

**ASSESSMENT AND RECOMMENDATIONS
FOR THE CONSERVATION OF
HAWKSBILL TURTLES IN THE ROCK ISLANDS OF PALAU**

BY

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DRAFT REPORT

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George

17 May 1991

Thanks for your earlier
comments, which have been
incorporated into this version.

Please review or let me know
if you have further thoughts
or comments on this

Thanks

SUMMARY

Two rare sea turtles, the endangered Hawksbill turtle (*Eretmochelys imbricata*) and the threatened Green Sea turtle (*Chelonia mydas*) inhabit Palau. The Palau nesting population of hawksbills is the largest in Oceania north of the equator, and concentrates its nesting activity on the small beaches of the Rock Islands. However, during the past decade, nesting activity has declined to half of its former level because:

- 1) chronic egg poaching destroys over 75% of the nests;
- 2) adult Hawksbills are hunted for their shells which are used for jewelry and crafts;
- 3) tourism and recreational expansion on Rock Islands beaches is encroaching upon or disturbing nest sites; and
- 4) virtually all remaining eggs not taken by poachers are collected for a "head start" turtle hatchery project.

The "head start" hatchery has failed to document any success in increasing the turtle population despite being in operation for at least 18 years. Out of nearly 2,400 juvenile turtles released between 1982-1990, only two tagged hatchery reared turtles have been reported as recaptured. Although the Hawksbill is protected by U.S. and Palauan laws and international convention, the monitoring, conservation and enforcement actions to date in Palau have been severely limited. Given that the egg mortality alone from the above factors has exceeded 95% or more over a continual basis during the past one to two decades, nesting activity is expected to decline precipitously and may eventually lead to the extirpation (local extinction) of nesting Hawksbills from Palau by the end of the next decade or so.

Drastic action is needed to save the Hawksbills, and the following recommendations are made to protect and conserve remaining turtles:

- 1) immediately terminate the head start hatchery program;
- 2) establish a continuous enforcement presence among the nesting areas in the Rock Islands to educate, discourage, and if necessary prosecute egg poachers;
- 3) disguise, move or hide nests to protect them from poachers, fishermen, picnickers and tourists;
- 4) institute a data collection and tagging program at all known nesting beaches including monitoring of egg-laying females, eggs, nests, hatchlings, and returning (previously tagged) turtles;
- 5) regulate construction activity and recreational and visitor use near the nesting sites; and
- 6) incorporate the above actions as part of a bioserve program for the Rock Islands and expand activities to include training, education and interpretation for sea turtle conservation. George Balazs, a NOAA turtle specialist is interested in conducting a training program in Palau on turtle monitoring and tagging.

INTRODUCTION

As part of possible bioreserve development for the Rock Islands of Palau, I visited Palau in April 1991 to review the scientific data base on key species that might be protected as part of an established bioreserve. Degree of threat to rare and otherwise important wildlife species is an important criterion for justifying bioreserve designation, and the hawksbill (*Eretmochelys imbricata*) and green sea (*Chelonia mydas*) turtles are designated as threatened and endangered, respectively, in accordance with the U.S. Endangered Species Act. These turtles are also recognized in other international conventions and are protected by Palauan law (Chapter 12, 24 PNC 1201; T24-44; para 1201). Although the largest Pacific nesting populations for hawksbill turtles are concentrated in the Seychelles of the Indian Ocean and Northern Australia, a small but important population of hawksbills nest within beaches in the Rock Islands. The Palau nesting population for the turtle may be the most important in Oceania north of the equator. Nesting populations of the green sea turtle generally occur outside of the Rock Islands area of Palau, and have been noted to be abundant in the Southwest islands of Palau. In the lagoon area of the Rock Islands, green sea turtles may visit and feed on the reefs and seagrass areas, but they are not known to nest there.

This assessment, thus, focuses on the status of the hawksbill turtle in the Rock Islands region. Aside from providing potential justification for bioreserve designation, this report also satisfies a request by the Republic of Palau's Chief of Marine Resources (MRD) for recommendations to protect and conserve remaining hawksbill populations in the Rock Islands.

METHODS

While in Palau I visited some of the known turtle nesting beaches in the Rock Islands and the sea turtle hatchery at the Micronesian Mariculture Demonstration Center (MMDC). I held interviews with Becky Madraisau, leader of the hatchery project and one of Palau's most knowledgeable marine biologists regarding the distribution and status of sea turtles. I reviewed the files for turtles at the offices of MRD and MMDC. The records of Gerald Heslinga, MMDC Director, were particularly comprehensive from late 1985 to the present, and included monthly progress reports prepared by the turtle hatchery staff. Earlier summary data on turtles and the hatchery were retrieved from an unpublished report by Milliken and Tokunaga (1987), two turtle specialists who visited Palau in 1985. In addition, I talked with Shigeaki Sone, turtle specialist from the Japan Tortoise Shell Association who provided me an unpublished summary report (Sone, 1989). I also interviewed George Balazs, NMFS turtle specialist in Honolulu who also visited Palau in 1989 and who prepared recommendations on the conservation of Palauan sea turtles (see Balazs 1989, 1990; see appendix A for copies of the recommendations and raw data of Balazs).

RESULTS

Previous on-site evaluations by turtle specialists (Milliken and Tokunaga, 1987; Balazs, 1989, 1990) focused somewhat on hatchery operations. Although my report

concentrates on the status of turtles in the Rock Islands, it is important to highlight some of the activities, accomplishments and data gathering as part of the turtle hatchery program over the years.

