Southwest Fisheries Science Center
Administrative Report H-01-06C

SEA TURTLES AND THEIR MARINE HABITATS AT TINIAN AND AGUIJAN, WITH PROJECTIONS ON RESIDENT TURTLE DEMOGRAPHICS IN THE SOUTHERN ARC OF THE COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS

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December 2001

NOT FOR PUBLICATION

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PREFACE

This report provides the results of recent research efforts to ascertain the status and habitat use of sea turtles in the Commonwealth of the Northern Mariana Islands (CNMI). The work was sponsored by the Southwest Fisheries Science Center Honolulu Laboratory with funding awarded through the Office of Protected Resources, National Marine Fisheries Service. As noted by the author, a continuation of assessment and monitoring is essential to determining the overall status and dynamics of resident and breeding assemblages of sea turtles within the CNMI, as well as elsewhere in the insular U.S. Pacific islands. Incorporating local community involvement in survey, monitoring and tagging programs can serve as a valuable means to extend conservation ethic regarding sea turtles within the region.

Because this report was prepared by an independent investigator, its statements, findings, conclusions, and recommendation do not necessarily reflect the official views of the National Marine Fisheries Service, NOAA, U.S. Department of Commerce.

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October 2001

EXECUTIVE SUMMARY

An assessment of resident sea turtles and their nearshore habitats at Tinian and Aguijan, Commonwealth of the Northern Mariana Islands (CNMI), was conducted from 12 to 21 March 2001. An estimated 351 individual *Chelonia mydas* were observed via 448 sightings in 27 surveys covering roughly 59 % of Tinian's total shore and outer reef perimeter. Fourteen *Chelonia mydas* were observed during tow surveys covering 95 % of Aguijan's shore and reef perimeter. No other turtle species were sighted. Juvenile turtles of various sizes dominated in all environments surveyed, and observations of turtles with estimated curved carapace lengths at or below 45 cm suggested recent and continuing recruitment at both Tinian and Aguijan. Projected turtle density and abundance was greatest along the relatively uninhabited eastern coast of Tinian. Twenty-four species of algae noted as green turtle forage in other regions of the world were identified at Tinian in this and previous surveys.

Projections of turtle densities and abundances based on data from recent surveys of four of the five CNMI southern arc islands suggest that the small uninhabited islands of Farallon de Medinilla and Aguijan sustain tens of turtles, turtle numbers around the larger inhabited islands of Saipan and Tinian range in the hundreds, while the CNMI portion of the southern arc (which includes Rota) likely supports between 1000 and 2000 resident green turtles. Turtle density and abundance appear highest at Tinian despite its smaller size relative to Saipan and its apparent lack of seagrass forage. A comparison of observed turtle species activities within the region suggests that the CNMI should presently be classified as primary resident green turtle habitat with a minor green turtle nesting component.

A continuation and expansion of assessment and monitoring is essential to determining the status and dynamics of both resident and breeding populations of turtles within the CNMI. Similar to Saipan, numerous sites along Tinian's shoreline stood out as candidate areas for capturing and tagging large numbers of turtles given appropriate methods and oceanic conditions. It is recommended that visual surveys of the islands continue, and that a tag and release program, focusing on both research and management, be initiated. Incorporating community involvement in tagging and monitoring programs could serve as a means to extend a conservation ethic regarding sea turtles within the region.

1. INTRODUCTION

The distribution and status of sea turtles at many Pacific island localities has yet to be determined but is of concern as continuing human expansion and coastal development throughout the region has great potential to negatively impact local sea turtle populations through increased harvests, incidental catch, and the degradation of nesting and critical nearshore and pelagic habitats (see Lutcavage et al. 1997, Bjorndal 1997). The lack of specific island and archipelago information hinders efforts to understand not only local, but also the large-scale regional dynamics of turtle populations, and reduces the ability to effectively plan development and human activities to minimize impacts and to manage sustainable utilization of turtles as a resource.

Recent efforts to investigate and document turtle activities within the Commonwealth of the Northern Mariana Islands (CNMI; McCoy 1997, Pultz et al. 1999, Kolinski et al. 1999, 2001, Dollar and Stefasson 2000) are providing baseline information that is relevant to estimating and understanding turtle demographics within the region. Such information is likely to be key to decision makers and managers as island populations and tourist development expands, and local public and political interest in gaining legal exemption under the U.S. Endangered Species Act to allow for traditional harvests of sea turtles continues (see McCoy 1997). Although far from complete, evidence to date suggests very limited turtle nesting on CNMI shores (Pritchard 1977, 1982, Johannes 1986, Wiles et al. 1989, 1990, Grout 1997, McCoy 1997, Pultz et al. 1999, Kolinski 2001). Anecdotal reports of turtles in nearshore environments exist (Pritchard 1977, 1982, Johannes 1986, Wiles et al. 1989, 1990, McCoy 1997), however concentrated assessments of the resident sea turtle population(s) are presently few (Pultz et al. 1999, Kolinski et al. 1999, 2001, Dollar and Stefasson 2000, Kolinski this study).

This study was commissioned to expand the focus on assessing the status of resident turtles and their habitats within CNMI waters. Data specific to the islands of Tinian and Aguijan are presented, and a summary of available information from known surveys within the region was used to construct a projection of present day turtle demographics for islands within the southern arc of the archipelago.

2. STUDY AREA

The Mariana Archipelago has 15 islands and various submerged banks and is oriented poleward from 13^{o} to 20^{o}5'N and 144.5^{o} to 146^{o}E (Figure 1). The Philippine Sea borders the western shores and the Pacific Ocean the east. The islands are located on two separate arcs. An inner, northern arc supports the volcanically active or recently active islands of Farallon de Pajaros (Uracas), Maug, Asuncion, Agrihan, Pagan, Alamagan, Guguan, Sarigan and Anatahan (the Northern Marianas). Islands on the frontal, southern arc are capped or surrounded by limestone terraces and include Farallon de Medinilla, Saipan, Tinian, Aguijan, Rota and Guam (the Southern Marianas; Wells and Jenkins 1988, Birkeland 1997). The archipelago is divided politically between the territory of Guam and the Commonwealth of the Northern Mariana Islands (CNMI), both United States affiliates. Approximately 61,000 humans inhabited the CNMI as of 1995, with more than 99 % found in the Southern Marianas, the vast majority living on Saipan (McCoy 1997).

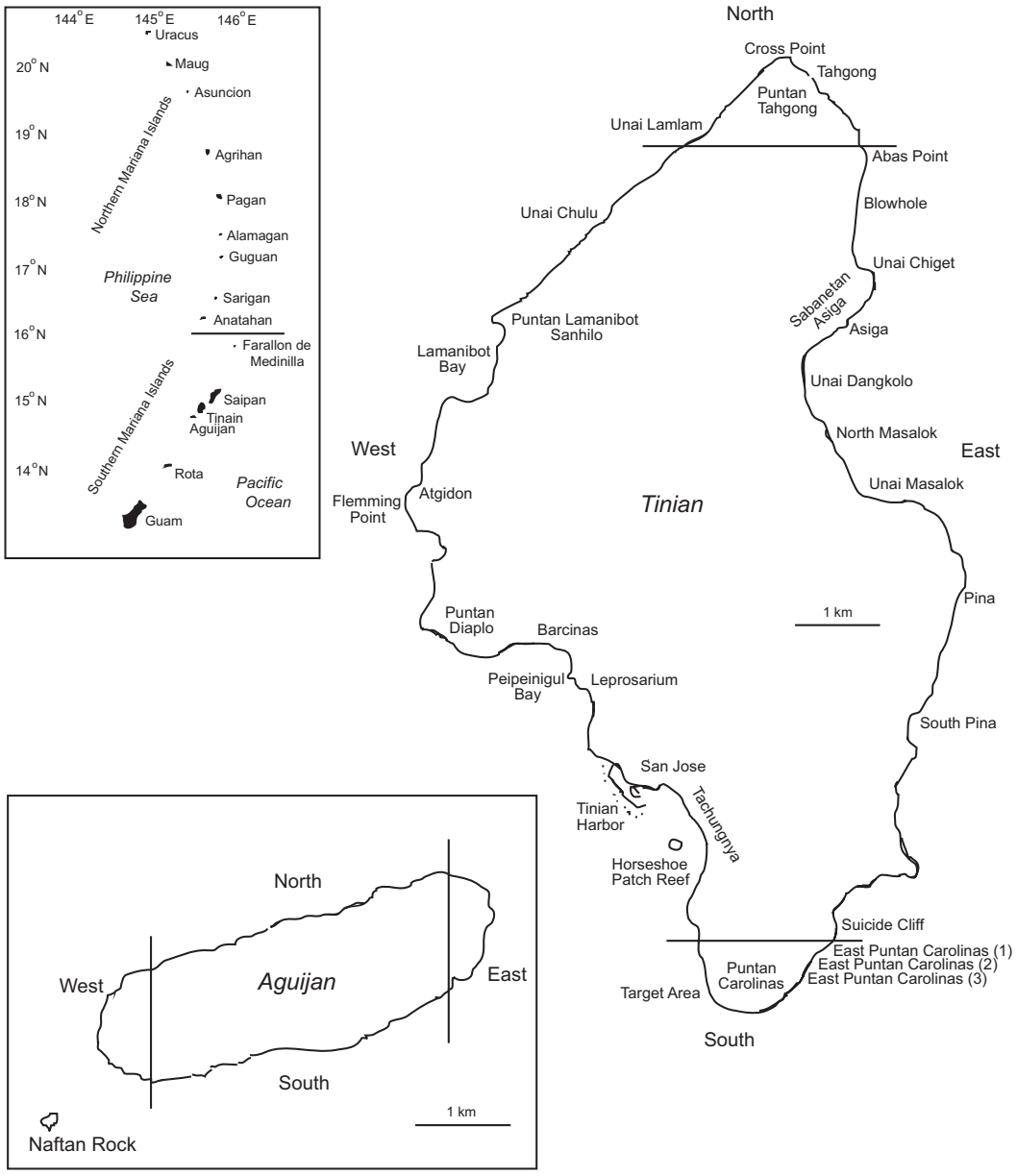

Figure 1: The Mariana Archipelago and Tinian and Aguijan Islands, CNMI

2.1 Tinian Island

Tinian (15°00'N, 145°38'E) is a raised, relatively flat, 102 km^2, limestone island reaching heights of 170 m (Figure 1; Eldredge 1983, Wells and Jenkins 1988). It is located five km southwest of Saipan and nine km northeast of Aguijan. The majority of shoreline consists of low to high limestone cliffs with sea-level caverns, cuts, notches and or slumped boulders, commonly bordered by intertidal benches (Doan et al. 1960, Eldredge and Randall 1980, Eldredge 1983). Thirteen beach districts have been defined (Pultz et al. 1999), 10 at west coast locations and three (one distinct and two discontinuous beach complexes) along the east coast. Beach deposits consist mainly of medium to coarse grain calcareous sands, gravel and rubble interspersed amongst exposed limestone rock (Doan et al. 1960). All beaches reportedly support turtle nesting activities (Wiles et al. 1989, Pultz et al. 1999).

The north, east, and south coasts have very limited fringing or apron reef development that is most conspicuous at Unai Dangkolo (Doan et al. 1960, Eldredge and Randall 1980, Maragos 1985). Submarine topography appears mainly characterized by limestone pavement with interspersed coral colonies and occasional zones of submerged boulders. Coral reef development is more prevalent at various west coast locations, with fringing coral reef habitats present inside Lamanibot and Peipeinigul Bays (Eldredge and Randall 1980, Maragos 1985) and a patch and small barrier reef system (altered as a breakwater for the harbor) located within the Tinian Harbor area (Doan et al. 1960, Eldredge and Randall 1980, Eldredge 1983, Maragos 1985). Human development is concentrated mainly along the west coast at San Jose. Roughly 3000 residents inhabited the island as of 1995 (McCoy 1997). Tourism and agriculture are the main industries.

2.2 Aguijan Island

Aguijan (14°51'N, 145°34'E) is a raised, steeply cliffed, 168 m high, nearly flat-topped limestone plateau approximately 7.2 km^2 in size located roughly nine km southwest of Tinian (Figure 1; Eldredge 1983, Wells and Jenkins 1988). Its nearest neighbor to the southwest is Naftan Rock (one km), and beyond that to the south is Rota (90 km). There are no beaches and bench development is limited (Eldredge and Randall 1980). Submarine topography is characterized by steeply sloping limestone pavement with scattered boulders and limited coral development around most of the island (Tsuda et al. 1971, Eldredge and Randall 1980, Maragos 1985, Randall 1985, Wells and Jenkins 1988, pers. obs.). Along the east coast an 18 m deep pavement platform extends roughly 300 m offshore and contains scattered corals, grooves and sand deposits. Along the west coast a topographically diverse platform connects Aguijan to Naftan Rock. This platform is characterized by limestone rock, live coral and sand, and reaches depths of from nine to 18 m. There is no permanent human settlement on the island, however the nearshore waters are regularly fished. A Japanese founded cement dock and stairway are present on the west side of the island. Island access requires government permit approval.

3. METHODS

3.1 Sea Turtle Assessments

Methods for turtle and marine habitat assessments are similar to those described in Kolinski et al. (2001). The marine nearshore environments of Tinian were surveyed from 12 to 21 March 2001 by investigators of the University of Hawaii, the Saipan Division of Fish and Wildlife and the Tinian Department of Land and Natural Resources. Aguijan was surveyed on 20 March 2001. Various members of the community, including Department of Land and Natural Resources representatives, local fishermen and other local observers, provided information regarding notable sea turtle habitat believed worthy of investigation (which included most of the marine habitat surrounding Tinian Island). Approximately 59 % of Tinian's, and 95 % of Aguijan's outer reef and shoreline perimeter was examined using one or more of the following three methods:

1. Tow surveys were conducted along portions of the north, south and the majority of the west coast of Tinian and all of Aguijan as permitted by oceanic conditions. Two boats (a 31 ft. fountain and a 14 ft. whaler) were used to survey parts of the north and west regions of Tinian. Two to three people were towed in back of each boat, with the whaler surveying shallower environments maintaining distances from shore approximately 20 to 100 m, and the fountain surveying deeper environments 30 to 50 m offshore of the whaler. When a turtle was sighted the boat was stopped and the species, size, activity, time, depth and habitat characteristics were relayed to a recorder on the boat. Latitude and longitude were noted at the location where each turtle was encountered using a Garmin hand-held GPS unit (only one GPS unit was available). In addition, boat observers searched the water's surface for turtle ascents, which were also recorded. Communication of turtle sightings between boats ensured multiple reports of individual turtles did not occur. Aguijan and part of southern Tinian were surveyed in a similar manner using only the 31 ft. fountain.

2. In a single snorkeling survey four observers swam an imaginary transect along the perimeter of a Tinian patch reef maintaining observer distances of approximately 10 m in a straight line perpendicular to the transect. Turtle species, size, activity, time, depth and habitat characteristics were relayed to a single person for recording on underwater writing paper. Latitude and longitude at the beginning and end of the transect were measured using a Garmin hand-held GPS unit.

3. Shoreline surveys of nearshore waters were conducted mainly along the northeast, east, and southern coasts of Tinian which were inaccessible to the water-based methods. Observers sketched the shoreline and prominent submerged benthic features within their range of visibility. When a turtle was sighted on the surface or swimming subsurface, the time was noted and binoculars were used to identify species and estimate size. Features such as tail length and any identifying marks were recorded when observed. The estimated surface time and behavior of each turtle was noted when possible, and the location and/or route of each turtle was plotted on the map sketch and numbered. The location of each observer was measured using a Garmin hand-held GPS unit. Environmental conditions and location factors deemed relevant were recorded.

Actual numbers of turtles were estimated for each transect by adjusting for re-sightings on the basis of unique features, time and specific locations and/or routes. These data were used to calculate estimates of total turtle abundance for each island by multiplying the mean number of turtles per kilometer from surveyed regions by total kilometers in similar non-surveyed areas, and then summing for each island. Estimates from single boat tow surveys were adjusted using a correction factor determined from multiple boat tow surveys (average percent increase in turtles from deep water tows). Total island estimates were made for the four surveyed CNMI southern islands (Kolinski et al. 1999, Dollar and Stefansson 2000, this survey). These estimates were used to make a general projection on present turtle abundance in the CNMI portion of the southern arc.

3.2 Assessment of Potential Sea Turtle Forage

Algae and seagrass samples were collected as a means to identify potential green turtle forage along five established west and east coast transects and from various areas along the south and west coasts of Tinian where assessable. Samples were not collected from Aguijan due to time and safety concerns. All specimens were identified by Jennifer E. Smith, Department of Botany, University of Hawaii at Manoa, Honolulu, Hawaii. In addition, a literature review was conducted and a species list of potential green turtle forage was compiled, along with locations and references. Hirth (1997) was utilized as a guideline for listing only those species identified as turtle forage in other parts of the world. Potential food resources of other turtle species were not surveyed.

4. RESULTS

4.1 Sea Turtles in Nearshore Environments

Site descriptions, notes on accessibility, methodologies, personnel, sources of information, raw data on turtle observations and estimates, and conclusions and recommendations for each transected location at Tinian and Aguijan are presented in the Appendix.

4.1.1 Tinian

An estimated 351 individual *Chelonia mydas* were observed via 448 sightings in 27 surveys covering roughly 59 % of Tinian's approximately 54.6 km of total shore and outer reef perimeter (Table 1). No other turtle species were sighted. Sixty-nine percent (242 turtles) of the turtles were juveniles, 17 % (61 turtles) were categorized as juvenile/adult, and 11 % (40 turtles) appeared to be of adult size. Size determinations could not be made for eight (2 %) of the turtles. Numbers of turtles categorized by size and general location are shown in Figure 2. Juveniles predominated along all coastlines. The proportion of adults to other turtles was greatest along the south (14 %) and west (13 %) coasts. A minimum of 11 juveniles with estimated curved carapace lengths (CCL) below 45 cm were observed, suggesting recent recruitment to the resident population.

Seven percent (24 turtles) of the turtles were observed at northern locations, 38 % (134 turtles) at east coast sites, 17 % (58 turtles) along the south coast, and 38 % (135 turtles) within west coast

Table 1: Observations of green turtles, *Chelonia mydas,* at Tinian Island, CNMI. (* = numbers not included in final sum as likely noted in repetitive surveys.)

Site	Date	Max. Time (hrs:mins)	Method	Transect Length (km)	Number of Observations					Estimated Number of Turtles Observed					Turtles per km
					Juv.	Juv./ Adult	Adult	Unknown	Total	Juv.	Juv./ Adult	Adult	Unknown	Total	
North Tinian															
Puntan Tahgong to Lamlam (northwest)	03/15/01	0:45	DoubleTow	2.45	1	0	0	0	1	1	0	0	0	1	0.4
Puntan Tahgong (Cross Point)	03/16/01	1:30	Shoreline	0.30	10	1	2	0	13	8	1	1	0	10	33.3
Tahgong (northeast)	03/19/01	1:16	Shoreline	0.44	18	1	0	0	19	12	1	0	0	13	29.5
Subtotal:		3:31		3.19	29	2	2	0	33	21	2	1	0	24	7.5
East Tinian															
Abas Point, Sabanetan Tahgong	03/16/01	1:40	Shoreline	0.44	11	6	0	5	22	8	6	0	4	18	40.9
Blowhole, Sabanetan Chiget	03/17/01	1:16	Shoreline	0.15	4	0	0	1	5	3	0	0	1	4	26.7
Sabanetan Asiga	03/16/01	1:15	Shoreline	0.40	6	3	3	0	12	6	2	2	0	10	25.0
North Masalok	03/19/01	1:15	Shoreline	0.63	12	1	1	0	14	11	1	0	0	12	19.2
Unai Masalok	03/18/01	1:15	Shoreline	0.16	2	0	0	0	2	2	0	0	0	2	12.5
Pina	03/19/01	1:31	Shoreline	0.86	50	2	3	0	55	28	2	2	0	32	37.2
South Pina	03/21/01	1:20	Shoreline	1.32	34	18	12	0	64	25	14	7	0	46	34.8
Suicide Cliff	03/13/01	1:37	Shoreline	0.80	9	2	3	0	14	7	1	2	0	10	12.5
Subtotal:		11:09		4.76	128	32	22	6	188	90	26	13	5	134	28.2
South Tinian															
East Puntan Carolinas (1)	03/17/01	1:25	Shoreline	0.22	5	1	2	2	10	3	0	2	2	7	31.8
East Puntan Carolinas (2)	03/17/01	1:18	Shoreline	0.22	1	0	0	0	1	1	0	0	0	1	4.5
East Puntan Carolinas (3)	03/12/01	0:50	Shoreline	0.22	1	0	0	0	1	1	0	0	0	1	4.5
Target Area, Puntan Carolinas	03/13/01	1:20	Shoreline	0.52	35	5	10	1	51	24	4	6	1	35	67.3
Target Area to N14°56.149 Puntan Carolinas	03/14/01	0:53	SingleTow	1.27	12	2	0	0	14	12	2	0	0	14	11.0
Subtotal:		5:46		2.45	54	8	12	3	77	41	6	8	3	58	23.7
West Tinian															
N14°56.149 Puntan Carolinas to Horseshoe Patch Reef	03/14/01	0:40	SingleTow	1.41	3	0	0	0	3	3	0	0	0	3	2.1
Horseshoe Patch Reef	03/14/01	1:00	Snorkle	1.14	3	0	2	0	5	3	0	2	0	5	4.4
Inner Tinian Harbor	03/14/01	0:05	Boat	0.93	3	0	0	0	3	2	0	0	0	2	2.2
Inner Tinian Harbor	03/15/01	0:05	Boat	*0.93	0	1	0	0	1	*0	*1	*0	*0	*1	
Inner Tinian Harbor	03/20/01	0:05	Boat	*0.93	1	0	0	0	1	*1	*0	*0	*0	*1	
Outside Tinian Harbor	03/14/01	0:41	DoubleTow	2.48	19	7	8	0	34	19	7	8	0	34	13.7
Leprosarium and Barcinas	03/14/01	1:32	DoubleTow	3.03	29	14	6	0	49	29	14	6	0	49	16.2
Puntan Lamanibot Sanhilo to Puntan Diablo	03/15/01	2:41	DoubleTow	9.63	29	4	0	0	33	29	4	0	0	33	3.4
Flemming Point	03/13/01	1:18	Shoreline	*0.36	2	0	0	0	2	*2	*0	*0	*0	*2	5.6
Puntan Lamanibot Sanhilo	03/13/01	1:15	Shoreline	*0.57	5	1	4	0	10	*5	*1	*2	*0	*8	14.0
Lamlam to Puntan Lamanibot Sanhilo	03/15/01	0:51	DoubleTow	4.98	5	2	2	0	9	5	2	2	0	9	1.8
Subtotal:		10:13		23.58	99	29	22	0	150	90	27	18	0	135	5.7
TOTALS:		30 hrs 39 mins		33.97	310	71	58	9	448	242	61	40	8	351	10.3

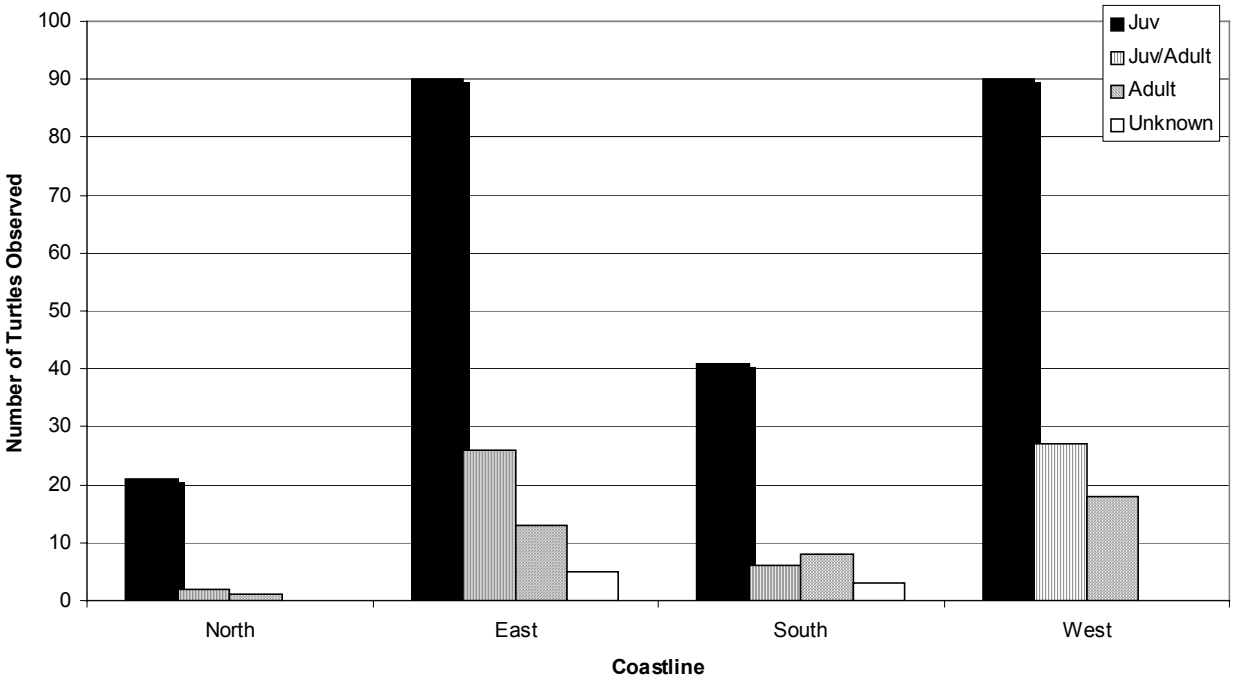

Figure 2: Estimated number of green turtles observed at Tinian Island categorized by size and location.

habitats. Total projected numbers of turtles per kilometer for the entire perimeter of each region are shown in Table 2. Projected turtle densities along the east coast appear to be nearly 1.5 times that of the south, twice that of the north, and 4.5 times that of west coast habitat. Other than general differences in wind and current exposure (Jones et al. 1974) and the presence of a small barrier and patch reef and limited port and human development along the west coast, no major habitat differences were noted between island regions. Survey techniques did, however, differ between regions (Table 1). The total number of green turtles inhabiting Tinian's nearshore environments is projected to be approximately 833 turtles.

