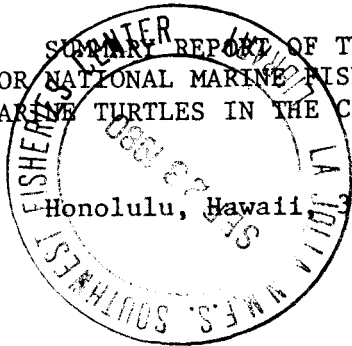
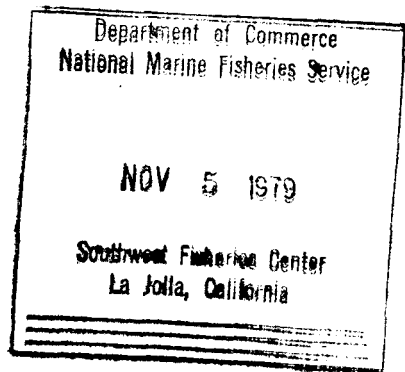


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SUMMARY REPORT OF THE PLANNING WORKSHOP
FOR NATIONAL MARINE FISHERIES SERVICE RESEARCH
ON MARINE TURTLES IN THE CENTRAL AND WESTERN PACIFIC



Honolulu, Hawaii 31 July-2 August 1979



Richard S. Shomura (Chairman)
Southwest Fisheries Center Honolulu Laboratory
National Marine Fisheries Service
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Honolulu, Hawaii 96812

October 1979

prohibit import of all marine turtles and marine turtle products. After 6 September 1979, further sales of turtle meat and products in interstate commerce will be strictly prohibited. However, because of the very large area--about 1.5 million square miles--enforcement in the Pacific is a problem of major proportion.

Current practices of the U.S. Customs Service were also discussed. In all areas under U.S. and quasi-U.S. jurisdiction, the laws state that there will be no taking of turtles, except in the Trust Territory where subsistence taking is allowed. Customs agents usually confiscate all turtle products that are declared at U.S. ports of entry. In order to retain turtle products, a citizen must be able to prove possession of that article before the laws were enacted.

Legal aspects of turtle harvesting in Micronesia are extremely confusing at the present time. In large part this confusion results from the transitional political status of various entities in the Trust Territory of the Pacific Islands. There are, however, provisions in Title 45, Section 2 of the Trust Territory Code, that prohibit the take of hawksbills less than 68.6 cm (27 in.) long, green turtles less than 86.4 cm (34 in.) long, and any turtles nesting during the periods 1 June-31 August and 1 December-31 January.

In American Samoa, there is no active enforcement of the Endangered Species Act. The primary reasons appear to be a lack of manpower to enforce the Act and lack of awareness of the threatened and endangered status of the marine turtles found in the area. There are no traditional native laws currently in effect which cover turtle conservation. It was noted, on the other hand, that in Western Samoa strong traditional tribal laws governing the conservation of endangered marine resources exist and are enforced.

In summarizing the enforcement difficulties, it was noted that these included the presence of many islands spread over a wide geographical expanse of the Pacific, lack of enforcement personnel, lack of public awareness of the provisions of the Endangered Species Act, and less than vigorous enforcement of existing regulations by the courts. To enhance public awareness, one suggestion was made to develop a brochure which would describe the turtles and the existing regulations. The brochure would be similar to that developed by WPPO to cover the humpback whales in Hawaiian waters. The workshop participants also compiled a list of recommendations relating to regulations, enforcement, and protection of marine turtles in the Pacific islands of U.S. interest (Appendix 3).

