NORTHWESTERN HAWAIIAN ISLANDS

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ATOLL RESEARCH BULLETIN

171. THE NATURAL HISTORY OF LAYSAN ISLAND, NORTHWESTERN HAWAIIAN ISLANDS

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Reptiles

Two species occur on Laysan--the Green Sea Turtle, Chelonia mydas, and the Snake-eyed Skink, Ablepharus boutoni--and another, the Fox Gecko (Hemidactylus garnoti), formerly occurred there. Both the lizards were probably introduced to the island by man but the turtle is native to Laysan. Turtles still use the island as hauling grounds but probably only a very few breed there. They were abundant on Laysan during the 19th century and were heavily utilized by visiting seamen and fishermen. Numbers were greatly reduced and there has been little increase in the population since.

Species Accounts

Birds

In the following species accounts (birds), the common and scientific names and the sequence of species are from standard references, primarily the AOU Checklist (1957)--and for the Procellariiformes and Laridae, King (1967).

A standard format is employed for each species as indicated below:

Status: Intended to provide a very brief summary of the occurrence and activity of each species while on Laysan. Included are:

A. Relative Abundance: For breeding seabirds the following scale is used: 1) abundant--peak populations in excess of 50,000 individuals; 2) common--peak populations of about 1,000-50,000 individuals; 3) uncommon--populations of less than 500 individuals. These limits were chosen because estimated breeding populations of all species fall easily within one of these categories. A different scale is used for transient shorebirds and endemic land birds because of the much smaller numbers involved: 1) abundant--peak populations in excess of 1,000 individuals; 2) common--peak populations of 100-1,000 individuals; 3) uncommon--regular in occurrence but peak populations less than 100 individuals.

B. Status: Two categories are used: 1) breeder--a species breeding on the island but most individuals absent during some part of the non-nesting season; varying numbers of non-breeding birds (local, from other islands, or both) may be present during the non-nesting season; 2) migrant--species visiting the island only during the non-reproductive season; may visit the island only briefly in transit elsewhere or remain for a substantial period, usually during the winter months.

C. Maximum recent estimate: These are maximum (conservative) estimates during the last decade. All extreme estimates have been re-evaluated and some have been omitted from the text. All such estimates are enclosed in brackets in the appropriate table of observations or wherever mentioned in the text. Whenever available, estimates made by the POBSP are used but some estimates were provided by the BSFW.

PIG — Sus scrofa

Status

Introduced by the guano company about 1890; evidently not present for more than a few years.

Observations

In June 1891 Munro (1946: 60) noted that "A few hogs roamed around, feeding on the dead albatross..." F.D. Walker (1909: 30) also noted that pigs were present during this visit and that they were known to feed on the tubers of a "false yam" which Tomich (1969: 79) has identified as Boerhavia.

Two pigs were still present a little more than two years later (Farrell, 1928: 399) but none was noted as present in May 1902 (Thomas, ms.).

DOMESTIC CATTLE — Bos taurus

Status

Introduced in the early 1900's; subsequently died, or were removed from Laysan.

Observations

Only two observers mention the presence of cattle. In May 1902, Thomas (ms.) noted that several cows, kept for the use of Schlemmer, were present. Subsequently Wilder (1905: 392) reported that "a few milch cows" were present in September 1905. Probably these animals were removed from the island during the next few years as none was present in January 1910.

Reptiles

GREEN TURTLE — Chelonia mydas

Turtles, presumably this species, were first recorded on Laysan coincident with the first known report of the island by Europeans in 1828 (von Kittlitz in Rothschild, 1893). Other early observers (e.g. Brooks, 1859) usually reported their presence but indications of the number present were rarely given.

Numbers of turtles seen on Laysan by different observers are summarized in tabular form below. Only those observations which give some idea of their abundance or breeding status are included here.