Table 2: Projected green turtle densities and abundance for Tinian Island.

Region	Total Perimeter (km)	Estimated No. Turtles Observed	Perimeter Surveyed (%)	Mean Projected No. Turtles / km	Total Projected No. Turtles
North	4.35	24	73.3	13.9	60
East	20.90	134	22.8	26.6	555
South	4.50	58	54.4	17.1	72
West	24.83	135	88.7	5.9	145
Total:	54.58	351	59.4	15.3	833

Actual numbers of turtles observed and estimates of turtles per kilometer for each transect suggested multiple high density turtle areas including Puntan Tahgong and Tahgong at north Tinian, all east sites surveyed (with the possible exception of Blowhole and Unai Masalok), East Puntan Carolinas (1), Target Area at Puntan Carolinas and the Target Area to N14^{O}56.149 at south Tinian, and the reef area outside of Tinian Harbor, Leprosarium and Barcinas, and Puntan Lamanibot Sanhilo, west Tinian (Table 1). The potential for tagging turtles in each area is

considered in the Appendix. In general, hand capture of turtles by experienced fishermen appears feasible for most high turtle density areas. Tangle nets might be successfully employed in the inner harbor. The vast majority of Tinian's coastline is fished regularly by spear-fishermen day and night. Nighttime work may increase catch success.

4.1.2 Aguijan

Fourteen individual *Chelonia mydas* were observed at Aguijan during tow surveys covering approximately 95 % of Aguijan's roughly 12.6 km of total shore and outer reef perimeter (Table 3). No other turtle species were observed. Twelve of the 14 turtles (86 %) were juveniles and the remaining two turtles (14 %) were classified as adults. Six of the turtles were very small with at least two having estimated CCLs below 45 cm. Twenty-nine percent of the turtles were located on both north and east sides of the island (4 turtles each), while 21 % (3 turtles each) were encountered in south and west side environments.

Table 3: Observations of green turtles, *Chelonia mydas,* at Aguijan Island, CNMI.

Region	Date	Max. Time (hrs:mins)	Method	Transect Length (km)	Number of Observations Juv.	Juv./ Adult	Adult	Total	Turtles per km
North	03/20/01	1:07	Tow	3.69	4	0	0	4	1.1
East	03/20/01	0:44	Tow	2.56	2	0	2	4	1.6
South	03/20/01	0:57	Tow	3.63	3	0	0	3	0.8
West	03/20/01	0:22	Tow	2.16	3	0	0	3	1.4
	Total:	3:10		12.03	12	0	2	14	1.2

Total projected numbers of turtles per kilometer for the entire perimeter of each region of Aguijan are shown in Table 4. Both observed and projected turtle densities are low and differ little between general island regions. The total number of green turtles inhabiting Aguijan's nearshore environment is projected to be approximately 19 turtles.

Table 4: Projected green turtle densities and abundance for Aguijan Island.

Region	Total Perimeter (km)	Estimated No. Turtles Observed	Perimeter Surveyed (%)	Projected No. Turtles / km	Total Projected No. Turtles
North	3.69	4	100	1.5	5
East	2.56	4	100	2.1	5
South	3.63	3	100	1.1	4
West	2.76	3	78.3	1.8	5
Total:	12.64	14	95.2	1.5	19

4.1.3 Summaries and Projections for Surveyed Southern Mariana Islands

Presuming limited migration between islands has occurred, 543 individual green turtles have been observed in surveys of four of the CNMI southern arc islands between 1999 and 2001 (Table 5). Overall, juvenile turtles have accounted for 67 % of the turtles observed, juvenile/adults for 18 %, and adult sized turtles for 12 %, with sizes of three percent of the turtles remaining unclassified. Juveniles have dominated in all island surveys and their relative proportions are significantly negatively correlated with total island and reef perimeter (Pearson's

r = -0.9672, P = 0.0328; see Table 6 for perimeter estimates). The proportion of adult sized turtles was below 15 % for all islands and was not significantly related to island and reef circumference (Pearson's r = 0.4809, P = 0.5191).

Table 5: Size distributions of green turtles, *Chelonia mydas*, at surveyed CNMI southern arc islands.

Island	No. Turtles	Percentage of Turtles Observed				Reference
		Juv.	Juv./ Adult	Adult	Unknown	
Farallon de Medinilla	9	100	0	0	0	Dollar and Stefansson (2000)
Saipan	169	60	22	12	6	Kolinski et al. (1999, 2001)
Tinian	351	69	17	11	2	This study
Aguijan	14	86	0	14	0	This study
Total:	543	67	18	12	3	

Total projected numbers of turtles per kilometer for the entire perimeter of each island are shown in Table 6. Projected densities and abundances are highest for the large islands of Tinian and Saipan and are exceedingly low for Aguijan and Farallon de Medinilla. Turtle densities at Tinian are estimated to be twice that of Saipan and an order of magnitude greater than those of Aguijan and Farallon de Medinilla. The estimated abundance of Tinian turtles is 1.5 times that of Saipan, 44 times that at Aguijan and 83 times that at Farallon de Medinilla. Island and reef perimeter are not significantly correlated with projected turtle densities (Persons r = 0.7240, P = 0.2760) or abundance (Pearson's r = 0.8673, P = 0.1327). A total of 1436 green turtles are estimated to inhabit nearshore environments of the surveyed southern arc islands. Suggested resident population structures based on projected abundances and size distributions are presented in Figure 3.

Table 6: Projected green turtle densities and abundances at surveyed CNMI southern arc islands. Calculations for Farallon de Medinilla and Saipan based on data from Dollar and Stefansson (2000) and Kolinski et al. (1999, 2001).

Island	Total Perimeter (km)	Estimated No. Turtles Observed	Perimeter Surveyed (%)	Projected No. Turtles / km	Total Projected No. Turtles
Farallon de Medinilla	6.7	9	94.6	1.5	10
Saipan	75.2	169	47.7	7.6	574
Tinian	54.6	351	59.4	15.3	833
Aguijan	12.6	14	95.2	1.5	19
Total:		543			1436

4.2 Relevant Algae and Seagrasses Identified in Tinian's Nearshore Environment

A compilation of data from this and previous marine plant and algae surveys indicated the presence of at least 24 species of algae that have been identified as green turtle forage in other parts of the world (Table 7). Eleven (46 %) of the species are Chlorophytes, three (13 %) are Phaeophytes, and 10 (42 %) are Rhodophytes. Eight (33 %) of the species were located at east coast survey areas, one species (4 %) at a south coast site, and 22 (92 %) were noted along the west coast.

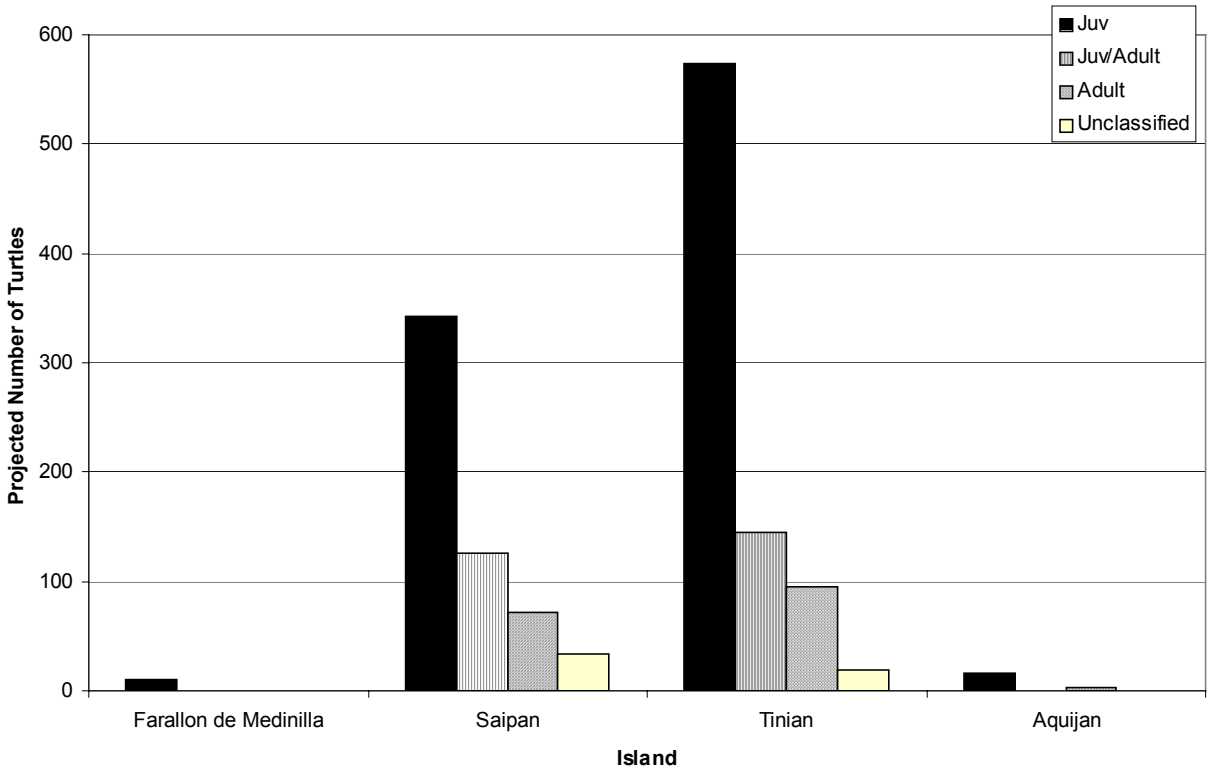

Figure 3: Projected population structures of *Chelonia mydas* at surveyed CNMI southern arc islands.

The presence of seagrasses in Tinian's nearshore environment is limited. Small beds of *Enhalus acoroides* exist in the narrow embayment at Unai Chiget (Eldredge and Randall 1980, pers. obs., see also Fosberg et al. 1987 and Tsuda and Kamura 1990). *Halophila minor* was identified in localized patches inside Tinian/San Jose Harbor by Jones et al. (1974, see also Maragos 1985, Tsuda and Kamura 1990). However, neither species is reported by Hirth (1997) to have been identified as material ingested by green turtles.

Pertinent literature examined (Jones et al. 1974, Gilbert 1978, Itono 1980, Tsuda and Wray 1977, Tsuda et al. 1977, Eldredge and Randall 1980, Tsuda 1981, Fosberg et al. 1987, Tsuda 1988, Tsuda and Kamura 1990, Sonoda 1990) made no reference to marine plant and algae species which likely serve as green turtle forage in Tinian's north and south coast nearshore areas. Algae were collected from none of the north coast transects, and only one south coast site in this survey. No listings of relevant algae collections from Aguijan were found.

5. DISCUSSION

5.1 CNMI Turtles

Of the four species of turtles (*Chelonia mydas*, *Eretmochelys imbricata*, *Dermochelys coriacea*, and *Lepidochelys olivacea*) reported from CNMI waters (Pritchard 1982, NMFS & USFWS 1998a, 1998c), only *Chelonia mydas* has been observed in recent surveys (Pultz et al. 1999, Kolinski et al. 1999, Dollar and Stefansson 2000, Kolinski this study). Although the absence of

Table 7: Tinian marine algae that are listed by Hirth (1997) as green turtle forage ([1] = Jones et al. 1974; [2] = Jones et al. 1974 with location identified by R. Tsuda pers. comm.; [3] = Sonoda 1990; [4] = present study.)

Classification	Location and Reference
Chlorophyta	
Bryopsis pennata	Horseshoe Patch Reef [3], Tachungnya region [3], West Tinian
Caulerpa cupressoides	Unai Chiget [4], Unai Dangkolo [4], East Tinian Tachungnya region [3], Peipeinigul Bay [1], West Tinian
Caulerpa racemosa	Unai Dangkolo [1, 4], Unai Masalok [4], East Tinian Puntan Carolinas Target Area [4], South Tinian Horseshoe Patch Reef [3, 4], Inside San Jose Harbor [1, 4], Peipeinigul Bay [1], Atgidon [2], West Tinian
Caulerpa sertularioides	Inside San Jose Harbor [1], Peipeinigul Bay [1], West Tinian
Caulerpa urvilliana	Unai Dangkolo [1], East Tinian
Codium arabicum	Cave Beach [2], West Tinian
Codium edulae	San Jose Harbor Entrance [4], Barcinas Region Peipeinigul Bay [4], Puntan Lamanibot Sanhilo [4], West Tinian
Dictyosphaeria cavernosa	Puntan Masalok [2], East Tinian Inside San Jose Harbor [1], Atgidon [2], Unai Chulu [4], West Tinian
Dictyosphaeria versluysii	Unai Dangkolo [1], East Tinian Horseshoe Patch Reef [3], Tachungnya region [3], Outside San Jose Harbor [1], Peipeinigul Bay [1], Atgidon [2], Lamanibot Bay [1], West Tinian
Ulva lactuca	Tachungnya region [3], West Tinian
Valonia aegagropila	Tachungnya region [3], West Tinian
Phaeophyta	
Hydroclathrus clathratus	Inside San Jose Harbor [1], West Tinian
Padina australis	Unai Chiget [4], East Tinian
Turbinaria ornata	Horseshoe Patch Reef [3], Peipeinigul Bay [1], Atgidon [2], Unai Chulu [4], West Tinian
Rhodophyta	
Acanthophora spicifera	Unai Dangkolo [4], East Tinian Inside San Hose Harbor [4], West Tinian
Amansia glomerata	Atgidon [2], West Tinian
Centroceras clavulatum	Tachungyna region [3], Peipeinigul Bay [1], West Tinian
Champia parvula	Outside San Jose Harbor [1], Unai Chulu [4], West Tinian
Gelidiella acerosa	Horseshoe Patch Reef [3], Tachungyna region [3], West Tinian
Halymenia floresia	Atgidon [2], West Tinian
Hypnea cervicornis	Horseshoe Patch Reef [3], Tachungyna region [3], Inside San Jose Harbor [1], Outside San Jose Harbor [1], Lamanibot Bay [1], West Tinian
Leveillea jungermannioides	Unai Chiget [4], Unai Dangkolo [1, 4], East Tinian San Jose Harbor Entrance [4], Unai Chulu [4], West Tinian
Spyridia filamentosa	Inside San Jose Harbor [1,4], Atgidon [2], West Tinian
Tolypiocladia glomerulata	Outside San Jose Harbor [1], Peipeinigul [1], West Tinian

observations of hawksbill turtles is discouraging given their highly endangered worldwide status (NMFS & USFWS 1998b), there is no evidence to suggest this species occurred in high numbers in this region in the past (McCoy 1997, Kolinski et al. 2001, see also Wiles et al. 1990). While green turtles may be common to CNMI southern arc waters, hawksbills should be classified as extremely rare. Leatherback presence within the region is pelagic and transient (NMFS & USFWS. 1998c), and olive ridelys are presumed to be waifs (see NMFS & USFWS. 1998d).

The findings at Tinian and Aguijan correspond well with reported local observations of relative turtle abundance and distributions (see Appendix). However it is important to impress that error associated with the estimates and projections in these surveys is difficult to ascertain without replication of transects, strict comparisons of differing methodologies and determination of error associated with each method in different habitats. Undoubtedly the estimates presented would benefit greatly if combined with long-term tagging studies. Nevertheless, some understanding of turtle demographics within the region is gained. In general, the small uninhabited islands of the CNMI southern arc appear to support tens of turtles, turtle numbers around the larger inhabited islands range in the hundreds, while the CNMI portion of the southern arc (which includes Rota) likely supports between 1000 and 2000 resident turtles. Estimates of turtle numbers in the remainder of the archipelago, including Guam, Rota and islands of the northern arc, are lacking (Rota has recently been surveyed and preliminary numbers appear to correspond fairly well with present projections, Larry Ilo, pers. comm.). Resident turtles (Prichard 1982, Eckert 1991, McCoy 1997, Jacinto Taman, Saipan DFW Fisheries Officer, pers. comm.) and various types of potential forage (e.g. Tsuda 1969, 1981, 1982, 1988, Tsuda and Tobias 1977a, 1977b, Tsuda and Wray 1977, Tsuda et al. 1977, Fosberg et al. 1987, Randall and Smith 1988, Smith et al. 1989, Tsuda and Kamura 1990) have been noted at these localities.

The predominance of juveniles at each of the four islands is interesting and in need of further investigation through direct tagging and measurement of turtles. The structure of resident populations in other areas of the world varies and includes populations which are overwhelmingly juvenile, those which are well mixed, and some which are primarily adult (reviewed by Hirth 1997). The absence of equitable numbers of adults in this survey may reflect size-age-survivorship relationships, migration of breeding adults to distant home rookeries, and/or differential distributions of size classes amongst the islands. Anatahan Island, for example, has been reported to host predominantly large green turtles (Jacinto Taman, Saipan DFW Fisheries Officer, pers. comm.). Observation of turtles estimated to be below 45 cm in CCL suggests recent recruitment to the Tinian and Aguijan turtle population(s). A predominance of juveniles of various sizes supports a conclusion of recurrent recruitment.

A comparison of turtle distributions within and between Tinian and Saipan (see Kolinski et al. 2001) in relation to the types of forage available, in combination with direct observations of turtle feeding at Tinian (Appendix) and reported seagrass and relevant algae distributions within the CNMI (e.g. Tsuda 1969, 1981, 1982, 1988, Jones et al. 1974, Tsuda and Tobias 1977a, 1977b, Tsuda and Wray 1977, Tsuda et al. 1977, Fosberg et al. 1987, Randall and Smith 1988, Smith et al. 1989, Tsuda and Kamura 1990, Sonoda 1990, Kolinski et al. 2001), strongly suggests that marine algae act as the predominant source of nutrition for the majority of green turtles within the region (note: the extent of animal matter in CNMI green turtle diets is, perhaps wrongly, presumed to be minimal; see Bjorndal 1997, Hirth 1997). Although migration to west

Saipan or Guam seagrass pastures is possible, such activity by high numbers of turtles would undoubtedly be observed and no reports of such have been encountered. In addition, studies on resident turtles in other Pacific populations suggest long-term site fidelity to local resting and foraging areas having sizes on the order of two to tens of kilometers squared (Balazs 1980, 1982, Balazs et al. 1987, Limpus et al. 1994, Musick and Limpus 1997). Diets consisting primarily of algae are quite common for green turtles in other areas of the world (reviewed by Mortimer 1982, Bjorndal 1997, Hirth 1997). This doesn't, however, negate a role for seagrasses in CNMI green turtle ecology. Examination of the stomach contents from a single deceased turtle located in Tanapag lagoon on Saipan's west shore found nearly 100 % of the locally abundant seagrass *Halodule uninervis* with only trace elements of the algae species *Acanthophora spicifera* and *Acrochaetium* sp. (identified by Dr. Dennis J. Russell, American University of Sharjah, United Arab Emirates). In addition, examination of cropped blades in *Halodule uninervis* pastures in Garapan lagoon Saipan suggested green turtle feeding (pers. obs.). A potential to migrate to alternative habitats with growth (see Hirth 1997**)** may mean that, over time, various turtles may be in a position to utilize CNMI seagrass resources**.** Bjorndal (1997) indicates that the adaptation of gut microbial communities to either algae, seagrass or some combination of both may influence diet selection but is not likely to overwhelm optimal foraging strategy. Turtles likely feed on what is locally available, and distributions of turtles may be driven primarily by availability and proximity of suitable foraging and resting habitats (see Balazs et al. 1997), the conditions of which may be subject to change with time.

It is presently difficult to explain the contrast between the inhabited islands of Saipan and Tinian with regards to observed and projected turtle densities and overall abundance. Saipan is the center of tourism, manufacturing and development within the CNMI, with a resident human population roughly 18 times larger than that of Tinian (McCoy 1997). In general, assessments on both islands (Kolinski et al 1999, Kolinski this study) found turtle densities to be greatest along the east coasts, corresponding with relatively low levels of human access and development. Turtle poaching occurs on both islands (McCoy 1997). A human relationship to turtle densities is thus suggestive. However, a finer scale examination of island distributions shows high turtle abundance and density just outside of Tinian Harbor, reports of turtles within the harbors of both islands, and a suggested relationship between turtle distributions and topographical complexity (vertical relief) of the benthos along the west coast of Saipan (Kolinski et al. 1999, 2001). In addition, low numbers and densities of turtles at the uninhabited islands of Farallon de Medinilla and Aguijan suggest additional factors, perhaps food availability, habitat preference, predator concentrations, and possibly relative exposure to recruitment, may act to determine distributions and thus may confound any potential relationship which exists between levels and types of human development and nearshore turtle abundance. Yet even Farallon de Medinilla (a military bombardment range) and Aguijan (reportedly subject to turtle poaching) are not immune from human disturbance. Unfortunately, the number of inhabited islands surveyed within the region is too few. Full-scale assessments of resident turtles in the remaining islands of the southern arc (Rota and Guam), as well as inhabited islands in the northern arc (Anatahan, Alamagan and Agrihan) may provide the data necessary to statistically examine regional human and turtle density relationships

The size of the resident population(s) at Tinian and Saipan greatly contrasts with the number of turtles believed to nest within the region (Wiles et al. 1989, Pultz et al. 1999, Kolinski et al. 2001). Given the suggested status of all turtle species in the area, the suggestion that Rota

supports few nesting turtles (Wiles et al. 1990, McCoy 1997), and that beaches on Farallon de Medinilla and islands of the northern arc may be unsuitable for turtle nesting (Dollar and Stefasson 2000, McCoy 1997), the CNMI as it relates to turtles might presently be classified as primary green turtle foraging habitat with a minor green turtle nesting component. Such classification in no way diminishes the importance of CNMI nesting habitat or its potential to support other turtle species, but it does highlight a direction for future investigative focus.

The criteria for de-listing a sea turtle species from protected status for any geographic region covered under the U.S. Endangered Species Act of 1973 mandate an extensive understanding of local and regional turtle abundances, dynamics, and habitat characteristics including carrying capacities and habitat stabilities (see NMFS & USFWS 1998a, McCoy 1997). Repetition and expansion of surveys focusing on resident turtles and their habitats throughout the CNMI will thus be critical to determining the CNMI's status with regards to resident green turtle "recovery". Localized concentrations of green turtles at Tinian and Saipan (Kolinski et al. 1999) appear accessible and high enough to support long-term investigative research in the dynamics of local abundance, growth rates, food preference and utilization, local and long-range migration, and identification of the genetic structure of the resident turtle population(s). Access to the majority of the remaining CNMI islands, however, may limit monitoring of turtle status in the remainder of the archipelago to infrequent short-term surveys. Additional habitat assessments will be necessary to estimate food abundance and carrying capacity for all islands within the CNMI. These suggested processes will require a long-term commitment of funding and expertise, but may begin to address the current concerns of local residents: many of whom would like to see turtle numbers remain or increase, but who also dislike the legal prohibition on access to turtles as a resource, especially given that prohibition appears to have been based (whether rightly or wrongly) on a very anecdotal understanding of local availability.

5.2 Recommendations

The potential for broadening sea turtle research efforts within the CNMI is immense. The resident turtle population is large and appears concentrated enough at Tinian and Saipan to allow for viable tag and release efforts. Institutions at Saipan (Division of Fish and Wildlife) and Tinian (Department of Land and Natural Resources, Department of Public Safety) possess facilities, boats, some equipment, and the interest necessary to initiate and support an expansion of research on turtles within the region. Given the preliminary findings and projections on resident turtle status at southern arc islands, the need for confirmation of findings, an assessment of dynamics, and in-depth investigations of habitat characteristics including food abundance and estimates of carrying capacities, the lack of knowledge concerning turtle population status and dynamics at northern arc islands, and continued local interest in re-initiating traditional usage of turtles as a resource, it is recommended that additional research on sea turtles be conducted in this region. More specific recommendations are listed below (note: recommendations for each transected area are located in the conclusion sections of the Appendix).

1. Continue monitoring of resident sea turtles using the methods and locations identified in this and previous surveys on at least a quarterly basis to confirm preliminary findings, determine variability, and establish peak times of abundance. Expand to other island areas if possible.

Long-term monitoring of island transects are needed to estimate population stability and dynamics.

2. Conduct benthic surveys along the north, east and south coasts of Tinian and the east coast of Saipan using tow, snorkel and or SCUBA methods. Describe identified sea turtle resting habitats and collect marine plant and algae samples for identification.

3. Initiate tag and release efforts at high density turtle areas identified in this and previous surveys. Deploy tangle nets where feasible and monitor appropriately.

4. In addition to multiple tagging and measuring, small pieces of hind-flipper should be collected from captured turtles, stored in salt preservative, and sent for genetic analysis.

5. Captured turtles should be examined for lesions, and lesion biopsies taken and sent for histological analysis.

6. Attempts should be made to collect and identify ingested forage from both captured and stranded turtles.

7. A full-scale investigation of algae and seagrass distributions and abundances for all CNMI nearshore environments is warranted to estimate food availability and potential green turtle carrying capacities.

