter, pointing out that Canada is a bilingual country. Official publications in Canada are indeed printed both in French and English, but this is not an official Canadian publication, just a letter sent out by a harassed professor to interested people.

For those only recently on our mailing list, we add that it was never intended that the newsletter should appear at regular intervals, but only as often as was merited and possible within a context of financial and other constraints.

RECENT PAPERS

Reference	Address of Author
Davis, G.E. and M.C. Whiting. 1977. Loggerhead sea turtle nesting in Everglades National Park, Florida, USA. Herpetologica, 33, 18-28. (on the spot and aerial surveys well correlated, the latter more conservative; 10% increase in nesting over the last 10 years; lower % false crawls than at more disturbed loggerhead beaches elsewhere; policy on raccoon predation discussed; data on clutch size, internesting intervals, etc.).	Gary E. Davis Everglades National Park P.O. Box 279 Homestead, Fla. 33030 U.S.A.
Ehrhart, L.M. Cold water stunning of marine turtles in Florida east coast lagoons: rescue measures, population characteristics and evidence of winter dormancy. Abstract of paper presented at an unspecified meeting. (143 turtles, mostly greens, some loggerheads, rescued after being stunned by exceptionally cold winter in Florida in 1977, water temperatures as low as 4°C; mud layer on carapace suggests turtles may overwinter on the bottom in a dormant state).	Llewellyn M. Ehrhart Florida Technological University P.O. Box 25000 Orlando, Fla. 32816 U.S.A.
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 the National Aeronautics and Space Administration, Kennedy Space Center, Biological Sciences Section. Biomedical Office Code MD, 1-119. (morphometrics include weights of 261 adult loggerhead turtles).	Llewellyn M. Ehrhart Florida Technological University P.O. Box 25000 Orlando, Fla. 32816 U.S.A.

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University of Toronto
Toronto, Ont. M5S 1A1, Canada

Reference	Address of Author
Ehrhart, L.M. 1977. Threatened and endangered species of the Kennedy Space Center. Semi-annual Report to the National Aeronautics & Space Administration, Kennedy Space Center Biomedical Office Code MD-B. (study of turtles, mostly sub-adult, within Mosquito Lagoon, Florida, has been initiated. One Atlantic ridley caught here. Extensive data on hatch rates, morphology, populations of loggerheads).	Llewellyn M. Ehrhart Florida Technological University P.O. Box 25000 Orlando, Fla. 32816 U.S.A.
Frair, W. 1977. Turtle red blood cell packed volumes, sizes, and numbers. Herpetologica, 33, 167-190. (large table of amphibian and reptilian haematological data, including values for sea turtles).	Wayne Frair, Biology Dept. The King's College Briarcliff Manor New York, N.Y. 10510 U.S.A.
Frair, W. 1977. Sea turtle red blood cell parameters correlated with carapace lengths. Comparative Biochemistry and Physiology, 56A, 467-472.	Wayne Frair, Biology Dept. The King's College Briarcliff Manor New York, N.Y. 10510 U.S.A.
Fretey, J. 1976. Les tortues marines de Guyane Française. Le Courrier de la Nature, 41, Jan-Feb. (ecology, predators described; dangers for turtles in French Guiana include drowning in nets of Japanese and USA shrimping fleets, sale of eggs on black market to Surinam, removal of sand from beaches for construction industry, and lack of enforcement of existing laws. In French).	Jacques Fretey Reptiles et Poissons Muséum d'Histoire Naturelle 25 Rue Cuvier 75005 Paris France
Hendrickson, J.R., Wood, J.R., and Young, R.S. 1977. Lysine : histidine ratios in marine turtle shells. Comparative Biochemisty and Physiology, 57B, 285-286. (work done at request of Enforcement Division, Fish and Wildlife Service, USA, suggests that captive reared green turtles have lower lysine:histidine ratios than wild animals; hawksbills have even lower ratios; these differences could be a new tool in enforcement of conservation laws).	J.R. Hendrickson Dept. of Ecology & Evolutionary Biology University of Arizona Tucson, Arizona 85721 U.S.A.
Hughes, G.R. 1973-1975. The St. Brandon turtle fishery. Proceedings of the Royal Society of Arts & Sciences of Mauritius, 111(2), 165-189. (catch of adult greens has remained about 300 a year since 1937; sex ratio in recent catches fairly even; recommendations made to Mauritius Fishing Development Co.).	George R. Hughes Natal Parks Board P.O. Box 662 Pietermaritzburg 3200 South Africa
Licht, P.,.Gallo, A.B., and Daniels, E.L. 1977. In vitro binding of radioiodinated sea turtle (Chelonia mydas) follicle stimulating hormone to reptilian gonadal tissues. General and Comparative Endocrinology, 33, 226-230. (lack of specificity in reptilian follicle-stimulating hormone (FSH) binding sites in gonads; FSH and luteinizing hormone (LH) may share the same binding sites in green turtles)	Paul Licht Department of Zoology University of California Berkeley, California 94720 U.S.A.

Reference	Address of Author
Licht, P., MacKenzie, D.S., Papkoff, H., and Farmer, S. 1977. Immunological studies with the gonadotropins and their subunits from the green sea turtle Chelonia mydas. General and Comparative Endocrinology, 33, 231-241. (physiological overlap between turtle FSH and LH further examined; radio-immunological assay methods)	Paul Licht Department of Zoology University of California Berkeley, California 94720 U.S.A.
Moll, E.O. 1976. West Malaysian turtles: utilization and conservation. Herpetological Review, 7, 163-166. (summary of usage of turtle products, egg prices, tourism and conservation legislation in this area)	Edward O. Moll Department of Zoology Eastern Illinois University Charleston, Ill. 61920 U.S.A.
Mrosovsky, N. 1977. Individual differences in the sea-finding mechanism of hatchling leatherback turtles. Brain, Behavior and Evolution, 14, 261-273. (transient tendencies to turn following changes of input to one eye and other esoteric aspects of the sea-finding mechanism).	N. Mrosovsky Departments of Zoology and Psychology University of Toronto Toronto, Ontario M5S 1A1 Canada
Mrosovsky, N. 1977b. Effects of flashing lights on sea-finding behavior of green turtles. Behavioral Biology, 22, 85-91. (intermittent illumination less preferred by hatchlings; argues that hatchlings average brightness information over time as well as over space).	N. Mrosovsky Departments of Zoology and Psychology University of Toronto Toronto, Ontario M5S 1A1 Canada
Servan, J. 1976. Écologie de la tortue verte a l'île Europa (Canal de Mozambique). La Terre et la Vie, 30, 421-464. (data collected on 3 visits to Europa Island, 1973-74; possibility that 2 different populations contribute to year round nesting here; estimated nesting population only 1300 compared to 5000 of previous estimates. Morphometric data, hatching success, estimates of predation level. In French, summary in English).	Jean Servan Laboratoire de Zoologie de l'École Normale Supérieure, Paris 46 Rue d'Ulm 75005 Paris France
Sumertha, I.N. 1975. Some biological aspects of Chelonia mydas L and its management on Ai Ketapang beach, Sumbawa Island. Report from the Fakultas Perikanan, Institut Pertanian Bogor. (includes description of turtle populations and local fishing methods. In Indonesian).	I. Njoman Sumertha Faculty of Fisheries Bogor Agricultural University Bogor Indonesia
ADDENDUM	
Pritchard, P.C.H. 1977. Marine turtles of Micronesia. Chelonia Press, 536 Fifth Av., San Francisco, CA. 94118, U.S.A. 83 pp. (survey of turtle populations; hawksbill souvenir trade widespread and harmful; conservation recommendations).	P.C.H. Pritchard Florida Audubon Society P.O. Drawer 7 Maitland. Florida 32751 U.S.A.

BOOK REVIEW

Memorias de Arrecife Tortuga (Memories of Turtle Reef), by Bernard Nietschmann. The text, in Spanish, can be purchased from Banco de America, Apdo. No. 285, Managua, D.N., Nicaragua. To order, specify: Serie Geografia y Naturaleza No.2, *Memorias de Arrecife Tortuga. Historia Natural y Económica de las Tortugas en el Caribe de América Central.*

Dr. Nietschmann has brought together in this book a rich collection of documents, both historical and recent, detailing the natural history of the sea turtles of eastern Nicaragua. The green turtle, hawksbill, loggerhead and leatherback all occur in the Caribbean waters of Nicaragua, but it is the green turtle and the hawksbill that have become thoroughly entrenched in the culture and economic history of the region. Excerpts from the accounts of early explorers and maritime adventurers in these waters include some of the first descriptions of the natural history of the green turtle and the hawksbill. Selections from William Dampier's book, *A New Voyage Round the World*, published in 1697, include remarkably accurate observations on the distribution, nesting behaviour, dietary preferences, and migratory capacity of the green turtle. Accounts by various other travellers, buccaneers, and castaways recount the colourful history of the region and the role turtles have played in the lives of the coastal inhabitants.

Selections from James J. Parson's *The Green Turtle and Man* describe how the green turtle became an exportable resource and how, as the focus of an international commercial fishery, it has suffered gross overexploitation. The effects of depletion on the social structure of the turtle-dependent Miskito Indians are described in papers by Nietschmann and Brian Weiss. Other contributions include selections from Archie Carr's *The Windward Road* and *So Excellent a Fishe*, and an article by Peter Matthiessen, author of *Far Tortuga*.

Dr. Nietschmann's important contribution has been a skillful integration of all these sources. His own work in the coastal villages of Nicaragua has given him a keen knowledge of the relationship between people and sea turtles, and his use of this central theme gives the book an interesting organizational framework.

Anne Meylan
Department of Zoology
University of Florida
Gainesville, Florida 32611
U.S.A.

INTERNAL WIRE TAGS

Frank J. Schwartz (Institute of Marine Sciences, University of North Carolina, Morehead City, N.C. 28557, U.S.A.) has begun to study the use of internal coded wire tags. These have been inserted into the body and fins of hatchling and larger turtles. So far the turtles have retained these tags. The retention, as well as possible effects of the internal tags on the turtles, will be studied.

TAGGING LEATHERBACKS

"..... since we have taken to tagging our leatherbacks in the hindflipper way up in the groin area, we have upped our recovery rate to over 50% with hardly any apparent tag loss and certainly no damage or corrosion of the monel."

George Hughes
P.O. Box 662
Pietermaritzburg 3200
S. Africa

Support for this newsletter came from World Wildlife Fund Canada & the University of Toronto

Marine Turtle Newsletter

IUCN/SSC

No. 7. APRIL 1978

Editor: N. Mrosovsky*

Editorial Advisor: Archie Carr

EDITORIAL

With this issue of the newsletter we enclose a copy of an article "The Shame of Escobilla" by Tim Cahill from Outside Magazine. This will be a matter of concern to everyone engaged in turtle conservation.

Mexico is an important country in world-wide efforts to preserve sea turtles, both because of the large numbers nesting there, and because it has the only significant nesting site for the Atlantic ridley, *Lepidochelys kempi*. Many recipients of this newsletter have already written to Dr. Jorge Carranza F. (Director, Instituto Nacional de Pesca, Chiapas 121, Mexico D.F., Mexico) expressing their concern about the Atlantic ridley. We have already described the new regulations that have been promulgated (Marine Turtle Newsletter No. 5, 1977). We now report that further action is to be undertaken jointly by the Instituto Nacional de Pesca in Mexico, the Texas Parks and Wildlife Department and the Department of the Interior, U.S.A., in whose waters this species feeds. These plans include moving 2000 eggs to Padre Island, Texas, in an attempt to establish a nesting colony there. Immediately after being collected these eggs will be placed in sand that has been shipped from Padre Island to Rancho Nuevo. They will then be sent, still buried in this sand, to Padre Island. This is a precaution against possible chemical imprinting that might occur if the eggs were to incubate in Rancho Nuevo sand. Another 2000 eggs will be put in Rancho Nuevo soil and kept there. Hatchlings from both batches will be allowed to crawl down to the water and into the surf but will then be recaptured, possibly using helicopters, and sent to the Marine Fisheries Service facilities at Galveston, Texas, for head-starting. It is hoped that this head-starting will compensate for the 2000 eggs removed to Padre Island. Measures less fraught with unknowns will include intensified beach patrols protecting turtles reproducing in their natural way at Rancho Nuevo. Whether these actions will be sufficient to save the Atlantic ridley remains to be seen. According to recent information, in 1977 only between 400 and 500 females came ashore, a decline of some 700 from the previous year. But it is elating to know that intensive efforts are now being made.

It is also impossible not to reflect that had Rancho Nuevo been properly managed from the start, the huge arribadas of Atlantic ridleys (about 40,000 in 1947) might still be coming ashore today. It is in this context that the reports of massive slaughter of turtles on the west coast of Mexico are so disconcerting. Is there some overall policy for turtle resources in Mexico? Are the authorities in control of what is going on? What is the logic behind intensive efforts to save turtles on the Atlantic coast while allowing large numbers to be slaughtered on the Pacific coast?

One problem in evaluating these matters is that management policies for marine turtles are in a rudimentary state. How many turtles can safely be cropped from a population? There is plenty of room for debate. But whether or not there is agreement about the attached article, we would like to thank Outside Magazine for permission to reprint it, and for helping make the public aware of the problems and potentials in the conservation of marine turtles. Because of the controversial nature of these matters, we also asked Dr. P.C.H. Pritchard, who also visited Escobilla recently, to give us his views on the situation there (see COMMENT, below).

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* Address all correspondence to: N. Mrosovsky, Departments of Zoology and Psychology
University of Toronto, Toronto, Ontario M5S 1A1, Canada.

Finally, we do not apologize for devoting so much attention to one country. What happens in Mexico is, as we said, of great importance in the conservation of marine turtles. But we would most assuredly welcome more informed opinions on critical problems in other areas.

COMMENT ON TIM CAHILL'S ARTICLE "THE SHAME OF ESCOBILLA"

Several points struck me as I read this article. It is uncommonly well-written; Tim Cahill uses the English language with skill and panache. It is factually accurate; the author describes what he saw with his own eyes, or when reporting what people said, he identifies his sources. And it is a frankly emotional document, in which the author's disgust with what he saw is presented in full and sometimes lurid detail. It is a document that all sea turtle conservationists should read carefully, and make up their own minds about, because the sea turtle harvest in Pacific Mexico is far larger -- in fact, orders of magnitude larger--than the harvest of any other country in the world.

I visited Puerto Angel and the turtle processing plant and captive culture tanks in November 1977, and spoke at length with José Tanus Sucar, the local boss for the PIOSA turtle operation. Sucar answered all my questions, and allowed me to go out one morning with a capture boat, and to see the slaughter and processing operation as well as the laboratory and turtle tanks. We started off with radically different philosophies regarding wildlife, of course; several certificates on the wall of Tanus' office at the local hotel showed that he was an avid sport hunter, so that killing was his pleasure as well as his business. My philosophy is opposite; one should kill only with reluctance, and only when necessary. I found the sight of beautiful female ridleys, fresh from the sea, being bashed in with iron bars and deftly eviscerated, one after the other, five hundred or more per day, a disgusting and demoralizing sight, and I found the idea of creatures being butchered in this way when they were gathering to lay their eggs totally unacceptable, both emotionally and biologically. Every single turtle harvested while I was at Puerto Angel was a female full of shelled eggs, gathered for a major arribada; but, as Cahill's article pointed out, the arribada was late and I do not know yet if it ever took place; with the turtles in the area being reduced by four or five thousand per week, most of the colony may have been conveyed to the slaughterhouse.

Why does Mexico allow this operation to take place? It must be understood that the Mexican turtle program is basically a commercially-oriented one; while Mexico has commendably placed the highly endangered Kemp's ridley on the totally protected list for ten years or more, elsewhere the policy is to harvest the adult turtles in the largest numbers that the populations can support, both to provide meat for Mexican consumption and to provide leather for the export trade (principally to Japan, France, and Spain). I find myself in basic disagreement with this policy, which is also in opposition to the stated IUCN recommendations on sea turtle harvesting; sea turtles should not be used for international commerce, but should be considered as a resource of local value only; moreover, the adult turtles should not be harvested, since much experience has shown that this is the surest way to decimate or destroy a population. Rather, a proportion of the eggs should be set aside for human consumption, and the remainder offered protection and allowed to hatch. The most logical human exploitation of the ridleys in Pacific Mexico then would be to allow harvesting of the eggs from the first arribada, or up to a certain date, each season (these being the eggs that would be liable to destruction by later turtles nesting in the same place), and to protect the adults completely.

The Oaxaca operation is based on the assumption that, by placing eggs in a hatchery, the harvest of adult turtles will be justified and counter-balanced. Not only is there no evidence to suggest that this is the case, but the experience with Kemp's ridley on the Gulf coast would suggest that the recuperative power of a ridley population is so poor that recovery is insignificant even if the nesting beach is completely protected, unless even the accidental catch of adults by trawlers can somehow be eliminated. The

huge populations of olive ridleys in the East Pacific doubtless grew to such high levels over an enormous period of time, so the present harvest is akin to mining a non-renewable resource; I am convinced that the population will collapse within a few more seasons, and that that collapse will be, to all intents and purposes, irreversible.

I questioned Dr. Jorge Carranza, Director of the Mexican Departamento de Pesca, closely when we met recently during a meeting in Miami. He provided some insight into why such huge quotas of ridleys were permitted in Oaxaca, and why the demand to allow harvesting during the breeding season for the first time had been approved. Coastal Oaxaca is a long way from Mexico City, and there is no real possibility of fielding a large crew of federal enforcement men in this remote area. Consequently, if PIOSA had not been allowed to have a quota as high as, or nearly as high as, it requested, such a harvest would simply have taken place anyway, with no real possibility of control. By granting one company a monopoly to purchase all turtles caught by the local cooperatives, it was hoped that the legitimate cooperatives and the PIOSA field men would act as unofficial enforcement agents, ensuring that no one else would dare get in on the act. This interpretation may reflect pragmatic reality, but also makes it clear that the quotas are set by commercial pressure rather than by any biological insight into what the populations can stand.

José Tanus Sucar, as I mentioned earlier, allowed me to see all aspects of the turtle operation, but was obviously particularly keen that I should see the lab and turtle raising facility, in which PIOSA had invested several million pesos. At the time of my visit (November 19, 1977), the tanks were still dry, and although fair numbers of turtles were hatching in the styrofoam boxes in the hatchery area (the hatching rate of the eggs from slaughtered females, I was told, was about 37%), no turtles were being maintained at the facility. Sucar explained to me that the tanks had been filled for the day of the inauguration of the facility, and emptied immediately afterwards, as Cahill observed; this was because the plumbing system had run into a problem. Even though the water was taken from a deep pit dug right in the beach, the water was less than half-strength sea water. Consequently it had been necessary to re-design the intake system and place the intake pipe actually in the sea, in a rocky area where it was hoped there would not be too much sand taken in to damage the pump. The inauguration, however, had been set for October 10 well in advance, and consequently it had been necessary to have some turtles in the tanks just for show. It is, incidentally, of interest that the largest tank, for mature turtles, had an artificial beach, and that, of forty female ridleys confined here for a few days for the inauguration, four had nested on the beach and that many of the eggs had hatched. However, I do not know if the facility is yet in proper operation.

It is worth asking whether the captive turtle facility is likely to do any good. Certainly, it is better to incubate eggs from slaughtered turtles than to throw them away or eat them, but the hatchery was only a small part of the facility. I personally do not recommend keeping turtles for some weeks after hatching before releasing them. It may disadvantage them directly, by causing them to be released in a less than vigorous condition, or with the infantile swimming frenzy passed so that they are liable to be swept back up on the beach; or it may short-circuit their imprinting mechanism (if this is indeed the mechanism by which they later locate a nesting beach), so that they will not become functional members of the breeding population. Therefore, while I will not pre-judge any purely scientific discoveries that may emanate from the rearing facility, I do not believe that it has any detectable conservation value, and may actually be doing harm, partly by disadvantaging the hatchlings released, partly by persuading the authorities that the turtle raising operation justifies a higher harvesting quota for the adults.

Incidentally, the opening of the turtle raising facility was reported--with approval and praise--in the October-November 1977 issue of *Técnica Pesquera*, the

major Mexican fishing technology journal. Clearly, the opening of the facility was considered a major event, with both the State Governor and the head of the Departamento de Pesca in attendance and making speeches. Ironically, the facility was named after an enforcement man, Daniel Leon Guevara, who was murdered in the course of his duty while cracking down on a major turtle egg smuggling operation - I say ironically because the turtle egg smugglers were in fact obtaining material benefits from the turtle resource in what most biologists would consider to be the recommended way, while the facility that now bears his name is linked to the operation that may ultimately cause the extermination of the Oaxaca ridley population.

If the turtle population does soon show a precipitous decline, as I feel it will, PIOSA, the cooperatives, and the Departamento de Pesca will undoubtedly be placed in quite a quandary, since they will realize for the first time that the population cannot stand the pressure to which it is being subjected. With such a massive investment of money in boats, freezing plants, buildings, and equipment, as well as a growing dependence of the people of Puerto Angel and neighboring villages on the turtle harvest for their employment, it will be difficult to reduce the scale of operations without major economic dislocation; yet to continue with full-scale slaughter as the populations visibly decline will surely strike even the most greedy and unthinking exploiters as a sure prescription for the end of both the turtles and the industry.

Peter C.H. Pritchard
Florida Audubon Society
P.O. Drawer 7, Maitland
Florida, U.S.A. 32751.

MARINE TURTLE SURVEY, 1977, SULTANATE OF OMAN.

The WWF and the Government of Oman are supporting a survey of marine turtles in Oman on the south eastern tip of Arabia. A general aerial survey was undertaken to identify nesting and feeding grounds. On Masirah Island, tagging and data collection carried out by counterparts is underway and aspects of the turtles' reproductive biology are being examined. Educational material about turtles and conservation has been distributed to schools and the press.

On Masirah a large population of loggerhead turtles, estimated at over 30,000, nest. This may be the largest loggerhead nesting ground in the world. Loggerheads like all marine turtles suffer heavy mortality of eggs and hatchlings. On Masirah the activities of people collecting eggs for food and the effect of lights on buildings near the beach disorienting the hatchlings are added to natural mortality. Only about 25% of the eggs laid result in hatchlings reaching the sea. The population is large at the present time and can sustain moderate removal of eggs but the effect of the lights may pose a future threat.

Green turtles are common on shallow water feeding grounds around Oman; major areas are the Masirah Channel and Sawqirah Bay. Local people around Masirah catch and eat moderate numbers of turtles but do not pose any immediate threat to the population. Two major green turtle nesting grounds have been discovered. One around Ras al Hadd supports several thousand turtles. The local people eat turtle eggs but do not kill adult turtles. The isolation of this population serves to protect it from immediate danger. The other nesting ground on Masirah Island shows signs of severe population decline. The main cause seems to be the killing of nesting turtles. The Government of Oman has banned the killing of nesting turtles on this beach and closed the immediate offshore area to trawling. If these protections are passed into law and adequately policed this population should recover.

Both hawksbill turtles and olive ridley turtles have been found nesting in small numbers in association with greens and loggerheads on Masirah. Neither hawksbills or olive ridleys are exploited at the present time and they will benefit from protection given the commoner species.

Much of the data collection has been carried out by counterparts. A continuing tagging study and data collection centre are planned. With the increase in conservation awareness in schools and among the people of Oman the information collected by the survey will be used to design a conservation programme for turtles.

Perran Ross
Ministry of Diwan Affairs
P.O. Box 246, Muscat
Sultanate of Oman.

GREEN TURTLE RANCH PILOT PROJECT MATAPICA, SURINAME

On 12 August, 1977 facilities went into operation at the Matapica Field Station of the Surinam Forest Service to raise newly-hatched green sea turtles (*Chelonia mydas*) in captivity. This pilot project is under the supervision of the Foundation for Nature Preservation in Suriname (STINASU), and is financed from the private funds of the Drs. Mittag, major stockholders in the Cayman Turtle Farm, Ltd.

Purpose of the project is to study the feasibility of raising green turtles to maturity, and to see if a captive breeding population can be maintained. The project was started with 5000 hatchlings from eggs collected on Suriname beaches. Even though the study will be with *Chelonia mydas*, it is expected that some of what is being learned might benefit the conservation of other Cheloniidae.

Specific goals of the project are:

a) Annually release turtles to the sea at an age when natural mortality is significantly less than that of hatchlings.

b) Mark and release individuals to study initial travel routes of 1-3 year olds, something about which little is known yet.

c) Study means to reduce, or even eliminate, the fossil fuel subsidiary energy presently used to power the system's pumps.

d) Investigate the use of alternate turtle food resources, emphasizing the search for food which is less desirable for direct human use.

e) Use facilities, and experience gained from raising *Chelonia mydas*, to raise hatchlings of other, more endangered, sea turtle species - specifically *Lepidochelys olivacea*.

f) Improve techniques for artificial hatching of sea turtle eggs of all species nesting in Suriname.

g) Investigate the feasibility of a commercial turtle farm in Suriname.

h) Provide access to facilities and data to interested scientists.

With reference to item d) we kindly request anyone who has data on the analysis of the composition of turtle grass (Thalassia spp.) to send these to: Dr. J.P. Schulz, STINASU, P.O. Box 436, Paramaribo, Suriname.

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"Sea turtles nesting in Surinam", by J.P. Schulz, 1976. There are only about 100 copies left of this publication, which contains data collected over the previous 12 years on what probably are the most important nesting beaches in the entire Caribbean region. For those interested in a copy, please, send your name, address, and U.S. $ 15.- in currency to: STINASU, P.O. Box 436, Paramaribo, Suriname.

H.A. Reichart
STINASU
P.O. Box 436,
Paramaribo, Suriname.

LOGGERHEAD PROJECT

Student, to be supervised by N. Mrosovsky, wishes access to hatchling loggerheads in the United States. Opportunity to carry out tests of sea-finding ability on the beach undisturbed by public, minimal field station facilities and ready availability of hatchlings from hatchery programme desirable. Turtles can be released after tests. Any suggestions and offers of assistance appreciated: please write to N. Mrosovsky, Department of Zoology, University of Toronto, Toronto, M5S 1A1, Canada.

RECENT PAPERS

Reference	Address of Author
Hughes, G.R. 1977. Sea Turtles: a guide. Natal Parks Board. pp. 24. (well produced brochure that could serve as useful model for others).	G.R. Hughes, Natal Parks Board, P.O. Box 662, Pietermaritzburg 3200, South Africa.
Zwinenberg, A.J. 1977. Kemp's ridley, *Lepidochelys kempii* (Garman, 1880), undoubtedly the most endangered marine turtle today (with notes on the current status of *Lepidochelys olivacea*). Bulletin Maryland Herpetological Society, 13, 170-192. (timely review with full supporting reference list).	A.J. Zwinenberg, Borneostraat 23 Vlaardingen Holland.

Support for this newsletter came from World Wildlife Fund Canada & the University of Toronto.

Marine Turtle Newsletter

IUCN/SSC

No.8 JULY 1978

Editor: N. Mrosovsky* Editorial Advisor: Archie Carr

EDITORIAL

If only turtles could be permanently tagged as hatchlings several outstanding gaps in our understanding of their biology could be filled: how long do they take to mature in natural conditions, what is their survival rate, what is the sex ratio, do they return only to their natal beaches for nesting? This newsletter gives accounts of some recent attempts to tackle this problem. These have not been very successful, but we encourage people to send us accounts of projects that failed as well as those that succeeded, because they should help avoid duplication of effort and stimulate further attempts.

EUROPIUM TAGGING OF GREEN SEA TURTLES

During 1971, in cooperation with Dr. Archie Carr, Anne M. Forbes and I initiated a project to develop a suitable tag for hatchling green turtles which could be identified when the animals reached adult size. After attempts to use several uncommon elements, the rare earth element europium was chosen for a number of reasons. Apparently, sea turtles are unable to transport the element across the gut barrier. Europium has a complex and partly unknown biochemistry, but it cannot normally be mobilized at normal body pH levels. In short, once deposited, the element is unlikely to be moved. Major deposition sites are heart muscle, liver, kidney and bone.

A 0.5 ml europium chloride-citrate injection into the hearts of hatchlings was administered at 4 concentrations ranging from 40 to 400 mg Eu/kg body weight. Controls received distilled water. Animals were fed twice or more each day and growth was above that of literature reports, but variable between individuals. Some animals reached 60 kg. in four years. Higher doses probably caused some mortality.