Turtle hatchery data

Apparently, the hatchery was started on or about 1973 under the guidance of Jim McVey (G. Balazs, personal communication) although the files and records at MMDC and MRD go back to 1981. The hatchery has been in continuous operations since 1981 as a head start program for hawksbills. The initial motivation for the hatchery was to improve survival success among eggs and hatchlings which are subject to high levels of human poaching of eggs and natural predation on hatchlings, respectively. Fresh eggs (less than one day old since being laid) are collected during boat trips to the nesting sites and are brought back to the hatchery where the eggs are incubated until hatching. The hatchlings are then reared in tanks until reaching a carapace length of 18-20 cm. Then the hatchlings are taken to known nesting beaches and released on the beaches next to the water. Within the main islands of Palau, Becky knows of about 40 sites where turtles presently or historically nested (Table 2) and about 30 of these occur in the Rock Islands area between Koror and Peleliu islands. Survivorship of eggs during collection and transport back to the hatchery decreases rapidly if prolonged beyond the first 24 hours (Milliken and Tokunaga, 1987). Hence, it was necessary for hatchery personnel to make frequent boating trips to the Rock Islands nesting beaches to insure an adequate supply of eggs for the hatchery. For reasons described later, the Chief of MRD has recently directed the turtle hatchery staff to stop collecting ^{ing} eggs at the nesting beaches.

Records indicate that between the years of 1982-1990, hatchery personnel made 317 boat trips to collect eggs, finding a total of 125 nests with eggs (Table 1)). Except for a few of the initially encountered nests in 1981-1982, all viable eggs were collected from each of the nests where eggs were found during the boat trips. Average clutch size is approximately 130 eggs, based upon comparing the number of eggs collected (7,654) from the 59 nests reported between 1982-late 1986 (Milliken and Tokunaga, 1987). The actual number of eggs collected during later phases could not be reliably estimated after late 1986, since the data in the progress reports do not lend themselves to such compilations. Nevertheless, I assume the clutch size has remained steady over the years. Based upon an average of 130 eggs per nest times the 125 nests encountered, the total number of eggs collected during 1982-1990 has been approximately 15,250 (say 15,000). Appendix A *includes* indicates additional unpublished data on the hatchery operation compiled by Balazs through September 1990.

Of the eggs collected, incubated, hatched and reared at the hatchery since 1982, 2,356 survived to be released at nesting beaches through 1990. This amounts to a 15.7% survival rate. The juveniles were fitted with tags prior to their release. Since the program was initiated in 1981, only two previously tagged turtles have been recaptured.

Nest site data

Other than the progress reports and statistics on turtles at the hatchery, information

is not available on the status of turtles, hatchlings, or eggs at the nesting beaches. Figure 1 includes the mapped location of the principal nesting sites in the Rock Islands. Table 1 gives a listing and status of all known sea turtle nesting sites in Palau, based on March 1991 interviews with Becky Madraisau.

The only useful information obtained from the records regarding turtle activity at the nest sites over the nine year period were the number of boat trips, the number of total nests reported, and the number of nests with and without eggs. The preparers of the progress reports attribute the differences between the two nest categories (with and without eggs) to poaching of eggs by unauthorized visitors to the nesting beaches. Over the nine year period (see Table 1), the poaching rate averages 76% of the total nests. It is not clear from the reports whether false nests (or deliberate attempts by sea turtles to dig nests but not lay eggs) could be differentiated from nests emptied by poachers, but I assume that the hatchery staff is capable of doing so, and did not include false nests in the statistics.

Data collected during each collection trip did not include the total number of eggs per nest, number of non-viable (non-fertilized, dead) eggs not collected, damaged eggs, and other information such as the size and tags on the egg-laying (female) adult sea turtles. As best as can be determined, eggs collected at particular nest sites were not tracked and necessarily returned to the same sites as juveniles when released. The lack of a meaningful data collection and tagging program at the nesting sites and lack of tracking system for collected eggs makes it virtually impossible to determine whether the hatchery program has been successful in rearing viable reproducing females and whether nesting turtle (and egg) populations at the nest sites are stable, declining, or rising. The fact that only two hatchery-reared and tagged turtles have been recaptured and reported to MMDC is likewise a near lack of evidence that the hatchery program is working.

Interviews

Interviews with Becky Madraisau revealed that he believes turtle nesting activity in the Rock Islands has declined substantially over the last decade. He attributed the decline to 1) the high degree of egg poaching, 2) the killing of adult hawksbills for the shells which are used in the jewelry and handicraft trade, and 3) disturbance of turtles at the nest sites due to harassment from tourists and picnickers, the construction of buildings and shelters (primarily for tourists) and light disturbance (from lanterns and fires) at night when the turtles haul out to attempt to lay eggs. Becky was able to identify a total of 40 nesting areas in the main islands and believes that 28 of these are considered disturbed or directly abandoned by nesting sea turtles (see Table 2 for a complete listing). Of the 28 sites, his team still visits to collect eggs for the turtle hatchery, only 12 are considered undisturbed. However, all sites are subject to poaching. The three most important clusters are several sites in Ngerukewid (#5), Kmekumed (#4), and Omekans (#7) as shown on Figure 1 and noted in Table 2).

Becky recommended implementation of an enforcement program to prevent poaching of eggs at the nest sites and capture of turtles. He also recommended controls to prevent encroachment of visitors and structures within remaining nesting areas. Important nesting areas should be kept off limits to visitors. He also recommended including Kmekumed

islands within the nearby 70-island (Ngerukewid) reserve.