Laysan Green Sea Turtle populations have clearly decreased gradually and steadily throughout the last two centuries, certainly as a direct result

of predation and disturbance by man. From a formerly abundant resident of the island, these turtles have become uncommon to rare and apparently are in distinct danger of becoming extinct at this breeding station. No recent observers, either POBSP survey teams or those of the U.S. Fish and Wildlife Service, have found any direct evidence that the species still breeds on Laysan although Woodside (1961) found some "nests" in September 1961, none of which, when examined, contained eggs.

Table GT-1. Observations of Green Turtles on Laysan.*

Date of Survey		Number Seen	Remarks and References
1828	24 Mar.	?	Some very large turtles seen (Rothschild, 1893-1900: vi).
1857	1 May	numerous	(Paty, 1857: 40).
1858	14 Jan.	?	6 small turtles killed (Log of the U.S.S. Fenimore Cooper).
1882	26-30 Jan.	?	104 turtles taken by crew of fishing schooner Ada (Hornell, 1934: 432).
	3 May	?	26 turtles taken by crew of Ada (Hornell, 1934: 432-433).
1886	ca. late Sept.	?	Some turtles killed (Farrell, 1928: 253-254) by crew of schooner General Siegal.
1896	24 June-24 Sept.	?	Numerous on Laysan's coasts; often in whole schools (Schauinsland, 1899: 64). One female captured contained several hundred eggs.
1905	19 Sept.	?	A few turtles shot (Wilder, 1905: 392).
1911	24 Apr.-5 June	?	1 turtle killed for food (Dill and Bryan, 1912: 421).
1912-1913	22 Dec.-11 Mar.	?	"Turtle appeared occasionally;" [1 or more killed for food]. (Salisbury, ms.).
1915	3 Apr.	?	Decaying turtle meat found in building (Munter, 1915: 138). [Turtles evidently killed for food by Japanese].

*Many early reports do not specifically identify turtles seen on Laysan as Green Turtles. However, as the Hawksbill and Ridley are not known to breed in the Northwestern Hawaiian Islands, we feel it a safe assumption that early records referred to the Green Turtle.

Table GT-1. (continued)

Date of Survey		Number Seen	Remarks and References
1915	12-31 July	4	Turtles captured for food on 14 July (1 small), 15 July (2), 27 July (1) (Schlemmer and Schlemmer, ms.).
	1-31 Aug.	2	Turtles killed or captured on 7 August (1) and 31 August (1) (Schlemmer and Schlemmer, ms.).
	1-31 Oct.	3	Turtles killed or captured 11th (2 small, 1 large) (Schlemmer and Schlemmer, ms.).
	1-30 Nov.	5	Turtles "turned over" and presumably captured on 8th (2 large); others captured 9th (2) and 22nd (1 small) (Schlemmer and Schlemmer, ms.).
1918	8-10 Sept.	in abundance	Many caught by crew of Hermes (Diggs, ms.).
1923	8 Apr.	at least 50	5 seen on west shore; largest thought to weigh over 200 lbs. (Dickey, ms.; Ball, ms.).
	10 Apr.	5	Seen on west shore; 1 ca. 50 lb..turtle captured for food (Dickey, ms.).
	3 May	2	Seen along beach (Wetmore, ms.).
	8 May	3	Small, 1 captured for food (Wetmore, ms.).
1934	26 June	?	A few large turtles seen (Baylis, ms.).
1936	7-8 Mar.	10-12	Seen along eastern beach (Trempe, ms.).
	12 Dec.	15	(Coultas, ms.).
1950	23 June	ca. 10	(POFI). Some presumably tagged (cf. Brock, 1951a: 371).
1951	12 May	?	Turtles numerous along northeast, north, and west side of island. No tagged turtles seen (POFI).
1954	3 Nov.	1	Seen; medium-sized (POFI).
1961	7 Mar.	6	Seen along beaches. All 40 lbs. or more but no evidence of egg laying (Woodside and Kramer, ms.).

