August 1, 1989

George Balazs
National Marine Fisheries Service
2570 Dole Street
Honolulu, Hawaii 96822

Dear George,

It was a real pleasure for Mike and myself to talk with you on the radio last week. It's beneficial to receive suggestions and comments on the methods and results at this time when adaptations and/or changes can be applied, instead of waiting until the next nesting season. The invitation to call is always open!

We did receive the mototool, 3M reflective tape, instructions and other information on the plane this morning and we had a chance to read your letter. Craig did send us the recovery tag information as well as other data on the sea turtles at French Frigate Shoals. It is interesting to read some history on the turtles that we are seeing here! Most important in having this information available to us is that we can use it as a guideline to review this data and check the accuracy of the data we collect (i.e. carapace lengths).

We will be reading the mototool instructions and practicing on the scutes you sent so that we are able to apply it onto the turtles as soon as possible. We appreciate your recommendations in regards to the safety in using this tool and will take heed! Both of us will have the opportunity to use the mototool for evaluation purposes. One goal is to have a sufficient sample of turtles to obtain substantial data. We will apply the mototool on as many turtles as possible but our minimum will be 20 turtles on East Island. The turtle camp on East will be shut down at the beginning of September, therefore, there will be a sample of turtles on Tern Island with the mototool identification - in this way, we can monitor its progress after September as well.

Trial with the 3M reflector tape will be performed in this same manner as well. After much discussion, we feel that at this time in the nesting season it would be best to maintain the painted numbers when applying the mototool. We will be keeping descriptive notes on all secondary identification applications. This will hopefully allow us to evaluate and make a fair comparison of the methods used so that we may make some helpful suggestions. We are more than willing to try these methods of temporary identification at this time in preparation for next nesting season - it certainly is beneficial all around to have a temporary identification that would last the entire nesting season.

In regards to the Deco Rez - unfortunately it has not shown to have the same retention time as the turtles at Sea Life Park! We

applied the Deco Rez on the turtles for over a month period of time and found that that it lasted anywhere from 7 to 24 days, after which only remnants remained. In the field, the Deco Rez appears to dry slower than that applied on the park's turtles (over 20 minutes, at which time the Deco Rez was still sticky). A majority of the time, the turtle would be crawling when painted then afterwards procede to begin her body pit so that the soil coats over the freshly painted number. The Deco Rez had been applied on the carapace after being wiped first to remove loose sand/soil. Included with this is a sample of the Deco Rez that we used here. We too are puzzled as to why there is such a difference in its retention between the sample turtles at Sea Life Park and those here, although there are a number of factors that play a role (i.e. soil/sand, slightly damp carapace).

As was mentioned over the radio, we would like to see something besides the Deco Rez being used as a temporary identification - one reason being the toxicity of the Deco Rez itself as well as the xylene which is said to be the solvent to remove it (actually it does not take the Deco Rez off unless it is still wet). We will keep you updated on the progress of the mototool and 3M reflector tape applications.

We are currently rechecking all W-series tags to ensure they are all closed completely. The value of these tags in the recovery program are understood so we are making every effort to recorrect any errors in its application. These tags do seem to be slightly harder to apply than those applied last year but the cause of the shed tags can also be attributed to the persons applying the tags.

Enclosed is a list of tags that were used for practice as well as those that were shed. There will be a complete list of all tags lost/wasted at the end of the season.

The tag list and turtle sighting data that is included is a more precise copy than the earlier one sent to you. We have had a chance to double check through the field notes and make necessary corrections to the data. We found it to our advantage to begin editing the data and checking it against the field notes at this time instead of waiting until the end of the season. You will, of course, be sent a complete final copy of the data at the end of the season.

In reference to the data, there can be seen some discrepancies in the carapace lengths - these turtles have been put on our "needs list" so that the measurement can be performed once again. Under the category "Color" the "S" stands for Deco Rez and the "W" stands for the Ace Hardware paint (which we are currently using).

The total number of turtles nesting on Tern Island has increased from last season. There have been a total of 39 nesting females to this date, 23 of which have been new identifications. Approximately 125 nests have been marked on Tern thus far and are for the hatchling success study.

It has been a busy season and Mike and I are having a great time working with the adult females as well as watching the hatchlings make their way to the ocean - what a special experience this has been for the both of us! We would like to talk with you at your convenience; it seems better if we go around your schedule since one of us is here on Tern at one time, and we certainly can't go far. It works really well, when you get in touch with the Honolulu office to set up a date and have them relay the message to us. The best reception was at 7:30pm when you drove up the hill - you came in loud and clear. Either 7:30pm or 7:00am is a good time on our end. On Mondays, Wednesdays and Fridays, we do make contact with the Honolulu office at 7:30am.

Once again George, thank you for making contact with us, it is beneficial for the turtle study to handle any concerns and questions now instead of at the end of the season. Mike and I look forward to trying these new methods of temporary identification and talking with you in a few days. Take care!

Aloha and Mahalo,

Glynnis

T. Mitchell Mon

July 30, 1989
NOAA Fisheries
Honolulu Laboratory

Dear Glynnis and Mike:

This will be a fairly short note, since I would prefer to do our "communications" by radio now that we've established a "protocol"(if that's what you call it!) for talking to one another. Also, it's a weekend here now, I'm at home, and the kids are urging me to do things with them.

I can't tell you how delighted I was to receive your letter with the invitation for direct radio communications. Nothing had been established specifically for this, so I had assumed, with just reason, that the FWS office felt it unnecessary, or inappropriate. I'm glad Glynnis sent a copy of the letter to Ken McDermond so there are no misunderstanding. I would have radio-called you right after getting your letter, but thought I would wait for the Kila's arrival. Please believe me when I say that there was absolutely no problem on my part that additional info didn't come back on the ship. I was happy to receive what you sent, and pretty amazed you even had the time to do that,given the abundance of turtle activity.

The package with this letter contains the items we discussed. The most important (besides the 100 tags) is the Dremel "free-wheeler" moto-tool. You probably know that Dremel has been around for a very long time. But only with AC cord plug-in. The rechargeable is a fairly new item that I "stumbled" across in a mail-order Jensen catalog. To my knowledge, no one as yet sells it here in Hawaii. I've enclosed photocopies of the instruction booklet, which of course should be carefully read by both of you and discussed for any needed clarification (with me too, by radio). As I see it, there are two main safety items, and believe me I am very big on safety. 1) letting the tool slip out of your hand, or be slapped-out by a turtle, so that the bit comes in contact with you while rotating. At 20,000 rpm it doesn't take much to draw blood through human skin. Yes, I'm speaking from experience! When engraving, grasp the unit very firmly, like holding a fat pencil, as near as you can to the rotating bit. I know this will feel awkward at first, but practice will get you used to it. 2) The other safety problem would be if the bit were to strike accidentally a very hard surface (harder than the turtle scute) and break, causing pieces of the bit to hit you in the eye or elsewhere. In order to be super safe, please consider wearing plastic safety goggles when doing the engraving. I haven't been doing that myself, but I really should. And, of course, you folks are much more removed from medical treatment centers.

I recommend that you engrave one of the turtle's Inconel tag numbers, omitting the letter prefix. That will only give you 3 numbers to do, except for tag-resighted turtles that have not had a new tag applied to them. Some turtles might be encountered that need 5 numbers (10,000 series tags), but those are probably few in number. I would

engrave at a site in the posterior region, out of reach of those "smacking" front flippers. Consider even using the 4th or 5th centrals, or the 11th or 12th marginals or the postcentrals. However, these latter sites would not offer a place to position and rest one's forearm, hand and elbow. A 4th or 5th central might therefore be ideal. Do one engraving per turtle, and try using the epoxy bottled paint (with brush built into the cap) that I've enclosed. I've been using this when engraving wild immature turtles. It's very convenient, and durable this way. Keep in mind that, although you are just doing some "late-season" experimental trials with this gadget, we might as well do it with two objectives in mind. That is, facilitating easier re-ID within season when encountering a nesting turtle; and longterm identification, should the engraving be retained for years. Personally, I have a suspicion that it will be, but it remains to be shown. The Inconel tag is the foundation means of ID, but secondary and tertiary back-up are highly desirable.

I have enclosed several turtle scutes that I've engraved, and that you can use to practice on. However, these are hawksbill scutes, and therefore generally thicker than greens. However, it is my experience now that lots of variability exists between greens, and that larger greens have thicker scutes than smaller greens. What you will want to do is engrave as deep as possible without going through the scute into tissue (cartilage) and bone. If you do breech this barrier every so often, I wouldn't worry about. Just try as best possible to stay in the scute, but as deep as possible. If you are like me in your learning process doing this, you will tend to engrave too shallow at first. Another thought- find the very most comfortable site to rest your hand and forearm on the turtle, and then engrave the numbers. It doesn't matter in what orientation the number ends up on the turtle. I say this because, with these numbers, you are going to have to get alot closer to re-read them, then with larger paint numbers more visible from a distance. But they will still represent an advantage over reading the flipper tag number, with a flash light necessary right by the turtle's eyes. And yet another comment, the size of the number you can engrave, in my experience, is dictated by range of the rotation of one's wrist working in conjunction with your thumb, first, and second fingers, as they grasp the unit like a pencil. The size of the numbers on the enclosed scutes is the maximum comfortable size that I can do. I feel these are entirely sufficient, although if they had to be smaller that would be fine too. As I mentioned by radio, on a fully charged unit I can do 30-35 turtles with 3 numbers on each one. But this comes after several months of practice.

I've experimented with several bits and the one I'm sending is the best all-around one. The cutting edge you will use with this one is of course the 90-degree (right angle) top edge of the cylinder. This will come naturally into place when the unit is held as you would a pencil. There is no need to remove the bit from the unit, although I've enclosed the necessary little wrench, and the instructions tell you how to do it. I'm sending an extra bit, just in case this one breaks, though I doubt it will.

Same shape, but smaller size. Use only if the first one breaks.

I believe that sea water would mean death to this unit, so you will want to excercise care about that. If you haven't guessed by now, I'm absolutely crazy out this little unit. At 20,000 rpm, I consider it my own portable dental drill. None of the students have yet taken-up my offer to fix teeth, though! Oh yes, the second unit I mail-ordered the other day won't be here in time, so you're being sent the one I've been using.

I talked Romar Sales into selling me a quart of fresh Deco-Rez, instead of the usual gallon minimum. I'll be using this to repeat tests, along with what you send back to me, on turtles at Sea Life Park. The owner has been in contact with the manufacturer, and quite frankly they, like us, can't figure out why its not working up there better than it has. A copy of the manufacturer's instructions are enclosed, which were just given to me. There's nothing striking in here that I can see. However, the Romar owner did say it might be possible for the company to supply an additive in which a couple drops could be mixed in, just before painting the number, which would speed-up the drying time.

The 3M reflector stickers can be tested however you wish. You will probably want to cut some into smaller pieces/different shapes. However, also try one or two whole, since when you cut them you fracture a sealed edge which almost certainly lets water penetrate more easily. This may reduce adhesion, but I simply don't know. In any event, these stickers are not a very high priority item in my mind. I don't hold much hope for their being successful/practical, when compared to the potential of the engraving.

I had the VHS "turtle special" made for loan to folks like you out at FFS, but have not viewed this particular cassette myself. I hope it turned out OK. We have beta at home, like all loyal local people do in Hawaii. Now that beta is dying, my wife constantly reminds me that it was I that insisted on beta, when she wanted VHS! Please return the tape on the next subsequent flight, as I will next loan it to one of our NOAA vessels in the east Pacific that has personnel doing a small pelagic sea turtle study. The ship will touch port in Manzanillo in two months. (I'll be talking to them by shortwave radio too- fun, huh?)

I talked to Craig Rowland about the "recovery records" data sheets current to Dec. 1988. He said he would take care of sending you the copy unless I heard from him otherwise. He's a reliable fellow (he worked for us first) so will assume its done, before he left for 1 month vacation. Please use the sheets to mark-up with new entries you are seeing this season. If returned to me at the end of the season it will make things easier. And then later I'll give you (and Ken at Tern) a clean up-dated copy.

This letter ended up longer than I expected, but I type fairly fast so that's OK. In closing I should say that you two appear to be doing one heck of a fine job up there. I have no concerns or questions about the data being generated. I noted in Glynnis' letter that, no less than 3 separate times, I was asked to express any concerns I might have, especially about data. I have none, it all looks, and sounds over the radio, great.

Even last year the data turned out excellent, although a lot of editing work was needed here, in view of the fact that 7 or 8 different people had contibuted to the field work and made entries in the field note books. Just for clarification purposes, I want you to know that concerns of mine in the past were <u>not</u> related to the quality of the data. Instead, they focus upon degree of impacts on the turtles we are studying (and other wildlife) as the result of the study, and the mental and physical well-being of the personnel I was responsible for at French Frigate Shoals. Having said that, we now move ahead to do the best job possible building on lessons of the past, and what we are constantly learning new each day.

Best regards, Aloha, and again, welcome to the magnificent realm of the "Honu Ohana".

George Balazs

PS This is surely saying the obvious, but sometimes that's OK and desirable for the "thinking-process". The paint is put into the engraving to make the numbers stand-out for readability. The paint, no matter what kind is used, should have enhanced durability because its down in a "groove" protected from the abrasions and other forces of "wear" more prevalent to the surface of the turtle's shell. And now let's see if this logic hold's up under test. I guess the worst that can happen is that the paint can come out (off) before the season is over. But still that would leave an engraved number, albeit more difficult to read.

You should feel free to pass messages to me asking for a radio schedule based on <u>your</u> best days/needs etc. I can come up at 7am almost any morning. Evening are ok, but perhaps a little harder because I have to go out in my car if we talk for more than 10minutes (due to neighbor's TV interference problems). I now have a 7.mhz antenna for my car.

Green Sea turtles identified on East Island
5/3/89 – 9/2/89
Sorted by Paint #'s

10/3/89

Record#	DATE	PAINTID89	COLOR	TAGNO	TAGPOS	NEW_OLD
1	07/30/89	U	W	W508	L	N
2	05/03/89	10	W	W26	L	N
3	05/03/89	10	W	6306	R	O
4	05/05/89	11	W	5139	R2	O
5	05/03/89	11	W	3701	L2	O
6	05/05/89	11	W	3810	R	
7	05/03/89	12	W	9674	L	O
8	05/03/89	12	W	9675	R	O
9	05/03/89	13	W	W27	R34	N
10	05/03/89	14		W28	R	N
11	05/25/89	14	S	W116	L	N
12	05/03/89	15		8208	L	O
13	07/08/89	15	W	W285	R23	N
14	05/18/89	16	W	W77	R34	N
15	06/22/89	16		9281	L12	O
16	06/10/89	16 – 17	W	W78	R	N
17	05/09/89	18	W	W42	R	N
18	05/09/89	18	W	W41	L	N
19	05/09/89	19	W	W44	L	N
20	05/09/89	19	W	W46	R	N
21	05/07/89	20		9712	R	O
22	05/07/89	20		9714	L	O
23	05/22/89	21	W	W88	L	N
24	05/22/89	21	W	W87	R	N
25	05/08/89	22		4251	L	O
26	05/08/89	22		4252	R	O
27	05/08/89	23	W	W30	R	N
28	05/08/89	23	W	W29	L	N
29	05/08/89	24	W	W33	L34	N
30	05/08/89	24	W	W31	L	N
31	05/08/89	24	W	W32	R	N
32	05/08/89	25	W	W36	R	N
33	05/08/89	25	W	W37	L34	N
34	07/25/89	25	W	W36	R	N
35	07/25/89	25	W	W482	L23	N
36	07/25/89	25	W	W483	R34	N
37	05/08/89	26	W	9365	L	O
38	05/08/89	26	W	9366	R45	O
39	05/08/89	27	W	W38	L34	N
40	05/08/89	27	W	9266	R34	O
41	05/08/89	28	W	6058	L	O
42	05/08/89	28	W	W40	R	N
43	05/08/89	29	W	3619	R	O
44	05/08/89	30	W	6192	L	O
45	05/08/89	30	W	6183	R	O
46	05/09/89	31	W	W43	R	N
47	05/09/89	31	W	3387	L	O
48	05/24/89	32	W	W102	R34	N
49	05/09/89	32	W	3615	R	O
50	05/09/89	32	W	3616	L	O
51	05/24/89	32	W	W103	L34	N
52	05/09/89	33	W	6213	L	O
53	05/09/89	33	W	W47	R	N
54	05/10/89	34	W	W49	R	N
55	05/10/89	34	W	W48	L	N
56	05/08/89	35	W	3541	L	O
57	05/10/89	35	W	3542	R	O

58	05/10/89	36		W	W52	L	N
59	05/10/89	36		W	W53	R	N
60	06/19/89	37		S	W386	L	N
61	05/11/89	37		W	W58	R	N
62	05/11/89	37		W	W57	L34	N
63	05/11/89	38		W	4271	L	O
64	05/08/89	38		W	4272	R	O
65	05/11/89	39		W	W60	R	N
66	05/11/89	39		W	W59	L	N
67	05/14/89	40		W	W66	L34	N
68	05/14/89	40		W	W68	R34	N
69	05/12/89	41		W	W62	R	N
70	05/12/89	41		W	W61	L	N
71	06/09/89	42		S	6131	L	O
72	06/09/89	42		S	5999	R	O
73	05/12/89	43		W	3601	R	O
74	05/12/89	43		W	6256	L2	O
75	05/14/89	44		W	9765	L	O
76	05/14/89	44		W	9673	R	O
77	05/11/89	45		W	3231	L	O
78	05/13/89	45		W	W64	R34	N
79	07/08/89	45		W	W284	R	N
80	05/14/89	46		W	3433	R	O
81	05/14/89	46		W	3432	L	O
82	05/14/89	48	47	W	6006	L	O
83	06/09/89	48	49	S	W319	R	N
84	05/15/89	50		W	6261	R1	O
85	05/15/89	50		W	6048	L	O
86	07/08/89	50		W	W75	L34	N
87	05/16/89	52	51	W	6148	R	O
88	05/16/89	52		W	-271	L	O
89	06/14/89	53		S	W362	R	N
90	07/23/89	53		W	W463	L	N
91	07/23/89	53		W	W464	R34	N
92	06/08/89	54		S	6004	R2	O
93	05/15/89	54		W	6199	R	O
94	05/15/89	54		W	6001	L	O
95	05/31/89	55		S	2816	R	O
96	05/31/89	55		S	W150	L	N
97	05/16/89	55		W	5438	R2	O
98	07/23/89	55		W	W478	L34	N
99	05/30/89	56			3444	R	O
100	05/15/89	56		W	8195	L	O
101	05/15/89	57		W			
102	05/16/89	58	59	W			
103	05/15/89	60		W	6010	L	O
104	05/23/89	60		W	W92	R	N
105	05/16/89	61		W	W69	L	N
106	05/16/89	61		W	W70	R	N
107	05/16/89	62		W	3378	L	O
108	05/16/89	62		W	3377	R	O
109	05/16/89	63		W	3002	R	O
110	05/17/89	63		W	2999	L	O
111	05/16/89	64		W	W71	L	N
112	05/16/89	64		W	W72	R	N
113	06/02/89	65		W	W171	R	N
114	06/02/89	65		W	W170	L	N
115	06/26/89	66			W245	R	N
116	05/20/89	66		W	W84	L	N
117	05/19/89	67		W	W79	R	N
118	05/19/89	67		W	6191	L	O
119	07/19/89	67		W	6217	L3	O
120	05/19/89	68		W	3438	L	O
121	07/28/89	68		W	W496	R	N
122	05/18/89	69		W	5196	L	O
123	05/19/89	69		W	5197	R	O

124	05/18/89	70		W	-340	R	O
125	05/18/89	70		W	W76	L	N
126	05/18/89	71		W	5368	L2	O
127	05/18/89	71		W	7181	R	O
128	05/23/89	72		W	W97	L	N
129	07/24/89	72		W	W480	R	N
130	07/24/89	72-73		W	W479	L34	N
131	06/02/89	74		S	W169	L	N
132	06/02/89	74		S	W168	R34	N
133	08/14/89	74		W	W547	L	N
134	05/19/89	75		W	966-	R	O
135	05/19/89	75-76		W	9668	L	O
136	06/02/89	77		S	2237	R	O
137	06/02/89	77		S	2235	L	O
138	06/02/89	77		S	3145	R34	O
139	06/02/89	77		S	5305	L2	O
140	06/04/89	78		W	W194	L	N
141	06/03/89	78		S	W182	R	N
142	05/19/89	79		W	W80	R34	N
143	05/19/89	79-80,81		W	3127	L	O
144	05/20/89	83-82		W			
145	05/20/89	84		W	W83	L	N
146	06/04/89	85		W	9681	L	O
147	05/03/89	85			9680	R	O
148	05/20/89	86-87		W			
149	06/05/89	88		W	6091	L	O
150	06/05/89	88		W	6111	R	O
151	06/26/89	89		Z	W246	L	N
152	06/26/89	89		Z	W247	R	N
153	07/21/89	89		W	W442	R23	N
154	05/21/89	90		W	W86	L	N
155	05/21/89	90		W	5276	R	O
156	05/23/89	91		W	W90	R	N
157	05/23/89	91		W	W89	L	N
158	05/24/89	92		W	5337	R	O
159	05/24/89	92		W	5317	L2	O
160	05/25/89	93		S	W112	R	N
161	05/25/89	93		S	W113	L	N
162	05/08/89	94		W	3427	L	O
163	06/18/89	94		S	W381	R	N
164	05/23/89	95		W	3756	L	O
165	05/24/89	95		W	W104	R	N
166	06/06/89	96		S	5320	L2	O
167	06/06/89	96		S	2223	L	O
168	05/23/89	96		W	W91	R	N
169	06/13/89	97		W	W356	R	N
170	06/13/89	97		W	W355	L	N
171	05/25/89	97		S	6149	L	O
172	05/25/89	97		S	W118	R	N
173	06/05/89	98		W	W200	L	N
174	06/05/89	98		W	W199	R	N
175	06/05/89	99		W	W304	R23	N
176	06/05/89	99		W	W305	L23	N
177	06/05/89	99		W	6179	L	O
178	05/23/89	100		W	W93	L	N
179	05/23/89	100		W	W94	R	N
180	05/23/89	101		W	W95	L34	N
181	07/08/89	101		W	W280	L	N
182	06/18/89	101		S	W380	R	N
183	05/23/89	102		W	W99	R	N
184	06/09/89	102-103		S	W322	L	N
185	05/26/89	105-104		S	W126	L	N
186	08/07/89	105		W	W527	R	N
187	05/24/89	106		W	9313	L	O
188	07/26/89	106		W	9314	R	O

190	07/23/89	107		W	5192	L2	O
191	07/23/89	107		W	W460	R34	N
192	05/24/89	108		W	W105	L	N
193	05/24/89	108		W	W106	R	N
194	05/24/89	110	-109	W	W108	L	N
195	05/24/89	110		W	W107	R	N
196	05/25/89	111		S	W111	L	N
197	05/25/89	111		S	W110	R	N
198	05/25/89	112		S	6021	L	O
199	05/25/89	112		S	6022	R	O
200	05/25/89	113		S	3213	L	O
201	05/25/89	113		S	5430	R	O
202	05/25/89	113		S	3837	R2	O
203	05/25/89	114		W	W51	R	N
204	05/25/89	115		S	9789	R	O
205	07/20/89	115		W	9788	L	O
206	05/25/89	116		S	W115	L	N
207	05/25/89	117		S	W119	L	N
208	05/25/89	117		S	6265	R	O
209	05/25/89	118		S	W120	L	N
210	05/25/89	118		S	W121	R	N
211	05/26/89	119		S	9663	R	O
212	05/26/89	119		S	9682	L	O
213	05/26/89	121	-120	S	W114	R	N
214	05/26/89	121		S	W124	L	N
215	05/26/89	122		S	7156	L	O
216	05/26/89	122		S	W128	R	N
217	05/26/89	123		S	3152	R	O
218	06/10/89	123		S	W335	L	N
219	07/29/89	123		W	W503	L34	N
220	07/23/89	124		W	W472	R34	N
221	05/26/89	124		W	W127	L	N
222	05/23/89	124			W100	R	N
223	07/23/89	124		W	W471	L34	N
224	05/26/89	125		S	3537	L	O
225	06/09/89	125		S	3369	R	O
226	06/30/89	126			5223	R	O
227	05/26/89	126		S	3787	L2	O
228	05/26/89	126		S	3732	L	O
229	05/26/89	126		S	5216	R2	O
230	05/27/89	128	-127	S	8164	L	O
231	05/27/89	128	-129	S	5428	R	O
232	05/27/89	130	-131	S			
233	07/08/89	132		W	-133	R	O
234	07/08/89	132		W	W286	L	N
235	05/28/89	133		S	W123	R	N
236	05/26/89	133		S	W122	L	N
237	05/28/89	134		S	W133	R	N
238	05/28/89	134		S	W134	L	N
239	05/28/89	134		*	W135	L	N
240	07/11/89	134		*	W287	R	N
241	05/28/89	135		S	W137	L	N
242	06/07/89	135	-136	S	W315	R	N
243	05/28/89	137		S	W140	L	N
244	05/28/89	137		S	W141	R	N
245	08/12/89	137		W	W546	R34	N
246	08/12/89	137		W	W545	L	N
247	05/28/89	138		S	W142	L	N
248	07/23/89	138		W	W470	R	N
249	05/28/89	139		S	W145	R	N
250	07/23/89	139	-140	W	W462	L	N
251	07/31/89	141		S	9369	L	O
252	07/31/89	141			9368	R	O
253	05/29/89	142		S			
254	05/29/89	143		S	9348	L	O

