U. S. FISH AND WILDLIFE SERVICE
TRIP REPORTS FOR THE HAWAIIAN
ISLANDS NATIONAL WILDLIFE REFUGE

compiled by

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Two pups were double tagged with the standard monel metal cattle ear tag - one tag per flipper. In addition one pup about 3 weeks old and still nursing was tagged at one of the small islands between Sand and Eastern at Midway on July 19 because cooperators there no longer had tags. The two tagged on the refuge already had been weaned and were very fat and had acquired the silver gray plumage. Tagging data are as follows:

#1001 Pup male North Island 7/15/71 Weaned Silver-gray
1002 Pup female North Island 7/15/71 Weaned Silver-gray
1003 Pup male Midway Atoll 7/19/71 Nursing Black (3-4 weeks)

As much as possible, all animals were checked for tags. There were 5 such returns. The information is as follows:

	Recovery Data				Tagging Data			
No.	Age	Sex	Date	Island	Age	Sex	Date	Island
A-99	SA	F	7/15/71	Southeast	P	F	3/22/67	Seal
A-137	A	F	7/15/71	Southeast	SA(Y)	F	7/6/67	Southeast
A-180	A	M	7/15/71	Kittery	A	M	7/10/67	Seal
A-338	A	F	7/15/71	Southeast	SA(Y)	F	3/22/68	Southeast
A-931	SA	F	7/15/71	Seal	P	F	8/17/70	Southeast

All except No. 931 had been tagged at Pearl and Hermes and had been recorded there several times before this trip. The latter was tagged as a pup on Laysan on Aug. 17, 1970 was very fat and looked very similar in appearance to a large gray pup. The tag on No. 338 was about half-way torn out of the web of the rear flipper. Other than No. 931, all appeared to carry but one tag only.

Moult condition was checked on 14 animals on North Island. Of 4 males recorded, 1 had moulted and 3 had not moulted as yet. Of the 10 adult females 2 had not mounted, but 8 were in the process of moulting. One of the unsexed adults had moulted and one had not. The subadult male had not moulted and possessed the usual brownish pelage well coated with green and brown algae or diatoms.

Green sea turtles - only 3 turtles were seen in the whole atoll and all at North Island. Two about 30 in. long were seen offshore about 20 ft. One animal which crawled ashore while we were on the island was tagged. The data follows:

Tag no.	Sex	Carapace	Width
498	F	32 5/8 in.	24 1/4

No straight-line measurements were taken since the calipers had not been put aboard the plane at Hickam AFB by cargo handlers.

There were several tracks on Southeast Island which appeared to have been made within the past night or two. Sixteen pits dug sometime earlier this summer were found on Southeast, 6 on North and 3 on Kittery Islands. One was dug into in an effort to find eggs - with no success. Several others were probed for the egg pits, with equal lack of success; however the probe was unsatisfactory and had time permitted more excavations might have yielded positive results. The pits appeared similar to those at French Frigate Shoals. We suspect that turtles do nest at Pearl and Hermes but in very low numbers.

how high?

Fish - only 1 shark was seen within the lagoon at the west side. None were noted around any of the islands.

General Observations - The mustard (Brassica) on Southeast Island was dormant and dry. Lush mats of Tribulus covered the western part of that island. Considerable Setaria covered the larger eastern area. On Seal Island there were lush growths of Eragrastis covering much of the vegetated part of the island. There was little change at North Island. Kittery, as usual, was devoid of any vegetation.

EXPEDITION REPORT
HINWR Aug 16-26, 1971

FFS

Studies of the Green Sea Turtle

Only two large turtles were seen at French Frigate Shoals. This was a marked difference from the great numbers observed during our visit in May and it was apparent that most of the adults had moved away from the atoll. The two large turtles observed had flippers bitten off and they both found swimming difficult. The one judged to be in fairly good condition was tagged. Another smaller platter size turtle was also tagged (table 4).

The Coast Guard crew reported that turtle hatching had passed its peak. The peak was from July 1 to August 15 and during that time young turtles could be seen almost every night around Tern Island. Confused by the lights around the island, they usually headed for the brightest lights and those were located at the "mess deck". The seaman on night watch usually picked up young turtles and released them into the sea. CBM Kline reported that three bucketfuls were picked up and dumped into the ocean one night during the peak of hatching.

From interviews with men stationed on Tern Island it appeared that at least several hundred young turtles hatched on Tern Island. Young turtles were never seen hatching during the daylight hours.

Although a thorough search was made of Tern Island each night we were there the hatching apparently occurs in spurts. No young turtles were noted on the first 2 nights. However 25 young were found on the third night. Most were found in and around the "mess deck". A few were picked up and simple experiments were performed with them. Several were placed near the dark end of the runway and a flashlight was turned on some 10 feet away. All immediately headed toward the light. They even changed direction as the light moved. Notes on speed of the young turtles were also made. It was observed that a young turtle could travel approximately 200 feet in less than 5 minutes. Their speed was amazing. Observations were also made of young turtles as they made their way into the water. Even as hatchlings they appear to be wonderful swimmers. Although they had a tendency to float they would immediately dive and swim under water for distances up to 10 feet. Although all the young turtles we released appeared to make it safely without being taken by reef fish, they men stationed at Tern Island reported that they commonly observed young turtles being taken by fish diring their first swim.

A turtle pit count was conducted on each of the islets (table 5). Although the data are somewhat subjective this count represents our best estimate. If each of the pits in this count represented a clutch of 80 eggs, approximately 37,000 young could have been hatched on French Frigate Shoals.

Table 4
Turtle Tagging Data
Tern Island
French Frigate Shoals
August 1971

Tag #	Sex	CL	CW	PL	TH	Est. Wt.	Round
1076		13.6	11.6	11.1	5.1	8 lbs.	14 3/8 X 13 1/8
1077	F	36.0	29.2	29.1		280 lbs.	38 1/4 X 35 1/4

Duplicated color photo of these two turtles in my files

Table 5
Turtle Pit Count*
French Frigate Shoals
August 1971

Tern	21
Trig	63
Whale Skate	118
East	180
Little Gin	12
Big Gin	70
Total	464

*This count represents all those pits which were thought to have been dug this year. Some were fresh while others were probably several months old. In some cases one pit was dug inside another. Shallow, probably false pits were not counted, however, undoubtedly some false pits were included in this count. In general, the count is somewhat subjective, but it represents our best estimate.

Studies of the Nihoa Finch

A total of seven Nihoa finch were counted on Tern Island. Two were obviously adult males (one banded) while the remainder were either females or immatures. A single active nest was located in the pile of concrete blocks near the east end of the island. A nestling probably no older than 2 days was found in the nest. The pile of concrete blocks appears to be the only location on Tern Island were Nihoa finch have been found nesting.

Marine Investigations

Some diving was conducted on Nihoa and French Frigate Shoals and Dr. Grigg collected a few specimens of coral for identification. Members of the precious coral team dove around the cliffs on the west side of Nihoa on August 18. They reported a number of sharks. Most appeared to be the grey reef shark (Carcharhinus menisorah). One larger shark was seen, however identification was not made.

Four members of the party rowed a rubber boat into Necker while other members of the party swam in along side the rubber boat. Again, a number of small sharks were noted.

A number of dives were made around French Frigate Shoals. Dr. Grigg collected a number of specimens of coral around East Island and they will be identified and reported on at a later date.

Dr. Grigg stated that in comparison with the main islands of Hawaii, French Frigate Shoals appeared to have far fewer species.

A dive was made at La Perouse Pinnacle primarily for photographic purposes. Rock samples were also collected which will eventually be analyzed by geologists from the Geological Survey Office in Menlo Park.

In an effort to determine if sharks were taking young turtles, a shark line was set a Tern Island. On the first night the line was set, a 5' grey reef shark C. menesorah was taken. Its stomach was empty. On the second day a small (approximately 4 1/2 ft.) grey reef shark apparently took the bait. A large tiger shark probably noted the struggling smaller shark and "gobbled him up", thus impaleing himself on the large hook. After quite a struggle, eight men managed to pull the shark just out on the beach. He was dispatched with a ".45" and lifted up on a boat winch for a long series of vanity pictures. She measured 11'10" and probably weighed over 1,000 lbs. Fifteen young no longer than 2" were found attached to a rather large yolk sack. A large slipper lobster was the only thing found in its stomach.

Table 2
Temperature and Precipitation Data
Hawaiian Islands National Wildlife Refuge

	Lihue, Kauai			French Frigate Shoals			Midway		
Month	High	Low	Prec.	High	Low	Prec.	High	Low	Prec.
JAN	83	56	7.32	80	60	3.45	69	62	4.6
FEB	83	58	.89	79	63	.64	69	62	3.7
MAR	85	62	.93	79	65	.60	70	63	3.1
APR	82	68	2.83	80	71	1.01	71	64	2.5
MAY	84	68	5.85	87	69	2.58	74	67	1.9
JUN	84	67	.77	90	73	1.35	79	72	3.1
JUL	87	72	1.76	89	75	2.02	81	74	2.9
AUG	87	73	1.33	90	73	3.23	82	75	3.9
SEP	87	66	1.42	93	74	1.59	82	75	3.7
OCT	86	67	2.47	89	72	4.41	79	72	3.7
NOV	84	64	11.05	88	66	2.10	75	69	3.6
DEC	81	66	2.29	85	67	5.77	72	65	4.2
Extreme	87	56		93	60		82	62	
Total Prec:			38.91			28.75			40.9

A total of 76 green sea turtles were tagged on the refuge during the year. Only a few small turtles were tagged; the majority weighed between 150 and 220 lbs. A total of 17 previously tagged animals were again observed on the refuge islands (Table 7). Most returns were found on Pearl and Hermes Reef where there seem to be turtles throughout the year.

Of interest was the return of 2 turtle tags taken off the island of Oahu. Both of these were tagged on July 10 on East Island in French Frigate Shoals. This substantiates our contention that a large percentage of the sea turtles using the entire Hawaiian archipelago utilize the French Frigate Shoals area for nesting and then migrate towards the main islands for feeding after the nesting season terminates. A few may move westward to Pearl and Hermes Reef. So far we have had none, however, taken from the Midway atoll.

Although the green sea turtle is considered peripheral in the redbook of endangered species, the state of Hawaii has no restriction on the taking of turtles in the state. Turtle authorities state that the refuge islands are the only remaining islands within the United States where nesting has been observed to any great extent. Unlike the Atlantic subspecies which never comes to land except to nest, the Pacific subspecies does haul up on the beaches at all times of the year to bask in the sun, especially on the refuge. Even though turtles are present in some areas in great numbers in the South Pacific, the Atlantic and Indian Oceans, they have been molested in every ocean to the point where no longer during the daylight hours do turtles venture up on beaches.

The Koral Kings, the diving club at Midway Naval Air Station, has cooperated with us in our study and has also tagged a number of turtles. The Commanding Officer has issued a station regulation prohibiting the taking of turtles under 24 inches in shell length. Most of the turtles seen in the vicinity of Midway atoll are small, and under this size limitation. When these animals are taken they are weighed, measured and tagged by members of the Midway diving club. During 1970 they tagged 14 animals and these data have contributed substantially to our understanding of the life history of the green sea turtles.

Periodically turtles with large growths around the head and neck have been observed. Two such growths were surgically removed from a turtle found on Pearl and Hermes Reef. The growths were frozen and given to the University of Hawaii department of physiology for identification. They were identified as papilloma One such growth weighed almost a pound. It had grown over one side of the mouth thus preventing the mouth from opening.

Table 7
Summary of Turtle Return Data - 1970

Date	French Frigate	Laysan	Lisianski	Pearl and Hermes
APR 13				8
JUN 22				1
AUG 21		1		
DEC 14		—		7
Totals:		1		16

Total Returns - 1970 - 17

Table 8
Summary of Turtle Tagging Data - 1970

Date	French Frigate	Lisianski	Pearl and Hermes
APR 13			3
JUN 23			6
JUL 10	47		
AUG 17		8	
DEC 14	—	—	12
Totals:	47	8	21

Total turtles tagged during 1970 - 76

HINWR Field Trip Report (Bound)
April 12-16, 1970

Green Sea Turtle

Complete turtle census data were obtained on all islets within the atoll (table 7). Three turtles were newly tagged on Southeast Island (table 8) while 8 other previously tagged turtles were checked (table 9). Due to a lack of time we were unable to take a complete set of measurements on all of these animals.

Table 7

Turtle Census Data

Location	Number
Little North	1
North Island	12
Seal Island	0
Kittery Island	0
Grass Island	0
Southeast Island	7
Total	20

Table 8

Turtle Tagging Data

Tag	Sex	Location	Plastron Length	Plastron Width	Carapace Length	Carapace Width	Thickness	Round Measurements	Weight
326	M	Southeast	27.8	27.3	32.1	27.9	12.9	34X33 1/8	210
327	M	Southeast	25.4	25.3	35.4	31.1	11.5	34X33 1/8	169
328	F	Southeast	31.85	30.3	38.4	31.9	14.7	41¼X39½	325

Table 9

Turtle Return Data

Tag	Location	Plastron Length	Plastron Width	Carapace Length	Carapace Width	Thickness	Round Measurements	Weight
161	Southeast	26.3	25.3	31.6	26.4	11.2	34¼X33	176
164	Southeast	28.8	27.2	35.1	29.1	11.7	37X36½	202
443	North Island	Unable to remeasure turtle - possible old streamer in tag						
868	Southeast	26.9	23.7	32.2	24.2	11.0	34X31	150
879	North Island	Unable to remeasure turtle						
885	North Island	Unable to remeasure turtle						
666	Little North	Unable to remeasure turtle - white plastic streamer in good shape						
1059	Southeast	29.3	28.4	35.7	28.4	14.1	36X38¼	250

Laysan Finch

One hundred random Laysan finch transects were made on Southeast Island. Thirty were completed on the west part of the island while 70 were completed on the larger end of the island. Each transect was 100' long by 16' wide. On transect, 19 unbanded and 3 banded birds were counted.

$$\text{Total Birds} = \frac{\text{Number counted X Total area}}{\text{Area sampled}}$$

$$\text{Total Birds} = \frac{22 \times 31.37}{\frac{(16 \times 100 \times 100)}{43{,}560}} = \frac{690}{3.67} = 188$$

Efforts were made to capture previously banded finch. Table 10 lists these recaptured birds and their dates originally banded. From these few band returns and from others in past trips it appears that there is a rapid population turnover in finch on Southeast Island.

June 22, 1970
P & H

Green Sea Turtle:

A total of only eight turtles were seen during the three days. One, subsequently tagged, was found on North Island. The others occurred on Southeast Island. Four of the latter (2 females and 2 males) were tagged later. A fifth, a female, had been tagged in 1964. Using the same method of measuring the carpace (a flexible rule) the shell was found to have grown 3 inches in length and 2 in width (39"L X 36"W versus 36"L X 34"W). Although six pits were found on Southeast Island, some of which did not appear to be recent, none contained eggs. No pits were found on any of the other islets. Pearl and Hermes superficially resembles French Frigate Shoals, yet we have not, in recent times, found evidences of successful nesting there. Perhaps others have, but we are not aware of it if they have. Following are tagging and recapture data.

Turtles Tagged

Tag #	Sex	Weight	Caliper (In.) Carapace Length	Caliper (In.) Carapace Width	Caliper (In.) Body Plastron Thickness	Caliper (In.) Body Plastron Length	Tape (In.) Carapace Length	Tape (In.) Carapace Width	Island	Date
329	F	No measurements taken							North	6/22/70
330	M	205	35.2	26.9	12.4	27.6	37 1/2	33 3/4	Southeast	6/23/70
331	M	195	35.3	27.7	12.4	28.0	37 1/2	33 1/2	Southeast	6/23/70
343	F	200	36.0	33.1	12.3	26.5	35 1/2	32 1/2	Southeast	6/23/70
344	Not used									
345	F	175	31.6	26.1	13.9	25.5	34 1/4	32 3/4	Southeast	6/23/70
1059*	F		36.0	28.7	13.3	29.4	39	36	Southeast	6/23/70

*Previously tagged but recaptured for measurements

Turtles Recaptured

Recapture Data				Tagging Data		
Tag #	Sex	Location	Date	Location	Date	Time Interval
1059	F	Southeast	6/22/70	Southeast	9/16/64	5 yrs 9 mos.