8. On site training by individuals experienced with the equipment and techniques needed to carry out the above recommendations will be necessary.

9. Paid involvement of local fishermen and turtles poachers in tag and release efforts will allow for utilization of their water skills and an opportunity to share a conservation ethic.

10. All above efforts should be expanded to include resident sea turtle populations on other islands within the archipelago, with an initial focus directed towards the islands of Rota, Anatahan, Alamagan, Agrihan and Guam. Tag and release of turtles in neighboring island habitats will allow for elucidation of potential turtle movements between islands, and regional assessments to be made.

11. Continue monitoring of Tinian and Saipan nesting beaches with a focus on recording crawl activity and obtaining adult/hatchling tissue samples for genetic analysis. Initiate a nesting turtle monitoring program on Rota, and interview residents of inhabited northern arc islands to document local knowledge concerning potential nesting activities of turtles at northern arc islands.

12. Coordinate with agencies on green turtle nesting islands throughout Micronesia and the western Pacific in an effort to collect tissue from breeding turtles/hatchlings for genetic analysis. Genetic profiling of regional breeding and resident populations is key to identifying source sink relationships and thus elucidating potential population impacts across political

boundaries. Such information may provide the basis for international cooperation in turtle research and management for coastal areas in the western Pacific.

13. Technical assistance with data base establishment and maintenance is warranted.

14. Establish funding sources for long-term monitoring of sea turtles in this region. Potential funding sources include the local governments, the U.S. Federal Government, the South Pacific Regional Environmental Programme, and various private organizations.

ACKNOWLEDGMENTS

This research was supported by a contract (40JJNF000136) from the National Marine Fisheries Service, Southwest Fisheries Science Center Honolulu Laboratory. I extend my fondest appreciation to the following people who participated in one or more aspects of this project: George Balazs (Honolulu, NMFS), Larry Ilo (Saipan, DFW Fisheries Technician), John Manglona (Saipan, DFW Conservation Supervisor), Frank Rasa (Saipan, DFW Conservation Officer), Henry King (Tinian, DLNR Conservation Officer), Alfonso Reyes (Tinian, DLNR Conservation Officer), Don Reyes (Tinian, DLNR Conservation Officer), Elvin Masga (Tinian, DLNR Conservation Officer), Jesse Pangelinan (Tinian, DLNR Conservation Officer), Jennifer E. Smith (Phycologist, University of Hawaii), Ray Aldan (Boating Safety), Gus Dusalua (Fire Rescue), Wayne Villagomez (Sergeant Boating Safety), Mayor Francisco M. Borja (Tinian), Councilman Tony Borja (Tinian), Senator David Cing (Tinian), Former Senator Henry San Nicholas (Tinian, Personnel), Director Richard Seman (Saipan, DFW), Resident Director Norman Manglona (Tinian, DLNR), Director Peter Cruz (Tinian, DPS), Jack Borja (Tinian, Gaming Commission), Joe San Nicholas (Tinian, Gaming Commission), Henry Cabrera (Tinian, DLNR Conservation Supervisor), Joe Ruak (Saipan, Information and Education Specialist, DFW), Jacinto Taman (Saipan, DFW Fisheries Officer), Mike Trianni (Saipan, DFW Fisheries Biologist), Raymond dela Cruz (Tinian, Volunteer), Dr. Evelyn Cox (Hawaii Institute of Marine Biology), Dr. Roy Tsuda (University of Guam)**,** Mike McCoy (Kona, Hawaii, Biologist and Fisheries Consultant), the staff of the Saipan Division of Fish and Wildlife, Tinian Department of Land and Natural Resources, and Tinian Department of Public Safety. All are acknowledged and thanked for their contributions and assistance.

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APPENDIX

SITE DESCRIPTIONS, ACCESSIBILITY, SOURCES OF INFORMATION, AND RAW DATA

Date: **03/15/01**
Type: **Tow**
Location: **Puntan Tahgong to Lamlam, North Tinian**

Site Description: Shoreline is characterized by low rocky limestone (roughly five meters above sea level) and narrow intertidal benches, with the exception of Unai Lamlam where medium to coarse grain sand, rubble and rock is present. Limited shallow water reefs and boulder zones extend roughly 10 to 25 m offshore. Limestone pavement with scattered corals and boulders slopes to depths exceeding 18 m roughly 125 m offshore and 37 m approximately 300 m offshore. Accumulated benthic sand deposits are found within the Unai Lamlam region. Green turtle nesting at Unai Lamlam has been reported (Wiles et al. 1989, Pultz et al. 1999). No stream entrances observed within the region. Swell one to two meters. Winds brisk. Visibility 35 plus meters. Limited photos available.

Access: The area is easily accessible by boat with estimated travel time from San Jose approximately 45 minutes (DPS 31 ft. Fountain). Land access to the Cross Point area is described elsewhere. Unai Lamlam was not approached by land in this survey, but presumably can be reached by car along a paved and then gravel/grass road. A short hike is likely required. Land access to the shoreline between these points is restricted and requires hiking from either point or swimming in from a boat.

Description of Methodology: Two boats (31 ft. Fountain and a 14 ft. whaler) were used in this survey. Two people were towed in back of each boat, with the whaler surveying shallower environments maintaining distances from shore approximately 50 to 100 m, and the Fountain surveying deeper environments 50 m offshore of the whaler. When a turtle was sighted the boat was stopped and the species, size, activity, time, depth and habitat characteristics were relayed to a recorder on the boat. Latitude and longitude were noted at the location where each turtle was encountered using a GPS unit (only one GPS unit was available). In addition, boat observers searched the waters surface for turtle ascents. Communication of turtle sightings between boats ensured multiple reports of individual turtles did not occur.

Personnel: Ray Aldan, Gus Dusalua, Henry King, Alfonso Reyes, Don Reyes, Elvin Masga, Jesse Pangelinan, Larry Ilo, John Manglona, Frank Rasa, Steve Kolinski

Source of Information: This location was suggested by Gus Dusalua (DPS Fire Rescue, Fisherman) who reported seeing turtles from cross point south both east and west while fishing. Green turtle nesting at Unai Lamlam has be reported (Wiles et al. 1989, Pultz et al. 1999).

Type: **Tow**
Observers: Ray Aldan, Jesse Pangelinan, Alfonso Reyes, Larry Ilo, John Manglona
Location: **Puntan Tahgong to Lamlam, Deep Transect**
Tide: Medium rising, 2 days before half moon (neap) towards new.

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
10:09	15°06.056	145°38.432	11.6							START: Just of Cross Point.
10:40				1	Gn	Juv	Swimming	30	Hardpan, sand	Lamlam area.
10:54	15°05.079	145°37.498								STOP: End transect south of Unai Lamlam.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
				1	Gn	Juv		
0:45	1	Gn	Juv				2.450	0.4

Type: **Tow**
Observers: Gus Dusalua, Don Reyes, Elvin Masga, Frank Rasa, Steve Kolinski
Location: **Puntan Tahgong to Lamlam, Shallow Transect**
Tide: Medium rising, 2 days before half moon (neap) towards new.

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
10:09	15°06.056	145°38.432	11.6							START: Just of Cross Point.
10:42	15°05.322	145°37.901	4.0							Lamlam area.
10:53	15°05.148	145°37.617	3.7							
10:54	15°05.079	145°37.498								STOP: End transect south of Unai Lamlam.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
0:45	0			**0**	2.450	0.0

Summary:

Max. Time (hrs:mins)	Tot. Obs.	Species	Size	Total Estimated Number of Turtles Observed			Tot. Transect Length (km)	Turtles per km
0:45	1	Gn	Juv	**1**	**Gn**	**Juv**	2.450	0.4

Conclusion: In contrast to expectations based on local observations, only one turtle was observed along this northwest transect. This may be due to a number of factors including (1) our inability to survey further inshore due to swell conditions (cliffline surveys along the north and northeast coasts found the vast majority of turtles inhabiting reef edge environments which are close to shore) and/or; (2) the potential movement of turtles within the region (local observations occurred mainly at night on different dates). Additional surveys covering different hours, moon, tide phases and months are needed to determine variability and establish peak times of abundance. Efforts to tag turtles within this area are not recommended at this time.

Date: **03/16/01**
Type: **Cliffline**
Location: **Puntan Tahgong (Cross Point), North Tinian**

Site Description: Five cliffline stations spread to the southeast of Cross Point. Low lying convoluted limestone shoreline two to three meters above sea level. Narrow intertidal bench extends up to five meters in some areas. Reef evident to 40 plus meters. Benthic features beyond the reef edge could not be viewed. Map bathymetry suggests a steep drop-off beyond the reef reaching 32 m depth roughly 150 m from shore and 166 m depth approximately 330 m from shore. No stream entrances noted within the region. Ocean conditions rough with swell 1.2 m and winds brisk. Photos available.

Access: A paved road leads north towards Puntan Tahgong. A right turn off onto a wide, well trimmed grass road leads to Cross Point at the northern tip of the island. Travel time by car from San Jose estimated at 35 minutes. A three minute hike across limestone is necessary to reach the low lying nearshore cliffs. Travel time by boat (31 ft. DPS Fountain) approximately 45 minutes.

Description of Methodology: Cliffline observers sketched the shoreline and submerged benthic features within their range of visibility. When a turtle was sighted on the surface or swimming subsurface, the time was noted and binoculars were used to identify species and estimate size. Features such as tail length and any identifying marks were recorded when observed. The estimated surface time and behavior of each turtle was noted when possible, and the location and/or route of each turtle was plotted on the area map sketch and numbered. The location of each observer was measured using a Garmin handheld GPS unit. Environmental conditions and location factors deemed relevant were recorded.

Personnel: Henry King, Don Reyes, Elvin Masga, Jesse Pangelinan, Larry Ilo, John Manglona, Frank Rasa, Steve Kolinski

Source of Information: This location was suggested by Gus Dusalua (DPS Fire Rescue, Fisherman) who reported seeing turtles from cross point south both east and west while fishing.

Location: **Puntan Tahgong (1)** **Lat.** $15^{O}06.060$ **Long.** $145^{O}38.688$ (+/- 4.3 m)
Observer: Larry Ilo

Time	Obs. No.	Species	Size	Notes
9:40				START
11:05				STOP

Tide: Medium rising, 1 day before half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
1:25	0			**0**	0.060	0.0

Location: **Puntan Tahgong (2)** **Lat.** $15^{O}06.053$ **Long.** $145^{O}38.709$ (+/- 8.5 m)
Observer: Elvin Masga, Frank Rasa

Tide: Medium rising, 1 day before half moon (neap) towards new.

Time	Obs. No.	Species	Size	Notes
9:50				START
9:55	1	Gn	Juv	Approx. 55 cm surface 15 m from shore for 5 secs.
10:00	2	Gn	Juv	Approx. 55 cm surface 10 m from shore. Swimming.
10:02	3	Gn	Adult	Approx. 110 cm surface 10 m from shore for 50 secs. Sex unknown.
10:14	4	Gn	Juv	Approx. 50 cm surface 12 m from shore for 20 secs. May be turtle # 2.

Time	Obs. No.	Species	Size	Notes
10:43	5	Gn	Adult	Approx. 100 cm surface 18 m from shore for 35 secs. Sex unknown. May be turtle # 3.
10:55	6	Gn	Juv	Approx. 70 cm 18 m from shore for 6 secs.
11:05				STOP

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:15	4	Gn	Juv	**3**	**Gn**	**Juv**	0.060	66.7
	2	Gn	Adult	**1**	**Gn**	**Adult**		
	6	Gn		**4**	**Gn**			

Location: **Puntan Tahgong (3)** **Lat.** 15^{O}06.028 **Long.** 145^{O}38.741 (+/- 4.3 m)
Observer: Don Reyes, Jesse Pangelinan

Time	Obs. No.	Species	Size	Notes
9:45				START
10:50	1	Gn	Juv	Approx. 50 cm surface 18 m from shore.
11:15				STOP

Tide: Medium rising, 1 day before half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:30	1	Gn	Juv	**1**	**Gn**	**Juv**	0.060	16.7

Location: **Puntan Tahgong (4)** **Lat.** 15^{O}06.003 **Long.** 145^{O}38.765 (+/- 5.2 m)
Observer: John Manglona

Time	Obs. No.	Species	Size	Notes
9:50				START
10:25	1	Gn	Juv	Approx. 60 cm surface 15 m from shore for 2 mins.
11:20				STOP

Tide: Medium rising, Neap

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:30	1	Gn	Juv	**1**	**Gn**	**Juv**	0.060	16.7

Location: **Puntan Tahgong (5)** **Lat.** 15^{O}05.977 **Long.** 145^{O}38.790 (+/- 4.3 m)
Observer: Steve Kolinski

Time	Obs. No.	Species	Size	Notes
9:58				START
10:07	1	Gn	Juv	Approx. 60 cm surface 20 m from shore in surf for 10 secs.
10:10	2	Gn	Juv/Adult	Approx. 70 - 80 cm surface 28 m from shore. Swimming.
10:11	3	Gn	Juv	Approx. 45 - 50 cm surface 25 m from shore off reef edge for 10 secs.
10:28	4	Gn	Juv	Approx. 50 - 60 cm surface 30 m from shore outer edge of wash. May be turtle # 1 or # 2.
11:00	5	Gn	Juv	Size? Surface 25 m from shore for 55 secs.
11:15				STOP

Tide: Medium rising, 1 day before half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:17	4	Gn	Juv	**3**	**Gn**	**Juv**	0.060	66.7
	1	Gn	Juv/Adult	**1**	**Gn**	**Juv/Adult**		
	5	Gn		**4**	**Gn**			

Summary:

Max. Time (hrs:mins)	Tot. Obs.	Species	Size	Total Estimated Number of Turtles Observed			Tot. Transect Length (km)	Turtles per km
1:30	10	Gn	Juv	**8**	**Gn**	**Juv**	0.300	33.3
	1	Gn	Juv/Adult	**1**	**Gn**	**Juv/Adult**		
	2	Gn	Adult	**1**	**Gn**	**Adult**		
	13	Gn		**10**	**Gn**			

Conclusion: Juvenile turtles noted in some abundance scattered along the coastline. Two "adult" sized turtles observed. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Capture and tagging of turtles in this region might be possible by hand if experienced fishermen employed. Nighttime captures might be feasible given appropriate oceanic

Date: **03/19/01**
Type: **Cliffline**
Location: **Tahgong, Northeast Tinian**

Site Description: Four stations spread along the cliffline. Low lying convoluted limestone shoreline two to three meters above sea level. Narrow intertidal bench extends up to five meters in some areas. Reef evident to 20 plus meters. Some boulders evident at reef edge. Benthic features beyond the reef edge could not be viewed. Map bathymetry suggests a steep drop-off just beyond the reef reaching 18 m depth, and 100 m depth approximately 180 m from shore. No stream entrances noted within the region. Swell 0.3 meters, winds light. Photos available.

Access: A paved road leads north towards Puntan Tahgong. A right turn off onto a wide, well trimmed grass road leads to Cross Point at the northern tip of the island. A gravel and grassy road extends to the southeast along the coastline, and widens at the selected site. Travel time by car from San Jose estimated at 40 minutes. A three minute hike across limestone is necessary to reach the low lying nearshore cliffs. Travel time by boat (31 ft. DPS Fountain) approximately 50 minutes.

Description of Methodology: Cliffline observers sketched the shoreline and submerged benthic features within their range of visibility. When a turtle was sighted on the surface or swimming subsurface, the time was noted and binoculars were used to identify species and estimate size. Features such as tail length and any identifying marks were recorded when observed. The estimated surface time and behavior of each turtle was noted when possible, and the location and/or route of each turtle was plotted on the area map sketch and numbered. The location of each observer was measured using a Garmin handheld GPS unit. Environmental conditions and location factors deemed relevant were recorded.

Personnel: Larry Ilo, John Manglona, Frank Rasa, Steve Kolinski

Source of Information: Turtles are noted by fishermen and Conservation Officers to be well distributed along the northeast and east coasts of Tinian.

Location: **Tahgong (1)** **Lat.** $15^{O}05.794$ **Long.** $145^{O}38.960$ (+/- 8.2 m)
Observer: John Manglona

Time	Obs. No.	Species	Size	Notes
17:15				START
17:20	1	Gn	Juv	Approx. 60 cm surfaced 10 m from shore. Same turtle reappeared 3 minutes later.
17:32	2	Gn	Juv	Approx. 70 cm surfaced 12 m from shore for 10 secs.
17:37	3	Gn	Juv	Approx. 65 cm surfaced 15 m from shore for 1 min.
17:47	4	Gn	Juv	Approx. 65 cm surfaced and swimming 5 m from shore for 2 min. May be turtle # 3.
18:25				STOP

Tide: High falling, 2 days past half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:10	4	Gn	Juv	**3**	**Gn**	**Juv**	0.110	27.3

Location: **Tahgong (2)** **Lat.** 15°05.741 **Long.** 145°38.984 (+/- 5.2 m)
Observer: Frank Rasa

Time	Obs. No.	Species	Size	Notes
17:09				START
17:09	1	Gn	Juv	Approx. 50 - 60 cm. Surfaced for 20 secs.
17:10	2	Gn	Juv	Approx. 45 - 50 cm surfaced for 15 secs.
17:15	3	Gn	Juv	Approx. 40 - 50 cm surfaced 20 secs.
17:18	4	Gn	Juv	Approx. 40 - 50 cm surfaced for 30 secs. May be turtle # 3.
17:21	5	Gn	Juv	Approx. 35 - 45 cm surfaced for 20 secs.
17:25	6	Gn	Juv	Approx. 40 - 50 cm surfaced 15 secs.
17:26	7	Gn	Juv/Adult	Approx. 70 - 80 cm surfaced or 5 secs.
17:28	8	Gn	Juv	Approx. 35 - 45 cm surfaced for 10 secs. May be turtle # 5.
17:44	9	Gn	Juv	Approx. 40 - 50 cm surfaced 30 secs. May be turtle # 3.
17:49	10	Gn	Juv	Approx. 35 - 45 cm surfaced for 10 secs.
18:25				STOP

Tide: High falling, 2 days past half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:16	9	Gn	Juv	**6**	**Gn**	**Juv**	0.110	63.6
	1	Gn	Juv/Adult	**1**	**Gn**	**Juv/Adult**		
	10	Gn		**7**	**Gn**			

Location: **Tahgong (3)** **Lat.** 15°05.708 **Long.** 145°39.024 (+/- 4.3 m)
Observer: Larry Ilo

Time	Obs. No.	Species	Size	Notes
17:19				START
17:20	1	Gn	Juv	Juvenile turtle surfaced 20 m from shore for 15 secs.
18:35				STOP

Tide: High falling, 2 days past half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:16	1	Gn	Juv	**1**	**Gn**	**Juv**	0.110	9.1

Location: **Tahgong (4)** **Lat.** 15°05.650 **Long.** 145°39.066 (+/- 3.4 m)
Observer: Steve Kolinski

Time	Obs. No.	Species	Size	Notes
17:15				START
17:39	1	Gn	Juv	Approx. 40 - 50 cm surfaced 6 m from shore for 10 secs.
18:13	2	Gn	Juv	Juvenile turtle swimming subsurface 13 m from shore.
18:16	3	Gn	Juv	Approx. 35 - 45 cm surfaced 8 m from shore. May be # 1.
18:29	4	Gn	Juv	Approx. 35 - 40 cm surfaced 10 m from shore. May be turtle # 3.
18:30				STOP

Tide: High falling, 2 days past half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:15	4	Gn	Juv	**2**	**Gn**	**Juv**	0.110	18.2

Summary:

Max. Time (hrs:mins)	Tot. Obs.	Species	Size	Total Estimated Number of Turtles Observed			Tot. Transect Length (km)	Turtles per km
1:16	18	Gn	Juv	12	**Gn**	**Juv**	0.440	29.5
	1	Gn	Juv/Adult	1	**Gn**	**Juv/Adult**		
	19	Gn		13	**Gn**			

Conclusion: Juvenile turtles noted in abundance scattered along the coastline, with some concentration at Tahgong (2). At least two very small (35 to 45 cm) turtles observed. Only one potential adult sized turtle observed. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Capture and tagging of turtles in this region might be possible by hand if experienced fishermen employed. Nighttime captures might be feasible given appropriate oceanic conditions.

Date: **03/16/01**
Type: **Cliffline**
Location: **Abas Point, Sabanetan Tahgong, East Tinian**

Site Description: Four stations spread along the cliffline. Low lying convoluted limestone shoreline four to five meters above sea level. Narrow intertidal bench extends up to 30 m in some areas with a gradually sloping reef/pavement beyond. Map bathymetry suggests depths exceeding 15 m roughly 250 m from shore and 37 m approximately 400 m from shore. No stream entrances noted within the region. Swell to one meter, winds light.

Access: A paved road leads to the Blowhole exit. A 4WD vehicle is required to proceed along an extremely overgrown non-paved back road along the shoreline towards Abas. Travel time by car from San Jose estimated at 40 minutes. A five minute hike through brush and across limestone is necessary to reach the low lying nearshore cliffs. Travel time by boat (31 ft. DPS Fountain) estimated at approximately 60 minutes.

Description of Methodology: Cliffline observers sketched the shoreline and submerged benthic features within their range of visibility. When a turtle was sighted on the surface or swimming subsurface, the time was noted and binoculars were used to identify species and estimate size. Features such as tail length and any identifying marks were recorded when observed. The estimated surface time and behavior of each turtle was noted when possible, and the location and/or route of each turtle was plotted on the area map sketch and numbered. The location of each observer was measured using a Garmin handheld GPS unit. Environmental conditions and location factors deemed relevant were recorded.

Personnel: Jesse Pangelinan, Don Reyes, Elvin Masga, Steve Kolinski

Source of Information: Turtles are noted by fishermen and Conservation Officers to be well distributed along the east coast of Tinian.

Location: **Abas Point (1)** **Lat.** 15°04.917 **Long.** 145°39.434 (+/- 4.6 m)
Observer: Jesse Pangelinan

Time	Obs. No.	Species	Size	Notes
13:54				START
	1	Gn	Juv/Adult	Approx. 75 cm surfaced 50 m from shore.
	2	Gn	Juv/Adult	Approx. 90 cm surfaced 67 m from shore.
	3	Gn	Juv	Approx. 55 cm surfaced 55 m from shore.
	4	Gn	Juv	Approx. 40 cm surfaced 70 m from shore.
	5	Gn	Juv	Approx. 55 cm surfaced 60 m from shore. May be turtle # 3.
15:01				STOP

Tide: Medium falling, 1 day before half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:07	3	Gn	Juv	**2**	**Gn**	**Juv**	0.11	36.4
	2	Gn	Juv/Adult	**2**	**Gn**	**Juv/Adult**		
	5	Gn		**4**	**Gn**			

Location: **Abas Point (2)** **Lat.** 15°04.859 **Long.** 145°39.431 (+/- 4.0 m)
Observer: Steve Kolinski

Time	Obs. No.	Species	Size	Notes
13:44				START
13:49	1	Gn	Juv/Adult	Approx. 70 - 80 cm surfaced 70 m from shore over reef for 3 mins.
13:54	2	Gn	Juv	Approx. 55 - 60 cm surfaced 100 m from shore for 20 secs.
14:16	3	Gn	Juv	Approx. 45 - 50 cm surfaced 80 m from shore over apparent hardpan.
14:16	4	Gn	Juv	Approx. 50 - 60 cm surfaced 80 m from shore over sand/hardpan. Up at same time as # 3.
14:33	5	Gn	Juv/Adult	Approx. 80 - 90 cm surfaced 100 m from shore for few secs.
14:38	6	Gn	?	Size unknown surfaced 100 m from shore. May be turtle # 5.
14:38	7	Gn	Juv	Approx. 60 cm surfaced 100 m from shore for 20 secs.
14:38	8	Gn	Juv	Approx. 50 cm surfaced for 10 secs. May be turtle # 4.
14:41	9	Gn	Juv	Very small surfaced 60 m from shore for 1 min. May be turtle # 3.
14:49	10	Gn	Juv/Adult	Approx. 80 - 90 cm surfaced 80 m from shore for 30 secs.
14:50	11	Gn	Juv	Swimming submerged 40 m from shore.
14:59				STOP

Tide: Medium falling, 1 day before half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:15	7	Gn	Juv	**5**	**Gn**	**Juv**	0.110	72.7
	3	Gn	Juv/Adult	**3**	**Gn**	**Juv/Adult**		
	1	Gn	?					
	11	Gn		**8**	**Gn**			

Location: **Abas Point (3)** **Lat.** 15°04.817 **Long.** 145°39.426 (+/- 6.1 m)
Observer: Don Reyes

Time	Obs. No.	Species	Size	Notes
13:25				START
14:25	1	Gn	Juv	Approx. 60 cm surfaced 80 m from shore.
14:48	2	Gn	Juv/Adult	Approx. 75 cm surfaced 90 m from shore.
15:00				STOP

Tide: Medium falling, 1 day before half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:35	1	Gn	Juv	**1**	**Gn**	**Juv**	0.110	18.2
	1	Gn	Juv/Adult	**1**	**Gn**	**Juv/Adult**		
	2	Gn		**2**	**Gn**			

Location: **Abas Point (4)** **Lat.** 15°04.? **Long.** 145°39.388 (+/- 4.0 m)

Observer: Elvin Masga

Time	Obs. No.	Species	Size	Notes
13:20				START
13:30	1	Gn	?	Surfaced 60 m from shore.
Time	**Obs. No.**	**Species**	**Size**	**Notes**
14:00	2	Gn	?	Surfaced 25 m from shore for 10 secs.
14:30	3	Gn	?	Surfaced 12 m from shore for 20 secs.
14:50	4	Gn	?	Surfaced 22 m from shore for 30 secs.
15:00				STOP

Tide: Medium falling, 1 day before half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:40	4	Gn	?	**4**	**Gn**	**?**	0.110	36.4

Summary:

Max. Time (hrs:mins)	Tot. Obs.	Species	Size	Total Estimated Number of Turtles Observed			Tot. Transect Length (km)	Turtles per km
1:40	11	Gn	Juv	**8**	**Gn**	**Juv**	0.440	40.9
	6	Gn	Juv/Adult	**6**	**Gn**	**Juv/Adult**		
	5	Gn	?	**4**	**Gn**	**?**		
	22	Gn		**18**	**Gn**			

Conclusion: Juvenile and juvenile/adult turtles noted in abundance scattered along the coastline, with some concentration at Abas Point (2). Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Accessibility problems and general habitat conditions limit the potential for successful tagging efforts within this area. Capture and tagging of turtles might be possible by hand if experienced fishermen employed and work conducted off a large boat. Nighttime captures might be feasible given appropriate oceanic conditions.