The lack of good data at the nesting sites made meaningful quantitative analysis near impossible. As a measure of trends in nesting activity over time, I pooled and expressed nest site observations as number of nests per visit. This gives a crude "catch-per-unit-effort" type indication of number of nests during each year period between 1982-1990. The data in Table 1 show a general downward trend in the number of nests over time, although there is considerable year to year variation. Nesting activity by 1990 appears to have declined to roughly half of the 1982 levels. This is not surprising given the concerted and chronic depletion of eggs and adult turtles over the nine year period.

The data were also pooled to describe seasonal trends in nesting activity (Table 1). Month-by-month plots of the number of nests per trip (Figure 3), reveal that hawksbill turtle nesting shows two peaks during the year: June-August and December-January.

DISCUSSION

One can only speculate on the status of existing nesting populations of hawksbill turtles due to the paucity of monitoring data. The best case scenario is that 76% of the eggs are lost to turtle/shell harvesting, and the head start program may eventually contribute replacements to nesting females lost to harvesting and old age.

The worst case scenario is that the head start program may not be contributing replacements, and that egg mortality at the nesting beaches attributed to both poaching and collection for the head start program has approached 100% over the past nine years. At present, all eggs in the nests are either poached or collected for the hatchery program. Only a few nests, if any, per year may be missed by the poachers and/or turtle hatchery collectors. No data are presently being collected which demonstrates the success of the head start program. To the contrary, the apparent decline of nesting activity on the beaches, the near lack of recaptures (of tagged, hatchery releases), and potential elimination of all major nesting activity by a combination of poaching, egg collecting, turtle killing, and development disturbance suggest that the entire nesting population is in danger of collapse.

Imprinting

A principal unresolved issue regarding "head start" programs in general is the likelihood of improper imprinting of hatchlings that prevents them from returning to the nest sites as breeding adults. If the eggs are removed from the nest sites within a day of laying, and if imprinting occurs before the juveniles are released back at the nest sites, it is likely that the turtles will have insufficient clues or guidance to allow them to return back to the nest sites should they survive to reach sexual maturity. Many researchers believe that imprinting occurs when the turtles hatch from the eggs and crawl down the beach and enter the water. A combination of visual and chemo-sensory clues, and a precise internal "navigation" system probably enables egg-bearing turtles to return precisely to the beaches from which they were hatched. Thus, if the turtles "imprint" in the hatchery at the time of hatching, it is highly unlikely that most would be able to find their way back to the

"correct" beach or even find a suitable nesting beach. The fact that no meaningful data are being collected at the sites for feedback (in revising the hatchery program) renders the possibility that the program may have been a complete failure in helping to sustain the nesting/breeding potential of hawksbill turtles in Palau.

Field data collection

It should be clear that a program for field data collection at the nesting sites should be initiated as soon as possible at the Rock Islands nesting beaches. The MRD library in Palau includes a publication "Manual of Sea Turtle Research and Conservation Techniques" provided by George Balazs and prepared by the Center for Environmental Education (1983) which contains very practical and useful guidance on a field data collection program for sea turtles. Two of the survey forms listed in the handbook seem particularly useful for use and implementation in Palau (Figures 3 and 4). One of the forms focuses on recording tagging and nesting data while the other focuses on sea turtle egg and hatching data.

Enforcement

The collecting of data at the nesting sites could also be included as part of an expanded monitoring and enforcement program at the same areas. The on-site presence of turtle censusing and enforcement personnel would discourage poaching and provide educational opportunities for would be poachers or disturbers of nesting turtles. Enforcement will also need to rely on regulations that curtail continued encroachment and disturbance into nesting areas by picnickers, tourists, shelters, houses and other forms of physical disturbance or harassment.

CONCLUSIONS AND RECOMMENDATIONS

Terminate the turtle hatchery program

Over the past nine years the hatchery program has collected over 15,000 eggs and released nearly 2,400 juvenile turtles. Yet the only evidence of any success of the program is the recapture of two previously tagged hatchery-reared turtles. This can hardly be considered encouraging. A more likely possibility is that the egg-collecting aspects of the program at the nesting beaches is aggravating an already critical egg-poaching problem. This level of impact cannot be maintained, since few younger turtles, if any, are entering the reproductive population to replace those which are beyond egg-bearing age or have been captured. Thus, the most prudent course of action at this time is to terminate the hatchery program immediately. This will have the beneficial effect of allowing eggs to hatch naturally and hatchlings to imprint properly at the nesting beaches.

Contrary to the opinions of representatives of Japan's bekko (tortoise shell) industry, Balazs maintains in a December 1990 memo, that the hatchery program has not been a success (see Appendix A). In addition, the U.S. Endangered Species Act (ESA) applies to the hatchery program, but the sponsors of the program have never consulted with federal fish and wildlife agencies and never applied for or received a permit for hatchery activities in accordance with the ESA. Thus, continued operation of the hatchery would be in violation of the ESA, and it is highly unlikely that a permit would be issued. For one, the hatchery program has completely ignored the earlier constructive criticisms by Milliken and Tokunaga and Balazs to improve hatchery operations and data collection.

Initiate field data collection

The turtle hatchery staff could be retrained to initiate a data collection program at all remaining and historical nesting sites on a regular basis. Among other things, the staff could record data on previously tagged turtles that were hatchery reared, if any survive and eventually return to the nesting beaches. In a sense, this is the best way to determine whether the hatchery program had any benefit, and could be resumed and/or modified to insure a higher degree of success at a later date. Otherwise, the hatchery program should be permanently terminated due to lack of measurable success.

The data collection and monitoring program should consider guidance presented in the earlier mentioned manual or follow the suggestions of the earlier turtle specialists (see Appendices A and B). George Balazs believes his earlier recommendations are still applicable and have been adopted by IUCN (see Appendix A). The earlier recommendations of Milliken and Tokunaga are summarized in Appendix B.