Table GT-1. (continued)

Date of Survey	Number Seen	Remarks and References
1961 4-10 Sept.	3-4	2 females tagged. 5 nest sites examined but no eggs found (Woodside, ms. c).
1963 11-13 Feb.	6	All seen were tagged by Kramer who saw no small turtles and no signs of egg laying (POBSP).
3-10 Dec.	3	Counted 3 December. A male and 2 females tagged 4 December (Walker, ms. b).
1964 10-11 Mar.	1	Seen on southeast beach 10 March. About 2 feet long (BSFW, POBSP).
16-20 Sept.	2	Seen close to shore on 16 September (POBSP).
1965 6-11 Mar.	2	Seen on southwest beach 7 March; one, a female, had been tagged in December 1963 (POBSP).
5-12 Aug.	2	Seen offshore west beach (POBSP).
1966 26-31 Mar.	2	Females (BSFW).
10-16, 20-21 June	3	Females seen along beaches; 1 ca. 18". 2 ca. 36" (POBSP).
17-18 Sept.	2	Females; 1 tagged, the other had been tagged February 1963 (BSFW).
20-23 Oct.	2	Large females counted 21 October. Neither previously tagged (POBSP).
1967 18-19 Mar.	2	1 male tagged (BSFW).
7-12 June	4	3 medium-sized, 1 large (POBSP).
21-24 Sept.	1	1 male tagged (BSFW).
13 Dec.	6	All females, 2 of which were returns. 1 had been tagged in February 1963, and was the same turtle that returned in September 1966 (BSFW).
1968 17-19 Mar.	5	4 (3 females and a male) newly tagged and 1 returned (the male tagged in September 1967) (BSFW).

Table GT-1. (continued)

Date of Survey	Number Seen	Remarks and References
1969 26-29 Mar.	2	Counted 26 March. Both small, tagged. 6 others seen swimming offshore (BSFW).
2-3 June	3	Counted 2 June (BSFW).
9 Sept.	0	9 nest sites found, 1 along south shore and 2 groups of 4 on northwest corner. 1 site investigated contained no eggs (BSFW).

FOX GECKO — Hemidactylus garnotii

The first report that the Fox Gecko occurred on Laysan was Werner's (1901: 382) statement that this species occurred there, apparently on the basis of collections made by Schauinsland in 1896. Snyder (1917) later reported that eggs had been found on Laysan, presumably by himself in May 1902. Subsequently, Willett (ms.) indicated that this species was occasionally seen during the visit of the Biological Survey party from December 1912 to March 1913. No more recent observers have reported this large gecko (or, for that matter, any gecko) from the island. It seems likely that the Fox Gecko was accidentally introduced by early visitors to the island and has since become extirpated.

SNAKE-EYED SKINK — Ablepharus boutonii

The earliest report of the occurrence of this lizard on Laysan was by Werner (1901: 385), who examined Schauinsland's reptile collections. Snyder subsequently observed that, of 10 specimens collected there (presumably in May 1902), none had uninjured tails. He attributed these deformities to predation on the skinks by the birds (Snyder, 1917).

Judging from field notes taken by the POBSP, skink populations on this island periodically exhibit great variation in size. On surveys from February 1963 through August 1965, none or very few skinks were seen, most being found in local concentrations in some of the rock formations.

In mid-June 1966 the skinks were evidently somewhat more abundant since some 22 individuals were collected in various locations around the island. During this survey a nest containing 23 eggs was found in a shallow depression beneath an old lumber pile. By the following October these lizards were abundant enough so that POBSP observers reported them as "very numerous."

POBSP specimens: 3, September 18-19, 1964, USNM 157670-157672; 21, June 13, 1966, USNM field numbers 10897-10917.