Early results are presented in the Master of Science Thesis of Forbes (1972). Through neutron activation analysis tagged animals were readily identified up to 160 days, and she predicted that identification using shell fragments (marginals) could continue at least until whole body weights of 17 kg. were reached. I continued the study for almost four years but was unable to detect europium after two years and wts of from 15 to 30 kg.

Attempts at liver biopsy were unsuccessful although tagged animals undoubtedly carried detectable levels of europium. I attribute lack of success in identifying larger marked animals to the difficulty of sampling the extremely small primordial bone sites where the europium was originally deposited. Hatchlings have little calcified bone, hence the lowered likelihood of encountering tagged bone tissue in larger animals.

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*Address all correspondence to: N. Mrosovsky, Departments of Zoology and Psychology
University of Toronto, Toronto, Ontario M5S 1A1
Canada

In summary, the technique works well for a year or two, but the problems associated with finding tagged tissues after two years greatly reduces the usefulness of europium tagging of hatchlings. A shortcoming is the lack of individually recognizable turtles.

C. Robert Shoop
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IS NOTCHING HATCHLINGS A RELIABLE TAGGING METHOD?

(based on information supplied by G.R. Hughes, P. Ross and C. Limpus)

Attempts have been made to tag hatchling turtles by notching their marginal scutes. For instance, in S. Africa, George Hughes (Natal Park Board, P.O.Box 662, Pietermaritzburg 3200, S. Africa) and his co-workers have notched 74,000 hatchlings over 7 seasons. Moreover, in the 1975/76 nesting season two female loggerheads were found that had notches in a site corresponding to that selected for the 5,000 hatchlings notched in the 1971/72 season. If notching is a reliable tagging method, these results imply a maturation period of only 4 years (3 years, 10 months to be exact)! In the 1977/78 season a third loggerhead female was found with a notch appropriate for 1971/72 hatchlings. If this was the first time this female nested, it would give a maturation period of 6 years. Even this is much less than has been thought probable by most biologists, including Hughes who remains cautious about the interpretation of these data.

Certainly there are others who consider that notching is a dubious procedure for long-term marking. For instance, Perran Ross (Ministry of Diwan Affairs, P.O.Box 246, Muscat, Oman) has looked at turtles held in captivity in the Torres Straits: some had been notched as yearlings but he found that they were indistinguishable after as little as two years from those with natural malformations of the shell. He has also occasionally seen loggerheads on Masirah, Oman, with very regular square notches in the marginals, but as far as he knows there has been no notching of turtles there.

Unless large numbers of turtles with notches in specific places are recovered, there may always be some doubt that the notches were the result of natural causes. But there is no reason to suppose that more than a few percent at most of any batch of hatchlings will survive, let alone be re-caught. At the least, estimates are needed of the frequency of notches and shell deformities in populations of turtles before any notching has been done.

Another approach is to double notch hatchlings, with a distinctive combination of notches for each year. This has been done by Colin Limpus (National Parks and Wildlife Service of Queensland, Pallarenda, Townsville, Australia, 4810) and will probably also be tried in Surinam. How many notches can a hatchling withstand without becoming disadvantaged? Even if there is some risk here, it may be worth attempting because answers about maturation period are so important for any management policy. But hopefully workers in different parts of the world will keep each other informed through this newsletter of details of any notching undertaken, lest different experiments become conflated.

N. Mrosovsky

TATTOOING GREEN TURTLES

The implantation of pigments under the skin to form indelible marks can be traced back to Paleolithic times, however the word "tattoo" is of comparatively recent Polynesian origin. Although sea turtle designs were incorporated into the tattoos of early Polynesians and other Pacific islanders, there is no record that the turtles themselves were ever tattooed by such people.

In November, 1975, I had two captive-reared Hawaiian *Chelonia* (average wt. 2 kg) tattooed in an effort to develop a permanent and practical secondary identification method for use in growth and migration studies of naturally occurring immature green turtles. Mike Malone, skilled artist and owner of China Sea Tattoo Company in downtown Honolulu, applied the tattoos using a custom-built electric vibrating apparatus with four converging needles. Black carbon ink was implanted in the white skin adjacent to the anterior edge of the plastron. The tattoos consisted of HAWAII #1 and HAWAII #2. No discomfort was exhibited by the turtles while being tattooed, and Mike expressed the wish that all of his customers would remain so motionless. Upon completion, petroleum jelly was applied to the areas. Mike informed me that humans are instructed not to go into the ocean for one month, or until the tattoo is completely healed, because salt water can draw out the pigment. Because this would be impractical for sea turtles, I waited only 10 hours before returning the animals to their floating cages.

In two weeks time the scab which developed over each tattoo sloughed off and healing appeared complete. The pigment remained intact and clearly visible. During the following two months, however, the tattoos gradually faded and disappeared.

Additional experimentation with sea turtle tattooing seems warranted. Implantation needs to be tested at different skin depths, and with zinc oxide and other light colored pigments in areas of dark skin. If a technique is perfected, a battery operated tattooing apparatus suitable for field use could be constructed.

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RAISING GREEN TURTLES AT RÉUNION ISLAND

SOMDIAA, a private organization, plan the construction of a ranch for Chelonia mydas in the French Island of Réunion (Indian Ocean). I am opposed to this project, named "CORAIL", which involves the annual collection of 30,000 newly born turtles in the sanctuary of Tromelin and Europa Islands. This ranching represents a new threat for the last nesting beaches of the green turtle around Madagascar. SOMDIAA do not envisage creating a breeding stock to obtain newborn turtles for the project. During attempts to raise green turtles by the Réunion ISTPM Institute, 35% of the young died before reaching 13 months; many died in the course of transport between the nesting beach and the laboratory facilities. I ask that IUCN oppose the creation of this ranch for which the necessary techniques for raising the young are not yet properly developed.

Jacques Fretey
Muséum National d' Histoire Naturelle
57 Rue Cuvier
75005, Paris
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EMBRYOLOGICAL STUDIES

I should like to correspond with researchers concerning the embryology and developmental biology of marine turtles. Current studies involve normal stages, embryonic osteology and morphology as well as rates of development of five species.

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University of New England
Armidale, New South Wales
Australia

SEA TURTLES NESTING ON THE COAST OF SENEGAL

Preliminary to a research programme on the sea turtles of Senegal, a survey of the beaches was carried out during the nesting season during the rainy period of 1977. Senegal has about 600 kms of beach, of which about 2/3 is sandy and might well be suitable nesting grounds for the 5 species of turtles that frequent the waters of West Africa. Because of limited resources, it was not possible to survey all the coast, but only regions included within the National Parks. No large aggregations of nesting were found.

1. North coast of Senegal: Tracks of turtles were found on the beaches of the Langue de Barbarie National Park by I. Touré (Park Warden) during the last 2 weeks in July and the first 2 weeks of August. Unfortunately they were not counted. They were probably made by green turtles, the most common species in the region. A green turtle was killed by fishermen in October 1977 on a beach south of Tare, outside the National Park. Inquiries among the fishermen of Gandiole (St. Louis region) indicated that 20 years ago about 300 nests were laid each year here. However, in 1975, the year before the establishment of the Langue de Barbarie National Park, only 3 nestings were observed. The coast between Dakar and Tare (160 km) was not surveyed in 1977, nor were the beaches north of St. Louis, a region where we have been told that nesting occurs (Maigret, 1975; Trotignon and Maigret, 1977).

2. Area of Cap-Vert and Petite-Côte: On October 19th 1977, some 50 young hawksbill turtles were found dead on a shingly beach of the National Park of the Madeleine Islands (facing Dakar). No observations were made this year on the beaches south of Dakar, nor on Sangomar Point (Saloum delta); this is regrettable because on two occasions leatherbacks have been reported laying here.

3. Casamance: The beaches of Casamance were not surveyed. However, turtles laying here have been reported between Cap Skirring and the village of Diemberring. It is important that these beaches be patrolled because facilities for tourists often modify the environment unfavourably for turtles.

Maigret, J. (1975). Notes et informations: Les Tortues de mer du Banc d'Arguin. Bull. Lab. Pêches Nouadhibou (Mauritanie), 4, décembre 1975, p. 118-119.

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Maigret, J. (1977). Les Tortues de mer du Sénégal. Bull. Ass. Avanc. Science, Sénégal, Dakar, no. 59, octobre 1977, p. 7-14.

Jacques Maigret
chargé du departement de Biologie marine
Institut Fondamental d'Afrique Noire
Université de Dakar
B.P. 206 Dakar, Sénégal

MARINE TURTLES IN INDIA's LAKSHADWEEP ISLANDS

Three sea turtle species - the Green Turtle (Chelonia mydas), the Hawksbill (Eretmochelys imbricata) and the Olive Ridley (Lepidochelys olivacea) - commonly occur and nest in the Lakshadweep Islands which lie 120 to 200 miles off India's south-west coast. The rare Leatherback (Dermochelys coriacea) is occasionally met with by fishermen; rarely does it come ashore to nest.

Of the ten inhabited and sixteen seasonally uninhabited islands that form the Union Territory, nesting appears to occur in substantial numbers only on four islands of the latter category - Suheli Valiyakara, Suheli Cheriyakara, Tinnakara and Bangaram. Surveyed during the period October '77 to January '78, the number of old nesting pits of Green turtles visible were found to be 200, 15, 40, and 15 at the respective islands. Nesting was sporadic on Suheli Valiyakara and on Tinnakara during the period October-January; the main nesting season is believed to occur during the months of the south-west monsoon, June to September.

Of the inhabited islands, Kadmat, Androth, Agatti and Minicoy appear to be the most favoured by nesting turtles. During survey visits averaging four days at each island, the number of egg-laden nests located were, respectively, 4, 4, 2 and 1; of these 11 nests, 7 had been made by Olive Ridleys, 3 by Hawksbills and one, at Minicoy, by a Green turtle. Off Minicoy, which is the southern-most in the group, Greens and Hawksbills are commonly sighted the year round, close to shore. The Ridley appears to be absent from Minicoy waters, but is quite common elsewhere, particularly at the 5 northern-most islands (the Amindivi group).

Excepting at Minicoy, turtles are sighted within the lagoons only during the monsoon months and during the few weeks that follow. In spite of protective legislation, turtles are actively hunted on all islands barring Minicoy, where turtling is sporadic (the men here are usually seamen, making good wages).

Green turtles and, to a lesser extent, Ridleys, are valued for the fat they contain; Hawksbills for the beautiful, glossy laminae on their shells. Leatherbacks, when encountered, are avidly harpooned (two instances related during the period September -December '77, one each off Kadmat and Androth). Its fat, like those of the other species, is used to waterproof the joints of country boats.

Suheli Valiyakara Island is evidently the most important turtle rookery in Lakshadweep. Plans are afoot to permanently settle islanders from Kavaratti there. At present, Valiyakara is inhabited (and sparsely so) only during the fair season (October-May). Coconut cultivators have begun fencing off parts of the half mile long main nesting beach, with the express purpose of preventing nesting turtles from coming ashore and inadvertently uprooting their coconut saplings.

Lakshadweep's turtle population, which is stated by local people to have dwindled over the years, urgently needs protection. Some suggested measures are: providing a substitute oil for the islanders' boat repairs; demarcating an uncleared, uncultivated zone between the beach and the coconut plantation (both to prevent erosion and to facilitate turtle nesting); re-examining the proposal to populate and build a light house on Suheli Valiyakara Island; publicizing the international plight of sea turtles, especially the rare Leatherback; designating at least two major nesting islands (Minicoy and Suheli Valiyakara) as Sea Turtle Preserves; investigating and sealing the continuing illegal outlet for Hawksbill shell to the mainland.

Satish Bhaskar
Field Officer
Madras Snake Park Trust Surveys
Madras 600022
India

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Reference	Address of Author
Fletemeyer, J.R. 1978. Underwater tracking evidence of neonate loggerhead sea turtles seeking shelter in drifting sargassum. Copeia, No.1, 148-149. (hatchling loggerheads tracked by "underwater propulsion unit" stop in sargassum 1-2 kms offshore).	John R. Fletemeyer 620 S.E. 5th Ct. Fort Lauderdale Florida 33301, U.S.A.
Fretey, J. 1977. Causes de mortalité des tortues luths adultes (Dermochelys coriacea) sur le littoral guyanais. Le Courrier de la Nature, No.52, 257-266. (in some areas 6.5% of turtles coming ashore die following entanglement in mangrove trees; beach cleaning operation proposed; other causes of mortality discussed. In French).	Jacques Fretey Laboratoire de zoologie (Reptiles et Amphibiens) Muséum national d'histoire naturelle 57 rue Cuvier 75005 Paris, France
Stancyk, S.E. and Ross, J.P. 1978. An analysis of sand from green turtle nesting beaches on Ascension Island. Copeia, No.1, 93-99. (green turtles have wide tolerance for sand particle size; less nesting on beaches with human disturbance).	S.E. Stancyk Department of Biology University of South Carolina Columbia South Carolina 29208, U.S.A.
Uchida, I. and Kajihara, T. 1977. On the temperatures in the nest of the pacific loggerhead turtle (Caretta caretta L.). Japanese Journal of Herpetology, 7, 36-37. (records of temperatures within, above and below egg mass over a 2 day period, plus prevailing weather. In Japanese).	I. Uchida Himeji City Aquarium Tegarayama Himeji City 670, Japan
Witham, R. and Futch, C.R. 1977. Early growth and oceanic survival of pen-reared sea turtles. Herpetologica, 33, 404-409. (recaptures of green turtles raised for about a year in pens show that captive raised animals can survive in the ocean, at least for periods of a few years; 6.7% of released animals recaptured so far).	Ross Witham Marine Research Laboratory 100 Eighth Avenue, S.E. St. Petersburg Florida, 33701, U.S.A.

JAPANESE TORTOISE SHELL TRADE

An English version of the "Preliminary report on the hawksbill turtle (Eretmochelys imbricata) in Indonesia, Philippines, Malaysia and Singapore", produced by the Japanese Tortoise Shell Association in August 1973, has now been prepared by George Balazs and Mae Nozoe. The report contains information about the sources of supply for hawksbill shell and also many facts about the Japanese Tortoise shell trade and the problems it faces in the future. A limited number of copies are available at the non-profit cost of $8.00 USA (post paid). Write to George Balazs (Hawaii Institute of Marine Biology, P.O.Box 1346, Kaneohe, Hawaii, 96744, U.S.A.)

Support for this newsletter came from World Wildlife Fund Canada and the University of Toronto.

Marine Turtle Newsletter

IUCN/SSC

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Editor: N. Mrosovsky* Editorial Advisor: Archie Carr

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University of Toronto, Toronto, Ontario M5S 1A1
Canada

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C. Robert Shoop
Department of Zoology
University of Rhode Island
Kingston, Rhode Island, U.S.A., 02881

IS NOTCHING HATCHLINGS A RELIABLE TAGGING METHOD?

(based on information supplied by G.R. Hughes, P. Ross and C. Limpus)

Attempts have been made to tag hatchling turtles by notching their marginal scutes. For instance, in S. Africa, George Hughes (Natal Park Board, P.O.Box 662, Pietermaritzburg 3200, S. Africa) and his co-workers have notched 74,000 hatchlings over 7 seasons. Moreover, in the 1975/76 nesting season two female loggerheads were found that had notches in a site corresponding to that selected for the 5,000 hatchlings notched in the 1971/72 season. If notching is a reliable tagging method, these results imply a maturation period of only 4 years (3 years, 10 months to be exact)! In the 1977/78 season a third loggerhead female was found with a notch appropriate for 1971/72 hatchlings. If this was the first time this female nested, it would give a maturation period of 6 years. Even this is much less than has been thought probable by most biologists, including Hughes who remains cautious about the interpretation of these data.

Certainly there are others who consider that notching is a dubious procedure for long-term marking. For instance, Perran Ross (Ministry of Diwan Affairs, P.O.Box 246, Muscat, Oman) has looked at turtles held in captivity in the Torres Straits: some had been notched as yearlings but he found that they were indistinguishable after as little as two years from those with natural malformations of the shell. He has also occasionally seen loggerheads on Masirah, Oman, with very regular square notches in the marginals, but as far as he knows there has been no notching of turtles there.

Unless large numbers of turtles with notches in specific places are recovered, there may always be some doubt that the notches were the result of natural causes. But there is no reason to suppose that more than a few percent at most of any batch of hatchlings will survive, let alone be re-caught. At the least, estimates are needed of the frequency of notches and shell deformities in populations of turtles before any notching has been done.

Another approach is to double notch hatchlings, with a distinctive combination of notches for each year. This has been done by Colin Limpus (National Parks and Wildlife Service of Queensland, Pallarenda, Townsville, Australia, 4810) and will probably also be tried in Surinam. How many notches can a hatchling withstand without becoming disadvantaged? Even if there is some risk here, it may be worth attempting because answers about maturation period are so important for any management policy. But hopefully workers in different parts of the world will keep each other informed through this newsletter of details of any notching undertaken, lest different experiments become conflated.

N. Mrosovsky

TATTOOING GREEN TURTLES

The implantation of pigments under the skin to form indelible marks can be traced back to Paleolithic times, however the word "tattoo" is of comparatively recent Polynesian origin. Although sea turtle designs were incorporated into the tattoos of early Polynesians and other Pacific islanders, there is no record that the turtles themselves were ever tattooed by such people.

In November, 1975, I had two captive-reared Hawaiian *Chelonia* (average wt. 2 kg) tattooed in an effort to develop a permanent and practical secondary identification method for use in growth and migration studies of naturally occurring immature green turtles. Mike Malone, skilled artist and owner of China Sea Tattoo Company in downtown Honolulu, applied the tattoos using a custom-built electric vibrating apparatus with four converging needles. Black carbon ink was implanted in the white skin adjacent to the anterior edge of the plastron. The tattoos consisted of HAWAII #1 and HAWAII #2. No discomfort was exhibited by the turtle while being tattooed, and Mike expressed the wish that all of his customers would remain so motionless. Upon completion, petroleum jelly was applied to the areas. Mike informed me that humans are instructed not to go into the ocean for one month, or until the tattoo is completely healed, because salt water can draw out the pigment. Because this would be impractical for sea turtles, I waited only 10 hours before returning the animals to their floating cages.

In two weeks time the scab which developed over each tattoo sloughed off and healing appeared complete. The pigment remained intact and clearly visible. During the following two months, however, the tattoos gradually faded and disappeared.

Additional experimentation with sea turtle tattooing seems warranted. Implantation needs to be tested at different skin depths, and with zinc oxide and other light colored pigments in areas of dark skin. If a technique is perfected, a battery operated tattooing apparatus suitable for field use could be constructed.

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RAISING GREEN TURTLES AT RÉUNION ISLAND

SOMDIAA, a private organization, plan the construction of a ranch for Chelonia mydas in the French Island of Réunion (Indian Ocean). I am opposed to this project, named "CORAIL", which involves the annual collection of 30,000 newly born turtles in the sanctuary of Tromelin and Europa Islands. This ranching represents a new threat for the last nesting beaches of the green turtle around Madagascar. SOMDIAA do not envisage creating a breeding stock to obtain newborn turtles for the project. During attempts to raise green turtles by the Réunion ISTPM Institute, 35% of the young died before reaching 13 months; many died in the course of transport between the nesting beach and the laboratory facilities. I ask that IUCN oppose the creation of this ranch for which the necessary techniques for raising the young are not yet properly developed.

Jacques Fretey
Muséum National d' Histoire Naturelle
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75005, Paris
France

EMBRYOLOGICAL STUDIES

I should like to correspond with researchers concerning the embryology and developmental biology of marine turtles. Current studies involve normal stages, embryonic osteology and morphology as well as rates of development of five species.

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University of New England
Armidale, New South Wales
Australia

SEA TURTLES NESTING ON THE COAST OF SENEGAL

Preliminary to a research programme on the sea turtles of Senegal, a survey of the beaches was carried out during the nesting season during the rainy period of 1977. Senegal has about 600 kms of beach, of which about 2/3 is sandy and might well be suitable nesting grounds for the 5 species of turtles that frequent the waters of West Africa. Because of limited resources, it was not possible to survey all the coast, but only regions included within the National Parks. No large aggregations of nesting were found.

1. North coast of Senegal: Tracks of turtles were found on the beaches of the Langue de Barbarie National Park by I. Touré (Park Warden) during the last 2 weeks in July and the first 2 weeks of August. Unfortunately they were not counted. They were probably made by green turtles, the most common species in the region. A green turtle was killed by fishermen in October 1977 on a beach south of Tare, outside the National Park. Inquiries among the fishermen of Gandiole (St. Louis region) indicated that 20 years ago about 300 nests were laid each year here. However, in 1975, the year before the establishment of the Langue de Barbarie National Park, only 3 nestings were observed. The coast between Dakar and Tare (160 km) was not surveyed in 1977, nor were the beaches north of St. Louis, a region where we have been told that nesting occurs (Maigret, 1975; Trotignon and Maigret, 1977).

2. Area of Cap-Vert and Petite-Côte: On October 19th 1977, some 50 young hawksbill turtles were found dead on a shingly beach of the National Park of the Madeleine Islands (facing Dakar). No observations were made this year on the beaches south of Dakar, nor on Sangomar Point (Saloum delta); this is regrettable because on two occasions leatherbacks have been reported laying here.

3. Casamance: The beaches of Casamance were not surveyed. However, turtles laying here have been reported between Cap Skirring and the village of Diemberring. It is important that these beaches be patrolled because facilities for tourists often modify the environment unfavourably for turtles.

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Maigret, J. (1977). Les Tortues de mer du Sénégal. Bull. Ass. Avanc. Science, Sénégal, Dakar, no. 59, octobre 1977, p. 7-14.

Jacques Maigret
chargé du departement de Biologie marine
Institut Fondamental d'Afrique Noire
Université de Dakar
B.P. 206 Dakar, Sénégal

MARINE TURTLES IN INDIA's LAKSHADWEEP ISLANDS

Three sea turtle species - the Green Turtle (Chelonia mydas), the Hawksbill (Eretmochelys imbricata) and the Olive Ridley (Lepidochelys olivacea) - commonly occur and nest in the Lakshadweep Islands which lie 120 to 200 miles off India's south-west coast. The rare Leatherback (Dermochelys coriacea) is occasionally met with by fishermen; rarely does it come ashore to nest.

Of the ten inhabited and sixteen seasonally uninhabited islands that form the Union Territory, nesting appears to occur in substantial numbers only on four islands of the latter category - Suheli Valiyakara, Suheli Cheriyakara, Tinnakara and Bangaram. Surveyed during the period October '77 to January '78, the number of old nesting pits of Green turtles visible were found to be 200, 15, 40, and 15 at the respective islands. Nesting was sporadic on Suheli Valiyakara and on Tinnakara during the period October-January; the main nesting season is believed to occur during the months of the south-west monsoon, June to September.

Of the inhabited islands, Kadmat, Androth, Agatti and Minicoy appear to be the most favoured by nesting turtles. During survey visits averaging four days at each island, the number of egg-laden nests located were, respectively, 4, 4, 2 and 1; of these 11 nests, 7 had been made by Olive Ridleys, 3 by Hawksbills and one, at Minicoy, by a Green turtle. Off Minicoy, which is the southern-most in the group, Greens and Hawksbills are commonly sighted the year round, close to shore. The Ridley appears to be absent from Minicoy waters, but is quite common elsewhere, particularly at the 5 northern-most islands (the Amindivi group).

Excepting at Minicoy, turtles are sighted within the lagoons only during the monsoon months and during the few weeks that follow. In spite of protective legislation, turtles are actively hunted on all islands barring Minicoy, where turtling is sporadic (the men here are usually seamen, making good wages).

Green turtles and, to a lesser extent, Ridleys, are valued for the fat they contain; Hawksbills for the beautiful, glossy laminae on their shells. Leatherbacks, when encountered, are avidly harpooned (two instances related during the period September -December '77, one each off Kadmat and Androth). Its fat, like those of the other species, is used to waterproof the joints of country boats.

Suheli Valiyakara Island is evidently the most important turtle rookery in Lakshadweep. Plans are afoot to permanently settle islanders from Kavaratti there. At present, Valiyakara is inhabited (and sparsely so) only during the fair season (October-May). Coconut cultivators have begun fencing off parts of the half mile long main nesting beach, with the express purpose of preventing nesting turtles from coming ashore and inadvertently uprooting their coconut saplings.

Lakshadweep's turtle population, which is stated by local people to have dwindled over the years, urgently needs protection. Some suggested measures are: providing a substitute oil for the islanders' boat repairs; demarcating an uncleared, uncultivated zone between the beach and the coconut plantation (both to prevent erosion and to facilitate turtle nesting); re-examining the proposal to populate and build a light house on Suheli Valiyakara Island; publicizing the international plight of sea turtles, especially the rare Leatherback; designating at least two major nesting islands (Minicoy and Suheli Valiyakara) as Sea Turtle Preserves; investigating and sealing the continuing illegal outlet for Hawksbill shell to the mainland.

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India

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Fletemeyer, J.R. 1978. Underwater tracking evidence of neonate loggerhead sea turtles seeking shelter in drifting sargassum. Copeia, No.1, 148-149. (hatchling loggerheads tracked by "underwater propulsion unit" stop in sargassum 1-2 kms offshore).	John R. Fletemeyer 620 S.E. 5th Ct. Fort Lauderdale Florida 33301, U.S.A.
Fretey, J. 1977. Causes de mortalité des tortues luths adultes (Dermochelys coriacea) sur le littoral guyanais. Le Courrier de la Nature, No.52, 257-266. (in some areas 6.5% of turtles coming ashore die following entanglement in mangrove trees; beach cleaning operation proposed; other causes of mortality discussed. In French).	Jacques Fretey Laboratoire de zoologie (Reptiles et Amphibiens) Muséum national d'histoire naturelle 57 rue Cuvier 75005 Paris, France
Stancyk, S.E. and Ross, J.P. 1978. An analysis of sand from green turtle nesting beaches on Ascension Island. Copeia, No.1, 93-99. (green turtles have wide tolerance for sand particle size; less nesting on beaches with human disturbance).	S.E. Stancyk Department of Biology University of South Carolina Columbia South Carolina 29208, U.S.A.
Uchida, I. and Kajihara, T. 1977. On the temperatures in the nest of the pacific loggerhead turtle (Caretta caretta L.). Japanese Journal of Herpetology, 7, 36-37. (records of temperatures within, above and below egg mass over a 2 day period, plus prevailing weather. In Japanese).	I. Uchida Himeji City Aquarium Tegarayama Himeji City 670, Japan
Witham, R. and Futch, C.R. 1977. Early growth and oceanic survival of pen-reared sea turtles. Herpetologica, 33, 404-409. (recaptures of green turtles raised for about a year in pens show that captive raised animals can survive in the ocean, at least for periods of a few years; 6.7% of released animals recaptured so far).	Ross Witham Marine Research Laboratory 100 Eighth Avenue, S.E. St. Petersburg Florida, 33701, U.S.A.

JAPANESE TORTOISE SHELL TRADE

An English version of the "Preliminary report on the hawksbill turtle (Eretmochelys imbricata) in Indonesia, Philippines, Malaysia and Singapore", produced by the Japanese Tortoise Shell Association in August 1973, has now been prepared by George Balazs and Mae Nozoe. The report contains information about the sources of supply for hawksbill shell and also many facts about the Japanese Tortoise shell trade and the problems it faces in the future. A limited number of copies are available at the non-profit cost of $8.00 USA (post paid). Write to George Balazs (Hawaii Institute of Marine Biology, P.O.Box 1346, Kaneohe, Hawaii, 96744, U.S.A.)

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Marine Turtle Newsletter

IUCN/SSC

No. 9 DECEMBER 1978

Editor: N. Mrosovsky* Editorial Advisor: Archie Carr

EDITORIAL

In a previous Newsletter (No. 8, July 1978) we reported continuing attempts to tag hatchling turtles. At least in the case of tagging hatchlings, we all know that failure to solve this problem is a serious impediment to devising rational management procedures. But we need constantly to remind ourselves of our ignorance of turtle biology because there are interventions in natural reproductive processes, taken by many people as self-evidently beneficial, that could, for all we know, have harmful long-term consequences.

Take, for example, the incubation of eggs in styrofoam boxes, a practice that is becoming increasingly embedded in established conservation procedures. What could possibly be wrong with this? Protection is afforded to eggs that might have been taken by predators or destroyed in some other way. The hatch rates are often excellent. The eggs can be cared for within a single hatchery area with minimal effort, and known numbers of hatchlings released. What could be more rewarding for a conservation officer or park warden than taking a mass of struggling hatchlings out of their boxes and letting them crawl into the sea ... hatchlings that he knows would have had much reduced chances of survival this long without his help.