256	06/19/89	144		S	W389	L34	N
257	05/29/89	144		S	6026	R2	O
258	05/29/89	145		S	3412	L	O
259	05/28/89	145		S	3245	R	O
260	05/29/89	146		S	3437	R	O
261	07/08/89	146		W	3229	L	O
262	06/02/89	147		S	W167	L	N
263	06/02/89	147		S	W165	R	N
264	06/19/89	147		S	W393	R	N
265	05/14/89	148		W	W65	R	N
266	05/30/89	148		S	W54	L	N
267	05/30/89	149		S	7313	L	O
268	05/30/89	149		S	7314	R	O
269	05/30/89	150		S	7173	R	O
270	05/30/89	150		S	7172	L	O
271	05/31/89	151		S	W146	R	N
272	07/26/89	151		W	W491	R34	N
273	07/26/89	151		W	W490	L34	N
274	05/16/89	152		W	9784	L	O
275	05/31/89	152		S	9783	R	O
276	05/31/89	153		S	W149	R	N
277	07/21/89	153		W	W447	R34	N
278	07/21/89	153		W	W446	L	N
279	06/01/89	154		S	W152	R	N
280	06/01/89	154		S	W151	L	N
281	07/29/89	154		W	W504	L34	N
282	06/01/89	155		S	2666	L	O
283	06/01/89	155	156	S	5372	R2	O
284	06/02/89	157		S	W159	L	N
285	06/02/89	157		S	W158	R	N
286	06/02/89	158		S	W173	R	N
287	07/03/89	158		S	W261	L	N
288	07/23/89	158		W	W477	R34	N
289	07/23/89	158		W	W172	L	N
290	07/23/89	158		W	W173	R	N
291	06/02/89	159		S	W160	L	N
292	06/02/89	159	160	S	W162	R	N
293	06/02/89	161		S	W175	L34	N
294	06/02/89	161		S	W176	R	N
295	06/03/89	162		S	W177	L	N
296	07/28/89	162		W	W497	R	N
297	06/03/89	163		S			
298	06/03/89	164		S	W179	L	N
299	08/11/89	164		W	W540	R	N
300	07/14/89	164		W	W428	R34	N
301	06/03/89	165		S	W180	L	N
302	07/14/89	165		W	W434	R	N
303	07/28/89	165		W	W181	R	N
304	06/03/89	166		S	3723	R	O
305	06/04/89	167		S	830	L	O
306	06/04/89	167		S	W186	R23	N
307	06/04/89	167		S	5194	R	O
308	06/02/89	168		S	W164	L	N
309	07/13/89	168		W	W426	R	N
310	06/03/89	169		S	W183	R	N
311	06/03/89	169		S	W184	L	N
312	06/30/89	170		S	W190	L	N
313	06/30/89	170		S	8211	R	O
314	08/11/89	170		W	W538	R	N
315	06/04/89	171		S	8190	L	O
316	06/04/89	171		S	W185	R	N
317	06/04/89	172		S	W188	L	N
318	06/04/89	172		S	W189	R23	N
319	07/23/89	172		W	W466	L34	N
320	07/23/89	172	173	W	W467	R	N

322	07/12/89	174	175	S	W297	L34	N
323	05/17/89	176		W	3365	L	O
324	05/19/89	176		W	W82	R	N
325	06/05/89	177		S	W303	R	N
326	06/05/89	177		S	7203	L	O
327	07/24/89	177		W	W481	R34	N
328	06/05/89	178		S	W197	L	N
329	06/05/89	178		S	W198	R	N
330	06/28/89	179		S	6034	L	O
331	07/22/89	179		S	W457	R	N
332	07/22/89	179		S	W456	R23	N
333	06/05/89	180		S	W302	L23	N
334	07/05/89	180		S	W266	R	N
335	07/23/89	180		W	W465	L34	N
336	06/05/89	180		W	W301	L	N
337	06/05/89	181		S	6204	R2	O
338	06/05/89	181		S	6187	L	O
339	07/16/89	181		W	3149	R	O
340	06/06/89	182		S	W308	L	N
341	06/06/89	182		S	W307	R	N
342	06/06/89	183		S	5451	L	O
343	06/06/89	183		S	5218	R12	O
344	06/06/89	184		S	#341-	R	O
345	06/25/89	185			W241	L	N
346	06/25/89	185			W248	R34	N
347	06/25/89	185			W242	R	N
348	08/24/89	185			W554	R	N
349	06/06/89	186		S	W312	L	N
350	06/06/89	186		S	W313	R	N
351	08/09/89	186		W	W535	R	N
352	06/06/89	187		S	9346	L	O
353	06/06/89	187		S	9347	R	O
354	06/06/89	188		S	3381	L	O
355	06/06/89	188		S	3382	R	O
356	06/20/89	189		S	W397	R	N
357	06/07/89	189		S	W396	L	N
358	06/07/89	190		S			
359	06/21/89	191		S	W227	-	N
360	06/21/89	191		S	W228	L34	N
361	06/07/89	191		S	W192	R	N
362	06/07/89	191		S	3217	L	O
363	06/21/89	191		S	W226	-	N
364	06/07/89	192		S	3221	L	O
365	06/07/89	192		S	3220	R	O
366	06/23/89	193		S	5275	L	O
367	06/23/89	193		S	3784	R	O
368	06/08/89	194		S	W174	L	N
369	07/16/89	194		W	W436	R	N
370	06/08/89	195		S	W323	L	N
371	06/08/89	196		S	W316	L	N
372	06/08/89	196		S	W317	R	N
373	06/08/89	197		S	6036	L5	O
374	06/08/89	197		S	6035	R5	O
375	06/09/89	198		S			
376	06/09/89	199		S	3367	L	O
377	07/14/89	199		W	W435	R	N
378	06/09/89	200		S	W320	L	N
379	07/23/89	200		W	W468	L34	N
380	07/23/89	200		W	W469	R34	N
381	06/09/89	201		S			
382	06/10/89	202		S	W326	R	N
383	06/10/89	202		S	W325	L	N
384	08/26/89	203			W555	R	N
385	07/31/89	203		W	W513	L34	N
386	07/31/89	203		W	W514	R34	N

388	06/10/89	204	S	W330	R	N
389	07/06/89	205	S	W273	L	N
390	06/10/89	205	S	W334	R	N
391	06/10/89	206	S	W332	R	N
392	06/10/89	206	S	W331	L	N
393	06/12/89	207	S	W354	R	N
394	06/13/89	207 208	S	W353	L	N
395	06/11/89	209	S	W338	L	N
396	06/11/89	209	S	W339	R	N
397	06/02/89	210	S	W166	R	N
398	06/11/89	210	S	W341	L	N
399	08/11/89	210	W	W539	R34	N
400	08/11/89	210	W	W541	L34	N
401	06/11/89	211	S	W340	L	N
402	06/11/89	211	S	W342	R	N
403	06/11/89	212	S	W345	L	N
404	06/11/89	212	S	W346	R	N
405	08/27/89	212		W575	L34	N
406	08/27/89	212		W575	L34	N
407	06/11/89	213	S	3250	L	O
408	07/15/89	213	W	9300	R	O
409	06/12/89	214	S	W349	R	N
410	06/12/89	214	S	W348	L	N
411	07/30/89	214	W	W510	R	N
412	06/12/89	215	S	W350	L	N
413	06/12/89	215	S	6273	R	O
414	06/12/89	216	S	W351	L	N
415	08/04/89	216	W	W520	L34	N
416	08/04/89	216 217	W	W519	R	N
417	06/13/89	218	S	W357	L	N
418	07/26/89	218	W	W489	R34	N
419	07/26/89	218	W	W488	L34	N
420	06/13/89	219	S	7176	R	O
421	07/01/89	219		7167	L	O
422	06/13/89	220	S	W360	R	N
423	07/30/89	220	W	W505	L	N
424	06/13/89	221	S	W368	R	N
425	08/06/89	221		W525	L	N
426	06/18/89	222	S	W378	L	N
427	06/18/89	222	S	W379	R	N
428	06/27/89	223		W252	R	N
429	06/27/89	223		W253	L	N
430	07/23/89	223	W	W461	L34	N
431	07/11/89	224	S	W290	L34	N
432	07/11/89	224	S	W291	R	N
433	06/14/89	225	S	6072	R	O
434	06/14/89	225	S	6071	L	O
435	07/22/89	226	S	W459	R34	N
436	06/14/89	227	S	3796	L	O
437	06/14/89	227	S	5087	R	O
438	06/14/89	227	S	5336	R2	O
439	06/27/89	228		W251	L	N
440	08/12/89	228	W	W542	R	N
441	05/27/89	229	S	W129	L	N
442	06/15/89	229	S	W130	R	N
443	07/22/89	229		W458	L23	N
444	06/15/89	230	S	3139	L	O
445	06/15/89	230	S	6207	L2	O
446	06/15/89	230	S	6208	R2	O
447	06/15/89	230	S	3161	R	O
448	06/15/89	231	S	W337	R	N
449	07/28/89	231	W	W500	R	N
450	07/28/89	231	W	W501	L	N
451	07/01/89	232		W260	L34	N
452	06/15/89	232	S	W365	R34	N

454	06/15/89	233		S	W154	L	N
455	06/01/89	233		S	W153	R	N
456	06/16/89	234		S	G223	R	O
457	06/29/89	234		W	6224	L	O
458	07/13/89	234		W	W300	L	N
459	07/11/89	235		S	W294	L	N
460	07/11/89	235		S	9797	R	O
461	07/11/89	235		S	W295	R34	N
462	06/16/89	236		S	W366	R	N
463	06/16/89	236		S	W373	L	N
464	06/16/89	237		S	6156	L	O
465	07/03/89	238		S	W256	R	N
466	06/04/89	238		S	W196	L	N
467	06/17/89	239		S	3718	L	O
468	06/17/89	239		S	5248	R2	O
469	06/18/89	240		S	W377	R	N
470	06/18/89	240		S	W376	L	N
471	06/19/89	241		S	W394	L	N
472	05/28/89	241		S	W139	R	N
473	07/29/89	241		S	W502	R34	N
474	06/30/89	242		S	5366	R	O
475	06/18/89	243		S	W382	L	N
476	06/18/89	243		S	W383	R	N
477	07/20/89	243		W	W441	R34	N
478	06/19/89	244		S	W384	L	N
479	06/19/89	244		S	W385	R	N
480	06/19/89	245		S	W388	R	N
481	06/19/89	245		S	W387	L	N
482	06/19/89	246		S	W392	R34	N
483	06/19/89	246		S	W390	L	N
484	06/19/89	246		S	W391	R	N
485	06/21/89	247		S	W230	R	N
486	06/21/89	247		S	W229	L	N
487	08/03/89	247		W	W516	L34	N
488	06/20/89	248		S	8169	L	O
489	06/20/89	248		S	W395	R	N
490	06/21/89	249		S			
491	06/21/89	250		S			
492	06/21/89	251		S	W398	R	N
493	06/21/89	251		S	9787	L	O
494	06/21/89	252		S	W399	L	N
495	06/21/89	252	253	S	W400	R	N
496	06/25/89	254		S	W239	L	N
497	06/25/89	254		S	W240	R	N
498	07/06/89	255		S	W276	R	N
499	07/06/89	255		S	W277	L	N
500	06/23/89	256		S	W231	L	N
501	07/08/89	256		W	W281	R	N
502	06/24/89	257		S			
503	06/24/89	258		S	9671	R	O
504	07/31/89	258		W	W511	L	N
505	07/08/89	258		W	W283	L23	N
506	07/31/89	258		W	W512	R	N
507	06/25/89	259		Z	W233	L	N
508	06/25/89	259		Z	W234	R	N
509	06/25/89	260		Z	2729	L	O
510	06/25/89	260		Z	5331	R	O
511	06/25/89	261		Z	W235	L	N
512	06/25/89	261		Z	W236	R	N
513	06/25/89	262		Z	W237	L	N
514	07/11/89	262		W	W289	R	N
515	06/26/89	263		Z	W244	R	N
516	06/26/89	263		Z	W243	L34	N
517	06/26/89	264		Z	W249	L	N
518	06/26/89	264		Z	W250	R	N

100

519	06/28/89	265		S	W254	L	N
520	06/28/89	265		S	W255	R	N
521	08/09/89	265		W	W534	R2	N
522	06/28/89	266		S	8217	R	O
523	06/28/89	266		S	8179	L	O
524	07/22/89	266		W	W459	R34	N
525	06/29/89	267		W	W257	L	N
526	06/29/89	267		W	W258	R	N
527	07/01/89	269	~268	W	W259	R	N
528	06/30/89	269	~270		6673	L	O
529	07/01/89	271		W	3359	R	O
530	07/13/89	271		W	W427	L	N
531	07/14/89	272		W	W429	L	N
532	07/14/89	272		W	W430	R	N
533	07/04/89	273		Z	W263	R	N
534	07/04/89	273		S	W262	L	N
535	07/04/89	274		Z	W265	R34	N
536	07/04/89	274		Z	W264	L34	N
537	07/05/89	275		Z	W267	L	N
538	07/05/89	275		Z	W268	R	N
539	07/05/89	276		Z	W269	L	N
540	07/05/89	276		Z	W270	R	N
541	07/06/89	277		Z	W271	L	N
542	07/06/89	277		Z	W272	R	N
543	07/06/89	278		Z	W274	L	N
544	07/06/89	278		Z	W275	R	N
545	07/06/89	279		Z	W278	L	N
546	07/06/89	279		Z	W279	R	N
547	07/08/89	280		W	W282	R	N
548	07/08/89	280		W	5405	L12	O
549	07/08/89	280		W	5361	L	O
550	07/11/89	282	~281	W	W293	R	N
551	07/11/89	282		W	W292	L	N
552	07/12/89	283		W	2732	R	O
553	07/12/89	283		W	2731	L	O
554	07/27/89	284		W	W493	R34	N
555	07/27/89	284		W	W492	L	N
556	07/12/89	284	~285	W	W299	L34	N
557	07/14/89	286		W	W431	L	N
558	07/14/89	286		W	W432	R	N
559	07/15/89	287		W	W225	L	N
560	07/15/89	287		W	W401	R	N
561	07/18/89	288		W	W437	L	N
562	07/18/89	288	~289	W	3416	R	O
563	07/18/89	290		W	W438	L	N
564	07/18/89	290	~291	W	W439	R	N
565	08/07/89	292		W	W526	R23	N
566	07/21/89	292		W	W444	L	N
567	07/21/89	293		W	W449	R	N
568	07/21/89	293		W	W448	L	N
569	07/21/89	294		W	W454	R	N
570	07/21/89	294		W	W453	L	N
571	07/23/89	295		W	W473	L	N
572	07/23/89	295		W	W474	R	N
573	07/25/89	296		W	W484	L	N
574	07/25/89	296		W	W485	R	N
575	07/26/89	297		W	W486	L	N
576	07/26/89	297		W	W487	R	N
577	07/27/89	299	~298	W	W495	R	N
578	07/27/89	299		W	W498	L	N
579	07/29/89	300		W	6248	R	O
580	07/29/89	300		W	9271	L	O
581	07/30/89	301		W	W506	L	N
582	07/30/89	301	~302	W	W507	R34	N
583	07/31/89	303		W	8186	R	O
584	07/31/89	303		W	8206	L	O

585	08/03/89	304		W	7180	R	O
586	08/04/89	304		W	W521	L	N
587	08/06/89	305		W	8000	R	O
588	08/06/89	305		W	7989	L	O
589	08/06/89	306		W	W524	R	N
590	08/06/89	306		W	W523	L	N
591	08/07/89	307		W	W528	L	N
592	08/07/89	307		W	W529	R34	N
593	08/08/89	308		W	W530	L	N
594	08/08/89	308		W	W531	R	N
595	08/08/89	309		W	W452	R	N
596	08/08/89	309		W	W451	L	N
597	08/09/89	310		W	W533	R	N
598	08/09/89	310		W	W532	L	N
599	08/10/89	311		W	W536	L	N
600	08/10/89	311		W	W537	R	N
601	08/11/89	312					
602	08/12/89	313		W	W543	L	N
603	08/12/89	313		W	W544	R	N
604	08/16/89	314		W	W349	R	N
605	08/16/89	314		W	W348	L	N
606	08/18/89	315		W	W550	L	N
607	08/18/89	315		W	W551	R	N
608	08/23/89	316			W552	L	N
609	08/23/89	316			W553	R	N
610	06/11/89	317			W343	L34	N
611	06/11/89	317			W344	R34	N
612	07/21/89	318			W451	L	N
613	07/21/89	318			W452	R	N
614	06/02/89	319			W157	R	N
615	07/23/89	320			W476	R	N
616	07/23/89	320			W475	L	N
617	07/30/89	321		W	W508	L	N
618	07/30/89	321	322-333 (12)	W	W509	R	N
619	06/15/89	334		S	W364	R	N
620	06/15/89	334		S	3450	L	O
621	07/27/89	334		W	W499	R34	N

111 TAG RECOVERIES

39.9%

334
-56 NOT NUMBERED
278 identities

Assessment of Green Sea Turtle Nesting Population
at French Frigate Shoals

PROGRESS REPORT
October 2, 1989

I. Analysis of the 1988 Saturation Survey Data

A. Data Base Management -

Data from the 1988 field surveys have been extracted, edited, rigorously cross-checked, coded, and entered into ASCII files. Eventually these files will be translated into Paradox dBase files. The data base covers East Island, Tern Island, and Whale-Skate, and includes a separate entry for each turtle encounter. Each entry consists of information on location, date, time, tag and/or paint numbers, observed activity, carapace length, and incidence of tumors.

B. Estimation of Residence Time Models -

The data base has been used to generate a nesting activity matrix (NAM) for each island, the first step in estimating residence time models. The NAM for a specific island has one row for each turtle encountered there (and nowhere else; crossovers are handled separately) and one column for each night of the season. A given cell in the matrix has the value "1" if the turtle was encountered on that night, or "0" otherwise.

Several computer programs have been written to process activity matrix data. These are tools which will be used with other information (such as confirmed egg depositions) to estimate:

(a) frequency distributions of successive nights of presence/absence on the beach;

(b) arrival distributions;

(c) frequency distributions of the number of nesting episodes, duration of nesting episodes, and interval between episodes;

With these tools completed we are ready to estimate residence time models. These models enable estimation of the nesting population for each season on the basis of the number of individual turtles encountered and the specific survey schedule for that season. The residence time model for East Island will be estimated first.

C. Estimation of Nesting Populations -

The East Island residence time model will then be applied to the historical survey data from East Island to reconstruct the time series of East Island nesting population estimates, up through the 1988 season. Models for Whale-Skate and Tern Island will follow. Confidence intervals for nesting population size will also be estimated (see below).

II. Monte Carlo Evaluation of Estimation Procedure and Survey Design

A. Simulation Model -

A computer simulation model has been written which will allow us to evaluate the statistical properties of the procedures used to estimate nesting populations. The model has three parts:

(a) A nesting population simulator generates a mock NAM for a specified number of turtles (we are using 200). This is done by randomly drawing an arrival time, number of nests, nesting episode durations, and inter-episode intervals for each turtle. The random variates are taken from probability distributions estimated using saturation survey data.

(b) A specified survey schedule is applied to the mock NAM to compute the number of individual nesting females seen during the survey. This number is then inserted in the nesting population estimator (updated using 1988 data) to produce a (simulated) population estimate.

(c) Steps 1 and 2 are repeated many times (at least 2000). In this manner the statistical distribution of population estimates is derived for the specified survey schedule.

B. Bias and Precision of Population Estimates -

Information generated by the Monte Carlo simulations will allow us to measure the statistical bias, variance, and other properties of the nesting population estimation procedure. For any set of assumptions regarding the underlying nesting behavior and survey schedule we can generate approximate confidence bounds for the true nesting population. This procedure will be applied to the historical East Island data.

C. Optimization of Survey Design -

The simulator can also be used to see how statistical properties of population estimates, such as bias and precision, vary with survey design. Alternative survey designs can be compared, and cost factors can be applied to determine the trade-offs between survey cost and precision. The model may therefore be a useful tool for survey optimization. Survey designs will be evaluated for East Island.

J. Wetherall
3 October 1989

AGENDA

Review of 1988-89 French Frigate Shoals
Turtle Monitoring

DATE: October 6, 1989

TIME: 9:00 a.m. - 11:00 a.m.

PLACE: SWFC Meeting Room

ATTENDEES: Bill Gilmartin, NMFS
George Balazs, NMFS
Jerry Wetherall, NMFS
Gene Nitta, NMFS
Stewart Fefer, FWS
Ken McDermond, FWS
Ken Niethammer, FWS
Glynnis Nakai, FWS
Michael Moser, FWS

TOPIC	TIME
I. Introduction (K. McDermond)	5 min.
II. Summary of 1988 Data (Jerry W.)	15 min.
III. Field Methodologies for 1989 (Moser, Nakai, Niethammer) A. Tagging etc. B. Data recording	30 min.
IV. Summary of 1989 East Is. Data (M. Moser)	15 min.
V. Summary of 1989 Tern Is. Data (K. Niethammer)	10 min.
VI. Level of impact (Moser, Niethammer, Nakai)	15 min.
VII. Where are we in relation to our goals? A. 1989 (K. Niethammer) B. Overall (Balazs, Wetherall, Nitta)	20 min.
VIII. Where do we go next? (Group)	15 min.

Notes for Turtle I.D. database file:

1. Tag W296 is on Turtle #237

2. Tags on Turtle #314 should be: W548L, W549R

3. Tag W77 on Turtle #16 is missing.

4. Confusion with Turtles #256 and #258 towards end of July

5. Tags # W 133 and W134 were applied on duplicate Turt #132

ADULT FEMALE GREEN TURTLES HANDLED AT FRENCH FRIGATE SHOALS DURING THE 1988 NESTING SEASON. (Oct. 89 version)
compiled by G.H. Balazs, B.K. Choy and M. Yong

PNT#	NEW TAGS[a]	OLD TAGS	ISLAND[b]	[c]FST-LST 88' DATES SEEN	CCL CM	COMMENTS[e]
EAST ISLAND						
1/96	10103	4264,4265	EAST	5/15-7/07 (53)		TMR,(1)
2		6128,6143 6144	EAST	5/15-7/11 (57)	93.5	36,10,11 (4)
3	10027,10028		EAST	5/15-7/21 (67)	100.5	16,11, 39(4)
4/93		9315,9316	EAST	5/15-8/06 (83)	97.0	12,13, 28,14(5)
5	10030,10035 10172,10173		EAST	5/16-7/27 (72)	103.5	TMR,42, 14(3)
6		9285	EAST	5/16-6/23 (38)	94.5	17(2)
7/110		3239,3384	EAST	5/16-7/10 (55)	95.0	30,13, 12(4)
8	10044,10529 10530		E/T	5/16-7/30 (75)	103.0	17,13, 28(4)
9	10031,10032		EAST	5/16-7/20 (65)	97.0	26,38 (3)
10		2209,2210 3846,5319	EAST	5/16-7/26 (72)	98.0	24,13, 10,11(5)
11		3581,3583	EAST	5/17-6/22 (36)	96.0	36(2)

12	10033,10034		EAST	5/17-7/05 (49)	99.5	25,24 (3)
13/y14	10342,10043		E/W-S	5/18-8/06 (80)	97.0	w17y14 y29y(4)
14	10036,10037		EAST	5/18-8/01 (75)	98.5	13,12, 14,11, 12,11(7)
15		3374,3375	EAST	5/18-7/22 (65)	95.5	40,25 (3)
16	10074	9711	EAST	5/18-7/14 (57)	104.5	16,14, 13,13(5)
17	10038,10042		EAST	5/19-7/31 (73)	105.5	21,38 (3)
18/112	10039	6068,6069 6070	EAST	5/19-6/27 (39)	100.5	(1)
19		6081,6088 6104	EAST	5/19-7/19 (61)	94.5	13,34, 13(4)
20/155	10040,10041		EAST	5/20-7/24 (65)	102.0	(1)
21	PN# ONLY NO RE-ID		EAST	5/20-5/24 (4)		(0)
22	10077	5370	EAST	5/21-7/25 (65)	89.5	12,39, 12(4)
23	PN# ONLY NO RE-ID		EAST	5/21-6/8 (18)	96.5	(1)
24	PN# ONLY NO RE-ID		EAST	5/21-5/24 (3)		(1)
25		9277,9342	EAST	5/22-6/30 (39)	94.5	13(2)

26	PN# ONLY NO RE-ID		EAST	5/22-6/5 (14)		(1)
27/82		6675,9778	EAST	5/23-7/15 (53)	96.5	TMR,10, 2(3)
28		3140,3141 5214,5230	EAST	5/23-7/23 (61)	96.5	30,15 (3)
29	10129	2246,3634 3645	EAST	5/23-7/04 (42)	100.5	30,12 (3)
30		2263,9334	EAST	5/23-7/27 (65)	102.0	14,13, 13,12(5)
31	9812,9813		E/W-S	5/23-6/11 (19)	101.0	y(1)
32	10226	3791,5333 5324	EAST	5/24-7/25 (62)	95.5	12,13, 12,12, 13(6)
33	10046	3379	EAST	5/24-8/12 (80)	96.0	12,30, 12(4)
34		7168,7169	EAST	5/24-7/27 (64)	95.5	25,12, 13(4)
35		3254,3255	EAST	5/24-7/14 (51)	101.5	25,12 (3)
36	10126		EAST	5/24-7/16 (53)	94.0	13,12, 13(4)
37		6055,6092 6093	EAST	5/24-7/21 (58)	101.5	11,12, 11,11, 12(6)
38	10144	2234,6123	EAST	5/25-7/28 (64)	100.5	TMR,12, 12,13(4)

39		7184,7202	EAST	5/25-8/04 (71)	101.0	19,28, 13,11(5)
40/79		3594,6141 6206	EAST	5/26-8/10 (76)	106.5	25,25, 13(4)
41/87		9272,9290	EAST	5/26-8/12 (78)	78.0	14,13, 25(4)
42	10505,10549	4281,4270	EAST	5/26-8/15 (81)	105.5	13,26, 12,13(5)
43	10093	5204	EAST	5/27-7/10 (44)	100.5	(1)
44	PN# ONLY NO RE-ID		EAST	5/27	94.0	(0)
45	10055,10056 10094		EAST	5/28-7/09 (42)	98.0	13(2)
46	PN# ONLY NO RE-ID		EAST	5/28		(1)
47	10095	3590,8244	EAST	5/28-7/29 (62)	106.5	14,11, 23,14(5)
48		8180,8181 8182	EAST	5/28-8/1 (65)	94.0	15,12, 38(4)
49	10179,10180	4280	EAST	5/28-7/04 (37)	95.5	13,12, 12(4)
50	10154,10061		EAST	5/29-8/08 (71)	95.5	28,27 (3)
51		2257,3584 6121	EAST	5/29-7/26 (58)	104.0	11,11, 12,12(5)
52/103		8176,8177	EAST	5/29-8/01 (64)	100.5	13,11, 25(4)