Biology of Pacific Turtle Stocks

The discussion on marine turtle resources of the Hawaiian Archipelago included a presentation of a slide show based on a draft report (Balazs, G. H. Synopsis of biological data on marine turtles in the Hawaiian Islands. Being prepared under a NMFS contract No. 79-ABA-02422). The report was not available for distribution at the workshop but will be distributed to workshop participants at a later date. The report covers life history aspects of the green turtle, Chelonia mydas, hawksbill turtle, Eretmochelys imbricata, and leatherback turtle, Dermochelys coriacea, and touches on two uncommon visitors to the Hawaiian Islands, the loggerhead turtle, Caretta caretta, and olive

The "Planning Workshop for National Marine Fisheries Service Research on Marine Turtles in the Central and Western Pacific," sponsored by the National Marine Fisheries Service (NMFS), was held at the Honolulu Laboratory, Southwest Fisheries Center, on 31 July-2 August 1979 (Appendix 1, Workshop Agenda). Twenty persons attended from the continental United States, Hawaii, American Samoa, Guam, Palau, Federated States of Micronesia, and New Caledonia (Appendix 2). Honolulu Laboratory Director Richard S. Shomura was chairman of the workshop.

The purposes of the workshop were to review the status of knowledge on the turtle resources in the Hawaiian Archipelago and in areas of U.S. jurisdiction and interest in the central and western Pacific and to aid the development of a planning document which will identify long-term research needs, prescribe a time frame required to undertake this research, and establish priorities and estimate costs.

For purposes of clarity the proceedings of the workshop have been organized into four sections: (1) current turtle regulations and enforcement, (2) biology of Pacific turtle stocks, (3) stock assessment, and (4) recommendations for research.

Current Turtle Regulations and Enforcement

Current turtle regulations which appear in the Federal Register (vol. 43, No. 146, p. 32800-32811) were reviewed by representatives from the Western Pacific Program Office (WPPPO) of the Southwest Region, NMFS. The Endangered Species Act of 1973, as amended, prohibits import, export, take, interstate commerce, possession, and selling of hawksbill, leatherback, and Atlantic ridley turtles. Exceptions to the Act include the taking of turtles, by permit, for scientific purposes and to enhance propagation or survival, the taking of turtles as a result of economic hardship, and possession of turtles under grandfather clause. The penalties for violating these regulations are fines up to \$10,000 in a civil case and up to \$20,000 in a criminal case. Citizen suits may also enjoin persons who are allegedly violating provisions of the Act.

Changes in the Endangered Species Act of 1973 added three species to the endangered or threatened lists:

1. Green turtle
 - a. Florida and Mexico Pacific Coast - Endangered
 - b. All other populations - Threatened
2. Loggerhead turtle - Threatened
3. Pacific ridley turtle
 - a. Mexico Pacific Coast - Endangered
 - b. All others - Threatened

However, the Act allows the taking of these turtles by permits for scientific uses, to enhance propagation or survival, and for zoological and educational purposes. Taking of green turtles is permitted as incidental catches by fisheries and as subsistence catches in the Trust Territory of the Pacific Islands. Concerning mariculture products, regulations now in effect also

ridley turtle, Lepidochelys olivacea. The report lists 669 references. Data from unpublished original research conducted by the author (George H. Balazs) are also included. Green turtles are the most abundant of the marine turtles found in Hawaiian waters. Based on available data, it appears that the Hawaiian Chelonia population probably represents an isolated breeding stock.

Briefly, the Hawaiian Chelonia population has not been given nomenclatural recognition. Characters that tend to distinguish them from other Chelonia populations include differences in coloration, steep-sided appearance of the carapace, indentations, or constrictions of the marginals over the hind flippers, and a unique land-basking behavior. Movement of the Hawaiian Chelonia has been studied through tagging. Of the various tags used, only one, Inconel 625 alloy tag, size 681, has been found to be corrosion-resistant in Hawaiian waters. Other identification techniques, such as production of antibodies, epoxy paint, tattoo, carapace notch, vinyl strip attached to the carapace, and plastic tags, have not proved to be satisfactory.

Green turtles occur only at select locations throughout the Hawaiian Archipelago. French Frigate Shoals in the Northwestern Hawaiian Islands has the largest breeding colony. Small groups and separately nesting individuals occur at Laysan, Lisianski, Pearl and Hermes Reef, Midway, and Kure. A resident non-breeding aggregation also occurs at Necker. The principal food source for Hawaiian Chelonia is marine benthic algae in shallow waters.