The thought that this procedure may be causing imbalances in the sex ratio of the population is probably far from his mind. But studies on freshwater and terrestrial chelonians have shown that changes of only a few °C can switch sex ratios from almost 100% male to 100% female (e.g. Yntema, C.L., 1976, Journal of Morphology, 150, 453-462). Now incubation times for marine turtle eggs in styrofoam boxes tend to be longer, presumably reflecting lower average temperatures in above ground hatcheries. The eggs are not experiencing the same temperatures as they would naturally. For a recent example, see the report below by R. Márquez in this Newsletter.

Fortunately some biologists, notably Dr. D.W. Owens (Department of Zoology and Entomology, Colorado State University, Fort Collins, Colorado, 80523, U.S.A.) have alerted turtle conservationists to the possibility that sexual differentiation of sea turtle eggs might also be influenced by temperature. Fortunately also it has been possible to interest Dr. C.L. Yntema (Department of Anatomy, State University of New York, Syracuse, New York, 13210, U.S.A.), an expert on chelonian embryology, in working on this problem. Information about his results

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will be made available through this newsletter as soon as there is anything clear cut to report, but surprisingly, these endeavors have been impeded by the regrettable reluctance of certain authorities to help in providing a few clutches of turtle eggs.

Of course, whatever the outcome of these researches, styrofoam boxes will have their uses. But let us also remember that nearly all of chelonian evolution has taken place not only in the pre-styrofoam era but also in the pre-human era. There is much to be said for the conservative policy of keeping at least some stretches of any turtle beach as natural as possible as a comparison area for any attempts to improve on what the turtles are doing themselves, and as a protection against our own ignorance. N.M.

THE ATLANTIC RIDLEY IN MEXICO: 1978 SEASON AND CONSERVATION PROGRAMME

This year the ridley sea turtle nesting season began in the middle of April and the last "arribada" was on June 18th, 1978. The total number of eggs transplanted to the nursery were 85833, divided in two lots, one reburied directly in the sand on the beach (65,316 eggs) and the other incubated in styrofoam boxes with 100-150 eggs per clutch. The overall hatching rate was 55.9% on the beach and 66.6% n the boxes, and the number of hatchlings released on the Rancho Nuevo beach was 53,953. The remainder were sent to the National Marine Fisheries Laboratory at Galveston, Texas. Some of the hatchlings were greens (96) and they were released at the same place and time. This year the nesting season was longer than in the five previous years and the total number of females was about double that of last year. We suppose that the population has increased, but how much has not yet been calculated.

Incubation in boxes was 10.7% more successful than incubation in natural conditions on the beach. The time for incubation was longer in the boxes, around five days more; this may be because the temperature was 2 or 3 °C lower in the boxes; and small changes in weather have had more influence in small boxes than open sand beach.

For the first time, the work in Rancho Nuevo was carried out in collaboration with U.S. scientists and students. The project was called "Restoration and Enhancement of Atlantic Ridley Turtle Population". Its principal features were: total protection of the turtle nesting in Rancho Nuevo, Tamaulipas, and the transportation for 2,000 eggs and a similar quantity of hatchlings to the Galveston Laboratory, for possible imprinting and head-starting of hatchlings the subsequent release taking place within the yearlings' natural distribution.

Biól. René Márquez M.
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COMPUTERIZATION

Address labels for this newsletter are now being handled by a computer. There have probably been a few errors in programming. If your address is wrong, please let the editor know soon, as another newsletter will be mailed shortly.

N.M.

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Hirth, H.F. 1978. A model of the evolution of green turtle (Chelonia mydas) remigrations. Herpetologica, 34, 141-147. (speculations on how long-distance remigrations evolved...perhaps through a stage of passive drift).	Harold F. Hirth Department of Biology University of Utah Salt Lake City, Utah 84112 U.S.A.
Ireland, L.C., Frick, J.A. and Wingate, D.B. 1978. Nighttime orientation of hatchling green turtles (Chelonia mydas) in open ocean. In: Animal Migration, navigation and Homing[1], Schmidt-Koenig, K. and Keeton, W.T. (eds.) Springer-Verlag, Berlin, pp. 420-429. (initial travel paths of hatchlings are roughly at right-angles to beaches; paths do not change when land is out of sight at turtle eye level).	Leonard C. Ireland Oakland University Rochester, MI U.S.A.
Isaacks, R.E., Harkness, D.R., and Witham, P.R. 1978. Relationship between the major phosphorylated metabolic intermediates and oxygen affinity of whole blood in the loggerhead (Caretta caretta) and the green sea turtle (Chelonia mydas) during development. Developmental Biology, 62, 344-353.	R.E. Isaacks Veterans Administration Hospital and Department of Medicine University of Miami School of Medicine Miami, Florida 33125, U.S.A.
Mrosovsky, N. 1978. Orientation mechanisms of marine turtles. In: Animal Migration, Navigation and Homing[1], Schmidt-Koenig, K. and Keeton, W.T. (eds.), Springer-Verlag, Berlin, pp. 413-419. (reviews sea-finding of hatchlings; argues that tracking of adult turtles is not necessarily the best way at present of understanding long-distance migrations).	N. Mrosovsky Departments of Zoology and Psychology University of Toronto Toronto, Canada M5S 1A1

[1] This volume contains papers on migration and orientation of many different species and is recommended as an up to date account of the progress, possibilities and methods in this area.

Owens, D.W., Hendrickson, J.R., Lance, V., and Callard, I.P. 1978. A technique for determining sex of immature Chelonia mydas using a radioimmunoassay. Herpetologica, 34, 270-273.

David W. Owens
Department of Zoology and Entomology
Colorado State University
Fort Collins, Colorado 80523
U.S.A.

(immature green turtles (4.8 yrs. old) can be sexed reliably by assaying plasma testosterone levels; discussion of other attempts to sex immature turtles).

Phillips, E.J. 1976. Raising hatchlings of the leatherback turtle, Dermochelys coriacea. British Journal of Herpetology, 5, 677-678.

E.J. Phillips
71 Jefferson Street
Westfield, Mass.
U.S.A.

(3 out of 4 hatchlings survived in captivity for at least 249 days; cooler water may have helped reduce swimming against sides of tank; chicken liver diet used).

Witham, R. 1978. Presented at the Conference on Assessment of Ecological Impacts of Oil Spills. 14-17 June 1978, Keystone Lodge, Keystone, Colorado. Coordinated by AIBS. Abstract.

Ross Witham
Florida Department of Natural Resources
Marine Research Laboratory
100 Eighth Avenue, S.E.
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(tar found in mouths of 2 small green turtles, one died; a third covered with liquid oil also died).

U.S.A. SEA TURTLE PROTECTION PLAN

In July, 1978, the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce announced new regulations designed to protect sea turtles. These include:

1) designation of green turtles with breeding grounds in Florida and the Pacific Coast of Mexico as endangered, and all other green turtles as threatened.
2) designation of olive ridley turtles breeding on the Pacific Coast of Mexico as endangered, and all other olive ridleys as threatened.
3) designation of loggerhead turtles throughout the world as threatened.
4) a ban on the importation of turtle products from mariculture operations.
5) a ban on subsistence taking of sea turtles except for limited taking in the Trust Territory of the Western Pacific.

The effect of the action is to prohibit trade in and the intentional taking of the three species of sea turtles, except for scientific research, public display, and the limited subsistence take

in the Trust Territory. While some incidental taking of the sea turtles may continue in fishing operations, such operations are to be strictly regulated to preserve the species. Commercial interests that will be affected by the regulation include leather goods, food, cosmetics, curios and jewellery concerns. A one-year grace period will be allowed for interstate commerce to enable dealers, shopkeepers and others to clear their shelves.

based on a news release from: National Oceanic and Atmospheric Administration
US Department of Commerce
Washington, D.C. 20230
U.S.A.

TOURISTS TO PAY FOR TURTLE WATCHING IN MALAYSIA

According to information published in the New Straits Times, 3 August 1978, licensed egg collectors in the Rantau Abang leatherback turtle nesting area will be permitted to charge fees to tourists. Some licensees pay as much as $12,700 USA per year for a stretch of beach, and they lose about $17 USA in revenue from sale of eggs for each turtle scared away.

N.M.

BLUE ROTOTAG FOUND IN COSTA RICA

A Dalton Jumbo Rototag, blue, numbered 264 on both sides, has been found on the North-Western Costa Rica (Golfo de Papagayo), in April 1978. This has been sent to Douglas C. Robinson (Escuela de Biologia, Universidad de Costa Rica, Rodrigo Facio, Costa Rica). He would appreciate hearing who uses these tags. Those in charge of tagging (or notching of hatchlings) are urged to keep others informed of the essentials of their programme (tag type, colour, location and species tagged, if tag to be removed or left on, and for notching which scutes are notched). This newsletter publishes brief accounts of this kind.

N.M.

TAGGING OF OLIVE RIDLEYS, PACIFIC COAST OF COSTA RICA

The University of Costa Rica is using the small Rototags (1 X 3.5 cm.), both red and yellow, numbered one side only. These are applied to the right fore flipper of Lepidochelys olivacea at Playa Ostional, Pacific Coast of Costa Rica. When a Dermochelys shows up, we tag it too, but not as part of a program. The use of two colors is designed to 1) at least receive information on the color of a tag if the number is not decipherable or recalled by locals walking the beach, and 2) serve as a fidelity check since, in theory, only we know which numbers go with which colors. We do not wish the tags removed since we are not studying "migrations".

Douglas C. Robinson
Escuela de Biologia
Universidad de Costa Rica
Rodrigo Facio, Costa Rica

HAWKSBILL SHELLS: PROSECUTION IN BRITAIN UNDER THE ENDANGERED SPECIES ACT

reprinted from The New Scientist 21 September 1978, p. 828.

Britain's first prosecution under the Endangered Species (Import and Export) Act began at Great Marlborough Street court last Saturday (16 September). Friends of the Earth (FoE) brought the case against Eaton's Shell Shop for possession of illegally imported shells of the endangered Hawksbill turtle. Imported from the Philippines, the 25 shells were whole and polished but otherwise untreated. Under the Act, tortoiseshell (which comes from the marine turtles) is controlled if "unworked or simply prepared". FoE maintain that polished shell is in this category, while the defendants say that simple preparation involves only removing the carapace from the rest of the animal. So they imported the shells as if worked. But duty is payable on worked shell, and Eaton's unfortunately neglected to declare the import until FoE caddishly blew the gaff. Having seized the shells, HM customs decided that, as they were polished, duty was payable. Walrus and elephant tusks and whalebone are among the other products controlled in the "unworked" state so that, if Customs interpretation holds, a polish will legalise their import in any numbers. The case has been adjourned until 21 October.

An order to amend the Act has been prepared by the Department of the Environment to control tortoiseshell whether or not worked. But that is not yet law. Nor is it adequate. Articles made of shell will be controlled, but the wording is so ill attended to that items, such as jewellery, made partly of other material will not be covered. Claws, one of the less important products, will be controlled for the first time. But turtle oil, one of the most important, has been excluded on the grounds that it is unidentifiable. That is no reflection on Customs Officers--but neither can they identify turtle claws. However, recognising turtle oil should require only reading the label on the container (e.g. in the shop) for its value lies in its true identity. You might call it something else but then you are answerable to the Trade Descriptions Act. Meanwhile trade has ostensibly increased, with at least two brands of toiletries having appeared in the UK this year extolling the virtues of their reptilian content.

Like the present regulations, the new order will not apply to the Luth turtle even though it is on Appendix I of the Washington Convention on International Trade in Endangered Species (i.e. it is endangered by Trade). Although written to enforce the Convention, and eliminate endangered species from international trade, the Act cannot hope to succeed if HM Customs continues to play fast and loose with it. Regrettably, even improvements to the Act appear haphazardly written and inconsistent.

Jon Barzdo

AN ALTERNATE TO TURTLE-OIL AS A BOAT-CAULKING AGENT

I read, with great interest, the letter on turtles in the Lakshadweep Islands in the July 1978 issue (No. 8) of the Marine Turtle Newsletter and would like to make this comment. For a number of years I was engaged in commercial fishing along the western and northern rim of the Indian Ocean basin - notably in Kenya, Somalia, what was then known as the Aden Protectorate, and the oceanic regions of Madagascar,

the Comores and the Seychelles. Both green and hawksbill turtles are (were) present in significant quantities throughout this region and, since much of the inshore coastal fishing consisted of gill and tangle netting, considerable numbers of these marine animals were taken on a year-round basis.

The boats which formed this fishery were usually either large dug-out canoes, or for vessels above 28 ft. in length, construction was of crude planking, nailed, pegged or lashed together and caulked with a variety of compounds such as sisal fibre, feathers, coral-rock lime, bits of leather and other available filler. Both wood and caulking were liberally dressed with what was termed "seefa".

"Seefa" is a crude oil substance obtained by shredding shark and rays' livers and dropping them into an empty 44 gallon drum through the small filler hole on the top. The partially-filled drum was then left in the sun with the filler cap loosely fitted. Organic decomposition of the tissue inside was rapid and effective and the smell indescribable. After 2 to 3 weeks the 'brew' stabilised into an oily substance having the colour and consistency of a watery molasses and it was this which was used as a caulking dressing.

The main point to note is that this shark-liver compound was preferred by all the Bajuni/Somali/Arab-coast fishermen as a water-proofing agent to turtle oil which was only used when sharks and rays were not present. The manufacturing process is as described and could not be simpler. The product is ready to use as soon as it ceases to produce gas. All that is required to apply it is a swab of sisal fibre and an insensitive nose.

W. Travis
Principal Fisheries Officer
Suva, Fiji
Pacific Ocean

TURTLE WITH PLASTIC TAG SEEN OFF NEW JERSEY, USA

A bifurcated yellow plastic tag (presumably a Rototag), bearing the numbers 03-60 on one side and 306 on the other side was seen on a turtle caught on a line off Ocean City, New Jersey, USA, on 28th July 1978. The turtle was released on the spot. For further information please contact: Arthur R. Vaughn, M.D., 5329 Rising Sun Avenue, Philadelphia, Pa., 19120, USA.

N.M.

A WESTERN NORTH ATLANTIC MARINE TURTLE ASSESSMENT PROGRAM

The University of Rhode Island (URI) has been awarded research funds to characterize marine mammals and marine turtles from shore to off the outer continental shelf from Cape Hatteras, N.C. to Nova Scotia.

Sampling will be completed primarily through the use of aerial surveys, ships and aircraft of opportunity, coordinated aerial-ship efforts, and selected volunteer observers. Additional data on turtles will be derived from stranding information collected by interested persons, and through aerial near-shore and beach surveys by URI teams. The data being collected include: species identification,

number, location, direction of movement, size, sex, and behavior. These data will be used to define distributions, migratory routes and behavior, estimates of relative abundance (density) and current status of stocks in the Western North Atlantic in the area of interest.

A list of 35 cetacean species, 5 pinnipeds, one sirenian and 5 turtles has been compiled and stratified to reflect the fact that some species are unlikely to be seen regularly in this study area. The turtle species included are: leatherback turtle, Dermochelys coriacea; loggerhead turtle, Caretta caretta; ridley turtle, Lepidochelys kempi; green turtle Chelonia mydas; and the hawksbill turtle, Eretmochelys imbricata.

Dr. C. Robert Shoop is principal investigator for the sea turtle aspects of the Cetacean and Turtle Assessment Program (C.E.T.A.P.) and additional URI turtle investigators are Dr. Thomas L. Doty, Ms. Sally Litwin and Ms. Nancy E. Bray, all of the Department of Zoology, URI. One mission of the program is to serve as a center for data on sightings, strandings, and encounters with sea turtles. All data generated by the CETAP program will be in the public domain unless noted as proprietary. Participation of marine turtle workers is encouraged. Stranding and sighting forms for marine turtles are available and can be obtained by contacting:

Dr. C. Robert Shoop
Turtle Watch - CETAP
Department of Zoology
University of Rhode Island
Kingston, RI, 02881 U.S.A.
Telephone: (401) 792-2372

Support for this newsletter came from World Wildlife Fund Canada and the University of Toronto.

INTERNATIONAL CONFERENCE ON MARINE TURTLES

Sponsored by
Government of the State of Trengganu, Malaysia
Jointly organized by:
Trengganu Fisheries Department
SSC/IUCN Marine Turtle Specialist Group
WWF Malaysia
and Malayan Nature Society

This conference will be held from 2nd September - 6th September 1979 (Registration on the evening of 1st September 1979), at either the Pantai Motel or the Tanjung Jara Motel, Trengganu, Malaysia. The Provisional Programme includes sessions on Taxonomy, General Biology, Distribution, Migration and Population trends, Malaysian Research Results, and Conservation Methodology. Papers dealing with sea turtle management methods or problems are particularly welcomed. Interested persons are invited to submit abstracts as soon as possible.

Abstracts should not exceed about 1/2 page and should include title, full mailing address of author, and affiliation with any conservation or research organization. If participants wish to show a film, a brief abstract of the film should be submitted, and the length of the film stated, together with type of film (e.g. with sound track etc.). Papers dealing with sea turtle management methods or problems are particularly welcomed, but papers on basic biology of sea turtles will also be welcome.

Those submitting abstracts from within Malaysia should send them to:

Mr. Siow Kuan Tow
State Fisheries Department
Kuala Trengganu
Trengganu, Malaysia

Those outside Malaysia should send abstracts to:

Professor N. Mrosovsky
Department of Zoology
University of Toronto
Toronto, M5S 1A1, Canada

Abstracts should be received by 1st April 1979, but it would be helpful if they could be sent earlier.

Please note that it might not be possible to include all abstracts in the programme. If too many are received, a selection will be made from abstracts received for inclusion in the programme, in order to avoid redundancy and make the best programme possible. Authors of papers selected will be asked to submit a written version before the conference starts. Proceedings of this conference will be published as a special issue of the Malayan Nature Journal. More details about the programme will be announced as it develops, either in this Newsletter, or by circular.

Scientists, conservationists, and people interested in marine turtles wishing to attend the conference, but not to submit papers, are cordially requested to write to Mr. Siow by March 15th, 1979 if possible, giving a short note of their association with conservation or research on marine turtles.

Participation will be limited to about 30 persons from within Malaysia and 50 from outside Malaysia. Papers on one out of the five days will be devoted to biology and conservation of turtles in Malaysia.

Approximate rates at the motels mentioned will be:

Single room	M$32.00
Double room	M$42.00
Extra bed	M$10.00
Continental breakfast	M$ 4.50
Roman breakfast	M$ 6.00
Lunch	M$ 8.00
Dinner	M$10.00

(M$ 2.30 = USA $ 1.00)

Anyone wishing to see if it is possible to negotiate some cheaper airfare should write to Mr. Siow (address above) as soon as possible. He will then see how many people are interested, and see if anything can be done.

Excursions: there will be opportunities to see leatherback turtles nesting.

Marine Turtle Newsletter

IUCN/SSC

No. 10 JANUARY 1979

Editor: N. Mrosovsky* Editorial Advisor: Archie Carr

EDITORIAL

Editorials in the last two Newsletters have discussed our ignorance of turtle biology. We return to this theme again. Working independently in different parts of the world, George Balazs and Colin Limpus have been studying the growth rates of immature green turtles in natural conditions in the sea. Preliminary accounts of their findings suggest that green turtles, and some other species, may often take more than 30 years to mature! On the other hand George Hughes has suggested, on the basis of marking hatchlings with notches, that loggerhead turtles may mature in 4-6 years (Marine Turtle Newsletter No. 8, July 1978, p. 2). A difference between 4 and more than 30 years has enormous implications for management programmes.

If maturation is more than 30 years ... and it seems to us that measuring carapace lengths is a more reliable way of estimating maturation than finding nesting notched turtles which could perhaps have received their notch in some natural way ... there still remain many questions to be answered. Are slow growth rates characteristic of all species and populations of sea turtles? For instance, what about ridleys? It may take the ridley arribadas in Mexico many years to recover from the extensive harvesting they are being subjected to at present (Marine Turtle Newsletter No. 7, April 1978).

It is also notable if a slow maturing animal is so prodigal with its egg production, because delayed reproduction and slow development are usually associated with high parental investment and low infant mortality (Daly, M. and Wilson, M. 1978, Sex, Evolution and Behavior, Duxbury Press, Mass. USA, p. 125). But perhaps there is some error in reasoning and marine turtles have some unusual form of growth curve, with a rapid spurt prior to first laying? We hope the important findings reported below by Balazs and by Limpus will be scrutinized and debated as much as possible.

N.M.

GROWTH, FOOD SOURCES AND MIGRATIONS OF IMMATURE HAWAIIAN *CHELONIA*

Major components of the life history study of Hawaiian *Chelonia* currently underway include the determination of growth rates, food sources and migrations of immature individuals as they naturally occur in shallow-water feeding pastures. Knowledge of these aspects, particularly growth and the resultant age at sexual maturity, is

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widely lacking for marine turtle populations due to the difficulties of capturing and tagging sufficient numbers of animals directly from the sea. Most research activities have instead focused on the colonial nesting beaches where large numbers of turtles are periodically accessible for observation and tagging. This has resulted in considerable insight into the reproductive ecology of the adult female, a critically important but nevertheless limited segment of the turtle's life history. The need to determine the rates of growth and migrations of immature marine turtles was emphasized as early as 1916 by Dr. J. Schmidt who pioneered such work in the Virgin Islands.

At select sites throughout the 2600 km Hawaiian Archipelago, immature green turtles are being sampled by the use of SCUBA, long-handled scoop nets and carefully monitored large-mesh tangle nets. Additionally, the unique land basking habit exhibited by some members of this population in the remote Northwestern Hawaiian Islands provides further access to immature turtles at their feeding pastures. A total of 375 individuals has now been measured and tagged using these capture techniques. Since October 1976 this has involved the use of tags specially manufactured from Inconel 625, an alloy that has thus far exhibited no corrosion and therefore appears to be far superior to the Monel tags previously used (see also Marine Turtle Newsletters No. 1, August 1976 and No. 2, January 1977). Food sources are being determined by the retrieval of mouth contents from turtles captured while actively feeding, and through the extraction of stomach contents using a flexible plastic tube inserted down the esophagus.

Recoveries of tagged turtles to date have demonstrated significant differences in the rates of growth between certain feeding pastures. At the southeast end of the archipelago off the Kau coast of the Island of Hawaii (19°10'N, 155°30'W), 4 recoveries of turtles 48 to 55 cm in carapace length have resulted in growth rates of .38-.52 cm per month (mean .44) over periods of 7 to 17 months in the wild. The major food source at this location has been found to be the red alga, *Pterocladia capillacea*. At French Frigate Shoals (23°45'N, 166°10'W) situated in the middle of the archipelago, 17 recoveries have been made of turtles 37 to 55 cm in carapace length. Growth rates of .01-.13 cm per month (mean .08) have been recorded over periods of 3 to 26 months in the wild. Food sources found to be utilized at this location consist mainly of green algae of the genera *Caulerpa* and *Codium*. At the northwest end of the archipelago, 9 recoveries have been made at Kure (28°25'N, 178°20'W) and Midway (28°13'N, 177°21'W). Turtles 40 to 59 cm in carapace length exhibited growth rates of .03-.21 cm per month (mean .10) over periods of 7 to 37 months in the wild. In addition to *Caulerpa* and *Codium*, turtles at these two locations have been found to feed on the invertebrates *Velella*, *Janthina*, and *Physalia* whenever such drift material is present.

If the growth rates thus far recorded remain constant throughout adolescence, a 35 cm turtle would require the following time periods to reach 91 cm, the mean size of sexually mature females in the Hawaiian population: Island of Hawaii - 10 years 7 months; French Frigate Shoals - 58 years 4 months; Kure/Midway - 46 years 7 months. Juveniles smaller than 35 cm are rarely seen in the Hawaiian Archipelago, therefore it has not been possible to estimate the age of this size category by tag and recapture experiments. Growth rates of these smaller turtles could, however, be more rapid if the food sources exploited are exclusively animal in origin as is thought to be the case during the period of open-ocean existence.

It is important to note that in those feeding pastures where slower growth occurs, the use of body weight as an index of growth has proved to be unreliable for most of the recoveries that have been made. This is undoubtedly due to differences in the amount of food material in the gastro-intestinal tract, a component that can comprise up to 18% of the body weight of immature turtles.

All recoveries, with the exception of two, have been made in the same feeding pasture where the original tagging took place. At French Frigate Shoals, recoveries have indicated that no movement takes place between feeding sites separated by as short a distance as 8 km. Furthermore, at Kure a turtle was recovered resting under the same coral ledge where it had been captured 13 months earlier. The two long-distance recoveries consisted of a 1540 km movement from Midway to Wake (19°18'N, 166°36'E), and a 2240 km movement from Midway to Hilo Bay on the Island of Hawaii. Both of these recoveries were reported by fishermen and did not include measurement data for determinations of growth.

Investigations of both immature and adult Hawaiian green turtles in their feeding pastures are presently being conducted with financial support from the Sea Grant College Program and the Marine Affairs Coordinator, State of Hawaii. Future support has been requested from the World Wildlife Fund in order to place continuing and greater emphasis on the important aspect of natural growth.

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NOTES ON GROWTH RATES OF WILD TURTLES

My growth data is derived from a study of wild turtle populations that has just entered its 5th consecutive year and based on two adjacent coral reefs of the southern Great Barrier Reef, i.e. Heron Island Reef and Wistari Reef (approx. 23.5° S). These reefs are the year round feeding grounds of large numbers of greens and loggerheads and a small number of hawksbills. Each spring there is an influx of migrant adult greens and loggerheads on to these reefs, aggregating for mating and subsequent nesting on nearby islands. These migrant turtles are also feeding on these reefs. While the immature turtles are definitely residents to the area, the residency status of many of the adults is uncertain. See Table 1 for size range and diets of these turtles.

Table 1: Size range and observed diet of turtles resident on the coral reefs of the southern Great Barrier Reef. Midline curved carapace length (CCL) is used as the standard measurement.

Species	CCL range (cm)	Observed diet
Chelonia mydas	38 - 120 immature to mature adults	algae, occasional jellyfish
Caretta caretta	70 - 110 immature to mature adults	molluscs, occasional fish, crab, jelly-fish

Table 1 (cont'd)

Species	CCL range (cm)	Observed diet
Eretmochelys imbricata	35 - 87 immature to mature adults	ascidians (and other encrusting animals), algae

Recaptures of these turtles during our successive trips to the area have provided growth measurements on over 100 green turtles, several hundred loggerheads and 4 hawksbills. The intervals between captures vary from a few months up to 4.25 years.

The overall impressions gained from these growth measurements are:

1. Green turtles above 38 cm inhabiting southern Great Barrier Reef feeding grounds grow slowly - usually between 0.5 and 2 cm per year. Maximum recorded is 3.24 cm/yr. Immature green turtles, 60 - 90 cm CCL gave a mean growth rate of 1.3 cm/yr (Table 2).
2. Mature male and female green turtles breeding in the southern Great Barrier Reef are growing very slowly - of the order of only a few millimetres per year (Tables 2 and 3).

Table 2: Measured growth rates of green turtles captured in southern Great Barrier Reef feeding grounds compared with growth rate of nesting females from Tortuguero and Heron Island.

Curved carapace length (cm)	Growth rate (cm/yr) $\bar{x}$	SD	range	n	Reference
Immatures 40 - 50	-	-	0 to 1.54	4	Limpus & Walter (MS)
" 50 - 60	-	-	0.95	1	
" 60 - 70	1.432	1.957	0 to 3.24	14	
" 70 - 80	1.42	0.653	0.6 to 2.25	15	
" 80 - 90	1.098	0.993	-0.6 to 2.86	11	
Mature males 90 - 102	0.14	0.1132	-0.3 to 2.6	12	Limpus (unpublished data)
Nesting females (Tortuguero)	0.4	-	-	-	Carr & Goodman (1970)
Nesting females (Heron Island)	<1 cm in 4 to 5 yrs	-	-	-	Bustard (1974)

3. Based on these growth rates it would appear that a green turtle living in the southern Great Barrier Reef could not reach maturity in less than 30 years. If green turtles, before they commence breeding, grow to an adult size beyond which little growth occurs then an average-sized nesting green turtle from Heron Island (CCL = 107 cm) could be more than 50 years old before she commences laying.