Date: **03/17/01**
Type: **Cliffline**
Location: **Blowhole, Sabanetan Chiget, East Tinian**

Site Description: Low lying flattened limestone shoreline two to three meters above sea level. A narrow intertidal bench extends approximately 10 m, and is followed by a gradually sloping reef/pavement 30 to 40 m offshore. Map bathymetry suggests a nearshore six meter depth reaching 11 m roughly 300 m from shore and depths of 37 m 575 m from shore. No stream entrances noted within the region. Swell 1.2 to 1.5 m, winds brisk. Restricted unexploded ordinance boundary bordering the site.

Access: A paved road leads north towards the blowhole. A right turn off onto a wide gravel road leads to a parking area about 100 meters from the site. A one minute hike across flattened limestone is necessary to reach the low lying nearshore cliffs. Travel time by car from San Jose estimated at 25 minutes. Travel time by boat (31 ft. DPS Fountain) estimated at 60 minutes from San Jose.

Description of Methodology: Cliffline observer sketched the shoreline and submerged benthic features within the range of visibility. When a turtle was sighted on the surface or swimming subsurface, the time was noted and binoculars were used to identify species and estimate size. Features such as tail length and any identifying marks were recorded when observed. The estimated surface time and behavior of each turtle was noted when possible, and the location and/or route of each turtle was plotted on the area map sketch and numbered. The location of the observer was measured using a Garmin handheld GPS unit. Environmental conditions and location factors deemed relevant were recorded.

Source of Information: Turtles are noted by fishermen and Conservation Officers to be well distributed along the east coast of Tinian.

Location: **Blowhole** **Lat.** 15°04.468 **Long.** 145°39.357 (+/- 4.3 m)
Observer: Steve Kolinski

Time	Obs. No.	Species	Size	Notes
15:52				START
16:09	1	Gn	Juv	Juvenile surfaced 20 m from shore for 10 to 15 secs.
16:29	2	Gn	Juv	Approx. 50 cm surfaced 30 m from shore for 2 mins. May be turtle # 1.
16:31	3	Gn	Juv	Approx. 50 cm surfaced 20 m from shore for 2 min.
16:54	4	Gn	Juv	Approx. 50 - 60 cm surfaced 20 m from shore for 5 secs.
17:06	5	Gn	?	Unknown size 20 m from shore way down in ordinance area.
17:08				STOP

Tide: Medium falling, day of half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:16	4	Gn	Juv	**3**	**Gn**	**Juv**	0.150	26.7
	1	Gn	?	**1**	**Gn**	?		
	5	Gn		**4**	**Gn**			

Conclusion: Juvenile green turtles observed along the coastline. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Proximity to a zone of unexploded ordinance and general habitat conditions limit the potential for successful tagging efforts within this region.

Date: **03/16/01**
Type: **Cliffline**
Location: **Sabanetan Asiga, East Tinian**

Site Description: Four stations spread along the cliffline. Low lying convoluted limestone shoreline eight to 11 m above sea level. Narrow intertidal bench extends up to 10 m in some areas. Gradual slope of presumed pavement with boulders and sand grooves to 75 m from shore followed by a steep drop off. Map bathymetry suggests depths approaching 10 m 75 m from shore, followed immediately by depths of 22 m. Swell one meter, winds brisk. No stream entrances observed within the area. Photos available. Green turtle nesting reported to the south at Unai Dangkolo (Wiles et al. 1989, Pultz et al. 1999) and to the north at Unai Chiget (Pultz et al. 1999). Algae samples collected from Unai Dangkolo by Jones et al. (1974) noted by Hirth (1997) as green turtle forage.

Access: A paved road can be taken north past Unai Dangkolo. A steep dirt side track (4WD required) leads towards the Asiga shoreline cliffs. A hike across limestone is necessary to reach the cliffs. Travel time by car from San Jose estimated at 35 minutes. Travel time by boat (31 ft. DPS Fountain) estimated at 60 plus minutes.

Description of Methodology: Cliffline observers sketched the shoreline and submerged benthic features within their range of visibility. When a turtle was sighted on the surface or swimming subsurface, the time was noted and binoculars were used to identify species and estimate size. Features such as tail length and any identifying marks were recorded when observed. The estimated surface time and behavior of each turtle was noted when possible, and the location and/or route of each turtle was plotted on the area map sketch and numbered. The location of each observer was measured using a Garmin handheld GPS unit. Environmental conditions and location factors deemed relevant were recorded.

Personnel: Jesse Pangelinan, Don Reyes, Elvin Masga, Steve Kolinski

Source of Information: Turtles are noted by fishermen and Conservation Officers to be well distributed along the east coast of Tinian. The Asiga region north of Unai Asiga was particularly noted as a turtle area by Gus Dusalua (DPS Fire Rescue, Fisherman) who fishes in the area. Turtle nesting noted north and south of site (Wiles et al. 1989, Pultz et al. 1999). Algae samples collected south of site (Jones et al. 1974) noted by Hirth (1997) as green turtle forage.

Location: **Asiga (1)** **Lat.** $15^{O}02.955$ **Long.** $145^{O}39.066$ (+/- 6.1 m)
Observer: Jesse Pangelinan
Tide: Medium falling, 1 day before half moon (neap) towards new.

Time	Obs. No.	Species	Size	Notes
16:13				START
16:54	1	Gn	Juv	Approx. 50 cm. Surfaced 20 m from shore.
16::58	2	Gn	Juv/Adult	Approx. 90 cm. Surfaced 45 m from shore.
17:03	3	Gn	Juv	Approx. 65 cm. Surfaced 15 m from shore.
	4	Gn	Adult	Approx.95 cm. Surfaced 80 m from shore. Sex unknown.
	5	Gn	Juv	Approx. 45 cm. Surfaced 30 m from shore.
	6	Gn	Juv/Adult	Approx. 80 cm. Surfaced 50 m from shore.
	7	Gn	Juv/Adult	Approx. 90 cm. Surfaced 60 m from shore. May be turtle # 2.
17:15				STOP

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:02	3	Gn	Juv	**3**	**Gn**	**Juv**	0.100	60.0
	3	Gn	Juv/Adult	**2**	**Gn**	**Juv/Adult**		
	1	Gn	Adult	**1**	**Gn**	**Adult**		
	7	Gn		**6**	**Gn**			

Location: **Asiga (2)** **Lat.** 15°02.911 **Long.** 145°39.031 (+/- 4.9 m)
Observer: Steve Kolinski

Time	Obs. No.	Species	Size	Notes
16:10				START
17:05	1	Gn	Juv	Approx. 35 - 40 cm. Surfaced 12 m from shore for 18 secs.
17:09	2	Gn	Juv	Approx. 35 - 40 cm. Surfaced 20 m from shore for 25 secs.
17:24				STOP

Tide: Medium falling, 1 day before half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:14	2	Gn	Juv	**2**	**Gn**	**Juv**	0.100	20.0

Location: **Asiga (3)** **Lat.** 15°02.870 **Long.** 145°38.994 (+/- 6.1 m)
Observer: Don Reyes

Time	Obs. No.	Species	Size	Notes
15:45				START
17:00				STOP

Tide: Medium falling, 1 day before half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
1:15	0			**0**	0.100	0.0

Location: **Asiga (4)** **Lat.** 15°02.859 **Long.** 145°38.986 (+/- 11.6 m)
Observer: Elvin Masga

Time	Obs. No.	Species	Size	Notes
15:59				START
16:10	1	Gn	Adult	Large turtle surfaced 37 m from shore for 15 secs. Sex unknown.
16:35	2	Gn	Adult	Large turtle surfaced 40 m from shore for 10 secs. May be turtle # 1.
17:00	3	Gn	Juv	Approx. 50 cm. Surfaced 20 m from shore for 5 secs.
17:14				STOP

Tide: Medium falling, 1 day before half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:15	1	Gn	Juv	**1**	**Gn**	**Juv**	0.100	20.0
	2	Gn	Adult	**1**	**Gn**	**Adult**		
	3	Gn		**2**	**Gn**			

Summary:

Max. Time (hrs:mins)	Tot. Obs.	Species	Size	Total Estimated Number of Turtles Observed			Tot. Transect Length (km)	Turtles per km
1:15	6	Gn	Juv	6	Gn	Juv	0.400	25.0
	3	Gn	Juv/Adult	2	Gn	Juv/Adult		
	3	Gn	Adult	2	Gn	Adult		
	12	Gn		10	Gn			

Conclusion: Turtle abundance along this transect variable. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine time related variability, and establish peak times of abundance. Capture and tagging of turtles might be possible by hand if experienced fishermen employed and work conducted off a large boat. Nighttime captures might be feasible given appropriate oceanic conditions. At least two very small turtles (35 to 40 cm) observed. Recommend surveys north towards Puntan Asiga and Puntan Chiget take place.

Date: **03/19/01**
Type: **Cliffline**
Location: **North Masalok, East Tinian**

Site Description: Five stations spread along the cliffline. Convoluted limestone shoreline four to six meters above sea level. Narrow intertidal bench extends up to 20 m in some areas. Presumed limestone pavement interspersed with boulders and sand filled grooves slopes gradually away from shore. Map bathymetry suggests depths less than or equal to 10 m up to 300 m from shore, followed by a steeper drop-off reaching depths of 37 m roughly 600 m offshore. No stream entrances noted within the region. Unai Dangkolo to the north and Unai Masalok to the south are known to host nesting green turtles (Wiles et al. 1989, Pultz et al. 1999). Algae from Unai Dangkolo collected by Jones et al. (1974) listed by Hirth (1997) as green turtle forage. Additional algae samples collected from Unai Dangkolo and Unai Masalok this survey. Swell one meter, winds variable.

Access: A paved road leads to the Unai Dangkolo turnoff. A fairly smooth dirt and grass back road to the right leads to the turnoff for North Masalok. A five minute hike along a narrow path is necessary to reach the shoreline cliffs. Travel time by car from San Jose estimated at 30 minutes. Travel time by boat (31 ft. DPS Fountain) estimated at approximately 60 plus minutes.

Description of Methodology: Cliffline observers sketched the shoreline and submerged benthic features within their range of visibility. When a turtle was sighted on the surface or swimming subsurface, the time was noted and binoculars were used to identify species and estimate size. Features such as tail length and any identifying marks were recorded when observed. The estimated surface time and behavior of each turtle was noted when possible, and the location and/or route of each turtle was plotted on the area map sketch and numbered. The location of each observer was measured using a Garmin handheld GPS unit. Environmental conditions and location factors deemed relevant were recorded.

Personnel: Henry King, Alfonso Reyes, Don Reyes, Elvin Masga, Jesse Pangelinan, Steve Kolinski

Source of Information: Turtles are noted by fishermen and Conservation Officers to be well distributed along the east coast of Tinian. Green turtle nesting has been reported to the north and south (Wiles et al. 1989, Pultz et al. 1999). Algae samples collected by Jones et al. (1974) from sites to the north listed by Hirth (1997) as green turtle forage in other areas of the world.

Location: **North Masalok (1)** **Lat.** $15^{O}01.591$ **Long.** $145^{O}39.189$ (+/- 5.5 m)
Observer: Alfonso Reyes

Time	Obs. No.	Species	Size	Notes
9:10				START
10:25				STOP

Tide: High falling, 2 days after half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
1:15	0			**0**	0.125	0.0

Location: **North Masalok (2)** **Lat.** 15°01.526 **Long.** 145°39.214 (+/- 7.9 m)
Observer: Henry King

Time	Obs. No.	Species	Size	Notes
9:05				START
10:20				STOP

Tide: High falling, 2 days after half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
1:15	0			**0**	0.125	0.0

Location: **North Masalok (3)** **Lat.** 15°01.460 **Long.** 145°39.214 (+/- 8.5 m)
Observer: Elvin Masga and Don Reyes

Time	Obs. No.	Species	Size	Notes
9:05				START
9:25	1	Gn	Juv	Approx. 50 cm. Surfaced 60 m from shore.
9:25	2	Gn	Juv	Approx. 70 cm. Surfaced 75 m from shore.
10:15				STOP

Tide: High falling, 2 days after half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
1:10	2	Gn	Juv	**2 Gn Juv**	0.125	16.0

Location: **North Masalok (4)** **Lat.** 15°01.422 **Long.** 145°39.224 (+/- 8.8 m)
Observer: Steve Kolinski

Time	Obs. No.	Species	Size	Notes
9:22				START
9:59	1	Gn	Juv	Approx. 40 - 45 cm. Surfaced 20 m from shore for 20 secs.
10:12	2	Gn	Juv	Juvenile green swimming submerged 20 to 30 m from shore.
10:24	3	Gn	Juv	Approx. 40 - 50 cm. Surfaced 30 m from shore swimming seaward.
10:37				STOP

Tide: High falling, 2 days after half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
1:15	3	Gn	Juv	**3 Gn Juv**	0.125	24.0

Location: **North Masalok (5)** **Lat.** 15°01.364 **Long.** 145°39.275 (+/- 6.7 m)
Observer: Jesse Pangelinan

Time	Obs. No.	Species	Size	Notes
9:30				START
9:44	1	Gn	Juv	Approx. 50 cm. Surfaced 30 m from shore.
9:49	2	Gn	Juv/Adult	Approx. 90 cm. Surfaced 45 m from shore.
9:56	3	Gn	Juv	Approx. 45 cm. Surfaced 27 m from shore.
10:09	4	Gn	Juv	Approx. 65 cm. Surfaced 40 m from shore.

Tide: High falling, 2 days after half moon (neap) towards new.

Time	Obs. No.	Species	Size	Notes
10:21	5	Gn	Adult	Approx. 90 - 95 cm. Surfaced 50 m from shore. May be turtle # 2.
10:24	6	Gn	Juv	Approx. 40 cm. Surfaced 45 m from shore.
10:36	7	Gn	Juv	Approx. 55 cm. Surfaced 30 m from shore. May be turtle # 3.
10:40	8	Gn	Juv	Approx. 70 cm. Surfaced 35 m from shore.
10:42	9	Gn	Juv	Approx.70 cm. Surfaced 65 m from shore.
10:45				STOP

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:15	7	Gn	Juv	**6**	**Gn**	**Juv**	0.125	56.0
	1	Gn	Juv/Adult	**1**	**Gn**	**Juv/Adult**		
	1	Gn	Adult					
	9	Gn		**7**	**Gn**			

Summary:

Max. Time (hrs:mins)	Tot. Obs.	Species	Size	Total Estimated Number of Turtles Observed			Tot. Transect Length (km)	Turtles per km
1:15	12	Gn	Juv	**11**	**Gn**	**Juv**	0.625	19.2
	1	Gn	Juv/Adult	**1**	**Gn**	**Juv/Adult**		
	1	Gn	Adult					
	14	Gn		**12**	**Gn**			

Conclusion: Turtle abundance along this transect variable. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine time related variability, and establish peak times of abundance. Accessibility problems and general habitat conditions limit the potential for successful tagging efforts of resident turtles within this region. Capture and tagging of turtles in this region might be possible by hand if experienced fishermen employed and work from a large boat. Nighttime captures might be feasible given appropriate oceanic conditions.

Date: **03/18/01**
Type: **Cliffline**
Location: **Unai Masalok, East Tinian**

Site Description: A number of small medium to coarse grained sand, gravel and rubble beaches are separated by three to five meter high limestone cliffs bordering approximately 325 m of shoreline. Shallow pavement extends 40 to 50 m offshore to a crest, and then slopes gradually. Map bathymetry suggests depths between 10 and 18 m 200 to 400 m offshore. Depths exceeding 37 m apparently occur 500 m offshore. No stream entrances noted within the region. Swell one meter, winds light. Turtle nesting occurs on beaches. Algae samples collected. Photo available.

Access: A paved road leads to the Unai Dangkolo turnoff. A fairly smooth dirt and grass back road to the right leads to the turnoff for Unai Masalok. Travel time by car from San Jose estimated at 35 minutes. A two minute hike down a well trodden path leads to the beach. Cliff access is most easily obtained by scaling from the ocean side. Travel time by boat (31 ft. DPS Fountain) estimated at approximately 60 plus minutes.

Description of Methodology: Cliffline observer sketched the shoreline and submerged benthic features within the range of visibility. When a turtle was sighted on the surface or swimming subsurface, the time was noted and binoculars were used to identify species and estimate size. Features such as tail length and any identifying marks were recorded when observed. The estimated surface time and behavior of each turtle was noted when possible, and the location and/or route of each turtle was plotted on the area map sketch and numbered. The location of the observer was measured using a Garmin handheld GPS unit. Environmental conditions and location factors deemed relevant were recorded.

Source of Information: Turtles are noted by fishermen and Conservation Officers to be well distributed along the east coast of Tinian. Green turtle nesting at Unai Masalok reported by Wiles et al. (1989) and Pultz et al. (1999).

Location: **Unai Masalok** **Lat.** 15°01.203 **Long.** 145°39.360 (+/- 4.9 m)
Observer: Steve Kolinski

Time	Obs. No.	Species	Size	Notes
16:11				START
16:11	1	Gn	Juv	Approx. 50 - 60 cm. Surfaced 60 m from shore.
16:47	2	Gn	Juv	Approx. 45 - 50 cm. Surfaced 110 m from shore.
17:26				STOP

Tide: High falling, 1 day past half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:15	2	Gn	Juv	**2**	**Gn**	**Juv**	0.160	12.5

Conclusion: Green turtles evident within the region. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Accessibility problems and general habitat conditions limit the potential for successful tagging efforts of resident turtles within this region. Capture and tagging of turtles in this region might be possible by hand if experienced fishermen employed and work from a large boat. Nighttime captures might be feasible given appropriate oceanic conditions.

Date: **03/19/01**
Type: **Cliffline**
Location: **Pina, East Tinian**

Site Description: Six stations spread along the cliffline. Convoluted limestone cliffs 8 to 12 m above sea level. Narrow intertidal benches extend up to eight meters in some areas. Limited pavement/reef with boulders and sand grooves evident to 20 plus meters, followed by an apparent steep slope. Map bathymetry and personal observations suggest deep nearshore waters. Depths exceeding 37 m noted 350 m from shore. No stream entrances apparent within the region. Swell one meter, winds light. Photos available.

Access: A paved road leads to the Unai Dangkolo turnoff. A fairly smooth dirt and grass back road to the right leads to the turnoff for Pina. The grass parking area is in a reforestation conservation district. An old overgrown rocky road towards the clifflines can be taken with 4WD. A 10 minute hike over convoluted limestone is necessary to reach the shoreline. Travel time by car from San Jose estimated at 25 to 30 minutes. Travel time by boat (31 ft. DPS Fountain) estimated at approximately 50 minutes. Access to other areas within Pina requires hiking north or south along cliffline.

Description of Methodology: Cliffline observers sketched the shoreline and submerged benthic features within their range of visibility. When a turtle was sighted on the surface or swimming subsurface, the time was noted and binoculars were used to identify species and estimate size. Features such as tail length and any identifying marks were recorded when observed. The estimated surface time and behavior of each turtle was noted when possible, and the location and/or route of each turtle was plotted on the area map sketch and numbered. The location of each observer was measured using a Garmin handheld GPS unit. Environmental conditions and location factors deemed relevant were recorded.

Personnel: Alfonso Reyes, Don Reyes, Elvin Masga, Jesse Pangelinan, Larry Ilo, John Manglona, Frank Rasa, Steve Kolinski

Source of Information: Turtles are noted by fishermen and Conservation Officers to be well distributed along the east coast of Tinian.

Location: **Pina (1)** **Lat.** $15^{O}00.387$ **Long.** $145^{O}40.419$ (+/- 12.5 m)
Observer: Jesse Pangelinan
Tide: High falling, 2 days past half moon (neap) towards new.

Time	Obs. No.	Species	Size	Notes
15:05				START
15:14	1	Gn	Juv	Midsized juvenile close to 10 plus m from shore.
15:15	2	Gn	Juv	Very small turtle 12 plus m from shore.
15:16	3	Gn	Juv	Small turtle 15 plus m from shore.
15:18	4	Gn	Juv	Small turtle 20 plus m from shore.
15:20	5	Gn	Juv/Adult	Larger turtle approx. 75 cm.
15:26	6	Gn	Juv	Midsized juvenile.
15:32	7	Gn	Juv	Midsized Juvenile. May be turtle # 6.
15:33	8	Gn	Juv	Very small turtle. May be turtle # 4.
15:38	9	Gn	Adult	Large turtle approx. 95 cm.
15:38	10	Gn	Juv	Midsized juvenile.
15:41	11	Gn	Juv	Very small turtle. May be turtle # 3.

Time	Obs. No.	Species	Size	Notes
15:45	12	Gn	Juv	Midsized turtle.
15:48	13	Gn	Juv	Very small turtle. May be turtle # 2.
15:57	14	Gn	Juv.	Small turtle.
16:00	15	Gn	Adult	Large turtle approx. 90 plus cm. May be turtle # 9.
16:02	16	Gn	Juv	Very small turtle. May be turtle # 4
16:10				STOP

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:05	13	Gn	Juv	**8**	**Gn**	**Juv**	0.200	50.0
	1	Gn	Juv/Adult	**1**	**Gn**	**Juv/Adult**		
	2	Gn	Adult	**1**	**Gn**	**Adult**		
	16	Gn		**10**	**Gn**			

Location: **Pina (2)** **Lat.** 15^{O}00.284 **Long.** 145^{O}40.417 (+/- 7.3 m)

Observer: Steve Kolinski

Tide: High falling, 2 days past half moon (neap) towards new.