Establish an enforcement presence on-site

Clearly enforcement has the greatest chance of success in saving Palau's hawksbill sea turtles because it could eliminate much of the poaching which is already responsible for destroying 76% of the eggs at the nesting beaches. Enforcement actions can also provide opportunities to counsel and educate others on site that may be disturbing, harassing, or harvesting turtles or their eggs. A conservation enforcement workshop was held in Palau in March 1991 to address long-range plans for enhanced enforcement including protection of hawksbills.

At a minimum, two teams of at least two enforcement officers should be stationed at the three principal nesting sites (Ngerukewid, Kmekumed, and Omekans). This might involve regular but unpredictable overnight outings and the construction of shelters for the enforcement officers or rangers.

Bioreserve planning

Further evolution of the bioreserve concept for the Rock Islands should include the need to support surveillance, monitoring, and enforcement personnel through equipment, training, and financial means. In turn, these personnel could be trained to educate would be egg poachers and disturbers of nest sites. For one, I recommend that George Balazs revisit Palau and conduct a one to two week training workshop on monitoring and tagging. He expressed a willingness to conduct such training in ~~May, 1991~~ (G. Balazs, personal communication).

The net result of the above four recommendations would be to protect the surviving elements of the turtle nesting population and give a greater chance for hatchlings and juveniles to reach maturity and join the breeding population. The data gathering aspects of the recommendations would also allow evaluation of the success of the terminated hatchery program and determine whether there is any justification for resuming it.

The earlier recommendations of Milliken and Tokunaga (1989) and Balazs (1989,

1990) are included in the appendix to this report. Several continue to be applicable to hawksbill turtle conservation in the Rock Islands. The recommendations in this report are also consistent with the SPREP turtle conservation programme (Peter Thomas, personal communication).

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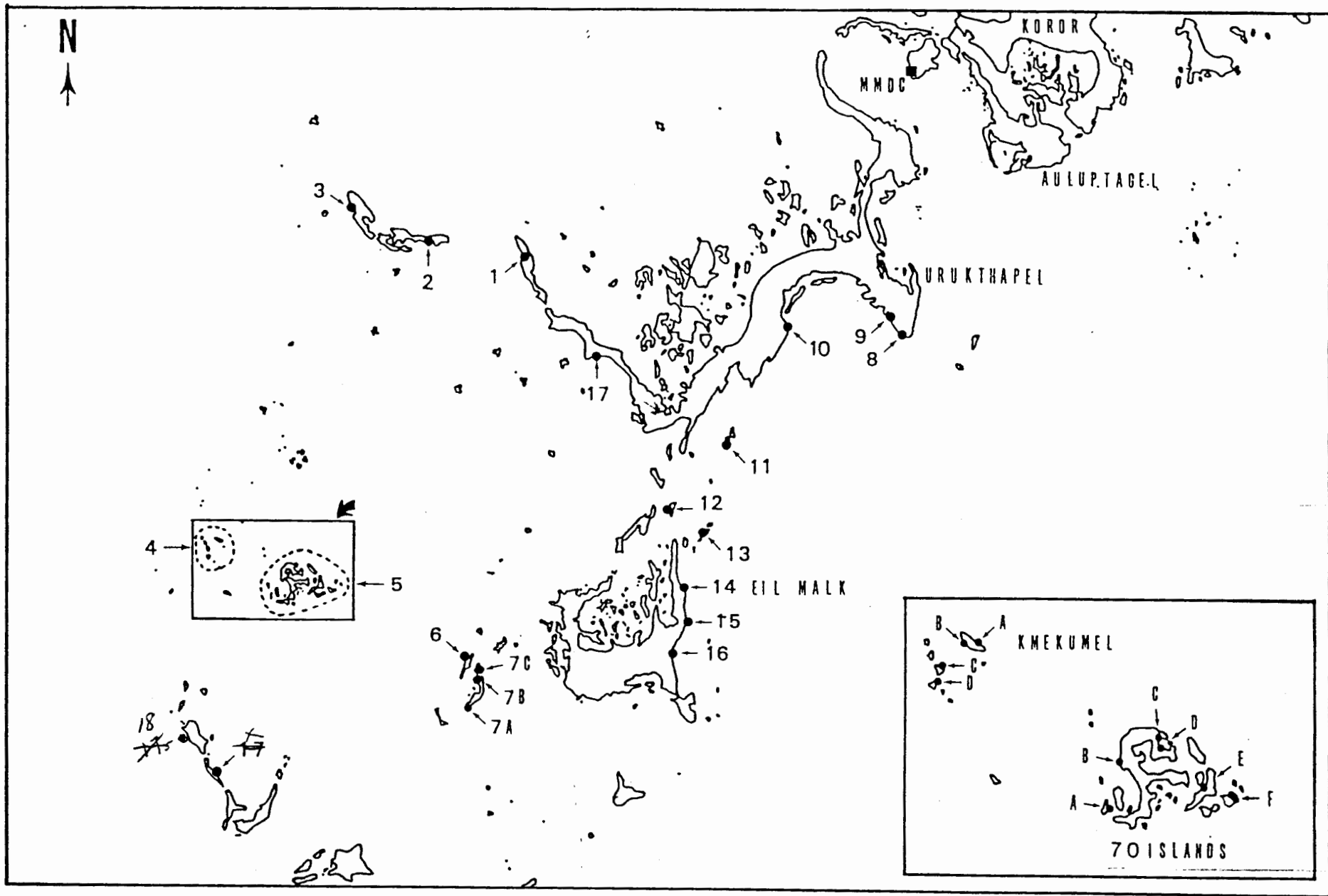


Fig. 1 Map of The Palau Rock Islands Showing the Principal Nesting Beaches of Hawksbill Turtle (*Eretmochelys imbricata*).