Table 3: Some of the largest growth increments recorded from turtles in the southern Great Barrier Reef feeding grounds.

	Initial CCL (cm)	Growth increment (cm)	Interval between captures (yr)	
Loggerheads:				
Sub adult	76	5.5	4	
"	80	6.5	4	
"	80.5	3.5	4	
" ♂	88	2.5	4	
Adult ♂	90.5	1.0	3 10/12	
" ♂	100.5	0	3 6/12	
" ♀	99.5	1	4	also observed nesting in another area
" ♀	99	1.5	10	
Greens: (see also Table 2)				
Sub adult	77	6	4 3/12	
♂	99	1	3 10/12	
Hawksbills:				
♀	81	6.5	4	
Sub adult	67	2.5	1 5/12	

4. Growth rates from the numerous loggerhead and the few hawksbill recaptures show these to be growing at a similar rate to that of green turtles of the same size.
5. Growth rates of wild turtles are very much less than those of captive reared turtles.

If the age of maturity for a sea turtle is 30 years plus, then a number of our management practices may need revision. For example it may take several decades before the effect of over harvesting of turtle eggs is seen on the numbers of nesting females at a rookery. Attempts to restock rookeries by releasing hatchlings should not be regarded as failures if turtles haven't returned to nest in less than 20 years. Similarly success of releasing programs may not be measurable in only a few years.

Bustard, R. 1972. Australian Sea Turtles. William Collins Sons and Co., London.

Carr, A. and D. Goodman. 1970. Ecological implications of size and growth in *Chelonia*. Copeia 1970: 783-786.

Limpus, C.J. and D.G. Walter. Manuscript. Growth rates of immature wild green turtles, *Chelonia mydas* (L.): a preliminary report.

Colin Limpus
National Parks & Wildlife Service
of Queensland
P.O. Box 190
Brisbane North Quay 4000, Australia

RECENT PAPERS

Reference	Address of Author
A team of workers from Indonesia have produced a report "Studi habitat dan populasi penyu belimbing (*Dermochelys coriacea*) di propinsi Bengkulu", published by Departemenen Pertanian, Bogor, 46 pp. (habitat, lists of vegetation, maps, egg sizes and some other morphological data for leatherback populations in the Bengkulu area. Text in Indonesian).	Ir. I. Njoman S. Nuitja Faculty of Fisheries, BAU I.M.T.S.G. Bogor Indonesia
Licht, P., Farmer, S.W. and Papkoff, H. 1978. Biological activity of hybrid combinations of ovine and sea turtle LH subunits. General and Comparative Endocrinology 35: 289-294. (analysis of differences between turtle and mammalian luteinizing hormone).	Paul Licht Department of Zoology University of California Berkeley, California 94720 U.S.A.
Limpus, C.L. 1978. The Reef. In: Exploration North, edited by H.J. Lavery, Richmond Hill Press, Victoria, Australia, pp. 187-222. (popular account of Great Barrier Reef turtles, their feeding, interactions with other species and habitat).	Colin Limpus National Parks & Wildlife Service of Queensland P.O. Box 190 Brisbane North Quay 4000 Australia
Owens, D.W. and Ralph, C.L. 1978. The pineal-paraphyseal complex of sea turtles. 1. Light microscopic description. Journal of Morphology, 158 (2): 169-179. (sea turtle pineal is very large; morphology and speculations on function).	David W. Owens Department of Biology Texas A & M University College Station, Texas 77840 U.S.A.

LA CUMBIA DE LA TORTUGA

(Folksong, 1978, from West Coast of Mexico. See Newsletter No. 7, April 1978, for background).

Corre, corre tortuguita
No te dejes agarrar
Porque ahi viene Antonia Suárez
Y pronto te va a destazar
La cumbia de la tortuga es
una cumbia muy sabrosa
No ven a Don Antonio lo bonito
que la goza
La cumbia de la tortuga
es una cumbia popular
La bailan en Puerto Angel
Y también en Michoacan

ASCENSION ISLAND: BRITISH JEOPARDIZE 45 YEARS OF CONSERVATION

Recently I returned from 16 months of fieldwork at Ascension Island. On Ascension, which is the type locality for *Chelonia mydas*, there nests a genetically isolated population of green turtles that is unique not only morphologically but also behaviorally. They are the largest green turtles in the world, commonly attaining weights of 450-500 pounds. Their round trip migration between feeding grounds on the coast of Brazil and their nesting grounds on Ascension, a total distance of over 4,000 km, is farther than that recorded for any other green turtle population.

For more than 50 years now, the turtles have enjoyed near-complete protection by the British government during their nesting at Ascension. The island is geographically remote, separated by 800 miles of water from the nearest point of land. Partly for logistic reasons, and partly for security reasons (much classified government work is carried out on Ascension) visitors have generally been denied access to the island. At the present time, the island is inhabited by approximately 1000 people, including British, Americans, Saint Helenians and South Africans.

However, I was recently appalled to learn that the British government is taking steps towards developing the island as a holiday resort area. The plans include construction of five hotels, with "about 1250 rooms available" (see The Islander, Ascension Island, #379, 27th October 1978). The hotels in this "tourist resort by the sea" would undoubtedly be located as near as possible to the island's picturesque beaches. Because only three miles of shoreline consist of beaches suitable for turtle nesting, I feel that this would spell disaster for the turtles. Nesting is very concentrated on these beaches, and even apparently slight disturbances near a beach can have a major impact. In all fairness, the British on the island have shown great concern for their turtles. However, even without the added burden of luxury beachfront hotels and a doubled or tripled human population, minor catastrophes have recently taken place. For example, I found the bodies of over 500 charred hatchling turtles which had wandered into the flames of a bonfire left unattended on the beach. Beach huts are located alongside two of the three major

nesting beaches on the island. Lights from these buildings frequently frighten female turtles coming ashore to lay their eggs, and draw newly emerged hatchling turtles away from the sea. On one occasion, more than 100 hatchlings were stomped to death when they were attracted by lights, and mistakenly crawled into a beach hut while a dance was in progress.

While on Ascension, I became very concerned that too much sand is being dredged from prime nesting beaches. Scars remain on beaches even though years may have elapsed since dredging in a particular area has ceased. In addition, there has been a tendency to take sand at all times of the year, regardless of the nesting season. Frequently nests are exhumed inadvertantly when the sand is removed.

In sum, I am extremely concerned about the obvious disruption in the form of lights and general commotion which would be caused by the presence of large resort hotels closely adjacent to concentrated nesting beaches. I also feel certain that the beach sand would be used in the construction of the hotels, and I dread the impact that this is likely to have on the nesting beaches themselves.

It seems a shame that when the British government has done so much to protect these animals during the past 45 years, all their efforts should end in naught because of such an ill-conceived scheme as this. It is difficult to stop commercial development of an area once plans have progressed too far. I am hoping there remains a chance of halting the proposed development at Ascension now while it is still in the "pre-feasibility study" stage, and urge that anyone else with similar concerns write as soon as possible to the British authorities about the situation. Letters should be addressed to:

Foreign & Commonwealth Office
Downing Street
London SW1 A 2AL
U.K.

It would be appreciated if copies of letters could be sent either to Dr. N. Mrosovsky (address on front page of newsletter) or direct to me at the address below.

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Marine Turtle Newsletter

IUCN/SSC

No. 11 MARCH 1979

Editor: N. Mrosovsky* Editorial Advisor: Archie Carr

EDITORIAL

The study of sea turtles has many inherent difficulties such as the long maturation period and the extraordinary fluctuations in numbers nesting from year to year. Studies often have to extend over many seasons to be really useful. Funding is not the only difficulty. Another problem confronting an investigator is the mass of data accumulated over the years that requires analysis and integration. This challenge is not always being met. For instance there has been extensive research on turtles, some of it assisted by the World Wildlife Fund, in the Indian Ocean, in Malaysia, in Australia, in the USA, and in the Middle East for which the detailed reports, the full data so necessary for anyone concerned with these populations in the future, are still not available.

In other cases excellent reports are available. "The Sea Turtles Nesting in Surinam", by J.P. Schulz (Zoologische Verhandelingen, 143, 1975) is an outstanding example. But even here the preface betrays the effort that went into this achievement, the struggle to catch up with the turtles that were always providing more data. Perhaps an easier method for most people is to produce interim reports, such as the admirable series by G.R. Hughes for the Tongaland beaches (see The Lammergeyer). Reports updating knowledge each season do not preclude more integrated accounts later on. On the contrary, they probably make them easier to write. Interim reports seldom provide the kind of theoretical progress that warrants publication in an international journal, but they can often readily be placed in local journals where they put on record what has been learnt and form the basis for assessing population trends, so essential for management of turtle populations.

The lost year is with us still ... but why compound our problems with lost data?

N.M.

MALAYSIAN SEA TURTLE CONFERENCE POSTPONED

The conference in Malaysia on marine turtles announced previously (Marine Turtle Newsletter No. 9, Dec. 1978) has been postponed until further notice on account of unforeseen administrative circumstances.

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ASCENSION ISLAND DEVELOPMENT: LESSONS FROM FLORIDA

In the January 1979 issue of the Marine Turtle Newsletter (No. 10), Jeanne Mortimer describes how the British government is jeopardizing 45 years of sea turtle conservation by making Ascension Island into a resort area. I know from my own observations in southern Florida that such a move would be disasterous to the sea turtles. In my own area sea turtles and development have not proved to be compatible. For six years I have conducted research along a 29-mile stretch of developed shoreline. During this time, I have observed only two green sea turtles nesting. This is in sharp contrast to less developed areas further north where higher concentrations of nests of this species have been reported.

Even after diligent efforts to locate additional green sea turtle nests during the same season in which the first had been observed, none could be found. This suggests that the two green sea turtles laid a single nest during the nesting season, or travelled a long distance out of my study area to find a more suitable area as some Atlantic loggerhead sea turtles, *Caretta caretta*, have been reported doing in developed areas of South Carolina. Whichever is the case, this appears to be unusual if not in fact deviant behavior among these animals. Such adverse effects may be attributed to coastal development.

Atlantic loggerhead sea turtles similarly have not fared well in my research area. Although I have observed a surprisingly large number of this species' nests (352 during the 1978 season), I found strong evidence that seaside development exerted a major influence on nesting behavior. These influences may be summarized as follows:

1. Nests were concentrated in areas which were less heavily developed than others.
2. Many nests were laid only a few feet from the high tide line making them vulnerable to unusually high tides.
3. The number of false crawls was significantly higher in the more heavily developed areas.
4. A large number of nests were destroyed by beach cleaning equipment.

The hatchlings also faced problems. Hundreds were confused and disoriented by artificial lights and wandered in the wrong direction onto the roads to be killed by cars. In areas which did not have roads running next to the beach, other hatchlings wandered in the wrong direction until they collided with sea walls and buildings. They continued to crawl either in a southbound or northbound direction until the sun appeared on the horizon. Some of the hatchlings attempted to redirect themselves seaward, but few made it. Most were too exhausted and died of fatigue and dehydration.

This evidence relating the effects of development on the sea turtle is not conclusive, but does nevertheless suggest that the green sea turtles nesting on Ascension Island will be affected in a similar manner if it is developed. Perhaps even more serious problems would result, since on this island there are only three miles of suitable shoreline for nesting. Development in this circumscribed area may result in the ultimate destruction of this unique population of migratory animals.

Hopefully this grim prediction will not come true if the British government can be convinced of the serious consequences that their plans would have on the sea turtle. This can only be achieved if all of us who have first-hand knowledge of sea turtles respond to the plea in the last Newsletter to send letters to the British authorities. Letters should be sent to: Foreign & Commonwealth Office, Downing Street, London SW1 A 2AL, U.K.

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PRELIMINARY REPORT ON SEA TURTLES IN THE GULF OF KUTCH

The Gulf of Kutch is a shallow arm of the eastern Arabian Sea and separates the peninsula of Saurashtra from Kutch in western India. Situated in the Gulf are about 15 islands, 1-20 kms off the northern coast of Saurashtra. The well known turtle nesting area at Hawke's Bay in Pakistan lies about 250 kms to the north-west.

Bhaidar Island (Lat. 22°28'N, Long. 69°18'E) is one of thirteen uninhabited islands and constitutes a focal nesting area for the Olive Ridley in the Gulf. Sand dunes 15 ft high (the most elevated among the Gulf's sandy-beach islands) occur along a 2 km long nesting beach on the island's western side. Numerous turtle egg shells lay scattered over large stretches of this beach when a survey visit was made to the island on 15 and 16 June '78. Their size suggested Ridley eggs; hawksbill and loggerhead turtles, which may lay eggs of roughly the same size have not, to date, been reported from the Gulf of Kutch. The only animals capable of excavating turtle eggs on Bhaidar island would appear to be wild cats. On inhabited Beyt Island, jackals, dogs and humans number among turtle nest predators. Nests on the mainland shores of Gulf of Kutch, in addition, are probably preyed upon by wild pig and monitor lizards.

About 20 body pits made by nesting green turtles were also found on Bhaidar Island. None appeared to have been made within the preceding two months. The Olive Ridley and the green turtle are the only species commonly occurring in the Gulf of Kutch. The nesting season for either species could not be ascertained though it is sometimes quoted as extending from late June through August (which are the months of the southwest monsoon). The leatherback is said to be sighted at sea on rare occasions.

On each of 2 nights spent on Bhaidar Island, 3 Olive Ridleys came ashore to nest, all near the time of high water. In the light of the abundance of turtle egg shells on Bhaidar's nesting beach, the sparse nesting that occurred during my visit there may be attributable to the prevalence of neap tides.

Visiting fishermen from Salaya on the Saurashtra coast who staked a net across a tidal creek at Bhaidar at high tide captured 3 adult green turtle females on the night of 16-17 June 1978. All were released

unharmed, turtle meat being rarely consumed locally. A few turtles are killed for their fat (used to protect boat timbers against infestation by shipworms and as a sealant). On occasion, a captured turtle's flippers may be hacked off and the salted flipper-hides converted into rough shoes. Fishermen use these as protection against jagged sub-littoral coral that fringes many islands in the Gulf.

Turtle eggs are diligently searched for and excavated for human consumption on Beyt Island and on the mainland shores of the Gulf of Kutch. Fishermen of the Wagir community are the main gatherers and consumers of turtle eggs. During periods of nesting abundance, turtle eggs are reportedly sold illegally in fish markets at Okha, Mithapur, and Dwarka at 25 paise (about 3¢ US) each. None was on sale on the occasions I visited these markets in June and early July though nests were undoubtedly being raided by humans during this period. Near Mandvi on the southern coast of Kutch I counted 4 day-old Ridley nests on a 6 mile stretch of beach on 6 July, a period of spring tides. Of these nests, 3 had been raided by jackals and one by humans. Wild pig tracks were also evident on the open beach about 30 m from the vegetation cover (primarily *Acacia*).

Fishermen state that turtles of many sizes frequent the area. A green turtle skull 20" long was found. The largest of the 3 green turtles caught on Bhaidar had a shell measuring 94 cm in length and 85 cm in breadth (over curves). Two Ridley shells measured 71 and 74 cm in length. Off Karumbhar Island, I counted 11 turtles from a fishing sailboat as they surfaced for air at intervals. No mating was observed.

The "totally protected" legal status of Indian sea turtles is widely known among the coastal inhabitants of the Gulf of Kutch. By their own accounts, turtle nesting has decreased drastically over the years in many areas (e.g. Karumbhar and Pirotan Islands). Rampant egg collection is evidently the prime cause but the indiscriminate mining of beach sand for construction purposes hastens the decline. Once-elevated sandy beaches on islands like Deda and Muada have over the last decades been "mined" down to spring high water level making nesting by sea turtles on the exposed water-logged silt impossible. Between sand and coral mining India stands to lose its two mainland reefs and associated marine life, including the turtles.

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South India

BACK ISSUES NOT AVAILABLE

The editor regrets that he cannot undertake to furnish readers with copies of back issues of Marine Turtle Newsletters. Instituting a charge for back issues would in itself be costly. Limited resources are being devoted to the production of further issues.

N.M.

SONIC AND RADIO TRACKING OF LOGGERHEAD TURTLES

To date, 8 loggerhead turtles (*Caretta caretta*) have been instrumented with sonic transmitters near Georgetown, South Carolina, and their pelagic activities monitored. (One individual was instrumented in 1977 and seven others in 1978). Four of the turtles were also equipped with radio transmitters to monitor their terrestrial activities. In excess of 1,000 locations were determined for these eight turtles. Either pre-emergence or post-emergence activity was monitored sonically on 12 occasions and 6 terrestrial emergences were monitored using radio telemetry. A total of 273 hours of sonic contact with turtles was maintained.

Nesting loggerheads did not remain in the vicinity of the nesting beach throughout the season. Long-distance, directional movements occurred during daylight hours. Movements did not appear to be related to the direction of winds or currents. Copulation appeared not to have occurred between nestings since sonic and radio equipment remained in position and functioning. Movements of turtles after non-nesting emergences differed.

This note is a preliminary presentation of information gained up to the present. Detailed analysis of the data has not been completed and the sample sizes are very limited. During the 1979 season, more extensive instrumentation and monitoring will be conducted with the South Carolina nesting loggerhead turtles.

Thomas M. Murphy, Jr.
Nongame and Endangered Species
Resources Dept.
S.C. Wildlife and Marine
Resources Dept.
Poco Sabo Plantation
Green Pond, S.C., 29446, U.S.A.

TURTLE STAMPS

The Republic of Maldives is to print a "Save the Turtle" issue of stamps, depicting the 7 species of sea turtle. It will be possible to obtain stamps in small quantities (up to the value of US $20.00) direct from the General Post Office, Malé, Republic of Maldives, Indian Ocean, or from M/S Inter-Government Philatelic Corporation, 48 West, 48th Street, New York, N.Y., U.S.A. For further details write to Ismail Rasheed, The Post Master at Malé.

N.M.

WHO IS NOTCHING ATLANTIC RIDLEYS?

In the fall of 1978 in Cape Cod Bay, 8 ridley (*Lepidochelys kempi*) and 7 loggerhead (*Caretta caretta*) turtles were washed ashore. One of the ridleys had a conspicuous notch out of the 11th lateral scute (see also Lazell, J.D., Marine Turtle Newsletter No. 5, Dec. 1977, p. 2). If anyone has information about this, or wishes to learn more about the strandings of turtles mentioned, please write to Robert Prescott, The Cape Cod Museum of Natural History, Brewster, Mass., 02631, USA.

N.M.

RECENT PAPERS

Reference	Address of Author
Balazs, G.H. 1978. Terrestrial critical habitat for sea turtles under United States jurisdiction in the Pacific Region. 'Elepaio, 39(4), 37-41.	George H. Balazs Hawaii Institute of Marine Biology P.O. Box 1346 Kaneohe, Hawaii 96744 U.S.A.
Brongersma, L.D. 1978. De bedreigde Zeeschildpadden. Panda (published by WWF Netherlands), 3, 35-39. (brief account of threats faced by turtles; farming advocated to take "wind from the poacher's sails". In Dutch, English version available from author).	L.D. Brongersma Rijksmuseum van Natuurlijke Historie Ramsteeg 2 Leiden, Netherlands
Carr, A., Carr, M.H. and Meylan, A.B. 1978. The ecology and migrations of sea turtles, 7. The West Caribbean green turtle colony. Bulletin of the American Museum of Natural History, 162, 1-46. (analysis of data from 22 years, especially the last few years of green turtle tagging at Tortuguero, Costa Rica; 1110 international tag returns; discussions of once-only nesting, nest site fixity, tagging efficiency, methods of estimating total populations; extensive tables and figures to back up claim that "more has been learned by tagging turtles than in any other way").	Archie Carr Department of Zoology University of Florida Gainesville, Florida 32611 U.S.A.
Dodd, C.K. 1978. Terrestrial Critical Habitat and marine turtles. Bulletin Maryland Herpetological Society, 14(4), 233-240. (definition of Critical Habitat and criteria used in determining if an area should be proposed as Critical Habitat for turtles; notes on areas in USA under consideration for Critical Habitat status).	C. Kenneth Dodd, Jr. Office of Endangered Species Fish and Wildlife Service Washington, D.C. 20240 U.S.A.
Fontanilla, C. and Carrascal-de Celis, N. 1978. The sea turtle that lays the golden egg is vanishing. Canopy 4(7), 8-9 (also p. 12), International Edition, published	C. Fontanilla Outdoor Recreation and Wildlife Research Division Forest Research Institute Philippines

by Forest Research Institute, Philippines.

(describes declining turtle stocks, and "thousands of stuffed turtles for export, particularly to Japan"; attempts to be made to farm green turtles).

Henderson, G.E. (ed.). 1978. Florida Marine Research Publications, No. 33. Proceedings of the Florida and Interregional Conference on Sea Turtles, 24-25 July 1976, Jensen Beach, Florida.

(see Marine Turtle Newsletter No. 2, Jan. 1977, for titles of papers given at this meeting).

George E. Henderson
Florida Department of Natural Resources
Marine Research Laboratory
100 Eighth Avenue SE
St. Petersburg, Florida 33701
U.S.A.

Hillestad, H.O., Richardson, J.I. and Williamson, G.K. 1978. Incidental capture of sea turtles by shrimp trawlermen in Georgia. Presented at 32nd Annual Conference of the Southeastern Association of Fish and Wildlife Agencies, Hot Springs, Virginia, Nov. 5-8, 1978.

(shrimp vessels operating out of State of Georgia, U.S.A., estimated to drown at least 778 turtles per season, mostly within 3 mile limit and mostly juveniles; nets less than 6.1 m wide seldom catch turtles).

Hilburn O. Hillestad
Southeastern Wildlife Services, Inc.
1960 Gaines School Road
Athens, Georgia 30605
U.S.A.

Leibovitz, L., Rebell, G. and Boucher, G.C. 1978. *Caryospora cheloniae* sp. N.: A coccidial pathogen of mariculture-reared green sea turtles (*Chelonia mydas mydas*). Journal of Wildlife Diseases, 14, 269-275.

(structure and developmental stages of a pathogen that especially damages the posterior third of the intestines).

Louis Leibovitz
Department of Avian and Aquatic Animal Medicine
New York State College of Veterinary Medicine
Cornell University
Ithaca, N.Y.
U.S.A.

Threlfall, W. 1978. First record of the Atlantic leatherback turtle (*Dermochelys coriacea*) from Labrador. Canadian Field-Naturalist 92(3): 287.

William Threlfall
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Memorial University
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Support for this newsletter came from World Wildlife Fund Canada and the University of Toronto.

THE AMERICAN SOCIETY OF ZOOLOGISTS: RESEARCH SYMPOSIUM

"The Behavioral and Reproductive Biology of Sea Turtles"

This symposium will be held in Tampa, Florida between 27-30 December 1979. The invited speakers include R. Ackerman, A. Carr, J. Hendrickson, H. Hirth, P. Licht, N. Mrosovsky, D. Owens, P. Pritchard, W. Rainey, R. Witham, J. Wood, F. Wood and R. Zangerl. The papers, ranging from Migratory Behavior to Endocrine Physiology, will be published in a 1980 volume of the American Zoologist. Ample time for discussion will also be available.

Contributed papers from anyone doing research on the biology of sea turtles will be scheduled the day after the symposium. All interested researchers are urged to submit contributed papers (you do not have to be a member[1] of the American Society of Zoologists) and/or to attend these always interesting meetings. The abstracts of the contributed papers will be published in the Fall 1979 issue of the American Zoologist. Registration fees (advanced) are $25.00 regular and $12.50 for graduate students[2]. Abstracts are due 31 August 1979. For more information contact:

Dave Owens
Department of Biology
Texas A&M University
College Station, Tx. 77843
U.S.A.
Telephone (713) 845-6131 or
(713) 693-7031
(home)

OR

Ms. Mary Wiley
American Society of Zoologists
Box 2739
California Lutheran College
Thousand Oaks, Ca. 91360
U.S.A.
Telephone (805) 492-4055

1. In this case a member of the society must sign the abstract; the member signing forfeits the right to give a paper at that meeting.
2. To join the society costs only $7.50 USA for a student; this entitles the student to nearly all the benefits of being a member.

SEA TURTLE MEAT SEIZED

Special agents of NOAA's National Marine Fisheries Service (NMFS) and the Fish and Wildlife Service have reported the seizure of 12,500 pounds of illegal sea turtle meat on December 22 from a cold-storage facility in east Los Angeles.

The meat is of Mexican origin, and it is believed that the importer may have been unaware of the sea turtles' protected status when the shipment was made. Prosecution in this case awaits completion of the investigation, and subsequent action by NOAA's Office of General Counsel.

Endangered Species Technical
Bulletin, 1979, 4, 11
Department of Interior
Washington, D.C. 20240 U.S.A.

INCUBATION TEMPERATURE AND SEX RATIO IN HATCHLING LOGGERHEAD TURTLES: A PRELIMINARY REPORT

It is already known that the sex ratio of hatchling freshwater turtles is influenced by the incubation temperature of the eggs (Pieau, 1976; Yntema, 1978). Because sea turtle eggs are often incubated in unnatural ways in conservation programmes and at temperatures different from those they would experience in the sand, we felt it important to discover if the sex ratio of sea turtles was affected by temperature in the same way as that of freshwater turtles (Mrosovsky, 1978).

A clutch of 118 eggs was obtained from a loggerhead turtle, *Caretta caretta*, laying on Little Cumberland Island, Georgia, USA, and sent to Syracuse, New York State, in a styrofoam container. The eggs were received 2 days after being collected and then placed in various constant temperature boxes set at different levels ($\pm$ 0.5 ^{o}C). All eggs were kept in large fingerbowls to maintain a moist environment. They were dusted with sulfadiazene powder (2-sulfamilamidopyrimidine, Sharp and Dohme) which is relatively insoluble and possibly helps prevent mould developing. In one set of experiments, the eggs were placed in small dry plastic cups which in turn were set in water covering the bottom of the fingerbowls. In another set, water was also present in the plastic cup. In a third set, the eggs were buried in moist vermiculite. All procedures were satisfactory; perhaps the vermiculite method is the easiest to use.

Seven eggs were fixed during incubation for assessing development of the embryos. Of the remaining 111 eggs, 41 hatched. At temperatures favourable to incubation, 26-32 ^{o}C, 76% of the eggs hatched. Future work will concentrate on these temperatures.

Sex was determined by histological examination of the gonads (Yntema and Mrosovsky, paper on methods in preparation). Table 1 shows that at 30 ^{o}C there were both males and females, but incubation temperatures of 32 ^{o}C resulted in females while those of 28^{o} and 26 ^{o}C resulted in males.

Table 1. Incubation temperature and sex of hatchling loggerhead turtles.

Incubation Temperature ^{o}C	22	24	26	28	30	32	34	36
Number of Eggs set	24	12	12	12	15	12	12	12
Numbers hatched	0	0	10	4[a]	14	11	2	0
Males hatched	-	-	9[b]	4	5	0	0	-
Females hatched	-	-	0	0	9	11	2	-
% of Females among hatchlings	-	-	0%	0%	64%	100%	100%	-

a It is suspected that the 28 ^{o}C box contained toxic residues from previous use when chemicals were stored in it.

b One animal was not well preserved.

We will discuss implications of these results for conservation practices in another paper (in preparation). It is important not to infer too much from this preliminary study. Only one clutch was involved, and in snapping turtles, *Chelydra serpentina*, about 5% of the clutches have an aberrantly high tendency toward female sexual differentiation (Yntema, 1978). It is also necessary to know what are the critical periods within the total incubation span for the temperature effects on sexual differentiation. And of course it is important to find out about differences between different species and populations of marine turtles.

We intend to explore these matters in future work. Our long term aims are to assist in rebuilding turtle populations to their former levels and to provide information that may be of value to conservation programmes. Styrofoam boxes and other unnatural ways of incubating turtle eggs may well have certain advantages but the possibility exists that they result in an abnormally high percentage of males being added to the population. Having now demonstrated temperature dependent sexual differentiation in a species of sea turtle, we hope that we will be assisted in obtaining the detailed knowledge that is so necessary for those managing turtle populations.

We thank Dr. L.M. Ehrhart for his efforts on our behalf, and are especially grateful to Dr. J.I. Richardson, Dr. H.O. Hillestad and their colleagues for their cooperation in obtaining eggs and foresight in recognizing the implications of this project. Support came from NIH grant HD 03484 and the Natural Sciences and Engineering Research Council of Canada.