Hatchlings emerge from their nests in mid-July and early August. From French Frigate Shoals, an estimated 25,000 to 50,000 hatchlings are produced each year. Following a rapid departure from the adjacent waters, the hatchlings are "lost" to human contact and are not seen until they grow into juveniles larger than 35 cm (14 in.) in carapace length,

Based on limited tagging data, there appear to be significant individual differences in rate of growth and hence in age at maturity. Estimates for a 35-cm juvenile to reach a mean size of an adult female range from 11 to 59 yr. Several participants found this wide range difficult to accept and urged research be undertaken on this problem. Observations at French Frigate Shoals indicate that seabirds do not prey on hatchlings. On the other hand, tiger shark, Galeocerdo cuvieri, appears to be a more serious predator on marine turtles. Many carapace parts and bones have been found in stomachs of tiger sharks. Furthermore, it was noted that adult turtles frequently have flippers missing which is presumed to result from shark attacks.

Only a few hawksbill have been observed in Hawaiian waters. This species appears to concentrate along the Ka'u and Puna coasts of the island of Hawaii. Six nestings in 4 yr have been observed along these coasts. Hatchlings have been seen in waters around Oahu.

Sightings of leatherback turtles have been reported in sufficient numbers to indicate that this species is not an occasional visitor to Hawaiian waters. Loggerhead and olive ridley turtles, however, appear only rarely and their occurrence probably results from weakened individuals being swept into Hawaiian waters by the prevailing currents.

Discussion on turtles in other areas brought out that the hawksbill turtle nests all over the tropical Pacific, whereas the Kemp's ridley turtle has been observed to nest only on beaches in Mexico. It was also emphasized that in the central and western Pacific the green turtle populations appear to be small and scattered.

One of the most glaring gaps in our knowledge of the life history of green turtles is that of age at maturity and sexual or reproductive longevity. Even the data collected on Hawaiian Chelonia seem to indicate a considerable variability in the age at maturity.

It was noted that before the depletion of the stocks in Florida waters, juvenile green turtles about the size of "saucers" and "dinner plates" were quite common. Chelonia of similar sizes have only rarely been observed in Hawaii. Speculation about feeding behavior of juveniles brought out that they may be feeding in pelagic waters where "shears" occur, that is, in areas where sharp temperature discontinuities occur. These discontinuities often result in accumulation of living and non-living material along the shear line.

The situation in other Pacific island areas are briefly summarized below.

Kosrae has no record of nesting sea turtles. At Ponape, nesting of green turtles has been observed at Oroluk, Pakin and Ant Atolls, and on some of the reef islands. Truk does not appear to have sea turtle populations of critical importance. Isolated nesting of green turtles occurs at East Fayu and on the flat coral islands. In Palau, green turtles are moderately abundant and hawksbills are abundant.

The results of an aerial turtle survey around Guam in 1975-79 indicated that positive species identification of turtles from a moving aircraft is difficult; however, it is generally believed that green turtles were most prevalent in Guamanian waters. Western Samoa has a program for raising sea turtles wherein hatchlings are kept in ponds, marked, and released after 4-6 mo.

Rose Atoll, under the jurisdiction of American Samoa, has been set aside as a wildlife refuge and landing on the atoll is strictly prohibited, except by permission. This is the only known breeding area for the green turtle in American Samoa; however, virtually nothing is known about the colony. Hawksbills are also believed to nest at this location.

Around the other small, outlying atolls and islands under U.S. jurisdiction, green turtles occur in waters around Johnston Island, which is about 720 nmi southwest of Honolulu. There are also reported sightings of green turtles from Palmyra Island but no evidence of any nesting. There are, however, some sand beaches that may be used for nesting. Kingman Reef contains one small islet but it is not known if nesting takes place there. Howland, Baker, and Jarvis Islands are part of a National Wildlife Refuge; there is no information on occurrence of nesting at these islands. Green turtles have been observed at Wake Island but nesting has never been documented. For those islands outside U.S. control such as Christmas and Malden Islands, information is insufficient; however, green and hawksbill turtles have been reported to nest occasionally at Christmas.