Time	Obs. No.	Species	Size	Notes
14:53				START
15:06	1	Gn	Juv	Approx. 35 - 40 cm. Surfaced over boulder 20 m from shore for 2 mins.
15:12	2	Gn	Juv	Approx. 50 - 60 cm. Surfaced 15 m off point.
15:12	3	Gn	Juv	Approx. 35 - 40 cm. Surfaced 20 m from shore.
15:17	4	Gn	Juv	Approx. 40 - 50 cm. Surfaced 25 m offshore for 1 min.
15:26	5	Gn	Juv	Approx. 50 - 60 cm. Surfaced 10 to 15 m from shore for 2 mins.
15:31	6	Gn	Juv	Approx. 50 - 55 cm. Surfaced 28 m offshore.
15:31	7	Gn	Juv	Approx. 35 - 45 cm. Surfaced 30 m from shore. May be turtle # 3.
15:33	8	Gn	Juv	Approx. 35 - 45 cm. Surfaced 40 to 50 m from shore.
15:39	9	Gn	Juv	Approx. 35 - 40 cm. Surfaced 20 m offshore. May be turtle # 1.
15:43	10	Gn	Juv	Approx. 35 - 40 cm. Surfaced 15 to 20 m from shore. Swimming.
15:50	11	Gn	Juv	Small turtle 15 m from shore.
15:55	12	Gn	Juv	Approx. 35 to 40 cm. Surfaced 40 m from shore for 4 mins. May be turtle # 8.
15:57	13	Gn	Juv	Approx. 35 to 45 cm. Surfaced 30 m from shore for 2 mins. May be turtle # 10.
16:02	14	Gn	Juv	Approx. 35 to 40 cm. Surfaced 25 m from shore for 20 secs. May be turtle # 3.
16:06	15	Gn	Juv	Approx. 50 - 60 cm. Surfaced 20 to 30 m from shore. May be turtle # 6.
16:08				STOP

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:15	15	Gn	Juv	**9**	**Gn**	**Juv**	0.120	75.0

Location: **Pina (3)** **Lat.** 15°00.207 **Long.** 145°40.384 (+/- 4.3 m)
Observer: Frank Rasa

Time	Obs. No.	Species	Size	Notes
14:39				START
14:39	1	Gn	Juv	Small turtle surfaced for 15 secs.
14:46	2	Gn	Juv	Surfaced for 25 secs.
14:50	3	Gn	Juv	Small turtle surfaced for 20 secs.
14:54	4	Gn	Juv	Small turtle surfaced for 30 secs. May be turtle # 3.
14:54	5	Gn	Juv	Surfaced for 35 secs.
15:10	6	Gn	Juv	Small turtle surfaced for 10 secs. May be turtle # 1.
15:12	7	Gn	Juv/Adult	Surfaced for 30 secs.
15:13	8	Gn	Juv	Surfaced for 40 secs.
15:14	9	Gn	Juv	Very small turtle surfaced for 15 secs.
15:15	10	Gn	Juv	Very small turtle surfaced for 40 secs.
15:27	11	Gn	Juv	Small turtle surfaced for 50 secs.
15:39	12	Gn	Juv	Small turtle surfaced for 25 secs. May be turtle # 11.
15:41	13	Gn	Juv	Surfaced for 1 min. May be turtle # 8.
15:46	14	Gn	Juv	Surfaced for 1 min. May be turtle # 8.
15:50				STOP

Tide: High falling, 2 days past half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:11	13	Gn	Juv	**8**	**Gn**	**Juv**	0.120	75.0
	1	Gn	Juv/Adult	**1**	**Gn**	**Juv/Adult**		
	14	Gn		**9**	**Gn**			

Location: **Pina (4)** **Lat.** 15°00.131 **Long.** 145°40.366 (+/- 4.0 m)
Observer: Larry Ilo and John Manglona

Time	Obs. No.	Species	Size	Notes
14:15				START
14:19	1	Gn	Juv	Approx. 50 cm. Surfaced 15 m from shore.
14:53	2	Gn	Juv	Approx. 50 cm. Surfaced at same time as turtle # 1.
14:53	3	Gn	Juv	May be turtle # 1.
15:11	4	Gn	Juv	May be turtle # 1 or 2.
15:18	5	Gn	Juv	May be turtle # 1 or 2.
15:25	6	Gn	Juv	May be turtle # 1 or 2.
15:25	7	Gn	Juv	May be turtle # 1 or 2.
15:35	8	Gn	Juv	May be turtle # 1 or 2.
15:46				STOP

Tide: High falling, Neap

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:31	8	Gn	Juv	**2**	**Gn**	**Juv**	0.140	14.3

Location: **Pina (5)** **Lat.** 15°00.103 **Long.** 145°40.357 (+/- 4.9 m)
Observer: Alfonso Reyes

Time	Obs. No.	Species	Size	Notes
14:30				START
15:50				STOP

Tide: High falling, 2 days past half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
1:20	0			**0**	0.120	0.0

Location: **Pina (6)** **Lat.** 15°00.023 **Long.** 145°40.334 (+/- 4.0 m)
Observer: Elvin Masga and Don Reyes

Time	Obs. No.	Species	Size	Notes
14:15				START
15:00	1	Gn	Adult	Large turtle no tail 20 m from shore surfaced for 6 secs.
15:10	2	Gn	Juv	Very small turtle 30 m from shore up only 3 secs.
15:30				STOP

Tide: High falling, 2 days past half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
1:15	1	Gn	Juv	**1 Gn Juv**	0.160	12.5
	1	Gn	Adult	**1 Gn Adult**		
	2	Gn		**2 Gn**		

Summary:

Max. Time (hrs:mins)	Tot. Obs.	Species	Size	Total Estimated Number of Turtles Observed	Tot. Transect Length (km)	Turtles per km
1:31	50	Gn	Juv	**28 Gn Juv**	0.860	37.2
	2	Gn	Juv/Adult	**2 Gn Juv/Adult**		
	3	Gn	Adult	**2 Gn Adult**		
	55	Gn		**32 Gn**		

Conclusion: Turtle abundance along this transect variable. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine time related variability, and establish peak times of abundance. Recommend areas further north and south along the Pina coast be surveyed. Capture and tagging of turtles in this region might be possible by hand if experienced fishermen employed and work conducted off a large boat. Nighttime captures might be feasible given appropriate oceanic conditions. At least four very small turtles (35 to 45 cm) observed.

Date: **03/21/01**
Type: **Cliffline**
Location: **South Pina, East Tinian**

Site Description: Six stations spread along the cliffline. Large and numerous inlets and points. Convoluted limestone cliffs 20 to 30 m above sea level. Narrow intertidal benches extend up to 25 m in some areas. Eroded caverns common at base of cliffs. Limited pavement/reef with boulders and sand grooves evident to 30 plus meters. Map bathymetry and personal observations suggest deep nearshore waters. Depths exceeding 37 m noted 450 m from shore. No stream entrances apparent within the region. Swell one to two meters, winds light. Photo available.

Access: Land access to south Pina (including regions north and south) is difficult. Travel time by car estimated at 25 minutes. Vehicles must be parked along the side of a slim dirt back road. A 40 to 50 minute hike through forest, underbrush and over limestone over infrequently used hunting trails is required (machetes necessary). Travel along the clifflines either north or south is over convoluted limestone. Estimated travel time by boat (31 ft. DPS Fountain) approximately 45 minutes.

Description of Methodology: Cliffline observers sketched the shoreline and submerged benthic features within their range of visibility. When a turtle was sighted on the surface or swimming subsurface, the time was noted and binoculars were used to identify species and estimate size. Features such as tail length and any identifying marks were recorded when observed. The estimated surface time and behavior of each turtle was noted when possible, and the location and/or route of each turtle was plotted on the area map sketch and numbered. The location of each observer was measured using a Garmin handheld GPS unit. Environmental conditions and location factors deemed relevant were recorded.

Personnel: Henry King, Alfonso Reyes, Don Reyes, Elvin Masga, Jesse Pangelinan, Ray Dela Cruz, Larry Ilo, John Manglona, Frank Rasa, Steve Kolinski

Source of Information: Turtles are noted by fishermen and Conservation Officers to be well distributed along the east coast of Tinian.

Location: **South Pina (1)** **Lat.** $14^{O}58.662$ **Long.** $145^{O}39.862$ (+/- 4.6 m)
Observer: Alfonso Reyes, Don Reyes
Tide: Medium falling, 4 days before new moon (spring).

Time	Obs. No.	Species	Size	Notes
10:35				START
10:37	1	Gn	Juv/Adult	Surfaced 90 m from shore for 2 mins.
10:37	2	Gn	Juv/Adult	Surfaced 90 m from shore for 2 mins.
10:40	3	Gn	Juv/Adult	Surfaced 100 m from shore for 2 mins.
10:59	4	Gn	Adult	Large turtle sex unknown surfaced 100 m from shore for 4 mins.
11:06	5	Gn	Juv	Small turtle 90 m from shore, swimming, surfaced for 3 mins..
11:15	6	Gn	Adult	Large turtle sex unknown surfaced 90 m from shore swimming northeast. May be turtle # 4.
11:32	7	Gn	Juv	Small turtle 100 m from shore swimming on surface for 4 mins.
11:55				STOP

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:20	2	Gn	Juv	**2**	**Gn**	**Juv**	0.250	24.0
	3	Gn	Juv/Adult	**3**	**Gn**	**Juv/Adult**		
	2	Gn	Adult	**1**	**Gn**	**Adult**		
	7	Gn		**6**	**Gn**			

Location: **South Pina (2)** **Lat.** **Long.**
Observer: Henry King, Ray Dela Cruz

Time	Obs. No.	Species	Size	Notes
10:45				START
10:45	1	Gn	Juv	Very small turtle. Surfaced approx. 60 m from shore for 16 mins.
10:45	2	Gn	Juv	Surfaced approx. 60 m from shore for 1hour 5 mins in debris.
10:45	3	Gn	Juv	Surfaced approx. 60 m from shore.
10:45	4	Gn	Juv	Surfaced approx. 60 m from shore for 1hour 5 mins in debris.
10:55	5	Gn	Juv	Surfaced approx. 100 m from shore.
11:00	6	Gn	Juv	Surfaced approx. 50 m from shore.
11:18	7	Gn	Juv	Surfaced for 1 min.
11:28	8	Gn	Juv	Surfaced for 12 mins.
11:53	9	Gn	Juv	Very small turtle surfaced 50 m from shore. May be turtle # 1.
12:00				STOP

Tide: Medium falling, 4 days before new moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:15	9	Gn	Juv	**8**	**Gn**	**Juv**	0.200	40.0

Location: **South Pina (3)** **Lat.** $14^{O}58.457$ **Long.** $145^{O}39.898$ (+/- 4.6 m)
Observer: Frank Rasa

Time	Obs. No.	Species	Size	Notes
11:08				START
11:50	1	Gn	Juv	Very small turtle surfaced for 10 secs.
11:51	2	Gn	Juv/Adult	Surfaced for 1.25 mins.
12:00	3	Gn	Juv/Adult	Surfaced for 25 secs.
12:12	4	Gn	Adult	Large turtle sex unknown surfaced for 15 secs.
12:15	5	Gn	Juv/Adult	Surfaced for 2 mins. May be turtle # 2.
12:20				STOP

Tide: Medium falling, 4 days before new moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:12	1	Gn	Juv	**1**	**Gn**	**Juv**	0.100	40.0
	3	Gn	Juv/Adult	**2**	**Gn**	**Juv/Adult**		
	1	Gn	Adult	**1**	**Gn**	**Adult**		
	5	Gn		**4**	**Gn**			

Location: **South Pina (4)** **Lat.** 14°58.379 **Long.** 145°39.931 (+/- 9.1 m)
Observer: Jesse Pangelinan

Time	Obs. No.	Species	Size	Notes
10:55				START
11:00	1	Gn	Adult	Large turtle sex unknown.
11:18	2	Gn	Adult	Large turtle sex unknown.
11:20	3	Gn	Juv/Adult	
11:22	4	Gn	Juv/Adult	
11:25	5	Gn	Juv	
11:25	6	Gn	Juv	
11:29	7	Gn	Juv	
11:30	8	Gn	Adult	Large turtle sex unknown.
11:33	9	Gn	Juv	Surfaced approx. 50 m from shore.
11:34	10	Gn	Juv	
11:35	11	Gn	Adult	Large turtle surfaced approx. 50 m from shore. May be turtle # 8.
11:36	12	Gn	Adult	Large turtle surfaced with turtle # 11.
11:39	13	Gn	Juv	
11:40	14	Gn	Juv	
11:42	15	Gn	Juv	Surfaced approx. 60 m from shore. May be turtle # 9.
11:44	16	Gn	Adult	Large turtle sex unknown. May be turtle # 1.
11:45	17	Gn	Juv	May be turtle # 6.
11:49	18	Gn	Juv	May be turtle # 13.
11:50	19	Gn	Juv/Adult	
11:50	20	Gn	Juv/Adult	May be turtle # 19.
11:52	21	Gn	Juv	May be turtle # 10.
12:00	22	Gn	Juv/Adult	
12:05	23	Gn	Adult	Large turtle sex unknown. May be turtle # 8.
12:05	24	Gn	Juv	
12:15				STOP

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:20	12	Gn	Juv	**8**	**Gn**	**Juv**	0.220	68.2
	5	Gn	Juv/Adult	**4**	**Gn**	**Juv/Adult**		
	7	Gn	Adult	**3**	**Gn**	**Adult**		
	24	Gn		**15**	**Gn**			

Location: **South Pina (5)** **Lat.** 14°58.283 **Long.** 145°39.939 (+/- 4.5 m)
Observer: Larry Ilo, John Manglona

Time	Obs. No.	Species	Size	Notes
11:22				START

Tide: Medium falling, 4 days before new moon (spring).

Time	Obs. No.	Species	Size	Notes
11:45	1	Gn	Juv/Adult	Surfaced for 2 mins.
11:45	2	Gn	Juv	Surfaced for 2 mins.
12:01	3	Gn	Juv	Very small turtle surfaced for 4 mins.
12:10	4	Gn	Juv	Very small turtle surfaced for 2 mins.
12:15	5	Gn	Juv	Surfaced for 1 min. May be turtle # 2.
12:30	6	Gn	Juv	May be turtle # 3.
12:37	7	Gn	Juv	Surfaced for 12 secs. May be turtle # 2.
12:40				STOP

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:18	6	Gn	Juv	**3**	**Gn**	**Juv**	0.250	16.0
	1	Gn	Juv/Adult	**1**	**Gn**	**Juv/Adult**		
	7	Gn		**4**	**Gn**			

Location: **South Pina (6)** **Lat.** 14^{O}58.139 **Long.** 145^{O}39.839 (+/- 5.2 m)

Observer: Steve Kolinski

Tide: Medium falling, 4 days before new moon (spring).

Time	Obs. No.	Species	Size	Notes
11:36				START
11:38	1	Gn	Juv/Adult	Larger turtle surfaced 40 to 50 m from shore for 2 mins.
11:47	2	Gn	Juv/Adult	Larger turtle surfaced 60 to 70 m from shore.
12:03	3	Gn	Juv/Adult	Dark shaded shell. Surfaced 60 m from shore.
12:05	4	Gn	Juv/Adult	Surfaced 60 m from shore for 5 mins. May be turtle # 3.
12:12	5	Gn	Adult	Sex unknown. Surfaced 50 m from shore.
12:13	6	Gn	Juv/Adult	Surfaced 50 m from shore.
12:14	7	Gn	Juv	Reddish coloration to shell. Surfaced 30 m from shore.
12:18	8	Gn	Adult	Surfaced 60 to 70 m from shore for 3 mins. Sex unknown.
12:28	9	Gn	Juv	Surfaced 40 to 50 m from shore. May be turtle # 6.
12:31	10	Gn	Juv	Surfaced 40 m from shore.
12:34	11	Gn	Juv	Surfaced 40 m from shore for 8 mins. Up same time as turtle # 10.
12:36	12	Gn	Juv/Adult	Large turtle surfaced 70 to 80 m from shore. Up same time as turtle # 11. May be turtle # 1.
12:51				STOP

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:15	4	Gn	Juv	**3**	**Gn**	**Juv**	0.300	30.0
	6	Gn	Juv/Adult	**4**	**Gn**	**Juv/Adult**		
	2	Gn	Adult	**2**	**Gn**	**Adult**		
	12	Gn		**9**	**Gn**			

Summary:

Max. Time (hrs:mins)	Tot. Obs.	Species	Size	Total Estimated Number of Turtles Observed			Tot. Transect Length (km)	Turtles per km
1:20	34	Gn	Juv	**25**	**Gn**	**Juv**	1.320	34.8
	18	Gn	Juv/Adult	**14**	**Gn**	**Juv/Adult**		
	12	Gn	Adult	**7**		**Adult**		
	64	Gn		**46**	**Gn**			

Conclusion: Green turtles of various sizes noted in abundance scattered along the coastline. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Locations further north and south recommended to be surveyed. Capture and tagging of turtles in this region might be possible by hand if experienced fishermen employed working off a large boat. Nighttime captures might be feasible given appropriate oceanic conditions.

Date: **03/13/01**
Type: **Cliffline**
Location: **Suicide Cliff, East Tinian**

Site Description: Four stations spread along the cliffline. Limestone cliffs 30 to 60 m above sea level. Cliff tops fairly flat and grassy. Intertidal benches extend up to 15 m in some areas. Eroded caverns common at base of cliffs. Pavement/reef with boulders and sand grooves evident to 30 plus meters at site 1, but less extensive at more southern sites. Map bathymetry and personal observations suggest deep nearshore waters. Depths exceeding 37 m noted 250 to 650 m from shore. No stream entrances apparent within the region. Swell one to two meters, winds brisk. Photos available.

Access: The road is paved south to Suicide Cliff. Parking is abundant near the historical monument. Travel time by car from San Jose estimated at 15 minutes. Shoreline south of the marker is accessible by foot. Land access to shoreline north of the marker is limited by steep cliffs and brush. Travel time by boat (31 ft. DPS Fountain) estimated at approximately 35 minutes.

Description of Methodology: Cliffline observers sketched the shoreline and submerged benthic features within their range of visibility. When a turtle was sighted on the surface or swimming subsurface, the time was noted and binoculars were used to identify species and estimate size. Features such as tail length and any identifying marks were recorded when observed. The estimated surface time and behavior of each turtle was noted when possible, and the location and/or route of each turtle was plotted on the area map sketch and numbered. The location of each observer was measured using a Garmin handheld GPS unit. Environmental conditions and location factors deemed relevant were recorded.

Personnel: Henry King, Alfonso Reyes, Don Reyes, Elvin Masga, Jesse Pangelinan, John Manglona, Steve Kolinski

Source of Information: Turtles are noted by fishermen and Conservation Officers to be well distributed along the east coast of Tinian. The region north of Suicide Cliff was particularly noted as a turtle area by Gus Dusalua (DPS Fire Rescue, Fisherman) who fishes in the area. Gus estimated seeing 30 to 40 turtles in boulder habitat during daylight fishing expeditions. Land access to northern regions restricted by cliff and thick forest barriers.

Location: **Suicide Cliff (1)** **Lat.** $14^{O}56.377$ **Long.** $145^{O}39.101$ (+/- 4.3 m)
Observer: Alfonso Reyes, Steve Kolinski

Time	Obs. No.	Species	Size	Notes
11:05				START
11:15	1	Gn	Juv	Approx. 70 cm. Surfaced 50 m from shore, swimming towards reef area.
11:44	2	Gn	Juv	Surfaced over deep water roughly 100 m from shore.
12:20				STOP

Tide: High falling, 3 days past full moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
1:15	2	Gn	Juv	**2 Gn Juv**	0.300	6.7

Location: **Suicide Cliff (2)** **Lat.** 14°56.319 **Long.** 145°39.136 (+/- ? m)
Observer: Don Reyes, Jesse Pangelinan

Time	Obs. No.	Species	Size	Notes
10:58				START
12:15	1	Gn	Juv	Surfaced for about 3 secs.
12:23				STOP

Tide: High falling, 3 days past full moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:25	1	Gn	Juv	1	Gn	Juv	0.200	5.0

Location: **Suicide Cliff (3)** **Lat.** 14°56.279 **Long.** 145°39.135 (+/- 3.7 m)
Observer: Henry King, John Manglona

Time	Obs. No.	Species	Size	Notes
11:00				START
11:20	1	Gn	Juv/Adult	Surfaced approx. 60 m from shore for 5 mins.
11:35	2	Gn	Juv/Adult	Surfaced approx. 37 m from shore for 2 mins. Believed to be turtle # 1.
12:20	3	Gn	Juv	Surfaced for extended period of time.
11:52	4	Gn	Juv	Believed to be turtle # 3.
12:20	5	Gn	Juv	Surfaced 60 m from shore and swam for at least 17 mins.
12:37				STOP

Tide: High falling, 3 days past full moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:37	3	Gn	Juv	2	Gn	Juv	0.150	20.0
	2	Gn	Juv/Adult	1	Gn	Juv/Adult		
	5	Gn		3	Gn			

Location: **Suicide Cliff (4)** **Lat.** 14°56.220 **Long.** 145°39.123 (+/- 3.7 m)
Observer: Elvin Masga

Time	Obs. No.	Species	Size	Notes
10:03				START
10:10	1	Gn	Adult	Surfaced for 3 secs.
10:13	2	Gn	Juv	
10:20	3	Gn	Adult	Surfaced for 30 secs.
10:32	4	Gn	Adult	Surfaced for 5 secs. May be turtle # 1.
10:45	5	Gn	Juv	Surfaced for 5 secs.
11:15	6	Gn	Juv	Swimming on surface for short period of time. May be turtle # 5.
11:18				STOP

Tide: High falling, 3 days past full moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:15	3	Gn	Juv	**2**	**Gn**	**Juv**	0.150	26.7
	3	Gn	Adult	**2**	**Gn**	**Adult**		
	6	Gn		**4**	**Gn**			

Summary:

Max. Time (hrs:mins)	Tot. Obs.	Species	Size	Total Estimated Number of Turtles Observed			Tot. Transect Length (km)	Turtles per km
1:37	9	Gn	Juv	**7**	**Gn**	**Juv**	0.800	12.5
	2	Gn	Juv/Adult	**1**	**Gn**	**Juv/Adult**		
	3	Gn	Adult	**2**	**Gn**	**Adult**		
	14	Gn		**10**	**Gn**			

Conclusion: Green turtles evident within the region. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Surveys north towards and beyond Puntan Kastiyu highly recommended. Capture and tagging of turtles in this region might be possible by hand if experienced fishermen employed and work from a large boat. Nighttime captures might be feasible given appropriate oceanic conditions.

Date: **03/17/01**
Type: **Cliffline**
Location: **Puntan Carolinas, Eastern Survey Site (1), South Tinian**

Site Description: Limestone cliff 30 to 35 m above sea level. Cliff top fairly flat and grassy. Intertidal benches and boulders extend up to 25 m in some areas. Eroded caverns common at base of cliffs. Pavement/reef with boulders and sand grooves evident to 40 plus meters. Map bathymetry suggests depths approaching 10 meters 200 m offshore, followed by a steep drop. No stream entrances apparent within the region. Swell one to two meters, winds brisk. Photo available.

Access: One can pull off onto the grass along the paved road to Suicide Cliff and easily hike across the flattened grassy limestone cliff top to the shoreline. Travel time by car from San Jose estimated at 15 minutes. Travel time by boat (31 ft. DPS Fountain) approximately 30 minutes.

Description of Methodology: Cliffline observer sketched the shoreline and submerged benthic features within the range of visibility. When a turtle was sighted on the surface or swimming subsurface, the time was noted and binoculars were used to identify species and estimate size. Features such as tail length and any identifying marks were recorded when observed. The estimated surface time and behavior of each turtle was noted when possible, and the location and/or route of each turtle was plotted on the area map sketch and numbered. The location of the observer was measured using a Garmin handheld GPS unit. Environmental conditions and location factors deemed relevant were recorded.

Source of Information: No indications of turtle abundance were obtained for this region. The site was selected as a means of adequately sampling south Tinian.

Location: **Puntan Carolinas (1)** **Lat.** $14^{O}56.036$ **Long.** $145^{O}38.946$ (+/- 7.9 m)
Observer: Steve Kolinski

Tide: High rising, half moon (neap) towards new.

Time	Obs. No.	Species	Size	Notes
11:01				START
11:10	1	Gn	?	Surfaced for approx. 30 secs 50 to 60 m from shore above boulder habitat.
11:10	2	Gn	Juv	Approx. 70 cm surfaced 50 to 60 m from shore above boulder habitat.
11:14	3	Gn	Juv	Surfaced approx. 50 to 60 m from shore, swam in circles for 7 mins before decending. May be turtle # 2.
11:49	4	Gn	Juv	Approx. 60 cm. Surface 30 m from shore over boulder habitat for 40 secs.
11:57	5	Gn	Adult	Approx. 100 - 110 cm. Surfaced 80 to 90 m from shore. Can't make out tail.
12:01	6	Gn	Adult	Approx. 90 plus cm. Surfaced 80 m from shore, swam towards shore for 2 mins.
12:04	7	Gn	?	Surfaced 100 m plus from shore.
12:19	8	Gn	Juv/Adult	Approx. 70 to 85 cm. Surface 70 to 80 m from shore for 1 min.
12:25	9	Gn	Juv	Approx. 40 - 50 cm. Surfaced 25 m from shore in ocean backwash.
12:26	10	Gn	Juv	Approx. 70 cm surfaced 60 m from shore. May be turtle # 8.
12:26				STOP

Puntan Carolinas, Eastern Survey Site (1), South Tinian

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:25	5	Gn	Juv	**3**	**Gn**	**Juv**	0.220	31.8
	1	Gn	Juv/Adult	**0**	**Gn**	**Juv/Adult**		
	2	Gn	Adult	**2**	**Gn**	**Adult**		
	2	Gn	?	**2**	**Gn**	**?**		
	10	Gn		**7**	**Gn**			

Conclusion: Green turtles evident within the region. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Capture and tagging of turtles in this region might be possible by hand if experienced fishermen employed and work from a large boat. Nighttime captures might be feasible given appropriate oceanic conditions.

Date: **03/17/01**
Type: **Cliffline**
Location: **Puntan Carolinas, Eastern Survey Site (2), South Tinian**

Site Description: Limestone cliff 30 to 35 m above sea level. Cliff top fairly flat and grassy. Intertidal benches and boulders extend up to 15 m in some areas. Eroded caverns common at base of cliffs. Pavement/reef with boulders and sand grooves evident to 40 plus meters. Map bathymetry suggests depths approaching 10 meters 200 m offshore, followed by a steep drop. No stream entrances apparent within the region. Swell one to two meters, winds brisk. Photo available.

Access: One can pull off onto the grass along the paved road to Suicide Cliff and easily hike across the flattened grassy limestone cliff top to the shoreline. Travel time by car from San Jose estimated at 15 minutes. Travel time by boat (31 ft. DPS Fountain) approximately 30 minutes.

Description of Methodology: Cliffline observer sketched the shoreline and submerged benthic features within the range of visibility. When a turtle was sighted on the surface or swimming subsurface, the time was noted and binoculars were used to identify species and estimate size. Features such as tail length and any identifying marks were recorded when observed. The estimated surface time and behavior of each turtle was noted when possible, and the location and/or route of each turtle was plotted on the area map sketch and numbered. The location of the observer was measured using a Garmin handheld GPS unit. Environmental conditions and location factors deemed relevant were recorded.

Source of Information: No indications of turtle abundance were obtained for this region. The site was selected as a means of adequately sampling south Tinian.

Location: **Puntan Carolinas** **Lat.** $14^{O}55.878$ **Long.** $145^{O}38.861$ (+/- 6.7 m)
Observer: Steve Kolinski

Time	Obs. No.	Species	Size	Notes
12:41				START
13:15	1	Gn	Juv	Approx. 50 - 60 cm. Surfaced 25 m from shore over boulder for 45 secs.
13:59				STOP

Tide: High falling, half moon (neap) towards new.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
1:18	1	Gn	Juv	**1 Gn Juv**	0.220	4.5

Conclusion: Turtles were not found to be abundant at this site. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Tagging efforts at this site are not recommended at this time.

Date: **03/12/01**
Type: **Cliffline**
Location: **Puntan Carolinas, Eastern Survey Site (3), South Tinian**

Site Description: Limestone cliff 30 to 35 m above sea level. Cliff top fairly flat and grassy. Intertidal benches and boulders extend up to 15 m in some areas. Eroded caverns common at base of cliffs. Pavement/reef with boulders and sand grooves evident to 40 plus meters. Map bathymetry suggests depths approaching 10 meters 200 m offshore, followed by a steep drop. No stream entrances apparent within the region. Swell one meter, winds light.