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Marine Turtle Newsletter

IUCN/SSC

No. 12 SEPTEMBER 1979

Editor: N. Mrosovsky* Editorial Advisor: Archie Carr

EDITORIAL

The 1979 nesting season for the Atlantic ridley has closed with mixed auguries. There were 540 encounters with adult turtles on the beach at Rancho Nuevo and 361 animals were tagged. Of these 111 were seen again during a second nesting; 53 turtles carried tags from previous years, mostly from 1978. These figures were supplied by Peter Pritchard of the Florida Audubon Society before the season was quite over and may be subject to minor revisions.

Tagging has been carried out for many years on this population. The small number of tag returns, 53, is puzzling. Perhaps tag loss is high, perhaps there is a large mortality, perhaps many ridleys do not nest every year as supposed or perhaps maturation is relatively fast. Nevertheless only a few hundred turtles came ashore this year, a figure similar to that of recent years. There is no sign that the Atlantic ridley is recovering.

The number of eggs protected, however, almost 98,000, was greater this year than last year (see Márquez, R., Marine Turtle Newsletter No. 9, Dec. 1978). Most eggs were reburied in the sand; only about 5,500 were incubated above ground in styrofoam boxes. Unfortunately the impact of this hard work by the joint Mexican-USA team might be offset by the huge oil slick offshore.

With so few adults nesting and the strains imposed by shrimping and perhaps pollution, it is not merely pessimistic but also prudent to wonder if this species can survive in its natural habitat. And if it cannot, what then? A number of people have considered it wise to establish a small captive breeding stock as an insurance policy. This could serve as a gene pool until prospects for this species in the wild are better and knowledge of turtle biology advanced sufficiently to make reintroduction possible. The Cayman Turtle Farm has offered to provide some facilities and help. Printed below is a Statement of Intent for the establishment of such a gene pool there. Because turtle farming remains controversial (see also USA Department of Commerce press release below), it is necessary to mention that this statement is not a legally binding document implying any very particular arrangement, but rather a statement that a number of people would like to see such a scheme tried. The details remain to be worked out. Opinions on farming, and on other matters that may be just as important to turtle

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conservation, often are divided, but there is little doubt now that notable progress has been made at the Cayman Farm in breeding farm raised turtles. Some of their results will be presented by Jim Wood at the Sea Turtle Symposium in Tampa, Florida, this December (see Marine Turtle Newsletter No. 11, March 1979). There is much to be said for using their facilities and expertise if available.

Also printed below is another proposal, by George Balazs, for breeding Atlantic ridleys in captivity, in this case in zoos and aquaria. These two plans are not mutually exclusive. Certainly zoos should be encouraged to cooperate in breeding with any ridleys they already hold. However, if hatchlings have to be taken from headstarting operations there may be constraints on how much can be attempted.

Whatever the relative merits of these plans, and their chances of success, they reflect the fact that the once bounteous and magnificent arribada of Atlantic ridleys is a thing of the past and the danger of losing this species forever is real.

Ending on an even more pessimistic note, while people are worrying about the extinction of the Atlantic ridley, this process appears to be repeating itself elsewhere, in India. We have rather little information about the turtle situation there, partly because of lack of funds for fact finding, but reprinted below is an item on the mass slaughter of olive ridleys in Orissa. According to one correspondent the number killed was not near a million, but nobody seems to know what the figure was. We hope the Indian authorities are familiar with the dismal chronicle of the Atlantic ridley.

N.M.

STATEMENT OF INTENT

To whom it may concern:

Recognizing the vital importance of the current and ongoing efforts by the Departamento de Pesca, Mexico, to restore and perpetuate the only known breeding colony of the endangered Kemp's Ridley Turtle (Lepidochelys kempi [Garman]) and motivated by the desire to assist this laudable effort in every possible way, acknowledging the essential approval and cooperation of Mexico, we are agreed that it appears desirable at this time to establish a captive breeding colony of Kemp's Ridley Turtle to ensure preservation of this genetic entity, if efforts to preserve the species in the wild should fail. Also the establishment of this captive colony should in no way lessen the vigour of the efforts to preserve the species in the wild.

We are agreed that Cayman Turtle Farm Ltd. facilities with its existing scientific and technical personnel appear to offer the best prospects at this time, for the housing of this captive colony.

We are agreed that this colony should not be drawn from the Mexican adult turtles, but that this stock should be derived from existing aquarium specimens, accidentally caught individuals, and/or individuals from the 1978 hatch currently in the hands of the U.S. National Marine Fisheries Service.

We are agreed that the management of the captive colony should be guided by a non-profit corporation dedicated to the propagation of the species, which shall establish overall policies for the colony in accordance with technical advice by the scientific director of Cayman Turtle Farm Ltd. This corporation shall be managed by a board of directors, which shall as a minimum include the Chief of the Nacional Sea Turtle Project of the Mexican Instituto Nacional de Pesca, Mexico, as an ex-officio member, as well as representatives of major non-governmental conservation organizations. It is considered important that the corporation shall have the endorsement of the bodies represented by the individual directors. The number of individual Ridleys kept by Cayman Turtle Farm Ltd. shall be mutually agreed upon by Cayman Turtle Farm Ltd. and the board of directors. This stock will be held in trust for the corporation only for propagation of the species. The sole intent of the signatories of this agreement, the proposed corporation, and its described activities is the safeguarding and augmentation of the species in its natural, wild state and no animals shall be disposed of for any other ultimate purposes.

We are agreed that the services provided for this purpose by Cayman Turtle Farm Ltd. shall not be utilized for promotional purposes, but that open channels of communication with all concerned scientists shall be maintained.

We are agreed that the costs of maintaining the initial captive stock for at least the first year of operation shall be arranged by Cayman Turtle Farm Ltd., and that subsequently, when the incremental costs of housing and maintaining those animals have been determined, discussions will be entered into for subsequent funding.

The actual investigations of the mechanics of this agreement shall be pursued by Prof. L.D. Brongersma, London, and Dr. P.C.H. Pritchard, Oviedo, Florida.

Orlando, Florida, U.S.A., April 7, 1979.

Signers:
Prof. L.D. Brongersma
Dr. P.C.H. Pritchard
Prof. L. Ehrhart
Prof. N. Mrosovsky
Dr. J. Mittag
Dr. R. Márquez Millan
Dr. G.H. Hughes
Ross Witham
Prof. J.R. Hendrickson
Dr. J.R. Wood
Herr Dr. H. Mittag

AN ADDITIONAL STRATEGY FOR POSSIBLY PREVENTING THE EXTINCTION OF KEMP'S RIDLEY, LEPIDOCHELYS KEMPI

The Kemp's ridley sea turtle is seriously endangered with extinction, having declined at its sole rookery of Rancho Nuevo (Mexico) from an estimated 40,000 nesting females in 1947 to 500 in 1978. While the reasons for this decline have not been fully documented, drownings in shrimp trawls appear to be a significant factor.

In 1978, intensive but nevertheless experimental management efforts to save the species were jointly initiated by government agencies of the United States and Mexico. These efforts include the captive rearing of hatchlings to a juvenile size prior to release

(headstarting), and exposure of eggs and hatchlings to the sand and beach environment of Padre Island (Texas) with the objective of establishing a new rookery. Even under ideal conditions, a number of years will be required to fully assess the effectiveness of such trial manipulations. Considering the small remaining breeding population, the rate of decline, and the length of time likely required to reach sexual maturity, the species could very well become extinct before an accurate determination can be made of the results of these recovery efforts.

An additional strategy needs to be implemented immediately that will provide some hope for the survival of the species in captivity, should it not prove possible to maintain the naturally occurring population. A reservoir of captive Kemp's ridleys should be established through the dissemination of hatchlings to responsible and consenting aquariums, oceanariums and appropriate zoological facilities in the United States, Mexico and other countries. Such a survival plan could involve 50 or more different facilities each being consigned a small group of hatchlings (4-10) for rearing and permanent maintenance in captivity. The actual number accepted would be dependent upon available holding and display space, as well as individual budgetary constraints.

Such a plan for establishing what will hopefully be a future captive breeding stock has several important advantages. For instance, financing would be minimal because each facility would absorb the small additional costs involved in caring for the number of turtles they have agreed to accept. Furthermore, the dispersal of turtles to many facilities would provide a valuable safeguard against a high percentage stock loss from an unpredictable disaster (i.e. disease, storm, vandalism) such as could take place if all the turtles were housed at only one or two locations. Dispersal to many facilities would also foster widespread public awareness as to the plight of the species, thereby possibly stimulating conservation efforts with other sea turtles in their natural habitat.

The number of hatchlings (200-500) needed to implement this plan would be relatively small, representing 6-16% of the hatchlings used in the 1978 headstarting effort. In addition, as a last remaining hope for the survival of the species, the plan should experience only minimal difficulties in securing the necessary permits or permit waivers under the U.S. Endangered Species Act or other protective laws currently in effect.

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Hawaii Institute of Marine Biology
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Kaneohe, Hawaii 96744
U.S.A.

IMPORT RESTRICTIONS ON MARINE SEA TURTLES AND TURTLE PRODUCTS NOW IN EFFECT (U.S.A. DEPARTMENT OF COMMERCE, PRESS RELEASE 20 JUNE 1979)

Regulations prohibiting the importation of all marine turtles and marine turtle products produced in mariculture operations are now in effect. Import restrictions went into effect May 25, 1979, by order of the U.S. District Court for the District of Columbia.

The regulations provide that supplies of turtle meat and products may be sold in interstate commerce until September 6, 1979. After September 6, 1979, it will be unlawful under the Endangered Species Act to deliver, receive, carry, transport, ship, sell or offer for sale, marine turtles or marine turtle products in interstate commerce. The purpose of this Notice is to allow persons the opportunity to dispose of present stocks of marine turtle meat and products.

For further information contact Joseph R. Sylvester, National Marine Fisheries Service, 9450 Koger Boulevard, St. Petersburg, Florida 33702, U.S.A., phone number (813) 893-3721.

INDIA: MASS SLAUGHTER OF SEA TURTLES

(reprinted from Hamadryad, Newsletter of the Madras Snake Park Trust, 3, No. 3, September 1978, p. 8).

T.A. Davis and Rajesh Bedi have very disturbing news about the widely publicized sea turtle rookery (one of the world's largest) at Gahirmatha in Orissa state. Their report, published in the Jan.-March '78 issue of "Environmental Awareness" states that though the '76 nesting season (Jan.-March) brought over 1,58,161* nesting female Lepidochelys olivacea ashore, not a single turtle nested on this beach in '77. The authors visited Gahirmatha on 12 February of this year, and saw hundreds of Ridleys carcasses on the beach. Forest officials counted 478 dead turtles on a 14 km coastal stretch.

The carcasses, of both males and females, were 7-10 days old, and the fore-flippers of some were tied with wire. It is obvious that launches were responsible for this slaughter and the rotting animals at Gahirmatha must have been abandoned turtles that had died on board due to overcrowding and suffocation. The total number of Ridleys captured (apparently while mating) must be staggering.

This report again brings home the question of whether it is wise to publicize the habitats, nesting locations, etc. of commercially valuable and endangered animals such as sea turtles. (In '76, several newspapers carried extensive reports about this nesting beach, which incidentally lies within the Bhitar Kanika Wildlife Sanctuary).

The Forest Department alone cannot handle this problem since the poachers have power launches operating several miles offshore. The Fisheries and naval personnel could provide valuable assistance in apprehending poachers and it is hoped that this possibility will be seriously investigated and implemented well before the '79 nesting season begins.

* (this figure appears to be misprinted - N.M.)

ASCENSION ISLAND: INTERIM REPORT

Following an appeal by Jeanne Mortimer in a previous Marine Turtle Newsletter (No. 10, Jan. 1979, p. 7-8) for people to express their views on a proposal to develop Ascension Island as a resort area, about 40-50 people have written to the British authorities. This is an estimate based on the copies of 38 letters or equivalent information received by your editor. In addition conservation organizations in the U.K. have been alerted to the situation, partly through the efforts of K.E.L. Simmons (Dept. Psychology, University of Leicester, Leicester, England). Copies of the Marine Turtle Newsletter have also been sent to the press in Britain. The response from the Netherlands has been particularly vigorous; more than half the letters of which your editor has copies have come from that country, including one from a teacher and her class. By comparison, considering the number of people concerned with sea turtles in the United States, the interest in this matter there has been rather modest. Overall, however, there has been enough input to the authorities in Britain to alert them to the concern felt about building hotels near the small beaches used by green turtles on Ascension Island. An official sent there as part of the pre-feasibility study had extra time to study the situation first hand after being trapped on the island by gales. From replies received from the Foreign Office to letters and other information, it seems likely that the views of conservationists about Ascension Island will be given serious and fair consideration. The final outcome, however, still remains uncertain.

N.M.

PERU

Presently I am conducting a marine turtle survey of the Peruvian coast which is funded by the New York Zoological Society. While we have found turtles nesting only to a limited extent in northern Peru, and evidence of past breeding areas, we are documenting the extent of exploitation among the four species of turtles that occur. The study has been hampered to a certain extent by a limited access to literature. I would greatly appreciate any help concerning reprints related to marine turtles as well as corresponding with anyone conducting research on eastern pacific turtles.

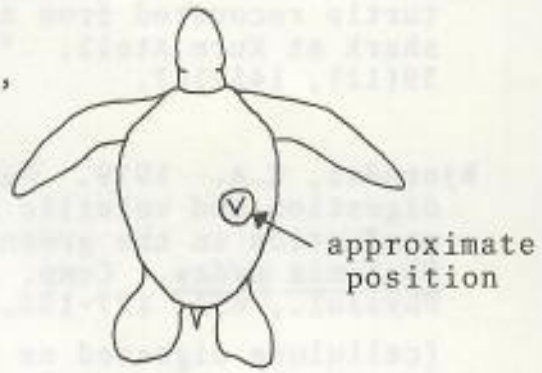
Coppelia Hays
Av. Arequipa 3051
Lima 27, Peru

Support for this newsletter came from World Wildlife Fund Canada and the University of Toronto.

RIDLEY WITH V MARK

An olive ridley turtle with a v mark on its carapace was found at Escobilla, Oaxaca, Mexico, on 25 Nov. 1978. This turtle has now been tagged, C-02805. If anyone knows the origin of this mark, please contact Biol. R. Márquez, Apdo Postal 79-052, Col. Doctores, Mexico 7, D.F.

N.M.



MUTILATED LOGGERHEADS

[Based on information in the Endangered Species Technical Bulletin (Dept. of Interior, Washington, D.C.) April 1979, Vol. IV, No. 4, p. 3 and in the SEAN Bulletin (Smithsonian Institution, Washington, D.C.) 30 April 1979, Vol. 4, No. 4, p. 14]

More than 60 dead loggerheads have been washed ashore along the Texas coast this year. About 45-50% of these appeared to have been mutilated, with cuts in the throat, neck and flippers, and flippers missing sometimes. Most of the turtles were juveniles (about 18-27 kg). This suggests the incidents occurred at sea. The U.S. National Marine Fisheries Service is investigating the matter. If anyone has further information about this, the editor of this newsletter would appreciate hearing.

N.M.

RECENT PAPERS

Reference	Address of Author
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George H. Balazs
Hawaii Institute of Marine Biology
P.O. Box 1346
Kaneohe, Hawaii 96744
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(cellulose digested as efficiently in green turtles as in ruminants and the dugong; fermentation especially in cecum and colon).

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Fenchel, T.M., McRoy, C.P., Ogden, J.C., Parker, P. and Rainey, W.E. 1979. Symbiotic cellulose degradation in green turtles, Chelonia mydas L. Applied and Environmental Microbiology, 37(2), 348-350.

(concentrations of bacteria and protozoa similar to those in cow rumen. Estimates of intestinal turnover time and intake of sea grass per day).

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(remoras found on nesting turtles, especially at start of season, excellent photographs, 24 specimens collected. In French, English summary).

J. Fretey
Laboratoire de Zoologie
(Reptiles et Amphibiens)
Muséum national d'Histoire naturelle
57, rue Cuvier, 75005 Paris
France

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(leatherback seen 46 m below surface).

G.R. Hughes
Natal Parks Board
Pietermaritzburg
South Africa

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Bernard Nietschmann
Department of Geography
University of California
Berkeley, California 94720
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(what happens to the green turtle and to the cultures that use it when shifts occur from harvesting for local subsistence to exploiting for foreign markets).

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(sphincters on pulmonary arteries described; speculates that shunting regulates heat flux with the environment).

C.W. Sapsford
Department of Biological Sciences
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Sapsford, C.W. and Hughes, G.R. 1978. Body temperature of the loggerhead sea turtle Caretta caretta and the leatherback sea turtle Dermochelys coriacea during nesting. Zoologica Africana, 13(1), 63-69.

(more data showing leatherbacks maintain temperatures above ambient, maximum differential > 7 °C in this study; loggerheads on same beach up to 4 °C warmer than the sea).

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MISCELLANEOUS PUBLICATIONS

Ehrhart, L.M. 11 Jan. 1977, 30 June 1977, 20 Jan. 1978, 25 July 1978, 2 Jan. 1979. A continuation of base-line studies for environmentally monitoring space transportation systems (STS) at John F. Kennedy Space Center. Five reports to NASA, John F. Kennedy Space Center, Biomedical Office, Code MD-B. These reports include data on interesting intervals and morphology of turtles nesting at the Kennedy Space Center, and their eggs. Dimensions of 143 cold stunned turtles found in lagoons which may serve as nurseries for immature turtles. Discussion of incidental catch by shrimpers, hibernation in Canaveral shipping channel and recommendations for Critical Habitat designation. The reports mainly concern loggerheads but data on green and Atlantic ridleys also included. Copies may be obtained from L.M. Ehrhart, Florida Technological University, P.O. Box 25000, Orlando, Florida 32816, U.S.A.

Henderson, G.E. (Editor), 1978. Proceedings of the Florida and Interregional Conference on Sea Turtles, 24-25 July 1976, Jensen Beach, Florida. Florida Department of Natural Resources, The Chelonia Institute (P.O. Box 9714, Arlington, Virginia 22209, U.S.A.), a non-profit organization concerned with the preservation of sea turtles, was primarily responsible for publication of these proceedings and will supply a reasonable number of copies free of charge upon request.

BOOK REVIEW: TURTLES: PERSPECTIVES AND RESEARCH

(edited by M. Harless & H. Morlock. John Wiley & Sons, New York, 1979. 695 pp. Price: $45.00.

This book attempts to survey all aspects of chelonian biology and behaviour, a formidable task that has produced an adequate but not outstanding general text on turtles. There are 30 contributed papers grouped under 6 major headings: 1) Methods, 2) Vital Functions, 3) Sensory Processes, 4) Reproduction & Development, 5) Behaviour, and 6) Population Dynamics, with an introductory paper on Taxonomy, Evolution, and Zoogeography.

The Methods section is straightforward, giving general information on collecting and mark-recapture techniques, photography (superficial treatment), maintenance in captivity, growth rates and population dynamics. This section is a review of field and laboratory techniques generally acquired in undergraduate training and is also applicable to a large number of non-chelonian species. Within the methods section is an informative paper on anaesthesia and surgery which gives a synopsis of drugs and their dosages, as used by various workers. Most of the data pertain to freshwater and terrestrial turtles. Problems associated with anaesthesia and surgery are examined.

The Vital Functions section is adequate and covers the cardio-vascular system, CNS, a good paper on respiration (mainly dealing with freshwater turtles), thermoregulation and a useful paper on feeding, drinking and excretion. The section on Sensory Processes is relatively comprehensive with an interesting paper on Behaviour and Olfaction. Within the Reproduction and Development section is a major paper on The Embryo and Its Egg, with extensive tables on egg characteristics, incubation periods and a discussion on morphological variations and deformities and a description of the development of the egg.

The section on Behaviour deals with learning, locomotion, social behaviour, rhythms and a paper on nesting habits with a heavy bias towards marine turtles. The final section on Population Dynamics devotes a paper to marine turtles, one to terrestrial and the last to freshwater turtles. These papers are somewhat discouraging in that they illustrate how little is known about population dynamics of turtles.

Considering the number of contributors, the book has emerged as relatively cohesive, drawing together, as well as might be expected at this time, the many and varied aspects of turtle biology into one text. It has attempted with dubious success to synthesize a subject that is still very much fragmented. Time and again various papers illustrate by lack of sufficient data just how much remains to be learned about turtle biology and behaviour.

The book is not up-to-date. Some authors have tried to remedy this by adding addenda at the end of their papers. However one paper published in 1974 is cited as being in press. It is perhaps unfortunate that one big bibliography was used instead of a separate one for each paper. The savings in time to the reader might well have outweighed the cost to the publisher. Nonetheless the bibliography is extensive and a good place to start if one wants to get a handle on the literature.

Turtles: Perspectives and Research would be most useful for the beginning student of turtle biology as a general reference text. An added bonus for the beginning student is that many authors identify the problems that require more research. However, keep in mind that the literature after 1974-5 is not well covered.

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WORLD CONFERENCE ON SEA TURTLE CONSERVATION

The World Conference on Sea Turtle Conservation is being held under the joint auspices of the following U.S. government agencies and private organizations which comprise the Conference Steering Committee: World Wildlife Fund - U.S., Defenders of Wildlife, New York Zoological Society, National Marine Fisheries Service, U.S. Fish & Wildlife Service, U.S. Department of State, Center for Environmental Education. Russell E. Train, President of World Wildlife Fund - U.S., is Chairman of the Steering Committee. The Conference will assemble for the first time an international forum of scientists, conservationists and government officials for catalytic efforts directed at finding solutions to sea turtle conservation problems, as well as focusing public attention on an urgent species and resource conservation problem. The Conference will be held at the Conference Center in the U.S. State Department, Washington, D.C., November 26-30, 1979. A final agenda including the titles of sessions, panels and invited papers is available from the Conference Coordinator.

Proposed session topics include: Value and importance of sea turtles, present knowledge of sea turtle biology, major threats to survival, review of the status of world populations of sea turtles, review of existing protective legislation and management, conservation strategy: recovery plans, treaties, etc.

Conference scientific committee: George Balazs (Hawaii Institute of Marine Biology), Mona Bjorklund (United Nations Environment Program), Archie Carr (University of Florida), Ken Dodd (U.S. Fish & Wildlife Service), David Ehrenfeld (Rutgers University), Wayne King (Florida State Museum), Tom Lovejoy (World Wildlife Fund - U.S.), Peter Pritchard (Florida Audubon), James Tyler (National Marine Fisheries Service).

Scientific papers: Papers related to topics above will be invited by the Scientific Committee. Time will preclude the presentation of unsolicited papers. The official conference language is English.

Attendance: Participant & Observer Status: All persons wishing to attend the Conference should write to the Conference Coordinator (Vivian Silverstein, 1244 19th Street, N.W., Washington, D.C. 20036, U.S.A., Tel. 202-659-9510) by Oct 15. Space is limited and participants' names must be listed at the State Department prior to the Conference opening.

Lodging: Participants requiring hotel accommodations must make their own reservations.

Transportation: Travel assistance is available only to invited speakers.

Address all correspondence to: Vivian Silverstein, 1244 19th Street N.W., Washington, D.C. 20036, U.S.A.

SEA TURTLE PROTECTION NEEDED AT THE CAPE VERDE ISLANDS

During my last visit to the Cape Verdes in summer 1977, I had a chance of obtaining information on the capture and trade of sea turtles. The Cape Verde Islands, lying about 500 km west of Africa, is an independent republic and includes about 15 reasonably sized islands, 9 of them inhabited. Hawksbill and loggerhead turtles are the species mostly caught. I talked with fishermen bringing in an adult female loggerhead at Boa Vista and they told me that they caught about 10-12 large sized turtles a month. Extrapolating from this figure for one island, probably about 1000 adult turtles are caught per year around the whole archipelago. This rate of exploitation does not take into account the losses in eggs resulting from daily searches made on the wide sandy beaches by inhabitants of the islands. The trade in turtle products is mainly accounted for by one European country, Belgium; preserved turtle shells and jewelry are frequently exported there. A turtle shell costs about $20 USA.

Consultations have taken place with the Cape Verde's Minister of Fisheries, Mr. Bettencourt. He is agreeable to the idea of a protection plan for sea turtles, if international interest and assistance would be forthcoming. For planning this project, reports on successful sea turtle conservation systems, reprints of relevant papers and suggestions are wanted.

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STOP PRESS

About 75% of this season's Atlantic ridley hatchlings at Rancho Nuevo were released before the oil spill arrived. The air-lifting of hatchlings beyond the spill by Pemex helicopters is designed to prevent the last 25% from hitting the spill. The intention is to locate mats of Sargassum offshore well away from the oil and put the turtles down there.

Marine Turtle Newsletter

IUCN/SSC

No. 13 NOVEMBER 1979

Editor: N. Mrosovsky* Editorial Advisor: Archie Carr

EDITORIAL

A conference on turtles, titled the "World Conference on Sea Turtle Conservation" is soon to open in Washington. Far from Washington, out in the Indian Ocean, lie a group of small islands, the Seychelles. Only 50-100 thousand people live on these islands and their views are not likely to be heard in Washington. But the history of recent efforts there to conserve sea turtles is an instructive one for participants to ponder.

In 1968 the Seychelles proclaimed a complete ban on taking green turtles. The intent was to give time for assessment of stocks and for devising a management plan that would enable exploitation of this resource without endangering it. Assistance was sought from IUCN. Unfortunately nothing materialized, letters from the Seychelles went unanswered, momentum was lost (see Salm, 1976; Frazier, in press). During this time there was considerable poaching and pressure to lift the ban increased. The Seychellois resented being told they could not eat turtle when it was an important and traditional source of meat. After resisting these pressures for a while, in 1976 the government, disillusioned, as one high official put it, by the apparent unwillingness of the international conservation movement to do anything for the green turtles of Seychelles, other than wring their hands in dismay at any proposal to modify the ban, rescinded it in favour of less complete restrictions.

The predicament of the Seychelles government is not unique. It exemplifies problems facing many countries with sea turtles. The political realities are often such that conservation is not possible unless governments are making, and are seen to be making, turtles available to local peoples as a source of food or income. Bans and sanctuaries have their place but more effort and imagination should be devoted to management plans.

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But how can rational plans be devised when there are so many gaps in our understanding of turtle biology? In an imperfectly known world some risks have to be taken. Conservationists have not shrunk from other risks. They have flown turtles around the Caribbean, they have flown them around the Gulf of Mexico. They have raised them for many months in artificial conditions, fed them food that may not be abundantly available in the wild, and released them in places unfrequented by turtles of that age class. Thousands of eggs have been incubated in plastic boxes above ground at unnatural temperatures, possibly masculinizing the population (Mrosovsky, 1978). Plenty of risks have been taken. We do not imply such risks are unjustified. These are matters for debate in Washington. It will probably be impossible to obtain much agreement, only to be informed and flexible; if things turn out well, a risk is justified, even if the grounds for taking it were not especially strong.

At least with the risk-taking in making recommendations for harvesting, there are a few simple points that provide some guidance. If a turtle population is to remain stable, then each animal will have to be replaced. Assuming an equal sex ratio, hatchlings from 2 eggs from each female on average will have to survive to maturity. Since turtles lay many eggs in their lifetime, often several hundred, sometimes many more, depending on the species and population, protection at the vulnerable egg stage should be able to compensate for harvesting (see Hirth and Schaffer, 1974, for additional points). Such protection does not need special technology. Much can be achieved by patrols to reduce human interference and by wire netting to reduce animal predation. The difficulties arise in determining just what size quotas should be; it must not be forgotten that predation continues beyond the egg stage. Recommendations should only be made with an appreciation of local environmental and social conditions and of the likelihood that protective measures will be enforced. But despite unknowns and problems, we still feel that controlled use of turtle resources is not just something for the future; there are places, such as the Seychelles, where it is appropriate now.