53	10112,10159 10160		EAST	5/30-7/22 (53)	96.5	14,13, 26(4)
54/104	10166,10211 10212		EAST	5/30-8/15 (77)	94.0	13,24, 13(4)
55/117	10168,10184 10511		EAST	5/31-7/28 (58)	98.0	15,13, 24(4)
56/106	10066	9343,8238	EAST	5/31-8/12 (73)	98.5	24,26 (3)
57	10067,10200		EAST	5/31-7/26 (56)	94.5	29,14, 13(4)
58	10068,10516		EAST	5/31-8/06 (67)	92.5	14,27, 13(4)
59	PN# ONLY NO RE-ID		EAST	5/31-6/1 (1)		(0)
60/100	10158	2743,6184	EAST	6/01-7/22 (51)	101.0	12,13 (3)
61	PN# ONLY NO RE-ID		EAST	6/3		(1)
62/154	10124	9324,9322	EAST	6/02-8/14 (73)	98.5	13,23, 13(4)
63	10250	8250,9252	EAST	6/02-8/13 (72)	96.5	24,36, 17(4)
64	10127,10128		EAST	6/03-7/20 (47)	94.5	18,29 (3)
65		3151,3158 6163	EAST	6/03-7/21 (48)	99.5	13,11, 13,11(5)
66	10072,10238		EAST	6/03-8/13 (71)	98.0	16,12, 13(4)

67	PN# ONLY NO RE-ID		EAST	6/04-6/16 (12)		(0)
68		8240,9296	EAST	6/04-7/26 (52)	90.0	12,12, 11(4)
69	10075,10076		EAST	6/04-8/15 (72)	98.0	TMR,13, 12,13, 22(5)
70/145	10078,10155		EAST	6/05-7/21 (46)	101.0	20,26 (3)
71	10175	2805	EAST	6/05-8/14 (70)	98.0	11,12, 12,11, 13(6)
72		5096,5182 6926,6927	EAST	6/05-7/26 (51)	97.0	13,12, 13,13(5)
73		3587,3597	EAST	6/05-8/05 (61)	99.0	12,11, 15,11, 12(6)
74	10080,10081		EAST	6/05-6/30 (25)	99.5	13,12 (3)
75	PN# ONLY NO RE-ID		EAST	6/06		(1)
76	10082	9258	EAST	6/06-8/21 (76)	104.0	12,26, 24,13(5)
77		9325,9326	EAST	6/06-8/22 (77)	98.5	12,25, 12,28(5)
78	10083,10084		EAST	6/07-8/19 (73)	106.5	13,12, 11,25(5)
80		2251,6115 6116	EAST	6/07-8/04 (58)	102.0	11,12, 23(4)

81	10085,10210		EAST	6/07-8/03 (57)	96.0	14,17, 13,13(5)
83	10089,10090		EAST	6/08-7/16 (38)	98.5	12,12, 13(4)
84	10087,10088		EAST	6/07-7/21 (44)	91.5	22,22 (3)
85		6107,6113	EAST	6/08-7/09 (31)	100.5	15,13 (3)
86		3201,3202	EAST	6/09-8/01 (53)	100.0	11,16 (3)
88/y8		3721,5285	E/W-S	6/03-7/26 (53)	105.5	12(2)
89	10092,10567		EAST	6/09-8/06 (58)	95.5	24,13, 11(4)
90	10538,10539		EAST	6/10-8/13 (64)	99.0	11,14, 13(4)
91	10104,10548	3550	EAST	6/10-8/02 (53)	105.5	13,8, 18(4)
92	10100	3351	EAST	6/10-7/26 (46)	98.0	16,29 (3)
94	10096,10097		EAST	6/11-7/29 (48)	104.0	25,12 (3)
95	10208,10209	9389,9390	EAST	6/10-8/17 (68)	98.0	14,13 12,14 14(6)
97	10201,10504		EAST	6/11-8/05 (55)		(0)

98	10116		EAST	6/11-8/14 (64)	98.0	16,14, 15(4)
99		6046,6047 6142	EAST	6/11-7/15 (34)	92.5	11,10, 12(4)
101	10114,10115		EAST	6/12-8/15 (64)	91.5	34(2)
102/148		6354,6355	EAST	6/12-7/23 (41)	99.0	TMR,(1)
105	10110,10174		EAST	6/12-8/10 (59)	94.0	16,28, 15(3)
107	10139	3610,3624	EAST	6/13-7/21 (38)	99.5	12,13, 13(4)
108	10113		EAST	6/13-7/14 (31)		(0)
109	PN# ONLY NO RE-ID		EAST	6/13-6/20 (7)		(1)
111	10526	9349,9350	EAST	6/13-7/29 (46)	95.0	TMR,26 (2)
113		8237,9255	EAST	6/13-8/19 (67)	100.5	12,16, 25,12(5)
114	PN# ONLY NO RE-ID		EAST	6/14		(0)
116	10118,10119		EAST	6/14-8/18 (65)	93.5	14,26, 25(4)
118/ 122	10123,10125		EAST	6/14-8/22 (69)	101.5	1,15, 12,14, 14(6)
119		8200,8151	EAST	6/15-8/14 (60)	94.5	(1)

120	10122,10196 10232		EAST	6/15-7/27 (41)	100.5	15,13, 14(4)
121/ 123		9283,9284	EAST	6/15-7/24 (39)	103.5	11,14, 12(4)
124		3721,5285	EAST	6/15-8/17 (63)	106.5	12(2)
125	PN# ONLY NO RE-ID		EAST	6/15-6/21 (6)		(1)
126	10195	5183	EAST	6/16-8/12 (57)	101.5	15(2)
127		3777,5233	EAST	6/17-8/13 (57)	96.5	24,12 (3)
129		6094,6099 6100	EAST	6/17-8/10 (54)	98.5	10,11 (3)
130	10149,10524 10525		EAST	6/18-7/29 (41)	89.5	13,14 (3)
131/ y94	10131,10132		E/W-S	6/18-8/20 (63)	99.0	w17y15y (3)
132	10145,10146		EAST	6/18-8/09 (52)	101.0	27,13, 11(4)
133		6051,6089, 6090	EAST	6/18-8/19 (62)	104.0	25,11 14(4)
134	10501,10502		EAST	6/18-8/18 (61)	95.0	16,15, 14,15(5)
135		9262,9263	EAST	6/18-7/15 (27)	94.0	13,14 (3)
136	PN# ONLY NO RE-ID		EAST	6/19-7/10 (21)		12 (2)

137	10535,10536		EAST	6/20-8/20 (61)	103.0	12,15 (3)
138	PN# ONLY NO RE-ID		EAST	6/20	94.0	(1)
139	10133,10134		EAST	6/22-8/11 (50)	98.0	13,15 (3)
140	10135,10136 10215,10216		EAST	6/23-8/05 (43)	97.0	16,27 (3)
141/ 195	10546,10547		EAST	6/24-8/12 (49)	100.5	12(2)
142	10151,10152 10153		EAST	6/25-8/21 (57)	95.5	16,13, 13(4)
143		5322,5394	EAST	6/25-8/03 (39)	100.5	26,13 (3)
144	PN# ONLY NO RE-ID (TRACES OF OLD PAINT)		EAST	6/25-6/26 (1)		(0)
146	10156,10157		EAST	6/26-8/25 (60)	101.0	16,13, 14(4)
147	10191	8239	EAST	6/26-8/09 (44)	101.0	TMR,13, 25(3)
149	10161,10171		EAST	6/27-8/22 (56)	104.5	14,14, 12,15(5)
150	10163,10164		EAST	6/27-8/24 (58)	90.5	16,28 (3)
151	10192,10193		EAST	6/27-8/12 (46)	101.5	14(2)

152	10167,10213 10214		EAST	6/27-8/04 (38)	94.5	12,13, 13(4)
153	PN# ONLY NO RE-ID (TRACES OF OLD PAINT)		EAST	6/27-6/30		(0)
156	10170	5211,3921	EAST	6/28-7/23 (25)	97.0	12,12 (3)
157	10233,10234		EAST	6/28-8/09 (42)	95.5	15,14, 13(4)
158	10199	8243	EAST	6/29-7/25 (26)	97.0	TMR,13 (2)
159	10197,10198		EAST	6/29-7/28 (29)	94.0	15,14 (3)
160	10194,10225		EAST	7/01-8/04 (34)	96.5	11(2)
161	10188		EAST	7/01-8/11 (41)	93.5	40(2)
162	10182,10183		EAST	7/01-7/31 (30)	99.0	13(2)
163	10187,10189		EAST	7/02-8/12 (41)	94.5	13(2)
164	PN# ONLY NO RE-ID		EAST	7/02		TMR,(1)
165	PN# ONLY NO RE-ID		EAST	7/02		(0)
166	10185,10186		EAST	7/02-8/13 (42)	94.5	15(2)
167	10202,10203 10626		EAST	7/03-8/17 (45)	97.0	15,13, 14(4)

168	10177	EAST	7/04-8/20 (47)	96.0	26(2)
169/ y92	10176,10439	E/W-S	7/03-8/17 (45)	84.0	w29y(2)
170	10178,10205	EAST	7/04-8/04 (31)	84.0	(1)
171	10207,10543	EAST	7/08-8/15 (38)	98.0	12,12, 14(4)
173	10541,10542	EAST	7/10-8/01 (22)	99.5	22(2)
174	PN# ONLY NO RE-ID	EAST	7/10		(0)
175	10220	EAST	7/11-7/26 (15)		
176	PN# ONLY NO RE-ID	EAST	7/11-7/12 (1)		(1)
177	10222,10540	EAST	7/11-8/24 (44)	100.0	20,24 (3)
178	10517,10518	EAST	7/11-8/17 (37)	91.5	11,13 (3)
179	10224	EAST	7/11		(1)
180	PN# ONLY NO RE-ID	EAST	7/12-7/25 (13)		(0)
181	10223,10229	EAST	7/13-8/19 (37)	94.5	12,13 (3)
182	10572,10573	EAST	7/12-8/21 (40)	98.5	12(2)
183	10239,10240	EAST	7/12-8/14 (33)	103.5	27(2)

184	10220,10227	EAST	7/13	95.0	(1)
185	10230,10231	E/W-S/T	7/13-8/13 (31)	95.5	(1)
186	PN# ONLY NO RE-ID (TRACES OF OLD PAINT)	EAST	7/13		(1)
187	PN# ONLY NO RE-ID	EAST	7/16-8/1 (16)		(1)
188	10533,10534	EAST	7/17-8/11 (25)		TMR,13, 12(3)
189	10236,10237	EAST	7/17-8/24 (38)	103.5	12(2)
190	10544,10545	EAST	7/18-8/15 (28)	96.0	TMR,28 (2)
191	10244,10245	EAST	7/19-8/04 (16)	91.5	16(2)
192	10246,10514	EAST	7/19-8/10 (22)	101.5	TMR (0)
193	10247,10248	EAST	7/20-8/15 (26)	100.5	(1)
194	10507,10515	EAST	7/21-8/17 (27)	99.5	14(2)
196	10512	EAST	7/22-7/23 (1)	92.5	(1)
197	PN# ONLY NO RE-ID	EAST	7/25		(1)
198	10520,10521	E/W-S	7/26-8/10 (15)	92.0	(1)

200		9289,9312	EAST	7/28-8/22 (25)	101.0	14,11 (3)
201	10523	6356,6357	EAST	7/29-8/22 (24)	94.0	12,22 (3)
202		3228,5409	EAST	7/29-8/20 (22)	100.0	11(2)
203	10531,10532		EAST	7/30-8/23 (24)	95.5	(1)
204	10537		EAST	7/31		
205	10550		EAST	8/02		
206	10627		EAST	8/02-8/18 (16)		14(2)
207	10561,10562		EAST	8/04-8/18 (14)	96.5	14(2)
208	10564,10566		EAST	8/05-8/18 (13)	101.5	(1)
209	10570,10571		EAST	8/06-8/21 (15)	96.0	14(2)
210	10568,10569		EAST	8/06-8/21 (15)	100.0	
211	10574		EAST	8/08-8/23 (15)		(1)
212	PN# ONLY NO RE-ID		EAST	8/15-8/16 (1)		(1)
214	10628,10629		EAST	8/17-8/22 (5)	94.0	(1)

215	10630	EAST	8/21-8/22 (1)	95.5

EAST IS. SUMMARY

165 turtles	71 tag recoveries (43%)	8 strays (4.8%)	12 tumors (7.3%)

508 egg clutches
3.1 clutches per turtle

WHALE-SKATE

yA/ y62/y67	10338,10343		W-S	5/26-6/20 (25)	102.0	12(2)
yB	9802,9803		W-S	5/25-7/21 (57)	95.5	13,10, 23,11(5)
yC	9808,9809		W-S	5/26-6/23 (28)	99.0	14(2)
yD/ y58	9816,9817	8105	W-S	5/27-7/01 (35)	102.0	11(2)
yE/ y63/y66	9806,9807		W-S	5/27-7/24 (58)	95.5	13,16 (3)
yF	9804,9805		W-S	5/27-8/01 (66)	95.5	54,12 (3)
yG	9814,9815		W-S	5/27-7/30 (64)	96.0	TMR,(1)
yH	9818,9823		W-S	5/27-7/31 (65)	98.5	12,3, 11,23 (5)
yI	9810,9811		W-S	5/27-7/17 (51)	103.0	12,13 (3)
yJ/bO		6373,6374	W-S/T	5/27-8/7 (72)	104.0	TMR,14, 41,14(4)b
yK		3815,5207	W-S	5/28-8/19 (83)	98.0	12,28, 12,31(5)
yL	9822,10474		W-S	5/29-6/30 (32)	89.0	14(2)

yM	10456,10457		W-S	5/28-8/11 (75)	98.0	12,12, 23,24 (5)
yN	10280	9752	W-S	5/28-7/31 (64)	103.0	13,12, 13,12(5)
yO	9820,9821		W-S	5/29-8/02 (65)	96.5	26,26, 13(4)
yP	10276,10277		W-S	5/29-7/22 (54)	101.5	23,26 (3)
yQ	10281,10282		W-S	5/29-8/12 (75)	95.5	13,37, 23(4)
yR	9824,9825		W-S	5/30-7/19 (50)	94.0	24,26 (3)
yS	10307,10311		W-S	5/30-7/8 (39)	89.0	11(2)
yT	10278,10279		W-S	5/30-7/30 (61)	97.0	12,13 36(4)
yU		5443,5444 5445	W-S	5/30-7/29 (60)	92.5	13,47 (3)
yV	10302,10303 10366		W-S/T	5/30-7/29 (60)	101.0	y11y36b (3)
yW	10283,10284		W-S	5/31-8/05 (66)	99.5	12,28, 12,14(5)
yX	10285,10286		W-S	6/01-8/18 (78)	98.5	53(2)
yY	10287		W-S	6/01-6/07 (6)		(1)

yZ	10296,10297		W-S	6/01-8/01 (62)	98.0	23(2)
y1		3828,3831 5429	W-S	6/01-7/21 (50)	96.5	37,13 (3)
y2	10378,10475 10476		W-S	6/02-8/07 (66)	97.0	13,13, 11,15,13(6)
y3		3187,5156	W-S	6/01-7/29 (58)	101.5	
y4	10288,10289		W-S	6/02-7/30 (58)	91.5	22,36 (3)
y5	10290,10467	7889	W-S	6/02-7/30 (58)	96.0	12,45 (3)
y6	10293,10294		W-S	6/02-6/16 (14)	82.5	TMR,(1)
y7	10291,10292		W-S	6/03-8/02 (60)	96.5	36,12 (3)
y8/88		3721,5285	W-S/E/WS/E	6/03-7/26 (53)	104.0	(0)
y9	PN# ONLY NO RE-ID		W-S	6/03-6/11 (8)	90.0	(1)
y10	PN# ONLY NO RE-ID		W-S	6/03-6/13 (10)	98.0	(1)
y11	10295,10468 10469		W-S	6/03-8/13 (71)	98.0	23,11, 14(4)
y12	10300,10326		W-S	6/04-7/27 (53)	100.0	15,11, 27(4)
y13	10298,10299		W-S	6/04-8/20 (77)	98.0	44,30 (3)

y15/ 56	10327,10328 10329		W-S	6/05-8/10 (66)	97.5	13,40, 13(4)
y16	10333,10341		W-S	6/05-8/08 (64)	92.5	12,36, 13(4)
y17/ 199	10330,10335		W-S/E/T	6/05-8/24 (80)	92.5	13,22 (3)y
y18	10331,10332	3017	W-S	6/06-8/10 (65)	103.0	40,11, 14(4)
y19	10346	7956	W-S	6/06-7/17 (41)	105.5	(1)
y20	PN# ONLY NO RE-ID		W-S	6/07		(0)
y21	10336,10337		W-S	6/07-8/17 (71)	97.5	52,14 (3)
y22	10334,10449		W-S	6/07-8/13 (67)	101.5	64(2)
y23	10339,10340		W-S	6/07-8/19 (73)	96.0	73(2)
y24	10344,10345		W-S	6/07-8/19 (73)	89.0	14,17 (3)
y25	10349	5473	W-S/T/WS	6/08-8/19 (72)	97.0	13(2)
y26	10347,10348		W-S	6/08-8/13 (66)	93.5	15,8, 11(4)
y27	10324,10325		W-S	6/09-8/16 (68)	96.5	14,15, 14,15(5)
y28	10322,10323 10409,10410		W-S	6/09-8/10 (62)	91.0	14,16, 32(4)

y29	10321,10350		W-S	6/09-8/13 (65)	92.5	TMR,13, 16,12(4)
y30	10319,10320		W-S	6/10-8/07 (58)	102.0	12,34, 12(4)
y31	10316,10317		W-S	6/11-8/19 (69)	81.0	13,14, 26(4)
y32	10313,10315		W-S	6/11-7/26 (45)	80.0	(1)
y33		6264,6270	W-S	6/11-8/10 (60)	77.0	37,12 (3)
y34/ 172	9812,9813		W-S/E	6/11-8/05 (55)	101.0	14,12 (3)w
y35	10301,10318		W-S	6/11-8/10 (60)	81.0	13,23, 12,11(5)
y36	10304,10305	3076	W-S	6/12-8/15 (64)	106.0	27(2)
y37	10306	3190	W-S	6/12-8/20 (69)	94.0	8(2)
y38		3400,3401	W-S	6/12-7/30 (48)	94.0	12,35 (3)
y39/ y95	10309,10412 10413		W-S	6/13-8/07 (55)	94.5	TMR, 12(2)
y40	10454,10455		W-S	6/13-8/06 (54)	96.0	(1)
y41	10458,10459		W-S	6/13-7/09 (26)	87.5	26(2)

y42	10377	7977	W-S	6/13-7/26 (43)	94.0	31(2)
y43	10460,10461		W-S	6/14-8/20 (67)	98.5	42,13 (3)
y44	PN# ONLY NO RE-ID		W-S	6/04		(0)
y45	10464,10465		W-S	6/14-8/15 (62)	99.0	45,17 (3)
y46	10466	2722	W-S	6/15-8/03 (49)	103.0	25,24 (3)
y47	10470,10471		W-S	6/15-7/28 (43)	95.5	16(2)
y48	10472,10473		W-S	6/16-8/08 (53)	92.5	26,14 (3)
y49	10462,10463 10479		W-S	6/16-8/12 (57)	95.5	22,23, 11(4)
y50	10399,10477 10482		W-S	6/16-8/16 (61)	95.0	30(2)
y51		8101,8110	W-S	6/16-8/10 (55)	99.5	13,27 (3)
y52	10478,10481		W-S	6/17-8/09 (53)	100.5	15,24 (3)
y53	10480,10490 10578		W-S	6/17-8/13 (57)	94.0	56(2)
y54	10483,10495		W-S	6/18-8/19 (62)	113.0	47(2)

y55	10484,10488 10489	W-S	6/18-8/20 (63)	97.5	(1)
y57	10485,10486 10487	W-S	6/18-7/14 (26)	91.5	14(2)
y59	10493	W-S	6/19-6/20 (1)		(1)
y60	10400,10494	W-S	6/20-8/15 (56)	100.5	29,13, 14(4)
y61	10491,10492	W-S	6/20-8/20 (61)	96.0	12,25, 11,13(5)
y64	PN# ONLY NO RE-ID	W-S	6/19		(0)
y65	PN# ONLY NO RE-ID	W-S	6/19		(0)
y68	PN# ONLY NO RE-ID	W-S	6/22		(0)
y69	10496,10497	W-S	6/23-8/17 (55)	95.5	14,13, 13(4)
y70	10498,10499	W-S	6/23-8/13 (51)	98.5	50(2)
y71	10376,10500	W-S	6/25-7/07 (12)	98.0	(1)
y72	10401,10402	W-S	6/25-7/19 (24)		11(2)
y73/ 216	10379,10380 1004(?)	W-S/E	6/29-8/25 (57)	98.0	(1)y
y74	10381,10382	W-S	6/30-8/01 (32)	90.0	19(2)

y75	10384,10577		W-S	6/30-8/13 (44)	105.0	17,13, 14(4)
y76	10385,10386		W-S	7/01-8/11 (41)	100.0	28,14 (3)
y77	10387,10388		W-S	7/01-8/07 (37)	98.0	37(2)
y78	10389,10390		W-S	7/02-8/10 (39)	96.0	26,13 (3)
y79	10442		W-S	7/07-8/08 (32)		(1)
y80	10406,10436		W-S	7/08-8/13 (36)	96.0	TMR, 11(2)
y81	10391,10392		W-S	7/09-8/13 (35)	90.0	12,23 (3)
y82	10411	8141	W-S	7/09-8/12 (34)	90.0	14(2)
y83	10395,10396		W-S	7/14-8/13 (30)	96.0	29(2)
y84	10397,10398		W-S/T	7/15-8/24 (40)	102.0	(1)
y85	PN# ONLY NO RE-ID		W-S	7/17		(0)
y87	10407		W-S	7/19-7/20 (1)		(1)
y88	10408		W-S	7/19-7/20 (1)	101.5	(1)
y90	PN# ONLY NO RE-ID		W-S	7/21		(0)

y109	10431,10432	W-S	7/30-8/15 (16)	95.0	15(2)
y110	10433,10434 10450	W-S	7/31-8/13 (13)	92.5	12(2)
y111	10435,10437	W-S	7/31-8/17 (17)	93.5	(1)
y112	10407,10408	W-S	7/31-8/13 (13)	101.5	13(2)
y113	PN# ONLY NO RE-ID	W-S	8/02-8/07 (7)	89.0	(0)
y115	10403	W-S	8/03-8/04 (1)	96.5	
y116	10440,10441	W-S	8/05-8/17 (12)	98.0	(1)
y117	10444	W-S	8/08-8/20 (12)		(1)
y119	10446,10447	W-S	8/11	90.0	(1)
y121	10582,10583	W-S	8/16		(1)

WHALE-SKATE SUMMARY

119 turtles	20 tag recoveries (16.8%)	8 strays (6.7%)	10 tumors (8.4%)

TERN ISLAND						
bA/bF	6867,6868 10256		TERN	5/13-7/02 (50)	94.5	11,12, 14,12(5)
bB	6871,6872		TERN	5/14-7/25 (72)	93.5	TMR,15 14,12 (4)
bC/bK	10259,10367 10266		TERN	5/17-8/04 (79)	100.5	12,32, 15(4)
bD	6869,6870		TERN	5/19-7/06 (48)	98.5	12,24(3)
bE	10263,10264 10267		T/W-S	5/25-7/23 (59)	97.0	21(2)
bG/ y86		5397,6179	T/W-S	5/25-8/09 (76)	89.5	TMR,13, 13,25,11 (5)y
bH		3119,3120	TERN	5/30-8/07 (69)	93.5	y28b40b (3)
bI		9770,9771	TERN	5/30-8/01 (63)	101.5	23,13, 23 (4)
bJ/bS	10274,10351		T/W-S	6/01-8/10 (70)	96.5	b13b14y (3)
bL	10268,10354		TERN	6/03-7/29 (56)	102.0	56(2)
bM/ y120	6875,10269		T/W-S	6/08-8/15 (68)	99.0	(1)
bN/115	10181,10270 10271		T/E	6/09-8/25 (77)	103.0	14,13, 13(4)
bP/ y118	10272,10273		T/W-S	6/15-8/08 (54)	100.0	b54y(2)

bQ	10361	3268	TERN	6/16-7/14 (28)		13(2)
bR		6041,9355	TERN	6/15-8/24 (70)	106.0	15,51 (3)
bT	10352,10353		TERN	6/26-8/20 (55)	97.0	15,13, 25 (4)
bU	10357,10358		TERN	7/01-8/17 (47)		(0)
bV/ y105	10355,10356		T/W-S	7/01-7/10 (9)	103.0	(1)y
bW	10359,10360		TERN	7/03-8/17 (45)	95.5	16,16, 12(4)
bX	PN# ONLY NO RE-ID		TERN	7/05		(1)
bY/ 213	10374,10575		T/E	7/12-8/17 (36)	94.5	b33w(2)
bZ	10362,10365		TERN	7/13-8/11 (29)	98.0	(1)
b1/y89/ y114	10364,10370		T/W-S	7/18-8/29 (42)	101.0	TMR, b14y 27b (3)
b2	PN# ONLY NO RE-ID		TERN	7/23		(1)
b3	10368,10369		TERN	8/05-8/21 (16)	99.0	(1)

TERN IS. SUMMARY

23 turtles	5 tag recoveries (21.7%)	9 strays (39.1%)	3 tumors (13%)