2 recaptures at P & H - logged at FFS

HAWAIIAN ISLANDS NATIONAL WILDLIFE REFUGE

Field Trip Report

August 19 - September 23, 1969

Field Trip Personnel

Eugene Kridler Wildlife Adminstrator BSFW, Kailua, Hawaii
David L. Olsen Refuge Manager Asst. BSFW, Kailua, Hawaii
John Sincock Research Biologist, BSFW, Koloa, Kauai
* Dr. John Maciolek Unit Leader, Cooperative Fisheries Unit BSFW, University of Hawaii.
** Dr. George Losey Associate Professor, University of Hawaii

* Cooperated from August 28 - September 23
** Cooperated from August 19 - 28

Itinerary

August 19	9:00 AM Depart Honolulu via USCG BUTTONWOOD enroute to Tern Island
August 21	9:30 AM Arrive Tern Island, Hawaiian Islands National Wildlife Refuge; conducted biological investigations on islets within French Frigate Shoals
September 7	7:00 PM Depart Tern Island via USCG BUTTONWOOD enroute to Laysan Island
September 9	7:30 AM Arrive Laysan Island; conducted biological investigations
September 9	2:30 PM Depart Laysan Island vis USCG BUTTONWOOD enroute to Pearl and Hermes Reef
September 10	3:00 PM Arrive Southeast Island, Hawaiian Islands National Wildlife Refuge; conducted biological investigations on the islets and lagoon within Pearl and Hermes Reef
September 19	9:45 AM Depart Southeast Island via USCG BUTTONWOOD enroute to Honolulu
September 23	*9:00 PM Arrive Honolulu*

GENERAL

The primary purpose of this, the annual fall expedition to the Hawaiian Islands National Wildlife Refuge was to check the islands for possible trespass, and to begin preliminary investigations of the marine life found within the refuge boundaries. Prior to this year, most of the field work has involved collection of life history data and population levels of sea birds, rare and endangered birds, the green sea turtle and the Hawaiian Monk seal. Since the ecologies of these forms of wildlife are intimately tied in with the marine fauna and flora found in the reefs surrounding these islands or within the atoll lagoons, it is essential that we learn more about the ecological requirements of such wildlife found on the refuge.

On former expeditions, ornithologists, mammalogists, entomologists and island ecologists have accompanied us at one time or another. On this trip two marine ecologists were part of the party. Both Drs. Losey and Maciolek were extremely helpful in setting up the marine transects and identifying most forms of reef life. Both are experienced divers.

During the past several years, there have been several requests by both private fishermen and personnel from the Hawaii Division of Fish and Game for the opening of the refuge reef areas for commercial lobstering and other types of fishing. Since the refuge islands have been designated as Natural Areas, use designed to exploit a natural resource would be contrary to the natural area concept and could not be permitted. We ourselves, however, were extremely interested in knowing whether all the claims to "fabulous lobster areas" at French Frigate Shoals were rumor or fact. Thus, during this expedition a considerable amount of time was devoted to looking for lobsters and sampling all types of habitat.

Public attention has recently been focused upon the damage which has been done by the Crown-of-Thorns starfish, or Acanthaster sp., in parts of the Pacific Ocean. Although the area most drastically affected by this starfish has been the Great Barrier Reef of Australia, Guam, Truk and some of the more southern Pacific islands, concentrations have been reported in latitudes as far north as the main Hawaiian Islands, especially Molokai. Naturally, we were interested in knowing if any large concentrations were present in reef areas surrounding the refuge islands. Thus a considerable amount of time was also devoted to conducting Acanthaster sp. surveys during this expedition.

Unfortunately, changes in local Coast Guard policy have affected our operations and we are nolonger able to have a strong voice in determining the itinerary of the expedition. As far as the Coast Guard is concerned, the primary mission of the ship is to conduct operations and maintenance on buoys at French Frigate Shoals and Pearl and Hermes Reef. The Coast Guard considered the day long stop at Laysan as "R and R" for the crew.

Although originally scheduled for three weeks, our trip was extended to slightly more than five because of changes in schedules of the BUTTONWOOD. We were apprised of the changes after the trip began.

FRENCH FRIGATE SHOALS

General

The party arrived at Tern Island on the morning of August 21. Scientific equipment and the Bureau's Boston Whaler were unloaded for use during our stay. We maintained headquarters at the Coast Guard Loran Station on Tern Island and worked out of that location each day. Quarters and meals were provided by the Coast Guard at the prevailing rates. The party remained on Tern Island for 17 days and departed on the afternoon of September 6. The BUTTONWOOD arrived from Honolulu where it had returned shortly after dropping us off on August 21.

Weather conditions were fair throughout our stay at French Frigate Shoals. Large cumulus clouds, many of which carried heavy rain squalls passed over the atoll daily. One day seven rain squalls could be counted passing over the area at one time.

Northeast to southeast winds averaged 15 to 20 knots throughout most of the period causing a heavy chop on the lagoon. This hampered operations during the latter part of our stay.

During the 17 days spent on French Frigate Shoals, some diving, either snorkel or SCUBA, was accomplished on 14 days. Approximately 61 hours of diving time was logged by four divers at French Frigate Shoals

Wildlife Population Surveys

As usual, albatross were absent. Overall seabird populations, numbers had declined considerably from the counts made during June by members of the Pacific Project, Smithsonian Institution. This decline reflected a completion of nesting cycles for many species. John Sincock completed most of the seabird counts and the data are presented in Table I.

Table I

French Frigate Shoals Wildlife Populations

	Tern Island 8/26/69	Trig Island 8/23/69	Whale Skate 8/24/69	East Island 8/30/69	Round Island 8/25/69	Gin Island 8/30/69
Wedgetailed shearwater	2 young	1	5	45 young		
Christmas Island shearwater		4				
Red tailed tropicbird		17	128	2		
Blue faced booby		36	186	6 young, 2 adult		31 chicks
Red footed booby		44	12	9 young, 1 adult		
Great Frigatebirds		17	128	5 adults		
Ruddy Turnstone	9	20	19	95		
Bristle thighed curlew	1		1	1		
Golden plover	25	2		3		
Wandering tattler		1				
Greybacked tern			1			
Sooty tern				300 adults		
Common noddy		220	850 w/eggs	775		
Hawaiian noddy		12	640	15		
Fairy tern	32, 1 egg					
Nihoa finch	5 (2 unbanded, 1 banded, 2 undertermined)					

Wildlife Management Studies

1) Studies of the Hawaiian Monk Seal

Complete seal census data were obtained on each of the islets within the atoll. When islets were visited more than once, additional censuses were made (Table II).

On August 22, when East Island was first visited, six tagged animals were recorded. On August 30, when the islet was visited again, only three tagged animals were recorded and of those, two had been observed on the 22nd. On August 23 when the first visit was made to Trig Island, only one previously tagged animal was observed. A subsequent visit on August 27 revealed that eight tagged animals were utilizing the area. Because of time limitations on previous trips, usually only a single visit was made to each islet, and we have assumed that the count obtained was the minimum number of animals utilizing the area. These data support our contention that there are frequent changes in animals utilizing an islet. Likewise, there may be many more animals associated with an island, or for that matter, an entire atoll, than our raw census data may indicate.

Of 39 seal pups tagged on French Frigate Shoals in June by members of the Pacific Project, only 13 were observed on this trip. Examination of the 13 returns showed that there had been a considerable amount of interchange between islets. This decline in the number of pups observed suggests either high pup mortality(possibly loss to sharks) or that at this age the pups have a tendency to wander freely in the lagoon, or leave the atoll entirely. Only through detailed analysis of tagging data will we be able to learn more about the losses of seal pups.

Table II

Hawaiian Monk Seal Census Data

French Frigate Shoals

Islet	Adults	Subadults	Pups	Unknown	Total
East 8/22	(4)	(4)	(6)		(14)
8/30	5	9	2		16
Trig 8/23	(6)	(3)	(2)		(11)
8/27	12	7	2	8	29
Whale Skate 8/24	9	13	8	2	32
Round Mullet 8/25	5	2	1		8
La Perouse 9/1	1		1		2
Gin 8/30	7	6	3		16
Shark 9/2	10	5	1	3	19
Disappearing 9/4				37	37 *
Totals	49	42	18	50	159

* Census made by FAA pilot as he departed for Honolulu

New Seal Tagging

Most of the pups born this year had already been tagged by personnel from the Pacific Project. A total of three new pups were tagged (Table III)

Table III

A 672	Pup male	double	tagged	with	yellow	nylon	control	Whale Skate
A 673	Pup female	"	"	"	"	"	"	Whale Skate
A 674	Pup male	"	"	"	"	"	"	Trig
A 675	Pup female	"	"	"	"	"	"	East

Table IV
Tag Returns

Number	Return Date	Est. Age	Location	Tagging Date	Age	Location	Number Previous Recording
A 2	8/24/69	S A	Whale Skate	3/12/67	pup	East Island	2
3	8/24/69	"	" "	3/12/67	"	East Island	3
14	8/24/69	"	" "	3/13/67	"	Trig	3
20	8/24/69	"	" "	3/14/67	"	Whale Skate	4
207	8/24/69		" "	9/17/67	yearling	" "	1
212	8/24/69	S A	" "	9/17/67	"	" "	1
214	8/23/69	"	Trig	9/17/69	"	" "	2
414	8/23/69	"	Gin Island	6/7/68	pup	" "	2
	Remains of old yellow nylon tag still evident						
680	8/27/69	pup	Trig	6/14/69	pup	Whale Skate	1
683	8/24/69	"	Whale Skate	6/14/69	"	" "	1
686	8/24/69	"	" "	6/14/69	"	" "	1
690	9/2/69	"	Shark	6/14/69	"	" "	1
692	8/27/69	"	Trig	6/14/69	"	" "	1
693	8/27/69	"	"	6/16/69	"	" "	1
694	8/24/69	"	Whale Skate	6/16/69	"	" "	1
	Missing one tag and yellow nylon, was not properly attached						
696	8/24/69	pup	Whale Skate	6/16/69	pup	Whale Skate	1
789	8/30/69	"	Gin Island	6/21/69	"	East Island	1
794	8/24/69	"	Whale Skate	6/21/69	"	" "	1

Table IV Tag Returns cont.

Number	Return Date	Age Est.	Location	Tag.Date	Age	Location	Number Previous Recording
795	8/30/69	pup	East Island	6/21/69	pup	East Island	1
796	8/27/69	"	Trig	6/23/69	"	Whale Skate	1
799	8/24/69	"	Whale Skate	6/24/69	"	Trig	1

2) Studies of the Life History of the Green Sea Turtle:

Very few turtles were observed on any of the islets within French Frigate Shoals. A single turtle was observed on Trig Island, and another hauled out on the beach at Tern Island for a short period of time. Some digging activity was still taking place on several of the islets. The following information was collected on each of the islets:

Tern Island. A single large turtle (over 150 lbs.) hauled up on the southwest corner of Tern Island. CPO Loud reported that a turtle pit had been constructed near the Loran building on the south side of the island. While snorkeling near "shark pier", Olsen observed a smaller turtle with a yellow nylon tag attached to its front flipper. This was probably the turtle tagged in the same location during March 23, 1969.

East Island Many turtle pits were noted along the southeast end of East Island, but only a few appeared to be freshly dug. One recently excavated hole was examined but no eggs were found.

Although no turtles were observed along the beach, four were noted on the transect off the east end of the island (two larger than 200 lbs. and two approximately 25 lbs. each). Two other turtles were noted swimming in the shallow waters adjacent to the beach on the north side of the island.

Round and Mullet Island Mullet Island had disappeared, and Round Island measured approximately 65 x 120 ft. at low tide. There was no evidence of any turtle activity on or around these islands.

Whale Skate Island Although there were no turtles observed on the beach, one large turtle and five small turtles were seen swimming in the shallows adjacent to the beach; some digging activity was noted.

Trig Island A single large turtle was noted on the transect and another observed on the second day we visited Trig Island. The west end of Trig Island was literally torn up by turtle digging. A nest of eggs had been torn up and exposed probably the night before we arrived on Trig for our first visit. One turtle apparently dug up another's nest while preparing to lay herself. Twelve eggs, almost fully developed, were collected and preserved.

Gin Islands A total of 66 pits were counted on little Gin Island and 25 on big Gin. Many of the pits appeared to be old. We did not check them for eggs. No turtles were observed on the beach while marine work was being conducted.

3) Studies of the Life History of the Nihoa Finch:

One adult male from the original 27 transferred from Nihoa in March 1967 remains while the offspring from the original birds probably make up the balance of the population. A total of eight individuals, all in one flock, were observed. A single old nest containing an infertile egg was found in the concrete block pile near the carpenter's shop near the middle of the island. This seems to be one of the favorite nesting sites for finch on Tern Island. The birds are quire tame and spend much of their time around the buildings gleaning food, such as small grass, seeds and insects. The pleasant warbling voice of the singing finch is a delightful song to hear on Tern Island.

Marine Investigations

For the past four years a considerable amount of data has been collected relating to seabirds, the green sea turtle and the Hawaiian Monk seal on French Frigate Shoals. Studies of the marine fauna associated with the other forms of wildlife have until now been secondary in priority.

This was the first time members of the refuge staff had attempted any extensive marine biological work on any of the refuge atolls. The primary purpose of this work was to inventory and attempt to learn more about the forms of marine life present in the area.

Permanent marine transects were established adjacent to Tern, Trig, Whale Skate, Round and East Islands. Groups of fish were recorded by family, approximate size and abundance. (See report prepared by Dr. George Losey)

Permanent transect markers fashioned from 5/8 inch reinforcing bar were driven into the sand on marked locations on each island. Using an underwater tape recorder, Dr. Losey conducted all of the transects on French Frigate Shoals. Each time a transect was run, Dr. Losey was accompanied by both Olsen and Kridler, who acted as shark guards and swam "shotgun" with powerheads. In addition, Kridler and Olsen attained a working knowledge of the families of fish present in the reef area.

Lobster Survey

Pressure has been placed upon the refuge staff and the Bureau to open the French Frigate Shoals reef area to "experimental or commercial lobstering". Those pushing for this have suggested that the extent of this lobster resource was tremendous. Although we believed these individuals had very little factual information about this resource, we felt it necessary to separate fact

from fiction. It was thus decided that we ourselves gather data relative to the abundance of lobster at French Frigate Shoals.

These investigations tied in well with the Acanthaster survey. The following types of habitat were sampled:

1. Shallow water, exposed reef with holes 4 - 8 feet deep adjacent to the reef, east of Tern Island.

2. Shallow water, with live Porites sp. heads coming with 2 feet of the surface. Depths of water 8 - 10 feet. Often the Porites compressa had large caves and openings at the base of the heads. (Shark Island and north side of Trig Island.)

3. Mid-depth 10 - 20 feet sand, coral and rubble bottom with large Porites compressa heads rising out of a relatively level bottom. (North side Whale Skate Island, middle of reef.)

4. Shallow to middle depth 6 - 15 feet large deep caves, primarilly dead coral with some Poscillapora, Porites, and Montippera. (West side of Gin Islands.)

5. Coral rubble bottom, generally with little relief but numerous large flat slabs of dead coral rock. Usually found in center of reef area, south of Whale Skate Island.

6. Deeper areas of dead coral covered with small heads of Porites, Poscillapora, and Montippera. Large deep caves - depths to 40 feet. (Waters adjacent to La Perouse Pinnacle.)

7. Artificial habitat adjacent to Tern Island, under rusted bulkheads, sunken barge and piles of old rusted iron.

In the total of 61 hours of diving time logged by the four investigators, a total of 22 lobsters were observed in natural reef type habitat. (See appendix.) Examination of the ledges of rusted bulkheads and piles of rusted iron near the northeast corner of Tern Island showed the two largest concentrations of lobster. On August 31, eleven were observed and on September 2, 29 were observed.

We were very surprised at the overall scarcity of lobster. An effort was made to sample all types of habitat and special emphasis was placed upon seeking out what Dr. Losey called optimum lobster habitat. The deep, dark caves and the flat rocks were present; the habitat looked excellent but very few lobsters were observed.

Acanthaster Survey

All types of habitat were surveyed, including the "cuts in the outer reefs" in an effort to determine if Ancanthaster populations were building. In the 61 hours of diving logged by Maciolek, Losey, Olsen and Kridler, not a single animal was observed. The lack of Acanthaster at French Frigate Shoals in this survey suggests that the population, if present, is relatively low.

Miscellaneous Marine Observations

Shark lines were set out on two locations on the west end of Tern Island and they were tended each night. Three species of sharks were collected while a fourth species, Tiger Shark, was observed by members of the party from the boat. Stomach contents from most of the collected sharks were checked but no evidence of seal remains were found.