In facing such problems, it may be worth recalling some cases where use and protection are being combined. At Trengganu, Malaysia, most of the eggs laid by leatherbacks are taken, as they have been for decades. However, for a number of years now a small percentage have been protected and the hatchlings later released. The State authorities in Trengganu sell rights to collect eggs on particular stretches of beach. The fees received from the licenced egg collectors go towards running the hatchery and looking after eggs on part of the beach set aside for conservation and tourists. People making their living collecting eggs obviously want the turtles to be undisturbed while nesting and they are not, therefore, especially enthusiastic about sightseers. They also have an interest in the success of conservation. However, although the leatherbacks at Trengganu appear to be holding their own despite many years of intensive egg har-

vesting, some biologists consider the number of eggs set aside for the hatchery, about 20%, to be too low. They fear that a population crash from over exploitation in the past has only been delayed by the longevity of the adults. Unfortunately, although many data have been collected, lack of full published accounts prevents informed evaluation. But if it was felt wise to increase the numbers protected, either as an insurance against disaster or as a chance of boosting populations to higher levels, it would only require adjustment to the controls, not a dismantling of the whole social machinery. The latter is excellent: Malaysians themselves eat most of the eggs and have a stake in the success of conservation and biologists from the Fisheries Department are able to exert, if not total control, at least a major influence on events at the rookery.

Use of turtle resources is also contemplated in South Africa. It is said that once the number of loggerheads nesting there reaches a certain preset target, the regulations giving complete protection on the Tongaland beaches will be replaced by others permitting limited cropping. If after years of protection turtles have increased in numbers and a system for monitoring the population established, this development should in principle be applauded. The details of implementation have not been made available yet.

Conservation combined with consumption of green turtle eggs has been practiced for the last few years in Surinam. Prior to 1964, most turtle eggs in Surinam were taken and adults were also being killed. Gradually the main beaches were declared nature reserves and extensive tagging and other studies were carried out. Later complete protection was relaxed and eggs were sent to the market place in Paramaribo. The proceeds helped pay for the programme (Schulz, 1975). Although initially there was some discontent among Carib Indians who previously made money by selling eggs (Kloos, 1971), this was ameliorated by employing some of them on the reserves. Together with former poachers, using their knowledge of the environment and the animals, they contributed greatly. Where formerly predation was at a devasting level, now the turtles in Surinam receive a large measure of protection, at least some employment is provided, protein is made available in the market at reasonable prices, a partial safeguard against political changes, and because monitoring of the numbers nesting continues, the quotas can be adjusted if appropriate, hopefully after awhile toward a greater take of eggs.

Most important, in the examples of the Trengganu and the Surinam programmes, both government and people are involved. This gives conservation roots in the cultural matrix and makes it robust. By contrast there are examples of fragile conservation schemes - schemes that may be appropriate in the circumstances but are nevertheless fragile in that they are not well embedded into the workings of the society. What would happen at Tortuguero, Costa Rica, if biologists from the United States stopped going there? Without the foresight of one man, the President of

Costa Rica, the park boundaries at Tortuguero would have been gravely diminished this year (see item on Costa Rica below). And what of the conservation through the military in Mexico? It might seem the strongest conservation of all not simply to have regulations but to have them enforced by marines with automatic weapons. This may indeed be an essential interim measure to prevent collapse of certain turtle populations there, but in the long run guns may not be as effective as giving people a hand in managing their own resources for their good.

The Seychelles ban was an example of fragile conservation because it was socially unacceptable, politically impossible. Robust conservation must take account of the political realities in many of the countries with turtles still left and of their wishes for management programmes.

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N.M.

DOUBLE TAGGING OF GREEN TURTLES IN THE GALAPAGOS ISLANDS

Tag loss has always been a problem for turtle researchers, so much so that it formed an important topic in four of the first five issues of the Marine Turtle Newsletter (No.1, 1976; Nos. 2,3, & 5, 1977). Partly with this in mind, in September of 1975, I started to double tag east Pacific greens, Chelonia mydas agassizi, in the Galápagos Islands. In addition to the normal monel tag fixed to the second or third proximal scute (or the skin in between) of the trailing edge of the right foreflipper, I also inserted a coloured plastic tag (Jumbo Rototag, Dalton Supplies, Henley, England) into the webbing between the fourth and fifth

digits of the right hindflipper. The plastic tag, which consists of a male and female portion, both embossed with a number, is inserted after a hole has first been made in the flipper with a leather punch in order to prevent buckling. By using a different colour at each tagging site, it was possible to determine the origin of a turtle without it having to be caught, this being particularly advantageous whilst in the water, the principal reason for the use of coloured plastic tags in the first place. The results can be divided into 3 sections: A - from resident population; B - from nesting beaches; C - from long-distance migration and re-nesters after several years absence.

A - Resident population. Although the majority of the adults migrate away from the archipelago after the nesting season (Dec-June), large numbers can be found all year round. This population consists mainly of subadults, virgin females and juveniles, but there are quite a few larger females and a sprinkling of males. Tag returns have shown that some of these latter females are late departures from the previous nesting season and early arrivals for the next, but an as yet undetermined percentage are truly resident. Table 1 shows the tag losses in 116 recaptures between Sept 1975 and the present, a period of almost 4 years. It is obvious that plastic tags have the greater staying power. Only 8 turtles out of the 116 recaptured had lost their plastic tags (cf 49 who had lost the metal one). If only the metal tag had been used then only 67 (57.8%) of the recaptures could have been identified. Using only the plastic tag would have meant identification of 108 (93.1%). As both were used, 112 (96.6%) were identified. In turtles recaptured 101-200 and 201-300 days after tagging, metal tags showed a loss of 22.2%. This agrees very closely with Schulz (see Marine Turtle Newsletter No. 1, 1976, p.4) who estimates a 15-20% tag loss. This percentage loss increases dramatically with time.

B - Nesting beaches. Table 2 shows results for 1979. The results are typical of other beaches in Galápagos and of other years. Again the plastic tags showed the greater staying power, but as all cases of tag loss occurred within 62 days, I would attribute this to faulty tagging or cases where the flippers were very thick and fleshy, rather than corrosion. This also applies to the plastic tag, where only the male half was still present. The metal tag losses of 1.3% and 3.1% are probably very low as a large proportion of turtles tagged were not seen again.

C - Long distance migrations (Table 3) and re-nesters after several years' absence. A turtle nesting after a 2 year absence had the plastic tag intact but no metal one. One re-nesting after 3 years had the reverse, the metal one intact but no plastic tag. Out of interest, 3 turtles tagged only with metal tags still had them when they re-nested after 685, 2208, and 2192 days, respectively.

Table 1. Tag loss: plastic v. metal in 116 recaptures of greens double tagged in Elizabeth Bay, Isabela and Turtle Cove, Santa Cruz, 1975-1979.

Days Recaptured After Tagging

	101 - 200			201 - 300			301 - 400			401 - 500			501 - 600		
	Tags Missing			Tags Missing			Tags Missing			Tags Missing			Tags Missing		
	P	M	N	P	M	N	P	M	N	P	M	N	P	M	N
n	1	8	27	0	4	14	1	15	9	1	8	7	0	4	1
%	2.8	22.2	75.0	0.0	22.2	77.8	4.0	60.0	36.0	6.3	50.0	43.8	0.0	80.0	20.0
%P + M loss combined		25.0			22.2			64.0			56.3			80.0	

	601 - 700			701 - 800			801 - 900			901 - 1000			Both Tags Missing
	Tags Missing			Tags Missing			Tags Missing			Tags Missing			
	P	M	N	P	M	N	P	M	N	P	M	N	
n	1	2	3	0	1	1	0	1	0	0	2	1	4
%	16.7	33.3	50.0	0.0	50.0	50.0	0.0	100.0	0.0	0.0	66.7	33.3	
%P + M loss combined		50.0			50.0			100.0			66.7		

P = Plastic Tag
M = Metal Tag
N = Neither tag missing

Total P loss = 4 = 3.5%
Total M loss = 45 = 38.8%
Total Both Loss = 4 = 3.5%
Total losses = 53 = 45.7%
Total No losses = 63 = 54.3%
n = 116

Table 2: Tag Loss: Plastic v. metal of 464 nesting female greens double tagged on Quinta Playa and Baltra, 1979.

Beach	Plastic Tag (P)	Metal Tag (M)	No. Days after Tagging absence noted
QUINTA PLAYA ISABELA ISLAND	Present	Absent	13
	Present*	Present	14
	Present	Absent	17
	Present	Absent	46
	Present	Absent	62
Total Tagged	301	in 140 days	
% loss	0.3	1.3	
% P + M Loss Combined	1.7		
LAS SALINAS, BALTRA	Present	Absent	13
	Present	Absent	14
	Absent	Present	14
	Present	Absent	16
	Present	Absent	43
	Present	Absent	45
Total Tagged	163	in 127 days	
% loss	0.6	3.1	
% P + M Loss Combined	3.7		

* Male portion only

Table 3: Tag loss: Plastic v. metal of 7 female greens recaptured outside the Galápagos, 1975-1979.

Plastic Tag	Metal Tag	No. days	Country recaptured
?	Present	98	Ecuador
Present	Present	307	Panama
?	Present	336	Peru
Present	Absent	409	Ecuador
Present	Absent	666	Panama
?	Present	726	Ecuador
?	Present	756	Ecuador

? = unknown if present

Condition of tags: 1. Metal. After periods of 170, 300, 425, 432, 465 and 676 days, respectively, 6 of the tags included in Table 1 were loose and had to be replaced. In 5 of these the plastic tags were still in good condition, but with the turtle recaptured after 432 days, the plastic tag was missing. In all 6 cases the metal bar had corroded and was absent/almost absent. Corrosion was also very obvious where the metal had come into contact with internal tissue, as previously noted by Balazs (Marine Turtle Newsletter No. 2, 1977). Referring to the resident population, in most cases the metal tags had algae growing on them which sometimes obliterated the number. In some of the more severe cases, barnacles, sponges, ascidians, hydroids, sipunculids and even polychaetes were found, but this was never as serious as with the plastic tags.

Condition of tags: 2. Plastic. In only 3 cases were the plastic tags damaged enough to warrant being replaced. In all 3 cases, damage was to the upper or male portion. One had a longitudinal crack after 495 days. In the other two, after 676 days and 949 days, respectively, the male part was broken in half horizontally, thus losing the third digit of the number. In the latter case (i.e. after 949 days) it was only through the embossing that the tag was able to be read, as the black paint of the numbering had disappeared. In all these 3 cases the metal tag was missing. Whereas metal tags suffer from corrosion, plastic ones do not. The most common reason for their loss is that the hole, normally 2-3 cm from the trailing edge of the flipper, gradually becomes enlarged by the continual rubbing of the male prong so that eventually the connecting strip of flipper tears, and the tag, both halves still joined, falls out. The biggest disadvantage of the plastic tag is its tendency to become obliterated by algae, especially encrusting species such as Lithothamnion, and barnacles - much more so than the metal ones. Even after only 2 weeks a growth of green filamentous algae is often obvious and after 4-6 weeks this needs to be scraped off in order to read the number, especially as these algae tend to grow on the number itself. On the nesting beaches, tags tend to remain in this state with an occasional barnacle creeping in. In the feeding areas, however, where the turtles lead a much more sedentary existence, the green algae are gradually replaced by reds, especially Lithothamnion. During this time, barnacles, bryozoans, sponges, ascidians and hydroids often appear, completely obliterating the number. The tag, in fact, becomes quite a marine park, for polychaetes, crabs, amphipods and even sipunculids are often found among the algae and barnacles. Even so, the colours remain distinct. Plastic tag returns of more mobile turtles such as long distance migrators and re-nesters after several years' absence show much less, if any, animal or plant growth.

Conclusion. There is no doubt of the plastic tag's superior staying power. It is so superior, in fact, that in Sept 1978, I

had return addresses stamped onto the back of the female half. It is also easier to check if they have been applied properly or not. In fact, experience has shown that they are much easier to apply than the metal ones. In addition, there is the advantage of colour coding. Unfortunately, they do not help solve the long-term problem. After less than three years, one of the tags was virtually impossible to read and I cannot envisage them being readable after 5 years. Even if an algae-free plastic was used, the embossing of the numbers would have to be improved. Ironically, the dense algal coat forms a protective covering for the tag and the number is plainly visible after scraping. However, although this is suitable for the resident population here, it is not suitable for migrating turtles or with long-term tag returns in mind. Perhaps the plastic tag's major asset is its method of fixation - the prong of the male portion passing through the flipper and entering the female portion on the other side. Perhaps inconel or even titanium (Cornelius, Marine Turtle Newsletter, No. 5, 1977) tags based on this type of fixation method could be the answer. Expensive I know, but it could pay dividends in the long run. After all, what price is knowledge? In the meantime, each turtle caught here will continue to receive two tags.

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Ecaudor

EXPERIMENTAL CARAPACE TAG

This nesting season, adult female loggerhead turtles near Georgetown, South Carolina, U.S.A., were outfitted with an experimental carapace tag. The purpose of the study is to assess the durability of this tag versus the traditional flipper tag. As of this writing, 48 turtles have been marked with both a monel flipper tag and a stainless steel disc carapace tag. The carapace tag is attached by drilling a 1/4 inch diameter hole through one of the posterior marginals. The tag consists of 2 fender washers, one on the dorsal side and one on the ventral side of the scute. The washers are held in place by a 1 1/2 inch long machine screw (round head) with a locking nut. All parts are matched 18/8 stainless steel. The washers are 1 7/16 inches in diameter and are stamped with a return address and the tag number.

If any turtles are found with one of these carapace tags, please note the following information: 1. Presence or absence of a flipper tag. 2. Number from both tags. 3. Conditions of tags and drill hole. 4. Location and circumstances of the animal when found. 5. PLEASE LEAVE TAGS IN PLACE ON LIVE SPECIMENS. 6. If the animal is dead, please return both tags, if available, to the address below.

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ENCOUNTER AT ESCOBILLA

During the last week of September, 12 people convened at Puerto Angel, Oaxaca, Mexico, where PIOSA (Pesquería Industrial de Oaxaca, S.A.), the company known for its massive harvesting of the golfina (olive ridley; Lepidochelys olivacea), has its slaughterhouse and packing plant, and a small laboratory building. Puerto Angel is a half-hour jeep drive from Escobilla, the site of a huge nesting aggregation or arribada, known locally as morriña of Lepidochelys, and a place made known to the world by Tim Cahill in a sensational article in Outside Magazine as the scene of intemperate exploitation (see Marine Turtle Newsletter No. 7, 1978).

The group assembled at the invitation of Sr. Antonio Suárez, G., founder and owner of PIOSA. His motive was to establish communication with serious opponents of his exploitation of sea turtles, especially the golfina. The group was comprised of the following: George Balazs, Archie Carr, Tim Clabaugh, Kim Cliffton, David Ehrenfeld, Richard Felger, Angie McGehee, Carlos Nagel, Peter Pritchard, Georgita Ruiz, Laura Tangley and Jack Woody. All the participants paid their own travel expenses to Mexico City. From there on they were the guests of PIOSA, and all activities were arranged and attended by Sr. Suárez and his assistant Sr. Alfredo Martinez. The schedule was as follows:

25 Sept. '79 Tues. P.M.
(1) Arrival of participants in Mexico City
(2) Showing of movie on industrialization of Mexican sea turtles
(3) Dinner in Mexico City

26 Sept. '79 Wed.
(1) Travel to Oaxaca and Puerto Angel
(2) Visit to Escobilla Beach
(3) Visit to PIOSA laboratory
(4) Visit to PIOSA slaughterhouse

27 Sept. '79 Thurs.
(1) Boat trip along coastline off Escobilla, where thousands of ridleys were strung out for 8 km in a longshore morriña
(2) Historical sketch by Sr. Suárez
(3) Arrival of editors of magazine DUMAC
(4) Night trip to Escobilla to watch for morriña emergence, which failed to materialize; only 6 turtles nested

28 Sept. '79
(1) Return by some participants to research facility and slaughterhouse

Fri.	(2)	Departure DUMAC editors
	(3)	Meetings with Sr. Suárez
29 Sept. '79	(1)	Return to Oaxaca
Sat.	(2)	Return to Mexico City
	(3)	Dinner at Suárez residence
30 Sept. '79	(1)	Dispersal of participants
Sun.		

After many hours of meetings with and without Sr. Suárez in attendance, the participants expressed continuing doubt that the sea turtles of Mexico can withstand the current level of harvest. It was clear that Sr. Suárez believed otherwise, but it was hoped that this disagreement would not bar further discussion. A final meeting was held to see whether any principles could be agreed on. The points on which agreement seemed possible, together with Sr. Suárez's reaction to each, were as follows:

(1) A conference to instigate conservation of L. olivacea in an integrated way in the East Pacific was proposed. This would involve the principal countries with large ridley populations: Mexico, Costa Rica and Ecuador. Suárez: Agreed.

(2) The need to maintain an outside observer in future seasons at Puerto Angel and Escobilla was pointed out; and gratitude was expressed for the PIOSA money that suported Tim Clabaugh's work in that role during the past season. Future funding should be negotiated. Suárez: Agreed.

(3) The need for careful study of migratory patterns of the East Pacific ridley, as grounding for conservation and management, was emphasized, and a substantial tagging program in Ecuador was recommended. Suárez: Agreed.

(4) Re beach patrols: in spite of the policy of total protection, enforcement by PESCA (Instituto Nacional de Pesca) had become lax and in some cases the marines assigned to the work had not been effective. It was hoped that Sr. Suárez would use his influence to improve the situation. Suárez: I don't know what the status of protection is now - I'll explore it further. We are paying $1000 per month for each group of marines - we want them to be effective. It is difficult to stop all illegal commerce, but, really, I feel that this is not heavy in Oaxaca.

(5) It was suggested that in the absence of a reliable population model, another technique to monitor population status, censusing nesting turtles annually, should be used. As a temporary rule-of-thumb, if the morriña of a given year is down 20%, a moratorium should be declared; if it is down 10%, the harvest would be reduced by 50%. Suárez: Because of socio-economic and political factors such a process must come about gradually. I table the proposition, although I agree that any reduction would indeed be a cause for concern. Probably, if we should experience

a clearly serious decline we would try to establish a moratorium, and to continue it until recovery.

(6) Sr. Suárez's support for a program of national beach reserves, with formal protection of beaches and the coastal zone behind them, was requested. Suárez: It's an old idea, and nothing has been done about it. We should do it gradually, starting with the beaches only.

(7) It was pointed out that several joint, informal U.S. - Mexican sea turtle projects are afoot, and Suárez's support in formalizing and reinforcing these was asked. Suárez: This is official business, at government level. It is my personal opinion, however, that if our relations here continue in a healthy way, such an advance is entirely possible.

Two features of our 4 days with Antonio Suárez were especially impressive. One was his unstinting hospitality. He is a man of vast energy. The round of inspection and sightseeing that he had organized was so continuously unflagging that it seemed for a while that he was purposely wearing us down as adversaries. As it turned out, however, this could hardly have been the case, because the feverish schedule continued unabated after all the negotiations were over. Another strong impression that we took away was that there was a curious lack of window-dressing. Some tidying had been done, especially at the laboratory, where, incidentally not much research seemed to be underway; and the slaughter session arranged was a mere demonstration of technique, with little of the shock power of the routine mass carnage. Otherwise, there was a surprising lack of effort to conceal the more unhappy aspects of an operation in which turtles are caught, landed, killed and dismembered by the tens of thousands.

The meetings at Puerto Angel were briefly attended by 2 members of the editorial staff of the Mexican magazine DUMAC, the bimonthly publication of Ducks Unlimited, in which a translation of Tim Cahill's The Shame of Escobilla had just appeared. Antonio Suarez had invited the editors down from Monterrey on the grounds that, even though Ducks Unlimited in mainly concerned with game birds, its membership is made up of prosperous, leisured people who are strongly opposed to environmental loss in Mexico. An article on the Puerto Angel meetings will appear in the next issue of DUMAC. What its tone will be remains to be seen. Certainly DUMAC subscribes to the sustained-harvest concept, which constituted the main bone of contention between PIOSA and its conceptual adversaries at the meeting. However, the sincerity of Sr. Suárez's belief that DUMAC is the most substantial hope for conservation in Mexico cannot be doubted.

Besides the hours of group discussions, I had protracted private conversations with our host. During these I told him of my view that the controlling issue was not whether he may be returning significant numbers of hatchlings to the sea, in his oviducal salvage program; but rather that, since the 1960's, when

the olive ridley became a theme for concern at meetings of the IUCN Marine Turtle Group, 3 and perhaps 4 arribadas of about the size of that at Escobilla had been destroyed. His reply to that was that it was just that kind of irresponsibility that he was preventing, by his disciplined exploitation and management. Then I told him that I personally opposed all international traffic in sea turtle products, and that the rapid spread of a brand new turtle leather industry since 1967 is an example of the ills that such traffic generates. Sr. Suárez replied that now it is precisely because of the growth of this profitable industry that he has exerted his influence in stopping the heedless destruction of the resource and in disciplining the fishery; and that if his two principles of operation: exploitación racional, and industrialización completa are adhered to, the fishery can be stabilized and perpetuated. Otherwise, he said, effective management of East Pacific ridleys would quickly disintegrate. In a concluding statement at the last group session, Sr. Suárez repeated a remark that he had made several times before. It was this: "I will not go down in the history of Oaxaca as a person who has contributed to the decline of sea turtles; this would be one of the worst inheritances that I could leave for my daughter."

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CONSERVATION, UTILIZATION, ANTELOPES AND TURTLES

Broad generalizations about the conservation status of animal species are often made and enlarged upon by the popular press. One's personal concern about a species or group often makes it difficult to assess its status in objective comparison with the status of other species or groups. A case in point is a comment in a recent report which stated that sea turtles cannot withstand intensive exploitation. Taken to mean maximum exploitation, viz., every animal that one can lay hands on, then, of course, no community, neither animal nor plant, can withstand this. If, however, this infers a degree of exploitation, in other words, it is stated as a suggestion that no turtle population should be exploited because it is likely to disappear rapidly, then it is a highly misleading statement.

There is every indication that sea turtle populations are extremely resilient. In the Caribbean, turtles have been ruthlessly and totally persecuted for 500 years. This was no idle casual relationship but intensive in the full meaning of the word. Despite the disappearance of many individual populations there are still sea turtles in the area. Even the Nicaraguan turtle factory came and went and there are still turtles in Tor-

tuguero. To me it is a source of great wonder that there are any sea turtles at all in the central Americas, the Seychelles, and, in Madagascar the presence of hawksbills is indicative that sea turtles are proven survivors against incredible odds (see Hughes, 1973, Biological Conservation, 5, 114-118).

This is not to suggest, of course, that sea turtle populations can, or ought to be exploited, but it is not in my opinion factually correct to infer that they are particularly vulnerable to exploitation of any sort. If one really wishes to see vulnerable animal populations, one need not leave Africa where antelope populations numbering hundreds of thousands, if not millions, have been nearly wiped off the face of the earth in less than 100 years. Smaller antelope populations have been totally extirpated. If protection was lifted from some antelope species, they would disappear in a year and some of them are not even listed as endangered by IUCN.

The survival of many antelope species is directly attributable to the rational commercial use thereof; springbok, blesbok, eland, etc., are all safeguarded because of a vigorous campaign involving the farmer and his game to the profit of both. In many parts of the world the survival of the sea turtle may depend upon the same tolerant view being pursued. The sea turtle record indicates that a turtle population could be exceedingly tolerant of rational exploitation and prove an enduring asset. As in every walk of life, broad generalisations can be highly misleading and every turtle population should be considered individually. Where total protection is feasible, let us have it; where not, let us not close the door to survival by ignoring a valid conservation technique - utilization.

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COSTA RICA: VETO OF PROPOSAL TO REDUCE TORTUGUERO PARK

(Based on information supplied by A. Carr, Department of Zoology, University of Florida, Gainesville, Florida, 32611, USA).

A proposal was recently made to move the seaward limits of the Tortuguero National Park closer in toward the shore. One reason advocated for allowing turtling nearer inshore was that exceptionally large numbers of turtles nested there last year, 1978. However, this was probably just part of the unexplained fluctuations in turtle populations that often occur from one year to the next; this year, 1979, far fewer green turtles than usual have nested at Tortuguero. The bill that would have reduced the park boundaries was passed but was then vetoed by President Rodrigo Carazo of Costa Rica.

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Leicester Polytechnic
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Leicester, LE1 9BH, U.K.

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Gloucester, Point, Va.
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Florida Audubon Society
P.O. Drawer 7
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Dept. of Biological Sciences
University of Natal
Durban, South Africa

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S.E. Solomon
Dept. of Veterinary Anatomy
Glasgow University
Glasgow, Scotland, U.K.

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Laboratory of Comparative Physiol.
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Utrecht, The Netherlands

(hatchlings not influenced by sun's position, geotactic effects, form vision proposed, and other challenges for current theories of sea-finding).

ENCYCLOPEDIA OF TURTLES

by P.C.H. Pritchard, 1979, 895 pp. has just been published by T.F.H. Copies may be obtained directly from the author at the Florida Audubon Society, P.O. Drawer 7, Maitland, Florida, 32751, USA. Price $40.00 USA plus $2 for postage.

BOOK REVIEW: TIME OF THE TURTLE

(By Jack Rudloe. Alfred A. Knopf, New York, 1979. 273pp. $12.95 USA).

Jack Rudloe is a man of many parts. By profession he is a marine specimen dealer in the little cracker fishing village of Panacea in the Florida Panhandle. But his work has opened his eyes to many other things. He is a vigorous defender of environmental quality in a part of Florida generally deficient in conservation activists. Over the years Jack has also beome interested in turtles, and now he has put his observations and thoughts on turtles into a superb book. There has been a rash of new turtle books in the last few years, all of them worth reading, but Rudloe's is one of the few that combines genuine literary merit with deep first-hand knowledge of turtles, their ways and the factors that are dragging them towards extinction. Rudloe knows and likes the shrimpers whose trawls are drowning sea turtles all over the world. He works with them and has gradually helped make them aware of the extent of the turtle problem. He - and the reader - suffer as a turtle is slowly and crudely butchered on board a shrimp boat; without excessive anthropomorphism, he tells us of the blood behind the statistics, of turtles that do not die properly even when their throats are cut and their heads twisted off their bodies. Rudloe also has a more than passing interest in what I can only call the mystical aspects of turtles. He explores the widespread myth of the Turtle Mother, and, without actually believing in it, he convinces his readers there must be something in it. The book is utterly

readable, and the browsing reader will soon find his attention totally absorbed. He will find little problem in reading the book cover to cover at one sitting, and in so doing will have painlessly acquired a very real and vivid knowledge of what turtles are all about and why we should try to save them.

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BOOK REVIEW: CARIBBEAN EDGE

(By Bernard Nietschmann. Bobbs-Merrill Co., Indianapolis, 1979. 280 pp. Price: $12.95 USA).

"Field research," writes Nietschmann, "can be a profound human experience. Yet the accounts of many studies are written as if the investigation had taken place in a vacuum -as if the researcher suddenly had been teletransported to the site and, by means of clairvoyance or immaculate conceptual perception, had faultlessly initiated and completed the research project in one blinding flash of academic ingenuity. Let me tell you, it usually doesn't work this way..." There follows a series of well-turned anecdotes, some in the genre of Carr's "The Windward Road". These describe in an amusing and sometimes moving way the difficulties Nietschmann encountered in his studies of the Miskito Indians living on the East Coast of Nicaragua. Behind these stories lies a serious theme: the damage done both to people and turtles when harvesting for subsistence is replaced by over-exploitation for foreign trade. For instance, in 1968 it took 2 people 4 hours on average to catch a green turtle in the Miskito cays, in 1971 8 hours, and in 1975 24 hours; villagers traditionally dependent on turtle meat were going hungry as a result. The book devotes 3 chapters to turtling techniques and the history and importance of turtles in this part of the Caribbean. Apart from occasional descriptive passages where the prose becomes clogged with adjectives, the writing is engaging. This book will be enjoyed by anyone interested in turtles as well as stimulating them to think about fundamental goals and problems of conservation.

N.M.

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Marine Turtle Newsletter

No. 14 MARCH 1980

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EDITORIAL

The Marine Turtle Newsletter is currently mailed out to about 700 people in 70 different countries. So far it has been possible to send the newsletter to anyone who asked for it. As a result of the increased circulation, the newsletter has become like a leatherback with the financial flippers of a ridley. Charging is a poor option because that in itself would entail extra costs and because those in remote places might often be the ones least able to afford it.

Over the last few years WWF Canada has provided the main support for the newsletter. Past readers owe them a debt of gratitude. However, WWF Canada only have limited funds and they feel that because marine turtle conservation is such an international matter costs should be shared.