63 egg clutches
2.7 clutches per turtle

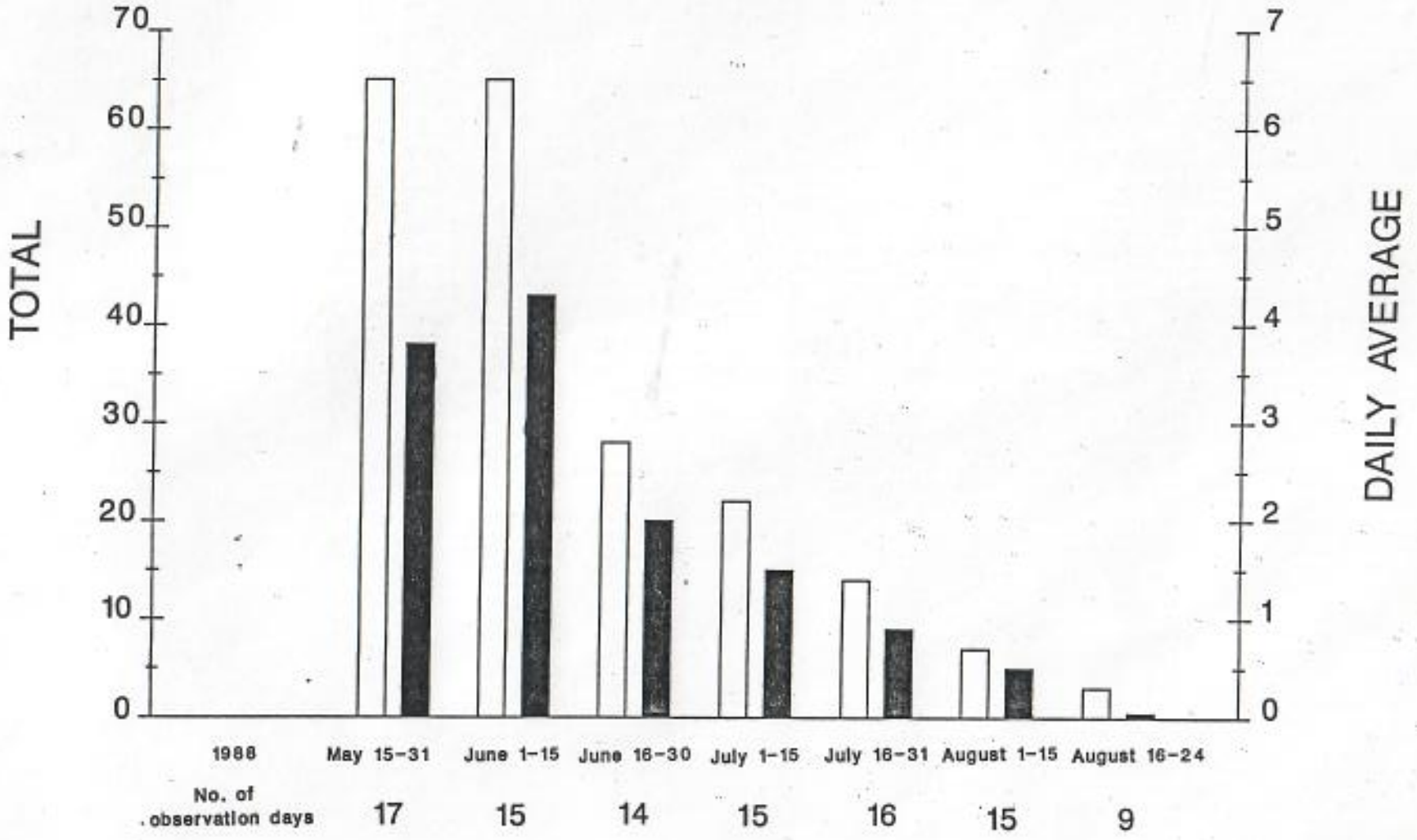
SUMMARY FOR ALL 3 ISLANDS

307 turtles	96 tag recoveries (31.3%)	25 tumors (8.1%)

571 egg clutches (East & Tern only)
3.0 clutches per turtle for 188 turtles

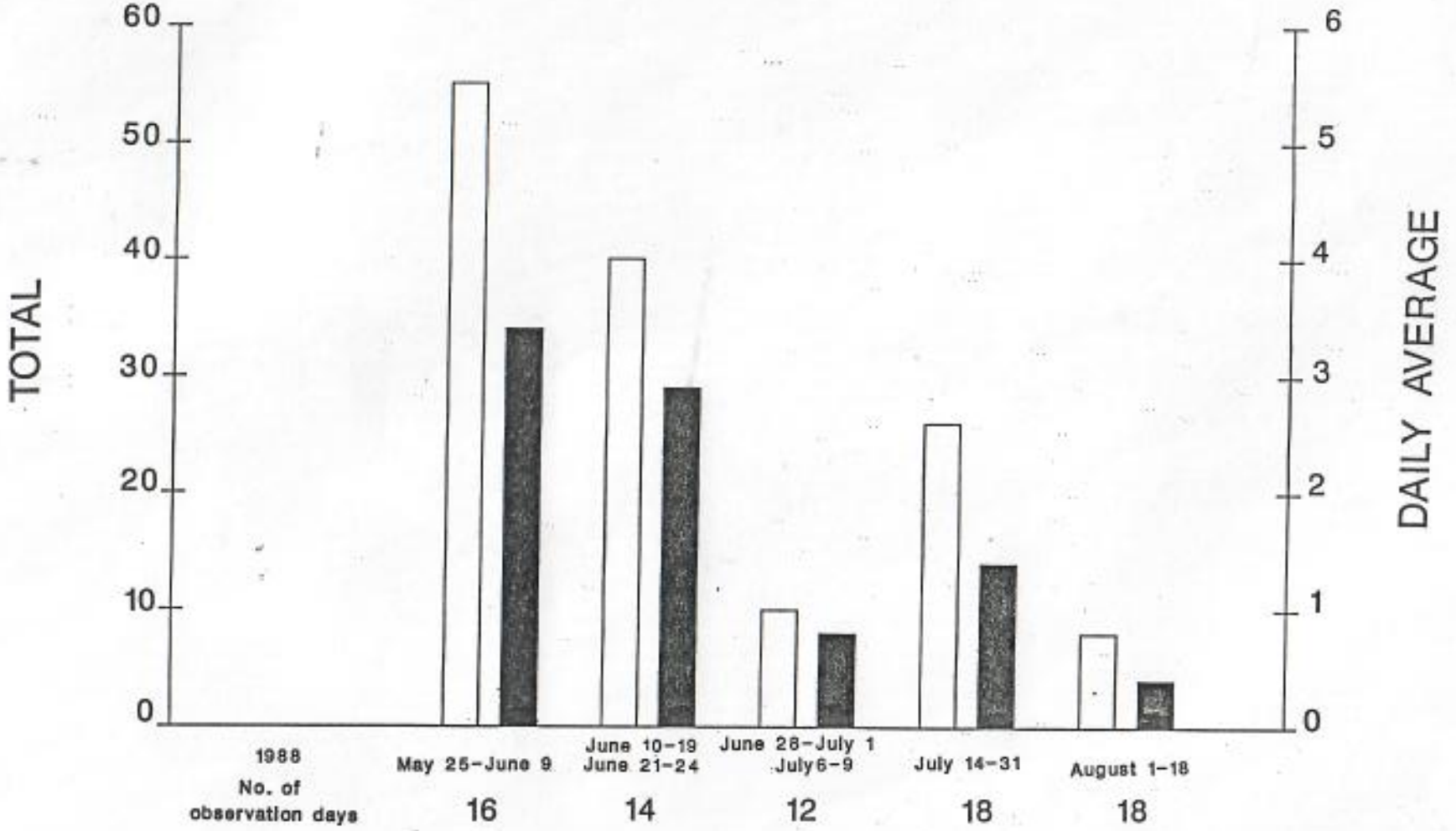
[a]Tags applied in 1988.
[b]E - East Island, T - Tern Island, W-S- Whale Skate Island.
Note: multiple islands are indicated in order of appearance on those islands.
[c]()= total number of days between first and last sighting during study period.
[d]CCL - Curved Carapace Length.
[e]TMR - tumor('s) observed, () - total number of clutches observed.
Note: numbers indicate days between subsequent clutches and letters indicate island the clutch was observed on: w - East, y - Whale-Skate, b - Tern. If only numbers are indicated all clutches were on the island indicated in the "Island" column for that turtle.

Number of New Turtles First Seen Ashore to Nest
in 1988 at East Island, French Frigate Shoals



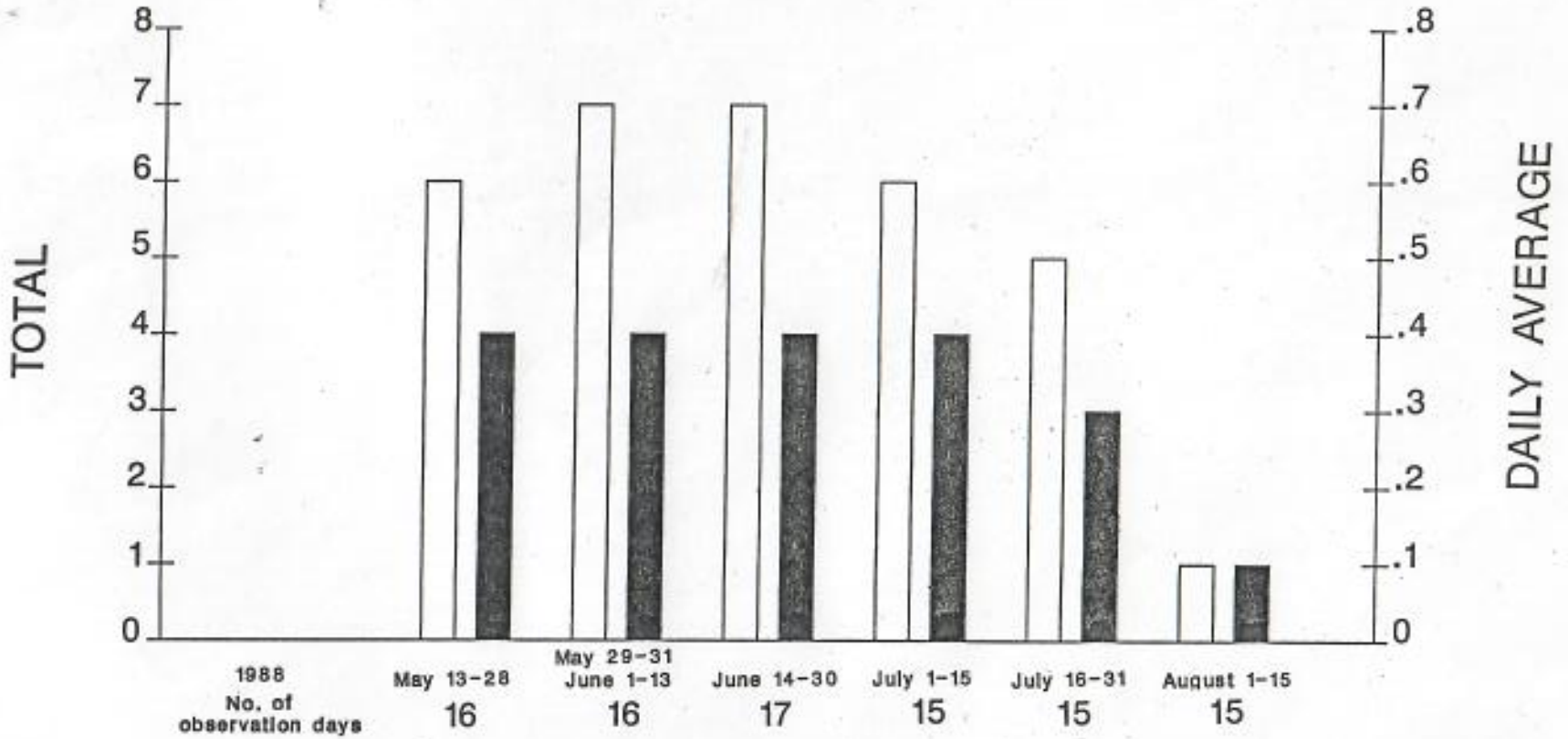
204 turtles
101 observation days

Number of New Turtles First Seen Ashore to Nest
in 1988 at Whale-Skate, French Frigate Shoals



139 turtles
78 observation days

Number of New Turtles First Seen Ashore To Nest
in 1988 at Tern Island, French Frigate Shoals



32 turtles
108 observation days

SUMMARY OF GREEN TURTLES EXHIBITIING AN INFIDELITY TO THE ISLAND AT FRENCH FRIGATE SHOALS WHERE THEY WERE FIRST RECORDED ASHORE TO NEST DURING THE 1988 SEASON

Compiled by G.H. Balazs
Oct. 1989

EAST ISLAND- 8 (4.8%) strays out of 165 turtles.

6 East to Whale-Skate. Successful nestings include: (1 East), (2 East), (1 East 2 W-S), (1 East 1 W-S), (1 East 3 W-S), (1 W-S).

1 East to Tern. Successful nestings include: (4 East, none on Tern).

1 East to Whale-Skate to Tern. Successful nestings include: (1 East).

WHALE-SKATE- 8 (6.7%) strays out of 119 turtles.

2 Whale-Skate to East. Successful nestings include: (3 W-S), (1 W-S).

3 Whale-Skate to Tern. Successful nestings include: (1 W-S), (2 W-S 1 Tern), (4 Tern).

1 Whale-Skate to Tern to Whale-Skate. Successful nestings include: (2 W-S).

1 Whale-Skate to East to Tern. Successful nestings include (3 W-S).

1 Whale-Skate to East to Whale-Skate to East. No successful nestings.

TERN- 9 (39.1%) strays out of 23 turtles.

7 Tern to Whale-Skate. Successful nestings include: (2 Tern), (3 Tern), (1 Tern), (2 Tern 1 W-S), (1 Tern 1 W-S), (2 Tern 1 W-S), (5 W-S).

2 Tern to East. Successful nestings include: (3 Tern),(1 Tern 1 East)

Dick
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Table a.--Number of adult female green turtles recorded nesting from 25 May to 18 August 1988 at Whale Skate Island, French Frigate Shoals (for 74 nights with complete coverage).

Date 1988	Total No. ashore to nest	No. of new females first seen ashore to nest in 1988	Approximate No. depositing eggs	Short-term repeat nesters seen ashore	Long-term recoveries
May					
25	2	2	2	0	0
26	5	5	2	0	1
27	9	4	7	5	2
28	9	6	3	3	1
29	7	2	3	5	0
30	7	3	4	4	1
31	9	4	7	5	0
June					
1	5	4	4	1	2
2	8	5	4	3	1
3	5	2	2	3	0
4	6	4	2	2	1
5	5	3	1	2	1
6	13	5	3	8	1
7	7	2	5	5	1
8	9	1	5	8	0
9	14	3	8	11	0
10	10	4	3	6	1
11	20	4	6	16	3
12	16	4	7	12	1
13	13	2	2	11	1
14	22	2	5	20	4
15	12	3	3	9	3
16	8	4	5	4	0
17	6	4	4	2	2
18	6	0	2	6	0
19	17	9	5	8	2
20	--	--	--	--	--
21	19	1	5	18	0
22	21	2	12	19	0
23	19	0	9	19	0
24	17	1	5	16	0
25-27	--	--	--	--	--
28	7	0	2	7	0
29	10	3	6	7	0
30	13	2	5	11	0

Table a.--Continued.

Date 1988	Total No. ashore to nest	No. of new females first seen ashore to nest in 1988	Approximate No. depositing eggs	Short-term repeat nesters seen ashore	Long-term recoveries
July					
1	7	1	4	6	0
2-5	--	--	--	--	0
6	18	0	2	18	0
7	19	2	9	17	0
8	18	2	7	16	1
9	9	0	5	9	0
10-13	--	--	--	--	--
14	17	2	6	15	0
15	8	0	1	8	0
16	16	1	7	15	0
17	18	0	5	18	0
18	24	3	10	21	0
19	21	2	8	19	0
20	14	1	9	13	1
21	7	1	2	6	0
22	9	0	2	9	0
23	15	0	4	15	0
24	14	0	5	14	1
25	19	4	5	15	0
26	18	4	12	14	1
27	16	2	8	14	0
28	10	1	4	9	0
29	19	2	8	17	0
30	14	2	5	12	0
31	11	1	4	10	0
August					
1	17	9	7	17	0
2	12	2	5	10	0
3	6	0	3	6	0
4	7	1	2	6	0
5	13	0	7	10	0
6	10	0	7	10	0
7	10	2	6	8	0
8	8	0	0	8	0
9	15	0	8	15	0
10	6	1	3	5	0
11	12	0	6	12	0

Table a.--Continued.

Date 1988	Total No. ashore to nest	No. of new females first seen ashore to nest in 1988	Approximate No. depositing eggs	Short-term repeat nesters seen ashore	Long-term recoveries
August					
12	15	0	11	15	0
13	11	0	2	11	0
14	9	0	6	9	0
15	8	1	3	7	0
16	12	0	2	12	0
17	8	1	2	7	0
18	9	0	4	9	0
Total	--	139	364 (2.6%)	--	33 (23.7%)

Table c.--Number of adult female green turtles recorded nesting from 15 May to 24 August 1988 at East Island, French Frigate Shoals (for 101 nights with complete coverage).

Date 1988	Total No. ashore to nest	No. of new females first seen ashore to nest in 1988	No. depositing eggs	Short-term repeat nesters seen ashore	Long-term recoveries
May					
15	8	8	5	0	5
16	5	3	3	2	2
17	4	3	2	1	0
18	3	3	2	0	2
19	6	4	5	2	2
20	2	0	1	2	0
21	4	3	2	1	2
22	7	6	4	1	4
23	7	4	2	3	2
24	7	5	4	2	3
25	3	2	2	1	2
26	4	3	0	1	2
27	8	2	1	6	0
28	14	6	6	8	4
29	10	3	5	7	1
30	9	6	4	3	1
31	9	4	3	5	0
June					
1	13	5	3	8	1
2	6	3	3	3	1
3	9	2	0	7	0
4	13	6	8	7	3
5	13	2	5	11	0
6	13	5	6	8	5
7	10	1	4	9	0
8	9	3	3	6	2
9	18	7	5	11	4
10	12	3	6	9	3
11	22	6	11	16	3
12	19	4	7	15	2
13	23	7	4	16	4
14	29	5	8	24	7
15	27	6	10	21	5
16	11	2	5	9	0
17	15	5	9	10	2
18	18	1	10	17	2
19	17	2	9	15	1

Table c.--Continued.

Date 1988	Total No. ashore to nest	No. of new females first seen ashore to nest in 1988	No. depositing eggs	Short-term repeat nesters seen ashore	Long-term recoveries
June					
20	16	1	4	15	1
21	14	0	7	13	0
22	18	1	8	17	1
23	--	--	--	--	--
24	16	3	8	13	1
25	13	1	7	12	2
26	21	4	8	17	2
27	24	3	14	21	1
28	22	3	12	19	1
29	21	0	7	21	0
30	17	2	6	15	0
July					
1	21	3	12	18	0
2	11	2	8	9	0
3	13	2	7	11	0
4	11	1	4	10	0
5	20	0	8	20	0
6	12	0	1	12	0
7	19	1	6	18	0
8	17	0	8	17	0
9	23	0	8	23	0
10	10	2	3	8	0
11	24	5	10	19	0
12	20	5	13	15	0
13	18	1	11	17	0
14	15	0	12	15	0
15	8	0	5	8	0
16	8	3	8	5	0
17	5	0	4	5	0
18	9	1	5	8	0
19	10	3	6	7	0
20	22	0	14	22	0
21	22	2	12	20	0
22	11	0	7	11	0
23	13	0	4	13	0
24	18	0	12	18	0
25	26	1	11	25	0

Table c.--Continued.

Date 1988	Total No. ashore to nest	No. of new females first seen ashore to nest in 1988	No. depositing eggs	Short-term repeat nesters seen ashore	Long-term recoveries
July					
26	13	0	7	13	0
27	14	2	7	12	1
28	14	0	5	14	0
29	14	0	6	14	1
30	12	2	8	10	0
31	7	0	2	7	0
August					
1	12	0	9	12	0
2	12	2	5	10	0
3	12	0	7	12	0
4	13	2	8	11	0
5	10	0	7	10	0
6	9	2	7	7	0
7	4	0	2	4	0
8	8	1	3	7	0
9	14	0	7	14	0
10	6	0	3	6	0
11	6	0	3	6	0
12	8	0	6	8	0
13	8	0	4	8	0
14	6	0	4	6	0
15	5	0	3	5	0
16	5	1	3	4	0
17	7	1	4	6	0
18	6	0	5	6	0
19	10	0	3	10	0
20	10	1	4	9	0
21	11	0	5	11	0
22	3	0	0	3	0
23	6	0	2	6	0
24	5	0	1	5	0
Total	--	20#	587 (2.8)	--	88 (43.1%)

Table b.--Number of adult female green turtles recorded nesting from 13 May to 29 August 1988 at Tern Island, French Frigate Shoals (for 106 nights with complete coverage).

Date 1988	Total No. ashore to nest	No. of new females first seen ashore to nest in 1988	No. depositing eggs	Short-term repeat nesters seen ashore	Long-term recoveries
May					
13	2	2	2	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0
17	0	0	0	0	0
18	2	1	2	1	0
19	1	0	1	1	0
20	1	1	0	0	0
21	0	0	0	0	0
22	0	0	0	0	0
23	0	0	0	0	0
24	1	1	0	0	0
25	2	1	1	1	1
26	1	0	0	1	0
27	0	0	0	0	0
28	1	0	1	1	0
29	4	1	1	3	1
30	1	1	0	0	0
31	4	1	0	3	1
June					
1	4	1	2	3	0
2	3	1	3	2	0
3	0	0	0	0	0
4	0	0	0	0	0
5	1	0	1	1	0
6	0	0	0	0	0
7	1	1	1	0	0
8	1	1	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	2	0	2	2	0
13	1	0	1	1	0
14	1	1	1	0	0
15	4	2	1	2	2
16	6	0	0	6	0
17	4	0	2	4	0
18	4	1	3	3	0
19	5	2	2	3	1

Table b.--Continued.

Date 1988	Total No. ashore to nest	No. of new females first seen ashore to nest in 1988	No. depositing eggs	Short-term repeat nesters seen ashore	Long-term recoveries
June					
20	1	0	0	1	0
21	0	0	0	0	0
22	0	0	0	0	0
23	1	0	0	1	0
24	5	0	1	5	0
25	4	0	3	4	0
26	--	--	--	--	--
27	3	0	0	3	0
28	4	0	2	4	0
29	1	0	0	1	0
30	4	1	0	3	0
July					
1	8	1	2	7	0
2	9	1	1	8	0
3	4	1	2	3	0
4	2	0	2	2	0
5	2	1	0	1	0
6	4	0	0	4	0
7	4	0	0	4	0
8	2	0	1	2	0
9	4	0	1	4	0
10	2	0	0	2	0
11	2	1	1	1	0
12	2	0	1	2	0
13	2	1	1	1	0
14	5	0	2	5	0
15	2	0	2	2	0
16	1	0	1	1	0
17	3	2	2	1	0
18	3	0	2	3	0
19	--	--	--	--	--
20	3	1	1	2	0
21	1	0	0	1	0
22	4	1	2	3	0
23	1	0	1	1	0
24	4	0	2	4	0

Table b.--Continued.

Date 1988	Total No. ashore to nest	No. of new females first seen ashore to nest in 1988	No. depositing eggs	Short-term repeat nesters seen ashore	Long-term recoveries
July					
25	1	0	1	1	0
26	1	0	1	1	0
27	3	0	1	3	0
28	6	1	3	5	0
30	--	0	--	--	--
31	2	0 (5)	1	2	0
August					
1	4	0	0	4	0
2	2	0	1	2	0
3	2	0	1	2	0
4	0	0	0	0	0
5	1	1	1	0	0
6	2	0	1	2	0
7	3	0	2	3	0
8	1	0	0	1	0
9	2	0	0	2	0
10	2	0	2	2	0
11	2	0	1	2	0
12	0	0	0	0	0
13	1	0	0	1	0
14	1	0	1	1	0
15	1	0 (1)	0	1	0
16	2	0	1	2	0
17	1	0	0	1	0
18	0	0	0	0	0
19	0	0	0	0	0
20	1	0	1	1	0
21	1	0	1	1	0
22	1	0	0	1	0
23	3	0	1	3	0
24	0	0	0	0	0
25	0	0	0	0	0
26	0	0	0	0	0
27	1	0	1	1	0
28	1	0	1	1	0
29	1	0	0	1	0
Total	--	33 32	85 (2.6)	--	7 (21.2%)

EAST RECOVERIES

Table 1.--Adult green turtles' ~~newly tagged~~ tags recovered at _____ _____
(dates)

Tag No.	Date	Location	Status[1]	Carapace length (cm) Straight	Curved
NOT FOUND:					
~~FE~~Male					
4265L (2-3rd)	5-15-88				
6128R (2nds), 6144L (2nds)	5-15-88				
9315R, 9316L	5-15-88				
2209L, 5319R 2nds. (+1 L 2nds)	5-16-88	Entry #71			
3581R, 3583L 2nds	5-16-88	Entry #209			
3372R, 3741L	5-18-88				
9711L	5/18				
6104R (2nds), 1R, +1L (2nds)	5-19-88				
6068R, 6069L + 1L (2nds) (New 10039R (3-4ths))	5-20-88				
5370L + 1R	5-21-88	#103			
9342L + 1R	5-22-88				
5214R (2nds), 1L (2nds)	5-23-88	#138			
Female					
2246L + 1R	5-23-88	#90			
2263R + 1L	5-23-88	#299			
5324R, 3791R (2nds) + 1L	5-24-88				
3379L, (10046R)	5-24-88				
3254L, 3255R	5-25-88	#112			
9220					
6093L (3rds) + 1R	5-25-88	#243			
7184L + 1R	5-25-88				
9772R	5-26-88				
9292R, 9290L	5-26-88				
6206R, 6141L	5-26-88	#87			
~~9770L 9771R~~	~~6-1-88~~	SEE NEXT PAGE			

[1] Basking, nesting, foraging, etc.