A specimen of C. menisorrah was dispatched with a powerhead in approximately 8 feet of water near Shark Island. This was the only occasion at French Frigate Shoals where the powerhead was actually used while diving. Usually when sharks were sighted, divers immediately left the water. The following information was collected on each of the species observed.

Tiger Shark - Galeocerdo cuvieri large specimen, 12 - 14 ft., swam under boat (while we were all in boat) on west end of Whale Skate.

Blacktip Shark - Carcharhinus limbatus caught on shark hook off west end of Tern Island (jaws collected), specimen measured 7 ft. and photographs taken.

Grey Reef Shark - Carcharhinus menisorrah killed several with powerhead at French Frigate shoals; caught several on shark lines off pier at Tern Island. Appeared to be the most common shark in French Frigate Shoals area. Most measured $4\frac{1}{2}$ - $6\frac{1}{2}$ ft. Usually easily distinguished by black band at trailing edge of the tail (Jaws collected.)

Galapagos Shark - Carcharhinus galapagensis Single specimen caught on shark line off Tern Island; length 6 ft.;(jaws collected)

Molluscs of French Frigate Shoals

Cowries:

Cypraea maculifera - Reticulate cowry - Common under La Perouse Pinnacle. Beachworn shells found on Shark Island.

Cypraea caputserpentis - Serpents Head Cowry - Common in exposed reef near Round Island

Cypraea sulcidentata - Groove Tooth Cowry - 2 specimens found in coral rubble.

Cones:

Conus leopardis - Leopard cone - several large specimens found

Conus vitulinus - Calf cone - several specimens found

Conus quercinus - Oak cone - 2 specimens found

Conus pulicarius - Flea bitten cone - common in sandy areas

Conus abbreviatus - Abbreviated cone - small specimens common on shallow reefs

Conus flavidus - Yellow tinged cone - common in shallow reefs

Terebrium

Terebra crenulata - Crenulate Auger - common in sandy areas

Terebra subulata - Spotted Auger - common in sandy areas

Terebra maculata - Big Auger - common in sandy areas

Terebra guttata - Eyed Auger - common in sandy areas

Horn shell

Cerithium pharos - Horn Shell - uncommon in sandy areas

Cerithium opeliscus - Obelisk Horn - common as beach worn shells

Moon Shells

Polinices pyriformis - White moon shell - uncommon in sandy areas

LAYSAN ISLAND

General

The schedule did not allow us any more than seven hours on Laysan. This limited us to conducting a seal census, a Laysan duck count and taking a brief look at some of the marine life on the west side of the island. Rather than using the four-man scientific party to walk around the entire island, the party was split into two teams, each walking half-way around the island and conducting a seal census and recording previously tagged animals in their own sector. Once the teams met on the opposite side of the island, the party moved inland and completed a beatout count of Laysan teal by walking abreast through the vegetation around the entire lagoon.

The island appeared drier than it did during March and June, and the gauge in the lagoon read .58 ft., which was down 2.3 ft. from the level recorded in March. Large portions of bottom of the lagoon on the north and west sides were exposed. The high and low on the maximum and minimum thermometer read 87° and 56°, respectively. As a public relations gesture, some of the crew were permitted to go ashore to swim off the beaches, collect glass floats and photograph wildlife. The captain himself participated.

Beautiful weather and surf conditions prevailed all day. Flies, as usual, were present by the thousands and were somewhat annoying.

Wildlife Populations Data

With the limited amount of time available seabird population estimates were not made, however, general observations made are as follows:

No albatross were noted.

Wedge-tailed shearwaters very abundant and numbered in the many thousands. Burrows were still being dug during daylight hours. Three downy white chicks were seen in the mouths of burrows.

Christmas Island shearwaters were much more common than at any time we had observed them on previous trips. They were particularly common in the Ipamea-Erogostis vegetation along the northwest perimeter of the lagoon.

Several common noddies were observed to be incubating eggs.

Hawaiian noddy tern nests in the ironwood tree at the campsite contained only young which varied in stages from downy to almost fledged. The majority were large downy.

Although there were thousands of adult sooty terns on the island, no chicks were seen.

Several downy young red-footed booby chicks were noted, as were some large downy blue-faced booby young. Several flying immature birds of

the latter species were seen.

Tropicbirds were common. The few nests checked contained eggs to almost fledge young.

One immature gray-backed tern was observed.

Hundreds of frigatebirds were present but nests were not checked.

Several thousand ruddy turnstones mixed with lesser numbers of golden plover and some tattlers were feeding at the shores of the lagoon. Occasionally a turnstone would fly out of the thick vegetation of Ipomoea during the teal census.

Two Bulwer's petrels were seen by Sincock.

A quick check of several burrows of the sooty storm petrel near the Pluchea at the southwest corner of the lagoon yielded negative results. None were seen elsewhere either.

A snake-tailed skink about three inches long was observed in the vegetation midway up the east side of the island.

Sixty-three pintails were censused at the lagoon. This was the greatest concentration of migrant waterfowl observed on Laysan Island since periodic checks have been initiated during 1964.

Wildlife Management Studies

1) Studies of the Hawaiian Monk Seal

A seal census was made, two pups were newly tagged and nine previously tagged animals were reported. (Tables V and VI)

Table V

Hawaiian Monk Seal Census Data

Laysan Island

	Males	Females	Unknowns	Total
Adults	40	29	57	126
Subadults Yearlings	6	2	7	15
Pups	1	2	3	6
Totals	47	33	67	147

Table VI

Tag Returns Laysan Island

Recapture Information		Original Tag Information		
Tag No.	Age	Date of Tag	Age	Location
A 32	Yearling	3/19/67	Pup	Laysan
A 37	Subadult	3/19/67	"	"
A 185	Large subadult	9/21/67	Subadult	"
A 199	Yearling	9/21/67	"	"
A 617	Pup	3/26/69	"	"
A 609	Yearling	3/26/69	Pup	"
A 625	Yearling	3/26/69	"	"
A 706 *	Pup	6/2/69	"	"
A 721 **	Pup	6/2/69	"	"

* This pup was double tagged with single metal tag on one flipper and yellow nylon tag with metal on other flipper. Entire flipper which had yellow tag had been bitten off.

** This pup also double tagged. Animal lost yellow tag and metal tag which held it. Could have been bitten off, torn out, or incorrectly secured on animal.

Newly Tagged Animals

671 Pup female double tagged plus yellow nylon of same number

668 Pup female double tagged plus yellow nylon of same number

Similar to information collected, only a few pups were observed. A total of 54 pups had been tagged at Laysan during the March and May trips and this count of only six pups again reflects a loss of pups. The loss can be attributed to mortality or that the pups have a tendency to move away from the island once they have been weaned.

2) Life History Studies of the Laysan Teal

Four men conducted a beatout census around the lagoon. An effort was made to minimize duplication by counting only individuals which landed behind the censusing party. The survey began at 10:15 AM and ended at 12:30 PM; a total of 74 teal were counted. This was the lowest count ever recorded using this method. One banded bird (575-94236) was captured and released. This bird had been originally banded on September 9, 1961 by personnel from the Hawaiian Division of Fish and Game. A Class la duckling, apparently dead for some time, was found near the edge of the lagoon. No broods or Class 3 ducks were observed. As usual, the largest number of birds were found in the vegetation near the lagoon on the east side. An adult female captured was growing new primaries and had almost completed its molt. More time ~~was~~ is needed on this island during the summer months to study this bird during the nesting and brooding season. We know so very little about production data on this species and possible limiting factors.

3) Life History Studies of the Green Sea Turtle

Nine turtle pits were observed on Laysan. One was found along the south shore while a group of four ~~were~~ was noted approximately 100 yds. north of the landing site, and another group of four were found approximately $\frac{1}{4}$ mile north of the landing site. One pit was checked for the presence of eggs; however, none were found. In addition five to six tracks were seen on the southwest side of the island, just north of the coral ledge. Another nine tracks were seen on the northwest beach. In one case, one animal had come high on the beach and traveled over 200 yds. before returning to the sea.

4) Life History Studies of the Laysan Finch

While conducting the teal and seal counts, Laysan Finch were abundant and were observed all over the island. Although no counts were possible, it was apparent that the finch have had a good year.

5) Vegetation Studies on Laysan Island

Two Cenchrus echinatus plants in flowering stage were found near the benchmark on the west side of the island. They were removed and thrown into the ocean.

The two Chenopodium plants near the campsite are both thriving and putting out much lateral growth. The second plant found is on the northeast corner of the ironwood tree.

Ipomeae was very lush near the lagoon. Much Sicyos was fruiting. Much of the Tribulus was exhibiting stress from lack of moisture. The cocoanut palms on the north end are flowering and bearing fruit. The two on the south end of the lagoon appear much thriftier and robust than in March. The Conyza was all dry but plant heads still retained much seed.

Marine Investigations

Olsen and Maciolek snorkeled for 45 minutes along the reef area approximately ½ mile north of the landing site. No Acanthaster or lobster were observed. Three sharks were noted, all were Carcharhinus menisorrah, between 3 and 6 ft.

Most of the coral reef in the area was dead, although in one area several large Porites compressa heads were growing well. A few underwater photographs were taken.

PEARL AND HERMES REEF

General

The shore party arrived on Southeast Island on the afternoon of September 10. The refuge Boston Whaler, rubber boat, scientific equipment and provisions were transported to the island with the help of the ship's boat. Approximately 60 gals. of water and 90 gals. of gasoline were also transported to the island for use during the stay.

Weather conditions at Pearl and Hermes were good. White caps were evident on the lagoon on only three days. Strong currents sweeping into the lagoon from outside the reef were experienced near every opening in the reef. It appeared that these currents existed regardless of the direction of the tide.

Temperatures were recorded daily. The high and low were 98° and 62° respectively.

Marine investigations were conducted on eight days. Approximately 61 hours of diving time were logged by the three divers, Maciolek, Kridler and Olsen.

Wildlife Population Surveys

Census data in Table VII are considered Class A data as each count was essentially a head count. However, seabird populations varied an undetermined amount between day and night. Toward dusk each day many returned to roost on the island after a day of fishing at sea. For example, only four wedge tailed shearwaters were counted during the day on Southeast Island, while after dark several thousand were observed. Likewise, a night count of sooty terns would be considerably greater that the 1,570 censused during the day at Southeast Island. As a result, populations listed are a minimum.

Table VII

Bird Populations Pearl and Hermes Reef

	Southeast	Grass	North	Little North	Seal
Red tailed tropicbird	2 (2)		3 (1)		
Wedge tailed shearwater	4		10		
Bonin Island Petrels	(300)*		10		5
Red footed Booby	6 (21)		10		19
Blue faced Booby	22 (4)		4	10	
Brown booby	90 (9)				
Great Frigatebirds	33 (67)	(40)	60 (80)		
Greyback Terns	4				12
Sooty Terns	1,570				20
Common Noddy Tern	630		1,300		
Hawaiian Noddy Tern	1,320	400			
Fairy Tern	4		10		
Bristle thighed Curlew	20				
Golden Plover	18				
Ruddy Turnstone	225		35		
Wandering tattler	1				
Sanderling	2				

Laysan Finch - See discussion under life history Laysan Finch

Figures in parenthises () are young.

* Estimate - Class D data

An immature male pintail was first observed on the 13th of September swimming along in the water near the campsite. Sex and age were verified when the bird was captured the following day. It was in an emaciated condition.

Wildlife Management Studies

1) Life History Studies of the Hawaiian Monk Seal

Complete seal census data were obtained on each of the isles with the atoll. (Table VIII) In addition, four counts were made on different days on Southeast Island (Table IX). These disclosed that there was considerable variation in not only numbers of animals, but in individual tagged animals observed. Six pups were tegged. Each was double tagged and given a yellow nylon control tag with the same number as the monel metal tag (Table X). Fourteen previously tagged animals were observed (Table XI). Four of the animals were observed for the first time since they were tagged over two years ago. This shows that we miss some of these animals on our periodic tours. Either they spend a considerable amount of time out at sea before returning to their natal island or they happen to be somewhere in the waters of the atoll while we are on a particular island. Several times in the past we were able to land on each island and sandbar harboring seals within the space of an hour or so (via Navy helicopter) but many tagged animals were not observed.

Individuals respond differently to our activities. Some move off, never to return during our stay on an island. Some just go back to sleep and ignore us from then on. Others will move into the water, but return to the island at another point, while still others that were not at first present will haul up on the beach while we are there.

Table VIII

Pearl and Hermes Reef Seal Census

September 11 - 17, 1969

		A	SA	P	Total
Kittery	M	3	1		4
9/11/69	F	1			1
	UNK	8			8
	T	12	1		13
Seal	M	1		1	2
9/11/69	F	4		2	6
	UNK	4			4
	T	9		3	12
Grass	M	3			3
9/11/69	F	2	1		3
	UNK	6			6
	T	11	1		12
Bird	M	2			2
9/11/69	F		1		1
	UNK	1			1
	T	3	1		4
Southeast	M	4			4
9/15/69	F	5	2		7
	UNK	9	8	3	20
	T	18	10	3	31

		A	SA	P	Total
Little North	M	4			4
9/12/69	F	2		1	3
	UNK	11		3	14
	T	17		4	21
North	M	6	1	3	10
	F	4	1		5
	UNK	3			3
	T	13	2	3	18
North Island	M				
Sand Spit	F	1			1
	UNK	2			2
	T	3			3
The Wreck	M				
	F				
	UNK	4	1		5
	T	4	1		5

All Islet Total

M	23	2	4	29
F	19	5	3	27
U	48	9	6	63
T	90	16	13	119

M - Males
F - Females
Unk - Unknown sex
T - Total
A - Adult
SA - Subadult or yearlings
P - Pups

Table IX

Variations in Seal Census
Southeast Island

September 13 - 18, 1969

		Males	Females	Unknown	Total	Retraps	Individuals
Sept. 13 9 AM	A	4	4	6	14		A 173 A 96
	SA	1	3		4		584
	P						
	T	5	7	6	18	3	
Sept. 15 2 PM	A	4	5	9	18		A 96 A 142
	SA		2	8	10		A 143 A 235
	P			3	3		A 662 A 667
	T	4	7	20	31	6	
Sept. 16 2 PM	A	7	4	9	20		A 140 A 662
	SA	2	2	2	6		
	P			1	1		
	T	9	6	12	27	2	
Sept. 18 11 AM	A	2	3	7	12		173 A 248
	SA	1	3	2	6		A 662
	P			1	1		
	T	3	6	10	19	3	

A - Adults
SA - Subadults or yearlings
P - Pups
T - Total

Table X

Pearl and Hermes Reef

New Seal Tag Data

Tag	Date	Age	Sex	Location	Comments
A 669	9/11/69	P	M	Seal	Double plus yellow nylon
A 670	9/11/69	"	F	"	" " " "
740	9/12/69	"	F	North	" " " "
741	9/12/69	"	M	"	" " " "
742	9/12/69	"	M	"	" " " "

Table XI

Recapture Information Pearl and Hermes Reef

Recapture Information				Original Tag Data			Previous
No.	Date	Location		Tag Date	Age	Location	No. Returns
A 96	9/13	Southeast	SA	3/21/67	SA	Southeast Island	3
A 126	9/11	Bird	SA	7/3/67	Yearling	Southeast Island	3
A 140	9/16	Southeast		7/6/67	Yearling	Southeast Island	1
A 142	9/15	Southeast		7/6/67	SA	Southeast Island	3
A 143	9/15	Southeast		7/7/67	AF	Southeast Island	1
A 152	9/16	Seal	A	7/7/67	AF	Seal Island	1
A 173	9/18	Southeast	SA	7/9/67	Pup	Grass Island 2-3 wks old	1
235	9/15	Southeast		9/25/67	Yearling	Lisianski	2
248	9/18	Southeast		9/27/67	Yearling	North Island	3
250	9/12	North	A	9/27/67	Yearling	North Island	2
584	9/13	Southeast	A	9/24/66	SA	Southeast Island	3
657	9/12	North	Pup	5/26/69	Pup	North Island	1
662	9/15	Southeast	Pup	5/26/69	Pup	North Island	1
667	9/15	Southeast	Pup	5/26/69	Pup	Southeast Island	1

2) Life History Studies of the Green Sea Turtle

As the scientific party approached Southeast Island for the first time, 27 turtles were counted on the beach east of the campsite. Most moved into the water while we were engaged in transferring gear ashore and setting up camp. During the 10 days at Southeast Island, 12 turtles were newly tagged while eight were recaptured and remeasured (Tables XII and XIII).

