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# NOAA Technical Memorandum NMFS



## RECOVERY RECORDS OF ADULT GREEN TURTLES OBSERVED OR ORIGINALLY TAGGED AT FRENCH FRIGATE SHOALS, NORTHWESTERN HAWAIIAN ISLANDS

GEORGE H. BALAZS



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U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
National Marine Fisheries Service  
Southwest Fisheries Center

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## **NOAA Technical Memorandum NMFS**

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**U.S. DEPARTMENT OF COMMERCE**

Malcolm Baldrige, Secretary

**National Oceanic and Atmospheric Administration**

John V. Byrne, Administrator

**National Marine Fisheries Service**

William G. Gordon, Assistant Administrator for Fisheries

<sup>1</sup> This is Sea Grant Cooperative Report UNIH-SEAGRANT-CR-83-03

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## INTRODUCTION

This report presents a complete and concise record of tag recoveries for the adult Hawaiian green turtle, *Chelonia mydas*, made from 1973 through 1982 in association with the breeding colony of French Frigate Shoals (FFS). During this 10-year period, the author has systematically monitored and tagged green turtles that assemble each summer at FFS as migrants originating from foraging pastures throughout the Hawaiian Archipelago. Visits to this site have also been made during other times of the year to tag and observe turtles present outside the breeding season. A list of all expeditions is presented in Table 1. A total of 385 research days and nights has been spent at this location.

At least 90% of the reproduction by green turtles in the Hawaiian Islands takes place within the Hawaiian Islands National Wildlife Refuge at FFS. This crescent-shaped atoll is located at about the midpoint of the archipelago and contains 11 sand islets extending over 26 km of reef (Fig. 1). Most nesting occurs on East (4.0 ha) and Whale-Skate (6.8 ha) Islands; nesting activity is lower on Trig, Tern, Gin, and Little Gin. East Island has been the major site of tagging over the past 10 years.

A rare terrestrial basking habit is displayed by green turtles at FFS and several other isolated sites in the Northwestern Hawaiian Islands (NWHI). Males and females regularly haul out to rest along the shoreline during the daytime and also occasionally at night. This behavior has allowed relatively easy tagging of adult males, a segment of sea turtle breeding colonies in other geographical areas that is not usually accessible. Due to the unique basking behavior and the isolated position of FFS in the North Pacific, this breeding colony was one of eight designated for high priority by the World Conference on Sea Turtle Conservation (1982).

A synopsis of biological information to June 1979 has already been prepared on the Hawaiian green turtle (Balazs 1980a). The tag recoveries given in this present report serve to complement the data in the synopsis. Other recent publications available on the Hawaiian green turtle have dealt with natural growth rates (Balazs 1982b), habitat usage at FFS (Dizon and Balazs 1982), and the ecology of basking (Whittow and Balazs 1979, 1982; Sheekey 1982). Overall accounts of the population that have appeared since the synopsis was issued include those by Balazs (1980b, 1982c, 1982e). A popular article by Wexler (1983) contains an array of color photographs showing Hawaiian green turtles.

## HISTORY OF TAGGING

Tagging was begun at FFS in June 1973 using No. 49 and No. 681 Monel<sup>2</sup> alloy flipper tags made by the National Band and Tag Company of Newport, Kentucky. In September 1976, the use of these tags was discontinued after detection of excessive corrosion. A total of 310 adult turtles had been

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<sup>2</sup>Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

marked with these tags between 1973 and 1976. Since then, No. 681 flipper tags made of Inconel 625 alloy have been the principal means of marking turtles. The dimensions of these tags are 25 x 8 x 9 mm, and up to four tags have been applied to each turtle. The No. 49 tags were somewhat larger, measuring 40 x 10 x 11 mm. No signs of corrosion have been seen to date in the Inconel tags. Corrosion and various other factors affecting the retention of flipper tags have been discussed in Balazs (1982a). At the end of 1982, a total of 605 adult turtles had been tagged at FFS with Inconel tags.

Prior to 1973, the tagging of green turtles in the NWHI was initiated in the early 1960's by the Hawaii State Division of Aquatic Resources (formerly Division of Fish and Game). Shortly thereafter, personnel of the U.S. Fish and Wildlife Service (known then as Bureau of Sport Fisheries and Wildlife), and the Pacific Ocean Biological Survey Program (Smithsonian Institution), began tagging turtles during intermittent survey and inspection visits to the area. By 1972, approximately 800 adults had been tagged as a result of these combined efforts. All turtles were tagged with No. 49 Monel tags bearing three different return addresses. The exact wording of these inscriptions is presented in the Key to Abbreviations. Amerson (1971) gives a historical overview of tagging and turtle observations at FFS until 1969. This present report also includes tag recoveries made between 1973 and 1982 of turtles that were initially tagged before June 1973. However, tag recoveries made before 1973, but not resighted between 1973 and 1982, are not reported here. These earlier records are fewer in number, due at least in part to excessive corrosion and tag loss. Some, but not all, of the pre-1973 tag recoveries are contained in unpublished trip reports of the U.S. Fish and Wildlife Service. The titles, dates, and authors of these reports are listed in Balazs (1980b). A card catalog of pre-1973 taggings and tag recoveries is on file at the Honolulu office of the U.S. Fish and Wildlife Service. A future report will be prepared to summarize the contents of this card catalog so that the basic results of this past work will also be readily accessible.

#### RECOVERY DATA

Over the 10-year period, 294 tagged turtles have been resighted either at FFS or at other localities after they were originally tagged at FFS. This total consists of 87 males (Table 2) and 207 females (Table 3). In most cases, the minimum interval between tag recoveries is the time between expeditions undertaken by the author to FFS (as shown in Table 1). Short-term recoveries, such as those that frequently occur within a single expedition (i.e., interesting-interval recoveries), are not presented as part of this report.

Forty-eight of the 87 males shown in Table 2 were recovered only once, whereas the remaining 39 (44.8%) were each seen on two or more occasions. The male resighted the greatest number of times (10) appears as Entry No. 9 in Table 2. For the females, 147 of the 207 individuals were recovered only once. The other 60 (29.0%) were resighted on two or more occasions. Entry No. 24 in Table 3 lists the female seen most often (nine times).

### Long-Distance Migrations

Migrations by males have been documented by tag recoveries on nine occasions during the 10-year period. Two of these resightings constituted a round-trip voyage by the same male traveling from Pearl and Hermes Reef to FFS and back again (Entry No. 21 in Table 2). The other movements by males are as follows:

<u>No. of turtles</u>	<u>Migration</u>	<u>Table 2 Entry Nos.</u>
2	Oahu to FFS	24, 61
1	Pearl and Hermes to FFS	26
3	FFS to Pearl and Hermes	55, 60, 77
1	FFS to Lisianski	78

Migrations by females have been documented on 39 occasions and include 6 round trips (Entry Nos. 11, 39, 41, 101, 104, and 159 in Table 3). Two of these were between Pearl and Hermes and FFS, two between Lisianski and FFS, one between Laysan and FFS, and one between Oahu and FFS. The remaining 27 one-way migrations recorded from tag recoveries consisted of the following:

<u>No. of turtles</u>	<u>Migration</u>	<u>Table 3 Entry Nos.</u>
6	FFS to Pearl and Hermes	105, 106, 151, 153, 204, 205
2	FFS to Lisianski	147, 206
3	FFS to Laysan	156, 157, 158
2	FFS to Oahu	5, 150
1	FFS to Maui	16
1	FFS to Kauai	17
1	FFS to Hawaii	53
1	FFS to Molokai	207
6	Pearl and Hermes to FFS	12, 14, 37, 42, 43, 103
1	Lisianski to FFS	10
1	Oahu to FFS	28
1	Hawaii to FFS	76
1	Niihau to FFS	13

Prior to 1973, 32 long-distance migrations were documented from tag recoveries made in earlier tagging efforts (see Balazs 1980a). Consequently, a total of 80 migrations (32 + 48 shown in this report) has been recorded in the Hawaiian Islands. Of these, 36 are between FFS and the main islands located at the southeastern end of the chain, and 44 are between FFS and the northwestern sites of Laysan, Lisianski, and Pearl and Hermes Reef. When compared with other tagging studies of the green turtle, the evidence for migrations from tag returns in the Hawaiian Islands is among the best gathered anywhere (Meylan 1982).

The known migrations documented from tagging at other islands in the Pacific have been summarized by Balazs (1982d).

## Reproductive Cycles

Reproductive cycles, as measured by remigration intervals, have been documented in 52 males and 130 females. For males, 42.3% displayed a 1-year cycle, 32.7% a 2-year cycle, and 25.0% a 3-year cycle. For the females, 36.2% showed a 2-year cycle, 43.1% a 3-year nesting cycle, 7.7% a 4-year cycle, and 12.2% nested at intervals ranging from 5 to 8 years. In addition, a single female nested again after an interval of only 1 year. All of these intervals are undoubtedly affected to some degree by tag shedding rates.

## Site Fixity

A total of 383 tag-recovery data can be used to determine the degree of site fixity turtles display for particular islets at FFS. For the 139 resightings of males, 86.3% occurred on the same islet where they were previously seen. For the 244 resightings of females, 90.6% occurred on the same islet. Females nesting and basking on East Island showed the greatest site fixity; 94.4% of the resightings occurred at this same location.

## Longevity

The longevity and duration of reproductive life for green turtles in the wild are presently unknown. Long-term tag recoveries can, however, help to answer these important questions. The longest recovery interval thus far recorded for a male in the Hawaiian Islands is 17 years, 8 months (Entry No. 21 in Table 2). The longest for a female is 18 years, 3 months (Entry No. 11 in Table 3). Both of these turtles were originally tagged as adults in 1964 while they were basking at Pearl and Hermes Reef.