TABLE 1 SELECTED SUMMARY DATA FROM TURTLE HATCHERY, MICRONESIAN MARICULTURE DEMONSTRATION CENTER (MMDC)

A. Yearly Trends

YEAR	BOAT TRIPS	NESTS FOUND	NESTS WITH EGGS	NESTS WITHOUT EGGS	NESTS WITH EGGS/TRIP	TOTAL NESTS/TRIP	% POACHING
1982	24	55	17	38	0.70	2.29	69
1983	32	81	14	67	0.44	2.53	83
1984	26	71	10	61	0.38	2.73	86
1985	26	57	9	48	0.35	2.19	84
1986	32	44	15	29	0.47	1.38	66
1987	49	58	24	34	0.49	1.18	59
1988	61	52	12	40	0.20	0.85	77
1989	40	62	14	48	0.35	1.55	77
1990	27	45	10	35	0.37	1.67	78
9 yrs.	317	525	125	400	0.39	1.66	76

B. Seasonal Data (1985-1991)

MONTH	BOAT TRIPS	# OF NESTS	# OF NESTS/TRIP
Jan.	20	30	1.5
Feb.	13	18	1.4
Mar.	21	20	1.0
Apr.	20	22	1.1
May	20	28	1.4
Jun.	24	35	1.5
Jul.	14	25	1.8
Aug.	16	27	1.7
Sep.	18	15	0.8
Oct.	22	16	0.7
Nov.	13	8	0.6
Dec.	20	35	1.8

¹Extracted from the monthly progress reports (1986-1991) in the files of the Director of the MMDC (Gerald Heslinga). 1982-1985 data extracted from Milliken and Tokunaga (1987)

TABLE 2

STATUS OF NESTING SITES FOR SEA TURTLES IN PALAU

Extracted from interviews with Becky Madraisal. Numbers correspond to sites shown on Madraisal's map (Figure 1).

NUMBER	NAME	PRESENT IMPORTANCE	DISTURBANCE
1.	Ngebedangel	high	picnic site, buildings nearby
2.	Biduul	high	none except poaching
3.	Ulong	moderate	declining nesting due to buildings, tourists
4.	Kmekumb - A	high	popular picnic area
	Kmekumb - B	moderate	none, except poaching
	Kmekumb - C	moderate	none, " "
	Kmekumb - D	moderate	none, " "
5.	Ngerukewid - A	high	none, " "
	Ngerukewid - B	high	none, " "
	Ngerukewid - C	moderate	none, " "
	Ngerukewid - D	moderate	none, " "
	Ngerukewid - E	high	none, " "
	Ngerukewid - F	high	none, " "
6.	Iyuuch	high	none, " "
7.	Omekans - A	high	picnics
	Omekans - B	high	picnics & buildings, crowded
	Omekans - C	high	picnics only occasionally
8.	Kisakc	moderate	picnic area, crowded
9.	Ngeremdiu	moderate	picnic area and buildings
10.	Breu	high	house/picnic area on large beach
11.	Ngkesiil	high	public bldng. in nest area which needs moving
12.	Ngeremcyaus	high	public recreation area, buildings
13.	Moir	moderate	declining nesting due to disturbance
14.	Ngeruauuch	high	none, except poaching & rare visitation
15.	Oiyars	moderate	continuous low level disturbance by visitors
16.	Such	high	inc. access due to power boats and disturbance
17.	Ngkisaul	low	visitors stay in nearby cave
18.	Ngemclis	moderate	several buldings, heavy picnicing and resting divers
---	Giangas	unknown	some bldngs, but turtles protected by lack of public access; possible disturb.
---	Ngaregur	low	poachers, fishermen, declining nesting
---	Ngarekeklaul	low	one house
---	Kayangel Island	unknown	none except poaching?
---	Ngaruangl	unknown	none, occasional poaching
---	NW Peleliu	unknown	poaching
---	SE Peleliu	unknown	poaching
---	Aufuptagel	low	declining nesting due to human disturbance
---	Ngeregong	moderate	housing
---	Oregi	moderate	housing
---	Pkulagsencig	unknown	house, human disturbance
---	Angaur(Ngcaur)	low	possible

TABLE 3 PROPOSED FORM TO RECORD DATA ON SEA TURTLE TAGGING
AND NESTING IN THE ROCK ISLANDS
(Adapted from Center for Environmental Education, 1983)

Species: _____ Nest or False Crawl (circle which)

Investigator: _____ Date: _____ Time: _____

Location: _____ Tide: _____

Evidence of previous tag: YES NO (circle which)

Old tag number(s): (1) _____ (2) _____

Other tag information: _____

New tag number(s): (1) _____ (2) _____

Surfwater condition: CALM MODERATE (2-3 ft.) ROUGH (3-6 ft.)
(circle which)

Carapace length: _____ cm. or inches (circle which)
(note whether straight or curved)

Weight: _____ kg. or lbs. (circle which)

Comments: Vegetation _____
Structures _____
Other _____

Distance nest constructed from mean high water line: _____ m. or ft.
(circle which)

Number of eggs: _____

Fate of nest: _____ Incubation days: _____

Number of hatchlings: _____ Percent hatch: _____

Comments: _____

Total investigating time: _____ hours _____ minutes

Crawl diagram: (sketch here or on reverse side)