Access: A well traveled dirt road leads off the paved road to Suicide Cliff. A short hike across a flattened grassy limestone cliff top required. Travel time by car from San Jose estimated at 15 minutes. Travel time by boat (31 ft. DPS Fountain) approximately 30 minutes

Description of Methodology: Cliffline observers sketched the shoreline and submerged benthic features within their range of visibility. When a turtle was sighted on the surface or swimming subsurface, the time was noted and binoculars were used to identify species and estimate size. Features such as tail length and any identifying marks were recorded when observed. The estimated surface time and behavior of each turtle was noted when possible, and the location and/or route of each turtle was plotted on the area map sketch and numbered. The location of each observer was measured using a Garmin handheld GPS unit. Environmental conditions and location factors deemed relevant were recorded.

Source of Information: Three fishermen at the site noted they rarely see turtles here.

Location: **Puntan Carolinas** **Lat.** **Long.**
Observer: Henry King, Alfonso Reyes, Don Reyes, Elvin Masga, Jesse Pangelinan, Larry Ilo, John Manglona, Frank Rasa, Steve Kolinski

Time	Obs. No.	Species	Size	Notes
17:10				START
17:10	1	Gn	Juv	Surfaced 20 to 30 m from shore for 20 secs.
18:00				STOP

Tide: Low rising, 2 days following full moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
0:50	1	Gn	Juv	1 Gn Juv	0.220	4.5

Conclusion: Turtles were not found to be abundant at this site. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Surveys further south recommended. Tagging efforts at this site are not recommended at this time.

Date: **03/13/01**
Type: **Cliffline**
Location: **Target Area, Puntan Carolinas, South Tinian**

Site Description: Four stations spread along the cliffline. Convoluted limestone shoreline 20 to 35 m above sea level. Narrow intertidal benches along some of the coast, but most cliff-water interfaces undercut and cavernous. Pavement and infrequent boulder habitat with scattered corals and various types of algae (samples collected). Depths of 10 m up to 50 m from shore, followed by steeply sloping pavement to depths of 18 m roughly 150 m offshore and 37 m 300 m from shore. No stream entrances noted within the region. Swell to one meter, winds light. Very strong southerly current. Photos available.

Access: A well traveled dirt road leads off the paved road to Suicide Cliff. A five minute hike down a well trodden path gives way to convoluted limestone cliffs. Travel time by car from San Jose estimated at 15 minutes. Travel time by boat (31 ft. DPS Fountain) approximately 10 to 15 minutes. The area is frequented by fishermen.

Description of Methodology: Cliffline observers sketched the shoreline and submerged benthic features within their range of visibility. When a turtle was sighted on the surface or swimming subsurface, the time was noted and binoculars were used to identify species and estimate size. Features such as tail length and any identifying marks were recorded when observed. The estimated surface time and behavior of each turtle was noted when possible, and the location and/or route of each turtle was plotted on the area map sketch and numbered. The location of each observer was measured using a Garmin handheld GPS unit. Environmental conditions and location factors deemed relevant were recorded.

Personnel: Henry King, Alfonso Reyes, Don Reyes, Elvin Masga, Jesse Pangelinan, Larry Ilo, John Manglona, Frank Rasa, Steve Kolinski

Source of Information: The target region of Puntan Carolinas was noted by Conservation Officers and fishermen for it's numerous turtles. Mr. Kim (fisherman) noted seeing five to seven turtles while fishing off the cliffs. Pultz et al. (1999) observed two juvenile green turtles during a dive survey in 1995.

Location: **Target Area (1)** **Lat.** $14^{O}55.450$ **Long.** $145^{O}37.986$ (+/- ? m)
Observer: Alfonso Reyes, Steve Kolinski

Time	Obs. No.	Species	Size	Notes
9:16				START
9:17	1	Gn	Juv	Approx. 70 cm. Surfaced 120 m from shore for 1 min.
9:20	2	Gn	Juv	Approx. 50 cm. Surfaced for 1 min.
9:22	3	Gn	Juv	Approx. 50 cm. Surfaced 45 m from shore for 1 min.
9:27	4	Gn	Juv	Approx. 50 - 55 cm. Surfaced 30 m from shore.
9:31	5	Gn	Juv.	Surfaced approx. 15 to 20 m from shore.
9:34	6	Gn	Juv	Approx. 70 cm. Surfaced for 2 mins.
9:45	7	Gn	Juv	Approx. 70 cm. Surfaced for 1 min. May be turtle # 6.
9:47	8	Gn	Juv	Approx. 70 cm. Surfaced 120 m from shore for 2 min. May be turtle # 1.
9:50	9	Gn	Juv	Surfaced approx. 20 m from shore. May be turtle # 5.
10:00	10	Gn	Adult	Male turtle with long tail. Approx. 100 cm. Surfaced for 1 min over sandy area.
10:08	11	Gn	Juv	Approx. 50 cm. Surfaced approx 60 m from shore for 1 min.

Tide: High rising, 3 days past full moon (spring).

Time	Obs. No.	Species	Size	Notes
10:10	12	Gn	Juv	Approx. 70 cm. Surfaced 20 to 25 m from shore for 10 secs.
10:10	13	Gn	Juv	Approx. 55 cm. Surfaced 15 to 20 m from shore for 1 min. May be turtle # 4.
10:10	14	Gn	Juv	Approx. 50 cm. Surfaced 70 m from shore for 10 secs. May be turtle # 2.
10:10	15	Gn	Juv/Adult	Approx. 70 to 80 cm. Surfaced 70 to 80 m from shore for 2 mins.
10:19	16	Gn	Juv	Surfaced 50 to 60 m from shore.
10:22	17	Gn	Juv	Approx. 70 cm. Surfaced 90 m from shore over sandy area for 2 mins. High domed shell.
10:27	18	Gn	Juv	Approx. 50 cm. Surfaced 130 to 150 m from shore for 10 secs.
10:30	19	Gn	Juv	Approx. 50 cm. Surfaced 15 to 20 m from shore for 1 min. May be turtle # 4 or 5.
10:31	20	Gn	Juv	Approx. 60 - 70 cm. May be turtle # 6.
10:31				STOP

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:15	18	Gn	Juv	**11**	**Gn**	**Juv**	0.150	86.7
	1	Gn	Juv/Adult	**1**	**Gn**	**Juv/Adult**		
	1	Gn	Adult	**1**	**Gn**	**Adult**		
	20	Gn		**13**	**Gn**			

Location: **Target Area (2)** **Lat.** $14^{O}55.495$ **Long.** $145^{O}37.934$ (+/- 4.0 m)

Observer: Don Reyes, Jesse Pangelinan

Tide: High rising, 3 days past full moon (spring).

Time	Obs. No.	Species	Size	Notes
8:25				START
8:34	1	Gn	Juv	Surfaced 40 m from shore for 5 secs.
8:35	2	Gn	Adult	Very large turtle, possibly female. Surfaced for 5 secs. White barnacles on carapace.
8:38	3	Gn	Juv	Very small turtle surfaced for 3 secs.
8:42	4	Gn	Juv	Surfaced 40 m from shore for 6 secs.
8:44	5	Gn	Juv	Surfaced for 10 secs.
8:47	6	Gn	Juv	Surfaced for 15 secs. May be turtle # 6.
9:30	7	Gn	Adult	Apparent male surfaced 60 m distant for 2 secs.
9:36	8	Gn	Adult	Apparent female surfaced 50 m from shore for 5 secs. May be turtle # 3.
9:45				STOP

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:20	5	Gn	Juv	**4**	**Gn**	**Juv**	0.140	42.9
	3	Gn	Adult	**2**	**Gn**	**Adult**		
	8	Gn		**6**	**Gn**			

Location: **Target Area (3)** **Lat.** 14°55.526 **Long.** 145°37.938 (+/- 7.9 m)
Observer: Henry King, John Manglona

Time	Obs. No.	Species	Size	Notes
8:25				START
8:30	1	Gn	Juv/Adult	Surfaced approx. 50 m from shore for 3 mins.
9:10	2	Gn	Juv	Surfaced approx. 70 m from shore for 3 mins.
9:22	3	Gn	Juv	May be turtle # 2.
9:28	4	Gn	?	Surfaced 60 m from shore.
9:35	5	Gn	Juv	Small turtle. Visible damage on carapace.
9:38	6	Gn	Adult	Large male turtle with algae on carapace surfaced 75 m from shore for 2 mins.
9:40				STOP

Tide: High rising, 3 days past full moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:15	3	Gn	Juv	**2**	**Gn**	**Juv**	0.120	41.7
	1	Gn	Juv/Adult	**1**	**Gn**	**Juv/Adult**		
	1	Gn	Adult	**1**		**Adult**		
	1	Gn	?	**1**	**Gn**	**?**		
	6	Gn		**5**	**Gn**			

Location: **Target Area (4)** **Lat.** 14°55.558 **Long.** 145°37.915 (+/- 4.0 m)
Observer: Elvin Masga

Time	Obs. No.	Species	Size	Notes
8:30				START
8:30	1	Gn	Adult	Sex unknown. Surfaced for 4 secs.
8:31	2	Gn	Juv	Surfaced 4 secs.
8:31	3	Gn	Juv	Surfaced 15 secs.
8:32	4	Gn	Adult	Sex unknown. Surfaced for 10 secs.
8:32	5	Gn	Juv	Surfaced for 15 secs.
8:36	6	Gn	Juv	Surfaced for 3 secs.
8:40	7	Gn	Adult	Surfaced 20 secs, swimming. May be turtle # 1.
8:45	8	Gn	Adult	Sex unknown. Surfaced for 30 secs. May be turtle # 1.
8:55	9	Gn	Juv	Surfaced for 10 secs. May be turtle # 5.
8:59	10	Gn	Adult	May be turtle # 4.
9:01	11	Gn	Juv/Adult	Surfaced for 3 secs.
9:05	12	Gn	Juv	Surfaced for 15 secs. May be turtle # 12.
9:05	13	Gn	Juv	Surfaced for 15 secs.
9:10	14	Gn	Juv/Adult	Surfaced for 20 secs. May be turtle # 11.
9:10	15	Gn	Juv	Surfaced for 10 secs.
9:14	16	Gn	Juv	White barnacles on carapace and tail. Surfaced for 4 secs.
9:27	17	Gn	Juv/Adult	Surfaced for 2 secs.
9:40				STOP

Tide: High rising, 3 days past full moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:10	9	Gn	Juv	**7**	**Gn**	**Juv**	0.110	100.0
	3	Gn	Juv/Adult	**2**	**Gn**	**Juv/Adult**		
	5	Gn	Adult	**2**	**Gn**	**Adult**		
	17	Gn		**11**	**Gn**			

Summary:

Max. Time (hrs:mins)	Tot. Obs.	Species	Size	Total Estimated Number of Turtles Observed			Tot. Transect Length (km)	Turtles per km
1:20	35	Gn	Juv	**24**	**Gn**	**Juv**	0.520	67.3
	5	Gn	Juv/Adult	**4**	**Gn**	**Juv/Adult**		
	10	Gn	Adult	**6**	**Gn**	**Adult**		
	1	Gn	?	**1**	**Gn**	**?**		
	51	Gn		**35**	**Gn**			

Conclusion: Green turtles noted in abundance within this region. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Capture and tagging of turtles might be possible by hand if experienced fishermen employed working off a large boat. Nighttime captures might be feasible given appropriate oceanic conditions.

Date: **03/14/01**
Type: **Tow**
Location: **Target Area to 14°56.149, Puntan Carolinas, South Tinian**

Site Description: Convoluted limestone shoreline 20 to 35 m above sea level. Narrow intertidal benches along some of the coast, but most cliff-water interfaces undercut and cavernous. Pavement and infrequent boulder habitat with scattered corals and various types of algae (samples collected). Depths of 10 m up to 50 m from shore, followed by steeply sloping pavement to depths of 18 m roughly 150 m offshore and 37 m 300 m from shore. No stream entrances noted within the region. Swell to one meter, winds light. Very strong southerly current.

Access: The area is easily accessible by boat with travel time from San Jose at 10 to 15 minutes (DPS 31 ft. Fountain). Land access appears difficult.

Description of Methodology: Two people were towed in back of the DPS 31 ft. Fountain surveying environments 50 to 70 m offshore. When a turtle was sighted the boat was stopped and the species, size, activity, time, depth and habitat characteristics were relayed to a recorder on the boat. Latitude and longitude were noted at the location where each turtle was encountered using a GPS unit. In addition, boat observers searched the waters surface for turtle ascents.

Source of Information: The west side of Puntan Carolinas was noted by conservation officers and fishermen for it's numerous turtles. Mr. Kim (fisherman) noted seeing five to seven turtles while fishing off the cliffs in the target area. Pultz et al. (1999) observed two juvenile green turtles during a dive survey in the region.

Observers: Ray Aldan, Henry King, Jesse Pangelinan, Alfonso Reyes, John Manglona, Steve Kolinski
Location: **Target Area to Puntan Carolinas Southwest Boundary**
Tide: High rising, 3 days before half moon (neap) towards new.

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
10:27	14°55.572	145°47.874	8.2							START
10:27	14°55.572	145°47.874	8.2	1	Gn	Juv/Adult	Resting	21	Under boulder	Size approx. 90 cm.
10:30										Algae collected from prominence.
10:30	14°55.631	145°37.837	7.0	2	Gn	Juv	Swimming	15	Sand, boulder	Size approx. 55 cm.
10:36	14°55.662	145°37.821		3	Gn	Juv	Swimming	8	Boulder	Size approx. 55 cm.
10:43	14°55.856	145°37.822	6.1	4	Gn	Juv	Swimming	1	Sand	Size approx. 60 cm. Seen on surface from boat.
10:44	14°55.856	145°37.822	6.1	5	Gn	Juv	Swimming	18	Sand	Size approx. 65 - 70 cm.
10:44	14°55.856	145°37.822	6.1	6	Gn	Juv	Swimming	18	Hardpan	Size approx. 70 cm.
10:50	14°55.928	145°37.777	7.0							Algae collected from benthos.
10:55	14°55.955	145°37.770	4.6	7	Gn	Juv	Swimming	18	Boulder	Size approx. 45 cm.
10:58	14°55.955	145°37.770	4.6	8	Gn	Juv	Swimming	21	Hardpan	Size approx. 55 cm.
11:02	14°56.008	145°37.751	5.5	9	Gn	Juv/Adult	Swimming	21	Hardpan	Size approx. 90 cm. Tail not visible.
11:02	14°56.008	145°37.751	5.5	10	Gn	Juv	Swimming	21	Hardpan	Size approx. 65 - 70 cm.
11:05	14°55.960	145°37.768	4.3	11	Gn	Juv	Swimming	24	Sand	Size approx. 45 cm.

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
11:10	14°55.942	145°37.765	5.5	12	Gn	Juv	Feeding	15	Hardpan	Size approx. 45 - 50 cm.
11:17	14°56.079	145°37.754	6.1	13	Gn	Juv	Resting	15	Boulder	Size approx. 65 cm.
11:20	14°56.147	145°37.762	6.1	14	Gn	Juv	Swimming	20	Hardpan	Size approx. 70 cm.
11:20	14°56.147	145°37.762	6.1							

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
0:53	12	Gn	Juv	**12**	**Gn**	**Juv**	1.270	11.0
	2	Gn	Juv/Adult	**2**	**Gn**	**Juv/Adult**		
	14	Gn		**14**	**Gn**			

Conclusion: Green turtles noted in abundance within this region. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Capture and tagging of turtles might be possible by hand if experienced fishermen employed working off a large boat. Nighttime captures might be feasible given appropriate oceanic conditions.

Date: 03/14/01
Type: Tow
Location: N14°56.149 Puntan Carolinas to Horseshoe Patch Reef, West Tinian

Site Description: Limestone shoreline low lying at south end of transect giving way to sand beach deposits at Unai Tachungnya to the north. Pavement and infrequent boulder habitat with scattered corals and various types of algae at the south end of the transect. Sand benthos with infrequent rock and/or coral outcrops is dominant on the north end of the transect. Depths varied between five and 18 m. No turtles observed over sand substrates. No stream entrances noted within the region. Swell to one meter, winds light. Randall (1990) observed fairly complex reef structure in nearshore habitats of Tachungnya which were bypassed in this survey. Sonoda (1990) identified various species of algae from the Tachungnya and Horseshore Patch Reef regions which have been listed by Hirth (1997) as green turtle forage in other areas of the world.

Access: The area is easily accessible by boat with travel time from San Jose at seven 10 minutes (DPS 31 ft. Fountain).

Description of Methodology: Two people were towed in back of the DPS 31 ft. Fountain surveying environments 50 to 300 m offshore. When a turtle was sighted the boat was stopped and the species, size, activity, time, depth and habitat characteristics were relayed to a recorder on the boat. Latitude and longitude were noted at the location where each turtle was encountered using a GPS unit. In addition, boat observers searched the waters surface for turtle ascents.

Source of Information: Conservation officers suggested that turtles are not very abundant along this transect. Potential green turtle forage noted in the area (Sonoda 1990, see Hirth 1997).

Observers: Ray Aldan, Henry King, Jesse Pangelinan, Alfonso Reyes, John Manglona, Steve Kolinski
Location: **Puntan Carolinas to Horseshoe Patch Reef**
Tide: High falling, 3 days before half moon (neap) towards new.

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
11:20	14°56.147	145°37.762	6.1							START
11:23	14°56.197	145°37.760	7.9	1	Gn	Juv	Swimming	15	Hardpan	Size approx. 55 cm.
11:25	14°56.200	145°37.760	8.8	2	Gn	Juv	Swimming	18	Hardpan	Size approx. 45 cm.
11:28	14°56.325	145°37.724						18	Hardpan	Numerous *Acanthaster planci.*
11:32	14°56.403	145°37.681	4.0	3	Gn	Juv	Swimming	18	Sand, hardpan	Size approx. 60 cm.
11:35	14°56.403	145°37.653	4.6							
11:50	14°56.796	145°37.609	6.1							
12:00	14°56.896	145°37.623	4.6							STOP: End of tow transect at Horseshoe Patch Reef.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
				3	Gn	Juv		
0:40	3	Gn	Juv				1.413	2.1

Conclusion: Turtles were not observed to be abundant along this transect. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Additional focus on nearshore areas at Tachungnya recommended. Tagging efforts not recommended for this region at this time.

Date: **03/14/01**
Type: **Snorkel**
Location: **Horseshoe Patch Reef, Tachungnya, West Tinian**

Site Description: The majority of shoreline within this area is medium to coarse grain sand beach with limited construction though fairly active tourist beach and water activity. The patch reef is approximately 400 m offshore of Unai Tachungnya, located south of the harbor. The reef is slightly elongated with its longest dimension in a northwest-southeast direction (Doan et al. 1960). Eldredge and Randall (1980) reported patch reef dimensions of 300 m by 180 m. Numerous species of live coral, algae and limestone rock make up the reef. The reef edge slopes at an approximate 50 degree angle to depths of 11m. No streams were noted to enter the region. Swell 0.2 m, winds light. Sonoda (1990) identified various species of algae from the Tachungnya and Horseshore Patch Reef regions which have been listed by Hirth (1997) as green turtle forage in other areas of the world. Algae samples collected this survey. Photo available.

Access: The area is easily accessible by boat with travel time from San Jose at five to seven minutes (DPS 31 ft. Fountain). One could also swim out to the patch reef from Unai Tachungnya.

Description of Methodology: A group of four snorkelers was dropped off at the patch reef edge to conduct a snorkeling transect. Swimmers spread out in a line perpendicular to the reef with observer distances at approximately10 m, and surveyed the slopes of the reef noting turtle species, size, activity, time, depth and habitat characteristics. One person recorded observations on underwater writing paper. The start and end points of the transect were measured with a GPS unit.

Source of Information: Conservation officers indicated limited turtle abundance around the patch reef, with higher abundance found within and outside the harbor walls. Pultz et al. (1999) reported green turtle nesting at Unai Tachungnya and Krammer Beach. Potential green turtle forage noted in the area (Sonoda 1990, see Hirth 1997).

Observers: Gus Dusalua, Don Reyes, Elvin Masga, Larry Ilo, Frank Rasa
Tide: High rising, 3 days before half moon (neap) towards new.

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
10:00	14°57.095	145°37.624	8.8							START
10:04				1	Gn	Juv	Swimming	8	Sand	East side of reef.
10:30				2	Gn	Juv	Resting	8	Coral	West side of reef.
10:45				3	Gn	Juv	Swimming	8	Coral, sand	Southeast side of reef.
10:50				4	Gn	Adult	Swimming	8	Rock, sand	Southeast side of reef. Large male turtle.
10:55				5	Gn	Adult	Swimming	8	Coral, rock	East side of reef. Large female turtle.
11:00	14°57.095	145°37.624	8.8							STOP: Algae samples collected along transect.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:00	3	Gn	Juv	**3**	**Gn**	**Juv**	1.138	4.4
	2	Gn	Adult	**2**	**Gn**	**Adult**		
	5	Gn		**5**	**Gn**			

Conclusion: Turtles were not observed to be abundant along this transect. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Capture and tagging of turtles might be possible by hand if experienced fishermen employed working off a boat. Nighttime captures might be feasible given appropriate oceanic conditions.

Date: **03/14/01, 3/15/01 and 3/20/01**
Type: **Boat Observations**
Location: **Inside Tinian Harbor, San Jose, West Tinian**

Site Description: Tinian Harbor was constructed upon a natural lagoon formed by a barrier reef on the southwest side of Tinian Island in San Jose (Jones et al. 1974). A corroded interlocking sheet steel breakwater is constructed along a natural barrier reef system and for the most part separates the inside from outside of Tinian Harbor. Two large breaks in the wall are located along the northwest sector, and are deep enough to easily allow for turtle movements between regions. The wall and reef are approximately 1.5 km in length, and curve towards land. The shoreline has been greatly modified by dredging and filling (Jones et al. 1974, Eldredge and Randall 1980). The harbor substrate is mainly sand, with some rock prominences supporting limited coral growth and various sorts of algae. Algae is also present on the sand substrate. Jones et al. (1974), Eldredge and Randall (1980) and Maragos (1985) all reported limited patches of seagrass. No seagrasses were observed in this survey along algae collection transects within the harbor. The harbor water was surprising clear. No streams observed to enter the region. Water calm.

Access: Paved roads lead directly to the harbor. Travel time by car from most hotels in San Jose estimated at five minutes.

Description of Methodology: Turtles observed while entering and exiting the harbor were recorded. When a a turtle was sighted the boat was stopped and the species, size, activity, time, depth and habitat characteristics were recorded. Latitude and longitude were noted at the location where each turtle was encountered using a GPS unit (only one GPS unit was available).

Source of Information: Conservation Officers and fishermen noted turtles frequently encountered inside Tinian Harbor, particularly at night. Algae collected by Jones et al. (1974) from inner harbor regions noted as green turtle forage by Hirth (1997) in other regions of the world. Eldredge and Randall (1980) and Maragos (1985) noted unspecified patches of seagrass within the harbor. Jones et al. (1974) mentions *Halophila minor* within the harbor.

Date: **03/14/01**
Type: **Boat Observations**
Observers: Ray Aldan, Gus Dusalua, Henry King, Alfonso Reyes, Don Reyes, Elvin Masga, Jesse Pangelinan, Larry Ilo, John Manglona, Frank Rasa, Steve Kolinski
Location: **Inside Tinian Harbor, San Jose, West Tinian**

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
12:06	14°57.097	145°37.038	5.2	1	Gn	Juv	Swimming	6	Sand, algae	Harbor entrance. High tide falling (neap).
13:44	14°57.854	145°37.070	4.9	2	Gn	Juv	Swimming	8	Sand, algae	Algae collected. High tide falling (neap).
13:50	14°57.776	145°37.328	4.3	3	Gn	Juv	Surface	9	Sand, algae	High tide falling (neap).

Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
3	Gn	Juv	**2**	**Gn**	**Juv**	0.925	2.2

Date: **03/15/01**
Type: **Boat Observations**
Observers: Ray Aldan, Gus Dusalua, Henry King, Alfonso Reyes, Don Reyes, Elvin Masga, Jesse Pangelinan, Larry Ilo, John Manglona, Frank Rasa, Steve Kolinski
Location: **Inside Tinian Harbor, San Jose, West Tinian**

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
9:24	14°59.357	145°35.853	32.9	1	Gn	Juv/Adult	Surface	9	Sand, algae	Inner harbor. Tide high rising (neap).

Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1	Gn	Juv/Adult	1	Gn	Juv/Adult	0.925	1.1

Date: **03/20/01**
Type: **Boat Observations**
Observers: Ray Aldan, Gus Dusalua, Henry King, Alfonso Reyes, Don Reyes, Elvin Masga, Jesse Pangelinan, Larry Ilo, John Manglona, Frank Rasa, Steve Kolinski
Location: **Inside Tinian Harbor, San Jose, West Tinian**

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
9:25				1	Gn	Juv	Surface		Sand, algae	Inner harbor. Tide medium falling (neap).

Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1	Gn	Juv	1	Gn	Juv	0.925	1.1

Conclusion: Numbers of turtles within the harbor during daylight hours appear minimal. However, fishermen suggest nighttime numbers may be high. Food resources are apparent within the harbor (Jones et al. 1974, per. obs.). It is suggested that tangle nets be employed during nighttime hours over the two wall breaches and harbor entrance to the boat ramp region in an effort to capture turtles for tagging.