## Frequency of Tag Recoveries.

The percentage of previously tagged turtles seen nesting each summer at FFS has increased considerably over the 10-year period:

1973 - 10.0%	1978 - 7.7%
1974 - 11.9%	1979 - 19.2%
1975 - 2.2%	1980 - 46.7%
1976 - 17.4%	1981 - 36.7%
1977 - 2.6%	1982 - 41.1%

The reasons for these higher recovery rates most likely include 1) a reduced tag loss from using No. 681 Inconel tags, 2) the practice of applying more tags on each turtle, 3) greater survival of turtles in resident foraging pastures since they became legally protected in late 1978 under the Endangered Species Act, and 4) the greater percentage of the adult population tagged at the end of each successive year over the 10-year period.



The frequency of tag recoveries at FFS during recent years is markedly higher when compared with long-term tagging projects at other breeding colonies. For example, only approximately 20% of the Caribbean green turtles nesting each summer in Costa Rica bear tags that were applied during previous years (Meylan 1982).

#### Tag Loss

Attaching two or more tags to each turtle increases the chances for future recognition. It also provides a basis for measuring rate of tag shedding. During the 1981 and 1982 breeding seasons at FFS, 59 nesting females were recovered that had previously been double tagged with Inconel tags (one on each front flipper). The recovery intervals for these turtles ranged from 2 to 5 years. Table 4 presents the estimated probability of tag shedding and the 95% confidence limits for each of these time intervals. A cumulative shedding rate of 30% after 4 years is indicated by these data. Consequently, there is a 9% chance ( $0.30 \times 0.30$ ) that a double-tagged turtle will lose both of its tags in 4 years. Tag recoveries anticipated during the 1983 and 1984 breeding seasons will help to determine if the rate of tag loss changes after 5 to 6 years. Forthcoming recoveries at FFS will also include a number of recoveries of turtles originally receiving three and four tags.

The shedding rates shown in Table 4 are the first values of this kind to be computed and published for sea turtles. Double tagging conducted elsewhere, as analyzed and discussed by Mrosovsky and Shettleworth (1982), has confounded variables such as tag type (metal versus plastic), tag color, front or hindflipper placement, sex, and size class (adult versus immature).

#### KEY TO ABBREVIATIONS

The following abbreviations identify the agencies that tagged turtles in the Hawaiian Islands.

- FG Tags bearing a return address of the State of Hawaii, Division of Fish and Game (now the Division of Aquatic Resources). Exact inscription: "RETURN TO FISH & GAME STATE OF HAWAII." The letters FG do not actually appear on the tags, but are used in the data tables as an abbreviation.
- FW Tags bearing a return address of the U.S. Fish and Wildlife Service. Exact inscriptions: "U.S. WILDLIFE HONOLULU" or "NOTIFY U.S. WILDLIFE HONOLULU, USA" or "BUREAU WILDLIFE KAILUA, HAWAII." The letters FW do not actually appear on the tags, but are used in the data tables as an abbreviation.
- T Tag number prefix present on tags used by the U.S. Fish and Wildlife Service bearing the inscription "BUREAU WILDLIFE KAILUA, HAWAII."

Tag numbers shown in the data tables that do not have an FG or FW abbreviation all bear one of the following return address inscriptions:

"UNIV. HAWAII HIMB BOX 1346 KANEOTE, 96744"	No. 49 Monel tags numbered 601-900
"NOTIFY UNIV. HAWAII MARINE LAB, BOX 1346 KANEOTE, HAWAII USA"	No. 49 Monel tags numbered 901-1400
"NOTIFY UNIV. HAWAII HIMB KANEOTE, 96744"	No. 681 Monel tags numbered 1401-1900
"NOTIFY HIMB UNIVHAWAII"	Fearing "Tuff-Tex" plastic tags 2001-2015 (blue) and 2026-2050 (black)
"WRITE HIMB UNIVERSITY HAWAII, 96744"	No. 681 Inconel tags numbered 2051 and higher

Letters and abbreviations refer to the following:

A	Plastic "Allflex" tags (not inscribed with a return address)
F	Fearing "Tuff-Tex" plastic tags
( )	Numbers in parentheses indicate additional tags that were applied when a previously tagged turtle was recovered.
FFS	French Frigate Shoals
SE	Southeast Island at Pearl and Hermes Reef
N	Nesting
B	Basking on shore
O	Offshore - turtle recaptured or resighted in the ocean
C	Copulating
RC	Released from captivity after being held for an extended period
D	Dead
A-D meter	Small depth meter attached to the carapace (see Balazs 1980b).

Freq. Frequency and turtle identification number of radio transmitters used in a telemetry study at FFS (see Dizon and Balazs 1982).

The following abbreviations are used at various places in the data tables to show the person responsible for making a tag recovery or, in some cases, initially tagging a turtle. All taggings and tag recoveries that bear an expedition number were carried out by the author working at FFS (Table 1). In certain instances, the author's initials are given for tagging and tag recoveries made at sites away from FFS where expedition code numbers do not apply.

AK	Alan Kam
BG	Brent Geizentanner
BP	Bill Puleloa
BS	Bob Schulmeister
CH	Craig Harrison
GB	George Balazs
JA	John Andre
JH	John Henderson
JL	Jerry Ludwig
RI	Ruth Ittner
RS	Robert Shallenberger
RW	Ronald Walker
SS	Sheridan Stone

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Table 1.--Expeditions to tag green turtles at French Frigate Shoals made during the 10-year period, 1973-82.

Expedition No.	Duration (days)	Dates
1	48	1 June-19 July 1973
2	6	11-17 October 1973
3	21	30 May-20 June 1974
4	21	27 June-18 July 1974
5	20	26 July-15 August 1974
6	21	19 September-10 October 1974
7	7	13-20 February 1975
8	6	16-22 May 1975
9	20	6-26 June 1975
10	20	18 July-7 August 1975
11	2	26-28 August 1975
12	3	1-4 December 1975
13	7	15-22 January 1976
14	11	8-19 April 1976
15	6	7-13 May 1976
16	14	28 June-12 July 1976
17	5	18-23 November 1976
18	13	20 June-3 July 1977
19	6	22-28 September 1977
20	7	1-8 December 1977
21	16	5-21 June 1978
22	5	2-7 May 1979
23	20	10-30 June 1979
24	25	6 June-1 July 1980
25	3	5-8 September 1980
26	4	15-19 December 1980
27	23	25 May-18 June 1981
28	1	15-16 November 1981
29	1	14-15 April 1982
30	21	5-26 June 1982
31	1	3-4 August 1982
32	1	3-4 September 1982

Table 2.--Recovery data for male green turtles observed or originally tagged at French Frigate Shoals (FFS).

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
1	74FW	29 August 1965	Trig, FFS-B	Trig, FFS-B	9-6	14 February 1975
	74FW			Whale-Skate, FFS-B	2-2	9 April 1977
2	937	17 February 1975	Whale-Skate, FFS-B	Whale-Skate, FFS-B	0-3	19 May 1975
		7				8
3	956, 957, 958	19 February 1975	Whale-Skate, FFS-B	Whale-Skate, FFS-B	0-4	21 June 1975
	957	7		Whale-Skate, FFS-B	1-5	19 November 1976
	956, 957, 958			Whale-Skate, FFS-B	3-7	30 June 1980
	957			Whale-Skate, FFS-B	1-4	7 September 1980
						24
						25
4	933	14 February 1975	Whale-Skate, FFS-B	Whale-Skate, FFS-B	0-4	18 June 1975
	933	7		Whale-Skate, FFS-B	0-1	20 July 1975
						9
						10
5	953	18 February 1975	Whale-Skate, FFS-B	Whale-Skate, FFS-B	0-4	9 June 1975
	953	7		Whale-Skate, FFS-0	0-2	1 August 1975
						10
6	974	12 June 1975	Trig, FFS-B	Trig, FFS-B	0-2	6 August 1975
		9				10
7	1160	31 July 1975	Whale-Skate, FFS-B	Whale-Skate, FFS-B	0-9	12 April 1976
	1160 (2400, 2401)	10		Whale-Skate, FFS-B	1-5	25 September 1977
	2400, 2401			Whale-Skate, FFS-B	2-9	30 June 1980
				(Freq. 351)		24
8	1200	17 January 1976	Mullet, FFS-B	Shark, FFS-B	0-3	13 April 1976
	1200	13		East, FFS-B	1-0	10 April 1977
						14

Table 2.--Recovery data for male green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
9	747FW	14 June 1968	East, FFS	Trig, FFS-B	5-4	15 October 1973 2
	747FW			Trig, FFS-B	1-4	14 February 1975 7
	747FW			Trig, FFS-B	0-4	12 June 1975 9
	747FW			Trig, FFS-B	0-1	18 July 1975 10
	747FW (1214)			Trig, FFS-B	0-9	11 April 1976 14
	747FW			Trig, FFS-B	1-8	7 December 1977 20
	747FW (2616, 2827)			Trig, FFS-B	0-6	12 June 1978 21
	747FW 2616			Trig, FFS-B	0-8	22 February 1979 17 June 1979
	747FW			Trig, FFS-B	0-4	23
	1214			Trig, FFS-B	3-0	6 June 1982 30
10	940	17 February 1975 7	Whale-Skate, FFS-B	Whale-Skate, FFS-B	0-4	11 June 1975 9
	940			Whale-Skate, FFS-B	0-2	31 July 1975 10
	940			Whale-Skate, FFS-B	0-8	11 April 1976 14
	940 (2825)			Whale-Skate, FFS-B	2-2	20 June 1978 21
11	948	18 February 1975 7	Trig, FFS-B	Trig, FFS-B	0-3	21 May 1975 8
	948			Whale-Skate, FFS-B	0-2	19 July 1975 10
	948			Whale-Skate, FFS-B	0-9	12 April 1976 14
	948			Whale-Skate, FFS-B	0-11	9 March 1977 9 April 1977
	948			Whale-Skate, FFS-B	0-1	2 July 1977 17
	948			Trig, FFS-B	0-3	27 September 1977 19
	948			Whale-Skate, FFS-B	0-3	3 December 1977 20
	948			Trig	0-2	
12	469FW (1790, 1791)	14 March 1967	Trig, FFS-B	Trig, FFS-B	9-1	12 April 1976 14