Two of the recaptured animals had been originally tagged at French Frigate Shoals, one during 1965 and the other during 1968. This is a distance of approximately 600 miles, nothing unusual for the Green Sea Turtle. Our tagging program has revealed this, as far as the Hawaiian archipelago is concerned. Longer distance have been documented elsewhere in the world, chiefly the Atlantic.

Examination of the return data have shown again that once a turtle reached adult stage (approximately 200 lbs. or over), the rate of growth declines. Complte sets of measurements were not taken during the earlier stages of this study and the only comparable figures we have are length and width measurement of the carapace, on the contour, taken with a steel tape.

Ten turtle pits were noted on the west end of Southeast Island. Five of the freshest appearing pits were excavated but no evidence of eggs was found.

Table XII

Turtle Tagging

Southeast Island September 1969

Tag No.	Date	Sex	Plastron Length	Carapace Length Straight	Carapace Width Straight	Carapace Length Curved	Carapace Width Curved	Thickness	Weight
321	9/12	F	25.0	30.1	24.1	32.0	31 3/4	11.8	150
322	9/15	F	30.0	37.4	27.4	38 5/8	36 ¼	16.2	290
323	9/15	F	20.8	24.9	20.2	27 ¼	24¼	9.3	80
324	9/15	F	15.8	18.9	15.2	20	18 1/8	6.9	30
325	9/16	F	18.3	21.9	17.8	23 ¼	21 1/8	9.2	50
894	9/15	F	21.6	27.3	22.1	29 ¼	27 7/8	10.2	95
895	9/15	F	27.6	34.2	25.9	37 1/8	33 ¼	14.3	215
896	9/16	M	28.3	36.1	27.1	38 1/8	33 3/4	13.4	235
897	9/16	F	29.5	36.2	28.7	39 3/8	36 3/4	15.1	280
898	9/17	M	27.5	32.0	23.6	34 ½	31.0	12.1	165
899	9/12	M	26.9	33.1	25.7	35 ¼	32 ¼	12.7	195
900	9/17	F	25.2	31.4	23.7	34.0	31 7/8	12.9	175

Table XIII

Turtle Retrap Information

All animals measured and released on Southeast Island

Tag No.	Date	Sex	Plastron Length	Carapace Length Straight	Carapace Width Straight	Carapace Length Curved	Carapace Width Curved	Thickness	Weight
44	9/16	F	30.1	37.4	29.2	39 ¼	35 3/8	14.2	280
Original	8/14/65					39	36	Whale Skate Island, French Frigate Shoals	
107	9/12	F	26.4	32.6	26.1	36 ¼	31 5/8	12.8	185
Original	4/1/66					34	31	Southeast Island	
121	9/16		28.7	35.9	28.5	38 ½	35 5/8	13.2	225
Original	9/20/66					37 ½	35 ½	Southeast Island	
153	9/15	ENTERED NO. 9	25.3	30.1	25.0	33 7/8	31 7/8	11.8	155
Original	9/23/66					31	29 ½	Southeast Island	
688	9/15	F	30.8	38.8	29.9	41 ½	38 ½	13.2	275
Original	6/7/68	no measurements taken, yellow streamer, Whale Skate Island, French Frigate Shoals							
891	9/16	M	26.4	32.9	25.5	33 3/4	30 ½	11.9	185
Original	5/26/69		26.8	32.9	25.6	34 ½	30 ½	11.4 Southeast Island	
1046	9/12	M	27.3	32.3	26.5	35 1/8	33 1/8	12.3	200
Original	3/18/64					32	30	Southeast Island	
1073	9/12	M	25.8	33.7	26.5	36	32 3/4	12.6	200
	tip of right flipper bitten off; tip of left flipper bitten so it flops								
Original	9/16/64					36	32 ½	Southeast Island	

3) Life History Studies of the Laysan Finch

Population data for the Laysan Finch on Southeast Island will be reported under separate cover later.

Marine Investigations

Priority was given to preliminary marine investigations, primarily fish, gastropods and corals. Such investigations were conducted during eight of the 10 days. A Total of 60 hours and 35 minutes of diving time was logged by the three divers at Pearl and Hermes Reef (Appendix). A single marine transect was established on the north side of Southeast Island. A permanent steel marker was placed in a coral head to designate the turning point of the transect (Maciolek's report).

Diving operations were conducted in accordance with general safety regulations covering such operations. In addition, at least two members of the party were armed with explosive powerheads for protection against possible shark disturbances. A sharp lookout was kept for the presence of sharks in the area in which we were diving. Although sharks never actually presented us with any "problems", on several occasions it was deemed prudent to leave the water.

1) Acanthaster Survey (Crown-of-Thorns)

A total of five Acanthaster planci were found during the marine investigations at Pearl and Hermes Reef. All were found in waters less than 15 ft. Two were found in a cut near the edge of the reef near North Island, while the others were found in shallower areas within the lagoon. We were unable to survey any of the areas outside the lagoon.

Two animals were feeding on Pocillopora damiscornis. One was feeding on Porites lobata, one on an unknown species of coral and the last animal was not feeding.

Crown-of-Thorns data collected were turned over to Dr. Banner at the University of Hawaii as part of the Pacific-wide Ancanthaster survey.

2) Pearl Shell Survey

One of the objectives of the marine investigations was to determine the status of the pearl shell population. We were only able to spend one day in the best pearl shell area as described by Galtsoff in 1933.

The party dove in three locations approximately 5 miles north of Southeast Island. In this area it was extremely difficult to position ourselves, for no natural landmark was evident (the islands being very low and flat), and a compass was the primary navigational instrument. Before departing from Southeast Island, a tarp was fastened to a tower in hopes that it might aid in navigation, giving us a known point which could be seen on the horizon. We were able to still see the tarp with the aid of binoculars at a distance of approximately 5 miles.

During the three dives made in the general area shown on the map (appended), only one live specimen was found. Many dead shells were found, but one had live spat attached to it. Judging from the number of dead shells found, we were probably in the area where, during the 1920's, the population was large.

3) Miscellaneous Marine Observations

While diving in the area of the pearl shell concentrations, a manta ray was observed. The approximate 8 ft. wide "wingspan" was an impressive sight. Unfortunately, no photographs were obtained since it moved away before cameras could be unlimbered.

The reef white tip shark (Triaenodon obesus) was the most common shark observed in the area. Eight were caught on shark lines off Southeast Island, and they averaged between 4 and 6 feet. All were males. A school of approximately eight were seen in an eddy area near the northwest corner of Southeast Island on several occasions. On almost every dive at least one of these sharks was seen. In the old wreck area, two were observed sleeping in a cave. Likewise, in the cut in the reef, east of North Island six to eight were seen slowly swimming around or sleeping in caves with only their tails exposed. Several were also seen around Seal and Kittery Islands. Three were found under a ledge of coral on the shore of Seal Island. One was dispatched and examination of the stomach showed two freshly eaten octopus about 18 inches long. The other sharks examined had empty stomachs.

A single specimen of a blacktip shark (Carcharhinus limbatus) was caught on a shark line off Southeast Island.

Using a 5 ft. reef white tip shark for bait, a 10 ft. 2 in. tiger shark was hooked in approximately three feet of water off Southeast Island. The strength of this mighty fish tested the 3/16 inch rope, the cable leader and the 5/8 inch reinforcing steel used for the "rod". The shark was finally pronounced "dead" after he received slugs from a 12 gauge, 303 British, and 410 powerheads in the brain. Sharks of this size cruising in the shallow waters are undoubtedly one of the main predators on the Hawaiian Monk seal and green sea turtles because we have found, on a number of occasions, huge jaw marks on the latter animals, flippers bitten off, or chunks bitten out of shells. How many seal pups are taken is a matter of speculation. The gape of this particular shark measured 16½ inches, more than enough to swallow a small pup whole, or a fat one in a few bites.

4) Molluscs of Pearl and Hermes Reef

Cowries

Cypraea sulsidenta, Groove-tooth Cowry - 2 specimens found in shallows of Southeast Island

Cypraea scurra, Jester Cowry - 1 specimen found in center of lagoon under Porites head

Cones

Conus leopardis - Leopard Cone - large specimens common in shallow area adjacent to Southeast and Kittery Islands. Many large dead shells. These shallow areas serve as a breeding ground.

Conus vitulinus, Calf Cone - several found in shallows near Southeast Island.

Conus quercinus, Oak Cone - three found in shallows near Southeast Island.

Conus dalli, Dall's Cone - single live specimen found south of Southeast Island

Conus striatus, Striate Cone - single beach worn specimen found on Grass Island.

Conus imperialis, Imperial Cone - single live specimen found.

Tun Shells

Malea pomum, Apple Tun - many beachworn specimens found on Kittery Island.

Ponna perdix, Partridge Tun - several found with hermit crabs.

Tonna olearium, Tun Shell - beachworn specimens found at Grass Island.

Phalium vibex, White Helmit Shell - common on beaches of Seal and Kittery Islands.

Triton Shells

Charonia tritonis, Trumpet Shell - several old shells found; one live specimen found in shallows of Seal Island.

Distorsio anus, Warped Shell - single live specimen found in shallows of Kittery Island.

Stromb Shell

Strombus hawiensis, Hawaiian Stromb - beachworn specimens found

Turbans

Turbo intercoatalis, Green turban - common in shallow areas of Southeast Island.

Augers

Terebra felina, Tiger Auger - several beachworn specimens found on Kittery Island.

Miscellaneous shells

Latirus nodatus, Spindle Shell - common in shallow reef areas.

Morula uva, Grape morula - common in beachworn shells.

Drupa morum, Mulberry Drupe - several found on shallow reef areas.

Mitre ferruginea, Rusty Mitre

Mitre cucumerina, Mitre

Nassarius papillosus, Papillose Dog Whelk - single beachworn specimen found.

Purpura patula pansa - small beachworn specimen found.

Appendix I

Summary of Diving Time at French Frigate Shoals

	Kridler	Olsen	Maciolek	Losey	Lobster	Type diving - depth location
Aug. 22	1 hr 30 min	1 hr 30 min		1 hr 30 min	0	snorkel transects, East Island
23	1 55	1 55		1 55	0	snorkel transects, Trig Island
23	35	35		35	0	SCUBA Transect 20, Trig
24	2	2		2	0	snorkel Transect 20, Whale
25	1 35	1 35		1 35		snorkel Transect 20, Round
25		25		25	7	SCUBA 30 ft. Reef near Round
26	2	3		2	2	snorkel 20 ft. east of Tern
27		1		1	3	snorkel Transect 20 Trig
27	55	55		55		Trig lobster survey
28	1	1	1 hr		3	snorkel, north Tern Island 20
29		1	1		0	snorkel, hunting powerhead Round Island
30	1 30	1 30	1 30		3	snorkel, Gin lobster survey
31		1 30	1		11	snorkel, Tern Island reef
Sept. 1	35	45	45		1	SCUBA, La Perouse 30 ft.
2		1 30	1 30		0	snorkel, Shark Island survey
					(29)	snorkel, Tern Island
3	45	1	1		0	snorkel, reef Whale Skate
5		2 50	2 50		3	snorkel, Trig 25 ft.
	14 : 50	24 : 00	10 : 35	11 : 55		

Appendix II

Summary of Diving Activities Pearl and Hermes Reef

Date	Olsen hr.	Olsen min.	Kridler hr.	Kridler min.	Maciolek hr.	Maciolek min.	Location	Activity
Sept. 11	2		1		2		Seal and Kittery Islands	Survey of marine life
	2		2		2		Grass Island	Survey of Marine life and photography
Sept. 12		15		15		15	Adjacent to North Island	Survey of marine life
	1	30	1	30	1	30	Rock shelf between North Island and reef	Collect unusual Labridae and survey lobster pop.
	1	45	1	45	1	45	Cut in reef east of North Island	Survey marine life and photography, Acanthaster(2)
		30		30		30	1 mile northeast of Southeast Island, reef	Survey marine life and photography.
Sept. 13		45		45		45	Northeast side Southeast Island	Survey marine life, set transect marker, Acanthaster(1)
	1		1		1		Southeast side Southeast Island	Survey marine life and photography.
Sept. 14	1		1		1		The Wreck	Survey and photography of marine life around wreck.
		30		30		30	Approx. 4 miles NE of Southeast I. on reef.	Survey of marine life and photography.
		15		15			Approx. 2 miles NE of Southeast I. on reef.	Survey marine life and photography.
		30		30			Approx. 1 mile north of Southeast I. "potholes"	Survey bottom type and photography
Sept. 15		50		50		50	Approx. 5 miles north of Southeast I.(location #1)	Erected temp marker Pearl oyster survey.
	1	10	1	10	1	10	Approx. 440 yds. west of location #1	Pearl oyster survey, Acanthaster (1)
		30		30		30	Approx. ½ mile NW location #1.	Pearl oyster survey.
Sept. 16	1	30	1	30	1	30	Shallows on SE side Grass Island	Photography and collecting possibly undescribed pomacentridae
Sept. 17		25				25	North side Southeast Island	Conducted "fish family" transect, Acanthaster (1)
	1		1		1		North side Southeast Island	Survey of reef life and photography.
Sept. 18		30				30	North side Southeast Island	Collecting possibly undescribed pomacentridae.
		45		45			South side Southeast Island	Marine survey and photography.
Totals	18	40	15	45	17	10		

HAWAIIAN

UNITED STATES
DEPARTMENT OF THE INTERIOR

175°55'

28°00'

DIVING LOCAT

PEARL AND HERM

SEPTEMBER 19

Date	Dive No.	Location
9/11	1	Seal and Kittery
9/12	2	North Island
9/12	3	East of North Island
9/12	4	Cut in reef- North Island
9/12	5	Northeast of Southeast Island
9/13	6	Southeast Island
9/13	7	Southeast Island
9/14	8	The wreck
9/14	9	4 miles northeast of Southeast Island
9/14	10	2 miles northeast of Southeast Island
9/14	11	1 miles northeast of Southeast Island
9/15	12	5 miles north of Southeast Island
9/15	13	¼ mile west of dive # 12
9/15	14	approx ½ mile northwest of location 13
9/16	15	Grass Island
9/17	16	Southeast Island
9/17	17	Southeast Island
9/18	18	Southeast Island
9/18	19	Southeast Island

27°55'

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72

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59

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ISLANDS NATIONAL WILDLIFE REFU

HAWAII

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FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE

175° 45'

28°00'

240

126

186

58

204

60

27°55'

NORTH ISLAND

120

50

sand (awash at high water.)