Date: **03/14/01**
Type: **Tow**
Location: **Outside Tinian Harbor Wall, San Jose, West Tinian**

Site Description: A corroded interlocking sheet steel breakwater is constructed along a natural barrier reef system and for the most part separates the inside from outside of Tinian Harbor. Two large breaks in the wall are located along the northwest sector, and are deep enough to easily allow for turtle movements between regions. The reef runs in a northwest to southeast direction and has crest depths of one meter gradually sloping to 11 m over 150 m distance. Numerous species of live coral, algae and limestone rock make up the barrier reef system. The wall and reef are approximately 1.5 km in length, and curve towards land. The inner harbor and shoreline features are described elsewhere. Turtles have been surveyed previously in this region (Pultz et al. 1999). Algae noted as green turtle forage in other parts of the world have been collected (Jones et al. 1974). Algae samples collected this survey. Swell 0.2 m, winds light. No streams were noted to enter the region. Photo available.

Access: The area is easily accessible by boat with travel time from Tinian Harbor at two minutes (DPS 31 ft. Fountain). The outer harbor wall and reef beyond can easily be reached by swimming across the harbor (boat traffic typically minimal) through either of two large holes in the sheet steal breakwater.

Description of Methodology: Two boats (31 ft. Fountain and a 14 ft. whaler) were used in this survey. Two people were towed in back of each boat, with the whaler surveying shallower environments maintaining distances from shore approximately 30 to 100 m, and the Fountain surveying deeper environments 30 to 50 m offshore of the whaler. When a turtle was sighted the boat was stopped and the species, size, activity, time, depth and habitat characteristics were relayed to a recorder on the boat. Latitude and longitude were noted at the location where each turtle was encountered using a GPS unit (only one GPS unit was available). In addition, boat observers searched the waters surface for turtle ascents. Communication of turtle sightings between boats ensured multiple reports of individual turtles did not occur.

Personnel: Ray Aldan, Gus Dusalua, Henry King, Alfonso Reyes, Don Reyes, Elvin Masga, Jesse Pangelinan, Larry Ilo, John Manglona, Frank Rasa, Steve Kolinski

Source of Information: Conservation officers, fishermen and boaters reported high numbers of turtles on the outer harbor wall, with occasional sitings within the harbor, especially at night. Pultz et al. (1999) recorded 11 juvenile and one adult green turtles during two dive surveys in 1995 along the outside harbor wall. Jones et al. (1974) reported algae noted by Hirth (1997) as green turtle forage from transects both inside and outside of the harbor.

Type: **Tow**
Observers: Ray Aldan, Henry King, Jesse Pangelinan, Alfonso Reyes, John Manglona, Steve Kolinski
Location: **Outside Tinian Harbor Wall, Deep Transect**
Tide: High falling, 3 days before half moon (neap) towards new.

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
13:55	$14^{O}57.623$	$145^{O}37.354$	3.4							START
14:03	$14^{O}57.576$	$145^{O}37.254$	4.0	1	Gn	Juv	Resting	9	Coral, sand	Size approx. 50 cm.
14:06	$14^{O}57.553$	$145^{O}37.145$	5.2	2	Gn	Juv	Swimming	6	Coral, sand	Size approx. 50 cm.
14:06	$14^{O}57.553$	$145^{O}37.145$	5.2	3	Gn	Adult	Swimming	18	Sand	Male turtle. Size approx. 90 cm.

Outside Tinian Harbor Wall, San Jose, West Tinian

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
14:09	14°57.570	145°37.037	4.0					20		Corner of harbor wall.
14:20	14°57.796	145°36.739	4.0					20		Corner of harbor wall.
14:24	14°58.014	145°36.641	3.4	4	Gn	Juv/Adult	Swimming	24	Hardpan, spur and groove	Size approx. 90 cm.
14:33	14°58.337	145°36.653	4.3							STOP: End of tow transect outer Tinian Harbor region, Telesource Power Plant, old dump site.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
0:38	2	Gn	Juv	**2**	**Gn**	**Juv**	2.475	1.6
	1	Gn	Juv/Adult	**1**	**Gn**	**Juv/Adult**		
	1	Gn	Adult	**1**	**Gn**	**Adult**		
	4	Gn		**4**	**Gn**			

Type: **Tow**
Observers: Gus Dusalua, Don Reyes, Elvin Masga, Larry Ilo, Frank Rasa
Location: **Outside Tinian Harbor Wall, Shallow Transect**
Tide: High falling, 3 days before half moon (neap) towards new.

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
14:04	14°57.623	145°37.354	3.4					8		START
14:05	14°57.623	145°37.354	3.4	1	Gn	Juv	Resting	8	Rock, sand	Under rock.
14:06				2	Gn	Juv	Swimming	9	Rock, sand	
14:07				3	Gn	Adult	Swimming	8	Boulder, sand	Male turtle.
14:08				4	Gn	Juv/Adult	Swimming	9	Rock, sand	Larger turtle.
14:10				5	Gn	Juv/Adult	Swimming	11	Boulder, sand	Larger turtle.
14:10				6	Gn	Adult	Swimming	11	Boulder, sand	Large turtle, small tail.
14:10				7	Gn	Adult	Swimming	11	Boulder, sand	Large turtle, small tail.
14:12				8	Gn	Juv/Adult	Resting	9	Boulder, sand	Larger turtle.
14:14				9	Gn	Juv	Swimming	6	Rock	
14:15				10	Gn	Juv	Swimming	8	Rock	
14:16				11	Gn	Juv/Adult	Swimming	8	Coral, rock	Larger turtle.
14:17				12	Gn	Juv	Resting	8	Coral, pavement	
14:21				13	Gn	Juv/Adult	Swimming	8	Rock	Larger turtle.
14:21				14	Gn	Juv	Swimming	8	Rock	
14:24				15	Gn	Juv/Adult	Swimming	8	Coral	Larger turtle.
14:26				16	Gn	Adult	Swimming	8	Coral	Large turtle, small tail.
14:27				17	Gn	Juv	Resting	9	Rock, sand groove	

Outside Tinian Harbor Wall, San Jose, West Tinian

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
14:28				18	Gn	Juv	Swimming	8	Coral	
14:29				19	Gn	Juv	Swimming	9	Coral, sand	
14:31				20	Gn	Juv	Swimming	12	Rock	
14:31				21	Gn	Juv	Resting	8	Pavement	
14:31				22	Gn	Juv	Swimming	10	Pavement	
14:31				23	Gn	Adult	Swimming	10	Pavement	Large turtle, small tail.
14:34				24	Gn	Adult	Mating	11	Pavement	Male turtle.
14:34				25	Gn	Adult	Mating	11	Pavement	Female turtle.
14:36				26	Gn	Juv	Swimming	9	Coral, pavement	
14:38				27	Gn	Juv	Swimming	8	Coral, pavement	
14:39				28	Gn	Juv	Swimming	8	Coral, pavement	
14:43				29	Gn	Juv	Swimming	6	Rock, sand, coral	
14:45				30	Gn	Juv	Swimming	6	Coral, pavement	
14:45	$14^{O}58.349$	$145^{O}36.671$	3.6							STOP: End of tow transect outer Tinian Harbor region, Telesource Power Plant, old dump site.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
0:41	17	Gn	Juv	**17**	**Gn**	**Juv**	2.475	12.1
	6	Gn	Juv/Adult	**6**	**Gn**	**Juv/Adult**		
	7	Gn	Adult	**7**	**Gn**	**Adult**		
	30	Gn		**30**	**Gn**			

Summary:

Max. Time (hrs:mins)	Tot. Obs.	Species	Size	Total Estimated Number of Turtles Observed			Tot. Transect Length (km)	Turtles per km
0:41	19	Gn	Juv	**19**	**Gn**	**Juv**	2.475	13.7
	7	Gn	Juv/Adult	**7**	**Gn**	**Juv/Adult**		
	8	Gn	Adult	**8**	**Gn**	**Adult**		
	34	Gn		**34**	**Gn**			

Conclusion: Green turtles noted in abundance within this region, especially along the shallow transect closer to the barrier reef. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Capture and tagging of turtles might be possible by hand if experienced fishermen employed working off a boat. Nighttime captures might be feasible given appropriate oceanic conditions. Tangle nets might be employed to capture turtles moving between breaks in the harbor wall.

Date: **03/14/01**
Type: **Tow**
Location: **Leprosarium and Barcinas (Peipeinigul Bay), West Tinian**

Site Description: The shoreline from Tinian Harbor to Leprosarium is low lying convoluted limestone rock a few meters above sea level. Benches, reef and scattered boulders comprise the nearshore habitat. Reef composed mainly of limestone pavement with patches of living coral in various abundances (Eldredge and Randall 1980). The reef extends up to 150 m from shore (Eldredge and Randall 1980), and slopes to pavement depths of 11 m 200 m from shore and 18 m depth 450 m from shore. A small beach along the shore has been reported to host nesting green turtles (Pultz et al. 1999). Peipeinigul Bay is roughly 1.3 km by 500 m. Shoreline cliffs heights vary between five and 20 m (Jones et al. 1974). Boulders and benches fringe various areas of shoreline. A fringing reef extends up to 150 m from shore (Eldredge and Randall 1980), with pavement sloping to 11 m roughly 200 m from shore and 18 m approximately 300 to 500 m from shore. Living coral is abundant in various nearshore shallow waters. Sea caves are present (Jones et al. 1974, Gus Dusalua pers. comm.). Algae noted as green turtle forage in other parts of the world have been collected (Jones et al. 1974). Algae samples collected during this survey. A small beach, Unai Barcinas, reported to host nesting green turtles (Pultz et al. 1999). No streams observed to enter the region. Swell < 0.2 m, winds light.

Access: The area is easily accessible by boat with travel time from Tinian Harbor at 10 to 12 minutes (DPS 31 ft. Fountain). Various areas of both sites appear to be accessible by road, although such routes were not taken..

Description of Methodology: Two boats (31 ft. Fountain and a 14 ft. whaler) were used in this survey. Two people were towed in back of each boat, with the whaler surveying shallower environments maintaining distances from shore approximately 50 to 150 m, and the Fountain surveying deeper environments 30 to 50 m offshore of the whaler. When a turtle was sighted the boat was stopped and the species, size, activity, time, depth and habitat characteristics were relayed to a recorder on the boat. Latitude and longitude were noted at the location where each turtle was encountered using a GPS unit (only one GPS unit was available). In addition, boat observers searched the waters surface for turtle ascents. Communication of turtle sightings between boats ensured multiple reports of individual turtles did not occur.

Personnel: Ray Aldan, Gus Dusalua, Henry King, Alfonso Reyes, Don Reyes, Elvin Masga, Jesse Pangelinan, Larry Ilo, John Manglona, Frank Rasa, Steve Kolinski

Source of Information: Leprosarium and in particular the Barcinas region were well noted by Conservation Officers and fishermen as areas to find numerous turtles. Gus Dusalua (DPS Fire Rescue, Fisherman) noted a cave at Barcinas in which he typically sees four to five large turtles resting. Pultz et al. (1999) conducted dive surveys in both regions and noted a total of seven juveniles in three dives at Leprosarium and nine juveniles and two adults in the Barcinas region over the coarse of four dives. Turtle nesting at Unai Barcinas has also been reported (Wiles et al. 1989, Pultz et al. 1999). Various species of algae collected within the region by Jones et al. (1974) have been noted by Hirth (1997) as green turtle forage.

Type: **Tow**
Observers: Ray Aldan, Henry King, Jesse Pangelinan, Alfonso Reyes, John Manglona
Location: **Leprosarium and Barcinas, Deep Transect**
Tide: Medium falling, 3 days before half moon (neap) towards new.

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
14:33	$14^{O}58.337$	$145^{O}36.653$	4.3							START: Telesource Power Plant.

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
14:45				1	Gn	Juv	Swimming	8	Hardpan	Off old dump site.
14:55				2	Gn	Juv	Swimming	9	Hardpan	Off old dump site.
15:00				3	Gn	Juv	Swimming	12	Rock	
15:02				4	Gn	Juv	Swimming	14	Rock	
15:04				5	Gn	Adult	Swimming	12	Sand	Male turtle 95 - 100 cm.
15:05				6	Gn	Juv/Adult	Resting	12	Coral, Rock	Larger turtle.
15:20				7	Gn	Juv	Swimming	12	Sand	Leprosarium beach.
15:25				8	Gn	Juv	Resting	12	Rock	Leprosarium beach.
15:50				9	Gn	Juv	Resting	9	Sand, coral	Very small turtle. Barcinas beach
15:54				10	Gn	Juv	Swimming	12	Sand, coral	Very small turtle. Barcinas beach
15:55				11	Gn	Juv	Swimming	12	Coral	Barcinas beach
15:59				12	Gn	Juv	Swimming	18	Sand, coral	Very small turtle. Barcinas beach
16:02				13	Gn	Juv	Swimming	12	Coral, sand	Barcinas beach
16:02				14	Gn	Juv/Adult	Swimming	12	Sand, coral	Barcinas beach
16:04				15	Gn	Juv/Adult	Resting	9	Coral	Barcinas beach
16:05	$14^{O}59.369$	$145^{O}35.853$	3.4							STOP: End at Barcinas Point, north.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:32	11	Gn	Juv	**11**	**Gn**	**Juv**	3.025	5.0
	3	Gn	Juv/Adult	**3**	**Gn**	**Juv/Adult**		
	1	Gn	Adult	**1**	**Gn**	**Adult**		
	15	Gn		**15**	**Gn**			

Type: **Tow**
Observers: Gus Dusalua, Don Reyes, Elvin Masga, Larry Ilo, Frank Rasa, Steve Kolinski
Location: **Leprosarium and Barcinas, Shallow Transect**
Tide: Medium falling, 3 days before half moon (neap) towards new.

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
14:47	$14^{O}58.337$	$145^{O}36.653$	4.3							START: Telesource Power Plant.
14:53	$14^{O}58.349$	$145^{O}36.671$	3.7	1	Gn	Adult	Resting	8	Rock, sand, coral	Large turtle with small tail: likely female.
14:54	$14^{O}58.354$	$145^{O}36.357$	3.4	2	Gn	Juv	Swimming	8	Coral, pavement	
14:54	$14^{O}58.354$	$145^{O}36.357$	3.4	3	Gn	Juv	Resting	8	Coral, pavement	
14:56	$14^{O}58.381$	$145^{O}36.665$	4.3	4	Gn	Juv	Swimming	9	Coral, pavement	Very small turtle.
15:03	$14^{O}58.519$	$145^{O}36.681$	3.0	5	Gn	Adult	Swimming	8	Coral, sand, pavement	Large turtle with small tail: likely female.
15:05	$14^{O}58.557$	$145^{O}36.688$	4.0	6	Gn	Juv/Adult	Swimming	11	Rock	
15:06	$14^{O}58.565$	$145^{O}36.679$	3.7	7	Gn	Juv/Adult	Swimming	14	Pavement	
15:11	$14^{O}58.634$	$145^{O}36.688$	3.0	8	Gn	Juv/Adult	Swimming	7	Coral, pavement	

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
15:15	14°58.723	145°36.687	3.0	9	Gn	Juv/Adult	Swimming	7	Coral, rock	
15:16	14°58.723	145°36.687	3.0	10	Gn	Juv	Swimming	11	Sand	Very small turtle.
15:20	14°58.879	145°36.647	3.0	11	Gn	Juv	Swimming	5	Coral, rock	Very small turtle.
15:20	14°58.879	145°36.647	3.0	12	Gn	Juv	Swimming	5	Coral, rock	Very small turtle.
15:20	14°58.879	145°36.647	3.0	13	Gn	Adult	Swimming	6	Sand	Large turtle with small tail: likely female.
15:28	14°58.905	145°36.615	4.0	14	Gn	Juv/Adult	Swimming	6	Coral, rock	
15:29	14°58.911	145°36.595	3.0	15	Gn	Juv	Resting	8	Coral overhang, sand	
15:32	14°58.960	145°36.577	3.4	16	Gn	Juv	Swimming	6	Rock	
15:34	14°59.030	145°36.530	3.4	17	Gn	Juv	Swimming	8	Coral, rock	Very small turtle.
15:35	14°59.023	145°36.515	3.4	18	Gn	Juv	Swimming	6	Pavement	
15:37	14°59.008	145°36.455	3.4	19	Gn	Adult	Swimming	9	Rock, sand groove	Large turtle short tail: likely female.
15:43	14°59.254	145°36.477	4.3	20	Gn	Juv	Swimming	11	Coral	Very small turtle.
15:45	14°59.276	145°36.443	4.9	21	Gn	Juv	Resting	6	Coral	Under rock. Very small turtle.
15:48	14°59.371	145°36.458	4.0	22	Gn	Juv	Swimming	5	Coral, rock	
15:52	14°59.419	145°36.347	4.0	23	Gn	Juv	Swimming	5	Sand	
15:54	14°59.431	145°36.234	4.0	24	Gn	Juv	Swimming	11	Coral, sand	
15:54	14°59.431	145°36.234	4.0	25	Gn	Juv	Swimming	11	Coral, sand	
15:54	14°59.431	145°36.234	4.0	26	Gn	Juv/Adult	Swimming	11	Coral, sand	
15:54	14°59.431	145°36.234	4.0	27	Gn	Juv/Adult	Swimming	11	Coral, sand	
15:56	14°59.431	145°36.234	4.0	28	Gn	Juv/Adult	Swimming	9	Coral	
15:56	14°59.431	145°36.234	4.0	29	Gn	Adult	Swimming	9	Coral	Large turtle short tail: likely female.
15:57	14°59.431	145°36.234	4.0	30	Gn	Juv/Adult	Resting	11	Coral	Under coral.
16:00	14°59.437	145°36.151	4.0	31	Gn	Juv	Resting	8	Coral	Under coral.
16:03	14°59.430	145°36.011	3.4	32	Gn	Juv	Feeding	9	Sand, rock, coral	Algae collected.
16:11	14°59.416	145°35.943	4.0	33	Gn	Juv/Adult	Swimming	11	Coral	
16:16	14°59.366	145°35.787	3.7	34	Gn	Juv/Adult	Swimming	15	Boulder, sand	
16:16	14°59.366	145°35.787	3.7							STOP: End at Barcinas Point, north.

Tot. Time (hrs:mins)	Transect Length (km)	Turtles per km
1:29	3.025	11.2

Obs.	Species	Size	Estimated Number of Turtles Observed		
18	Gn	Juv	**18**	**Gn**	**Juv**
11	Gn	Juv/Adult	**11**	**Gn**	**Juv/Adult**
5	Gn	Adult	**5**	**Gn**	**Adult**
34	Gn		**34**	**Gn**	

Summary:

Max. Time (hrs:mins)	Tot. Obs.	Species	Size	Total Estimated Number of Turtles Observed			Tot. Transect Length (km)	Turtles per km
1:32	29	Gn	Juv	**29**	**Gn**	**Juv**	3.025	16.2
	14	Gn	Juv/Adult	**14**	**Gn**	**Juv/Adult**		
	6	Gn	Adult	**6**	**Gn**	**Adult**		
	49	Gn		**49**	**Gn**			

Conclusion: Green turtles noted in abundance within this region, especially along the shallow transect. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Capture and tagging of turtles might be possible by hand if experienced fishermen employed working off a boat. Nighttime captures might be feasible given appropriate oceanic conditions. Tangle nets might be employed to capture turtles in the Barcinas region. Leprosarium portion of transect has 14.5 turtles per km; Barcinas has 18.9 turtles per km.

Date: **03/15/01**
Type: **Tow**
Location: **Puntan Lamanibot Sanhilo to Puntan Diapblo (North Barcinas), West Tinian**

Site Description: Lamanibot Bay is roughly 1.8 km long and 0.625 km in width. Shoreline cliffs vary from 10 to 40 m high. The coast is rocky with numerous large boulders. A fringing reef approximately 90 m in width (Eldredge and Randall 1980) supports numerous species of coral and algae. Coral cover approaches 40 % in some areas. The substrate slopes gradually from the inner bay reaching depths of 11 m 250 m from shore, 37 m depth just outside of the bay, and 183 m roughly 300 m further oceanward. Previous reports of turtles in the region include HA(I), Inc. (1985) and Wiles et al. (1989). Jones et al. (1974) collected algae from the region. Algae collected during tow survey. The Atgidon and Diapblo areas are characterized by convoluted limestone cliffs with heights seven to 15 m, narrow intertidal benches, eroded cliff caverns, and for the most part deep nearshore waters. Boulder zones and shallow fringing reef/pavement are present in some areas. The substrate is mainly steeply sloping pavement with scattered corals and algae. No streams observed to enter the region. Swell one to two meters. Winds light. Limited photos available.

Access: Travel time by boat (31 ft. DPS Fountain) approximately 20 to 25 minutes. Road access at Puntan Lamanibot Sanhilo and Fleming Point described elsewhere. The main paved road towards Puntan Tahgong is taken north, and various side roads can be taken towards shore. Broad access from land appears limited by thick forest and a lack of back roads.

Description of Methodology: Two boats (31 ft. Fountain and a 14 ft. whaler) were used in this survey. Two people were towed in back of each boat, with the whaler surveying shallower environments maintaining distances from shore approximately 50 to 150 m, and the Fountain surveying deeper environments 30 to 50 m offshore of the whaler. When a turtle was sighted the boat was stopped and the species, size, activity, time, depth and habitat characteristics were relayed to a recorder on the boat. Latitude and longitude were noted at the location where each turtle was encountered using a GPS unit (only one GPS unit was available). In addition, boat observers searched the waters surface for turtle ascents. Communication of turtle sightings between boats ensured multiple reports of individual turtles did not occur.

Personnel: Ray Aldan, Gus Dusalua, Henry King, Alfonso Reyes, Don Reyes, Elvin Masga, Jesse Pangelinan, Larry Ilo, John Manglona, Frank Rasa, Steve Kolinski

Source of Information: Source information for Puntan Lamanibot Sanhilo and Fleming point are listed elsewhere. The other areas surveyed along this transect were not noted by Conservation Officers or fishermen for high turtle abundances. Jones et al. (1974) collected algae from Lamanibot Bay and south Puntan Diapblo. Both regions had species listed by Hirth (1997) as green turtle forage in other regions of the world.

Type: **Tow**
Observers: Ray Aldan, Jesse Pangelinan, Alfonso Reyes, Larry Ilo, John Manglona
Location: **Puntan Lamanibot Sanhilo to Puntan Diapblo, Deep Transect**
Tide: High falling, 2 days before half moon (neap) towards new.

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
11:45	15^{O}03.200	145^{O}35.730	5.5							START: Dunk Coke northernmost point, rock extension.
11:57	15^{O}03.031	145^{O}35.882	3.7							STOP: Lunch, just inside bay at Lamanibot.

Puntan Lamanibot Sanhilo to Puntan Diaplo (North Barcinas), West Tinian

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
12:33	15°03.031	145°35.882	3.7							START.
13:08				1	Gn	Juv	Swimming	18	Sand	South end of Dunk Coke. Very small turtle.
13:46				2	Gn	Juv	Swimming	18	Hardpan	Very small turtle.
13:46				3	Gn	Juv	Resting	18	Hardpan	
13:51				4	Gn	Juv	Resting	23	Sand	Very small turtle.
14:30				5	Gn	Juv	Resting	20	Hardpan	Very small turtle.
14:34				6	Gn	Juv	Swimming	15	Hardpan, sand	
14:36				7	Gn	Juv	Resting	18	Hardpan	Very small turtle.
14:56				8	Gn	Juv	Swimming	15	Hardpan	
14:58				9	Gn	Juv	Surface	15	Coral	
15:02	14°59.369	145°35.834	3.4							STOP

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
2:41	9	Gn	Juv	9	Gn	Juv	9.625	0.9

Type: **Tow**
Observers: Gus Dusalua, Don Reyes, Elvin Masga, Frank Rasa, Steve Kolinski
Location: **Puntan Lamanibot Sanhilo to Puntan Diapblo, Shallow Transect**
Tide: High falling, 2 days before half moon (neap) towards new.

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
11:45	15°03.200	145°35.730	5.5							START: Dunk Coke northernmost point, rock extension.
11:47	15°03.144	145°35.763	7.9	1	Gn	Juv/Adult	Surface		White wash area	Observed inshore from boat, inside Lamanibot bay.
11:48	15°03.113	145°35.861	3.7	2	Gn	Juv	Feeding	8	Hardpan with algae	Inside Lamanibot bay. Algae sample collected.
11:50	15°03.113	145°35.861	3.7	3	Gn	Juv	Feeding	8	Hardpan with algae	Inside Lamanibot bay. Algae sample collected.
11:57	15°03.031	145°35.882	3.7							STOP: Lunch, just inside bay at Lamanibot.
12:33	15°03.031	145°35.882	3.7							START.
12:40	15°03.012	145°35.893	4.3	4	Gn	Juv	Swimming	5	Coral, sand	Very small turtle (approx. 40 cm.).
12:49	15°02.620	145°35.806	4.0							
12:59	15°02.310	145°35.540	3.7	5	Gn	Juv	Swimming	8	Coral	Very small turtle (approx. 45 cm.).
13:05	15°02.297	145°35.360	7.6	6	Gn	Juv	Swimming	8	Coral, hardpan	Very small turtle (approx. 45 cm.).
13:06	15°02.260	145°35.276	4.0	7	Gn	Juv	Swimming	15	Hardpan	
13:09	15°02.172	145°35.272	3.7	8	Gn	Juv/Adult	Swimming	18	Hardpan	Outside Lamanibot Bay
13:27	15°01.530	145°35.067	2.1	9	Gn	Juv	Swimming	12	Hardpan	
13:34	15°01.406	145°35.021	3.4							End of Flemming Point Grotto.