Table 2.--Recovery data for male green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
13	456FW (1224)	13 March 1967	Whale-Skate, FFS-B	Whale-Skate, FFS-B	9-1	12 April 1976 14
14	930	15 February 1975 7	Trig, FFS-B	Whale-Skate, FFS-B	0-10	3 December 1975 12
	930			Whale-Skate, FFS-B	0-2	20 January 1976 13
	930			Whale-Skate, FFS-B	0-3	18 April 1976 14
15	1243	14 April 1976 14	Trig, FFS-B	Whale-Skate, FFS-B	0-1	10 May 1976 15
16	1230	13 April 1976 14	Trig, FFS-B	Trig, FFS-B	0-1	10 May 1976 15
	1230			Trig, FFS-B	2-9	25 February 1979
	1230			Trig, FFS-B	0-2	6 May 1979 22
	1230			East, FFS-B	2-0	28 May 1981 27
17	1215	11 April 1976 14	Trig, FFS-B	Trig, FFS-B	0-1	10 May 1976 15
18	1241	14 April 1976 14	Trig, FFS-B	Tern, FFS-0	0-3	11 July 1976 16
19	2002, 1717 2002	3 December 1975 12	Trig, FFS-B	Trig, FFS-B Tern, FFS-0	0-4 0-3	14 April 1976 14 10 July 1976 16
20	2004, 1198 2005	3 December 1975 12	Trig, FFS-B	Trig, FFS-B Tern, FFS-0	0-4 0-3	14 April 1976 14 10 July 1976 16
	2004 (3035)			Trig, FFS-B	2-10	3 May 1979 22
	3035, 2004			Trig, FFS-B	3-1	6 June 1982 30
21	1060FG (1272, 2011) 2011	16 September 1964 RW	SE Pearl and Hermes-B	East, FFS-B SE Pearl and Hermes-B SE Pearl and Hermes-B	11-10 1-0 4-10	4 July 1976 16 July 1977 RG 10 May 1982 SS
	1272, 2011					

Table 2.--Recovery data for male green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
22	959, 960	19 February 1975	Whale-Skate, FFS-B	Whale-Skate, FFS-B	0-5	2 August 1975
	959	7		Whale-Skate, FFS-B	0-11	10 July 1976
	959			Whale-Skate, FFS-B	0-4	16 23 November 1976
	959, 960 960			Whale-Skate, FFS-B Whale-Skate, FFS-B	4-7 1-0	17 13 June 1981 25 June 1982 30
23	1212	10 April 1976	Whale-Skate, FFS-B	Whale-Skate, FFS-B	1-0	16 April 1977
	1212	14		Whale-Skate, FFS-B	0-5	23 September 1977
	1212			Whale-Skate, FFS-B	0-2	19 6 December 1977
	1212 (2824)			Whale-Skate, FFS-B	0-6	20 20 June 1978
	2824			Whale-Skate, FFS-B	0-10	21 2 May 1979
	2824			Whale-Skate, FFS-B	1-4	22 7 September 1980
	2824			Whale-Skate, FFS-B		25
24	2411	13 October 1977	Waikiki, Oahu-RC	East, FFS-B	0-8	11 June 1978
25	1233 (2593)	13 April 1976	Trig, FFS-B	East, FFS-B	2-2	11 June 1978
	2593 (3131, 25A)	14		Trig, FFS-B	1-0	21 17 June 1979
	2593, 3131, 25A (2579)			East, FFS-B	2-0	23 3 June 1981 27
26	122FW (2594)	20 September 1966	Pearl and Hermes-B	East, FFS-B	11-9	11 June 1978
	122FW			East, FFS-B	1-0	21 18 June 1979 23
27	1282 (2655)	6 July 1976	East, FFS-B	East, FFS-B	1-11	11 June 1978
	2653 (5070, 5147)	16		East, FFS-B	3-0	21 27 May 1981 27
28	1210	10 April 1976	Trig, FFS-B	Trig, FFS-B	2-2	12 June 1978
	1210	14		Trig, FFS-B	4-0	21 6 June 1982 30

Table 2.--Recovery data for male green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
29	1220 (2618, 2619) 2618	12 April 1976 14	Trig, FFS-B	Trig, FFS-B	2-2	12 June 1978 21
				Trig, FFS-C	3-10	15 April 1982 29
30	2001, 1197 (2829) 2829	3 December 1975 12	Trig, FFS-B	Trig, FFS-B	2-6	20 June 1978 21
				Trig, FFS-B	0-10	4 May 1979 22
31	T127FW (2828) 2828	? ?	? ?	Trig, FFS-B	? ?	20 June 1978 21
				Trig, FFS-B	0-11	6 May 1979 22
	2828 (3132)			Trig, FFS-B	0-1	17 June 1979 23
32	2659, 2600 2600 (6105, 6198)	13 June 1978 21	East, FFS-B	East, FFS-B	0-11	3 May 1979 22
				East, FFS-B	3-1	11 June 1982 30
33	2710	15 June 1978 21	Whale-Skate, FFS-B	Trig, FFS-B	0-11	3 May 1979 22
34	2614 (3032)	12 June 1978 21	Trig, FFS-B	Trig, FFS-B	0-11	3 May 1979 22
35	2397 2398, 2399	25 September 1977 19	Whale-Skate, FFS-B	Whale-Skate, FFS-B	1-9	16 June 1979 23
36	3063 (3169) 3063, 3169	5 May 1979 22	East, FFS-B	East, FFS-B	0-1	16 June 1979 23
				East, FFS-B	0-11	26 May 1981 27
37	3059 3059 (5140, 5334)	5 May 1979 22	East, FFS-B	East, FFS-B	0-1	17 June 1979 23
				East, FFS-B	1-11	29 May 1981 27
38	3058 3058 (3769) 3058 (3741)	5 May 1979 22	East, FFS-B	East, FFS-B	0-1	18 June 1979 23
				East, FFS-B	1-0	10 June 1980 24
				East, FFS-B	0-11	26 May 1981 27

Table 2.--Recovery data for male green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
39	2688 (3225) 3225 (5374)	19 June 1978 21	East, FFS-OC	East, FFS-B	1-0	18 June 1979 23
				East, FFS-B	2-0	9 June 1981 27
40	3028 (3153) 3028, 3153 (5078)	3 May 1979 22	East, FFS-B	East, FFS-B	0-1	18 June 1979 23
				East, FFS-B	1-11	27 May 1981 27
41	3041 3041 (3558) 3041 (6164)	4 May 1979 22	Whale-Skate, FFS-B	Whale-Skate, FFS-B	0-1	19 June 1979 23
				Whale-Skate, FFS-B	1-0	8 June 1980 24
				Whale-Skate, FFS-B	2-0	17 June 1982 30
42	3018	2 May 1979 22	Whale-Skate, FFS-B	Whale-Skate, FFS-B	0-1	19 June 1979 23
43	3077	6 May 1979 22	Whale-Skate, FFS-B	Whale-Skate, FFS-B	0-1	19 June 1979 23
44	2597, 2598	11 June 1978 21	East, FFS-B	East, FFS-B	1-0	19 June 1979 23
45	3039	4 May 1979 22	Whale-Skate, FFS-B	Whale-Skate, FFS-B	0-2	26 June 1979 23
46	2663 2663	13 June 1978 21	East, FFS-B	Whale-Skate, FFS-B	1-0	29 June 1979 23
				Whale-Skate, FFS-B	0-11	9 June 1980 24
47	2756 (3276) 2756	17 June 1978 21	Whale-Skate, FFS-B	Whale-Skate, FFS-B	1-0	29 June 1979 23
				Whale-Skate, FFS-B	1-11	8 June 1981 27
48	1205 (3277) 1205, 3277	21 January 1976 13	Trig, FFS-B	Trig, FFS-B	2-5	29 June 1979 23
				Trig, FFS-B	1-11	11 June 1981 27
49	3274 (3629)	29 June 1979 23	Whale-Skate, FFS-B	East, FFS-B	1-0	20 June 1980 24

Table 2.--Recovery data for male green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
50	2599 (3551)	11 June 1978 21	East, FFS-B	East, FFS-B	2-0	7 June 1980 24
51	2576 (3582)	10 June 1978 21	East, FFS-B	East, FFS-B	2-0	10 June 1980 24
52	3075 (3556)	6 May 1979 22	Whale-Skate, FFS-B	Whale-Skate, FFS-B	1-1	8 June 1980 24
53	3215 (3559)	23 June 1979 23	Whale-Skate, FFS-B	Whale-Skate, FFS-B	1-0	8 June 1980 24
54	3069	5 May 1979 22	Trig, FFS-B	Whale-Skate, FFS-B	1-1	8 June 1980 24
54	3069	5 May 1979 22	Trig, FFS-B	Whale-Skate, FFS-B	1-0	13 June 1981 27
55	3047	4 May 1979 22	Whale-Skate, FFS-B	Whale-Skate, FFS-B	1-1	9 June 1980 24
55	3047	4 May 1979 22	Whale-Skate, FFS-B	North I., Pearl and Hermes-B	2-5	30 October 1982 AK
56	3031 (3762)	3 May 1979 22	Trig, FFS-B	Whale-Skate, FFS-B (Freq. 541)	1-1	9 June 1980 24
57	3234 (3765)	26 June 1979 23	Whale-Skate, FFS-B	Whale-Skate, FFS-B	0-11	9 June 1980 24
58	2712	15 June 1978 21	Whale-Skate, FFS-B	Whale-Skate, FFS-B	2-0	9 June 1980 24
59	1204, 1749 (3647, 3648)	21 January 1976 13	Trig, FFS-B	Trig, FFS-B	4-5	23 June 1980 24
60	948FW	14 May 1971	Whale-Skate, FFS-B	North Island, Pearl and Hermes-B	9-1	18 June 1980 JL/CH
61	2279, 2280 (5446)	6 July 1977	Kaneohe Bay, Oahu-O	East, FFS-B	3-11	17 June 1981 27
62	2586 (3740)	14 June 1978 21	East, FFS-B	East, FFS-B	2-11	26 May 1981 27
63	2668, 2669 (5267)	13 June 1978 21	East, FFS-B	Little Gin, FFS-B	3-0	3 June 1981 27
				Trig, FFS-B	0-10	15 April 1982 29