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234

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exposed

HAWAIIAN

175° 55'

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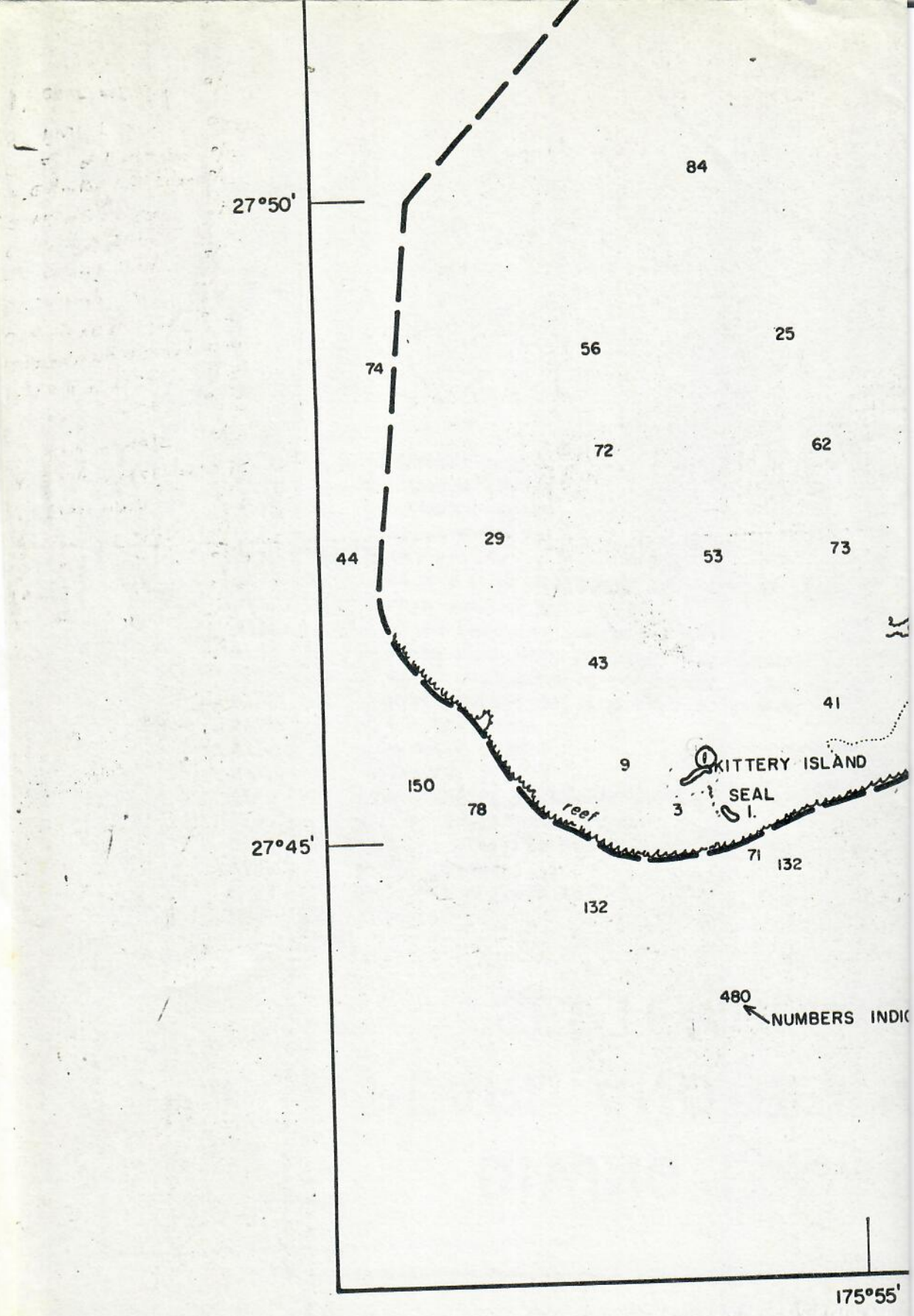
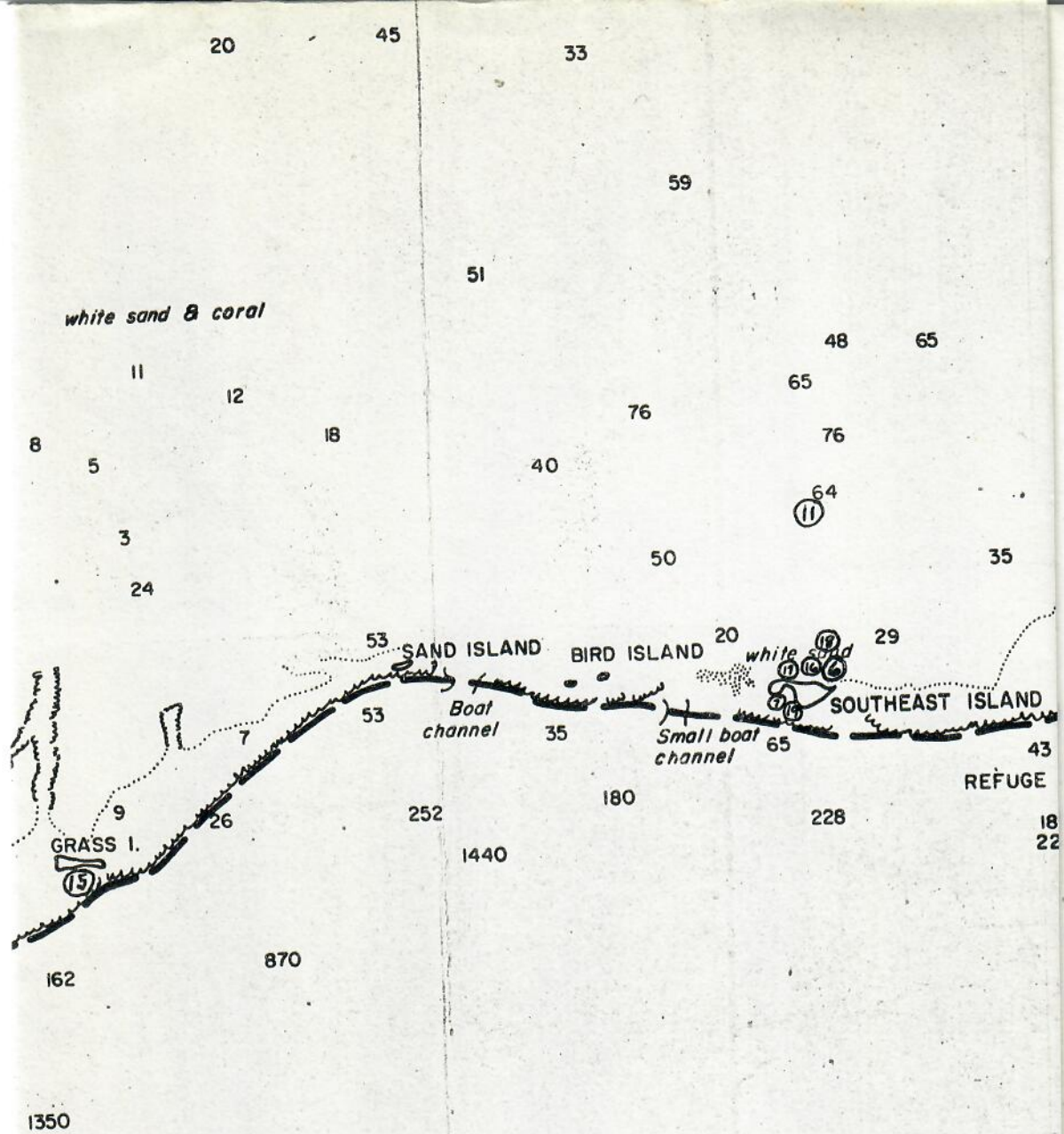


COMPILED IN THE DIVISION OF ENGINEERING
FROM SURVEYS BY C & GS

PORTLAND, OREGON NOVEMBER 1967



CATE DEPTH IN FEET

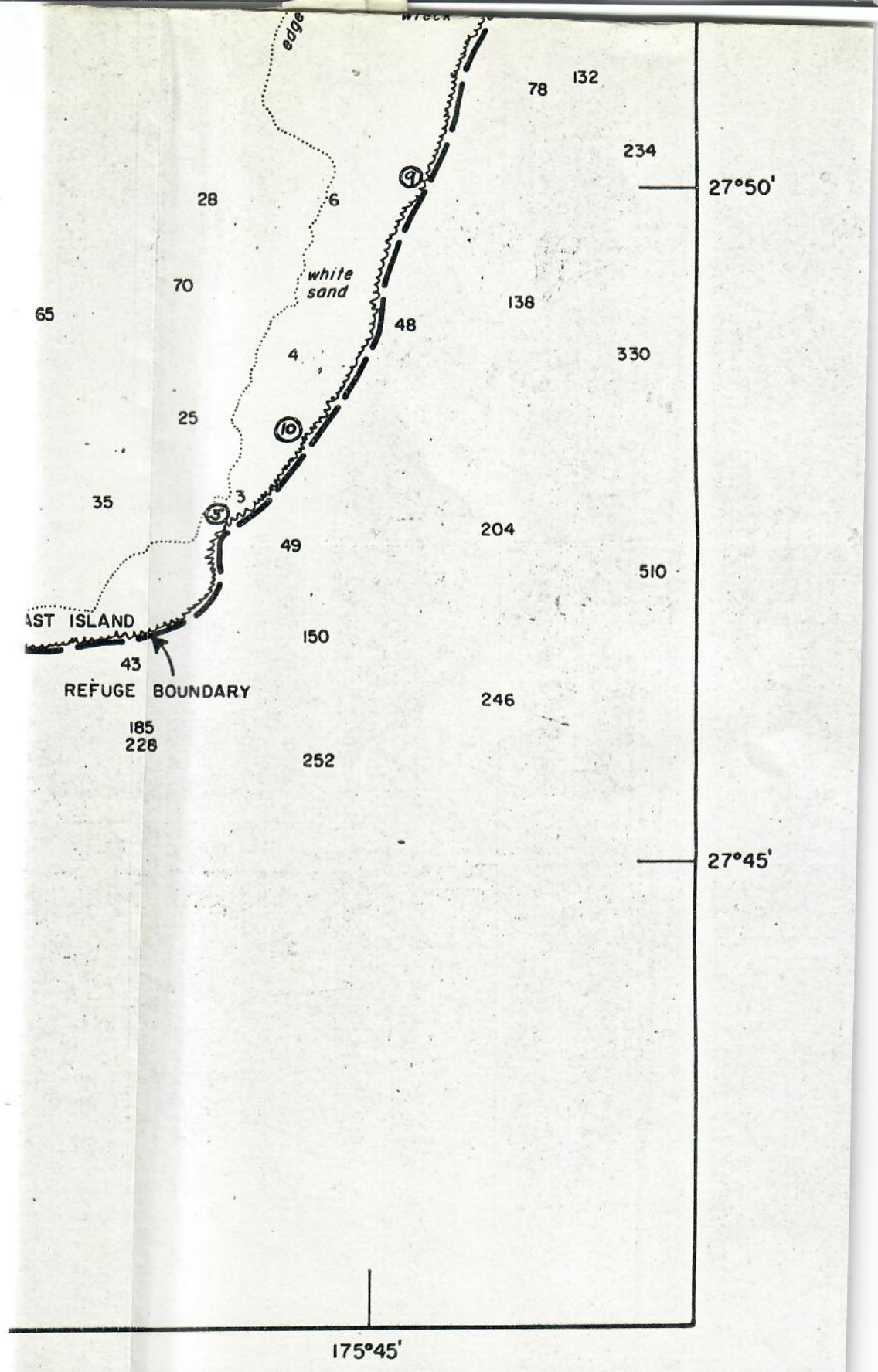
PEARL AND HERMES REEF

175°50'

Scale

1 1/2 0 1 2 3

NAUTICAL MILES



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EXPEDITION REPORT (BOUND)
MIDWAY, LISIANSKI, LAYSAN
NOV 9-13, 1969

Movement of V turtles from FFS to LISIANSKI

From the time we departed from Midway, to the time we arrived at Pearl Harbor, only three days elapsed. This was undoubtedly the fastest sea trip that has been made from one end of the Leeward Islands to the other. Between islands and on the last leg of the trip, the USS Halsey averaged approximately 29 knots. For about a half day, the maximum speed of 32 knots was achieved.

Midway Island

Wildlife Population

The Laysan and Black footed albatross had only been on the island approximately 2 weeks before we arrived. Officers indicated that the last large "home coming" flight arrived on November 8.

Mr. Eberle reported seeing a flock of waterfowl in the fresh water collecting pond near the junction of the two ~~islands~~ runways. We toured the area and found 5 pintails, a scaup (lesser or greater) and a female bufflehead. Around the pond we found approximately 20 dead pintails, all apparently expired during the past month or two. It appeared that there was no food, especially for the pintails and this may have been the primary reason for the death of so many.

ildlife Management Studies

Although no seals were observed, Mr. Eberle reported that there have been approximately 7 seals on the small islets between Sand and Eastern Island during the past month or two.

The tagging of green sea turtles by members of the Coral Kings is progressing at a fine rate. From May 2 - October 12, 24 turtles have been tagged. To Mr. Eberle's knowledge, no "legal" turtles have been taken by divers of Midway. There have been a few larger turtles observed (over 100 lbs) but the divers were unable to catch them.

Apparently, Midway is an area where the smaller turtles congregate and only a few larger ones are found.

LISIANSKI ISLAND

General

Olsen walked around the entire island, censused the seals and turtles and made some general wildlife observations. A cackling goose was observed at a distance of approximately 10 ft on the west shore of the island. Attempts to catch the bird were unsuccessfull. A dead pintail was also observed on the shoreline. The bird had been dead no longer than a day or so.

Wildlife Management Studies

Life history of the Hawaiian Monk seal

A seal census was conducted around the shore of the island. (table I)
Four returns were noted.

Table I

Seal Census

Adults	Sub adults	Pups	Total
59	2	4	65

Seal Tag Returns

Tag No.	Age	Tag Information	Original Tag Information	
732	pup	Yellow nylon double tagged. Noted only single tag	June ~~11~~ 4, 69	Lisianski pup tagged with yellow double
733	pup	Noted only single tag	June ~~11~~ 4, 69	Lisianski pup, tagged with yellow-double
737	pup	Only noted single tag (yellow tag missing)	June ~~11~~ 4, 69	" originally tagged with yellow
828	pup	Only noted single tag	March 30, 69	Lisianski originally tagged with yellow

Studies of the Green Sea Turtle

Twelve turtles were censused on the tour around Lisianski. Two tagged animals were noted and both retained the grey plastic streamer which had been placed on them during August 1965 at French Frigate Shoals. One tag, although having the usual "notify U.S. Wildlife, Honolulu, had no number. The other tag was number 66. — Originally Tagged 8/26/65 on French Frigate Shoals by Amerson - Laying eggs

LAYSAN ISLAND

General

While the shore party was cleaning up and burning the tarps, Olsen walked the beach on the east half of the island and censused seal and turtle populations. Time did not permit an entire walk of the island, or a check of the lagoon. A brief look at the lagoon, from the north end of the island indicated that the water levels were up since the September trip. The shallow pocket at the north end of the lagoon was almost full thus reflecting a higher overall lagoon water level. No evidence of extremely high waves ▪ was noted along the beach, thus the high water levels must have been from rain.

Eight men worked approximately 4½ hours to complete the tarp cleanup. The tarps were burned and the steel stakes were placed in burlap bags and dumped off the ship into the ocean.

Wildlife Management Studies

Life History of the Hawaiian Monk Seal

Thirty seals were censused on the east side of the island and the helicopter pilot reported counting 44 seals on the west beach. His latter count is believed to be inaccurate since only the obvious seals on the shoreline were counted and those in the vegetation were undoubtedly missed. (table II).

Table II

Seal Census Laysan Island

Adults	Sub adults	Pups	Unknown	Total
22	5	3	44*	74

*West side of the island count made by helicopter pilot.

Life History of the Green Sea Turtle

Turtle Observations

Four turtles were observed on the beach. None were tagged. A single turtle was covered with cysts around the head and front flippers.

SEAL TAG RETURN DATA

Seal ~~Turtle~~ Tag Returns

Tag No.	Age	Tag Information	Original Tagging Information
A196	Sub adult		Originally tagged 9/26/67 Laysan checked 2/10/69 Southeast Island
614-814	pup		3/26/69 Pup Laysan
711	pup	double tagged plus nylon	6/2/69 pup Laysan
816	single tag		3/26/69 pup " animal originally had double tags plus yellow nylon, yellow and #614 now gone.

The wound where the tag was placed on animal wearing 711 was still bleeding. (Again makes us wonder if we should abandon this yellow nylon tag).

Regional Director, Bureau of Sport Fisheries and Wildlife, Portland, Oregon

July 6, 1968

Wildlife Administrator, Kailua, Hawaii

June trip to Hawaiian Islands Refuge

Last month a trip was made to French Frigate Shoals to continue studies of the Hawaiian monk seal and green sea turtle. Major objectives were to tag seal pups produced this spring and to tag and observe nesting of turtles during the peak of the breeding season. Other objectives were patrol, inspect habitat conditions and wildlife populations there, and observe activities of employees of the Smithsonian Institution conducting studies there under the cooperative agreement with the Bureau.

Personnel included in the Bureau party included myself, Biologist Ernest Kosaka of the Hawaii Division of Fish and Game, and Dr. Hendrickson of the Oceanic Institute, Waimanalo, Hawaii. Most of Kosaka's expenses were funded through our contract with the Division to furnish assistance to me on the refuge while the balance was funded by the Division itself. Hendrickson was a last minute substitute for Biologist John Sincock who was unable to go because of an accident to his knee on Kauai about a week before the trip. Hendrickson is an authority on sea turtles, and the trip afforded him an opportunity to inspect this area where he hopes to conduct turtle investigations financed by either the National Science Foundation or the Office of Naval Research.

Hendrickson was there for one week, Kosaka for two weeks, and I for three weeks. I was forced to stay for a week longer than planned, to June 27, because personnel at the Loran station there forgot to notify Coast Guard District headquarters about the number of passengers who would be returning on June 20, and as a result there was not enough room on the plane for me. Kosaka was needed by his agency that week.

Transportation to and from French Frigate Shoals was via the Coast Guard aircraft operating from Oahu and in conjunction with its weekly support trip there. The Coast Guard cooperated further by allowing us to berth and mess with Loran station personnel. Travel within the atoll was via the 14-ft. skiff left there in March, 1967 and the 20hp outboard motor we brought with us. We primarily operated out of Tern Island since we were limited to the amount of supplies and equipment which we could take out with the airplane; however, a number of nights were spent camping on the other islands.