Puntan Lamanibot Sanhilo to Puntan Diaplo (North Barcinas), West Tinian

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
13:44	15°01.012	145°34.910	5.8							Tali Point.
13:45	15°01.012	145°34.910	5.8	10	Gn	Juv	Swimming	21	Hardpan	
13:45	15°01.012	145°34.910	5.8	11	Gn	Juv	Feeding	21	Hardpan	
13:47	15°00.953	145°34.922	3.7	12	Gn	Juv	Resting	21	Hardpan	
14:12	15°00.322	145°35.196	4.3	13	Gn	Juv	Resting	14	Hardpan, algae	End of Tali Point.
14:27	14°59.697	145°35.092	4.0	14	Gn	Juv	Swimming	12	Hardpan	
14:34	14°59.513	145°35.390	3.7	15	Gn	Juv	Resting	15	Hardpan	
14:34	14°59.513	145°35.330	3.7	16	Gn	Juv	Swimming		Surface	Very small turtle (approx. 40 cm.).
14:37	14°59.536	145°35.366	5.8	17	Gn	Juv	Swimming	12	Rock overhang	Very small turtle (approx. 45 cm.).
14:40	14°59.504	145°35.392	4.9	18	Gn	Juv	Swimming	2	Ledge	Very small turtle (approx. 35 - 40 cm.).
14:41	14°59.468	145°35.386	3.7	19	Gn	Juv	Swimming	15	Hardpan	Very small turtle (approx. 40 - 45 cm.).
14:47	14°59.389	145°35.522	4.0	20	Gn	Juv	Swimming	12	Hardpan	Very small turtle (approx. 40 - 45 cm.).
14:50	14°59.395	145°35.605	4.0	21	Gn	Juv	Swimming	18	Hardpan	
14:54	14°59.377	145°35.616	3.7	22	Gn	Juv/Adult	Resting	15	Boulder	Resting between boulders.
14:58	14°59.373	145°35.136	4.6	23	Gn	Juv	Swimming	20	Boulder	
15:02	14°59.369	145°35.834	3.4	24	Gn	Juv/Adult	Swimming	18	Rock	
15:02	14°59.369	145°35.834	3.4							STOP.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
2:41	20	Gn	Juv	20	**Gn**	**Juv**	9.625	2.5
	4	Gn	Juv/Adult	4	**Gn**	**Juv/Adult**		
	24	Gn		24	**Gn**			

Summary:

Max. Time (hrs:mins)	Tot. Obs.	Species	Size	Total Estimated Number of Turtles Observed			Tot. Transect Length (km)	Turtles per km
2:41	29	Gn	Juv	**29**	**Gn**	**Juv**	9.625	3.4
	4	Gn	Juv/Adult	**4**	**Gn**	**Juv/Adult**		
	33	Gn		**33**	**Gn**			

Conclusion: There were a few localized areas where turtles were found in relatively high abundance, including Puntan Lamanibot Sanhilo. Lamanibot Bay had 2.8 turtle per km. The rest of the transect had 3.6 turtles per km. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Capture and tagging of turtles might be possible by hand if experienced fishermen employed working off a boat. Nighttime captures might be feasible given appropriate oceanic conditions. At least six very small turtles (35 to 45 cm) observed.

Date: **03/13/01**
Type: **Cliffline**
Location: **Fleming Point, Atgidon, West Tinian**

Site Description: Six cliffline stations spread out along the shoreline. Convoluted limestone cliffs 10 to 15 m above sea level. Few intertidal benches evident. The majority of the cliffline undercut into caverns at waters edge. Limited reef extension (up to eight meters) with the exception of site (1) where shallow (seven meter) reef pavement extends roughly 30 m from shore. This region is marked with a buoy for mooring dive boats. Nearshore depths are extremely deep with pavement dropping to depths exceeding 50 m very close to shore. Map bathymetry suggests depths exceeding 182 m 375 m offshore. No stream entrances noted within the region. Ocean conditions calm with swell < 0.2 m and winds light to nonexistent. Photos available.

Access: The main paved road towards Puntan Tahgong is taken north, and then a grass and gravel back road off the left backtracks through forest. Room for parking is available on the side of the road, however a 10 minute hike though forest and then across sharp convoluted limestone is necessary to reach the shoreline. Travel time by car from San Jose estimated at 40 minutes. Travel time by boat (31 ft. DPS Fountain) approximately 20 minutes. The roads and paths are fairly well used as the area is popular to fishermen.

Description of Methodology: Cliffline observers sketched the shoreline and submerged benthic features within their range of visibility. When a turtle was sighted on the surface or swimming subsurface, the time was noted and binoculars were used to identify species and estimate size. Features such as tail length and any identifying marks were recorded when observed. The estimated surface time and behavior of each turtle was noted when possible, and the location and/or route of each turtle was plotted on the area map sketch and numbered. The location of each observer was measured using a Garmin handheld GPS unit. Environmental conditions and location factors deemed relevant were recorded.

Personnel: Henry King, Alfonso Reyes, Don Reyes, Elvin Masga, Jesse Pangelinan, Larry Ilo, John Manglona, Frank Rasa, Steve Kolinski

Source of Information: This location was suggested by Conservation Officers who noted reports of turtles by fishermen.

Location: **Fleming Point (1): reef outcrop with buoy** **Lat.** $15^{O}01.050$ **Long.** $145^{O}34.939$ (+/- 4.3 m)
Observer: Alfonso Reyes, Steve Kolinski

Time	Obs. No.	Species	Size	Notes
15:20				START
16:18	1	Gn	Juv	Approx. 70 cm. Surfaced 35 meter from shore for 2 mins.
16:20	2	Gn	Juv	Surface 50 meters from shore for 1 min.
16:38				STOP

Tide: Low falling, 3 days past full moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:18	2	Gn	Juv	**2**	**Gn**	Juv	0.060	33.3

Location: **Fleming Point (2)** **Lat.** 15°01.093 **Long.** 145°34.954 (+/- 4.6 m)
Observer: Don Reyes, Jesse Pangelinan

Time	Obs. No.	Species	Size	Notes
15:15				START
16:30				STOP

Tide: Low falling, 3 days past full moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
1:15	0			**0**	0.060	0.0

Location: **Fleming Point (3)** **Lat.** 15°01.106 **Long.** 145°34.963 (+/- 4.0 m)
Observer: Henry King, John Manglona

Time	Obs. No.	Species	Size	Notes
15:24				START
16:40				STOP

Tide: Low falling, 3 days past full moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
1:16	0			**0**	0.060	0.0

Location: **Fleming Point (4)** **Lat.** 15°01.128 **Long.** 145°34.962 (+/- 4.0 m)
Observer: Elvin Masga

Time	Obs. No.	Species	Size	Notes
15:13				START
16:30				STOP

Tide: Low falling, 3 days past full moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
1:17	0			**0**	0.060	0.0

Location: **Fleming Point (5)** **Lat.** 15°01.150 **Long.** 145°34.971 (+/- 4.0 m)
Observer: Larry Ilo

Time	Obs. No.	Species	Size	Notes
15:13				START
16:30				STOP

Tide: Low falling, 3 days past full moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
1:17	0			**0**	0.060	0.0

Location: **Fleming Point (6)** **Lat.** 15°01.191 **Long.** 145°34.987 (+/- 3.7 m)

Observer: Frank Rasa

Time	Obs. No.	Species	Size	Notes
15:40				START
16:45				STOP

Tide: Low falling, 3 days past full moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
1:05	0			**0**	0.060	0.0

Summary:

Max. Time (hrs:mins)	Tot. Obs.	Species	Size	Total Estimated Number of Turtles Observed			Tot. Transect Length (km)	Turtles per km
1:18	2	Gn	Juv	2	**Gn**	**Juv**	0.360	5.6

Conclusion: Few turtles were observed in this region in both shoreline and tow surveys. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Efforts at tagging turtles at this site are not recommended at this time.

Date: **03/13/01**
Type: **Cliffline**
Location: **North Dunk Coke, Puntan Lamanibot Sanhilo, West Tinian**

Site Description: Four cliffline stations spread out along the shoreline. Cliffs vary from low lying convoluted limestone four to 10 m above sea level outside of Lamanibot Bay to grassy flat-topped 10 to 30 plus m tall cliffs along the northern edge of the inner bay. Narrow intertidal benches extending five to seven meters are found along shoreline outside of the bay. Fallen boulders and reef border the cavernous undercut cliff water interface within the inner northern region of the bay. Nearshore waters reach 11 m depths 125 m from shore and 37 m roughly 300 m from shore at the tip of Puntan Lamanibot Sanhilo. The substrate is mainly limestone pavement with scattered corals and algae. The inner bay of the Dunk Coke area is characterized by a shallower reef zone of pavement, boulders, scattered corals and algae. Lamanibot Bay is roughly 1.8 km long and 0.625 km in width. Depths approach 37 m just outside of the bay, and 183 m roughly 300 m further oceanward. Previous reports of turtles in the region include HA(I), Inc. (1985) and Wiles et al. (1989). Jones et al. (1974) collected algae from the region. Algae collected during tow survey. No stream entrances noted within the region. Ocean conditions calm with swell one meter and winds light. Photos available.

Access: The main paved road towards Puntan Tahgong is taken north, and then a grass and gravel back through forest leads to the shoreline (4WD recommended though not necessary). Travel time by car from San Jose estimated at 25 minutes. Travel time by boat (31 ft. DPS Fountain) approximately 25 minutes. The roads and paths are fairly well used as the area is popular to fishermen.

Description of Methodology: Cliffline observers sketched the shoreline and submerged benthic features within their range of visibility. When a turtle was sighted on the surface or swimming subsurface, the time was noted and binoculars were used to identify species and estimate size. Features such as tail length and any identifying marks were recorded when observed. The estimated surface time and behavior of each turtle was noted when possible, and the location and/or route of each turtle was plotted on the area map sketch and numbered. The location of each observer was measured using a Garmin handheld GPS unit. Environmental conditions and location factors deemed relevant were recorded.

Personnel: Henry King, Jesse Pangelinan, Larry Ilo, John Manglona, Frank Rasa, Steve Kolinski

Source of Information: This location was suggested by Conservation Officers who noted reports of turtles by fishermen. Green turtles have also been reported in this region by HA(I), Inc. (1985) and Wiles et al. (1989). Jones et al. (1974) collected algae from the region which have listed by Hirth (1997) as green turtle forage in other areas of the world.

Location: **North Dunk Coke (1)** **Lat.** $15^{O}03.111$ **Long.** $145^{O}35.834$ (+/- 3.4 m)
Observer: Larry Ilo, Steve Kolinski
Tide: Low rising, 3 days past full moon (spring).

Time	Obs. No.	Species	Size	Notes
17:28				START
17:48	1	Gn	Juv	
18:15	2	Gn	Juv	
18:35	3	Gn	Adult	Swimming on surface. Long tail visible.
18:43				STOP

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:15	2	Gn	Juv	**2**	**Gn**	**Juv**	0.250	12.0
	1	Gn	Adult	**1**	**Gn**	**Adult**		
	3	Gn		**3**	**Gn**			

Location: **North Dunk Coke (2)** **Lat.** 15°03.126 **Long.** 145°35.808 (+/- ? m)
Observer: Henry King, John Manglona

Time	Obs. No.	Species	Size	Notes
17:25				START
17:34	1	Gn	Juv	Surfaced 23 m from shore in 9 m depth water for 3 mins.
17:41	2	Gn	Adult	Very large turtle with small tail surfaced 10 m from shore for 30 secs.
18:00	3	Gn	Adult	Very large turtle with small tail surfaced over deep water for 1 min. May be turtle # 2.
18:27				STOP

Tide: Low rising, 3 days past full moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:02	1	Gn	Juv	**1**	**Gn**	**Juv**	0.150	13.3
	2	Gn	Adult	**1**	**Gn**	**Adult**		
	3	Gn		**2**	**Gn**			

Location: **North Dunk Coke (3)** **Lat.** 15°03.165 **Long.** 145°35.784 (+/- 3.4 m)
Observer: Jesse Pangelinan

Time	Obs. No.	Species	Size	Notes
17:25				START
17:35	1	Gn	Juv	Surfaced roughly 15 m from shore.
18:00	2	Gn	Juv	Surfaced roughly 10 m from shore.
18:04	3	Gn	Adult	Larger turtle with long tail (male) surfaced roughly 17 m from shore. Later believed noted by Larry and Steve.
18:18	4	Gn	Juv/Adult	Larger turtle with no noticably long tail surfaced roughly 15 m from shore.
18:30				STOP

Tide: Low rising, 3 days past full moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
1:05	2	Gn	Juv	**2**	**Gn**	**Juv**	0.100	30.0
	1	Gn	Juv/Adult	**1**	**Gn**	**Juv/Adult**		
	1	Gn	Adult					
	4	Gn		**3**	**Gn**			

Location: **North Dunk Coke (4)** **Lat.** 15°03.209 **Long.** 145°35.826 (+/- 4.6 m)
Observer: Frank Rasa

Time	Obs. No.	Species	Size	Notes
17:35				START
18:42				STOP

Tide: Low rising, 3 days past full moon (spring).

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed	Transect Length (km)	Turtles per km
1:07	0			**0**	0.070	0.0

Summary:

Max. Time (hrs:mins)	Tot. Obs.	Species	Size	Total Estimated Number of Turtles Observed			Tot. Transect Length (km)	Turtles per km
1:15	5	Gn	Juv	**5**	**Gn**	**Juv**	0.570	14.0
	1	Gn	Juv/Adult	**1**	**Gn**	**Juv/Adult**		
	4	Gn	Adult	**2**	**Gn**	**Adult**		
	10	Gn		**8**	**Gn**			

Conclusion: Green turtles evident within this region. Feeding activities have been observed. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Capture and tagging of turtles might be possible by hand if experienced fishermen employed working off a boat. Nighttime captures might be feasible given appropriate oceanic conditions.

Date: **03/15/01**
Type: **Tow**
Location: **Lamlam to Dunk Coke, Puntan Lamanibot Sanhilo, West Tinian**

Site Description: Shoreline is characterized by low lying limestone rock five meters above sea level and two beaches, Unai Babui and Unai Chulu, which reportedly host nesting green turtles (Wiles et al. 1989, Pultz et al. 1999). The beaches measure roughly 480 m and 170 m respectively, and are made up of sand and gravel (Eldredge and Randall 1980). Benches occur at various areas along the shoreline. Shallow reef pavement with scattered live corals (very abundant at places) and algae fringe the coast. Accumulated sand deposits cover benthic regions offshore of the beaches. Depths of 11 m are suggested by map bathymetry to exist 100 to 325 m offshore. Depths exceeding 27 m are found 275 to 500 m offshore. No streams were observed to enter the region. Algae samples collected from Unai Chulu. Swell one to two meters. Winds brisk. Strong southward current. Visibility 35 plus meters. Limited photos available.

Access: The area is easily accessible by boat with travel time from Tinian Harbor estimated at 25 to 30 minutes (DPS 31 ft. Fountain). Land access is limited pretty much to the beach areas. A gravel turnoff from the paved road north ends at Unai Chulu where parking is available. Unai Babui was not approached by land in this survey, however there appears to be a back road leading to the region. Thick forest makes access from other land areas difficult.

Description of Methodology: Two boats (31 ft. Fountain and a 14 ft. whaler) were used in this survey. Two people were towed in back of each boat, with the whaler surveying shallower environments maintaining distances from shore approximately 50 to 150 m, and the Fountain surveying deeper environments 30 to 50 m offshore of the whaler. When a turtle was sighted the boat was stopped and the species, size, activity, time, depth and habitat characteristics were relayed to a recorder on the boat. Latitude and longitude were noted at the location where each turtle was encountered using a GPS unit (only one GPS unit was available). In addition, boat observers searched the waters surface for turtle ascents. Communication of turtle sightings between boats ensured multiple reports of individual turtles did not occur.

Personnel: Ray Aldan, Gus Dusalua, Henry King, Alfonso Reyes, Don Reyes, Elvin Masga, Jesse Pangelinan, Larry Ilo, John Manglona, Frank Rasa, Steve Kolinski

Source of Information: There was no indication this region is well known for turtles, other than at Puntan Lamanibot Sanhilo (transect end point) and for green turtle nesting at Unai Chulu and Unai Babui (Wiles et al. 1989, Pultz et al. 1999).

Type: **Tow**
Observers: Ray Aldan, Jesse Pangelinan, Alfonso Reyes, Larry Ilo, John Manglona
Location: **Lamlam to Puntan Lamanibot Sanhilo, Deep Transect**
Tide: High rising, 2 days before half moon (neap) towards new.

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
10:54	15°05.079	145°37.498								START: Lamlam region.
11:15				1	Gn	Juv	Swimming	15	Hardpan, sand	Chulu area.
11:22				2	Gn	Adult	Swimming	18	Boulder, sand	Male turtle. Choda area.
11:43				3	Gn	Juv	Swimming	18	Hardpan	Dunk Coke.
11:45	15°03.200	145°35.730	5.5							STOP: Dunk Coke rock extension.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
0:51	2	Gn	Juv	**2**	**Gn**	**Juv**	4.975	0.6
	1	Gn	Adult	**1**	**Gn**	**Adult**		
	3	Gn		**3**	**Gn**			

Type: **Tow**
Observers: Gus Dusalua, Don Reyes, Elvin Masga, Frank Rasa, Steve Kolinski
Location: **Lamlam to Puntan Lamanibot Sanhilo, Shallow Transect**
Tide: High rising, 2 days before half moon (neap) towards new.

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
10:54	15°05.079	145°37.498								START: Lamlam region.
10:55	15°04.890	145°37.378	4.3	1	Gn	Juv	Swimming	9	Coral	
10:57	15°04.843	145°37.333	4.0	2	Gn	Juv	Swimming	11	Boulder	
10:58										Invasion beach, Unai Babui.
10:59	15°04.792	145°37.256	4.3	3	Gn	Juv/Adult	Resting	9	Sand	
11:02	15°04.714	145°37.144	3.7	4	Gn	Juv/Adult	Swimming	9	Coral, rock	
11:04	15°04.685	145°37.108	3.7	5	Gn	Juv	Swimming	10	Rocky	
11:08	15°04.519	145°36.938	3.7	6	Gn	Adult	Swimming	9	Rocky	Large male turtle with very large tail.
	15°04.431	145°36.857	4.0							Northern tip of Unai Chlulu.
11:20	15°04.074	145°36.626	4.6							
11:30	15°03.755	145°36.324	4.9							
11:45	15°03.200	145°35.730	5.5							STOP: Dunk Coke rock extension.

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
0:51	3	Gn	Juv	3	**Gn**	**Juv**	4.975	1.2
	2	Gn	Juv/Adult	2	**Gn**	**Juv/Adult**		
	1	Gn	Adult	1	**Gn**	**Adult**		
	6	Gn		6	**Gn**			

Summary:

Max. Time (hrs:mins)	Tot. Obs.	Species	Size	Total Estimated Number of Turtles Observed			Tot. Transect Length (km)	Turtles per km
0:51	5	Gn	Juv	**5**	**Gn**	**Juv**	4.975	1.8
	2	Gn	Juv/Adult	**2**	**Gn**	**Juv/Adult**		
	2	Gn	Adult	**2**	**Gn**	**Adult**		
	9	Gn		**9**	**Gn**			

Conclusion: Turtles were not observed to be abundant along this transect. Additional surveys covering different hours, moon, tide phases and months are needed to confirm preliminary findings, determine variability, and establish peak times of abundance. Tagging efforts not recommended for this region at this time.

Date: **03/20/01**
Type: **Tow**
Location: **Aguijan Island**

Site Description: Aguijan (Goat Island) is a raised, steeply cliffed, 168 m high, nearly flat-topped limestone plateau approximately 7.2 km^2 in size located nine km southwest of Tinian. There are no beaches and bench development is limited. Submarine topography is characterized by steeply sloping pavement with scattered boulders and limited coral development around most of the island. Along the east coast an 18 m deep pavement platform extends roughly 300 m offshore and contains scattered corals, grooves and sand deposits. Along the west coast a topographically diverse platform connects Aguijan to Naftan Rock. This platform is characterized by limestone rock, live coral and sand, and reaches depths of from nine to 18 m. Visibility during the survey exceeded 60 m. Swell was less than one meter, with morning winds light. Shark attacks against humans are known for this area. Limited photos available.

Access: Aguijan island is easily accessible by boat from Tinian, although access to land requires permit approval. A ride on the DPS boat (31 ft. Fountain) takes roughly 30 to 40 minutes from San Jose, Tinian. A Japanese founded dock and stairway are present on the west side of the island. Dock access is limited by ocean conditions.

Description of Methodology: Three people were towed behind the DPS 31 ft. Fountain boat which maintained a distance of approximately 50 to 100 m from shoreline or shallow reef areas. When a turtle was sighted the boat was stopped and the species, size, activity, time, depth and habitat characteristics were relayed to a recorder on the boat. Latitude and longitude were noted at the location where each turtle was encountered using a GPS unit. In addition, boat observers searched the waters surface for turtle ascents. Snorkel surveys along the outer barrier reef edge were not conducted due to time and safety considerations.

Source of Information: Aguijan island is not known locally to host large numbers of turtles. Fishermen frequent the area.

Type: **Tow**
Observers: Ray Aldan, Wayne Villagomez, Henry King, Alfonso Reyes, Don Reyes, Elvin Masga, Jesse Pangelinan, Larry Ilo, John Manglona, Frank Rasa, Steve Kolinski

Location: **Aguijan Island**
Tide: High falling, 3 days past half moon (neap) towards new.

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
10:00	$14^{O}52.067$	$145^{O}34.449$	7.9							START
10:00	$14^{O}52.013$	$145^{O}34.473$	7.6	1	Gn	Adult	Resting	18	Hardpan bench	Sex unknown. Approx. 90 - 100 cm. East.
10:00	$14^{O}52.013$	$145^{O}34.473$	7.6	2	Gn	Adult	Resting	18	Hardpan bench	Sex unknown. Approx. 90 - 100 cm. East.
10:03	$14^{O}51.983$	$145^{O}34.534$	7.3	3	Gn	Juv	Resting	17	Hardpan bench	Approx. 70 cm. East.
10:04	$14^{O}51.961$	$145^{O}34.591$	7.3	4	Gn	Juv	Swimming	11	Hardpan	Approx. 50 - 60 cm. East.
10:44	$14^{O}50.994$	$145^{O}34.289$	9.4							East side end of fishing base.
10:45	$14^{O}50.886$	$145^{O}34.223$	6.4	5	Gn	Juv	Resting	18	Hardpan	Approx. 50 cm. South.
10:49	$14^{O}50.834$	$145^{O}34.158$	6.7	6	Gn	Juv	Swimming	11	Hardpan	Approx. 40 cm. South.

Time	Lat.	Long.	Error (m)	Obs. No.	Species	Size	Activity	Depth (m)	Habitat	Notes
10:54	14°50.812	145°34.133	6.7	7	Gn	Juv	Resting	13	Hardpan	Approx. 40 - 45 cm. South.
10:59	14°50.634	145°33.869	7.6							Southeast point.
11:04	14°50.613	145°33.544	4.6							Hakiya.
11:38	14°50.554	145°32.282	4.3							Between bird island and Aguijan.
11:45	14°50.609	145°32.234	5.8							Lunch break on back side reef.
12:15	14°50.609	145°32.234	5.8							Start again.
12:25	14°50.980	145°32.263	6.1	8	Gn	Juv	Swimming	12	Sand	Approx. 40 cm. Japanese winch site, back reef platform. West.
12:28	14°50.999	145°32.283	5.5	9	Gn	Juv	Swimming	11	Hardpan	Approx. 60 cm. West.
12:29	14°51.030	145°32.298	8.8	10	Gn	Juv	Swimming	12	Sand, coral	Approx. 40 cm. West.
12:36	14°51.216	145°32.460	9.8							Turning corner, narrow reef platform.
12:45	14°51.320	145°32.679	9.8	11	Gn	Juv	Swimming	11	Hardpan, boulder	Approx. 35 cm. North.
12:50	14°51.362	145°32.767	6.1	12	Gn	Juv	Swimming	12	Hardpan	Approx. 40 cm. North.
12:54	14°51.406	145°32.944	6.4							Reef extension to 40 meters, deep slope.
13:04	14°51.509	145°33.207	8.8							Reef boulder 10 meters from land.
13:15	14°51.665	145°33.541	4.3	13	Gn	Juv	Swimming	9	Rock, boulder	Approx. 40 cm. North.
13:15	14°51.665	145°33.541	4.3	14	Gn	Juv	Surface	6	Inshore reef, hardpan	North.
13:30	14°51.867	145°34.001	5.5							
13:40	14°52.015	145°34.364	3.7							STOP

Tot. Time (hrs:mins)	Obs.	Species	Size	Estimated Number of Turtles Observed			Transect Length (km)	Turtles per km
3:10	12	Gn	Juv	**12**	**Gn**	**Juv**	12.026	1.2
	2	Gn	Adult	**2**	**Gn**	**Adult**		
	14	Gn		**14**	**Gn**			

Conclusion: Aguijan appears to support tens of turtles, in contrast to larger islands like Tinian and Saipan where turtle abundances number in the hundreds. The vast majority of turtles around the island appear to be juveniles, although two adult sized turtles were observed. Further investigations might consist of repeated tows to monitor changes and variability in turtle numbers, sizes and locations. A focused assessment of food resources may help to determine whether food availability correlates with limited turtle abundance. Six very small turtles (35 to 45 cm) observed.