9 9770L, 9771R 6-9-88 0

NOTED TO GEORGE 5-30

29 MAY - RECOVERIES FOUND, ENTERED ON MASTER LIST

PASSED TO GEORGE ON 5-30

~~TERN RECOVERIES~~

~~6374 6373 5-29~~

Tern Recoveries (not on master list) 6374 6373 keyed 5/29

EAST- RECOVERED TAGS pg. 3

Table 1.--Adult green turtles newly tagged at _____ _____
(dates)

Tag No.	Date	Location (initials)	~~Status~~	Carapace length (cm) Straight	Curved
Female					
6104R (2nds) 6081R 6088L (2nds)	6/2/88	HH	Entry #68		
3158R 6163L (2nds)	6/3/88	HH	Entry #170		
2805R, 2806L	6-05-88	GN	Entry #83		
5096R, 6926R (3-4) 6927L (4-5), 5182L	6-05-88	GN	Entry #157		
3587L, 3597R	6-05-88	GN	Entry #184		
9258R (10082L)	6-06-88	GN	Ø		
9325R, 9326L	6-06-88	GN	Ø		
8240R, 9296L	6-07-88	GN	Ø		
3594R, 6206R (2nds) 6141L (2nds)	6-07-88	GN	Entry #87		
6115R, 2251L, --16L (2nds)	6-07-88	GN	Entry #160		
~~Female~~					
6107R, 6113L	6-09-88	GN	Ø		
~~3202~~					
3201L, 3202R	6-09-88	GN	Entry #178		

Passed to Geo. 6/9

~~Basking, nesting, foraging, etc.~~

East RECOVERED TAGS [redacted]

Table 1.--Adult green turtles ~~newly tagged~~ RECOVERED at _____ _____ (dates)

Tag No.	Date	~~Location~~	PAINT # ~~Status~~[1]	~~Carapace length (cm)~~ Straight INITIALS	Curved ENTRY #
~~Male~~ 4265 L + ??	6-9		96	VG	NONE
9290 L, 9272 R	6-9		87	↓	NONE
3550 L, no R	6-10		91		NONE
3351 L + ??	6-10		92		NONE
add 6121 R (2" S)	6-10	(2257, 3584) to	51	VG	
add 3846 L (2" S)	6-10	(2209, 5319 Q.MS)) to	10	VG -> ?!	
add 5204 L (2" S) to	6-10	(5204 L 2nd S)	43	VG	
		lost 10051 R, lost 10057 L	43	VG	
lost 10045 L	6-10	remaining = 10044 R	8	VG	
~~to 1 not 5317 R 2nd scale not~~		5319 for	10	VG	
9315 R, 9316 L	6-10		93	VG	
add 10094 R to 10055 L, 10056 R (2-3)	6-10		45	VG	
add 10095 R (3-4) to 3590 R, 8263 L (2-3)	6-10		47	VG ← other tag, 6244 lost	
removed 10053 L (2-3) not closed,					
☆ 4270 R, 42__ L	6-10		42	VG	
Female					
9389 L, 9390 R	6-10	46-12	95	VG	
added 10100 R to 3351 L			92	VG + LF	
6142 L; 6047 L (2-3), 6046 R	6-11		99	LF	
2748 R, __ L (embedded)	6-12		100	LF	
add L (2-3) ___ (algae) to (8180 L, 8181 R)	6-12		48	VG + LF	
~~6344 + 6345 R~~	6-12		102	LF	
add 10102 R to (4270 R, 42__ L)	6-12		42	VG + LF	
8176 L, 8177 R	6-12		103	VG + LF	

Change to 3375 R (from 3372), + add 3374 L, 6-12 PN 15 VG + LF

[1] Basking, nesting, foraging, etc.

~~Change to~~ 6354 & 6355 (~~from 6344 & 6348~~) 6-12 PN 102 VG + LF

EAST RECOVERIES

Table 1.--Adult green turtles ~~newly tagged~~ RECOVERED at EAST 1988 (dates)

Tag No:	Date	~~Location~~	PAINT # ~~Status~~[1]	~~Carapace length~~ (cm) ~~Straight~~ ~~Curved~~ INITIALS ENTRY #
~~FE~~ Male 3624 R, 3610 L	6-13		107	VG + LF
10063 L, no R	6-12		104	VG + LF
add 10104 R ~~to~~ (3550 L)	6-12		91	VG + LF
10066 R (3-4), 7343 L, 82-- R algae	6-12		106	VG + LF
3384 R, ____ L algae	6-13		110	VG + LF
5472 R	6-13		98	VG + LF
7350 R ← questionable "7"	6-13		111	LF
10039 R (3-4), 6068 R, 6069 L, 6070 L (3-4)	6-13		112	VG + LF
add 10117 R ~~to~~ (10063 L)	6-14		104	VG + LF
7255 R, ____ L (algae)	6-14		113	VG + LF
add 3151 L ~~to~~ (3158 R) (6163 L 2^5)	6-14		65	VG + LF

Female

[1]Basking, nesting, foraging, etc.

NEW TAGS

Table 1.--Adult green turtles newly tagged at EAST

(dates)

Tag No.	Date	Location	Carapace length (cm) Straight	Curved
Female		EAST ISLAND		
10027R 10028L	5-15-88			
10030R	5-16-88			
10031R 10032L	5-16-88			
10033 R 10034 L	5-17-88			
10036 R 10037 L	5-19-88			
10035 L 3-4S	5-17-88			
10038 L	5-19-88			
10042R	5-20-88			
10040R + 10041 L	5/20/88			
10043L	5/21/88			
10044R, 10045L	5/21/88			
~~10048~~ R 2-3	5/26/88	unsuccessful		
10049L 2-3 10050R 2-3	5/26/88			
10051 R	5/27/88			
10053 L(2-3)	5/27/88			
10055 L 10056 R(2-3)	5/28/88			
10057 L	5/28/88			
10059 L	5/28/88			
10061 L(2-3)	5/29/88			
10062 L	5/30/88			
10063 L	5/30/88			

Tag No. ~~Status~~	Date	
10064 R(2-3)	5/30/88	
HT 10066 R(2-3)	31 MAY 88	
HT 10067 L(2-3)	31 MAY 88	
HT 10068R 10069L	31-MAY-88	
HT 10070R 10071 L(2-3)	3-JUNE-88	
HT 10072L 10073R	3-JUNE-88	
10075R, 10076L	6-04-88	gn
10078R, 10079L	6-05-88	gn
10080R, 10081 L	6-05-88	gn
10083R, 10084L	6-07-88	gn
10085R, 10086L	6-07-88	gn
10087R, 10088L	6-07-88	gn
10089R, 10090L	6-09-88	gn

~~Basking, nesting, foraging, etc.~~

timed clutches:
6-8 - 19 minutes
6-9 - 22 min
6-9 - 28 min
6-10 - 40 min

RECOVERED

~~TAGGED~~

Table 1.--Adult green turtles ~~newly tagged~~ RECOVERED at WHALESKATE 1988
(dates)

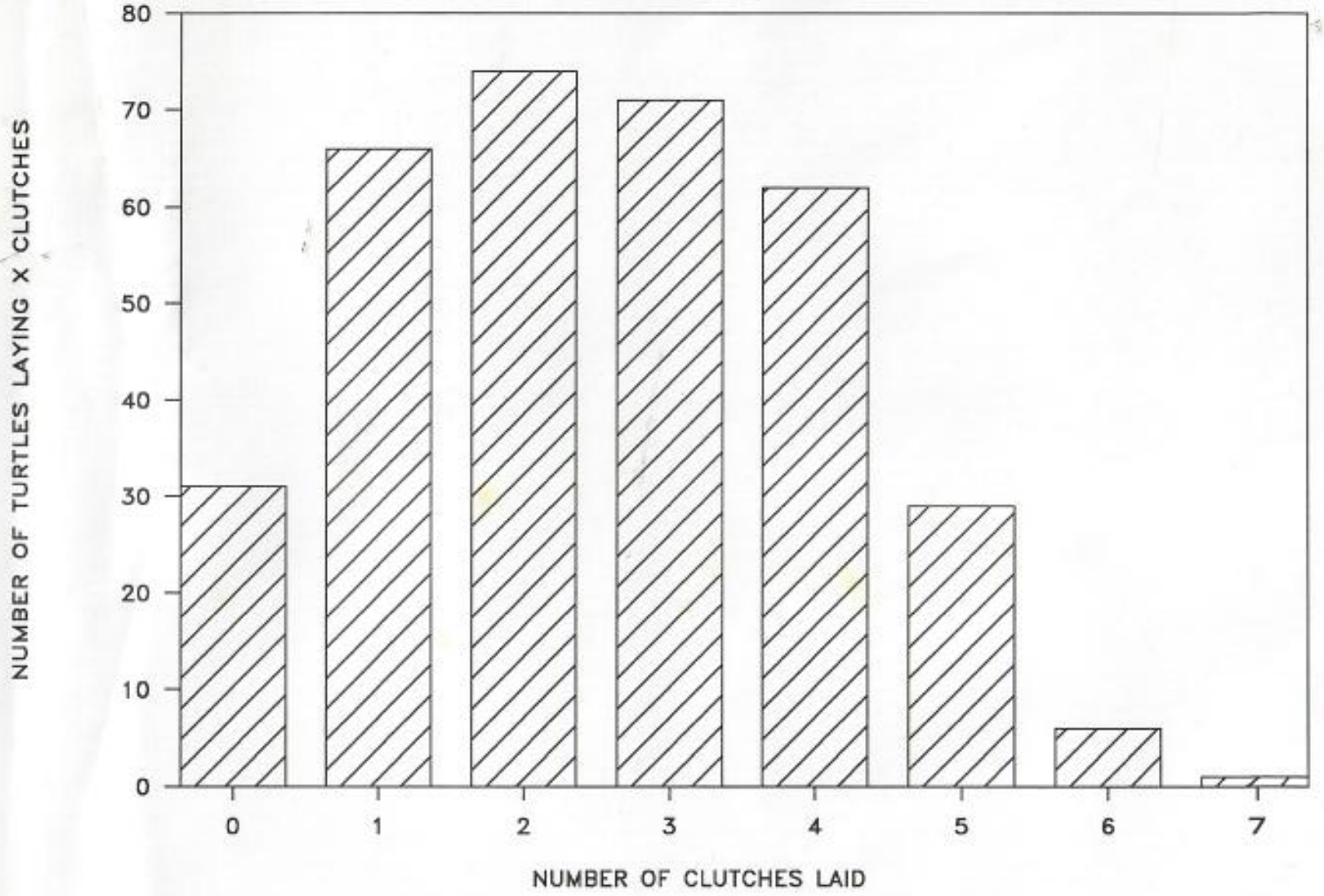
Tag No.	Date	Location (initials)	Status[1]	Carapace length (cm) Straight	Curved
FEMale					
5473L	6-8	HJ			
7956R (new: 10346L)	6-8	HJ			
6264L					
6270R	6-11	HJ			
10318R(10301L)	6-11	SM, PD			
3190R, (10306L(3-4)	6-12	SM, PD			
3400R; 3401L	6-12	SM, PD			
7977L	6-13	SM PD			

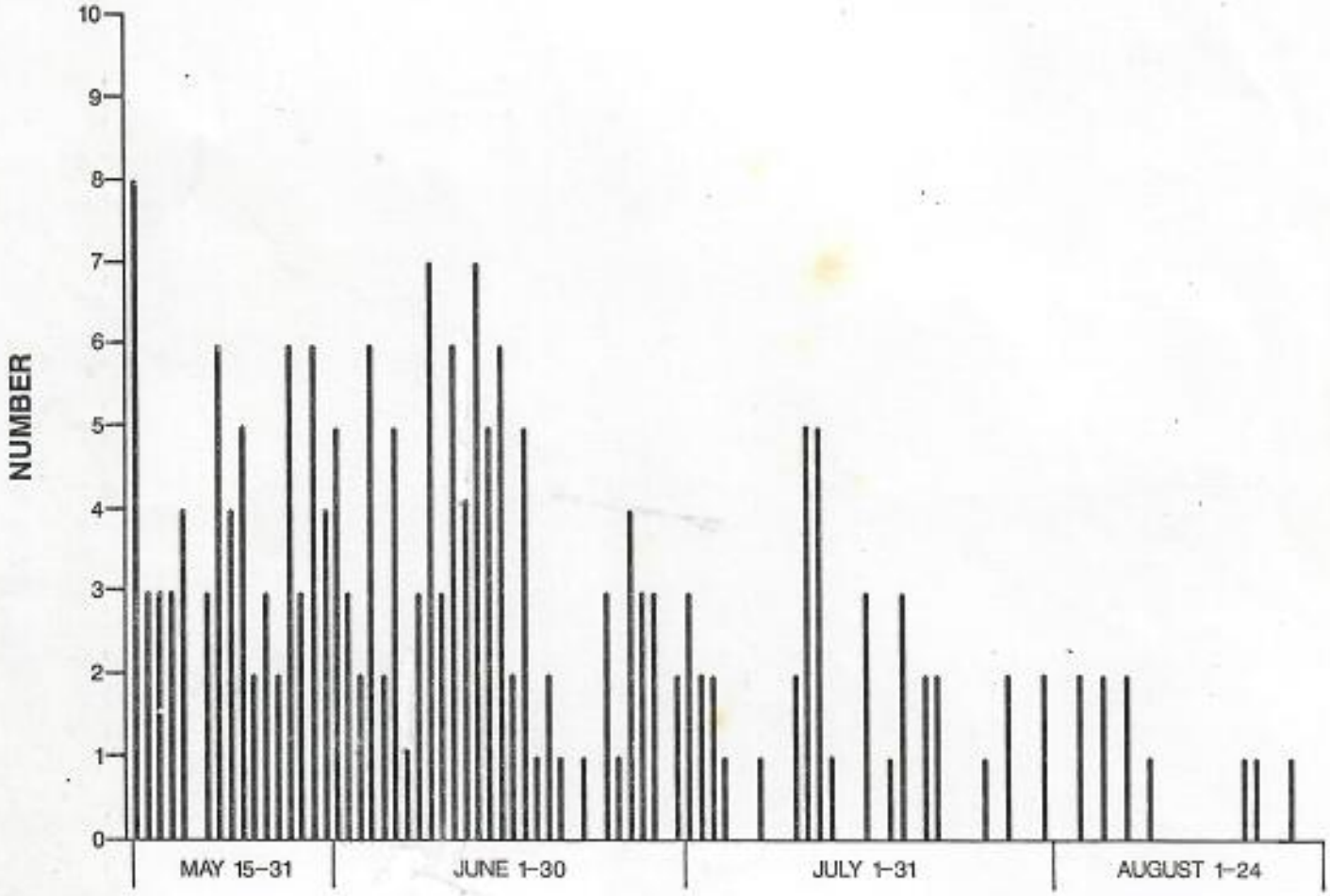
Female

[1]Basking, nesting, foraging, etc.

CLUTCH DISTRIBUTION FOR FRENCH

FRIGATE SHOALS, 1988.





Number of new nesting turtles sighted nightly on East Island over a 101 day period from 15 May to 24 August 1988.

Brief summary of adult female green turtles handled at French Frigate Shoals during the 1988 nesting season (13 May–29 August 1988)

Island	No. newly tagged	Long-term tag resightings				Total tagging encounters[a]
		Total	(First time	+	Previous resightings)	
East	94	72	(30	+	33)	166
Whale-Skate	100	20	(15	+	5)	120
Tern	18	6	(1	+	5)	24
Total	212	98				310

[a]In addition, 22 turtles on East, 12 turtles on Whale-Skate, and 2 turtles on Tern were encountered and censused by paint-mark only, and did not receive a permanent flipper tag. Eight turtles on East, 8 on Whale-Skate, and 7 on Tern were subsequently recorded on other islands.

1987 Tagging data for green turtles at East Island, French Frigate Shoals.

Compiled by George H. Balazs

New tag	Old tag	1987 Date first sighted	Curved carapace length, cm	Resighting catalog No.	Comments
FEMALES					
9951	--	5/25	--	--	--
--	3432, 3433	5/25	--	344	Nest relocated
--	3362, 3363	5/26	--	345	--
--	2212	5/26	99	92	--
--	3181, 5339	5/26	--	45	Nest relocated; DNA8
9953	--	5/26	--	--	--
--	5184	5/26	--	144	--
--	6580, 6581	5/26	--	363	--
9952	--	6/1	--	--	--
--	3600, 3601, 6256	5/27	100	194	--
--	6243, 6244	5/27	--	358	Tumor
9954, 9994	--	5/27	102	--	Tumor; DNA10
10004	+1	5/28	--	--	--
--	5244 + 1	5/29	--	119	DNA7
--	8190	5/29	99	346	--
--	3541, 3542	5/29	--	347	--
9955, 9956	--	6/8	--	--	--
9966, 9967	--	6/1	--	--	--
--	3147, 6211	6/1	--	171	--
--	7963, 8212	6/3	--	348	--

New tag	Old tag	1987 Date first sighted	Curved carapace length, cm	Resighting catalog No.	Comments
9957	--	6/3	--	--	--
--	6057, 6103	6/3	--	358	Also basking at Gin
9958	--	6/3	--	--	--
9959	--	6/3	99	--	Also basking at L. Gin
9960	--	6/3	101	--	--
9961	--	6/3	93	--	--
--	8108	6/4	--	349	--
--	5306	6/4		277	--
9962	--	6/4	93	--	--
--	8179, 8217	6/4	88	350	--
--	3411, 3422	6/4	99	351	--
9963	--	6/4	95	--	Inland at 1 pm
9964	--	6/4	94	--	--
--	3538	6/5	97	352	Also basking at W-S
9968	--	6/5	98	--	--
9970	--	6/6	98	--	--
--	3229, 3437	6/6	--	248	--
9971	--	6/6	104	--	--
--	5999, 6131	6/7	--	256	--
9972	--	6/7	95	--	--
9974	--	6/11	92	--	DNA2

New tag	Old tag	1987 Date first sighted	Curved carapace length, cm	Resighting catalog No.	Comments
--	2767, 2768, 5341	6/11	--	123	--
--	6260	6/11	--	199	DNA12
--	3213, 5420	6/11	101	140	
9975	--	6/11	91	--	--
9979	--	6/11	--	--	--
9976	--	6/11	--	--	--
--	5221	6/11	97	356	--
--	3217	6/11	101	221	--
--	3711, 5209, 5210	6/11	96	229	--
--	2244, 5299	6/11	--	115	DNA1
9977	--	6/12	101	--	--
9978	--	6/12	101	--	DNA4
10005	--	6/12	97	--	Tumor
--	2232	6/12	103	67	--
9980	--	6/12	99	--	--
9981	--	6/13	92	--	--
9982	--	6/13	--	--	--
--	3182, 3723, 5281	6/13	--	104	Chun's Reef
9983	--	6/13	91	--	--
--	6183, 6192	6/13	98	257	--
9984, 10024	--	6/13	104	--	--
9985	--	6/13	96	--	--
9986	--	6/14	95	--	--

New tag	Old tag	1987 Date first sighted	Curved carapace length, cm	Resighting catalog No.	Comments
9987	--	6/14	103	--	--
--	3836	6/14	103	235	Tumor; DNA6
9988	--	6/15	87	--	DNA9
9989	--	6/15	99	--	--
9990	--	6/15	99	--	--
--	8163, 8171	6/16	--	353	--
9991	--	6/16	96	--	--
9992	--	6/16	95	--	Tumor
9993	--	6/16	93	--	--
--	7560, 7562	6/16	--	343	Johnston Island
--	6205	6/16	--	359	--
--	3137, 3138, 6138	6/16	--	168	--
9995	--	6/17	101	--	--
9996	--	6/17	100	--	DNA11
--	2652, 3772, 6161	6/17	--	81	--
--	6048, 6261	6/17	--	314	--
--	3733	6/18	--	260	--
9997	+1	6/18	95	--	--
9999, 10000	--	6/18	95	--	--
9998	--	6/18	97	--	--
10001, 10018	--	6/19	98	--	--
10002	--	6/19	90	--	--
10003	--	6/20	96	--	Gin

New tag	Old tag	1987 Date first sighted	Curved carapace length, cm	Resighting catalog No.	Comments
--	6273	6/20	--	310	--
10006	--	6/21	97	--	--
10007	+1	6/21	91	--	--
--	5368, 3178	6/21	--	143	--
10022	?870	6/21	--	--	--
10008	--	6/26	95	--	--
--	6158	6/26	--	360	
10009	--	6/26	92	--	--
10013	--	6/26	103	--	--
--	3714	6/26	--	357	Tumor
10012	--	6/26	95	--	--
10011	--	6/26	107	--	--
--	3175, 3176	6/26	--	222	--
10010	--	6/26	92	--	--
10014	--	6/26	102	--	--
10015	--	6/27	95	--	--
10016	--	6/27	101	--	--
10019	--	6/28	92	--	--
--	7178, 7179	6/27	--	362	--
--	2794, 3803 5063, 5137	6/27	--	130	--
--	6082, 6083	6/28	--	361	--
10020	--	6/28	--	--	--
--	8119	6/28	--	354	Also on Tern

New tag	Old tag	1987 Date first sighted	Curved carapace length, cm	Resighting catalog No.	Comments
10023	--	6/28	90	--	--
--	4257, 4258	7/15	--	355	--
--	9372	7/14	--	364	--
10025	--	7/14	--	--	--
--	6172	7/14	--	100	--
MALES					
--	6077, 4273	5/26	--	108	--
--	4275	5/26	--	114	--

1986 Green turtle tagging summary for French Frigate Shoals (19 May-24 June).

	No. newly tagged	No. of tag recoveries	Total No. of tagging encounters
Adult females	47	28	75
Adult males	23	16	39
Total	70	44 (38.6%)	114

1986 Green Turtle Tagging Summary for French Frigate Shoals (29 May–14 June).

Island	Nesting		Basking		Total
	Newly tagged	Tag recoveries	Newly tagged	Tag recoveries	
East					
Female	23	23	3	2	51
Male	--	--	4	9	13
Whale-Skate					
Female	0	0	15	3	18
Male	--	--	13	2	15
Trig					
Female	0	0	1	0	1
Male	--	--	1	3	4
Tern					
Female	4	0	1	0	5
Male	--	--	5	2	7
Total	27	23 (46%)	43	21 (33%)	114

Number of adult female green turtles recorded nesting during June 1986 at East Island, French Frigate Shoals (for 15 nights with complete coverage).

Date June 1986	Total No. ashore to nest	No. of new females first seen ashore to nest in 1986	Short term repeat nesters seen ashore	Long-term tag recoveries
1	4	4	0	3
2	6	6	0	1
3	7	3	4	3
4	5	4	1	2
--	--	--	--	--
9	6	6	0	2
10	6	3	3	2
11	4	0	4	0
12	4	2	2	2
--	--	--	--	--
15	4	2	2	2
16	3	1	2	0
17	8	3	5	1
18	8	1	7	1
--	--	--	--	--
21	5	5	0	2
22	5	3	2	1
23	9	3	6	1
Total	--	46	--	23 (50%)

Numbers of adult female green turtles recorded nesting during June 1986 at Tern Island, French Frigate Shoals (for 16 nights of coverage).

Date June 1986	Total No. ashore to nest	No. of new females first seen ashore to nest in 1986	Repeat nesters seen ashore	Long-term tag recoveries
5	2	2	0	0
6	1	1	0	0
7	1	--	--	--
8	1	1	0	--
9	--	--	--	--
10	--	--	--	--
11	1	1	0	0
12	1	0	--	--
13	1	0	--	--
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	--	--	--	--
18	1	0	1	--
19	1	0	1	--
20	2	1	1	0
21	1	0	1	0
22	0	0	0	0
23	0	0	0	0
Total	--	6	--	0

Summary of green turtles with tumors tagged or tag recovered at French Frigate Shoals during June 1986

Tag numbers - East Island - nesting females

9680, 9681
*3595, 6094
*7172, 7173
9718, 9719
7761, 9762
5 (11%) of 46 handled

Tag numbers - East Island - basking females

*5236, 5175
*7194
2 (40%) of 5 handled

Tag numbers - East Island - basking males

*3737
9677
9679
3 (23%) of 13 handled

Tag numbers - Whale-Skate Island - basking females

9660, 9691
9703
9756, 9757
9731
4 (22%) of 18 handled

Tag numbers - Whale-Skate Island - basking males

9760
1 (7%) of 15 handled

Tag numbers - Tern Island - basking males

*5456, 9699
9698, 9720
2 (29%) of 7 handled

Overall: 17 (15%) of 114 handled

*Long-term tag recovery.

Number of adult female green turtles recorded nesting during June 1986 at East Island, French Frigate Shoals (for 15 nights with complete coverage).

Date June 1986	Total No. ashore to nest	No. of new females first seen ashore to nest in 1986	Short term repeat nesters seen ashore	Long-term tag recoveries
1	4	4	0	3
2	6	6	0	1
3	7	3	4	3
4	5	4	1	2
--	--	--	--	--
9	6	6	0	2
10	6	3	3	2
11	4	0	4	0
12	4	2	2	2
--	--	--	--	--
15	4	2	2	2
16	3	1	2	0
17	8	3	5	1
18	8	1	7	1
--	--	--	--	--
21	5	5	0	2
22	5	3	2	1
23	9	3	6	1
Total	--	46	--	23 (50%)

Milestone III-4-23-021

Complete Annual Assessment of East Island Green Turtle Nesting Population

Reported by: Richard S. Shomura, Milestone Leader

Report date: 23 December 1986

Results:

The nesting population of green sea turtles at East Island, French Frigate Shoals was observed for 29 nights during June and July, 1986. As in past years, comprehensive records were kept on the history of each nester, both neophytes and remigrants. All neophyte nesters were tagged and remigrants were retagged if necessary.

During the survey period, observers encountered 105 individual turtles hauling out to nest. Using a model of nesting behavior derived from detailed observations in 1974 and 1975, the probability of encountering a member of the 1986 nesting population (neophytes and remigrants) during the specified survey period was estimated to be 0.57.

By dividing the sample count of nesters by the encounter rate, the total 1986 nesting population was estimated to be 184 females. This is less than the estimates of 252 nesters in 1985 and 248 nesters in 1984. However, this decrease in the East Island nesting population in 1986 is consistent with the pattern of the previous 13 years, which indicates short-term cyclic variation superimposed on a long-term increasing trend.

Dissemination:

The results will be reported to the Sea Turtle Recovery Team and incorporated into the population assessment section of the Green Turtle Recovery Plan under development by the team. They will also be made available to other interested parties through normal channels.

29 Feb 88

George -

The 1987 estimated nesting population at East Island is 217.

Jerry.

30 March 1988

To: George Balazs, Bill Gilmartin
From: Dr. Jerry Wetherall, Population Dynamics Specialist - Hawaiian Sea Turtle Recovery Team
Subject: Survey of green turtle nesting at French Frigate Shoals, 1988

Based on my limited knowledge of the situation, I offer the following thoughts on sampling during the 1988 field season.

Primary Objectives:

(1) Improve estimates of factors critical to estimation of the total nesting population. These are (a) the arrival time distribution, (b) the distribution of number of nests per female, (c) the distribution of the duration of each nesting episode, and (d) the distribution of the interval between successive nesting episodes. These must vary somewhat among islands, and ideally we would have island-specific models. However, virtually all our available information comes from East Island, and we will have to apply East Island parameter estimates to the other islands until more comprehensive surveys are done. Improving the East Island parameters is therefore critical.

Because (c) and (d) are short term events, we have more observations on these factors, and can get useful info on them during relatively short survey periods (say 3-4 weeks of complete nightly coverage during peak of season). But estimation of (a) and (b), which are least well known, requires season-long saturation coverage for really solid results. Presently, we have to do a fair amount of guesswork on these factors.

(2) Validate assumptions and improve estimates regarding proportions of the total nesting population utilizing the various islands, i.e., extend the basic nesting survey procedure to as many islands as possible.

(3) Estimate degree of inter-island movement, nesting beach fidelity, etc., both intra-seasonal and inter-seasonal.