Activities were hampered for several days by strong winds and rough lagoon waters which confined us to Tern Island. During the first week I was hampered by a reaction to bird tick bites which caused fever, watery and bloody blisters where bitten, and a badly swollen leg for several days. These ticks are abundant here and on the other refuge islands during the summer months and are noted for attacking humans. Most people are not bothered too much, but others, such as myself, are highly allergic to their bites.

A total of 65 monk seals (49 pups and 16 yearlings) were sexed and tagged.

Since September 1966, a total of 475 monk seals have been tagged by us on the refuge. In addition to the tagging this month, another 13 animals tagged during previous trips were recaptured. All had been tagged here.

Including the pups, a total of 136 animals were tallied on the various islands. The 49 pups produced this year was a surprisingly large number and far exceeded expectations. Since this was the first time we have had the opportunity to visit this area during this time of the year and after most pupping has taken place, we are unable to say whether this would be normal production. It does, however, point up to this area as a very important breeding area for this animal.

A total of 118 green sea turtles were tagged. This brings the total of animals tagged on the refuge to 426 - 253 of which were tagged at French Frigate Shoals. Return of tags so far is rather meagre, but we have records of tagged animals being taken by fishermen off Hawaii, Molokai, and Kauai of the main islands. In addition we have recaptured breeding animals here which we tagged on Laysan Island and Pearl and Hermes Reef. A pattern appears to be developing which indicates that French Frigate Shoals is the most important breeding area by far for all the turtles in the Hawaiian archipelago. All the more reason to keep it inviolate.

Only animals basking on the beaches or returning to the sea after egg laying were tagged. Others engaged in digging nests or laying eggs were not disturbed. A vinyl bouy paint was used to paint identifying numbers on shells of tagged animals, but observations later indicated that this paint, also, was failing the test for a good permanent marking on the shell. Other methods, possibly notching the shell or perhaps branding the shell, will have to be tried. At present it is necessary to turn the animal in order to immobilize it for tagging. This is hard on both turtle and man. We want to avoid handling them as much as possible. Measurements of both the carapace and plastron were taken of 87 animals.

Records were kept of animals which showed evidence of bites, presumably shark bites. More than a few were missing parts of flippers and tails or had pieces out of their shells which gave every appearance of having been bitten off. Photo Sharks abound in these waters. Late during the afternoon of June 26, a large male turtle was observed being washed back and forth by the surf on the beach of Tern Island. The animal was dragged ashore in hopes that it could rest and possibly recover somewhat from the shock of having its entire tail, right rear flipper, and left front flipper very recently bitten off. The animal died during the night. Photographs were taken to document the extent of the wounds.

Attempts to devise a quick way to estimate the probable breeding populations were proven unreliable so it is back to the drawing board. However, of the 118 tagged, we only observed four again. Dr. Hendrickson surmised that perhaps there were 1,500 to 2,000 animals using the atoll for the breeding season from late May to midAugust. This was off the top of the head figure, but it could very well be that this is the case.

While there, I reviewed A. Binion Amerson's preliminary draft of the Smithsonian report on this area. The report was not complete, however. Amerson hopes to be able to complete the first draft sometime this year. Both he and Ronald Amerson (no relationship) spent most of June on the refuge banding birds, recapturing those previously banded, censusing populations, and taking blood samples.

Of note was the red-billed tropicbird they collected on East Island during the second week of June. The only other record for the Hawaiian Islands was that of a bird collected by Alexander Wetmore off Nihoa Island in 1923.

They were using a 16-man rubber raft with a transom suitable for a 10 to possibly 20hp outboard motor. The raft was far more seaworthy than the 14-ft. fibre glass skiff we were using. Weighing about 250 lbs., it is readily transported, when deflated and rolled up, in a car or airplane. They store it at Tern Island. I was informed that it cost about $600.00. I prefer the 16-ft. Boston Whaler for this type of work, but the raft has its merits; not the least of which is its ease of transport by plane.

Three large porpoises were seen inside the reef once as they accompanied our skiff from Tern to Trig Islands. Rays were noted several times around Whale-Skate Islands. Sharks did not appear to be as abundant off Whale-Skate Island as they usually are. Several 10-ft. specimens were seen. One patrolled East Island for some time, and the Amersons reported it taking unwary albatross chicks which had either alighted on the water or swam offshore for reasons only a gooneybird could explain.

Having to spend the last unplanned week on Tern Island upset a scheduled speaking engagement before a bird group here, since rescheduled, plus end of the fiscal year reports, purchases, bookkeeping, etc..

Eugene Kridler

aug 31, 1969

REPORT OF
WILDLIFE MANAGEMENT STUDY

Progress Report No.1

Division of Wildlife Refuges — Project: Hawaiian Islands Refuge

Region: 1 — Code: No. 2

Title: Populations and Movements of the Green Sea Turtle (Chelonia mydas) on the Hawaiian Islands National Wildlife Refuge.

ABSTRACT

Since 1961, a total of 469 green sea turtles have been tagged on the Hawaiian Islands Refuge. Another 35 have been tagged on Midway Island which is about 95 miles west of the last unit of the refuge, Pearl and Hermes Reef. Tag returns confirmed the hypothesis that turtles which breed on refuge islands are taken by fishermen from waters off the main Hawaiian Islands. Censuses reveal that the islets at French Frigate Shoals are by far the most important nesting areas for this species in the central Pacific and probably the nation. No known nesting takes place in the Hawaiian archipelago except on refuge islands. Nesting can occur from May through August. Preferred islets are those which are low and sandy and free of human disturbance. Reef fish, ghost crabs, and possibly frigate birds are highly predaceous on hatchling turtles. Sharks prey on adult turtles, but the incidence of this predation is limited to observations of loss of limbs and chunks bitten out of shells. Measurements and weights have not been analyzed yet, but most involve adult animals. Unknown is what happens to hatchlings after they leave. Few small "platter" size turtles have been observed around refuge islands. A full scale study confined to this species alone is needed to obtain information about food habits, breeding populations, success of nests, and fate of hatchlings from time of reaching the sea until they return as nesters. Lack of time plus inadequate transportation facilities hamper the study. Originally set up as a five-year study, it will have to be extended indefinitelly.

OBJECTIVES

1. Gather data on populations of sea turtles using the Hawaiian Islands Refuge by islands, seasons, and year.
2. Determine probable breeding populations.
3. Determine nesting requirements.
4. Determine migration and movement in the Hawaiian archipelago and possibly the central Pacific ocean.
5. Investigate the possible relationship of refuge populations with those harvested in waters of the main Hawaiian Islands.
6. Determine subspecies in the Hawaiian Islands.

7. Begin preliminary life history studies with special reference to longevity, growth rates, foods, and mortality factors.

INTRODUCTION

Although the green sea turtle has been almost completely eliminated as a breeding entity in the Mainland United States, it is still fairly common in the Hawaiian Islands. However, until recently, little attention has been devoted to this animal to obtain even the most elementary information about its populations (including trends), movements, breeding areas, productivity, or basic life histories. A few animals have been tagged by the Hawaii Division of Fish and Game, but other than this, little else has been done. There are no restrictions on the seasons, kind, or number of turtles that can be taken in the state. They receive protection only on the refuge. Although there is some information obtained on the commercial take, this is skimpy at best. No one has any idea what the noncommercial take is, and this undoubtedly far exceeds what may be the commercial harvest. Although it was surmised that animals taken around the main islands probably bred on the Northwestern Islands since no known breeding areas existed on the main Hawaiian Islands, there was no proof. Accordingly, refuge personnel with assistance later from Mr. John Sincock, endangered wildlife research biologist stationed on Kauai, initiated a fact gathering program in 1964. Emphasis was placed on a tagging program to determine movements of turtles. So-called turtle experts were unsure as to what species exist in this part of the Pacific. Refuge personnel have taken a number of measurements which might be of assistance in determining subspecies as well as growth rates. In 1967 Dr. John Hendrickson, who had studied this animal thoroughly in Sarawak, evinced interest in initiating a complete study of the turtle on the refuge as well as the main islands. He accompanied refuge personnel to French Frigate Shoals in June, 1968 to familiarize himself with this area during the breeding season so he could better plan his study. Unfortunately, he has sinced moved to Arizona without following through on his original plans. Lack of time plus lack of transportation has resulted in refuge personnel limiting themselves so far to a tagging and censusing program. With acquisition of SCUBA training and diving authorization, it is hoped that we can follow the animals into the water to study their activities there.

Methods

Census Techniques

So far this has been limited to counting turtles found on beaches. When they can be captured they are sexed, tagged, or examined for tags placed previously. During June, 1968, attempts were made to determine numbers coming up the beach each night on one particular islet to nest by dragging the beach each morning to obliberate tracks made previously. This was given up because we were unable to spend all our time on only one islet. This system has merit if one was able to spend all his time going from islet to islet each morning for the four month nesting season, seas permitting travel each day between islets.

Tagging

Animals have to be turned over on their backs in order to tag them. Very powerful, it takes at least two men to turn one unless you are able to get behind them and flip at the moment both front flippers are just past the half way mark to the rear. Thus its forward motion assists flipping. According to Hendrickson, turtles on Sarawak were easily tagged with no disturbance after

they had completed nesting and had just finished covering the nesting hole. Supposedly they were exhausted from the effort. However, they must differ from the Sarawak turtles in this regard because when a tag was affixed at this time, the animal lurched forward convulsively and quickly began crawling down to the water with one man trying to hold it back and the other trying to tag or get his pliers open after tagging. Two men cannot handle an adult turtle in this manner. This method, however, might be useful if one has much time to spend an entire night on an islet waiting for the laying activity for each animal to terminate - an act that may take as much as an hour and a half per animal.

The tag itself is a monel metal cattle ear tag which is numbered on one side and bears the inscription "U.S. Wildlife, Honolulu" or later "U.S. Wildlife, Kailua, Hawaii" on the other side. It is affixed to the right front flipper near the body just where the flipper begins to flatten out. In June, 1968 bouy paint was used to number each animal; however, it did not last since males copulating later with females in the water mount them clawing and scraping with their own front flippers thereby scraping the paint off. In March, 1968 epoxy paint was used at Pearl and Hermes Reef, but none of the animals were seen since so we were unable to determine the success of this method. We plan to work with the Oceanic Institute at Waimanalo, Oahu to test paints on turtles they have in their display pond at Sea Life Park. Pressure paint guns used for marking fish in the water were tested, but the shell proved to tough for penetration. Observations on previously tagged animals indicate that the monel metal tag is retained well. This method is used by Dr. Carr of the University of Florida for tagging green sea turtles in the Carribean.

Measuring

During the early phases of the program, measurements were taken of the carapace in a manner used by the Hawaii Division of Fish and Game. This consists of using a steel tape and measuring the longest and widest parts of the shell on the round. Later calipers were used to measure horizontal distances of the longest and widest parts of the carapce, longest of the plastron, and the thickness of the animal at the thickest part of the body. Measurements on the round were also taken for later analysis of possible correlation between the two methods.

Weights

Because it is necessary to travel as lightly as possible while walking around the beaches of the islands, a spring scale with 5-lb. graduations and a capacity of 500 lbs. is used. The animal is dragged onto a small tarpaulin which is drawn together by a rope. This is attached to the scale, and the animal is suspended from a two stout bamboo poles lifted by brute force by two men while the third man reads the scale.

DISCUSSION

Pearl and Hermes Reef and French Frigate Shoals support by far the largest populations on the refuge. Southeast Island and North Island at Pearl and Hermes are the most important there. However, very little nesting takes place at Pearl and Hermes although superficially it is very similar to French Frigate Shoals. Since it is further north, it may be that warmth of sand may be a factor. Almost all nesting takes place at French Frigate Shoals at Trig, Whale-Skate, and East Islands. Pits have been found on Gin and Little Gin, but we have been unable to determine success of these nests even though 50-60 pits may be noted on the latter two islands when visited in the late summer and early fall.

Little nesting takes place on Tern Island because of the activity of Coast Guard personnel manning the Loran station there. Lights, noise, and movements seem to warn the animals to go elsewhere.

Since these animals may dig more than one pit before depositing their eggs in one, there is no way of determining which are active without digging them up or being present when they hatch. This is impractible. Occasionally one female may dig a pit on top of a nest constructed by another thereby scattering the eggs of the first nest over the surface of the sand. Occasionally turtles will crawl into a sooty tern colony and destroy tern eggs by crawling over them or scattering them about while it digs its pit. The entire north half of Trig Island may be churned up by digging activities.

Old reports relate how many turtles used to be taken by crews of ships landing at Laysan and Lisianski. One such crew even left a sign behind requesting any parties which may land later to exercise restraint in taking turtles. However, at no time have we ever recorded more than 6 turtles on Laysan or more than 25 on Lisianski. There is little evidence of nesting activity on either.

Since there are no mammalian predators on refuge islands, there is little predation, if any, on eggs. Hatchlings, however, are subjected to predation by ghost crabs, reef fish, and occasionally by frigate birds (if a nest hatches during the day). Since most nests hatch at night, birds are not too much of a problem. Reef fish probably are the most severe predators. In September, 1966 a nest with 64 hatchlings reaching the surface was observed for checking on the fate of the hatchlings. Several were flipped over on their backs while encountering obstacles while making their way to the beach. Many which made it to the water disappeared in a swirl a few feet from the beach as reef fish fed upon them.

Tagging to date has been largely confined to animals found on the beaches. Occasionally members of the diving club on Midway have cooperated with us by catching animals at night in the water. This cooperation has been sporadic and is contingent on whomever happens to be president of the club at the time or on the enthusiasim of some members. Table No. 1 shows the numbers of animals tagged by year and refuge unit. Numbers reflect relative abundance of animals although were refuge personnel able to spend several summers at French Frigate Shoals during the nesting season, the numbers for that unit would far exceed those for all others combined.

So far over 55 observations have been made of animals tagged previously. Most take place on the unit where they had been originally tagged. Table No. 2 shows animals observed or taken in areas other than where tagged. Seven were of animals tagged during the breeding season at French Frigate Shoals which were later taken by fishermen in waters around all the main Hawaiian Islands except Maui and Lanai. Doubtless others were taken but were not reported. Other records show travel between refuge units. Of significance was a male tagged at Pearl and Hermes Reef and observed 6 months later at French Frigate Shoals. A female tagged also at Pearl and Hermes Reef in September, 1966 was recorded at French Frigate Shoals a year later. There is a likelihood that at one time or the other adults may journey to French Frigate Shoals to breed.

Turtles are reputed to reach breeding age when about 5-6 years old. Frequency of breeding is reported to be every other year to every fourth year. Determination of frequency of breeding of the refuge population is as yet unknown. The average turtle is supposed to nest about five times each breeding season.

Sharks will attack adult turtles. Animals have been found with flippers and tails bitten of in part of even wholly. On June, 1968 an adult was found washing back and forth in the surf at Tern Island. When pulled ashore, it was discovered to have both rear flippers, its tail, and halves of the front flippers completely bitten off. It died that night. In March, 1968 another adult also found on the beach at Tern Island had a piece bitten out of its shell that was 10 inches long and 4 inches deep. The shape of the wound looked every bit like that which would be caused by a shark. Although some of the viscera was exposed, the animal was still lively so it was tagged in hopes that if it lived, it might be encountered later. Sharks are abundant around all refuge islands.

Unlike the Atlantic subspecies which supposedly does not come ashore at any time except to nest, that found on the refuge frequently comes ashore at all seasons to bask. This includes both males and females. As many as 25 have been found strung along the beach near the edge of the water at one time.

Females on the beach outnumber males, especially during the nesting season - to be expected then. Generally during the breeding season males await offshore to copulate with the females in the water although on two occasions copulation was witnessed in June, 1968 occurring on the beach.

All data, including tagging and recovery, have been transcribed onto 3 x 5 cards. Later it is planned to enter the data on special cards for ease of organization and analysis. Much literature search is needed.

CONCLUSIONS AND RECOMMENDATIONS

Because of the other studies refuge personnel are conducting on the short semiannual trips plus the uncertainty of receiving transportation to the refuge, acquistion of data is and will continue to be a slow process. The study should be extended to at least 10 years. Preferably, and if it can be arranged, a university sponsored research program should be encouraged and undertaken with the refuge plugging in that already done and contributing what it can in the future, especially on other refuge islands. Care would have to be exercised, however, that the study not be detremental to other forms of wildlife using the refuge, especially the monk seals on the smaller islands.