TABLE 4 PROPOSED FORM TO RECORD SEA TURTLE EGG AND HATCHING DATA (adapted from Center for Environmental Education, 1983)

Date nest laid: _____ If not fresh, estimate age (days) _____

Species: _____ Date nest hatched: _____

Date: _____ Nest excavated by: _____

Location of nest: _____

Tag number of turtle (if applicable): _____

Incubation method: _____ Hatching data: _____

Hatched eggs (H) from which hatchlings escaped from eggs: _____

Hatchlings escaped from nest (HN): _____

Hatchlings dead in nest (DN): _____

Unhatched eggs (UH): _____

Turtles dead in pipped eggs (DPE): _____

Turtles alive in pipped eggs (LPE): _____

Infertile eggs with no obvious embryos (INF): _____

Unhatched eggs with discernible embryos (DE): _____

Deformed hatchlings alive in nest (DA): _____

Deformed hatchlings dead in nest (DD): _____

Survival percentage of hatchlings from nest: _____

Using: $SP = \frac{HN}{H + UH}$

Comments: _____

Weight of 20 hatchlings selected at random from nest (living turtles only): gm. or oz. (circle which)

1. _____	6. _____	11. _____	16. _____
2. _____	7. _____	12. _____	17. _____
3. _____	8. _____	13. _____	18. _____
4. _____	9. _____	14. _____	19. _____
5. _____	10. _____	15. _____	20. _____

Average weight: _____

Disposition of hatchlings (released, pen-reared, other): _____

APPENDIX A

MISCELLANEOUS CORRESPONDENCE AND DATA IN THE FILES OF:

George H. Balazs
Zoologist and Leader
Marine Turtle Research, and
Deputy Chairman, IUCN Marine Turtle Specialist Group



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

November 13, 1989 F/SWC2:GHB

Mr. Tosh Paulis
Director
Division of Marine Resources
P.O. Box 359, Koror
Republic of Palau 96940

Dear Tosh,

Thank you for stopping by my office during your recent visit to Honolulu. I appreciated having the opportunity to speak with you again regarding the hawksbill hatchery and headstart project, and my September trip to Palau to visit the facility on behalf of IUCN. As the result of this opportunity, I have certainly obtained a better understanding of your project goals, and the efforts that are currently underway. Thank you again for the hospitality and helpfulness that you, Becky Madrisau, Gerald Heslinga, and others provided during my visit. Without this outstanding assistance I would never have been able to obtain a good grasp of the situation in the short time that was available. You may, of course, continue to call upon me for technical advice and opinion whenever you feel it is necessary and appropriate.

As requested when you visited with me, in advance of my report to IUCN I am providing you with some recommendations and options you may wish to consider for the hawksbill project. The premise I have used for these recommendations is the overall project goal that you stated to me while I was in Palau. That is, "to restock Palauan waters with Palauan turtles, for Palauans." Although you are not "closing the door" to possible future turtle ranching or farming endeavors, and the inherent international commerce that would result, if I understood you correctly this is not an immediate project objective nor one that is feasible or being seriously examined for implementation at the present time. Given these important considerations (of which I strongly concur), the following suggestions are offered:

1. Develop a plan to ensure that at least some, if not many or most, of the eggs deposited at nesting beaches in the Rock Islands can be safeguarded from poaching and thereby develop and hatch in their natural state. I realize that this may be a difficult task, but some steps must be taken to work toward this critical objective. I recommend that the persons doing the poaching be identified and met with to help work-out the required long-term solutions. Meeting and negotiating with the poachers may seem like a radical proposal, but I believe it is absolutely essential for such a small, close-knit island community as Palau.



2. Eggs that are more than 12-hours old and have not been dug-up by poachers should be candidates for being left on the nesting beaches for incubation and hatching in their natural state. The excavation and movement of eggs for incubation elsewhere, even after as short a period as 12-hours, is known to induce a substantial decrease in hatchability. The generally low hatch rates seen in some of the clutches at the project's facility are likely the result of eggs being moved well after this 12-hour period. It is now well-known that if sea turtle eggs have to be relocated for protection, the very best time to do so is immediately after they are laid. However, given the numerous scattered small beaches of the Rock Islands, and the very low level of nesting now occurring, immediate egg movement would be impractical, if not impossible. Although leaving eggs greater than 12-hours old where they were laid might be subjecting them to continued exposure to poachers, it is my understanding that the Palauan dietary preference for turtle eggs is almost exclusively for ones freshly laid. Consequently, the risk of loss by poaching should decline dramatically with the passing of another day or two. Some efforts to disguise the nesting site, or possibly give it the appearance of the eggs having already been taken, might be worthwhile.

3. For freshly-laid eggs less than 12-hours old that must be relocated in order to save them from poachers, consideration should be given to directly releasing the hatchlings on the same day, or late afternoon, of their hatching. The release site should be on the nesting beaches of the Rock Islands, allowing the turtles to crawl to the sea in as normal a manner as possible. In spite of headstarting being a somewhat widespread and, in certain quarters, popular thing to do, it is nevertheless a highly experimental and unproven effort aimed at trying to conserve sea turtles. There are many unanswered questions about headstarting, and some projects involved in this activity are now reconsidering what they have been doing. I have enclosed two articles on this subject that I am certain you will find interesting.