At the recent Washington Sea Turtle Conference a resolution was adopted that: The IUCN/SSC Marine Turtle Newsletter should make biologists and government conservation officials aware of the latest information on sea turtle conservation, management, and research and the status of implementation of the Sea Turtle Conservation Strategy. Unfortunately it was not possible to work out mutually satisfactory arrangements with IUCN International. There were problems about costs and content. Many people are now involved in sea turtle conservation, but opinions about the best means to that end and priorities are often deeply divided. A newsletter with inflexible viewpoints would not reflect this state of affairs. This editor would never accept funds from any agency that circumscribed the expression of his opinions or prevented him from accepting articles with diverse viewpoints. Fortunately, however, Hans Christian Mittag and Dr. Judith Mittag have now offered additional support for the newsletter without any restrictions on content, and the editor has decided to accept this.

Of course, editorial opinions do not necessarily reflect opinions of supporting individuals or organizations, nor do articles and letters necessarily reflect their opinions or those of the editor, nor does any of this material necessarily reflect opinions of editorial advisors. Because of the controversial nature of turtle farming, in which the Mittags have a commercial interest, it is best to state these disclaimers explicitly, obvious though they may be. In fact, your editor will continue to try not to emphasize turtle farming in this newsletter because many people are not illuminated by and are tired of having the same issues debated over and over and because there are other important topics that need space.

In summary, changes have been made in the financial base of the newsletter to enable it to swim more vigorously in the rising waves of higher costs. It is expected that the newsletter will continue much as before. It still stands ready to help the IUCN Marine Turtle Group and organizers of the successful Washington Sea Turtle Conference with the dissemination of information and ideas on the conservation, management and biology of turtles and on plans for action. These topics have always been the main concern of the Marine Turtle Newsletter and we hope that it will continue to be useful and stimulating to those with similar concerns.

N.M.

LOGGERHEAD TURTLES IN NEW JERSEY, USA

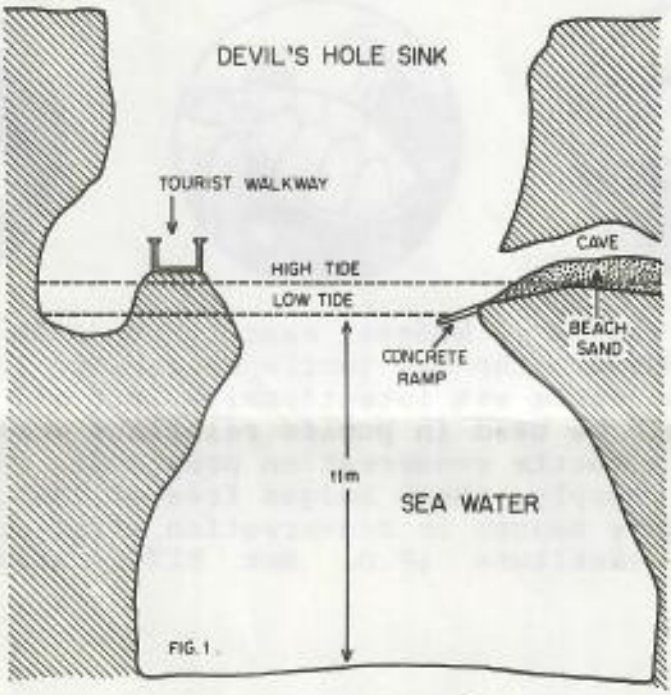
During the past several years there have been several reports of Caretta caretta nesting along the New Jersey coast. This is the most northerly nesting known for sea turtles in N. America. The New Jersey Department of Environmental Protection have appointed Robert L. Brandner (Dept. of Herpetology, N.Y. Zoological Society, The Zoological Park, Bronx, N.Y. 10460, USA) to study this population and its possible protection. If you have any information about loggerheads in New Jersey or suggestions about this study, please write to Dr. Brandner.

CAPTIVE TURTLES NEST ON ARTIFICIAL BEACH IN A CAVE

How exacting are the environmental prerequisites which have to be met before sea turtles will be bred in captivity? Recent evidence suggests that they may be more flexible than we thought. The captive breeding programmes at Cayman Turtle Farm and elsewhere have already demonstrated that sea turtles can be induced to breed on beaches other than those on which they have hatched. I provide evidence here that captive turtles in breeding condition may lay their eggs in almost any combination of environmental restraints.

The Devil's Hole tourist attraction on Bermuda is a sheer sided limestone sink, drowned by post-glacial rise in sea level to a depth of 11 m. Three species of sea turtles have been held captive there for decades including Chelonia mydas (2 male and 2 female), Caretta caretta (2 male and 2 female) and Eretmochelys imbricata (1 female). Although tidal flushing of the sink is good, keeping the water clean and clear, the turtles are forced to exist almost exclusively on a diet of fish (mainly moray eels) which they obtain from hookless fishing lines provided for the tourists.

Despite these constraints, it came to my attention some years ago that both the green and loggerhead turtles were in the habit of mating and, for lack of a suitable breeding beach, laying their eggs into the water. Earlier attempts to salvage these eggs and hatch them on a normal beach environment were unsuccessful, so in 1974 I obtained approval from the Devil's Hole management to create an artificial nesting beach on one side of the sink where a natural cave recess at tide level provided the only possible place for doing so. With assistance from Lightbourne's Diving Services, Ltd. and from volunteers, a concrete ramp was extended out into the water from the cave entrance and the cave itself was backfilled with beach sand (see Fig. 1).



The turtles have used this beach for laying in the summer of 1975 and again in 1976, 1977 and 1979, despite the fact that the maximum height of beach allowable under the cave roof is insufficient to prevent drowning of most of the beach at high tide. Partly for this reason and partly to prevent early layed clutches from being destroyed by later nestings, all clutches were transplanted to a natural beach hatchery as soon as possible after laying.

From 1975 through 1979, there have been 6 nestings by loggerheads and 3 by green turtles. These occurred from the end of June to 11 September. Only 2 clutches of loggerhead eggs have hatched successfully so far, but the results are encouraging because fertility rates in both species were high (% of eggs showing embryonic development was 42, mean, 5-90% range, n = 8). In most cases hatching failure was clearly attributable to secondary factors such as partial drowning of the eggs before they were transplanted (the caretaker was sometimes lax in reporting the nestings to me); excessive chilling by low temperature or heavy rains during incubation; or dietary deficiencies affecting the adults (in the case of the green turtles the eggs had whitish yolks). Efforts are now being made to improve the diets of both species by feeding them the protein rich pelleted food formulated for Cayman Farm by Central Soya Limited.

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TURTLE BADGES AVAILABLE

A large number of badges, exactly the same as those distributed at the Washington Sea Turtle conference last November, are available. The title was intentionally left off these badges so that they could be used in public relations work by anyone wishing to create a turtle conservation programme. The Chelonia Institute will supply these badges free of charge. If you would like to use these badges in conservation work, please write to the Chelonia Institute (P.O. Box 9174, Arlington, Virginia, 22209, USA).

ATTEMPTS TO PROTECT HAWKSBILLS IN A VENEZUELAN NATIONAL PARK

The Los Roques islands lie about 110 kms north of La Guaira on the Caribbean coast of Venezuela. With some 2500 km^2 of shallow water and 40 islets, there are more than 25 kms of good turtle beaches. Until 1973 the area supported a 50,000 kg/year turtle fishery, mostly hawksbills. Now a part of the National Parks system, no commercial fishery is allowed, but fishing con-

tinues all year and eggs are taken, supposedly for local consumption. The fishermen of Los Roques do not need turtle meat or eggs for protein; the only reason they take eggs is that they believe them to be aphrodisiacs. In 1979, about 80% of the nests were destroyed and the turning of nesting turtles and the use of gill nests nearby the beaches continues.

The Los Roques Scientific Foundation is trying to protect the few hawksbills that nest in the archipelago. Financial assistance has been requested from the 'Fundacion para la Defensa de la Naturaleza, WWF' (FUDENA). At present, a round hole, some footprints and a few old egg shells from a hatched nest, is usually enough to protect any intact nests found. Eggs from half of the protected nests are collected after 45-55 days and placed in boxes; it is hoped in this way to avoid any untoward temperature effects on sexual differentiation (see Mrosovsky, 1978, Marine Turtle Newsletter No. 9, 1-2). Hatch rates are good. The hatchlings from the boxes are for a head-start programme; some 1500 hatchlings per year can be released with the current level of support. The turtles are kept in pens until they are 300 gms (100 days); then they are put in a 2500 km^2 area in the sea enclosed with nets and walls. Growth rates are high and mortality low. The turtles are given 5 non-commercial species of sardine in addition to food they find in the 'corral'. The remaining half of the nests are left in place to hatch naturally. Research on the theory that hatchlings go to sargassum is also being undertaken.

A few hawksbills nest on other Venezuelan islands, but if they have no protection in a National Park, what hope is there in other places?

Based on information sent by:
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ANOTHER NOTCHED RIDLEY FOUND

On 27th April 1979, while visiting islands off the Kanika coast near Palmyras point, Orissa, an olive female ridley turtle (46.5 cm curved carapace) was found dead near the coast in the north-eastern part of the Kayangola Bali Island. The specimen was very fresh and both left and right 11th marginal scutes had conspicuous 'V' shaped notches (see also Lazell, J.D., Marine Turtle Newsletter 1977, No. 5, p. 2; Marine Turtle Newsletter 1979, No. 11, p. 5). The turtle was young and no eggs were found after dissection. If anyone has information about notching hatchlings and sub-adult ridleys, please write to me.

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Marine Turtle Newsletter

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EDITORIAL

Head starting turtles is the practice of raising hatchlings in captivity for a number of weeks, months or even years and then releasing them. The rationale is that they will then be less vulnerable to predators than the smaller hatchlings and so contribute more to the population. Head starting is becoming widespread despite lack of proof that it is effective. But the problem goes still deeper. Not only is head starting unproven but no one has yet formulated what would constitute evidence that it is useful as a conservation procedure. Suppose a tagged head started turtle was found nesting, would this constitute evidence of success? Suppose even head started turtles in fair numbers emerged on nesting beaches, would that constitute evidence that head starting is quantitatively superior in contributing to the population than releasing hatchlings? Can the scientific and economic aspects of head starting be separated? For a given cash outlay would it be better to give protection to many eggs and emerging hatchlings on the beach or spend the money raising a few turtles in tanks? Can these questions be answered without a way of marking hatchlings?

We invite readers to send us their views on what would constitute evidence that head starting is effective. Please keep contributions short. Is head starting the 'green revolution' of turtle management or is it only a costly and elaborate way of depressing turtle populations? How could one tell?

N.M.

THE GAHIRMATHA TURTLE ROOKERY ALONG THE COAST OF ORISSA, INDIA

Davis & Bedi (1978) and Davis et al. (1978) have drawn attention to the rookery of the olive ridley along the 35 km stretch of coast commonly called Gahirmatha, which forms a part of the Bhitar Kanika Wildlife Sanctuary in the State of Orissa, on the east coast of India. I have been carrying out investigations since 1976 and have been staying close to the rookery since 1977. Available information indicates that this is one of the largest nesting grounds of olive ridley turtles in the world. Although adult females are encountered on the beach practically throughout the year, the arribada is observed in February or March, when more than 100,000 females reach the coast. In other months the number of females encountered on the beach is less than 100 per month. During 1976, when detailed studies were initiated, over 150,000 females were estimated to be involved in the arribada. The numbers are so large and the number of trained personnel available to make the counts so limited, that it is not possible to give more precise figures, but there is no doubt that the above figures are close to the actuals. Counting is done on the basis of a sampling technique suggested by Dr. H. R. Bustard, FAO Consultant-cum-Chief Technical Advisor to the Government of India, under whose guidance the work is being carried out. During 1977, the numbers were even larger. Davis et al. (1978) are not correct in their statement that not a single turtle arrived on this beach during the 1977 nesting season. They visited part of the rookery on one day in February 1977. During the 1978 season, the number of females which reached the rookery was more than 200,000; during 1979, the number was 133,000.

It may be mentioned that the arribada takes place during the period when the coastal surface currents run parallel to the coast in a northeasterly direction (Ganapati & Murthy, 1954). This is also the period when the coastal waters support a good fishery for small, pelagic fishes like clupeids, engraulids, leiognathids, etc. (Dr. S. Dutt, pers. comm.). Until recent years, fishermen mainly from the neighbouring State of West Bengal were regularly capturing the adults at sea and collecting the eggs. From 1975, the Government of Orissa has prohibited the collection and sale of eggs as well as capture of adults; though some poaching still takes place, the collection of eggs has practically stopped. Fishermen operating traditional non-mechanised fishing craft as well as mechanised vessels continue to capture adults at sea, in the absence of any effective agency to enforce the regulations. A new threat during the last 5 years has come from the increasing number of small shrimp trawlers operating along the continental shelf from ports in West Bengal, Orissa and Andhra. At this time it can be assumed that they capture turtles only incidentally but since turtles fetch an attractive price in Calcutta, the trawlermen may be tempted to catch increasing numbers during their movement to the beach for laying eggs.

The female ridleys which reach the beach at Gahirmatha have been tagged since 1978 with Monel tags. So far, more than 2000 females have been tagged; the tags are attached to the trailing edge of the left fore-flipper. The tag carries on one side the serial number beginning from 1 and on the other side the legend: REWARD RETURN FOREST DEPARTMENT, ORISSA, INDIA. So far, there have been only 5 returns: 5 tagged in March 1978 were recaptured within a distance of 3 km in February 1979, thus providing evidence of the females returning to the same nesting grounds and of annual nesting.

In the course of my survey of the Orissa coast I have observed that there are also nesting grounds further south at Barunei Muhana, Hukitola Island, Astaranga, Chandravaga, Puri, Paluru and Gopalpur-on-Sea. Only Gahirmatha and Hukitola Island are subject to relatively low levels of capture of adult female turtles from the nesting beach and poaching of eggs from nests. In the other areas the rookeries are in danger of being destroyed in the near future because of inadequate numbers of trained personnel to enforce the legislation and due to increasing fishing activity and settlement of people in hitherto sparsely inhabited regions. The work on turtles along the Orissa coast has been possible because of the active support and encouragement given by the Chief Conservator of Forests and the Chief Wildlife Warden of the State of Orissa. It gives me great pleasure to express my thanks to Dr. H.R. Bustard who initiated me in this study.

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SHOULD SEA TURTLES BE EXPLOITED?

I was delighted with the positive approach shown to this topic in the Marine Turtle Newsletter No. 13 (Nov. 1979), particularly with the Editorial. Perhaps, as someone with extensive experience both in developed countries (Australia) and in very traditional and developing areas of the world (Melanesia and India respectively), I can take up some of the points so cogently made by Mrosovsky, Carr and Hughes in their contributions.

I have strong emotional sympathies with Carr. It would be nice to have no international trade in turtles or other endangered or potentially endangered species. I eat turtle happily at the village level but do not myself have any desire to make a business out of it. In Australia - where we could afford it - my advice to Government, which was accepted in the 1960's, was total protection. However, in Melanesia such an approach would cut across traditional usage, and here my advice has been to continue utilisation (how can one stop it?) but channel this, in my view, legitimate right to use turtles to broaden the conservation base. This may not be as difficult as it appears because all traditional users have a strong vested interest in the survival of turtles. Such a policy, I am sure, would be right for areas like Papua New Guinea and the Seychelles Islands for example.

Mrosovsky points out that we should take risks. Writing as a population ecologist, I would say that we can limit the odds and make the risks acceptable by taking up schemes which are conservative like the people who will benefit from them. The point that Mrosovsky makes, that both the people and the Government must be involved, is true. In much of the developing world including India, I am convinced that unless wildlife is utilised we will lose most or all of it. In eastern Orissa we have a number of large Pacific ridley rookeries. One of these has been monitored since 1975 and has c. 150,000 nesting females in a good season (see article by Kar above). The Government formerly sold the rights for collection of approximately two million eggs per annum. These licences were cancelled, following my advice in 1975, and total protection afforded to the nesting turtles and their eggs. Since the protecting agency (the State Forest Department) does not have sea-going vessels, poaching, which we are trying to control by other means, still continues several miles offshore. If we are able to protect several huge rookeries of this kind, limited and scientifically managed exploitation of sea turtles can take place elsewhere, both within and outside of Orissa. I have never approved of the 'ban anything' mentality. Unfortunately, our small, but I think significant contribution to Lepidochelys olivacea conservation was strongly criticised in a recent issue of the Marine Turtle Newsletter (No. 12, Sept. 1979) without bothering to ascertain the facts. It is important to appreciate that shortcomings or accidents will always be more newsworthy in a spectacular sense than solid conservation achievements.

The international conservation fraternity's 'protect everything' philosophy does real conservation - which surely includes sustained/yield utilisation - as opposed to mere preservation, a great disservice in that it makes the countries in the developing world feel that total protection alone represents advanced thinking. This results in blanket conservation laws being brought in - never mind that they may not be enforced - which prevent the operation of conservation through good utilisation schemes which would substantially benefit the populations. I have been preaching conservation through utilisation since the IUCN Marine Turtle

Group was formed. IUCN Groups who wish to advance their animals must be pragmatists, have access to good scientific data and contain within their midst people with extensive experience of the sheer enormity of problems in the developing world, especially the enormous pressure on all resources - especially land - as a result of huge human population growth.

The Government of India/FAO/UNDP large-scale Project - Crocodile Breeding and Management is able to protect some very large Lepidochelys rookeries in Orissa. However, this can only be for a few years - covering the decade or so of the life of the Project. The future of this sanctuary, which was set up for the endangered saltwater crocodile (Crocodylus porosus), and extended to include the Lepidochelys rookeries, is in scientifically-managed utilisation. To enable this to have access to the best scientific advice, I have 7 Indian students working for their Ph.D degrees under my guidance in India - not training overseas.

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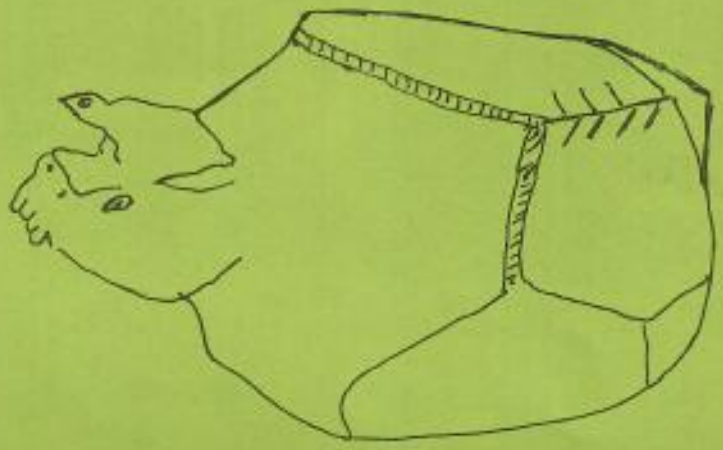
INNUIT TURTLE SONG: LEATHERBACK TURTLES NEAR BAFFIN ISLAND?

Although known above the Arctic Circle in Europe (Brongersma, L.P., 1972, Zool. Verhand., 121, 318 pp.), records of leatherback turtle, Dermochelys coriacea, north of Labrador in the western North Atlantic Ocean are lacking (Threlfall, W., 1978, Can. Field Nat., 92, 287). During the past year an interesting suggestion that leatherbacks occasionally reach Baffin Island has come to light. Ms Maurie Brown of KBPS, Public Broadcasting, San Diego, California, contacted me about a program dealing with the science-folklore. She found that an Innuit song-story from Baffin Island, Canada, referred to a "rare catch...a delicacy rarely caught...hard to see in the water...thin head reaching up...outstretched neck...birds flying overhead tell one it is there...birds around its head...delicacy to eat...all can have or share a feast." I was especially intrigued by the description of the association with birds since we noted a similar association between Dermochelys and terns off of Rhode Island in September 1978, during an aerial survey. At that time, 18 of 19 leatherbacks observed in a mile-wide strip along the shore from South Kingstown to Westerly were associated with 3 or more birds. We located many of the turtles by searching for circling birds which would alight on or near a surfacing leatherback.

The description in the song-story was strengthened by the fact that Ms Brown had photographs of a soapstone carving which was about 19 inches in length, 14 inches in width, and 4 to 8.5 inches in height, from the Cape Dorset, Baffin Island, settlement. She sent the photographs to me for identification of the carving. As Ms Brown suggested, the carving is obviously a turtle, or part of a turtle, with a bird on the turtle's head

(Fig.1).



Sketch of a soapstone carving of a leatherback turtle with a bird on its head

I judge the carving to represent the anterior portion of a Dermochelys with fore flippers folded over the back in the manner that other sea turtles often do. The hooked jaw is prominent (Fig.1). Ms Brown related that the carving was described to her as a "training aid" for the younger men and boys since the occurrence of the animal was a rare event. The carving was crafted by an older hunter and came from the settlement in 1973.

Cape Dorset, at about 64 N, 76 W, is considerably north of the northernmost documented record off Labrador at 56 45'N, 61 00'W and represents a range extension if the Innuit song refers to the Cape Dorset area. At least, the Hudson Strait should be considered as possible habitat for leatherbacks during some years. I thank Ms Brown for providing the above information. This note is the result of U.S. Department of the Interior, Bureau of Land Management support to the Cetacean and Turtle Assessment Program through contract AA 551-CT8-48.

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A PRELIMINARY ANALYSIS OF SEA TURTLE EGGS FOR DDE

Four sterile loggerhead sea turtle eggs representing a population of marine turtles nesting during the summer of 1979 on the southeast coast of Florida were analyzed for DDE. This synthetic compound is a metabolite of the globally dispersed and once widely used pesticide, DDT (dichlorodiphenyltrichloroethane). Results revealed that DDE was present in the eggs at the level of 34 ppb (dry basis). Unfortunately the significance of this level of DDE is unknown due to the fact that few investigators have studied the subtle effects of low level DDE contamination in wildlife (mammal or reptile). I believe, however, some concern over this finding is justified because some investigators have found that values from 1-17 ppm can result in egg shell thinning in certain species of predatory birds (e.g.

falcons). Some investigators suggest that even smaller levels may cause harmful effects.

I hope this report will encourage others with the necessary facilities at hand to conduct more comprehensive studies of this subject. Presently, I do not believe live specimens or fertile eggs should be sacrificed until it can be demonstrated with sterile eggs that synthetic chemical contamination may indeed pose a threat to the sea turtle. Those investigators not directly involved in this research can nevertheless help by carefully documenting deformities in turtles from naturally and artificially incubated eggs from season to season. It should be pointed out that no increase in the visible deformities among sea turtles nesting in Florida has been reported (Witham, pers. comm.). I thank Tom Sullivan and the chemists from the Broward County Environmental Quality Control Board for processing the eggs used in this analysis and Ross Witham for comments.

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MALDIVES TURTLE STAMPS

The Republic of Maldives issued a special 'save the turtles' series of 7 stamps on 17 Feb. 1980. These depict each of the species of sea turtle. The cost per set is M.Rs 10.93 plus 4.00 for a souvenir sheet. In addition, a first day cover envelope was issued along with the set (M.Rs 1.00). Orders for stamps and first day covers should be sent together with payment by International Money Order to: The Postmaster, General Post Office, Male', Republic of Maldives, Indian Ocean (US $1.00 = M.Rs. 3.93).

MAGNETIC MATERIAL IN TURTLES: A PRELIMINARY REPORT AND A REQUEST

The mystery of how migratory animals, particularly sea turtles, can navigate accurately over large distances has been and is a perplexing problem, requiring the organism to have both a map and a compass sense. Recent behavioral experiments on this map sense in homing pigeons suggest that the magnetic field may play an important role in their orientation. Pigeons released at magnetic anomalies (<6% of the earth's field), for example, seem confused even on sunny days (Walcott, 1978). It seems reasonable to speculate that other migratory animals may use the magnetic field as part of their map sense as well.

Although the sensory mechanism underlying the ability of organisms to detect the geomagnetic field is as yet not definitely established, it seems likely that the small crystals (<0.1 um) of organic magnetite that my colleagues and I have located in magnetically sensitive honey bees and homing pigeons are respon-

sible (Gould et al., 1978; Walcott et al., 1979). However, the number of individual crystals we located in these organisms is on the order of 10^8, whereas it would require only a few hundred to maybe a thousand crystals to build an extremely sensitive magnetic compass (Kirschvink & Gould, in press; Yorke, 1979). Why is there so much magnetite? If all the crystals were used for a compass, the accuracy of the organ would be far greater than any organism could possibly need to keep track of its own orientation. The extra sensitivity would be useless. I have suggested elsewhere (Kirschvink & Gould, in press) that this extra magnetite may be used to monitor the total intensity of the magnetic field and that it may provide the magnetic component of the pigeon's map sense. Enough magnetic material is present to provide it with all the sensitivity it needs; by integrating over about 4 seconds it should theoretically be able to sense 1 nT (10^{-5} Gauss) changes against the Earth's roughly 50,000 nT background (Kirschvink & Gould, in press). N.B.: $1nT=10^{-5}Gauss=10^{-9}$ Tesla. On the average, the Earth's field increases in strength away from the equator at an average rate of 5 nT/km, so a magnetic sense with this type of resolution would be extremely useful for migratory animals. If animals use the magnetic field in this manner, then the above argument implies that enough magnetite must be present in them to detect on our extremely sensitive superconducting magnetometers (Gould et al. 1978; Walcott et al. 1979).

I have examined the heads of 3 loggerhead turtles, Caretta caretta. These were from hatchlings that had been incubated in Dr. C.L. Yntema's laboratory in his studies of sex ratio and temperature. There was, indeed, something magnetic in these loggerhead turtles, comparable in amount to that in a honey bee. Heads from 4 hatchling snapping turtles, Chelydra serpentina were also examined. These were collected at the same time as the loggerhead sample, and preserved (rapidly frozen) and dissected in the same way. Magnetic material within the head was not detected in the snapping turtles. This suggests that the magnetic material within the loggerhead turtles was not the result of contamination of some sort. However, a larger sample would be desirable, and it is still necessary to isolate the magnetic material and examine it carefully before it can be identified as biogenic magnetite. Unfortunately, hatchlings are too small for accurate dissection using my collection of plastic knives, forks and bits of broken glass (metallic dissection instruments often leave trails of magnetic particles behind, so we are forced to use non-magnetic tools). For these reasons I would like to examine materials from more marine turtles. If anyone can help in providing specimens, this would be much appreciated. The best turtles for this work, like the best pigeons, would be those which have been selected for the ability to navigate over long distances (the colonies breeding on Ascension come to mind). Any specimen that has been frozen or preserved in a non-acidic medium (e.g. buffered formalin or alcohol) would be suitable for this kind of work. Turtles somewhat larger than hatchlings would be easier to work with. Of course, only behavioural experiments can

determine whether or not sea turtles actually sense and use the magnetic field for anything.

I thank Dr. C.L. Yntema for kindly loaning specimens, and Dr. N. Mrosovsky for suggesting and facilitating this project. The work was supported by NSF grant SPI 79-14845

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BOOK REVIEW: 'THE WINDWARD ROAD' REISSUED

(by Archie Carr, reissued 1979 in paperback by the University Presses of Florida, 15 N.W. 15th Street, Gainesville, Florida, U.S.A. $6.95, U.S.A.)

For most readers of the Marine Turtle Newsletter this delightful book, first published in 1956, needs no review. All they need to know is that now they have a chance to have their own copy. For those who have not read it, the subtitle "Adventures of a Naturalist on Remote Caribbean Shores" may be instructive. Carr tells of his adventures "nosing around the tropics" in search of information about sea turtles. As to what is meant by adventure, "the thing is...as you may know, but I had not discovered then...", he writes in the 1956 edition, "...adventure is just a state of mind, and a very pleasant one...a great asset

if you use it right". In a newly added preface for the 1979 reissue, he tells of the water that has passed under the bridge since 1956 and how his state of mind has changed, for example on such things as eating endangered species. However, only a general evaluation of Operation Green Turtle is given: it cannot be proved that it restored any green turtle colonies, but it brought about the start of international concern about Chelonia mydas and led to new research. Perhaps some day Carr will provide a full account of the release of hatchlings on different beaches in the Caribbean, with tables of how many were released and when. Details of this ambitious attempt to reestablish turtle colonies should be collated and available. The story of Kemp's ridley is brought up to date with a reprint of Carr's letter to Sir Peter Scott describing its recent decline (see also Marine Turtle Newsletter No. 4, May 1977) and the recent joint Mexican-American efforts to save this species. This is all in the new preface. Apart from this preface, the addition of a few not very well reproduced photographs, and a foreward by Joshua B. Powers telling of the impact that "The Windward Road" made and how it led to the formation of the Brotherhood of the Green Turtle and the Caribbean Conservation Corporation, the original book is unaltered. Temptations to improve and justify have been wonderfully resisted. This is a classic and it remains as fresh and vibrant as ever.