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Laysan

Appendix Table 3. (continued)

Chordata

Vertebrata

Pisces

Steindacher, 1900.	Reports 51 species of fish collected by Schauinsland.
Jordan and Snyder, 1904.	Reports fish collected at Oahu, Hawaii, and Laysan, the latter collection by Max Schlemmer, but does not always give collection localities. Lists 7 species from Laysan.
Snyder, 1904.	Reports 33 species of fish collected by the Albatross Expedition.
Gilbert, 1905.	Records 24 species of deep sea fishes collected in the vicinity of Laysan by the Albatross Expedition and one species collected at Laysan by Max Schlemmer.
Fowler and Ball, 1924.	Describes a new family, genus and species for a fish collected by the Tanager Expedition.
Fowler and Ball, 1925.	Reports 71 species of fish collected by the Tanager Expedition.
Fowler, 1927.	Lists 7 species, 6 from the Tanager collections of which 1 was not reported in Fowler 1925, and 1 from a collection in May 1893.
Fowler, 1934.	Lists 2 additional species of fish from Laysan from collection made in August 1930.
Strasberg, 1956.	Revises taxonomy of Hawaiian blennioid fishes recording 3 species from Laysan.

Reptilia

Paty, 1857.	Mentions presence of turtles in 1857.
Schauinsland, 1899.	Gives observations of turtles from 1896.
Rothschild, 1893-1900.	Indicates turtles were seen in 1828.
Werner, 1901.	Reports 2 lizards from Schauinsland's visit.

Appendix Table 3. (continued)

Reptilia (continued)

Wilder, 1905.	Mentions that turtles were shot in September 1905.
Dill and Bryan, 1912.	Mentions occurrence of turtles and their eggs, and the killing of one turtle for food.
Snyder, 1917.	Reports collections and observations of 2 lizards in May 1902.
Munro, 1946.	Reports that "one or two species" of lizards were present in 1891.
Brock, 1951a.	Mentions field party went ashore to tag turtles.
Anon., 1951b.; Coultas, ms.	Reports that 15 turtles were seen in December 1936.
Udvardy, 1961b.	Gives turtle observations made September 1961.
Beardsley, 1966.	Reports collection of a skink in September 1964; erroneously records it as new record.

Mammalia

Paty, 1857.	Mentions presence of seals in 1857.
Rothschild, 1893-1900.	Mentions seals were seen in 1828.
Matschie, 1905.	Describes Hawaiian monk seal from skull collected by Schauinsland.
Wilder, 1905.	Mentions presence of donkey and a few cows in September 1905.
Dill and Bryan, 1912.	Gives information on introduction and habits of rabbits; presence of guinea pigs and absence of seals.
Munter, 1915.	Mentions presence and capture of rabbits in April 1915.
Bailey, 1918.	Notes collection of a seal specimen by the Biological Survey party 1912-1913.
Wetmore, 1925.	Reports that only a few hundred rabbits were present in 1923.

ARB No. 174 Dec 31, 1979
The Natural History of Pearl and Hermes Reef, NHI

61

by American Eggs of Wirtz

BLACK TURTLE

Chelonia agassizi

Status

Uncommon resident breeder; a few probably present year-round; frequents Little North, North, and Southeast Islands. Maximum recent POBSP and BSFW population estimate 55 in September 1966.

Observations

Morrell (1832: 218) first recorded sea turtles in 1825; he wrote that "great numbers of green turtles are found on the sand-beaches, where they come to deposit their eggs." He further noted that "the hawk's-bill turtle, also, sometimes visits this place, but in small numbers." Osbun (Kemble, 1966: 155) in August 1850 caught one small sea turtle on the reef, but saw "no Turtle nor the signs of any" on shore.

Turtles were next recorded in 1857 by Paty (1857: 2-3) who wrote that the lagoon "seemed to abound with...turtle." Two years later Brooks (1860: 502) noted "plenty of...turtle," and in 1882 the crew of the Japanese schooner Ada killed 28 (Hornell, 1934: 432). Turtles were also reported to be plentiful in 1913 (Bailey, 1956: 30) and 1914 (Elschner, 1915: 60). Munter (ms.) noted eight on the beach in February 1916. Wetmore (ms.), however, did not observe them in April 1923.

POBSP and BSFW personnel recorded turtles on most survey trips since early 1963. All turtle observations are summarized in Table 3.