4. Any hatchlings that are kept and raised for headstarting as an experimental restocking effort should be raised to at least 35 cm in carapace length. This will provide for the greater possibility of the turtles establishing residency in Palauan waters when they are released. It is my understanding that hawksbills less than about 35 cm are not found in Palau's lagoon. Consequently, the present practice of releasing the captive-reared turtles at a size of 15-18 cm may not be the ideal. At this small of a size the turtles still appear to be adapted for living in pelagic habitats, instead of the benthic environment of Palau's lagoon. This idea is supported by the three tag recoveries that have thus far been made by the project showing that turtles 15-18 cm move to distant locations such as Guam and the Philippines.

5. Hatchlings that are kept for headstarting should be fed at a increased rate, preferably three times a day to near satiation. Consideration should be given to feeding fresh (not frozen) sardines whenever possible. The entire fish should be fed in a chopped state, without removing the head and viscera. A multi-vitamin supplement should also be considered for incorporation into the turtles' diet. A month or so prior to releasing the turtles at 35 cm, efforts should be undertaken to introduce freshly gathered sponges to acquaint the turtles with natural dietary material.

6. A thorough evaluation should be made of the likely negative impacts to the Palau hawksbill population resulting from the commercial sale of hawksbill products (jewelry, stuffed juveniles, polished shells, etc.) occurring at the "Shell Museum" store, and other possible tourist shops, on Koror.

I trust that these preliminary ideas, most of which we have already touched upon in our discussions, will be helpful in charting the future course of Palau's very important sea turtle conservation efforts. Again, many thanks for stopping by to see me while you were in Honolulu.

Sincerely,

George H. Balazs
Zoologist

Enclosures

cc: Gerald Heslinga
Becky Madrisau



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

June 8, 1990

F/SWC2:GHB

Mr. Tosh Paulis, Director
Division of Marine Resources
P.O. Box 359, Koror
Republic of Palau 96940

Dear Tosh,

Following an exchange of correspondence with IUCN in Switzerland, I have been informed that the six preliminary recommendations I made to you on November 13, 1989 (at your request) have now been accepted as IUCN's official position.

It is evident that the project's overall goal ("to restock Palauan waters with Palauan turtles for Palauans") is not being accomplished. This is in spite of the fact that the hatchery and headstart efforts have been underway since at least the early 1970's (with involvement by Jim McVey). In addition, the intermediate objectives of the project are not being achieved, such as high hatch rates of transplanted nests, low mortality of hatchlings, healthy juveniles without disfigurement (e.g., blindness), residency of headstart juveniles in Palauan waters (versus movements elsewhere), and increasing numbers of females nesting on the beaches.

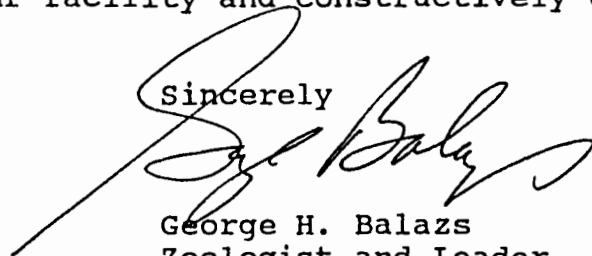
In my best judgement and professional opinion, the time has now come to take new directions on behalf of the Palauan hawksbill. Becky Madraisau has, for many years, put forth commendable efforts as a dedicated conservationist to this project. My six recommendations for pursuing alternate courses of action (to those followed without demonstrable success since the 1970's) should in no way negatively reflect on Becky Madraisau. Becky is clearly the foremost authority and defender of the hawksbill in Palau. It is Becky's leadership that will be absolutely essential these next few years before his retirement in order to implement the recommendations endorsed by IUCN, if they are to be undertaken by your office.



The National Sea Turtle Coordinator for the U.S. Fish and Wildlife Service (Jack Woody) has expressed interest in work being conducted on the hawksbill in Palau. I am therefore taking the liberty of sharing some of our correspondence and data with him.

In closing, I want to again thank you for the courtesy of allowing me to visit your facility and constructively express my views.

Sincerely

A handwritten signature in cursive script, appearing to read "George H. Balazs". The signature is written in dark ink and is positioned above the typed name and title.

George H. Balazs
Zoologist and Leader
Marine Turtle Research


cc: B. Madraisau
G. Heslinga
S. Edwards, IUCN



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center Honolulu Laboratory
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December 14, 1990

F/SWC2:GHB:JJA
REPORT-7M.GHB

MEMORANDUM FOR: George W. Boehlert
THROUGH: William G. Gilmartin
FROM: George H. Balazs 
SUBJECT: Report of Foreign Travel to Nagasaki, Japan

On Sunday, November 18, 1990, I traveled to Japan to attend and participate in the "Nagasaki International Symposium on the Resource Management of the Hawksbill Turtle."

My expenses to the symposium were paid by the National Marine Fisheries Service, even though the invitation offered full funding for travel by the symposium sponsors (prefecture governments of Nagasaki, Osaka, and Tokyo). The sessions of this invitational symposium covered three days, November 20-22. I returned to Honolulu on the morning of November 23. A marine turtle symposium that I had attended in Himeji City, Japan, in 1988 formed the foundation for the 1990 event in Nagasaki.

The Nagasaki symposium provided a unique international forum to exchange biological and management-oriented information and ideas on the endangered hawksbill turtle, *Eretmochelys imbricata*. Twenty sea turtle specialists from eleven nations (including Cuba) were invited to the symposium to frankly discuss research activities with Japanese scientists and representatives of the Japan tortoiseshell (bekko) federation. Most of the non-Japanese scientists attending the symposium were members of the IUCN Marine Turtle Specialist Group.

I gave a 30-minute oral presentation covering biological and cultural aspects of the hawksbill turtle in Oceania, and the hatchery and headstart activity being conducted in Palau in the western Pacific. Data resulting from this latter effort indicate that the project has not been a success, as had been claimed by the bekko industry. The bekko industry provided considerable financial support to the Palau hawksbill project over the past 8 years.