Table 2.--Recovery data for male green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
64	2810, 2811 (5260)	19 June 1978 21	East, FFS-B	East, FFS-B	3-0	3 June 1981 27
65	3053	5 May 1979 22	East, FFS-B	East, FFS-B	1-11	28 May 1981 27
66	3062 (5073)	5 May 1979 22	East, FFS-B	East, FFS-B	1-11	27 May 1981 27
67	3065 (5398)	5 May 1979 22	Trig, FFS-B	Trig, FFS-B	1-11	11 June 1981 27
68	3236, 3237 (5295)	26 June 1979 23	Whale-Skate, FFS-B	East, FFS-B	1-11	4 June 1981 27
69	3637	22 June 1980 24	East, FFS-B	East, FFS-B	1-0	26 June 1981 27
70	2038, 3588, 3673	13 June 1980 24	East, FFS-B	East, FFS-B	1-0	15 June 1981 27
71	3117, 3118, 2029	15 June 1979 23	Trig, FFS-B	Trig, FFS-B	2-11	15 May 1982 29
72	T19FW	May 1972	Trig, FFS-B	Whale-Skate, FFS-D	10-0	18 May 1982 JA
73	3066	5 May 1979 22	Trig, FFS-B	Trig, FFS-B	2-11	14 April 1982 29
74	5159	30 May 1981 27	Whale-Skate, FFS-B	Whale-Skate, FFS-B	0-11	15 April 1982 29
75	3563	8 June 1980 24	Whale-Skate, FFS-B	Whale-Skate, FFS-B	1-9	15 April 1982 29
76	5400 (5781)	11 June 1981 27	Trig, FFS-B	Trig, FFS-B	0-11	15 April 1982 29
77	52FW (97FW) 97FW	16 August 1965	Trig, FFS-B	Trig, FFS-B North I., Pearl and Hermes-B	0-7 15-5	22 March 1966 7 August 1981 GR
78	465FW 465FW (5940, 6327)	13 March 1967	Trig, FFS-B	Lisianski-B Lisianski-B	15-1 0-2	2 April 1982 JH 6 June 1982

Table 2.--Recovery data for male green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
79	3040 (5990)	4 May 1979 22	Whale-Skate, FFS-B	Whale-Skate, FFS-B	3-1	6 June 1982 30
80	3052 (6106, 6197)	5 May 1979 22	East, FFS-B	East, FFS-B	3-1	18 June 1982 30
81	3216 (6018)	23 June 1979 23	East, FFS-B	East, FFS-B	3-0	7 June 1982 30
82	3674 (5987, 5988) (5987, 5988)	29 June 1980 24	Trig, FFS-B	Whale-Skate, FFS-B	2-0	6 June 1982 30
83	3758	9 June 1980 24	Whale-Skate, FFS-B	Whale-Skate, FFS-B	2-0	17 June 1982 30
84	5084, 5085, 5086	27 May 1981 27	East, FFS-B	East, FFS-B	1-0	13 June 1982 30
85	5257 (6016)	3 June 1981 29	East, FFS-B	East, FFS-B	1-2	7 June 1982 30
86	5784 (6237)	15 April 1982 29	Whale-Skate, FFS-B	Whale-Skate, FFS-B	0-2	21 June 1982 30
87	2664 (5839) 2664, 5839	13 June 1978	East, FFS-B	Lisianaki-B Lisianaki-B	4-0 5-0	6 June 1982 4 November 1982 SS

Table 3.--Recovery data for female green turtles observed or originally tagged at French Frigate Shoals (FFS).

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
1	T253FW (636)	26 April 1973	East, FFS-B	East, FFS-N	0-1	8 June 1973 1
2	T254FW (649)	26 April 1973	East, FFS-B	East, FFS-N	0-1	14 June 1973 1
3	699FW (642)	11 June 1968	Whale-Skate, FFS-B	East, FFS-N	5-0	10 June 1973 1
4	372FW (641)	10 July 1970	East, FFS-B	East, FFS-N	2-11	10 June 1973 1
5	362FW (648) 362FW, 648	10 July 1970	East, FFS-B	East, FFS-N	2-11	17 June 1973 1
6	464FW (679, 699) 679, 699 (5986)	16 March 1967	Trig, FFS-B	Kailua Bay, Oahu-OD Whale-Skate, FFS-B Whale-Skate, FFS-B	0-3 6-7 8-8	12 September 1973 16 October 1973 2 6 June 1982 30
7	391FW (779, 797)	13 July 1970	East, FFS-B	East, FFS-N	3-11	2 June 1974 3
8	T60FW (723, 728, 789)	7 May 1972	East, FFS-B	East, FFS-N	2-1	3 June 1974 3
9	976FW (763)	18 May 1971	Ein, FFS-B	East, FFS-N	3-1	11 June 1974 3
10	655FW (758, 828) 758, 828 (3586)	20 March 1968	Lisianski-B	East, FFS-N East, FFS-N	6-3 6-1	4 June 1974 3 28 June 1980 24
11	1048FG (749) 749, 3641, 3642 749, 3641, 3642	13 March 1964 RW	Pearl and Hermes-B	East, FFS-N East, FFS-N SE, Pearl and Hermes-B	10-3 6-1 1-11	2 June 1974 3 23 June 1980 24 7 May 1982 55



Table 3.--Recovery data for female green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
12	440FW 440FN (742)	21 March 1967	Pearl and Hermes-B	Pearl and Hermes-B East, FFS-N	4-1 3-2	27 April 1971 30 June 1974 3
13	T216FW (816, 818)	24 March 1973	Niihau-RC	East, FFS-N	1-2	3 June 1974 3
14	167FW (794, 795)	26 September 1966	SE, Pearl and Hermes-B	East, FFS-N	7-9	30 June 1974 4
15	370FW (3567, 3568)	10 July 1970	East, FFS-N	East, FFS-N	4-0	5 July 1974 4
	3567, 3568			Whale-Skate, FFS-B (Freq. 450)	5-11	9 June 1980 24
	3567, 3568			East, FFS-N	1-0	2 June 1981 27
	3568			Trig, FFS-B	0-10	14 April 1982 29
16	672	9 July 1973 1	East, FFS-N	Maalaea Bay, Maui-OD	1-1	31 July 1974
17	853	15 July 1974 4	Whale-Skate, FFS-N	Princeville, Kauai-OD	0-1	15 August 1974
18	473FW	14 March 1967	Trig, FFS-B	Trig, FFS-B	7-11	19 February 1975 7
19	T22FW (963)	5 May 1972	Trig, FFS-B	Trig, FFS-B	2-9	19 February 1975 7
20	951 951 (3067)	18 February 1975 7	Trig, FFS-B	Trig, FFS-B	0-3	20 May 1975 8
	951,			Trig, FFS-B	4-0	5 May 1979 22
	951, 3067			Trig, FFS-B	2-11	14 April 1982 29
				East, FFS-N	0-2	8 June 1982 30
21	951FW	15 May 1971	Trig, FFS	Trig, FFS-B	4-1	6 June 1975 9
22	959FW	16 May 1971	East, FFS	East, FFS-N	4-1	10 June 1975 9

Table 3.--Recovery data for female green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
23	650 (1075, 1076)	4 June 1973 1	East, FFS-N	East, FFS-N	2-0	18 June 1975 9
24	942FW	May 1971	Trig, FFS	Trig, FFS-B	4-1	25 June 1975 9
	942FW (1226)			Trig, FFS-B	0-10	13 April 1976 14
	942FW			Trig, FFS-B	0-1	10 May 1976 15
	942FW			Trig, FFS-B	1-7	3 December 1977 20
	942FW (2731, 2732)			East, FFS-N	0-7	16 June 1978 21
	1226			Whale-Skate, FFS-B	3-5	15 November 1981 28
	1226, 2731, 2732			Whale-Skate, FFS-B	0-5	15 April 1982 29
	1226, 2731, 2732 (6110)			East, FFS-N	0-2	11 June 1982 30
	1226, 2731, 2732, 6110			East, FFS-N	0-1	21 July 1982 RI
25	964, 1141	19 February 1975 7	Trig, FFS-N	East, FFS-N	0-5	26 July 1975 10
	1141 (6133)			East, FFS-N	6-11	19 June 1982 30
26	943	17 February 1975 7	Trig, FFS-N	Trig, FFS-B	0-11	21 January 1976 13
	943			Trig, FFS-B	2-5	12 June 1978 21
	943			Trig, FFS-B	1-0	17 June 1979 23
	943			Trig, FFS-B	1-0	9 June 1980 24
27	1196	2 December 1975 12	Trig, FFS-B	Trig, FFS-B	0-4	12 April 1976 14
28	702	6 December 1973	Makapuu, Oahu-RC	Whale-Skate, FFS-B	2-1	16 January 1976 13
				Whale-Skate, FFS-B	0-3	10 April 1976 14