ACKNOWLEDGEMENTS

To John L. Sincock, endangered wildlife research biologist, Division of Wildlife Research, Koloa, Kauai, Hawaii for his assistance since September, 1966.

Submitted by: _____

Eugene Kridler
Wildlife Administrator
August 31, 1969

Distribution: John L. Sincock, Division of Research
Central Office

Table No. 1. Numbers of Green Sea Turtles Tagged on Hawaiian Islands National Wildlife Refuge and Midway Atoll, 1961-69

Date	Necker Island	French Frigate Shoals	Laysan Island	Lisianski Island	Pearl Hermes Reef	Midway Atoll	Totals
September, 1961			2				2
December, 1963			3				3
March, 1964					7		7
September, 1964		3			20		23
March, 1965					2		2
August, 1965		87					87
March, 1966		10			1		11
April, 1966					9		9
June, 1966		4					4
August, 1966		2	1	2	45		50
March, 1967	2	24	1	8	11		46
May, 1967		34					34
September, 1967	1	2	1	5	7	13	16
March, 1968	1	1	3	9	9	22	45
June, 1968		118					118
February, 1969		3					3
March, 1969	1		2	9	12		24
May, 1969					1		1
June, 1969	—	9	—	—	—	—	9
Totals	5	297	13	33	124	35	507

Table No. 2. Noteworthy Green Sea Turtle Tag Return Observations, Hawaiian Islands National Wildlife Refuge

Date Tagged	Date Returned	Elapsed Time	Island Tagged	Island Returned	Distance Traveled	Sex	Tagging Number	
6/18/68	9/12/68	3 months	French Frigate	Oahu	500 miles	F	Breeder	785
6/22/68	9/-/68	3 months	" "	Molokai	525 miles	F	"	787
6/17/68	6/-/69	1 year	" "	"	"	M	-	768
6/16/68	1/25/69	6 months	" "	"	"	F	Breeder	755
9/20/66	3/12/67	"	Pearl & Hermes	French Frigate	550 miles	M	Basker	123
6/12/66	2/12/67	8 months	French Frigate	Hawaii	650 miles	M	Breeder	110
3/22/66	5/22/68	1 yr. 3 mo.	" "	Kauai	390 miles	F	Basker	91
3/21/65	12/13/67	2 yr. 9 mo.	Pearl & Hermes	Laysan	270 miles	F	"	1101
6/18/67	2/27/68	8 months	French Frigate	Molokai	525 miles	F	Breeder	612
9/22/66	9/17/67	1 year	" "	Pearl & Hermes	550 miles	F	Basker	168

Distances are rounded off.

Animals taken at Oahu, Kauai, Molokai, and Hawaii were harvested by fishermen. Others were recorded and released.

Table 6

Turtle Tagging
French Frigate Shoals
May 1972

Tag #	Date	Sex	Plastron Length	Carapace Length Straight	Carapace Width Straight	Carapace Length Curved	Carapace Width Curved	Thickness	Weight	Tat
19	5/5	M	32 1/2	31 1/4	25 1/4	32 1/2	32	11 1/2	155	Trl
20	5/5	M	25 1/4	31 1/2	25	33	31 1/4	10 3/8	155	Trl
21	5/5	F	23 1/2	29 3/4	22 3/4	32	30	11 1/2	140	Trl
	Missing 1/2 hind right flipper									
22	5/5	F	30 1/4	36 1/4	28 3/4	38 1/2	40 1/4	13 1/8	280	Trl
	Missing 1/2 hind right flipper									
23	5/5	M	27 1/4	34	25 1/2	35 1/2	34 1/2	12 1/2	175	Trl
24	5/5	M	27 3/4	35 1/2	27 1/2	36	34 3/4	12 1/4	205	W.S
25	5/5	M	24 1/4	31	24 3/4	32 1/4	30 1/4	10 1/4	145	W.S
26	5/5	M	27 1/2	33 1/4	26 3/4	35 1/4	34 3/4	11 1/4	190	W.S
27	5/5	F	28	36 1/4	27 1/2	38	34 1/4	16	210	W.S
28	5/5	M	29	36 1/4	27 3/4	38 1/4	37	12 1/2	210	W.S
29	5/5	M	27 3/4	34 3/4	29 1/4	38	35 3/4	10 1/4	215	W.S
30	5/5	M	28 1/2	35 1/2	27 1/2	36 3/4	34 1/4	12 3/4	235	W.S
31	5/5	M	26 3/4	31 3/4	24 1/2	34 1/4	33	13 1/2	185	W.S
32	5/5	F	31 3/4	38 1/2	30	39 1/2	41	15 1/4	282	W. S
33	5/5	M	25 3/4	32 1/4	25	34	32	12 1/4	160	W.S
34	5/5	F	31 1/4	37 1/4	29	39	39	15 1/2	285	W.S.
35	5/5	M	26 1/4	33 1/4	24 3/4	34 3/4	32 1/2	11	175	W. S
36	5/5	M	29	37	28	39	35	11 1/2	205	W. S
37	5/5	M	26 1/2	33 1/4	25 1/2	35	33 3/4	11 1/2	180	W. S
38	Tag lost in sand									
39	5/5	F	29 3/4	36	29 1/4	37 1/2	37 1/2	12 1/4	230	W. S

Table 5

Tag #	Date	Sex	Plastron Length	Carapace Length Straight	Carapace Width Straight	Carapace Length Curved	Carapace Width Curved	Thickness	Weight	Island
40	5/5	F	29	36	27 1/2	38	36	14 1/2	265	W. S.
41	5/5	F	29 1/2	35 3/4	28 3/4	38 1/4	35 1/2	14	255	W. S.
42	5/5	M	24 1/2	32 1/4	25 1/4	34	31	10 1/4	160	W. S.
43	5/5	F	30 1/4	35 3/4	27 3/4	39 1/2	36	15 1/4	280	W. S.
44	5/5	M	27 3/4	33 1/2	26	35	33 1/4	11 1/2	185	W. S.
45	5/5	M	25 3/4	33 1/4	25 1/4	35 1/2	32	11 3/4	180	W. S.
46	5/5	M	26	33 1/2	25 1/4	34 1/2	32 1/2	11 1/2	200	W. S.
47	5/5	M	27 1/2	32 3/4	26 1/2	34 1/2	34 1/4	13 1/4	210	W. S.
48	5/5	F	33 3/4	36 1/2	29	38 1/4	37 1/4	15 1/2	325	W. S.
49	Tag destroyed									
50	5/5	F	28 1/2	35 1/4	25	37 1/4	34 1/4	14 3/4	260	W. S.
51	5/5	F	27 1/2	35 1/4	26 3/4	38	34	13 1/2	250	East
52	5/5	F	29 1/4	35 3/4	26 3/4	37 3/4	36	14	255	East
53	5/5	F	29 1/4	35 1/2	28 3/4	38 1/4	35 1/2	12 1/4	230	East
54	5/5	F	30 1/2	37	28	39 1/2	38 1/2	14	280	East
55	5/7	F	28 1/4	36 1/4	27 1/2	36	34 1/4	13 1/4	205	East
56	5/7	F	29 1/4	36	26 1/2	39	37 1/2	16 3/4	315	East
57	5/7	F	29 1/2	37	28 3/4	39 1/4	37 1/4	14 3/4	280	East
58	5/7	M	28 1/4	34 1/4	23 3/4	35 1/2	33 3/4	12 1/2	220	East
59	5/7	F	28 1/4	35 1/4	28	38 1/8	35 1/4	14 1/4	205	East
60	5/7	F	28 1/2	34 3/4	27 1/4	38	36	15 1/4	255	East
	Photos of egg pit and sand									
61	5/8	F	27 1/4	33 3/4	25 3/4	36 3/4	35	14 1/4	210	East
62	5/8	F	29 3/4	35 1/4	28 1/4	38	37	14 1/4	230	East
63	5/8	F	28 3/4	35 3/4	26 1/2	38	36	13 1/2	230	East

Table 6

Tag #	Date	Sex	Plastron Length	Carapace Length Straight	Carapace Width Straight	Carapace Length Curved	Carapace Width Curved	Thickness	Weight	Island
64	5/9	F	30	37 1/2	27 1/4	40	38	13/3/4	270o	W.S.
65	5/9	M	27 3/4	34 3/4	25 3/4	37	34	13 3/4	210	W.S.
66	5/9	M	27 1/2	33 3/4	26 3/4	36	35 3/4	13 1/4	205	W. S.
67	5/9	M	26 3/4	33 3/4	25 3/4	35	32 1/4	12 1/2	190	W. S.
68	5/9	F	29 1/4	35 3/4	27 1/2	38	37 3/4	15 1/2	260	W. S.
69	5/9	F	28 1/4	35 3/4	27 1/4	36	36 3/4	14 1/4	230	W. S.
70	5/5	F	28 3/4	35 3/4	27	37	34 1/2	14/3/4	225	W. S.
71	5/9	M	28 1/4	36 1/4	27	38	34	13 3/4	225	W. S.
72	5/10	F	28 3/4	34	27 1/2	37 1/2	36 3/4	14 3/4	275	East
73	Lost in sand									
74	Did not use									
75	Did not use									

Table 7

Turtle Retraps
French Frigate Shoals

Tag #	Sex	Location	Date	Carapace Length	Carapace Width	Plastron Length	Thick.	Round Measurements	Weight
736	F	East Is.	6/14/68	No measurements taken					
	F	Trig Is.	5/17/71	37.8	28.6	29.9	13.7	40 X 36 1/2	270
	F	Trig Is.	5/5/72	37 1/4	29.0	30	13 1/2	39 X 37	275

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NECKER SEPT 15

No tagged animals were found. After their initial disturbance while we checked for tags and sex, the animals returned to this spot to resume their resting and sunning while we busied ourselves elsewhere on the island.

F. Other Birds.

Ruddy Turnstone. We observed two flocks of 30 and 7 of these birds. No dyed or banded birds were seen. These birds usually frequent the rocky shelves just above the surge zone.

Golden Plover. _ were seen scattered over the island.

Mockingbird. This species was recorded for the first time on this island. It is not, however, the first for the refuge. Woodside of the Hawaii Division of Fish and Game saw several on Tern Island of French Frigate Shoals a number of years ago. Two years ago one was collected by Amerson of the Smithsonian Institution on Tern Island. This species was introduced years ago on the main Hawaiian Islands and those recorded from the refuge apparently are strays from those islands.

All four members of the party saw this bird as it flew up about 50 ft. behind us on the south slope of Annexation Hill. The long tail with the outer white tail feathers, the white wing patches, gray coloration, and the undulating flight were all distinctive.

H. Reptiles.

Green Sea Turtles. 3 of these animals were sunning themselves near the turtles when we landed upon the island. All were turned for tagging, measuring and weighing. Some difficulty was experienced turning them because of the poor footing on the slippery rocks. We instigated a new method of measuring by use of calipers as well as that of taping the length and width of the shells by use of a steel measuring tape.

No.	Sex	L (Cal.) W	L (Tape) W	Lbs.	Growths
450	Female	33.8" x 24.8"	36.25" x 33.75"	200	None
636	Male	31.3" x 26.5"	33.50" x 31.50"	185	None
426	Female	30.3" x 24.1"	32.75" x 30.50"	155	None

No. 426 was tagged on this island on March 10, 1967. There was no significant growth of the shell during the intervening period.

Sept 16-19, 1967

TERN ISLAND

I GENERAL

A. Weather. The weather during the entire period spent at French Frigate Shoals was warm and sunny with little wind. Rains during the summer were frequent enough to enable the water reservoirs maintained by the Coast Guard Loran Station there to keep the station complement of 20 men adequately supplied. No damaging storms had occurred during the summer.

II WILDLIFE

A. Migratory Birds.

1. Seabirds. Very little use is made of this island by wildlife. During the winter and spring albatross nest here in low numbers. There is a scattering of other species nesting here throughout the year, but just a handful. During our stay here, we found 9 large red-tailed tropicbird chicks completely feathered out, one small downy young wedge-tailed shearwater chick , and 1 dead adult Common noddy tern.

B. Other Birds.

Ruddy Turnstones. Only 3 seen.

Golden Plover. 3 seen.

Nihoa Finch. Only 5 remain of the 30 transplanted on this island in March, 1967. This experiment appears doomed to failure. A pair was seen feeding on Cenchrus seeds north of the radio building. The other 3 frequently are seen in front of the barracks-mess hall building. On a number of occasions during our stay there, we noticed them coming to drink water from the dripping water tap in front of the recreation building. All birds were banded. Thus there is no evidence that there was any reproduction during the summer. For what it is worth, discussions with Coast Guard personnel stationed there revealed that no nests had been found.

D. Other Mammals. No seals were noted. Seal use is very low because of human disturbance.

H. Reptiles.

1. Green Sea Turtle. We saw none. Use is low; however, Coastguardsmen told us that several nests had hatched on the east end of the island this past summer.

III REFUGE DEVELOPMENT AND MAINTENANCE

A. Physical Development. The large refuge recognition sign was erected on

the island in a prominent place in front of the buildings so that any and all persons landing on the island, usually by aircraft, would have to see it. Attempts to erect it on the March, 1966 trip were frustrated by the local commanding officer there at the time, a Lt. (jg) Archer, who insisted that the Bureau had no jurisdiction there. Rather than precipitate a needless argument there at the time, we decided to wait until the Coast Guard had formally recognized our primary jurisdiction through the new in effect cooperative agreement then erect the sign at the earliest convenient occasion. All major islands or island groups now have such sign on them at the most prominent landing site except Necker and Gardiner Pinnacles. One erected at Necker in September, 1966 was destroyed by a fierce winter storm. We never have been able to land at Gardiner Pinnacles to put the sign up there. This will be a [illegible] could say that anyone who can land there desires to be upon it for a while.

VII OTHER ITEMS

A. Items of Interest. A discussion held several weeks ago with the officer in charge of the Loran station in the district revealed that eventually they plan to enlarge the runway on Tern Island to enable C-130's to land there for logistic purposes. At present this station is supplied weekly by Albatross amphibians which are long obsolete and for which they are having very much difficulty in obtaining parts. These planes will have to be phased out in the near future. They also plan to deepen and straighten the channel from the present ship anchorage to the island to accommodate bouy tenders so that they could dock against the island. The present channel can only accommodate small boats during relatively calm weather. The terms of the cooperative agreement specify that the Coast Gaurd shall have the use of the island for Loran and other aids to navigation and the improvement or enlargement of these facilities as deemed necessary by the Coast Guard, with the right of ingress and egress thereto. They also plan to demolish the present old buildings there and erect new and better ones. The officer mentioned that provision could be made for quarters and possibly another room for Bureau personnel when at French Frigate Shoals for research purposes. If new buildings are constructed, we should make sure that such provisions are included. There is not a definite year set for the improvements, but we should be aware of their proposals and be in a position to act and comment upon them at the time.

TRIG ISLAND

I GENERAL

B. Habitat Conditions.

2. Cover. The island looked dry. Leaves of Tribulus were rolled up. The Boehavia, however, was blooming profusely. Photostations were recorded.

II WILDLIFE

A. Migratory Birds. No count made.

D. Other Mammals.

Hawaiian Monk Seal. The following seals were tallied:

2 adult male	4 subadult unclassified
7 adult female	1 pup
9 adult unclassified	

Notes were taken on the moult stages.

H. Reptiles. On the first day we landed no turtles were found on the beaches. This is very unusual because Trig has in the past supported the largest populations in this atoll every time we visited it in March and September in previous trips. One dead adult bearing Tag No. 168 was found dead and on its back. This looked as if someone had landed on the island and flipped it. Coast Guardsmen on Tern Island denied landing there, but chance remarks dropped by several of them while we were there later indicated that some were going there to look for glass balls. The commanding officer there was told that landing upon them was not permitted because of wildlife disturbance and the possibilities of introducing weeds from Tern Island.

The next day when we returned to this island late in the afternoon, there were two turtles sunning themselves on the beach. These were sexed, measured, and tagged.

WHALE-SKATE ISLAND

I GENERAL

B. Habitat Conditions.

2. Cover. This island also looked dry. Vegetation conditions were similar to those found on Trig Island.

II WILDLIFE

A. Migratory Birds.

1. Seabirds.

Sooty Tern. Almost all of the breeding population had departed, and only 2 adults were noted flying overhead.

Common Noddy Tern. There were 275 adults present. Most were nesting birds. Of a total of 134 nests tallied, 123 contained a single egg and 18 contained small downy chicks. Nests were located in low grassy areas in the central part of the island.

Hawaiian Noddy Tern. About 270-280 adults were observed resting in small flocks mixed on the beaches with common noddies. No nests were seen.