Strategy:

(1) Since our historical record at East Island is crucial to the nesting population assessment, trend monitoring, etc., we should try to bolster the information currently available there, particularly regarding factors (a) and (b). This means uninterrupted nightly coverage for as long a period as possible on East Island, particularly during the period of greatest nesting activity, but preferably for the entire season.

(2) In extending the survey to the other islands and estimating inter-island movements the same considerations would apply, i.e., complete coverage would be ideal. However, if resources are limited, then it would probably be better to have all islands occupied concurrently during the peak of the season (for at least a month), rather than rotate folks around and cover the other islands sequentially. Concurrent surveys during the

peak nesting period would provide the highest coverage rates and estimates with greatest reliability. However, if the feasible observation period is short, then information on longer-term intra-seasonal movements between islands would be sacrificed.

Preferred option (X)

(3) Maybe the best use of resources would be to assure season-long, saturation coverage of East Island nesting activity. Then at least the basic parameters will be improved. In future seasons, the other objectives can be tackled.

(4) What we need is more volunteers. We should drum up support for a single-season campaign of saturation coverage at all islands. Gotta make green turtles sexier. Can we feature them in a Bud Lite commercial?

=217

Number of adult female green turtles recorded nesting during May/June 1987 at East Island, French Frigate Shoals (for 26 nights with complete coverage).

Date 1987	Total No. ashore to nest	No. of new females first seen ashore to nest in 1987	Short-term repeat nesters seen ashore	Long-term tag recoveries
May				
25	2	2	0	1
26	7	6	1	4
27	5	3	2	2
28	1	1	0	0
29	8	6	2	5
--	--	--	--	--
June				
1	4	4	0	1
2	0	0	0	0
3	8	7	1	2
4	9	7	2	4
5	5	3	2	1
6	8	3	5	1
7	3	2	1	1
--	--	--	--	--
11	15	13	2	7
12	10	6	4	1
13	17	8	9	3
14	8	4	4	2
15	8	3	5	0
16	15	8	7	4
17	15	5	10	2
18	9	5	4	3
19	8	3	5	0
20	14	3	11	2
21	14	3	11	1
--	--	--	--	--
26	15	10	5	3
27	11	4	7	2
28	17	5	12	2
Total	--	124	--	54 (43.5%)

NOAA, National Marine Fisheries Service
SWFC Honolulu Laboratory F/SWC2
2570 Dole Street
Honolulu, HI 96822-2396

GREEN SEA TURTLE HATCHLING SUCCESS STUDY
TERN ISLAND, FRENCH FRIGATE SHOALS
MAY-NOVEMBER, 1986

Objective:

To observe prey-predator relationships between green sea turtle hatchlings and ghost crabs.

Another objective, which evolved as a result of the primary objective, was to monitor the nesting behavior of female green sea turtles and egg hatching success on Tern Island.

Comments:

Originally, 4-6 hours per week were projected for field work involving the identification of nest sites and observations of nest hatches (about 60 days later). However, once the field work actually began, it was soon discovered that the identification of nest sites required 14 hours per week (at odd hours of the work day on a daily basis). Additionally, the work necessary to observe a hatch required 20 hours per week. During periods of egg laying and hatching, the work load became intense, with over 30 hours required per week. Thus, the study was very demanding, considering the odd hours worked and the amount of time required. However, the rewards were many, and much was learned about nesting behavior, and about the hatchling survival rates prior to entering the water. Aside from collecting data, over 260 hatchling lives were saved. Additionally, the lives of 4 trapped adult breeding females were saved. This was only accomplished by daily beach patrols.

Initial Procedure:

1) Determining the Nest Site (Egg Laying May 20- September 16)

Two beach patrols were conducted daily, one at 0630 and the other at 2300. The 2300 patrol allowed the observer to record turtles that arrived after dusk and were completing egg laying. This allowed for a determination of the exact location of the eggs, which is often difficult to establish during the 0630 patrol. Information was also noted on turtles just arriving. In both cases, turtles were spray painted with Lucite paint and tagged, if it did not interfere with nesting activities. If turtles already displayed tags, an effort was made to read the tags and document the numbers. Painted numbers on the shell allowed the observer to identify the turtle at a distance on future sitings, and during the second nesting (about two weeks later).

A final patrol was conducted at 0630 the next day, to document nesting that occurred after the night patrol. This morning patrol allowed the observer to determine the activities of turtles that were observed digging the night before, and in some cases even match a tagged or numbered turtle to its nest. Often, turtles were observed laying eggs or completing the last

phase of covering a nest. When a nest site was observed, a 3 foot steel post with a numbered tag was placed about 5 feet from the nest. The nest location was mapped on the Narum vegetation map, and the turtle number and detailed information on the nest were also documented.

Also, confrontations with seals were avoided by conducting the morning patrol at this early hour, since most of the seals are hauled out far above the beach berm, and usually are under vegetation. Turtle nests usually occur near the high side of the berm.

2) Monitoring Hatching (July 25- November 16)

A minimum of three beach patrols were conducted daily during this period, at 0600, 2030, and 2300. During the part of the season when egg laying and hatching were occurring simultaneously, data were collected on both events. Most of the hatching observations occurred during the dusk patrol (2030), and hatchings that took place later were discovered during the 2300 and the 0600 patrols. Any hatchlings discovered on the morning patrol were collected, and released that night at the same location they were collected.

Several days before the scheduled hatch, a wood enclosure (4 feet square and 10 inches high) was positioned around the nest site. During the day, seals commonly dislodged the enclosures by rubbing against them. These enclosures were repositioned during the dusk patrol to prevent hatchlings from emerging without human observation. When a hatch occurred, the hatchlings were temporarily restrained until a scheduled beach patrol was conducted. When hatchlings were discovered in an enclosure, they were released and monitored as they crawled toward the water. Attempting to locate a hatch without the enclosures would be almost impossible, because a hatch usually lasts only 10 minutes and can occur within a range of 23 days of the predicted hatch date.

While monitoring hatchling movement, numerous ghost crabs encounters took place, but the beam of the flashlight frightened the crabs, and they released the hatchlings unharmed. On other occasions when a light was necessary, it would disturb the crabs and hatchlings before natural observations could be made. The crabs are also very sensitive to just the presence of the observer, even without a flashlight.

This problem was partially solved by using an elevated observation platform. When a nest was due to hatch, a table was placed below the nest site, on the beach. Once the observer was positioned on the table and ghost crabs reemerged from their burrows, a second observer released the hatchlings. Several nests were monitored in this manner, until too many nests hatched simultaneously. Observations did indicate that hatchlings were being attacked and eaten by the crabs. The crabs picked up hatchlings, and carried them to a secluded beach area to eat them. On other occassions, a crab would drag the turtle into a burrow and eat it.

The best observations were made with natural light from the moon. One interesting observation indicated that hatchlings

accidentally fall into ghost crab burrows, and often never emerge. Upon inspection of several burrows, ghost crabs were observed inside, eating the hatchlings. Basically, if ghost crabs are present during a turtle hatch, turtles will be attacked. The number of attacks depends on the size of the ghost crab colony near the hatch site. These colonies change locations weekly. All observations of ghost crab attacks are summarized by nest site on the attached table. However, considering the disturbance caused by the presence of observers, these figures do not reflect an accurate total; the actual figure is probably higher.

In addition to monitoring ghost crab attacks, data were also collected on hatching success, by digging the nest up after the hatch. Many hatchlings were rescued that were trapped behind large pieces of coral or debris left behind from previous agencies. In some cases, a few hatchlings were rescued from entanglement with morning glory plants. All of this data, including other observations, is summarized on the table.

Recommendations

1) Experiment with state-of-the-art, light gathering night viewers (military-type). If they work, a table might not be necessary for viewing. If a table is used (regardless of the light system), it should be larger, to accomodate two observers.

2) After a hatch occurs, excavate the ghost crab burrows near the hatch site, and examine them for turtles and ghost crabs. Unfortunately, by the time this is completed most of the turtles could be severely wounded. Including the numbers of these hatchlings with the number of others that were carried off by ghost crabs would provide a good estimate of hatchlings killed.

DATA BASED ON 23 TURTLE NESTS AT TERN ISLAND IN 1986

Egg laying period	May 22- August 24
Hatching period	July 27- November 16
x incubation period	67.6 days
Range of incubation periods	60-83 days
x hatch time	1100
% with hatch pits	30%
x eggs/nest (dead & alive)	85
Range of eggs/nest (dead & alive)	63-119
x eggs hatched/nest	67
Range eggs hatched/nest	30-112
Total eggs (dead & alive)	1970
Total hatched eggs	1540
x infertile eggs/nest *	9.6
Range infertile eggs/nest *	0-48
Total infertile eggs *	221
x 1/2 - 3/4 developed/nest	2
Total 1/2 - 3/4 developed	53
x dead hatchlings/nest	0.2
Total dead hatchlings	4
x hatchlings dug up/nest	8
Total hatchlings dug up	184
x hatchlings saved/nest **	11
Total hatchlings saved **	262
% nests with ghost crabs present	39%
% nests with hatchlings kills in which ghost crabs were present	78%
Total # hatchlings killed by ghost crabs	15

* Not determined whether these eggs were infertile, or whether they died at an early developmental stage.

** Includes individuals caught in vegetation.

1 July 1987
R. Vetter

V.G.

Sorted by mstr. list

d#	FIRST_TAG	SEC_TAG	THIRD_TAG	FOURTH_TAG	MSTR_LIST	DATE	LOCATION
1	3550					10 JUN	EAST
2	9770	9771				01 JUN	TERN
3	8238	9343				12 JUN	EAST
4	9711					18 MAY	EAST
	8237	9255				14 JUN	EAST
	9349	9350				03 JUL	EAST
	8180	8181	8182			28 MAY	EAST
	9324	322 •				14 JUN	EAST
9	8176	8177				29 MAY	EAST
10	9277	9342				22 MAY	EAST
11	8151					14 JUN	EAST
12	9262	9263				19 JUN	EAST
13	7285	--08 • (possibly 9285)				31 MAY	EAST
14	8295					15 JUN	EAST
15	7184	7202				25 MAY	EAST
16	8250	9252				26 JUN	EAST
17	3777	5233				22 JUN	EAST
18	8240	9296				07 JUN	EAST
19	3791	5324	53-- •			24 MAY	EAST
20	3351					10 JUN	EAST
21	3374	3375				18 MAY	EAST
22	3379					24 MAY	EAST
23	977					26 MAY	EAST
24	6046	6047	6142			11 JUN	EAST
25	9389	9390				10 JUN	EAST
26	9325	9326				06 JUN	EAST
27	9315	9316				15 MAY	EAST
28	4264	4265				15 MAY	EAST
29	9258					06 JUN	EAST
30	4270	42-- •				10 JUN	EAST
31	8243					29 JUN	EAST
32	4280					28 MAY	EAST
33							
34	9272	9290				26 MAY	EAST
35	8239					26 JUN	EAST
36	6051	6089				18 JUN	EAST
37	6128	6143	6144			15 MAY	EAST
38	5183					14 JUN	EAST
39	6109					20 JUN	EAST
40	6107	6113				09 JUN	EAST
41	6068	6069	6070			13 JUN	EAST
42	3190	0	0	0	0	12 JUN	W-S
43	3828	3831	5429	0	0	01 JUN	W-S
44	3400	3401	0	0	0	12 JUN	W-S
45	3815	5207	0	0	0	28 MAY	W-S
46	5443	5444	5445	0	0	30 MAY	W-S
47	8141	0	0	0	0	09 JUL	W-S
48	7956	0	0	0	0	08 JUN	W-S
49	7977	0	0	0	0	13 JUN	W-S
50	9752	0	0	0	0	28 MAY	W-S
51	7998	0	0	0	0	02 JUN	W-S
52	6373	6374	0	0	0	27 MAY	W-S
53	8105	0	0	0	0	28 MAY	W-S
54	8101	8110	0	0	0	18 JUN	W-S
55	6264	6270	0	0	0	11 JUN	W-S
56	5473	0	0	0	0	08 JUN	W-S
57	6081	6088	6104		68	02 JUN	EAST
58	2209	2210	3846	5319	71	16 MAY	EAST
59	3590	8244			82	28 MAY	EAST
60	2805	(2806) (Chad)			83	05 JUN	EAST
61	2257	3584	6121		86	29 MAY	EAST
62	3594	6141	6206		87	07 JUN	EAST

64	2234	6123			91	19	JUN	EAST
65	5204				121	27	MAY	EAST
66	3017	0	0	0	136	06	JUN	W-S
67	5214	5230			138	23	MAY	EAST
68	3254	3255			142	25	MAY	EAST
69	5397	6179	0	0	154	28	MAY	W-S
70	5096	5182	6926	6927	157	05	JUN	EAST
71	2251	6115	6116		160	07	JUN	EAST
72	2743	6184			164	12	JUN	EAST
73	3151	3158	6163		170	14	JUN	EAST
74	3201	3202			178	09	JUN	EAST
75	3595	6094	6099	6100	183	18	JUN	EAST
76	3587	3597			184	05	JUN	EAST
77	5472				195	13	JUN	EAST
78	5394	5322			208	25	JUN	EAST
79	3581	3583			209	16	MAY	EAST
80	3610	3624			212	13	JUN	EAST
81	3239	3384			224	14	JUN	EAST
82	6055	6092	6093		243	25	MAY	EAST
83	3119	3120			270	28	JUN	TERN
84	6041	9355			280	15	JUN	TERN
85	2263	9334			289	23	MAY	EAST
86	3721	5285			301	14	JUN	EAST
87	5370	(+ 1 tag)			303	21	MAY	EAST
88	6354	6355			308	27	JUN	EAST
89	6008				311	14	JUN	EAST
90	3268				365	15	JUN	TERN

Sorted by date

#	FIRST_TAG	SEC_TAG	THIRD_TAG	FOURTH_TAG	MSTR_LIST	DATE	LOCATION
1							
2	9770	9771				01 JUN	TERN
3	3828	3831	5429	0	0	01 JUN	W-S
4	7998	0	0	0	0	02 JUN	W-S
5	6081	6088	6104		68	02 JUN	EAST
6	9349	9350				03 JUL	EAST
7	2805	2806 (lost)			83	05 JUN	EAST
8	5096	5182	6926	6927	157	05 JUN	EAST
9	3587	3597			184	05 JUN	EAST
10	3017	0	0	0	136	06 JUN	W-S
11	9325	9326				06 JUN	EAST
12	9258					06 JUN	EAST
13	3594	6141	6206		87	07 JUN	EAST
14	2251	6115	6116		160	07 JUN	EAST
15	8240	9296				07 JUN	EAST
16	7956	0	0	0	0	08 JUN	W-S
17	5473	0	0	0	0	08 JUN	W-S
18	8141	0	0	0	0	09 JUL	W-S
19	6107	6113				09 JUN	EAST
20	3201	3202			178	09 JUN	EAST
21	3550					10 JUN	EAST
22	3351					10 JUN	EAST
23	4270	42--●				10 JUN	EAST
24	9389	9390				10 JUN	EAST
25	6046	6047	6142			11 JUN	EAST
26	6264	6270	0	0	0	11 JUN	W-S
27	3400	3401	0	0	0	12 JUN	W-S
28	8238	9343				12 JUN	EAST
29	2743	6184			164	12 JUN	EAST
30	3190	0	0	0	0	12 JUN	W-S
31	3610	3624			212	13 JUN	EAST
32	6068	6069	6070			13 JUN	EAST
33	5472				195	13 JUN	EAST
34	7977	0	0	0	0	13 JUN	W-S
35	8151					14 JUN	EAST
36	3721	5285			301	14 JUN	EAST
37	9324	-322●				14 JUN	EAST
38	3239	3384			224	14 JUN	EAST
39	6008				311	14 JUN	EAST
40	5183					14 JUN	EAST
41	3151	3158	6163		170	14 JUN	EAST
42	8237	9255				14 JUN	EAST
43	6041	9355			280	15 JUN	TERN
44	8295					15 JUN	EAST
45	3268				365	15 JUN	TERN
46	9315	9316				15 MAY	EAST
47	6128	6143	6144			15 MAY	EAST
48	4264	4265				15 MAY	EAST
49	3581	3583			209	16 MAY	EAST
50	2209	2210	3846	5319	71	16 MAY	EAST
51	3595	6094	6099	6100	183	18 JUN	EAST
52	8101	8110	0	0	0	18 JUN	W-S
53	6051	6089				18 JUN	EAST
54	3374	3375				18 MAY	EAST
55	9711					18 MAY	EAST
56	2234	6123			91	19 JUN	EAST
57	9262	9263				19 JUN	EAST
58	6109					20 JUN	EAST
59	5370	(+ 1 to 3)			303	21 MAY	EAST
60	3777	5233				22 JUN	EAST
61	9277	9342				22 MAY	EAST
62	2246	3634	3645		90	22 MAY	EAST

53	2263	9334			289	23	MAY	EAST
54	5214	5230			138	23	MAY	EAST
55	3791	5324	53-- •			24	MAY	EAST
56	3379					24	MAY	EAST
57	5394	5322			208	25	JUN	EAST
58	7184	7202				25	MAY	EAST
59	3254	3255			142	25	MAY	EAST
70	6055	6092	6093		243	25	MAY	EAST
71	8239					26	JUN	EAST
72	8250	9252				26	JUN	EAST
73	9272	9290				26	MAY	EAST
74	977					26	MAY	EAST
75	6354	6355			308	27	JUN	EAST
76	5204				121	27	MAY	EAST
77	6373	6374	0	0	0	27	MAY	W-S
78	3119	3120			270	28	JUN	TERN
79	8180	8181	8182			28	MAY	EAST
80	4280					28	MAY	EAST
81	3815	5207	0	0	0	28	MAY	W-S
82	9752	0	0	0	0	28	MAY	W-S
83	8105	0	0	0	0	28	MAY	W-S
84	3590	8244			82	28	MAY	EAST
85	5397	6179	0	0	154	28	MAY	W-S
86	8243					29	JUN	EAST
87	8176	8177				29	MAY	EAST
88	2257	3584	6121		86	29	MAY	EAST
89	5443	5444	5445	0	0	30	MAY	W-S
90	7285	--08 •				31	MAY	EAST

(possibly 9285)

*Note: The computer sorted by date not date & month. But I hope you can make some use of this anyway!

26 JUN 88

Howzit George?!!!!!!!!!!!!

Greetings from all the turtle people here at FFS! Thanks for the last shipment of supplies, etc. At this time, we have no additional needs, except for the usual standing order of fresh food, etc. I passed the latest food list to FWS, so someone at NMFS should have this list. We understand that some of this stuff will have to come up on the FERESA, space permitting.

Enclosed you will find the latest update on the nightly summaries for Tern, East, and Whale-Skate. This should be self explanatory. Also, you will find three lists of recovered tags, sorted by first tag, master list, and date. I sorted by these three methods because I figured you might have reason to look at the data in different ways. The list where the tags are sorted by first tag allows you to check for resighted tags this year. The list where the tags are sorted by master list number allows you to update data on individual turtles. Finally, the list where the tags are sorted by date gives you the latest update on recovered tags since we last spoke to you.

Notice that these lists are recovered tags for the entire 1988 field season. I did this for two reasons: (1) The paperwork is getting so confusing that inevitably there were tags we forgot to pass to you over the radio previously and (2) we badly needed to update and get some order to our data. Also, further updates will be much easier now that we have this data on computer.

In response to your previous inquiry regarding tags numbered 10454 through 10500, those tags are currently on Whale-Skate. So, they did make it up on the FERESA ok.

Sheila will have a bag of misapplied and removed tags for you when you see her.

Thanks a lot for taking care of personal messages, etc. for all of us!!!

If you have any questions call me on the radio. Good luck and have fun in Japan! (Pul)

The turtle people

P.S. That book you left here, "Time of the Turtle", by Jack Rudloe, is an excellent and inspiring book. Thanks! ~~see of ... date.~~

(Crazy computer!)

1988

NO.	PLACE	POSITION Lat.	POSITION Long.	DIFFERENCES Time High water	DIFFERENCES Time Low water	DIFFERENCES Height High water	DIFFERENCES Height Low water	RANGES Mean	RANGES Diurnal	Mean Tide Level
		° ′ N	° ′ W	h. m.	h. m.	ft	ft	ft	ft	ft
	Arctic Ocean <15>-Continued Time meridian, 135°W				on KODIAK, p.136					
2349	Point Barrow	71 22	156 22	-0 33	-0 23	*0.05	*0.05	0.3	0.4	0.2
2351	Flaxman Island	70 11	145 50	-0 53	-0 25	*0.08	*0.08	0.5	0.7	0.3
2353	Herschel Island, Mackenzie Bay	69 34	138 55	-1 32	-1 39	- -	- -	0.6	0.7	1.5
2355	Tuktoyaktuk, Mackenzie Bay	69 27	133 00	-1 26	-0 51	- -	- -	1.1	1.2	1.3
	HAWAIIAN ISLANDS Time meridian, 165°W				on HONOLULU, p.160					
2357	Midway Islands	28 13	177 22	+0 12	+0 09	*0.67	*0.67	0.8	1.2	0.6
2359	Lisianski Island	26 04	173 58	- - -	- - -	- -	- -	0.5	0.8	0.3
	Time meridian, 150°W									
2361	Laysan Island	25 46	171 45	+1 02	+1 12	*0.53	*0.50	0.7	1.0	0.4
2363	East Island, French Frigate Shoals	23 47	166 13	+0 03	+0 08	*0.73	*0.73	0.9	1.4	0.6
2365	Nihoa, Nihau Island	21 52	160 14	-0 16	-0 11	*0.77	*0.77	1.0	1.6	0.7
	Kauai Island									
2367	Waimea Bay	21 57	159 40	-0 20	-0 07	*0.77	*0.77	1.0	1.6	0.7
2369	Port Allen, Hanapepe Bay	21 54	159 35	-0 36	-0 22	*0.85	*0.85	1.1	1.7	0.7
2371	Nawiliwili Bay	21 58	159 21	-0 27	-0 25	-0.1	0.0	1.2	1.9	0.8
2373	Hanamaulu Bay	22 00	159 20	-0 17	-0 21	-0.1	0.0	1.2	1.8	0.8
2375	Hanalei Bay	22 13	159 30	-1 28	-1 47	0.0	0.0	1.3	1.8	0.8
	Oahu Island									
2377	Haletwa, Waialua Bay †	21 35	158 07	-1 02	-2 05	*0.80	*0.80	- -	1.6	0.7
2379	Waianae	21 27	158 12	+0 20	+0 18	-0.1	0.0	1.2	1.8	0.8
2381	HONOLULU	21 18	157 52		Daily predictions			1.3	2.0	0.8
2383	Honauna Bay	21 17	157 42	-0 59	-0 45	0.0	0.0	1.3	1.9	0.8
2385	Waimanalo	21 20	157 42	-1 15	-1 09	*0.85	*0.85	1.1	1.8	0.8
2387	Moku o Loe	21 26	157 48	-1 24	-1 14	+0.1	+0.2	1.2	2.0	1.0
2389	Waikane, Kaneohe Bay	21 30	157 51	-1 46	-1 18	+0.3	+0.2	1.4	2.2	1.1
2391	Laie Bay	21 39	157 56	-1 45	-1 46	+0.1	+0.1	1.3	2.2	0.9
	Molokai Island									
2393	Kolo	21 06	157 12	+0 05	+0 01	0.0	0.0	1.3	2.0	0.8
2395	Kaunakakai	21 05	157 02	-0 05	-0 08	+0.1	0.0	1.4	2.1	0.9
2397	Kemalo Harbor	21 03	156 53	-0 37	-0 16	+0.1	0.0	1.4	2.1	0.9
2399	Pukoo Harbor	21 04	156 48	-1 03	-0 48	+0.1	0.0	1.4	2.1	0.9
2401	Kaumalapau, Lanai Island	20 47	157 00	+0 02	+0 03	+0.2	0.0	1.5	2.2	0.9
	Maui Island									
2403	Kahului	20 54	156 28	-1 53	-1 41	+0.4	+0.2	1.5	2.3	1.1
2405	Hana	20 46	155 59	-1 13	-1 23	+0.5	0.0	1.8	2.5	1.1
2407	Makena	20 39	156 27	-0 32	-0 32	-0.1	0.0	1.2	1.8	0.8
2409	Kihei, Maalaea Bay	20 47	156 28	-0 01	-0 22	+0.3	0.0	1.6	2.3	1.0
2411	Lahaina	20 53	156 41	-0 35	-0 40	+0.2	+0.1	1.4	2.2	1.0
	Kahoolawe Island									
2413	Kuheia Bay	20 36	156 36	-0 09	-0 09	+0.2	0.0	1.5	2.1	0.9
2415	Smuggler Cove	20 31	156 41	-0 15	+0 03	+0.2	0.0	1.5	2.2	0.9
	Hawaii Island									
2417	Mahukona	20 11	155 54	-0 26	-0 17	+0.1	0.0	1.4	2.1	0.9
2419	Kawaihae	20 02	155 50	-0 04	-0 03	0.0	0.0	1.3	2.0	0.8
2421	Kailua Kona	19 39	156 00	-0 26	-0 22	+0.1	0.0	1.4	2.1	0.9
2423	Napoopoo, Kealakekua Bay	19 28	155 55	-0 16	-0 12	+0.1	0.0	1.4	2.1	0.9
2425	Honuapo	19 05	155 33	-0 26	-0 16	+0.5	+0.1	1.7	2.5	1.1
2427	Hilo	19 44	155 04	-1 04	-0 59	+0.5	+0.1	1.7	2.4	1.1
2429	Johnston Island	16 45	169 31	+1 26	+1 16	+0.5	0.0	1.9	2.2	1.1

Endnotes can be found at the end of table 2.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P. O. BOX 50167
HONOLULU, HAWAII 96850

William G. Gilmartin
National Marine Fisheries Service
2570 Dole Street
Honolulu, HI 96822-2396

Dear Bill:

Enclosed please find Special Use Permit HWN-3-88 for your activities proposed in your correspondence of January 26, 1988.

Special Use Permit, HWN-3-88, authorizes you to conduct Hawaiian monk seal and green sea turtle population studies within the Hawaiian Islands NWR, to collect biopsy samples from adult seals (except lactating or pregnant females) to collect and burn nets and other hazardous debris, and to monitor entanglements/ entrapments of monk seals and green sea turtles and provide assistance for their release. In order to conduct this work, this permit authorizes you to conduct field camps on the islands of the Hawaiian Islands NWR and to land on Tern Island in approved aircraft in accordance with the Special Conditions included herein.