Table 3.--Recovery data for female green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
29	1131	21 June 1975 9	East, FFS-N	Trig, FFS-B	0-9	12 April 1976 14
	1131, 1093			Trig, FFS-B	6-0	14 April 1982 29
	1131, 1093 (6159, 6162)			East, FFS-N	0-2	17 June 1982 30
30	962	19 February 1975 7	Trig, FFS-B	Trig, FFS-B	1-2	13 April 1976 14
31	632 (1798, 1235) 1235	4 June 1973 1	East, FFS-N	Trig, FFS-B	2-9	13 April 1976 14
	1235, 1798, 632 (6034)			Trig, FFS-B	6-0	14 April 1982 29
				East, FFS-N	0-2	8 June 1982 30
32	985FW	18 May 1971	Little Gin, FFS-B	Whale-Skate, FFS-B	5-0	10 May 1976 15
33	96FW 96FW (1120, 1121) 96FW 96FW (2416) 1120, 2416	22 March 1966	Trig, FFS	Trig, FFS Trig, FFS-B Trig, FFS-B Trig, FFS-B Trig, FFS-B	0-3 9-0 0-5 0-5 1-7 4-7	10 June 1966 26 June 1975 9 12 15 4 December 1977 20 30
34	945, 947 945 945 945 945, 947 (5399)	17 February 1975 7	Trig, FFS-B	Trig, FFS-B Trig, FFS-B Trig, FFS-B Trig, FFS-B Trig, FFS-B	1-2 0-1 2-1 2-0 1-0	10 April 1976 14 10 May 1976 15 20 June 1978 21 9 June 1980 24 11 June 1981 27
35	1219	12 April 1976 14	East, FFS-B	East, FFS-N	0-3	6 July 1976 16

Table 3.--Recovery data for female green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
36	1039	13 June 1975 9	East, FFS	Trig, FFS-B	0-10	13 April 1976 14
	1039			Trig, FFS-B	0-2	30 June 1976
37	883FW (1291)	April 1969	Pearl and Hermes-B	East, FFS-N	7-3	7 July 1976 16
38	719 (1294, 1295)	2 June 1974 3	East, FFS-N	East, FFS-N	2-1	8 July 1976 16
39	660FW (1298, 1299)	20 March 1968	Lisianski-B	East, FFS	3-2	16 May 1971
	1298, 1299, (3585)			East, FFS-N	5-2	9 July 1976 16
	1298, 1299			East, FFS-N	4-0	27 June 1980 24
40	985FW (1280, 1281)	18 May 1971	Little Gin, FFS-B	Lisianski-B	1-9	1 April 1982 SS
41	132FW (1303, 1304)	20 September 1966	Pearl and Hermes-B	Whale-Skate, FFS-B	5-2	6 July 1976 16
	1303, 1304 (5560)			Trig, FFS-B	9-10	9 July 1976 16
	1303, 5560			SE Pearl and Hermes-B	5-1	8 August 1981 GB
42	995FW	27 April 1971	Pearl and Hermes-B	SE Pearl and Hermes-B	1-3	28 October 1982 AK
43	152FW (T209FW) 152FW (1306)	23 September 1966	Pearl and Hermes-B	Whale-Skate, FFS-B	5-3	10 July 1976 16
44	1221	12 April 1976	Trig, FFS-B	Pearl and Hermes-B	6-0	September 1972
45	842	11 August 1974 5	East, FFS-N	East, FFS-N	3-10	12 July 1976 16
	842 (2269, 2270)			Trig, FFS-B	1-0	28 March 1977
	2269, 2270 (3181)			East, FFS-B	2-9	11 May 1977
	2270, 3181			East, FFS-N	0-2	2 July 1977 18
	3181 (3794, 5339)			East, FFS-B	1-10	7 May 1979 22
				East, FFS-N	0-1	21 June 1979 23
				East, FFS-N	2-0	8 June 1981 27

Table 3.--Recovery data for female green turtles observed or originally tagged at French Frigate Shoals.--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
46	947	17 February 1975 7	Trig, FFS-B	Trig, FFS-B	2-5	2 July 1977 18
47	1746, 1203 (2304, 2305)	21 January 1976 13	Whale-Skate, FFS-0	Whale-Skate, FFS-B	1-8	26 September 1977 19
48	1229 (2417, 2418) 1229	13 April 1976 14	Trig, FFS-B	Trig, FFS-B	1-8	4 December 1977 20
49	958FW (2787, 2788)	16 May 1971	East, FFS-B	East, FFS-N	6-1	19 June 1978 21
50	1063 1063 (3663, 3664)	16 June 1975 9	East, FFS-N	Whale-Skate, FFS-B	3-0	15 June 1978 21
51	1029, 987 (2605, 2606) 2606 (5088, 5089, 5401)	24 July 1975 10	East, FFS-N	East, FFS-N	2-0	26 June 1980 24
52	1047 (2729, 2730) 2729 (5331, 3788)	21 June 1975 9	East, FFS-N	East, FFS-N	3-0	12 June 1978 21
53	2229	27 June 1977	East, FFS-N	Hilo Bay, Hawaii-0	3-0	16 June 1978 21
54	2259, 2260 2259, 2260 2259, 2260 (6087)	2 July 1977 18	East, FFS-N	East, FFS-B	1-10	5 May 1979 22
55	1237, 1799 (3033) 1237	13 April 1976 14	Trig, FFS-B	Trig, FFS-B (B-meter) Trig, FFS-B	3-1 0-1	24 June 1979 23 10 June 1982 30 3 May 1979 22 15 June 1979 23

Table 3.--Recovery data for female green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
56	1239	14 April 1976 14	Trig, FFS-B	Trig, FFS-B	3-1	3 May 1979 22
57	2003 (1718, 1719) 2003 (3034)	3 December 1975 12	Trig, FFS-B	Trig, FFS-B (C-meter) Whale-Skate, FFS-B	3-4 0-1	3 May 1979 22 16 June 1979 23
58	941 (3083, 3084) 941	17 February 1975 7	Trig, FFS-B	Trig, FFS-B (D-meter) Trig, FFS-B	4-3 0-2	6 May 1979 22 29 June 1979 23
59	1202 (3057) 1202, 3057 (6067)	20 January 1976 13	Mullet, FFS-B	East, FFS-B East, FFS-N	2-4 3-1	5 May 1979 22 9 June 1982 30
60	1255	10 May 1976 15	Trig, FFS-B	Trig, FFS-B	2-9	18 February 1979
61	1231	13 April 1976 14	Trig, FFS-B	Trig, FFS-B	3-1	2 May 1979 22
62	1201 (3129, 2032)	17 January 1976 13	Trig, FFS-B	Trig, FFS-B	3-5	17 June 1979 23
63	3082 (3130) 3082 3130	6 May 1979 22	Trig, FFS-B	Trig, FFS-B Trig, FFS-B	0-1 1-0	17 June 1979 23 9 June 1980
64	3076	6 May 1979 22	Whale-Skate, FFS-B	Whale-Skate, FFS-B	0-2	26 June 1979 23
65	3019	2 May 1979 22	Whale-Skate, FFS-B	Whale-Skate, FFS-B	0-2	29 June 1979 23
66	1268	2 July 1976	East, FFS-N	East, FFS-B	3-0	24 June 1979 23
67	2232 (3248)	28 June 1977 18	East, FFS-N	East, FFS-B	2-0	26 June 1979 23

Table 3.—Recovery data for female green turtles observed or originally tagged at French Frigate Shoals.—Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
68	2238, 2239	28 June 1977 18	East, FFS-N	East, FFS-B	2-0	27 June 1979
	2238, 2239 (5441, 5442)			East, FFS-N	2-0	23 17 June 1981
	2238 (6081, 6088)			East, FFS-N	1-0	27 11 June 1982 30
69	2216, 2217	26 June 1977 18	East, FFS-N	East, FFS-N	2-0	17 June 1979
	2216, 2217 (5347, 5348)			East, FFS-N	2-0	23 8 June 1981 27
70	2235, 2237 (3145)	28 June 1977 18	East, FFS-N	East, FFS-N	2-0	18 June 1979
	3145 (5305)			East, FFS-N	2-0	23 6 June 1981 27
71	2209, 2210	25 June 1977 18	East, FFS-N	East, FFS-N	2-0	24 June 1979
	2209, 2210 (5319, 3846)			East, FFS-N	2-0	23 6 June 1981 27
72	2253, 2254 (3228)	2 July 1977 18	East, FFS-N	East, FFS-N	2-0	24 June 1979
	2253, 2254, 3228 (5409)			East, FFS-N	1-11	23 12 June 1981 27
73	2240 (3231)	28 June 1977 18	East, FFS-N	East, FFS-N	2-0	25 June 1979
	2240, 3231 (5384, 5411)			East, FFS-N	2-0	23 13 June 1981 27
74	2268 (3257)	2 July 1977 18	East, FFS-N	East, FFS-N	2-0	28 June 1979
75	2255 (3266)	2 July 1977 18	East, FFS-N	East, FFS-N	2-0	28 June 1979
	5016, 5018	8 May 1977	Kaunolu, Hawaii-0	East, FFS-N	2-1	23 28 June 1979
76	5016 (5185, 5186, 5187)			East, FFS-N	1-11	23 30 May 1981 27

Table 3.--Recovery data for female green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
77	651 (3264, 3265)	18 June 1973 1	East, FFS-N	East, FFS-N	6-0	28 June 1979 23
78	3054 (3160)	5 May 1979 22	East, FFS-B	East, FFS-N	0-1	19 June 1979 23
79	3055 (3163)	5 May 1979 22	East, FFS-B	East, FFS-N	0-1	19 June 1979 23
80	3008 (3206)	2 May 1979 22	Trig, FFS-B	East, FFS-N	0-2	23 June 1979 23
	3008			Whale-Skate, FFS-B	1-11	6 June 1981 27
	3008			Tern, FFS-B	1-10	30 April 1982
	3008 (6064, 6065)			East, FFS-N	0-1	9 June 1982 30
81	2652 (3653, 3772)	13 June 1978 21	East, FFS-N	East, FFS-N	2-0	11 June 1980 24
	2652, 3772 (6161)			East, FFS-N	2-0	17 June 1982 30
82	2690 (3590, 3669)	15 June 1978 21	East, FFS-N	East, FFS-N	2-0	14 June 1980 24
	2690, 3590 (6130)			East, FFS-N	2-0	12 June 1982 30
83	2805, 2806 (3656)	19 June 1978 21	East, FFS-B	East, FFS-N	2-0	24 June 1980 24
	2805, 2806 (6228)			East, FFS-N	2-0	8 June 1982 30
	2805			East, FFS-N	0-2	3 August 1982 31
84	2589, 2590 (3672)	11 June 1978 21	East, FFS-N	East, FFS-N	2-1	29 June 1980 24
	2589, 2590 (6262, 6263)			East, FFS-N	2-0	12 June 1982 30
85	2218, 2219	2 July 1977 18	East, FFS-N	East, FFS-N	2-11	10 June 1980 24
86	2257 (3584)	2 July 1977 18	East, FFS-N	East, FFS-N	2-11	13 June 1980 24
	2257, 3584 (6121)			East, FFS-N	2-0	12 June 1982 30