The discussion then turned to the stock of turtles at the Galápagos Islands. About 99% of the turtles occurring there are green turtles and the remaining 1%, hawksbill turtles. The green turtle is widespread, nests on most of the beaches, and shows rather strong, seasonal nesting which begins in January and is completed by March. Several thousand turtles have been tagged to study their movement. Information on feeding pastures, however, are insufficient at the present time.

The Galapagos green turtles are morphologically rather small and are heavily pigmented. The pigments run to either black or yellow; the yellow variety is probably a genetic offshoot. Yellow pigmented turtles never mature sexually and are invariably obese. The Galapagos green turtles lay about 70-80 eggs per clutch.

The workshop participants then touched on turtles of Papua New Guinea. Both green and hawksbill turtles occur around Papua New Guinea and the stocks apparently are in good condition because of the rigidly enforced conservation policies. Green turtles nest along black sand beaches in Papua New Guinea.

The leatherback turtle is the third most important species in Papua New Guinea waters. This species has been observed to nest on black sand beaches. The Pacific olive ridley also occurs in Papua New Guinea and has been observed to be relatively abundant on the island of New Britain; however, there are no extensive nesting grounds for this species in this particular part of the world. The loggerhead turtle, a temperate water species, is an occasional visitor to Papua New Guinea. Of interest is the recovery of a tagged Australian loggerhead turtle which was recovered in Papua New Guinea. The flatback, Chelonia depressa, and the black-pigmented variety of green turtle are also found in Papua New Guinea waters.

Among South Pacific Commission (SPC) island states, the green turtle occurs around the Cook Islands and New Hebrides; New Caledonia possibly has a large population. Among species present in this very vast area of the South Pacific are the hawksbill, loggerhead, and green turtles; however, there is insufficient documentation of the occurrence of the leatherback turtle. The South Pacific Islands Fishery Development Agency (SPIFDA) has done some work on turtles but the project was terminated in 1973. Recent research among SPC countries involves turtle mariculture, especially in the Cook and Fiji Islands.

Five useful references on marine turtles in the Pacific are listed in Appendix 4.

Stock Assessment

Much of what was discussed previously was summarized to get a better perspective on how to plan for research on stock structure of marine turtles. Turtles evidently are long-lived, somewhat similar to cetaceans. There is definitely a need to initiate a population count in order to do any kind of stock assessment work, an urgent need to be able to age turtles accurately, to find out where turtles reproduce, and to examine the mechanisms that regulate populations. Tagging programs are definitely needed. The relative abundance and socio-economic importance of some of the major species of marine turtles in the central and western Pacific were summarized (Table 1).

Table 1.--Relative abundance and socio-economic importance of marine turtles in various U.S. territories and possessions and associated island groups in the central and western Pacific Ocean.

Area	Relative abundance ¹					Socio-economic importance ²
	Green turtle	Hawksbill turtle	Leatherback turtle	Olive ridley	Other species	
Hawaii	A	L	L	--	Loggerhead is stray	1.00
American Samoa	M	A	?	?	?	2.00
Guam	A	L	?	?	?	2.00
Northern Mariana Islands	--	--	--	--	--	--
Palau	M	A	?	?	?	2.50
Federated States of Micronesia	A	L	L	stray	--	3.00
Marshalls	A	M (prob.)	--	--	--	2.75

¹A = Abundant
M = Moderate
L = Low
(?) = Not seen
-- = No data

²3.00 = High
2.00 = Medium
1.00 = Low

Recommendations for Research

The following actions were highly recommended by the workshop participants:

1. Continuation of the in-depth study currently being conducted on the Hawaiian Chelonia and other marine turtles in the Hawaiian Archipelago as the results obtained from this research will most likely have wide application to other stocks of marine turtles throughout the central and western Pacific.
2. A "first-look" survey of the 20 green turtle nesting areas (Table 2) to determine the number of females using these nesting sites. The "first-look" survey should include an on-site survey and/or aerial reconnaissance over the nesting grounds. Islands best approached by land are Yap and Ponape (outer islands), whereas those more practically surveyed by air include islands in the Marshalls.
3. Time, personnel, and fund permitting, intensive studies to (a) evaluate hatching rate, localities of feeding pastures for adults, juveniles, and hatchlings, (b) determine reproductive potential of a given population, (c) collect and analyze life history statistics, and (d) conduct experiments to acquire knowledge on the behavior and physiology of marine turtles.
4. High priority be given to a tagging program to study turtle movement and problems of tag shedding and corrosion also be addressed. Tagging should be conducted not only among adult turtles but also hatchlings to determine their movements.
5. The determination of the "critical habitat" of the various species of marine turtles.
6. Aging of turtles should be given high priority. Without data on the age structure of a population, estimates of stock size cannot be derived with much confidence.
7. On-site surveys for one night to find out which species are nesting and to determine where they go. Surveys that run for 1 mo should provide more data on internesting period, whereas a 3-mo survey should reveal how many times turtles are coming back to nest.
8. Tracking of nesting females be given high priority. Research in this area will provide answers to short- and long-term movements of turtles. Information thus gained will aid in management of the stocks; e.g., knowledge of behavior and movement of green turtles during multiple nesting periods is needed for identification of "critical" habitat.
9. An agency be established to serve as a coordinating body and to be a depository for biological data and observations.

Table 2.--Nesting and feeding areas for green and hawksbill turtles
in the central and western Pacific Ocean.

Area	Nesting area		Feeding area	
	Green turtle	Hawksbill turtle	Green turtle	Hawksbill turtle
Hawaii	X	--	X	--
Palau				
Helen's Reef	X	--	--	--
Merir	X	--	--	--
Pulo Anna	X	--	--	--
Seventy Islands	--	X	--	--
West Barrier Reef	--	--	--	X
Ngeruangel	X	X	--	--
Yap				
Ulithi	X	--	--	--
Gaferut	X	--	--	--
Olimarao	X	--	--	--
West Fayu	X	--	--	--
Pikelot	X	--	--	--
Ngulu	X	--	--	--
Truk	--	X	--	--
Ponape				
Oroluk	X	--	--	--
American Samoa				
Swains	X	--	--	--
Rose Atoll	X	X	--	--
Marshalls				
Ujelang	X	--	--	--
Jemo	X	--	--	--
Bikar	X	--	--	--
Bikini	X	--	--	--

Appendix 1



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
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31 July 1979

Planning Workshop for NMFS Research on Marine Sea Turtles
in the Central and Western Pacific

31 July-2 August 1979
Honolulu Laboratory Room 120

Agenda

1. Opening Remarks. (R. Shomura)
2. Review of Current Turtle Regulations in U.S.A. (R. Iversen)
3. Marine Turtle Resources of Hawaiian Archipelago. (G. Balazs, others)
4. Marine Turtle Resources of Other Pacific Island Areas. (M. McCoy, P. Pritchard, H. Hirth, G. Balazs, Fisheries Officers)
5. General Review and Comments of Green Sea Turtles. (A. Carr)
6. Discussion of Research Planning Document. (R. Shomura)
7. Discussions of Specific Topics--
 - a) Long-Term Objectives;
 - b) Stock Assessment;
 - c) Life History;
 - d) Socio-Economic.
8. Summary.
9. Closing Remarks. (R. Shomura)

Appendix 2



U.S. DEPARTMENT OF COMMERCE
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List of Participants