Please sign the SUP and both copies of the Special Conditions. Keep the original copy of the SUP and a copy of the special conditions and mail these and appropriate copies of your Marine Mammal/Endangered Species Permits to this office. We look forward to working with you this field season.

Sincerely yours,

Stewart

Stewart I. Fefer
Refuge Complex Manager

Enclosures
as stated

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

FORM 3-1383
(REV. 11/75)

UNITED STATES DEPARTMENT OF THE INTERIOR
U.S. Fish and Wildlife Service

Hawaiian Islands National Wildlife Refuge

SPECIAL USE PERMIT

Permit number	Sta. No. to be credited
HWN-3-88	
Contract number	
Date: February 2, 1988	

Permittee (Name and address)
William G. Gilmartin
National Marine Fisheries Service
2570 Dole Street
HOnolulu, HI 96822-2396

Period of use (inclusive)
From February 25, 19 88
To September 30, 19 88

Purpose (Specify in detail privilege requested, or units of products involved)
To conduct on-going Hawaiian monk seal and green sea turtle population studies on the islands and atolls of the Hawaiian Islands NWR, to collect and burn nets and other hazardous debris, to monitor entanglements and entrapments of monk seals and sea turtles and provide assistance for their release, and to collect biopsy samples from adult seals (except lactating or pregnant females).

Description (Specify unit numbers; metes and bounds; or other recognizable designations)
Permittee and his assistants (listed in Item 1 of Special Conditions) may enter the Refuge for the purposes above. The objectives of the research conducted under this SUP are listed under Item 2 of the Special Conditions. Procedures, justification and other details are described in the SUP request dated 1/26/88.

Amount of fee $ * * If not a fixed fee payment, specify rate and unit of charge:

** Permittee will provide water, food, necessary communications systems, and other supplies necessary for sustaining a field camp on the various islands and will provide transportation to and from the islands for all NMFS personnel.

☐ Full payment
☐ Partial payment-Balance of payments to be made as follows:

Record of Payments

Special Conditions

Permittee has the responsibility to ensure that all assistants covered under this SUP have read the conditions herein and are fully briefed concerning these Special Conditions.

Special Conditions are attached.

This permit is issued by the U.S. Fish and Wildlife Service, and accepted by the undersigned, subject to the terms, covenants, obligations, and reservations, expressed or implied therein, and to the conditions and requirements appearing on the reverse side.

Permittee (Signature) William G. Gilmartin

Issuing Officer (Signature and title) Stewart I. Fefer, Refuge Complex Manager

HWR-3-88
William G. Gilmartin

SPECIAL CONDITIONS

1. This permit applies to the permittee and the following persons:

D. Alcorn	G. Balaza	B. Becker
M. Brown	B. Choy	M. Finnegan
R. Forsyth	T. Gerrodette	W. Gilmartin
M. Gilmartin	J. Henderson	L. Hiruki
T. Johanos	A. Kaiser	J. Lenox
R. Morris	R. Morrow	G. Nakai
R. Westlake	M. Wilcox	R. Withrow

If additional personnel are required, they must be identified to the Refuge Manager prior to Refuge entry.

2. Research objectives by location are as follows:

A. French Frigate Shoals
   1) Tag weaned monk seal pups
   2) Resight tagged seals and turtles
   3) Conduct regular censuses of seals and turtles
   4) Monitor injuries to seals and necropsy dead seals
   5) Collect data on identities of paturient female seals
   6) Free entangled seals and turtles
   7) Collect and burn nets and other hazardous debris
   8) Tag basking turtles
   9) Monitor turtle nesting

B. Laysan Island
   1) Same as objectives 1-9 for French Frigate Shoals
   2) Tag and mark adult and subadult male seals
   3) Mark adult female seals
   4) Monitor and document "mobbings" by adult male seals
   5) Collect biopsy samples from all adult seals except lactating or obviously pregnant females.
   6) Collect data on behavior and associations of adult males

C. Lisianski Island, Pearl and Hermes Reef, Necker Island and Nihoa Island
   1) Census seals
   2) Resight tagged seals and turtles
   3) Tag weaned seal pups
   4) Tag basking and foraging turtles
   5) Collect and destroy nests and other hazardous debris

Other objectives include:
   1) Collect and burn nets and other hazardous debris
   2) To monitor entanglements/entrapments of monk seals and green sea turtles and provide assistance for their release.

3. Campsites will be located to minimize disturbance to wildlife populations, including nesting seabirds. At Pearl and Hermes Reef, the North Island camp shall be located on the beach below the vegetation.

4. Flight service to Tern Island, French Frigate Shoals, must meet FWS, Office of Aircraft Safety standards. The Refuge Manager should be notified as to dates of flights and persons on board at least one working day prior to departure, but preferably as soon as the flight is scheduled.

5. Seabird nesting colonies will be avoided to the extent practicable. Travel through the interior portions of all islands will be kept to the minimum necessary to carry out this research and will be conducted in a manner that minimizes disturbance to nesting birds and their habitat. Movement about these islands should generally be limited to the beach crest. If travel through colonies is necessary, a trail should be marked to limit the area of disturbance. Trail markers should be removed when no longer in use. Placement of trails should be based on discussions with Refuge Manager or FWS representative.

6. On Necker Island, temporary camps of up to three nights for two people are permitted. However, camping and all other activities must avoid archeological sites, especially those proposed for listing on the National Register of Archeological Sites. Camping activities should be limited to ledges on the west face of Annexation Hill. Camping on the flat area on the north slope of Annexation Hill is not permitted, as the area includes an archeological site. FWS personnel can provide further information on suggested camp locations. Permittee should notify the Refuge Manager when actual visits are scheduled and the identity of camp personnel.

7. The taking of any animal, vegetable, or mineral matter, except as authorized in writing by the Refuge Manager or by this Special Use Permit, is prohibited on all Refuge lands and waters.

8. The permittee will be responsible for removing all trash and refuse resulting from his activities. No trash or pollutants of any kind will be dumped into Refuge waters.

9. The permittee shall protect, maintain, and keep in good order the premises and/or facilities occupied under this SUP.

10. The Federal Government will not be held liable for any damages to equipment or injuries to persons covered by this SUP.

11. While at French Frigate Shoals, the permittee and others covered by this SUP will coordinate all activities on a daily basis with the Refuge staff member in charge of the Tern Island field station. Likewise, if Refuge staff are present on other islands (Laysan) when field camps are conducted, daily activities will be coordinated with those individuals. Refuge staff will have the authority to regulate and restrict activities more stringently than defined in this SUP if, in his/her opinion, such action is necessary to limit disturbance to wildlife, to protect government equipment, or to insure safety of all personnel. The Refuge Complex Manager or Refuge Manager (Remote Islands) will resolve any disputes which may arise. "Rules for Tern Island" will apply, except as exempted by other provisions of this SUP.

12. During any absence of FWS personnel from Tern Island, NMFS research staff included in this permit will check Tern Island biweekly for potential entanglements/entrapments of seals and/or turtles. This would apply only while NMFS research field camps are active in French Frigate Shoals.

13. All activities of the permittee and his assistants are subject to all Federal laws, rules, and regulations governing National Wildlife Refuges.

14. The permittee will furnish the Refuge Complex Manager with a report of work accomplished and study results on or before December 31, 1988. This report should include, at a minimum, an itinerary of field activities, a description of each separate project undertaken, and a summary of results for each project and location. The report should include a listing of all specimens taken or collected (with location); a listing of all entanglements/entrapments with date, location, age, sex, and disposition; a generalized list of debris collected including amounts, types and disposition; a record of all unusual observations; and a preliminary description of anticipated future work relating to this project. In addition, the permittee will provide the Refuge Complex Manager with copies of all reports (internal and external) and publications resulting from this work in both draft and final stages.

15. The permittee will implement necessary precautions to prevent the introduction of exotic pest plants and insects. Tents, clothing, and boots should be carefully cleaned to remove seeds and insects before traveling to Refuge islands and carefully inspected and brushed before traveling between islands. Plastic or metal containers will be used for transporting equipment whenever practical and shall be carefully cleaned before use. Major items of equipment should be fumigated before use within the Refuge and, if possible, by portable fumigants and/or freezing before traveling between islands. Containers of grains and cereals should be carefully inspected for infestation prior to transport to and between islands. Gear and supplies may not be landed on any islands except French Frigate Shoals, unless properly packed, cleaned and fumigated.

16. "The Radio Schedule and Contingency Plan" is attached hereto and considered a part of the Special Conditions. FWS personnel at Tern Island and Honolulu will handle routine radio checks with NMFS field camps as well as urgent/emergency requests. The permittee will maintain radio contact with field camps at least once a week to handle routine requests and normal business.

17. The "Rules for Use of Tern Island by Researchers", the "Tern Island Boat Use Policy", and the "Field Camp Protocol" attached hereto are also considered part of the Special Conditions.

18. Photographs, films, and videotapes taken and/or recorded as part of the activities under the SUP on the Hawaiian Islands NWR may not be used for commercial purposes.

19. All nets and other debris should be burned during daylight hours in order not to cause illumination which attracts shearwaters and petrels which may become disoriented and perish/become injured in the fire or fly into other objects/ground and become injured.

20. All open water catchment containers will be covered by small mesh netting in order to preclude drowning of endangered Laysan Finches.

21. Copies of appropriate Marine Mammal/Endangered Species Permits will be provided to the Refuge Manger with the signed copy of this permit.

Having read the cover page and three pages of attachments in this Special Use Permit, I, the undersigned, agree to the terms of the SUP:

William G. Gilmartin

Stewart I. Pefer
Refuge Manager

RULES FOR USE OF TERN ISLAND BY RESEARCHERS

The use of Tern Island as a research station is of mutual benefit to the researcher and the Hawaiian Islands National Wildlife Refuge. However, the resident Assistant Refuge Managers' primary responsibilities are maintenance of the facilities and research. They will be willing to assist visiting researchers as their schedules permit but are not in any way obligated to do so other than to see that facilities are utilized in a manner that is safe for personnel, non-destructive to equipment and to insure the welfare of the natural resources. As their schedule permits, they may render technical assistance in the repair of motors and other equipment, but it is the visitor's responsibility to be as independent as possible. Although tools and other equipment are available at Tern Island in an emergency, visitors should supply their own equipment and be prepared to perform maintenance and repairs as needed.

The following rules are to be strictly adhered to. Failure to do so will be grounds for the resident Refuge Manager to request that the offender leave Tern Island or for the researcher to no longer be permitted to conduct research within the Hawaiian Islands National Wildlife Refuge.

SUP conditions applying to work at Tern Island:

1. The total number of researchers may be limited to those named on the SUP unless prior written permission is obtained from the Refuge Manager or his designated assistants.

2. The presence of endangered Hawaiian monk seals, threatened green sea turtles, and a variety of nesting seabirds that are involved in experiments necessitates restrictions upon movement of personnel about Tern Island to the areas designated by the resident Assistant Refuge Manager. Except in emergency situations, movement outside of this area without prior permission from the resident Refuge Manager will be grounds for termination of use of Tern Island by the permittee. The restricted areas are indicated on the attached map.

3. Due to costs involved in logistics, maintenance, and the unpredictable nature of supply, care must be taken to limit use of electricity, cooking and boat gas, and water. Avoid frequent opening of large refrigerators, dry clothes outside, turn off unnecessary lights, avoid excessive use of kitchen facilities, rinse dive gear in large pails instead of running hoses, and conserve in other ways.

4. Boat use shall be at the discretion of the resident Refuge Manager even if boats do not belong to the Fish and Wildlife Service. Adverse wave or wind conditions will preclude or limit boat use. In almost all cases small craft advisories (winds exceeding 25 knots) will curtail activities.

5. Servicing of motors is the responsibility of the researcher, although the resident Refuge Managers may be available for technical assistance. Boats and motors are to be supplied by the researchers, unless other arrangements can be made in advance.

6. All boats are required to have a principle motor and a back-up motor in working condition. Both motors are to be shown to be working before any boat leaves the dock area. Motors should be attached to the boat by a safety chain or rope. Boats must also have standard safety equipment including life preservers for each person (diving buoyancy compensators and wet suits are not adequate), a waterproof light, anchors, paddles or oars, emergency day and night signaling devices, emergency tools, a first aid kit, communication radios including a "walkie-talkie", and an emergency locating transmitter.

7. All boat users are to file a trip plan, including time of return with the resident Refuge Manager and to make sure that their radio equipment is operable each day. Arrangements should be made to call in to Tern Island at intervals not to exceed four hours. Whenever possible, radio equipment is to be supplied by the permittee.

8. Approach to less than one-half mile of any island not specifically mentioned on Special Use Permits is prohibited except in emergency situations, or unless permission is obtained in advance from the resident Refuge Manager.

9. Persons allowed on islands are to remain within areas outlined in their Special Use Permit.

10. Only certified divers are allowed to use SCUBA techniques at French Frigate Shoals.

    a. Diving is limited to no decompression depths and/or times.
    b. Diving is only to be done with a buddy present.
    c. Extreme care is to be taken with air compressors in order to insure safe air is being pumped. Exhaust fumes are to be kept well away from the air inlet. Filter changes are to meet or exceed manufacturer's recommendations. Only manufacturer recommended lubricants are to be used.
    d. Minimally acceptable equipment for diving will include:
        1. Tank that has been hydro-tested within five years and visually inspected within one year.
        2. Regulator in perfect operating condition
        3. Buoyancy compensator or inflatable safety vest

11. While at French Frigate Shoals, the permittee and others covered by this SUP will coordinate all activities on a daily basis with the Refuge staff member in charge of the Tern Island field station. Likewise, if Refuge staff are present on other islands (Laysan) when field camps are conducted, daily activities will be coordinated with those individuals. Refuge staff will have the authority to regulate and restrict activities more stringently than defined in this SUP if, in his/her opinion, such action is necessary to limit disturbance to wildlife, to protect government equipment, or to insure safety of all personnel. The Refuge Complex Manager or Refuge Manager (Remote Islands) will resolve any disputes which may arise. "Rules for Tern Island" will apply, except as excepted by other provisions of this SUP.

12. During any absence of FWS personnel from Tern Island, NMFS research staff included in this permit will check Tern Island biweekly for potential entanglements/entrapments of seals and/or turtles. This would apply only while NMFS research field camps are active in French Frigate Shoals.

13. All activities of the permittee and his assistants are subject to all Federal laws, rules, and regulations governing National Wildlife Refuges.

14. The permittee will furnish the Refuge Complex Manager with a report of work accomplished and study results on or before December 31, 1988. This report should include, at a minimum, an itinerary of field activities, a description of each separate project undertaken, and a summary of results for each project and location. The report should include a listing of all specimens taken or collected (with location); a listing of all entanglements/entrapments with date, location, age, sex, and disposition; a generalized list of debris collected including amounts, types and disposition; a record of all unusual observations; and a preliminary description of anticipated future work relating to this project. In addition, the permittee will provide the Refuge Complex Manager with copies of all reports (internal and external) and publications resulting from this work in both draft and final stages.

15. The permittee will implement necessary precautions to prevent the introduction of exotic pest plants and insects. Tents, clothing, and boots should be carefully cleaned to remove seeds and insects before traveling to Refuge islands and carefully inspected and brushed before traveling between islands. Plastic or metal containers will be used for transporting equipment whenever practical and shall be carefully cleaned before use. Major items of equipment should be fumigated before use within the Refuge and, if possible, by portable fumigants and/or freezing before traveling between islands. Containers of grains and cereals should be carefully inspected for infestation prior to transport to and between islands. Gear and supplies may not be landed on any islands except French Frigate Shoals, unless properly packed, cleaned and fumigated.

16. "The Radio Schedule and Contingency Plan" is attached hereto and considered a part of the Special Conditions. FWS personnel at Tern Island and Honolulu will handle routine radio checks with NMFS field camps as well as urgent/emergency requests. The permittee will maintain radio contact with field camps at least once a week to handle routine requests and normal business.

17. The "Rules for Use of Tern Island by Researchers", the "Tern Island Boat Use Policy", and the "Field Camp Protocol" attached hereto are also considered part of the Special Conditions.

18. Photographs, films, and videotapes taken and/or recorded as part of the activities under the SUP on the Hawaiian Islands NWR may not be used for commercial purposes.

19. All nets and other debris should be burned during daylight hours in order not to cause illumination which attracts shearwaters and petrels which may become disoriented and perish/become injured in the fire or fly into other objects/ground and become injured.

20. All open water catchment containers will be covered by small mesh netting in order to preclude drowning of endangered Laysan Finches.

21. Copies of appropriate Marine Mammal/Endangered Species Permits will be provided to the Refuge Manger with the signed copy of this permit.

Having read the cover page and three pages of attachments in this Special Use Permit, I, the undersigned, agree to the terms of the SUP:

William G. Gilmartin

Stewart I. Hefer
Refuge Manager

4. Submersible tank air pressure gauge.
5. Depth gauge
6. Mask, fins, and snorkle
7. Waterproof watch.

11. Tern Island visitors are to be responsible for keeping their rooms, hallways, bathrooms, and work areas (boat houses, etc.) clean during their stay, and when they leave. They are also responsible for cleaning the kitchen, dishes, and tables after meals and for coordinating meal schedules with the resident Refuge Manager. Except through prior arrangement, visitors are to supply their own food.

12. Researchers will be charged a daily fee for the use of Tern Island facilities.

13. All accidents are to be reported immediately to the resident Refuge Manager.

14. The welfare of personnel is to be placed above that of equipment at all times. The safety of overboard or injured personnel is to be assured before equipment is retrieved.

15. Visitors are responsible for replacing any U.S. Fish and Wildlife Service equipment that they lose or damage.

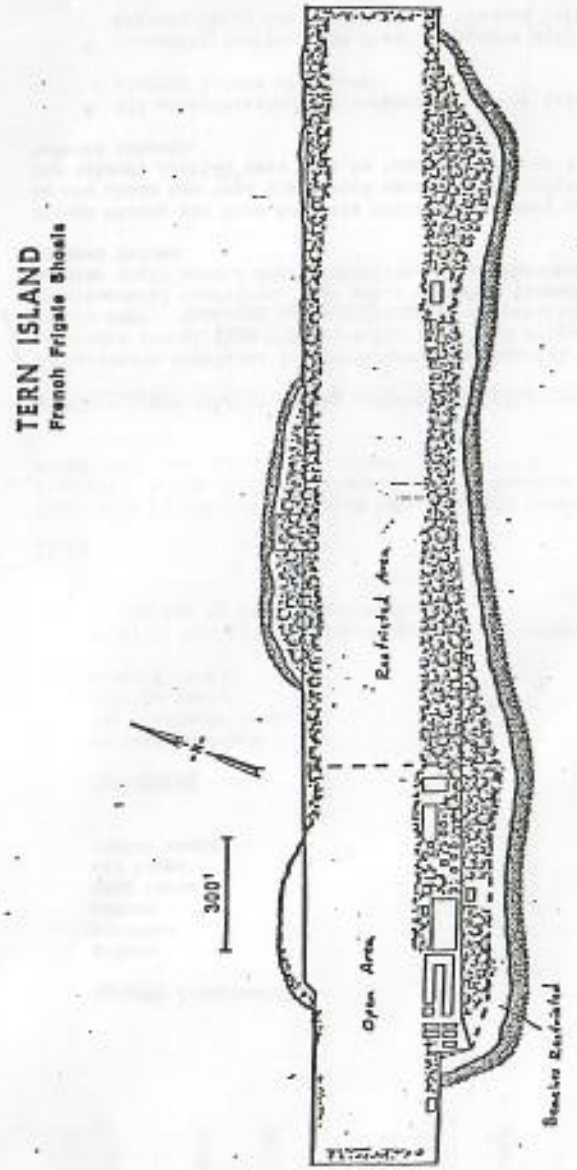


Figure 3. Tern Island - extent of vegetation.

FIELD CAMP PROTOCOL

One of the gravest threats to the unique Northwestern Hawaiian Islands (NWHI) ecosystems is the introduction of exotic plants and animals. The introduction of rats on Midway and Kure are responsible for the extirpation of Bulwer's petrel and low breeding success of Bonin petrels. The introduction of rabbits to Laysan in the early 1900's caused almost complete devegetation and led to the extinction of three endemic birds. The introduction of wild mustard (Brassica campertris) on Pearl and Hermes Reef altered the natural composition of vegetation and eliminated nesting habitat. Midway is the only island in the NWHI where avian pox reaches epidemic proportions. This is probably due to the introduction of the mosquito (Culex quinquifaciatus) which acts as a vector in the spread of the disease.

The U.S. Fish and Wildlife Service (USFWS) is responsible for the management and protection of the islands and wildlife of the Hawaiian Islands National Wildlife Refuge (HINWR). To this end, the following precautions are taken to limit the possibilities of accidental introductions.

* Repack all equipment, supplies, etc., just prior to any trip to the HINWR; examining and cleaning all items.

* Pack supplies in plastic buckets with fitted lids or packing crates since they can be washed and cleaned. Cardboard boxes disintegrate in a short time and harbor seeds, animals, etc., which cannot be easily removed.

* Carefully clean all shoes and clothing to remove all dirt and seeds.

* Tarp all non-food supplies and fumigate them just prior to departure.

FOOD

Fresh foods which are typically transported to island field camps (potatoes, onions, cabbage, apples, oranges, etc.) are not likely to become established and flourish on the leeward islands, however, other less typical food items such as currant tomatoes could easily become established. Soil can contain many seeds, eggs, larvae, etc., and should not be transported to the islands. Seeds, such as alfalfa, mustard and cress, used for sprouted greens could potentially become established and are not allowed on the islands. Other species such as mung beans, soy beans and radishes probably would not survive on the islands and can be used for fresh greens. Below is a list of fresh foods which may be transported to the islands and a list of fresh foods and seeds which are prohibited. All plant material not included on these two lists must be cleared with the USFWS botanist prior to transport. (Contact through Stewart Fefer (808)546-5608).

ALLOWED

apples
oranges
grapefruits
papayas
pineapples

ALLOWED (continued)

grapes
potatoes
onions
mung beans
soy beans
radish seeds

PROHIBITED

currant tomatoes
raw sunflower seeds
alfalfa seeds
mustard seeds

* Dried fruits are allowed but must be frozen solid for at least one day to kill any insects.

TENTS

Tents must be carefully cleaned to remove all seeds and insects before transport to the islands. Tents should be brushed, especially in the seams where seeds and eggs become lodged.

TRAVEL BETWEEN ISLANDS AND/OR MOVEMENT OF FIELD CAMPS

The greatest potential for introduction of harmful exotics exists when personnel travel from Midway, Kure, or French Frigate Shoals to other islands of the NWHI. Numerous exotics flourish on these islands in the same environmental conditions that exist on other leeward islands. These pest species would have a high probability of establishing and flourishing on any leeward island.

Though Midway and Kure have the highest abundance of exotics, every island in the chain has some introduced species. Therefore, when travelling between any island, special care must be taken to prevent transport of these species between islands.

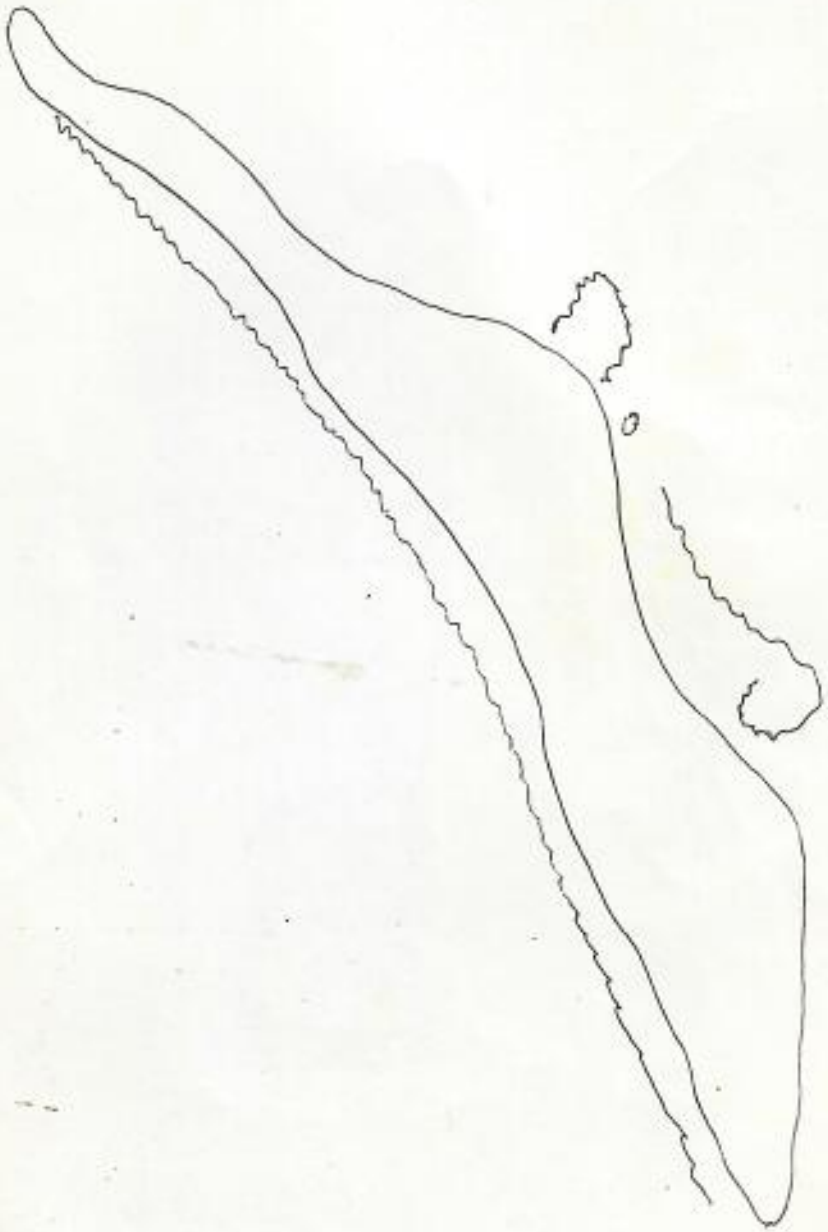
* All containers being transported between islands must be unpacked and cleaned before transport.

* Transport equipment in plastic buckets with fitted lids or packing barrels which can be washed and cleaned between islands.

* Tents and clothing must be cleaned and inspected. If possible, new equipment should be used as cleaning tents on beaches and/or ships is difficult.