Table 3.—Recovery data for female green turtles observed or originally tagged at French Frigate Shoals (FFS).—Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
87	2249 (3594) 2249, 3594 (6141)	30 June 1977 18	East, FFS-N	East, FFS-N	2-11	14 June 1980 24 14 June 1982 30
88	2227, 2228	27 June 1977 18	East, FFS-N	East, FFS-N	3-0	17 June 1980 24
89	2222 (3612, 3613) 2222, 3612 (6215, 6227)	27 June 1977 18	East, FFS-N	East, FFS-N	3-0	19 June 1980 24 19 June 1982 30
90	2245, 2246 (3634, 3645) 2246, 3634, 3645	30 June 1977 18	East, FFS-N	East, FFS-N	3-0	23 June 1980 24 20 June 1982 30
91	2233, 2234, 2233, 2234 (6123)	28 June 1977 18	East, FFS-N	East, FFS-N	3-0	22 June 1980 24 12 June 1982 30
92	2212 (3643, 3644)	25 June 1977 18	East, FFS-N	East, FFS-N	3-0	23 June 1980 24
93	1058 (3619, 3635)	16 June 1975 9	East, FFS-N	East, FFS-N	5-0	22 June 1980 24
94	751 (3622, 3623)	30 June 1974 3	East, FFS-N	East, FFS-N	6-0	20 June 1980 24
95	802 (3659, 3660)	16 July 1974 4	East, FFS-N	East, FFS-N	5-11	25 June 1980 24
96	859 (3591)	1 August 1974 5	East, FFS-N	East, FFS-B	5-10	14 June 1980 24
97	677 (3592, 3593) 3593 (6225, 6226)	13 July 1973 1	East, FFS-N	East, FFS-N	6-11	16 June 1980 24 6 June 1982 30
98	956FW (3773, 3774)	16 May 1971	East, FFS-B	East, FFS-N	9-1	11 June 1980 24

Table 3.—Recovery data for female green turtles observed or originally tagged at French Frigate Shoals (FFS).—Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
99	3164 (3760)	19 June 1979 23	Whale-Skate, FFS-B	Whale-Skate, FFS-B (Freq. 491)	1-0	9 June 1980 24
100	2716, 2717 2716, 2717 (6172)	15 June 1978 21	Whale-Skate, FFS-B	Whale-Skate, FFS-B Whale-Skate, FFS-B	2-0 2-0	8 June 1980 24 17 June 1982 30
101	115FW, 986 115FW, 986 115FW, 986 (3678)	17 September 1966	Laysan-B	Whale-Skate, FFS-B Whale-Skate, FFS-B Laysan-B	8-8 5-1 1-10	21 May 1975 8 30 June 1980 24 22 April 1982 AK
102	1247	17 April 1976 14	Trig, FFS-B	Trig, FFS-B	4-2	9 June 1980 24
103	665FW (3570, 3571)	22 March 1968	Pearl and Hermes-B (Freq. 200)	Trig, FFS-B	12-3	9 June 1980 24
104	3182, 3183 3182 (3723, 5281)	20 June 1979 23	East, FFS-N	Chun's Reef, Oahu-0 East, FFS-N	1-9 0-2	20 March 1981 4 June 1981 27
105	3636	22 June 1980 24	East, FFS-B	Pearl and Hermes-B	0-9	28 March 1981 RS
106	2758	17 June 1978 21	East, FFS-B	Pearl and Hermes-B	2-9	28 March 1981 RS
107	2207, 2208 (5145, 5412, 3707)	25 June 1977 18	East, FFS-N	East, FFS-N	4-0	13 June 1981 27
108	2223, 2224, 2225 (5320)	27 June 1977 18	East, FFS-N	East, FFS-N	3-0	6 June 1981 27
109	2241, 2242 (5296, 5378, 3800)	28 June 1977 18	East, FFS-N	East, FFS-N	3-0	10 June 1981 27
110	2271, 2272 (5276, 5303)	3 July 1977 18	East, FFS-N	East, FFS-N	4-0	18 June 1981 27

Table 3.--Recovery data for female green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
111	2577 (5076, 5077)	11 June 1978 21	East, FFS-N	East, FFS-N	3-0	16 June 1981 27
112	2584, 2585	10 June 1978 21	East, FFS-N	East, FFS-B	3-0	10 June 1981 27
113	2587, 2588 (5385)	11 June 1978 21	East, FFS-N	East, FFS-N	3-0	10 June 1981 27
114	2603, 2604	12 June 1978 21	East, FFS-N	East, FFS-N	3-0	26 May 1981 27
115	2244 (5299, 3778)	29 June 1977 18	East, FFS-N	East, FFS-N	4-0	16 June 1981 27
116	2607 (5249, 5250)	12 June 1978 21	East, FFS-N	East, FFS-N	3-0	14 June 1981 27
117	2653, 2654 (5091)	14 June 1978 21	East, FFS-N	East, FFS-N	3-0	8 June 1981 27
118	2666, 2678 (5372)	14 June 1978 21	East, FFS-N	East, FFS-N	3-0	15 June 1981 27
119	2692, 2693 (5072, 5243, 5244)	15 June 1978 21	East, FFS-N	East, FFS-N	3-0	16 June 1981 27
120	2694, 2677 (5191, 5424)	15 June 1978 21	East, FFS-N	East, FFS-N	3-0	14 June 1981 27
121	2696, 2697 (5146, 5204)	20 June 1978 21	East, FFS-N	East, FFS-N	3-0	18 June 1981 27
122	2705 (5434)	15 June 1978 21	Whale-Skate, FFS-B	Whale-Skate, FFS-B	3-0	16 June 1981 27
123	2767, 2768 (5341, 5342)	18 June 1978 21	East, FFS-N	East, FFS-N	3-0	8 June 1981 27
124	2769, 2770 (5130, 5287)	18 June 1978 21	East, FFS-N	East, FFS-N	3-0	16 June 1981 27
125	2775	18 June 1978 21	Gin, FFS-B	Gin, FFS-B	3-0	3 June 1981 27

Table 3.—Recovery data for female green turtles observed or originally tagged at French Frigate Shoals (FFS).—Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
126	2740, 2741 (3802, 5379)	17 June 1978 21	East, FFS-N	East, FFS-N	3-0	6 June 1981 27
127	2785, 2786 (3798, 5346)	18 June 1978 21	East, FFS-N	East, FFS-N	3-0	8 June 1981 27
128	2771 (3750, 5094, 5095)	18 June 1978 21	East, FFS-N	East, FFS-N	3-0	11 June 1981 27
129	2766 (5300)	18 June 1978 21	East, FFS-N	East, FFS-N	3-0	5 June 1981 27
130	2794 (3803, 5063, 5137)	19 June 1978 21	East, FFS-B	East, FFS-N	3-0	10 June 1981 27
131	2803 (3783, 5316)	19 June 1978 21	East, FFS-B	East, FFS-N	3-0	6 June 1981 27
132	2807 (5283, 5284)	19 June 1978 21	East, FFS-B	East, FFS-N	3-0	4 June 1981 27
133	2808	19 June 1978 21	East, FFS-C	East, FFS-B	3-0	10 June 1981 27
134	2815, 2816 (5438)	20 June 1978 21	East, FFS-N	East, FFS-N	3-0	18 June 1981 27
135	2817 (5157)	20 June 1978 21	Whale-Skate, FFS-B	Whale-Skate, FFS-B	2-11	30 May 1981 27
136	3017 (5415)	2 May 1979 22	Whale-Skate, FFS-B	Whale-Skate, FFS-B	2-1	13 June 1981 27
137	3029 (5383)	3 May 1979 22	East, FFS-B	East, FFS-B	2-1	10 June 1981 27
138	3140, 3141 (5214, 5230)	18 June 1979 23	East, FFS-N	East, FFS-N	2-0	15 June 1981 27
139	3087 (5156)	21 June 1979 23	Whale-Skate, FFS-B	Whale-Skate, FFS-B	1-11	30 May 1981 27
140	3213, 3214 (3837, 5420)	23 June 1979 23	East, FFS-N	East, FFS-N	2-0	16 June 1981 27
141	3232 (3827, 5375)	23 June 1979 23	East, FFS-N	East, FFS-N	2-0	14 June 1981 27