N.M.

WANTED: INFORMATION ON HAWKSBILL TURTLES

The Southeast Fisheries Center is presently compiling all biological and fishery data on hawksbill turtles. The material will be summarized and published as a synopsis of data using the existing FAO format. Basic information, such as nesting locations, nesting seasons, size of females, number and size of eggs, incubation period, growth, migration, etc., are often known locally but do not get written up. This is a request to pull data out of file cabinets and write them up into citable manuscript for inclusion into this synopsis. Also needed are copies of unpublished manuscripts. All data and manuscripts submitted will be properly credited. Please send information to: Wayne Witzell, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida, 33149, U.S.A. (Telephone: (305) 361-5761).

NEW NATIONAL PARKS PROTECTING TURTLE HABITAT IN QUEENSLAND

(Information supplied by C.J. Limpus, National Parks and Wildlife Service, Pallarenda, Townsville, 4810, Queensland, Australia)

The Australian Government declared a Marine Park over approximately 12,000 km^2 of reefs and waters surrounding the islands of the Capricorn and Bunker groups, southern Great Barrier Reef in October 1979. A management plan for this Marine Park is currently in preparation. The Marine Park does not include the islands within its boundary. The park surrounds 13 coral cays, 10 of which support substantial breeding populations of Chelonia

mydas and Caretta caretta. Four of these islands (Heron (portion only), Hoskyn, Fairfax and Lady Musgrave) have long been national parks. In February 1980, the Queensland Government declared two additional islands (North West and Wreck) surrounded by the Capricorn Marine Park as national parks. This means that a major part of one of the major breeding areas in Australia and the South West Pacific region for each of C. mydas and Caretta is now under strong habitat management; this includes not only the beaches but the surrounding waters where the mating turtles aggregate and the breeding females gather in their "refuges" between successive fortnightly nestings. In addition, the Capricorn Marine Park provides protected habitat for a very large year-round resident community of C. mydas, C. caretta and Eretmochelys imbricata. These resident turtles migrate to other areas to breed. The declaration of these national parks represents a major contribution to sea turtle conservation in the region.

On 28 February 1980, the Queensland Government declared most of Wild Duck Island (a continental island off the central Queensland coast inshore from the Great Barrier Reef) a national park. The national park includes the important nesting beaches for Chelonia depressa on the island. Wild Duck Island and neighbouring Avoid Island form the most important C. depressa breeding area known from eastern Australia. A tourist resort is being developed on that part of Wild Duck Island which is not national park. The Wild Duck Island National Park has been declared specifically to safeguard the C. depressa nesting area on the island. This is the first legislation specifically designed for the conservation of the Australian endemic C. depressa.

EDITOR'S ADDRESS

From 1st July 1980, until about 31 August 1981, Professor Mrosovsky will be at the Department of Zoology, South Parks Road, Oxford, OXI 3PS, U.K. The Marine Turtle Newsletter will continue to be mailed from Toronto and letters will be forwarded from there. To save time, however, correspondents may wish to write directly to the editor at Oxford. Professor Mrosovsky hopes it may be possible to meet with people in Europe concerned with turtle conservation.

STOP PRESS: RANCHO NUEVO

Peter Pritchard has just returned from Rancho Nuevo, Mexico and reports that there is no new oil on the beaches there. Most of the oil remaining nearby is in hard weathered clumps. As of May 1st this year, 180 clutches of eggs have been reburied in the protected hatchery.

Support for this newsletter came from H.C. Mittag, Dr. J. Mittag, the University of Toronto and World Wildlife Fund Canada. K. Radway Allen kindly donated $50.

Marine Turtle Newsletter

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EDITORIAL

The last editorial (Marine Turtle Newsletter No. 15 May 1980) asked how the practice of head starting turtles might be evaluated. A future issue will present the replies received, but there were very few of these. Should one infer that despite the widespread use of head starting there are few ideas on what would constitute a scientific test of its value?

N.M.

RIDLEYS IN ECUADOR - A RAY OF HOPE?

On the question of exploitation of the Pacific ridley, Lepidochelys olivacea, in Ecuador two more sources of information, hitherto inaccessible, have now become available because the Instituto Nacional de Pesca (INP) want to start a tagging program of L. olivacea on the mainland of Ecuador and so needed access to exportation figures other than their own. These new sources are the records of Banco Central (body responsible for the financial arrangements of three turtle companies during their international transactions) and the files of the turtle companies themselves. The data are given in Tables 1-3, together with data from sources available previously (i.e., the Instituto Nacional de Pesca and the Direccion General de Pesca (DGP) presented by Green and Ortiz-Crespo (in press) and Green (unpubl. data)). These new data refer to the actual numbers of turtles rather than estimates; the number of juegos or sets of flippers (one juego or set per turtle) appears on the invoices.

In 1978 (Table 1), the number of turtles actually exported (86,916) falls between the minimum and maximum estimates made by Green and Ortiz-Crespo (in press). In 1979, however, the actual number of turtles killed (93,232) is about 30% lower than the minimum estimate (133,233) obtained using figures supplied by the

YEAR	SKINS			MEAT				TOTAL NO. TURTLES		% UTILIZATION OF MEAT	SOURCE
	EXPORTED			EXPORTED		INTERNAL MARKET	TOTAL****				
	Weight (Kg)	Estimated no. turtles		Weight (Kg)	Estimated no. turtles		Estimated no. turtles				
		Min.	Max.		Min. Max.		Min. Max.	Min.	Max.		
1978	161,070	80,535	89,483	62,967	9,246 13,869		9,246 13,869	80,535	89,483		DGP and INP Green and Ortiz-Crespo, (in press)
		86,916***		55,545	10,862*	388*	11,250*	86,916***		13.50	Banco Central (this paper)
1979	266,465	133,233	148,036	6,405	940 1,410			133,233	148,036		Green and Ortiz-Crespo, (in press) Green (unpubl. data)
		93,232***		8,415	1,254*	7,158*	8,412*	93,232***		9.19	Banco Central (this paper)
1980		15,127***		460	90*	1,173*	1,263*	15,127***		8.35	Banco Central (this paper)

TABLE 1: Combined annual exploitation by three companies (viz Neptuno, Expromar and Exporklore) of skins and meat of the Pacific ridley in Ecuador for the period 1978 to May 1980. Figures supplied by courtesy of the Direccion General de Pesca (DGP), Instituto Nacional de Pesca (INP) and the Banco Central, Guayaquil.

* Based on a mean of 5.11 kg of meat per turtle (Hurtado, in press); other estimates of turtle equivalents based on the following Min - 2.0 kg of skin or 6.81 kg of meat per turtle; Max - 1.8 kg of skin or 4.54 kg of meat per turtle.

** Figures for the first five months only.

*** These figures are not estimates but known numbers of turtles.

**** This meat is from turtles already butchered for their skins and so does not increase the total number of turtles killed.

1979	SKINS			
MONTH	Weight * (kg)	Estimated no. * turtles		Known No. ** turtles
		Min.	Max.	
JAN.-JUNE	139,900	69,950	77,722	49,832
JULY	14,051	7,026	7,806	19,400
AUGUST	5,414	2,707	3,008	9,000
SEPT.	5,300	2,650	2,944	2,000
OCT.	0	0	0	0
NOV.	96,400	48,200	53,556	8,000
DEC.	5,400	2,700	3,000	5,000
TOTALS	266,465	133,233	148,036	93,232

TABLE 2: Monthly exportation of ridley skins from Ecuador during 1979.

* Figures supplied by courtesy of the Direccion General de Pesca (DGP), Guayaquil.
Estimates of turtle equivalents are based on the following: Min - 2.0 kg of skin per turtle; Max - 1.8 kg skin per turtle.

** Figures by courtesy of Banco Central, Guayaquil.

DGP and the INP (Green, unpubl. data; Tables 1 and 2). Perhaps fearing a curbing of turtle exploitation due to investigations by Green, Cantos and Ortiz-Crespo in May and June of 1978, companies started during 1979 to obtain their exportation permits from the DGP and INP in advance of actual business transactions. These permits are considered by both the DGP and INP as a true representation of the actual quantities exported. However, many of these permits are still to be used, and so exportation figures supplied by these two organizations for 1979 and 1980 are actually too high. This also applies to the 1979 exportation figures presented by Green and Ortiz-Crespo (in press) who used these figures as a basis for their estimates of turtle exploitation. Exportation figures supplied by the Banco Central (used in Tables 1-3) are more accurate because they involve the actual transaction. Even so, they are still about 4% lower than figures supplied by the turtle companies. In addition, we believe that the actual numbers of turtles killed are about 14% higher than indicated by the Banco Central figures. This means that during 1979 about 107,000 ridleys were killed.

	1977		1978	1979	1980
	Estimated no. * turtles		Known no. turtles	Known no. turtles	Known no. turtles
	Min.	Max.			
JANUARY	2,135	2,602	5,490	8,000	3,000
FEBRUARY	2,646	3,127	5,608	2,737	2,000
MARCH	4,785	5,446	6,190	5,042	4,972
APRIL	5,060	5,622	4,500	5,656	0
MAY	11,645	12,938	8,686	13,100	5,200
5 Month Totals	26,271	29,735	30,474	34,535	15,127
Yearly Totals	55,080	61,194	86,916	93,232	
% 5 Month Total of Yearly Total	47.70	48.59	36.15	37.04	
Source	INP + DGP Green and Ortiz-Crespo (in press)		Banco Central (this paper)		

TABLE 3: Numbers of ridleys killed in Ecuador between January and May for the period 1977 - 1980.

* Min. estimate - 2.0 kg skin per turtle; Max. - 1.8 kg skin per turtle.

Table 3 shows the number of turtles killed during the first five months of 1980 and compares it with the numbers killed during the equivalent time periods for 1977-79. There is a noticeable decline in exportation, which can be attributed to several causes. One is that workers from one of the factories were on strike for 3 1/2 months between February and May. Another is that both the Ministerio de Recursos Naturales (responsible for the DGP and INP) and the Ministerio de Agricultura y Ganaderia are refusing to give export permission if the exportation is to a country ratifying CITES (e.g., Italy). This still leaves Japan

to corner Ecuador's export market - but it is not happening; during June 1980 only one minor transaction took place. Could it be that the bottom has at last fallen out of the skin market as it did the meat market? Whether or not this is true, let us hope that the lessened exploitation is not due to another reason: a dramatic decline in the ridley population in Ecuador.

Green, D. and Ortiz-Crespo, F. (in press). The status of sea turtle populations in the Central Eastern Pacific. Proceedings of the World Sea Turtle Conference, 1979. Washington, D.C.

Hurtado, M. (in press). Exportación Industrial de Lepidochelys olivacea en Ecuador durante el periodo 1976-1980. Instituto Nacional de Pesca, Guayaquil.

DEREK GREEN.
Charles Darwin Research Station, Isla Santa Cruz, Galapagos, Ecuador.

MARIO FURTANDO G.
Instituto Nacional de Pesca, Guayaquil, Ecaudor.

Sr. SUAREZ SELLS OUT

As of the start of June 1980, Sr. Antonio Suarez has sold his interests in turtles to Productos Pesqueros Mexicanos, a company owned by the Mexican government. The implications of this for the management of turtles in Mexico are not yet apparent. The Cooperatives there will continue to exist.

LARGE FINE FOR CAPTURING A TURTLE

(based on information in the Corpus Christi Caller, Texas, 17 April 1980).

A crewman of a shrimping vessel from Fort Myers, Florida, was fined $5,000 for taking a loggerhead turtle off the Yucatan Peninsula. The man was prosecuted for violating the Endangered Species Act of the USA. The Chief agent-in-charge of the National Marine Fisheries law enforcement division in St. Petersburg, Charles Fuss, was quoted as saying "If you don't have a fairly significant sanction, compliance is going to be almost nil."

"CONFISCATED!": AN EXHIBITION

(review based on information sent by Tara Busser, Public Relations Officer, Cleveland Museum of Natural History, Wade Oval, University Circle, Cleveland, Ohio, USA 44106.)

The Cleveland Museum of Natural History has prepared an exhibition of confiscated specimens of endangered wildlife and their products that have been seized by US Fish and Wildlife Agents after entering the United States illegally. "Confiscated!" covers rhinos, large cats and many other animals but a large section is devoted to sea turtles. The exhibit has been on view at Cleveland till Oct. 5, 1980. It will then travel as follows: Cincinnati Museum of Natural History (opens Feb. 14, 1981), Dallas Museum of Natural History (Aug. - Nov. 1981), Denver Museum of Natural History (Feb. - May, 1982), American Museum of Natural History, N.Y. (Aug. - Nov. 1982), Philadelphia Academy of Science (Feb. - May, 1983), Grand Rapids Public Museum (Aug. - Nov. 1983), Milwaukee Public Museum (Feb. - May 1984).

The written material associated with this exhibition is exaggerated (e.g. "If present trends continue, the green turtle will become extinct by 1983.") but the displays are eyecatching and skillfully prepared. Making people aware of import laws is a relatively unexplored area for conservationists and this pioneering exhibition should find widespread use beyond the schedule given above. If only it could be shown at airports rather than museums!

N.M.

LONG DISTANCE HAWKSBILL RECOVERY

A female hawksbill Eretmochelys imbricata which was originally tagged in the Solomon Islands has been recovered from Papua New Guinea. The hawksbill in question, tag number X03, beached without nesting on Kerehikapa Beach in the Arvanon Wildlife Sanctuary where it was tagged by Andrew McKeown on the 5th December, 1976. In late February, 1979, a turtle hunter, Mr. Korau Kara of Fisherman's Island, Central Province Papua New Guinea killed this turtle. It was subsequently eaten and the tag kept in the village. The tag was recovered in early March 1979 by S. Spring while on a routine patrol to Fisherman's Island. Unfortunately no accurate measurements were recorded by the village people, only estimates could be obtained. The straight line distance between the two points of capture is 1400 kms which is the second longest hawksbill return known to the authors. If this turtle followed a straight line, she transversed one major oceanic current and then swam 400 kms against another. Her minimum average speed was 1.7 kms/day. This return is unusual in its length, but several other recoveries indicate that it is not unusual for turtles to 'wander' away from the Arnavon Islands after nesting. All other returns have been from the island of Choiseul which

lies in the general direction of local surface currents, and the returns have all been less than 70 kms in length.

PETER VAUGHAN
Marine Turtle Project, Fisheries Division, Honiara, Solomon Islands.

SYLVIA SPRING
Marine Turtle Project, Wildlife Division, P.O. Box 2582, Konedobu, Papua New Guinea.

PRELIMINARY STUDIES ON SKELETAL MORPHOLOGY OF THE LEATHERBACK TURTLE

The leatherback turtle (Dermochelys coriacea) is known to have an extensively cartilaginous skeleton, but no study of the internal architecture of its appendicular bones has ever been undertaken. We have examined longtitudinal sections of freshly preserved limb bones from several adult marine turtles, including 4 leatherbacks, 2 loggerheads and 2 Kemp's ridleys. Additional dried bones of 2 leatherbacks, 1 hawksbill and 3 greens were also examined.

The hard-shelled marine turtles have a pattern of chondro-osseous morphology highly reminiscent of terrestrial or aquatic turtles (Haines, 1938; Suzuki, 1963). A thick, distinct compacta is clearly delineated from a medullary cancellous region. The epiphyses are covered by a very thin avascular cartilage which serves the purpose both of articular cartilage and physis, or growth cartilage. The subchondral plate of the epiphyseal bone surface is smooth. The only difference in marine turtles is the failure of development of a medullary cavity.

Dermochelys exhibits several important differences in skeletal morphology (Fig. 1). Each epiphyseal end of the long bones develops large, thick cartilaginous epiphyses. The articular and physeal portions of the cartilage are well separated and oriented in different planes from each other. Each of the chondroepiphyses is filled with an extensive cartilage canal vascular system. The vessels are both perichondral and transphyseal in origin and allow continuity of circulation between metaphysis and epiphysis. Both large and small vessels cross the physis, the smaller ones probably participating in endochondral chondro-osseous replacement, the large ones probably involved with cartilaginous expansion and nutrition of the epiphysis itself. No secondary calcification or ossification centers develop in any of the chondro-epiphyses. The subchondral plate is extensively fenestrated by the vascular channels. The diaphysis and metaphysis are filled with relatively dense cancellous trabecular bone without secondary medullary cavity formation. The metaphysis appears to be almost totally derived from endochondral bone formation and the diaphysis from a combination of endochondral and periosteal membranous growth. This is dramatically evident because of a combination of dark pigmentation in the

periosteally derived bone and lack of internal ontogenetic remodeling. Cones of light endochondral and dark periosteal bone are therefore formed, radiating in a well-delineated fashion from the central nutrient artery.

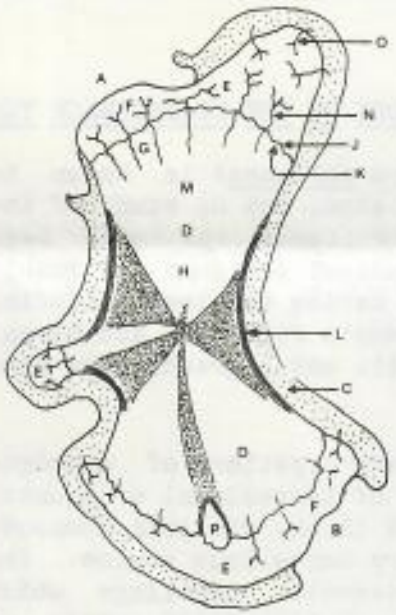

Figure 1:

Longtitudinal section of humerus of a medium-sized adult leatherback. A = shoulder joint with capsule; B = elbow joint with capsule; C = soft tissues attached to bone, composed of periosteum along bone surface and perichondrium along cartilage surface; D = bone; E = cartilage; F = epiphysis; G = metaphysis; H = diaphysis; J = physis (growth cartilage) = site of endochondral bone formation; K = subchondral plate (bone directly under physis); L = compacta = site of membranous (periosteal) bone formation; M = medullary cancellous region; N = transphyseal vessels; O = perichondral vessels; P = ectepicondylar foramen.

No other extant reptile known exhibits this combination of chondro-osseous developmental features. Whereas some extant reptiles (e.g. varanid lizards, Agama and Chamaeleo) vascularize their chondroepiphyses, this vascularization is always perichondrally or circumphyseally derived, never transphyseally across the growth cartilage. In addition, the vascularization is invariably followed by secondary calcification and ossification of the epiphysis. All other turtles plus all crocodilians, including species of large body size, fail to vascularize their chondroepiphyses, which also remain thin and cartilaginous throughout adulthood.

Certain marine mammals, notably whales and manatees, show remarkably similar chondro-osseous morphology (Felts and Spurrell, 1966; Fawcett, 1942) with the only real differences being the development of secondary ossification centers and a reversal of the pigmentation pattern in the endochondral and periosteal cones. In view of the well-developed homoiothermic, if not endothermic, qualities of the leatherback (Frair et al., 1972; Greer et al., 1973) and the striking similarity of its chondro-osseous morphology to marine mammals, Dermochelys can become a valuable model in studies relating to the phylogeny of endothermy or of the evolution of mammals from reptiles.

Further work will be needed to delineate the ontogenetic skeletal development of Dermochelys, comparing it to hard-shelled marine turtles, as well as to marine mammals. We have been able to examine both adults and hatchlings. However, we have been unable to secure any post-hatchling juveniles for study. We would greatly appreciate hearing from any one who has access to fresh or preserved juvenile leatherbacks (carapace length 10 to 100 cm) and who would be willing to allow us to examine one set of flippers (front plus rear) from each specimen. Please contact us if you have suitable material available.

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RAISING SEA TURTLES ON RÉUNION

(Translated from La Pêche Maritime, 20 May 1980, pp. 266-267)

France is one of the few countries in the world to practice the raising of sea turtles (specifically green turtles) on an industrial scale. For more than one year now a turtle farm has been operating at Saint-Leu, on the west coast of the island of Réunion; the farm is the result of a joint initiative by the government and the private sector. This joint initiative has in fact been at work for several years. It was observed some time ago that the richest turtle nesting islands in the world -- namely Tromelin and Europa -- were politically included in Réunion dependency. These two nesting sites owe their present existence to their rugged and inhospitable coastlines, which effectively prevented local fishermen from going there and despoiling the nesting areas as they have everywhere else. The existence of these abundant nesting areas today also stems from the foresight on the French administration which placed these islands in the status of nature reserves, with a prohibition on hunting and fishing.

The presence of such a rich unexploited resource, which is estimated to result in the annual production of 1,500,000 hatchling turtles, led the administration to investigate the possibility of exploitation. It then turned to a private group with the financial and technical means of carrying such a proposal to fruition. After protracted studies, and even more lengthy negotiations, the Grands Moulins de Paris group, represented by its overseas affiliate (S.O.M.D.I.A.A.) agreed to take responsibility for the project. It should be pointed out that the latter is under the permanent and rigorous control of the government and more specifically of technical and scientific government agencies, notably I.S.T.P.M. The organization known by the acronym CORAIL (the Réunion Agriculture and Coastal Industries Company) was created in June 1977, with the participation of S.O.M.D.I.A.A. Its capital is 3,350,000 francs, of which 1,500,000 francs were provided by S.O.M.D.I.A.A., the remainder by local investors.

Total technical responsibility for the project falls upon SOMDIAA, while all studies of animal nutrition that are of interest to the parent company (Grands Moulins de Paris) are conducted by a subcontractor, GIERNAA. In the specific area of turtle culture, GIERNAA has perfected a special food that meets all the requirements for the successful raising of sea turtles. The farm at Saint-Leu is directed by Monsieur Guy Lebrun, a 32-year old agronomy engineer and specialist in marine biology. The farm consists of about thirty tanks each with a capacity of about 100 cubic meters (surface 17 m x 4 m., depth 1.4 m), each of which can hold 1500 turtles, representing a total weight of 55 tons. Every month the net weight increase for the entire group is about 6 or 7 tons. Using a particularly interesting type of food, the

turtle can show a gross increase of 1 kg in weight for less than 2 kg of food taken in. In three years, the weight increases from 25 g to 40-50 kg. This level will be reached by the turtles at Saint-Leu in eighteen more months, at which time total investment will have reached the sum of 8 million francs. Harvest will then commence on the first group of turtles, numbering 2500, that arrived at the farm as 25 g hatchlings in the middle of 1978. The green turtle has high commercial value and also has a high potential for add-on-value. The following products are listed in decreasing order of value: shell, leather, calipee, meat, and finally oil.

(Translated from Le Monde, Paris, 16 March 1980; p 14.)

At Saint Leu, on the island of Réunion, a successful turtle farm has laid to rest the notion that this type of operation is not feasible. Another farm has existed for some ten years on the island of Grand Cayman in the Caribbean. At Saint-Leu, the farm consists of 30 tanks, each of about 100 cubic meters (17 m x 4 m; depth 1.5 meters), each containing 1500 turtles piled up one on the other, a situation to which they accommodate very well. The farm raises green turtles (Chelonia mydas), which according to the promotor of the project are the most profitable species to raise. Five kinds of product are yielded by this species: a low-fat meat, high in protein, used for steaks; calipee, derived from plastral cartilage, that is used in the manufacture of turtle soup; an oil found under the carapace, used in perfumery; the skin of the flippers and the neck, which produces a good imitation of the skin of the crocodile; and the shell, used in jewelery and inlay-work. The animal has a very favorable food conversion ratio; one kilo of meat is produced from less than two kilos of food taken in. In three years, the turtle grows from 25 grams to 30 to 50 kilograms. The owner of the farm forsees reducing the maturation time to only 18 months. The food is of primarily vegetable origin, and is imported from mainland France. Composition of the food remains secret. The farm is built at the edge of the sea, and the water flowing in to the tanks is first warmed by the sun in lagoons. The black walls of the tank allow further solar heating of the water.

The operation, started in 1977, became completely operational in 1979, with slightly under 15,000 turtles with a combined weight of 55 tons. The farm has the potential already of producing 80 live tons annually, and in due course 100 live tons annually should be possible. The manufacture of the products derived from the turtles will take place in Réunion itself utilizing facilities either already operational or in the course of construction. Means of breeding the turtles in captivity have not been developed, and the baby turtles for the farm are derived from nearby natural breeding areas - the islands of Europa and Tromelin.

COMMENT ON RÉUNION TURTLE PROJECT

A number of turtle specialists realized that the French had proposals afoot for raising hatchling green turtles from Europa when France proposed the downlisting of the Europa population to Appendix II at the 1979 CITES meeting in Costa Rica. The matter was also raised in 1978 by J. Fretey in the Marine Turtle Newsletter (No. 8, p.3). However, I for one had not realized how far the proposal had gone.

Several points can be raised:

i) Purists will point out, quite correctly, that the operation described is a ranch, not a farm.

ii) The exuberance of the opening sentence of the quote from Le Monde is surely a little premature; the turtles have apparently survived for a year and a half and are growing well, but the overall economic feasibility remains to be demonstrated; and it is hard to see how the farm can project the weight of the turtles after three years when the oldest turtles there are only eighteen months of age.

iii) Whatever the rights and wrongs of commercial turtle farming, it is certainly a pity that nothing seems to have been learned from the Grand Cayman experience. At a time when costs of fuel and imported feed are forcing the Cayman Turtle Farm to look for less energy-intensive means of raising turtles (such as the Surinam experiments), the Réunion "farm" is repeating the technique of high-density tanks and food imported from the far side of the world.

iv) The downlisting of the Europa green turtle population will undoubtedly be sought again. Modest extractions of eggs from this population will probably have no detectable effect; but it should not be taken for granted that this population is safe since green turtles are caught avidly on both sides of the Mozambique Channel.

PETER C.H. PRITCHARD
Florida Audubon Society, P. O. Drawer 7, Maitland, Florida, USA.

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SECRET RETURN: FILM

(Secret Return, circa 13 minutes, written by D.L. Stoneburger, L. Edwards and J.I. Richarson, filmed by D.L. Stoneburger and R. Molleur. Orders to the Institute of Ecology, University of Georgia, Athens, Georgia, USA. Cost $75.00 USA.)

This film shows loggerhead turtles nesting on the Georgia Coast. It is a remarkable document in that it is filmed almost entirely through a nightscope so that the behaviour shown is unaffected by lights. It also demonstrates the potential of this technique for studying turtles. For instance, it is possible to see very clearly how the female, after stranding, pushes her nose and throat through the sand. There is also an arresting sequence of a racoon taking eggs from a nest while the turtle is still laying. With the nightscope technique the film is somewhat grainy and is in monochrome and the quality is inevitably not as good as many of the commercial animal films available today. The commentary and music are pitched at a rather simple level. Turtle experts should be able to ignore these minor deficiencies; this is a film they will want to see.

N.M.

TAG RECOVERY OF LEPIDOCHELYS OLIVACEA IN EAST PACIFIC

The U.S. National Museum has a specimen of Lepidochelys olivacea caught in 1966 off Ecuador. Associated with the specimen is monel cattle ear tag, looking fairly new, and with only "647" as an inscription. Who tagged this animal? Full details of the specimen, date and place of capture, will be provided on request.

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FREE TURTLE BOOKS FOR SHRIMPERS

About 500 copies of Rudloe's "Time of the Turtle" (see Marine Turtle Newsletter No 13, 1979, p 17-18) are being distributed free to shrimpers and owners of seafood restaurants in Florida. The project, called Turtle Awareness for Shrimpers, is supported by the Chelonia Institute (P.O. Box 9174, Arlington, Virginia, USA). If this type of approach is effective, the Chelonia Institute may expand the project and include other books such as Carr's "The Windward Road".

MARINE TURTLE NEWSLETTER

For those recently added to the mailing list a few points may help answer some questions arising. This newsletter does not appear regularly but only as often as possible within a context of financial and other constraints. So far there have usually been 3 to 5 issues a year. So far it has been possible to avoid charging. We do not, however, provide back issues; if you need these please obtain photocopies from whomever told you about the newsletter in the first place. Nor do we send copies of recent papers listed; those needing reprints should write direct to the authors whose addresses are given. We are sorry we cannot provide these services. Limited resources are being devoted to the production of further issues.

N.M.

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