Red-tailed Tropicbird. 2 large and completely feathered chicks were found under a clump of Messerschmidtia.

Blue-faced Booby. Tallied were 1 adult, 17 flying immatures in first year plumage, and 9 large but downy chicks. These were scattered along both beaches by themselves. 1 dead unbanded chick was found.

Brown Booby. I adult was recorded incubating an egg in its nest.

Red-footed Booby. Recroded were 1 adult, 3 flying immatures in first year plumage, and 2 half-grown chicks in nests in the Messerschmidtia.

Frigatebird. Tallied 85 adults, 3 flying immatures, and 81 chicks. The latter were 2/3 to 3/4 grown and in nests in clumps of Chenopodium in the central part of the island.

2. Shorebirds.

Golden Plover. 9 in winter plumage.

Ruddy Turnstone. 102 most of which were in winter plumage. No banded birds seen although all were checked.

Sanderling. 3 in their white and gray winter plumage.

Bristle-thighed Curlew. 3 seen.

D. Other Mammals

Hawaiian Monk Seal. A seal census resulted in the following observations:

6 adult male	1 Subadult male	2 yearling male
4 adult female	1 Subadult female	6 yearling female
5 adult unclassified	1 Subadult unclassified	

Tagged were 2 yearling males, 6 yearling females, 1 subadult smle, and 1 subadult unclassified. The latter was not sexed through oversight. Moult stages were recorded.

5 animals tagged on previous trips were recorded. 3 had been tagged on this island and 2 on nearby Trig Island.

No abnormal conditions were noted.

Sept 16-19, 1967

H. Reptiles.

Green Sea Turtle. None observed.

EAST ISLAND

I. GENERAL

B. Habitat Conditions.

2. Cover. The north end of the island has been eroded away for at least 50 or more yards, and the expanse of beach is gone. It was necessary to walk into the water to take one of the photostation pictures normally taken from the beach. Beaches come and go with the storms. The very large Chenopodium bush near the old concrete refrigerator (?) block is now gone; however, scattered within the old Coast Guard trash and fallen down Quonset huts are 8 smaller plants of this species, all of which were producing seed. As on the other islands, leaves of Tribulus plants were closed indicating stress from lack of water. Boerhavia was flourishing over the island.

II WILDLIFE

A. Migratory Birds.

1. Seabirds.

Sooty Tern. Noted 8 adults and 8 immatures flying about the island. These are probably the last of the breeding colony to migrate.

Common Noddy Tern. In the low grassy and herbaceous vegetation on the north end we tallied 104 nests with single eggs and 107 with chicks. Near the south end there were 14 nests with eggs and 10 with chicks. This indicates that the birds using this island are slightly ahead in breeding phenology than those on Whale-Skate but a few miles distant. Nests were located in Tribulus and Boerhavia. Recorded also were 430 adults most of which were on nests.

Red-tailed Tropicbird. 1 almost fully grown chick was found under the Messerschmidtia clump at the south end.

Blue-faced Booby. Just 3 immatures capable of flight were found wandering around the beaches.

Red-footed Booby. Recorded were 5 adults, 1 flying immature in first year plumage, and 8 half-grown chicks in the Messerschmidtia at the south end or small clumps of Chenopodium in the interior. Nights spent on the islands throughout the chain reveal that many adults and flying immatures return to the islands to roost at night. These thus are daytime counts.

Frigatebird. About 250 were soaring high above the island. No nests or chicks were found on the island. The old antenna poles are favored perches.

2. Shorebirds.

Golden Plover. 16 in winter plumage.

Ruddy Turnstone. 93 mostly in full winter plumage. No dyed or banded birds were seen.

Bristle-thighed Curlew. 2 noted on this island.

D. Other Mammals.

Hawaiian Monk Seal. A total of 10 were found.

7 adult female	1 yearling male
1 subadult male	
1 subadult female	

The two subadult animals and 1 adult female were tagged. Later another subadult male carrying tag No. 506 was recorded as it hauled up on the beach while we were there. This animal was tagged as a male pup on September 13, 1966 on Whale-Skate Island nearby. Moult data was taken.

No abnormal conditions were noted.

H. Reptiles

Green Sea Turtles. None observed.

GIN ISLAND

I GENERAL

B. Habitat Conditions.

2. Cover. Neither Gin or Little Gin Islands support any vegetation. Both are entirely sand. Shapes and sizes change continually because of storms and surf conditions. Little Gin is about half of what it was last year. We always experience trouble landing on these islands because of the strong surf and undertow.

II WILDLIFE

A. Migratory Birds.

None

d. Other Mammals.

Hawaiian Monk Seal. Only 4 animals were on the island.

1 adult male	1 adult unclassified	2 yearling female

A yearling female was tagged. A yearling female tagged March 12, 1967 on East Island was recorded.

LITTLE GIN ISLAND

II WILDLIFE

A. Migratory Birds.

None.

D. Other Mammals.

Hawaiian Monk Seal. A total of 17 animals were loafing on the beaches just out of reach of the surf.

2 adult male	1 yearling male
3 adult female	1 yearling female
9 adult unclassified	1 unclassified yearling

The unclassified adults were those which escaped into the water before we could sex them. No animals were tagged nor were previously tagged animals seen.

LAYSAN SEPT 21-24

We had not anticipated any problem and felt that the activities of both parties would dovetail in with one anothers. However, apparently not enough time had elapsed between visits to give some animals a chance to settle down. The other party must have been extremely active because we noted that seals on all islands were more wary than usual. Blue-faced boobies on Lisianski had been worked intensively, and it was obvious because they would almost invariably rush off squawking down the beach well ahead of us when we were making our seal census there. Usually a few can be counted on to do this, but not so many or so far ahead of this. This hampered our research on seals there because we frequently could not get close enough to seals to check age or sex, or tags, because they were awakened by the squawking and frightened boobies had hauled off into the water ahead of us.

A total of 24 animals, mostly yearlings and subadults, were tagged. This also disturbs their peace of mind, but it is necessary to begin accumulating data on movements, breeding age, annual breeding cycles, population dynamics, and other basic life history activities. Young animals react much less vigorously to tagging. Adults are too strong, and there is a far greater chance of being bitten through some mishap.

Another 14 animals previously tagged were recorded. All had been tagged as pups or yearlings in March and June, 10 in March. This suggests possible affinity of a natal island.

Almost all animals counted were sleeping or resting on the beaches just above the surf line. Apparently the millions of flies which are found on the island during the summer and fall months are bothersome. this has been noted by other investigators. No night count, however, was made on Laysan.

No dead seals were observed.

H. Reptiles.

Green sea turtle. Only one turtle was observed. It was tagged. Very few of these animals are seen on Laysan. This is interesting because Parson, in his book THE GREEN SEA TURTLE AND MAN, cites accounts made by whalers and other mariners visiting this island during the last century that turtles were very abundant on this island and offered a ready and welcome source of meat.

Skinks were common around the campsite.

LISIANSKI SEPT 25-26
1967

D. Other Mammals.

Hawaiian Monk Seal. A total of 108 seals were counted the morning of the first day. Sex and age data are as follows:

33 adult male	2 subadult male	4 yearling male
26 adult female	3 subadult female	8 yearling female
25 adult unclassified	3 subadult unclassified	4 yearling unclassified

A total of 19 animals were tagged - 7 adults, 1 subadult, and 11 yearlings. Adults were tagged by slipping up on them from behind while they were sleeping then quickly affixing the tag to the rear flipper.

Four previously tagged animals were recorded. All had been tagged on Lisianski,; two in 1966 and others in 1967.

As at Laysan, almost all animals during the day were sleeping or resting on the beaches just beyond the water line. A count made during the night totaled 103 animals so there was little difference between daytime and nighttime use. Records were not kept of the locations of all the animals but of the 67 that were, 60 were hauled up into the vegetation and only 7 were on the beach. This strongly indicates that animals prefer the beaches during the day to avoid the swarms of houseflies active then. At night the seals haul up when the flies are inactive.

The following day while the island was again circumvented to reestablish vegetative photostations, count was kept of the seals. A total of 109 was obtained, most of which were back on the beaches.

No dead animals were found.

F. Reptiles.

Green Sea Turtles. Young, platter sized turtles are frequently seen on this island. This time was no exception. This is in contrast to Laysan were almost none are seen. About 8 of this size were observed, two of which were tagged, measured and weighed. Each weighed 25 lbs.. Altogether a total of 5 animals were tagged. One previously tagged animal was recorded, but we are unable to obtain the tagging data because the records cannot be located by persons who may have done this work.

PEARL AND Hermes
SEPT 27-29

3 adult male 1 yearling female
3 adult female
4 adult unclassified

F. Reptiles.

Green Sea Turtle. When the island was first landed upon, there were no turtles present on the beach. This was the first time this has happened. At dusk the first day, however, one after another hauled up on the beach on the lagoon side near camp until 19 were present. 10 were captured, measured, and weighed. Three were males.

Weights ranged from 127 lbs.(female) to 24[illegible] lbs. (also a female)

Four were tagged. One was retagged on the other flipper because the original tag was hanging on precariously. There were 6 recoveries of previously banded animals. All had been banded on this island within the past 3 years.

The subspecies of the turtle in Hawaiian waters has never been determined. One important behavioral difference between it and the Atlantic subspecies is that it comes to land throughout the year to sun whereas the latter, according to the experts there, never does except to lay eggs. Presumably males of that subspecies never do come to land.

NORTH ISLAND

II WILDLIFE

B. Migratory Birds. See Smithsonian Report.

D. Other Mammals.

Hawaiian Monk Seal. A total of 29 were recorded. 6 were tagged of which 5 were yearlings. An adult female had been previously tagged on Southeast Island a year ago.

6 adult male 2 yearling male 1 subadult unclassified
9 adult female 3 yearling female
6 adult unclassified 1 yearling unclassified

Considering its small size, this island supports a large number of these animals.

LITTLE NORTH ISLAND

II WILDLIFE

B. Migratory Birds. See Smithsonian Report. Apparently this is the island someone of their staff took upon himself to name Humphrey Island, presumably after his project leader. This should be corrected before they publish this in literature.

BACK TO FFS

all the islands from the air.

Island	No. Seals
Tern	0
Trig	7
Whale-Skate	8
East	5
Gin	7
Little Gin	5
Shark	19
Total	51

DEC 7-11

This is 31 less than we saw in September. No pups were noted.

H. Reptiles. No turtles were seen on any of the islands during the helicopter flight. While passing over Trig Island as we were about to land on Tern Island the first day, two had been noted on Trig. Coastguardsmen on Tern told me that several nests had hatched there during the late summer. These were on the very eastern end.

A. Migratory Birds (Addendum)

1. Seabirds.

Bonin Petrel. Data about this species was omitted when this category of birds was discussed on page 34. They are as follows: No petrels were noted during the day, but after dark I found 12 resting on the ground. Ten were caught and checked for presence of eggs in their body but with negative results. Another 5-6 were flying about. There were a number of freshly dug holes in the antenna fields, but I was unable to find any which contained eggs.

SHARK, TRIG, WHALE-SKATE, LA PEROUSE, EAST, GIN, LITTLE GIN

All of these are being lumped together because of general observations made during the helicopter flight on December 9. None but fleeting impressions could be gathered in the very brief time as we flew over.

The 19 seal seen on Shark was surprising because this is just a sand spit a few square hundred yards.

On Trig Island a large number of Black-footed and Laysan albatrosses was noticed nesting. There were about a dozen Blue-faced boobies and perhaps 300-400 Common noddies there also. Vegetation appeared to be thriving and everything appeared normal.

On Whale-Skate there were an estimated 800-1,000 Black-footed albatross nesting. This estimate may be high because these birds were mixed up with frigatebirds and segregation was not possible. Another 100 or more frigatbirds were soaring high in the air over the helicopter.

LAYSAN
DEC 13

Sleeping animals were checked quietly for tags, and a total of 14 were so recorded. Most of the animals had not as yet moulted. None were seen which were actually moulting.

The total of 151 animals was the lowest I have ever recorded during the past four years. This and the corresponding lower number tallied at French Frigate Shoals means something, possibly movements to other islands or else foraging at sea preparatory to the pupping season soon to start in a few months - February.

23 adult male	18 subadult unclassified	26 yearling unclassified
22 adult female	2 yearling male	
52 adult unsexed	8 yearling female	

All the tagged animals with the exception of one, had been tagged as pups or yearlings on Laysan during the past year and a half. The exception was an adult female which had been tagged on Kittery Island, Pearl and Hermes Reef, last July.

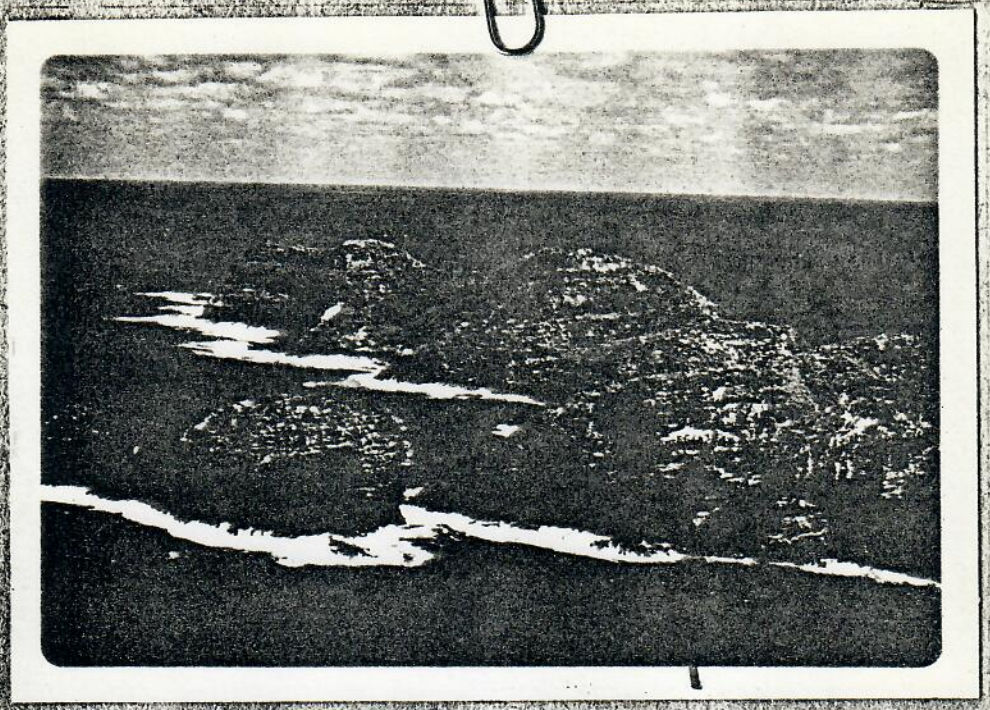
H. Reptiles.

Green Sea Turtle. Six animals, all females, were found on the beaches. All were very tame and easily approached. Since I had no tags or tapes, they could not be tagged or measured. Three were very large, a shell length of about 34-36 inches(one about 42 inches), two had lengths of 20 inches, and one slightly smaller. Two animals bore tags. One had been tagged on Southeast Island at Pearl and Hermes Reef on March 21, 1965. The tagging data for the other never have been found. This tagging was done by someone from Hawaii Fish and Game at least 5 years ago when they used to visit the islands once in a while through a contract with the Bureau.

VII OTHER ITEMS

A. Items of Interest. This was the first time we have ever landed on the northeast side. The northwest side is preferable because it is possible to land a boat right on the beach, anchorage is good, and the west side is usually the lee side. Such was not the case this time. The landing craft grounded on the coral rock about 50 feet from the beach, and I and two Coastguardsmen swam and waded ashore with lines. The equipment and the remainder of the party were transferred from the landing craft to the beach by pulling the rubber raft back and forth. The landing craft had to back off into water deep enough to float it because it had only a thin plywood bottom which would have been ground to pieces had it remained on the rocks.

The resoluation target was placed on the high beach just above this point with a minimum of effort. Only 4 albatross nests had to be moved. Suuposedly it is to be picked up in March providing the military follows through with their space plans.



Necker Island is over 260 feet high and has no beaches upon which to land. As swell carries the small boat up against rocks, one leaps for a handhold and scrambles up before next wave hits. Nimbleness and a cool head re required. Arrow points to landing site when seas are calm. Calm?

Weighing green sea turtle on Necker Island. This female weighed about 250 lbs. Ronald Walker of Hawaii Division of Fish and Game and Bob Ballou of Refuges, Washington Office, are the strong boys. Crude method but effective.