Table 3.--Recovery data for female green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
142	3254, 3255	28 June 1979 23	East, FFS-N	East, FFS-N	1-11	30 May 1981 27
143	3157, 3178 (5368)	20 June 1979 23	East, FFS-N	East, FFS-N	2-0	8 June 1981 27
144	1019, 1020 (5184, 5241, 5242)	25 July 1975 10	East, FFS-N	East, FFS-N	5-11	16 June 1981 27
145	645 (3701, 3810, 5139)	12 June 1973 1	East, FFS-N	East, FFS-N	8-0	11 June 1981t 27
146	830 (5138, 5194)	7 August 1974	East, FFS-N	East, FFS-N	6-10	14 June 1981 27
147	1292, 1293 (3748, 5090) 1292, 1293, 5090	8 July 1976 16	East, FFS-N	East, FFS-N	4-11	15 June 1981 27
148	3703	30 May 1981 27	East, FFS-N	Tern, FFS-N	0-2	31 July 1981 BS
149	1206	10 April 1976 14	Trig, FFS-B	Tern, FFS-N	5-4	31 July 1981 BS
150	2761, 2763 (5515, 5516)	18 June 1978 21	East, FFS-N	Ala Wai, Oahu-0	3-2	3 August 1981 GB
151	3473 (5522)	7 September 1980 25	Whale-Skate, FFS-B	Little North Is., Pearl and Hermes-B	0-11	7 August 1981 GB
152	1232	13 April 1976 14	Trig, FFS-B	Trig, FFS-B	6-0	14 April 1982 29
153	9[?]FW (2968, 2969, 2970, 2024) 2968, 2969, 2970, 2024 2968, 2969, 2970, 2024	March 1966	FFS-B	SE, Pearl and Hermes-B SE, Pearl and Hermes-B SE, Pearl and Hermes-B	12-7 2-6 0-4	5 October 1978 GB 28 March 1981 RS 8 August 1981 GB
154	5397 5397 (6179)	11 June 1981 27	Trig, FFS-B	Trig, FFS-B Whale-Skate, FFS-B	0-10 0-2	14 April 1982 29 17 June 1982 30

Table 3.--Recovery data for female green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition tNo.
155	3167 3167 (6238)	19 June 1979 23	Whale-Skate, FFS-B	Whale-Skate, FFS-B	2-10	15 April 1982 29
156	3579, 3580	25 June 1980 24	East, FFS-N	Whale-Skate, FFS-B	0-2	21 June 1982 30
157	5096, 5182	6 June 1981 27	East, FFS-N	Laysan-B	1-9	20 March 1982 AK
158	5363 (5913)	8 June 1981 27	Whale-Skate, FFS-B	Laysan-B	1-10	3 April 1982 AK
159	43 [1] FW (3554, 3555) 3554	March 1967 (?)	Lisianski-B	Whale-Skate, FFS-B	13-3	8 June 1980 24
160	2251, 2252 (6115, 6116)	1 July 1977 18	East, FFS-N	Lisianski-B	1-9	28 March 1982 SS
161	2580, 2581 (6032, 6033)	10 June 1978 21	East, FFS-N	East, FFS-N	5-1	11 June 1982 30
162	2651, 2671 (5994, 6129)	16 June 1978 21	East, FFS-N	East, FFS-N	4-0	20 June 1982 30
163	2791, 2792 (6118, 6119)	19 June 1978 21	East, FFS-N	East, FFS-N	4-0	24 June 1982 30
164	2742, 2743 (6184)	17 June 1978 21	East, FFS-N	East, FFS-N	4-0	25 June 1982 30
165	2591, 2812 (6026)	20 June 1978 21	East, FFS-N	East, FFS-N	4-0	18 June 1982 30
166	2804 (6000, 6210)	19 June 1978 21	East, FFS-B	East, FFS-N	4-0	24 June 1982 30
167	2818	20 June 1978 21	Whale-Skate-FFS-B	Whale-Skate, FFS-B	4-0	20 June 1982 30
168	3137, 3138 (6138)	17 June 1979 23	East, FFS-N	East, FFS-N	3-0	25 June 1982 30

Table 3.—Recovery data for female green turtles observed or originally tagged at French Frigate Shoals (FFS).—Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
169	3142, 3143 (6153)	18 June 1979 23	East, FFS-N	East, FFS-N	3-0	16 June 1982 30
170	3151, 3158 (6163)	19 June 1979 23	East, FFS-N	East, FFS-N	3-0	17 June 1982 30
171	3146, 3147 (6211)	18 June 1979 23	East, FFS-N	East, FFS-N	3-0	20 June 1982 30
172	3149 (6187, 6203, 6204)	18 June 1979 23	East, FFS-N	East, FFS-N	3-0	19 June 1982 30
173	3139, 3161 (6208, 6209)	19 June 1979 23	East, FFS-N	East, FFS-N	3-0	19 June 1982 30
174	3155 (6216)	19 June 1979 23	East, FFS-N	East, FFS-N	3-0	20 June 1982 30
175	3165	19 June 1979 23	Whale-Skate, FFS-B	Whale-Skate, FFS-B	3-0	17 June 1982 30
176	3123, 3124	16 June 1979 23	Whale-Skate, FFS-B	Whale-Skate, FFS-B	3-0	17 June 1982 30
177	3243, 3244 (6029)	29 June 1979 23	East, FFS-B	East, FFS-N	3-0	19 June 1982 30
178	3201, 3202 (6255)	21 June 1979 23	East, FFS-N	East, FFS-N	3-0	23 June 1982 30
179	3211, 3212 (6189, 6190) 6190	24 June 1979 23	East, FFS-N	East, FFS-N	3-0	18 June 1982 30
180	3220, 3221	24 June 1979 23	East, FFS-N	East, FFS-N	3-0	20 June 1982 30
181	3226, 3227 (6251, 6252, 6253)	25 June 1979 23	East, FFS-N	East, FFS-N	3-0	23 June 1982 30
					0-2	4 August 1982 31

Table 3.--Recovery data for female green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
182	3246, 3247	27 June 1979 23	East, FFS-B	East, FFS-B	3-0	8 June 1982 30
183	3595, 3596 (6094, 6099, 6100) 6099	28 June 1980 24	East, FFS-N	East, FFS-N	2-0	22 June 1982 30
184	3587, 3597	27 June 1980 24	East, FFS-N	East, FFS-B	2-0	23 June 1982 30
185	3632, 3633 (6135, 6259)	21 June 1980 24	East, FFS-N	East, FFS-N	2-0	25 June 1982 30
186	3602, 3603 (6209)	29 June 1980 24	East, FFS-N	East, FFS-N	2-0	19 June 1982 30
187	3606	29 June 1980 24	East, FFS-N	Whale-Skate, FFS-B	2-0	17 June 1982 30
188	5453	September 1981 BS	Tern, FFS-B	Tern, FFS-B	0-9	10 June 1982 30
189	5454 (6218)	April 1982 JA	Tern, FFS-B	East, FFS-N	0-2	19 June 1982 30
190	5458	16 May 1982 JA	Tern, FFS-B	Trig, FFS-B	0-1	25 June 1982 30
191	4951, 5782	15 April 1982 29	Whale-Skate, FFS-B	Whale-Skate, FFS-B	0-2	17 June 1982 30
192	780, 815 (6035, 6036)	16 June 1974 3	East, FFS-N	East, FFS-N	8-0	25 June 1982 30
193	1286 (6095, 6096)	7 July 1976 16	East, FFS-N	East, FFS-N	6-0	24 June 1982 30
194	3600, 3601 (6256)	29 June 1980 24	East, FFS-N	East, FFS-N	2-0	23 June 1982 30
195	6126 (5472)	12 June 1982 30	East, FFS-N	East, FFS-N	0-2	3 August 1982 31
196	6219, 6220, 6230	21 June 1982 30	East, FFS-N	East, FFS-N	0-1	3 August 1982 31



Table 3.--Recovery data for female green turtles observed or originally tagged at French Frigate Shoals (FFS).--Continued.

Entry No.	Tag No.	Date tagged/ expedition No.	Location tagged and status	Location recovered and status	Interval years/months	Date recovered/ expedition No.
197	6015, 6031	8 June 1982 30	East, FFS-N	East, FFS-N	0-2	3 August 1982 31
198	6185	17 June 1982 30	East, FFS-N	East, FFS-N	0-2	3 August 1982 31
199	6182, 6242, 6260	25 June 1982 30	East, FFS-N	East, FFS-N	0-1	3 August 1982 31
200	6010, 6011	22 June 1982 30	East, FFS-N	Whale-Skate, FFS-N	0-1	14 July 1982 RI
201	5471 (5475, 6351)	3 August 1982 31	East, FFS-B	East, FFS-N	0-1	3 September 1982 32
202	3654, 3655	24 June 1980 24	East, FFS-N	East, FFS-N	2-2	3 September 1982 32
203	5452	September 1981 BS	Tern, FFS	Tern, FFS-B	0-8	16 May 1982 JA
	5452			Tern, FFS-B	0-5	19 October 1982 RI
	5452			Tern, FFS-B	0-1	15 November 1982 RI
204	3604, 3605, 3671 3671	29 June 1980 24	East, FFS-N	SE, Pearl and Hermes-B SE, Pearl and Hermes-B	2-0 0-4	2 July 1982 AK 29 October 1982 AK
205	6156, 5992	20 June 1982	East, FFS-N	North I., Pearl and Hermes-B	0-4	30 October 1982 AK
206	5200, 5201 3707, 3830	14 June 1981 27	East, FFS-N	Lisianski-B	1-5	5 November 1982 JH
207	3188, 3269	21 June 1979 23	Whale-Skate, FFS-B	Molokai-OD	3-7	17 January 1983 BP

Table 4.--Shedding rates of Inconel tags: 59 recoveries of double-tagged green turtles at French Frigate Shoals during the 1981 and 1982 breeding seasons (analysis by J. A. Wetherall).

Recovery interval in years (i)	No. of turtles with no tags shed	No. of turtles with one tag shed	Estimated probability of tag shedding ( $1-\hat{K}_i$ )	95% confidence limits on $(1-K_i)$	
				Lower limit	Upper limit
2	12	5	0.17	0.02	0.32
3	17	10	0.23	0.09	0.37
4	7	6	0.30	0.07	0.53
5	1	1	0.33	0.00	0.95

$$\hat{K}_i = \frac{2r_{di}}{r_{si} + 2r_{di}}$$

where:  $\hat{K}_i$  = Probability of tag retention from the time of tagging until the midpoint of the recapture period  $i$  years later.  
 $r_{di}$  = Number of turtles recovered with two tags  $i$  years after tagging.  
 $r_{si}$  = Number of turtles recovered with one tag  $i$  years after tagging.