The symposium was productive from the standpoint of scientific exchange among researchers and resource managers who seldom



have the opportunity to meet one another (i.e. workers from Indonesia and Cuba). On a closing note, I was pleased to be informed at the symposium of my appointment as the new Deputy Chairman of the IUCN Marine Turtle Specialist Group.

cc: I. Barrett

Table 1--Results of hawksbill hatchery and headstart activities as summarized from monthly reports of the Micronesian Mariculture Demonstration Center (MMDC), Koror, Republic of Palau, November 1987-September 1990. Compiled by George H. Balazs.

MMDC report date	No. hatched	No. died*	No. missing	No. released alive after "headstarting"
1987				
Nov.	17	104	7	0
Dec.	119	56	0	0
1987 Subtotal	136	160	7	0
1988				
Jan.	146	51	0	0
Feb.	0	148	0	26
Mar.	156	139	0	34
April	52	100	0	39
May	0	78	0	0
June	133	39	0	31
July	60	22	0	39
Aug.	229	20	0	21
Sept.	268	41	0	49
Oct.	57	95	0	0
Nov.	24	79	(1 adult)	0
Dec.	0	62	71	0
1988 Subtotal	1125	874	72	239
1989				
Jan.	0	114	0	0
Feb.	23	50	0	0
Mar.	219	36	0	27
Apr.	0	110	114	0
May	0	31	0	0
June	128	21	0	0
July	186	37	0	33
Aug.	266	73	0	0
Sep.	22	75	0	28
Oct.	106	145	0	24
Nov.	95	140	0	4
Dec.	0	63	0	0
1989 Subtotal	1045	889	114	116

Table 1.--Continued.

MMDC report date	No. hatched	No. died*	No. missing	No. released alive after "headstarting"
1990				
Jan.	118	40	0	35
Feb.	246	72	0	2
Mar.	122	90	0	0
April	74	76	0	8
May	107	80	0	8
June	29	74	0	14
July	221	64	0	0
Aug.	8	56	0	0
Sept.	41	79	0	20
1990 Subtotal	966	631	0	87
3-Year total	3272	2554	+ 192 = 2746 (Total loss)	442 (13.5%)

*The number reported as having died each month at the facility does not necessarily consist of turtles that were hatched during the same month.

HHH-6T.GHB

Table 2.--Results of hawksbill egg collection activities as summarized from monthly reports of the Micronesian Mariculture Demonstration Center (MMDC), Koror, Republic of Palau, November 1987-September 1990. Compiled by George H. Balazs.

MMDC Report date	No. successful nesting sites located	No. nests collected for hatching	No. nests and % taken by poachers	No. of boat trips to locate nests
1987				
Nov.	2	1		3
Dec.	10	5		5
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1987 Subtotal	12	6	6 (50%)	8
1988				
Jan.	5	2		4
Feb.	5	2		3
Mar.	0	--		5
April	2	0		6
May	3	3		6
June	6	2		6
July	8	1		5
Aug.	9	3		5
Sep.	3	0		4
Oct.	4	0		6
Nov.	1	0		7
Dec.	5	0		4
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1988 Subtotal	51	13	38 (75%)	61
1989				
Jan.	7	4		3
Feb.	2	0		3
Mar.	4	0		4
Apr.	6	1		3
May	4	2		3
June	12	3		5
July	7	1		4
Aug.	8	1		3
Sep.	3	1		3
Oct.	1	0		3
Nov.	5	0		3
Dec.	3	1		3
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1989 Subtotal	62	14	48 (77%)	40

Table 2.--Continued.

MMDC Report date	No. successful nesting sites located	No. nests collected for hatching	No. nests and % taken by poachers	No. of boat trips to locate nests
1990				
Jan.	3	1		3
Feb.	5	2		3
Mar.	8	1		4
April	3	0		3
May	7	2		3
June	2	0		3
July	0	0		0
Aug.	4	1		2
Sep.	1	0		2
1990 Subtotal	33	7	26 (79%)	23
3-year total 11/87-9/90	158	40	118 (75%)	132

NOTE: The clutch size and percent hatch for individual nests taken to MMDC are not reported/not available. However, using the 3-year total of 3272 turtles hatched at the facility (Table 1), and a total of 40 nests collected for hatching (this table above), an average of 82 live hatchlings was produced from each clutch.

HEG-6T.GHB

APPENDIX B**SUMMARIZED RECOMMENDATIONS OF MILLIKEN AND
TOKUNAGA (1987) REGARDING THE PALAU HEADSTARTING
PROGRAM**

1. Maintain strict temperature control during incubation of eggs.
2. Conduct sexing and sex ratio determinations of hatchlings.
3. Examine eggs which fail to hatch to determine if infertile or not.
4. Conduct pathological examination of dead hatchlings to determine the cause of death.
5. Relieve overcrowding in the hatchery tanks by using the new JICA funded tanks. Do not use the new tanks to increase production (e.g., maintain crowding).
6. Disease factors in hatchery turtles need to be established and addressed; tank cleaning and regular removal of uneaten food may reduce mortality.
7. Institute a multiple tagging system for the released hatchlings to avoid reliance on any one method. Improve the return address on the tags.
8. Clutch identity of all hatchlings should be maintained for tracking beginning at collection and continuing through the point of release.
9. Better security measures are needed in the hatchery to reduce or eliminate the high number of missing (stolen, harvested) turtles.
10. Institute regular patrols at the nesting beaches.
11. Institute an educational program.