* Whenever possible, tarp and fumigate containers (tents, equipment and other non-food/non-cooking items) enroute to the next location.

* Containers of grains and cereals, etc., should be carefully inspected for infestation prior to transport between islands.



JERRY

Revised 12-9-88 (NO further changes anticipated!)

21 Nesting turtles that were only marked with a temporary painted number at East Island and therefore could not be reidentified on subsequent nights after the paint wore off (ie distinct possibility exists that these turtles were subsequently counted again as "new" turtles in the nightly censuses)

Compiled by George Balazs for Jerry Wetherall 12/6/88

Painted No.	Date painted and censused	Painted No.	Date painted and censused
21	May 20	125	June 15
23	May 21	138	June 20
24	May 21	164	July 2
26	May 22	165	July 2
44	May 27	174	July 10
46	May 28	176	July 11
59	May 30	180	July 12
61	June 2	187	July 16
67	June 4	197	July 25
75	June 6		
109	June 13		
114	June 14		

	No. Newly Tagged	long term tag resightings	(first time resighted / previous sightings)	Tagging encounters Total *
East Island	94	72	(39 33)	166
Whale-Skate	100	20	(15 5)	120
Tern Island	18	6	(1 5)	24
TOTAL -	212	98		310

* In addition, 22 turtles on East, 12 turtles on Whale-Skate, and 2 turtles on Tern were ~~tagged~~ recorded and released by paint mark only and did not receive a permanent flipper tag

Note - ~~8 turtles handled on East~~ 8 turtles handled on East, 8 ~~turtles~~ on whale and 7 on Tern were subsequent ~~are also recorded elsewhere~~ recorded on other islands

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P. O. BOX 50167
HONOLULU, HAWAII 96850

February 24, 1988

Dear Bill,

I want to commend you and your staff on the quality of the packing for the Laysan field camp. Most equipment appeared to have been fumigated or was scheduled for freezing. However, I was surprised to find that the radio boxes had not been properly prepared for shipment to Laysan. I specifically addressed those boxes in the meeting with your staff prior to packing. Yet they had not been sealed or fumigated to insure against transporting pests. I went and bought several bug bombs just before the ship departed and told Thea to make sure the boxes were treated before offloading. I would have thought that they had bug bombs for treating equipment that will be transported later between Laysan and other camps. I understand the need for the boxes, but will not continue to allow them to be used if proper steps aren't taken to pest proof them.

Also concerning radios, I understand that the radio going to Laysan is not tunable. This will preclude contacting the coastguard, unless you sent the proper antenna for their frequency. Again, as I stressed in the meeting, due to communications problems at Tern Is. contacting them at other than scheduled times may be difficult to impossible. Thus you should have a radio that can contact the CG. You should make arrangement to send equipment for this purpose on the FERESA in April.

I would like to take this time to request space etc. on the CROMWELL in May.

Personnel- 2 HNL to FFS (Turtle techs.)
2 LAY to LIS and back to HNL (Curlew)

Equipment- 17' Boston Whaler and trailer HNL to FFS
4 Propane tanks HNL to FFS
50 miscellaneous boxes of food and supplies HNL to FFS
15' steel I beam HNL to FFS
Seal Cart HNL to LAY
9 rolls drift fence HNL to Laysan
Used batteries (crated) FFS to HNL
Curlew researchers field gear LAY to LIS and HNL
1 FREEZER HNL to FFS
1 propane refer HNL to FFS

Sincerely,

Duane K. McDermond
Refuge Manager; Hawaiian Is. NWR

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

November 7, 1988 F/SWC2:GHB

Ms. Lynne Fukuda
94430 Kiilani Street
Mililani, HI 96789

Dear Lynne,

I want to take this opportunity to formally thank you for the fine job you did this past summer working with nesting green turtles, Chelonia mydas, at French Frigate Shoals. The data you helped to collect as part of our research team contributed substantially to census and tag resightings for the 1988 breeding season. We are most appreciative of your voluntary contribution of time and talent.

Best wishes for all you future endeavors.

Sincerely,

George H. Balazs
Zoologist and Leader, Hawaiian
Sea Turtle Recovery Team

GHB:ey
cc: Balazs
HL

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P.O. BOX 50167
HONOLULU, HAWAII 96850

February 24, 1988

Dear Bill,

Time is rapidly approaching for field work to begin on FFS and we need to make some logistical decisions. To help us with this we would like to request a study proposal for the work we discussed earlier this month. Ken Niethammer is planning a couple of additional monitoring projects that we would also appreciate comment on.

I would just like to restate what I think we agreed on concerning this study.

The FWS will provide 2 temporary (3 month) GS-5 bio-techs to do turtle work at FFS. NMFS will provide 1 (3 month) person to do turtle work at FPS. A rotational system will be worked out by Ken Niethammer and the study participants. Your staff will also subsample nesting at Trig and Whale-Skate a couple? of days per week. The CROMWELL will transport the crew (including George) to FPS in mid-May to begin the study. After the field season, the data will be turned over to you for analysis and report preparation. The project will be a joint effort between NMFS and FWS and should be credited accordingly.

If it would help, arrangements could be made to enter the data into a database system at Tern Is. concurrent with the study.

I have some specific questions about the work that should be addressed:

1) What will be the sampling scheme for Whale-Skate and Trig, and how will this be accomplished logistically?

2) Are there plans for a person other than the turtle tech. to be on East Is. regularly?

3) What equipment will you need us to supply?

4) What is the question we are trying to answer and how does it relate to recovery?

5) How good of an answer should we get from this type of effort?

6) What is the typical nightly routine for a person doing this work?

7) What period of time should we cover? If the 3 months proposed is not enough, please make recommendations. I need this to do my

hiring soon.

I would appreciate a timely response to this as the hiring process sometimes takes awhile. If you can't get at the entire response right away, please call me with the info pertaining to personnel.

Sincerely,

Ken McDermond
Refuge Manager
Hawaiian Is. NWR

Attachments
LTTR8803.dkm

My main comments are:

1. There is a serious error in equation #8.

2. Because you have a fairly small data set and because the data are clumped in terms of body size, using growth models is, in my opinion, not the most effective approach to presenting your data. I think it would be better to compare data within size classes directly both with other areas in Hawaii and with other geographic regions. Something like Alan and I tried to do in Table 4 of our green turtle growth paper. Nat Frazer told me that he also took this approach in his manuscript in which he presented Ralf Boulon's data on green turtle growth rates in St. Croix. His paper is still in review; I haven't seen it. I believe we didn't run statistical tests on the data because of differences in data collection techniques, but you would certainly be able to compare statistically among your Hawaiian study sites.

If you have any questions about my comments, please let me know. I'll respond to your other missives in the near future (where have you heard that before?). I work with turtle feces for years and never get them famous! It's not fair that your turtle feces get all the press attention. No, I've never heard of anything like that before, and I don't know of any reason for a health concern. Captive turtles have been found with salmonella, etc., as would be expected, but not wild turtles, as far as I know. Elliott Jacobson would be the best person to check with on that. You must have a lot of turtles out there to be producing those quantities of feces. Very exciting. Hope all is well. Give my best regards to Linda.

all the best,
Karen

10/4/89

Dear Karen & Alan -
A fellow that worked for me for awhile, but now joined NOAA corps, put this together with my encouragement. I wonder, if you would briefly look it over for us, especially the math? I'd like to hear some quick preliminary comments from you before proceeding. As your time permits.

Many thanks

George

Growth Curves for green turtles, *Chelonia mydas*, at Pearl and Hermes Reef

By

Barry K. Choy and George H. Balazs

ROUGH DRAFT

Work with wild stock green turtles *Chelonia mydas*, in Hawaii, has progressed to a point where there is enough tag and recapture data to formulate growth curves. As a pilot project data from one of the North Western Hawaiian Islands, Pearl and Hermes Reef, was used in growth models, for more information on the location and history of Pearl and Hermes see Amerson et. al. (1974). Between the years of 1964 and 1988 slightly more than 500 turtles were tagged at Pearl and Hermes Reef, of these 18 tag recoveries were made with the morphometric data necessary for the formulation of mathematical growth models for turtles associated with the area. These growth models will serve as another facet of information useful in the conservation and recovery of the species.

Aging turtles by bone or other methods ( ) is without verification and/or refinement as of yet, thus best estimates of age using available data can be achieved mathematically using Fabens (1965) version of the von Bertalanffy growth model, where absolute age does not have to be known. Growth curves as a result of this model for *Chelonia* and *Caretta* in Florida, and *Chelonia* in the U.S. Virgin Islands, is provided by Frazier and Ehrhart (1985), and Frazier and Ladner (1986), respectively. In Frazier and Ladner (1986) a comparison between the von Bertalanffy and Logistic models ability to fit the data revealed a better fit of the data to the von Bertalanffy model, but cautioned that the data fit both models well for the given data (which does not represent the smaller sizes where the curves differ the most).

Straight carapace measurements (x = 37.4 - 86.8cm) from tag and recapture data of wild green turtles (N = 18) at Pearl and Hermes Reef (Choy and Balazs, 1989) was fit to a von Bertalanffy and Logistic growth models. Intervals between time of original tagging and recaptured *Chelonia* at Pearl and Hermes Reef ranged from 0.96 to 5.00 years. Turtles were captured while foraging the reef flats from a boat by either hand capture or with the use of a scoop net, and also tagged while basking on the beach.

Fabens (1965) version of the von Bertalanffy model, where x is a

$$x = a(1 - be^{-kt}) \qquad (1)$$

measurement, in this case straight carapace length, a is the asymptotic length, b is a parameter related to length at time t = 0, k is a constant growth rate, and t is some age at which the measurement x is expected. To get estimates for the parameters a, b, and k Fabens (1965) used some measurement y at time t + d as follows:

$$y = a(1 - be^{-k(t + d)}) \qquad (2)$$

$$= a(1 - be^{-kt}e^{-kd})$$

$$= [a(1 - be^{-kt})]e^{-kd} + a - ae^{-kd}$$

Substituting x

$$= xe^{-kd} + a - ae^{-kd}$$

$$= a - (a - x)e^{-kd} \qquad (3)$$

making substitutions for x and y with R and T respectively where T is the straight carapace length of a turtle at time of original tagging and R is the length at time of recapture yields the expression,

$$R = a - (a - T)e^{-kd} \tag{4}$$

$$dR/da = 1 - e^{-kd} \qquad dR/dk = kae^{-kt} - kte^{-kt}$$

which gives an expression for which a and k can now be estimated using least squares nonlinear regression (SAS Inc., 1979; utilizing NLIN procedure, Marquardt algorithm, and providing dR/da and dR/dk) best fitting the model for given data R, T, and d (Table. 1). Substituting S_0 for x in equation 1 and providing a t value which would correspond to time of hatching t = 0,

$$S_0 = a(1 - be^{-kt})$$

for $t = 0$

yields $S_0 = a(1 - b)$

solving for b $b = 1 - S_0/a$ (5)

with S_0 being the straight carapace length of a hatchling (Balazs 198).
Similarly the logistic model (Schoener and Schoener, 1978),

$$x = a/(1 + be^{-kt}) \tag{6}$$

with the same parameters as the von Bertalanffy model, can be rearranged in to a form,

$$R = aT/[T + (a - T)e^{-kt}] \tag{7}$$

$$dR/da = [(T + ae^{-kt})T - aT(e^{-kd})]/[(T + ae^{-kd} - Te^{-kd})]$$

$$dR/dk = [-aT(-kae^{-kd} + kTe^{-kd})]/[(T + ae^{-kd} - Te^{-kd})^2]$$

where R and T are also the same as the R and T in the von Bertalanffy model. For t = 0 and solving equation 6 for b yields:

~~$b = S_0/a - 1$~~ $b = \frac{a}{S_0} - 1$ (8)

where S_0 is the same as defined for the von Bertalanffy model. Utilizing the NLIN procedure (SAS Inc, 1979) again, a least squares nonlinear regression could then be performed which gave the best estimates of a and k from which b could be computed (equation 8) and applied to equation 6. Values for t could then be input into equation 6 and corresponding length values calculated and plotted (Lotus,).

Not much point in repeating all this - covered thoroughly in earlier growth papers + in Frazer + Ehrhart for sea turtles

same comment as above

if $t=0$

$x = a/(1+be^{-kt}) \Rightarrow$

$x = \frac{a}{(1+b)} \Rightarrow$

$b+1 = \frac{a}{x} \Rightarrow$

$b = \frac{a}{x} - 1 \Rightarrow$

$b = \frac{a}{S_0} - 1 \Rightarrow$

were the calculations + computer program based on incorrect equation #8 or is that a typo?

Table 1.--Striaght Carapace Measurement(cm) at Original Tagging and Recapture of Chelonia at Pearl and Hermes Reef.

Tag	Date R	Date T	Years	SL(R)	SL(T)	Growth	cm/yr
7095	06/27/88	06/30/83	5.00	41.1	37.4	3.70	0.74
8283	08/26/86	07/13/83	3.12	41.5	39.5	2.00	0.64
7093	06/14/88	06/30/83	4.96	43.5	40.0	3.50	0.71
5582	07/29/84	08/09/81	2.97	49.5	47.2	2.30	0.77
6990	07/16/84	05/12/83	1.18	49.9	48.4	1.50	1.27
7000	07/12/84	05/24/83	1.14	50.7	49.7	1.00	0.88
6982	07/16/84	05/11/83	1.18	51.3	49.7	1.60	1.35
7353	06/25/84	07/11/83	0.96	50.0	50.0	0.00	0.00
5570	05/30/88	05/24/83	5.02	55.0	50.0	5.00	1.00
6973	07/23/84	05/07/83	1.21	51.9	50.8	1.10	0.91
6969	07/12/84	05/05/83	1.19	56.1	54.7	1.40	1.18
6968	07/12/84	05/02/83	1.20	56.3	54.9	1.40	1.17
7070	07/19/84	06/18/83	1.09	59.2	58.4	0.80	0.74
6957	07/08/84	04/30/83	1.19	60.1	59.5	0.60	0.50
6965	07/12/84	05/02/83	1.20	80.5	78.1	2.40	2.00
6953	08/23/86	04/30/83	3.32	83.3	79.2	4.10	1.24
7021	08/23/86	06/01/83	3.23	80.9	80.1	0.80	0.25
6995	08/23/86	05/19/83	3.27	87.8	86.8	1.00	0.31
					Ave		0.87

? this value is inappropriate given wide size class range.

Utilizing the growth interval equations for the von Bertalanffy and Logistic models, and performing the non linear regression giving estimates for a and k and the analysis of variance (ANOVA Table. 2),

? where does this sentence end? Is there text missing?

Table. 2--Analysis of variance (ANOVA) for a and k in the von Bertalanffy and Logistic models (applying data from table. 1).

	a	k
Chelonia mydas		
von Bertalanffy	110.05cm (12.69)	0.013 (0.064)
Logistic	110.00cm (0.00)	0.030 (0.603)

Incorporating a into equations 5 and 8 yields values for b,

von Bertalanffy $b = 1 - 5.3/110.05$

$b = 0.95$ → same value found by Frazer & Ehrhart.

Logistic using correct equation #8 ⇒ $b = 5.3/110.00 - 1$ $(110.00/5.3) - 1$

$b = 19.75$ → similar to value found by Frazer & Ehrhart

and then a, b, and k can be substitutded into equations 1 and 6, yielding

von Bertalanffy $x = 110.05(1 - 0.95e^{-0.013t})$

and

Logistic $x = 110.00/(1 + 19.75e^{-0.030t})$

respectivily.

Values for t can then be inputted to get values for x and the result plotted (Graph. 1).

This must be repeated for logistic w/correct equation

Graph 1.--von Bertalanffy and Logistic growth curves for Pearl and Hermes Reef, Hawaii.

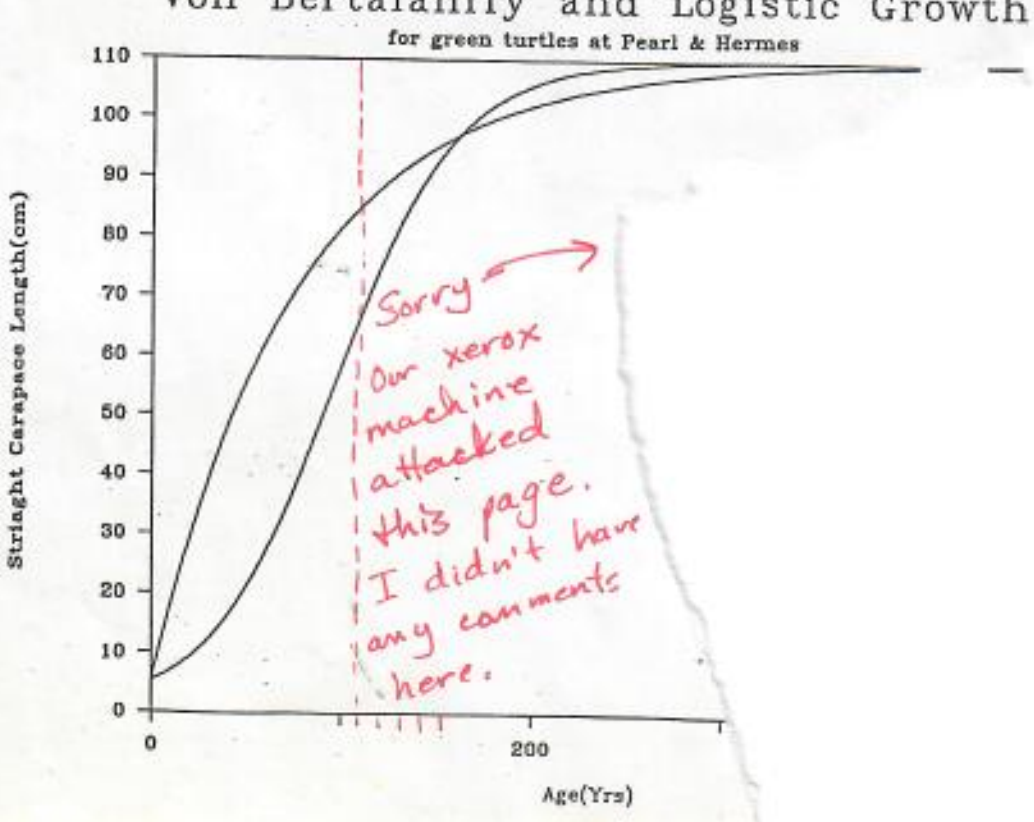
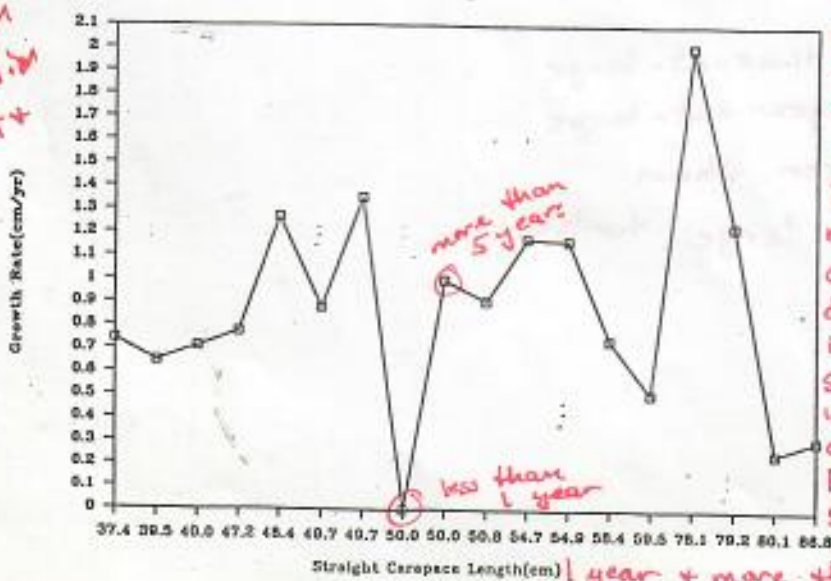


Table. 3-- Table of Variance Analysis for the Non-Linear Regression of the von Bertalanffy and Logistic Growth Models.

	dt	SS	MS	F
Chelonia				
von Bertalanffy:				
Regression	2	64753.16	32376.58	28877.16
Residual	16	17.93	1.12	
Total	18	64771.10		
Logistic:				
Regression	2	64786.86	32393.43	44374.61
Residual	17	12.33	0.73	
Total	19	64799.19		

These values for a and k fit the convergence criterion equally as well as several other a and k values, indicating that within the grid there are several local depressions, but no values fitting this particular data precisely. Observing the data directly indicates variability in growth rates which wouldn't conform to either of the curves unless some of the points are excluded. If there was indication of data not being taken in the proper manner this might be acceptable practice, but this not being the case all data must be considered and the nonlinear regression considers these points equally weighted. In lieu of this it is prudent to say that the growth of turtles at Pearl and Hermes Reef, based on this limited data, is not consistent with other areas where data fit these growth models. Possibly influx of turtles from other locations in the chain where growth rates are faster may explain for faster growth in near adult turtles compared to some of the immatures (Graph. 2).

Graph. 2
Variability in Average Growth Rates



Not necessarily - several of the data time points are for long intervals - See Dunham lizard growth papers for justification of deleting very short + long time intervals

this makes no sense to me.

What is this supposed to represent? This is not a plot of variability but of individual growth rates. You cannot compare growth rates directly between individuals of the same initial size when time intervals are very different. For example the 2 50 cm turtles had intervals of less than 1 year + more than 5 years! (over)

For most of the time-at-large interval, the 5-year-at-large turtle was larger than the 1-year-at-large turtle.

Growth rate of pelagic stage turtles, being carnivorous, should be considerably faster then that of the herbivorous turtles which come into areas such as Pearl and Hermes indicating there maybe a step in the actual growth curve during the transitional period, but this wouldn't effect the areas of the graph defined by this data set. A higher concentration of Tiger sharks *Gleocerdo cuvier* (De Costa, 1984; Witzell, 1987), the primary predator of *Chelonia*, at Pearl and Hermes may also effect growth indirectly by changing the feeding of the turtles to evade predation. Seasonal and cyclic (ENSO) temperature regimes, effecting metabolism of turtles confined to the area (non-migrants), may be another growth rate variable. A combination of several reasons is most likely the case, the next step is to use data from other parts of the chain and compare the results.

Experience with green turtles from other parts of the Hawaiian archipelago indicate a considerably faster growth rate for immature turtles at more of the southern locations compared to those in the NWHI. Recovery efforts in the future should possibly entertain the idea of transplanting immature turtles from an area such as Pearl and Hermes Reef where there is an abundance to an area which has greater foraging capacity and where turtles grow at faster rates.

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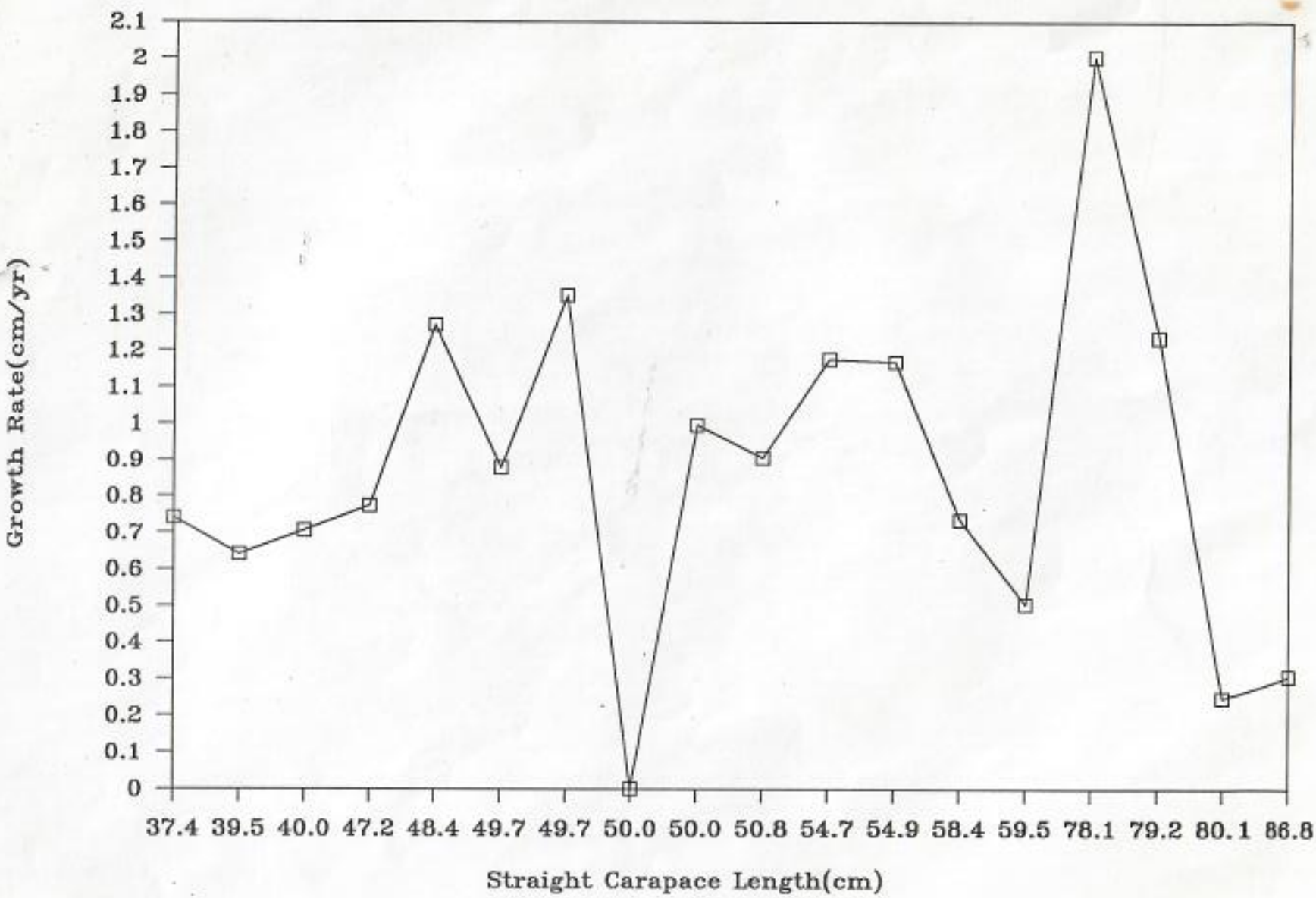
Variability in Average Growth Rates



Von Bertalanffy and Logistic Growth

for green turtles at Pearl & Hermes