George H. Balazs	Hawaii Institute of Marine Biology
Serge Birk	Marine Resources Division, Palau
Archie Carr	University of Florida
Rene Grandperrin	South Pacific Commission, Noumea
Harold F. Hirth	University of Utah
Robert T. B. Iversen	Western Pacific Program Office, Southwest Region, National Marine Fisheries Service, Honolulu
Harry Kami	Government of Guam
Ernest Kosaka	U.S. Fish and Wildlife Service, Honolulu
Mike A. McCoy	Micronesian Maritime Authority, Ponape
John J. Naughton	Western Pacific Program Office, Southwest Region, National Marine Fisheries Service, Honolulu
Eric Onizuka	Hawaii State Division of Fish and Game
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Jeffrey Polovina	Honolulu Laboratory, Southwest Fisheries Center, National Marine Fisheries Service
Peter C. H. Pritchard	Florida Audubon Society/Southeast Region Sea Turtle Recovery Team
Richard S. Shomura	Honolulu Laboratory, Southwest Fisheries Center, National Marine Fisheries Service
Tim Smith	La Jolla Laboratory, Southwest Fisheries Center, National Marine Fisheries Service
Joseph Sylvester	Southeast Region, National Marine Fisheries Service, St. Petersburg, Florida
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Richard Wass	Office of Marine Resources, American Samoa
Howard O. Yoshida	Honolulu Laboratory, Southwest Fisheries Center, National Marine Fisheries Service

Appendix 3

Recommendations on regulations, enforcement, and protection for marine turtles
in the Pacific islands of U.S. interest.

Area	Recommendations	Remarks
Palau	<ol style="list-style-type: none"> 1. Scientifically supervised pilot headstarting program for hawksbills. 2. Protection of green turtle at Helen Reef and Merir. Tagging of same. 3. Stop sales of hawksbills to tourists. 	Personnel changes (McVey, Owens).
Yap	<ol style="list-style-type: none"> 1. Reinforce traditional restraints. 2. Grant "cultural variances" for subsistence use. 3. Avoid use of Yap outer island turtles by others (including Trukese). 	<p>Traditional restraints still strong. Provided for in 1978 regulations. Pikelot turtles still exploited by Trukese. Intense Pikelot tagging might temper situation; or might start civil war.</p>
Guam and Northern Marianas	<ol style="list-style-type: none"> 1. Endangered Species Act be enforced. 	
Truk	<ol style="list-style-type: none"> 1. Cessation of capture and sale of hawksbills. 2. Institute field studies and tagging. 	<p>Capture continuing; level uncertain. Not yet begun. No plans.</p>
Ponape	<ol style="list-style-type: none"> 1. Enforce U.S. law protecting hawksbills. 2. Declare Oroluk turtle sanctuary. 	<p>Law being enforced, but not in outer islands or outer villages. No action. Resident human population becoming permanent.</p>
Marshalls	<ol style="list-style-type: none"> 1. Strict enforcement of U.S. and Trust Territory of the Pacific Islands' law. 2. Conduct tagging or beach patrols to provide population estimates. 	Main turtle islands controlled by one man or family.

Appendix 4

Background and Working Papers

Balazs, G. H.

1979. Synopsis of biological data on green turtle in the Hawaiian Islands. Final report, prepared for Southwest Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96812, 180 p., September 1979.

Hirth, H. F.

1971. Synopsis of biological data on the green turtle Chelonia mydas (Linnaeus) 1758. FAO Fish. Synop. 85:1:1-8:19.

Molina, M. E.

1979. Summary of marine turtle sightings made on aerial fishery surveys during fiscal years '75 through '79. Division of Aquatic and Wildlife Resources, Department of Agriculture, Government of Guam, Agana, Guam, 5 p. (mimeogr.).

Pritchard, P. C. H.

1977. Marine turtles of Micronesia. Chelonia Press, San Francisco, 83 p.

[U.S.] Federal Register.

1978. Listing and protecting loggerhead sea turtles as "Threatened Species" and populations of green and olive ridley sea turtles as threatened species of "Endangered Species." Federal Register, 43(146):32800-32811.