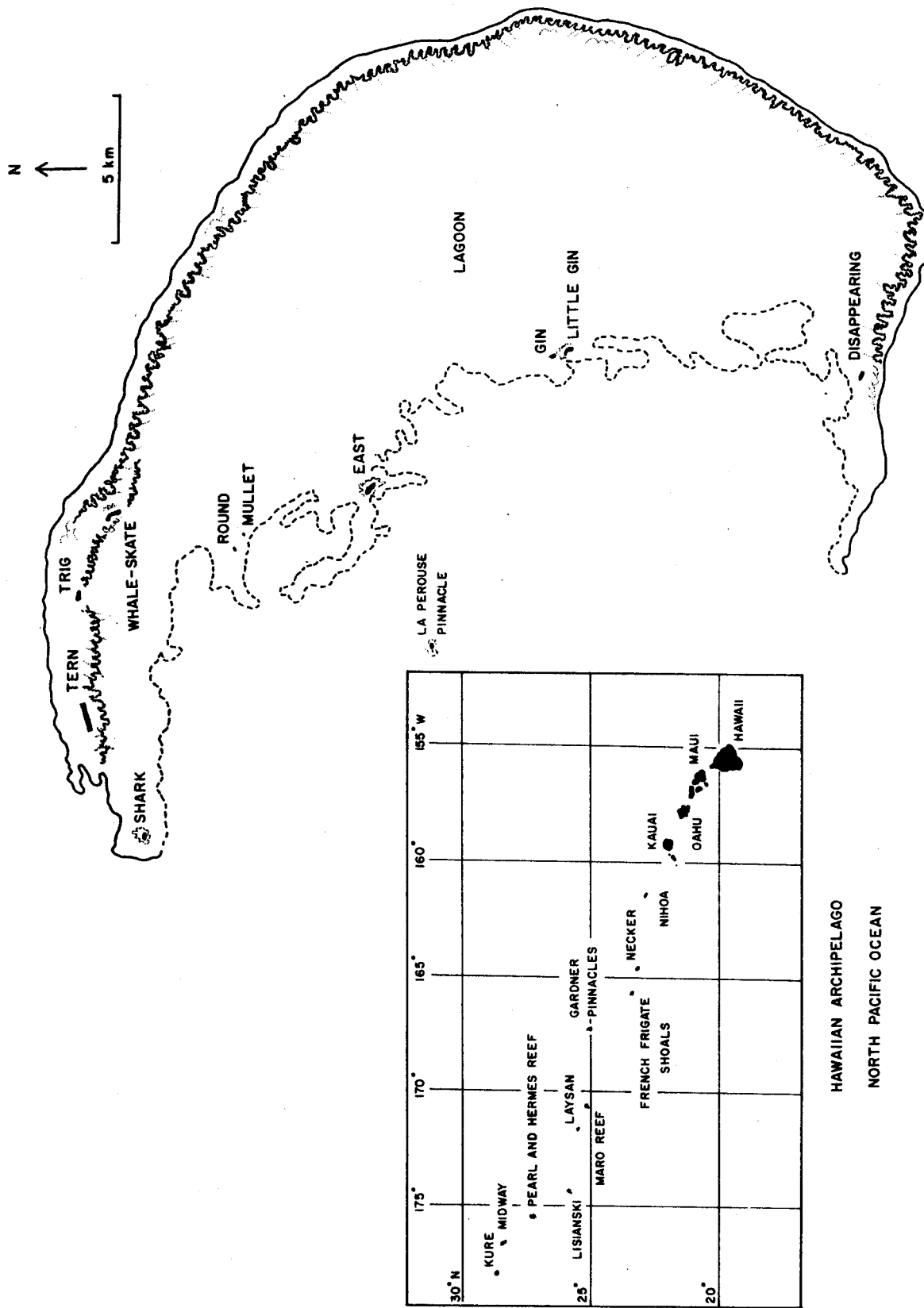


Figure 1.--French Frigate Shoals and the Hawaiian Archipelago. FRENCH FRIGATE SHOALS



Figure 2.--East Island, French Frigate Shoals.



Figure 3.--Adult green turtles basking on East Island.



Figure 4.--Adult male green turtle basking on East Island.



Figure 5.--Adult female green turtle nesting on East Island.

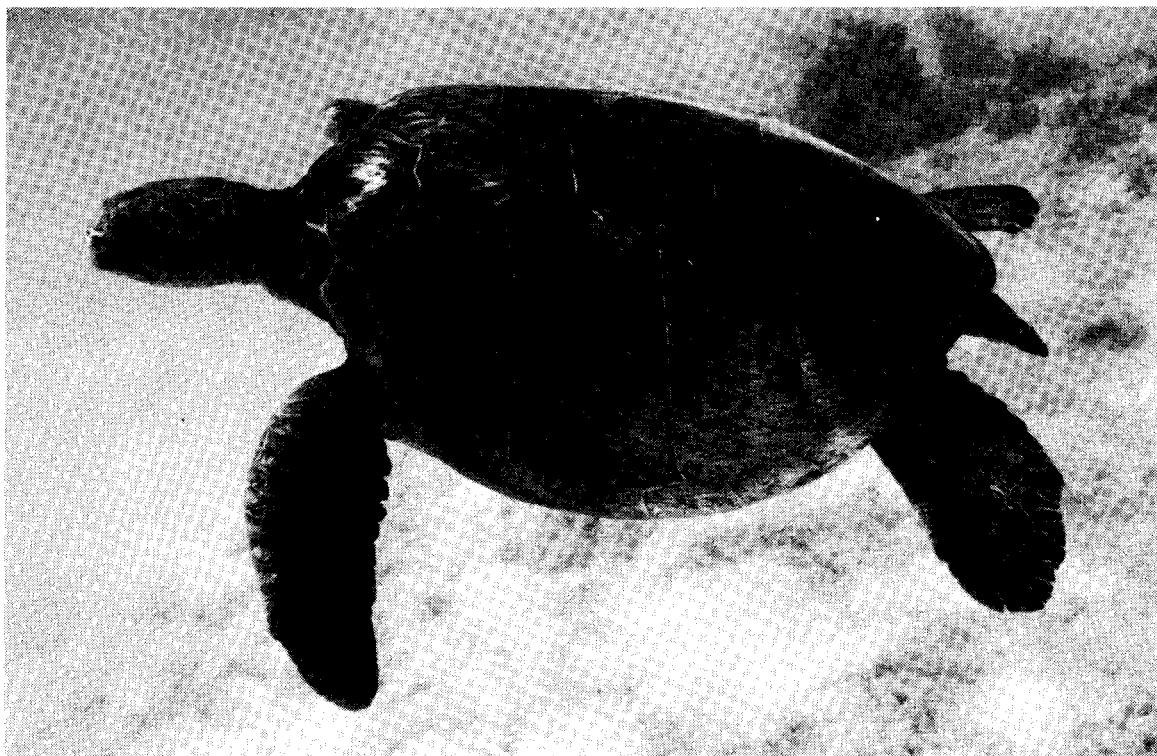


Figure 6.--Adult female green turtle swimming near bottom.

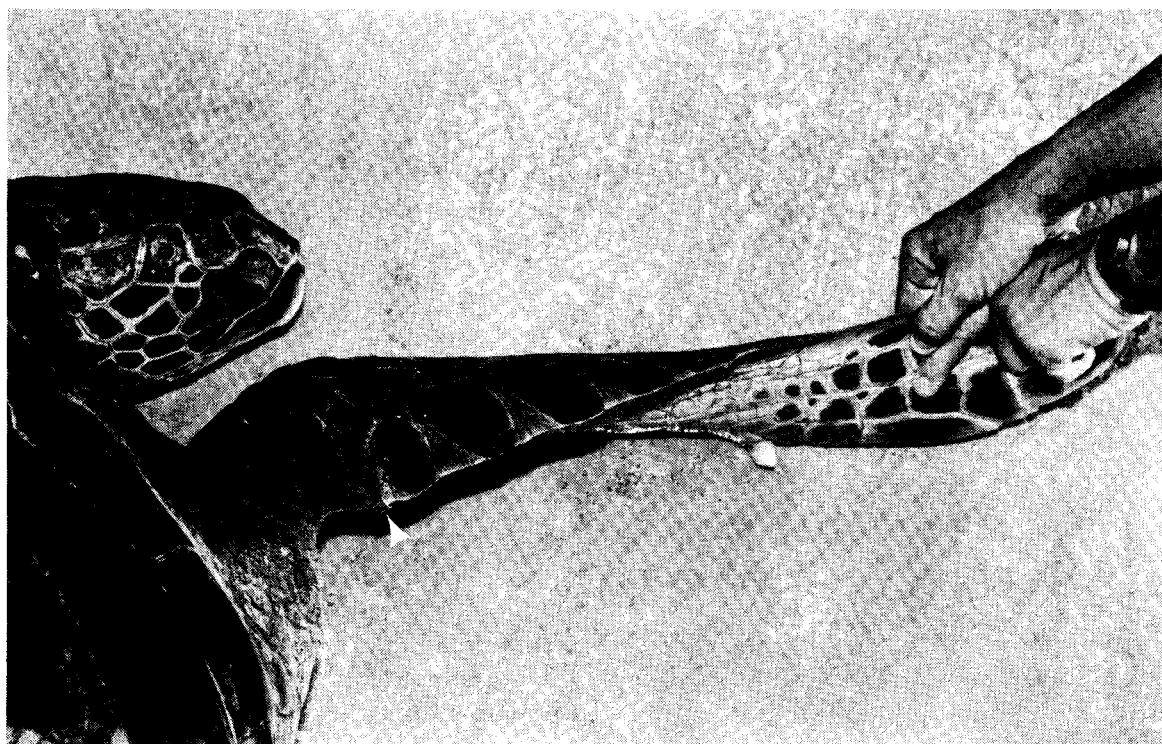


Figure 7.--Front flipper showing standard placement of tag.

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