Table 3. Black Turtle observations at Pearl and Hermes Reef

Date of Survey	Island	Population Estimate	Breeding Status, Remarks, References
1825 8-11 July	?	great numbers	On beaches; notes eggs (Morrell, 1832: 218).
1850 11 Aug.	Southeast?	0	Saw "no Turtle nor the signs of any" on the island but caught "one small Green Turtle on the reef" (Kemble, 1966: 155).
1857 19-20 May	?	?	Lagoon abounded with turtle (Paty, 1857: 2-3).
1859 5 July	?	?	Plenty of turtle (Brocks, 1860: 502).
1882 19-21 Jan.	?	28	Killed by crew of schooner Ada (Hornell, 1934: 432).
1913 15 Mar.	North	?	Many large Green Turtles (Bailey, 1956: 30).

Table 3. (continued)

Date of Survey	Island	Population Estimate	Breeding Status, Remarks, References
1914 Sept.	North	?	Good many turtles (Elschner, 1915: 60).
1916 4 Feb.	Southeast	8	Hauled out on beach (Munter, ms.).
1923 26-28 Apr.	?	0	Did not record turtles (Wetmore, ms.).
1930 22 July-23 Aug.	?	?	Notes presence of large amount of algae (Codium) in turtle stomachs (Galtsoff, 1933: 16).
1950 27 June	Southeast	12	Tagged (POFI, 1950).
1956 22 Mar.	Southeast	44	Counted (POFI, 1956a).
26 May	Southeast	3	(POFI, 1956b).
26 May	North	1	Digging nest (POFI, 1956b).
1957 ?	Southeast	20-50	Basking on north beach (Parsons, 1962: 69-70).
?	North	10-20	Basking on south beach (Parsons, 1962: 69-70).
1958 ?	Southeast	20-50	Basking on north beach (Parsons, 1962: 69-70).
?	North	10-20	Basking on south beach (Parsons, 1962: 69-70).
1961 12 Mar.	Southeast	4	Adults; copulation observed in shallow water; no sign of egg laying (HDFG, 1961).
1962 Jan.*	Bird and Sand	30	Seen from aerial survey; 8 ♀ basking (Carr, in litt.).
1963 26 Feb.-8 Mar.	Southeast	15	On beaches, mostly at night (POBSP, 1964d).
6 Mar.	North	7	On east beach cove (POBSP, 1964d).

*Between 14 and 28 January.

Table 3. (continued)

Date of Survey		Island	Population Estimate	Breeding Status, Remarks, References
1963	18-23, 25 June	Southeast	20	On beaches, mostly nocturnal (POBSP, 1963).
	23-25 June	North	9	On beaches (POBSP, 1963).
	23, 25 June	Little North	2	On beaches, 1 15" yearling caught (POBSP, 1963).
1964	13-14 Mar.	Southeast	8	Adults; 2 ♂ and 5 ♀ tagged (BSFW, 1964a; POBSP, 1964b).
	16-19 Aug.	Southeast	12	Nocturnally (POBSP, 1964a).
	19-20 Aug.	North	10	Nocturnally (POBSP, 1964a).
	16 Sept.	Southeast	31	Adults; 5 ♂ and 14 ♀ tagged; nest pits, but no eggs (BSFW, 1964b; POBSP, 1964c).
	17 Sept.	North	2	Small 2' x 2' turtles; 8-10 pits, no eggs, 1 3" mummified young (BSFW, 1964b; POBSP, 1964c).
	17 Sept.	Little North	2	Adults; 1 ♀ on beach (BSFW, 1964b).
1965	15-19 Mar.	Southeast	12	Counted on 15th (POBSP, 1965b).
	17-18 Mar.	North	5	Counted on 17th; 1 mummified hatchling (POBSP, 1965b).
	21-22 Mar.	Southeast	5	1 ♂ and 1 ♀ tagged; 1 recaptured (BSFW, 1965; POBSP, 1965a).
1966	1 Apr.	Southeast	12	3 ♂ and 6 ♀ tagged (BSFW, 1966a).
	20-26 Sept.	Southeast	50	44 tagged, 6 recaptured (BSFW, 1966b).
	22 Sept.	North	2	Adults, 1 ♂ and 1 ♀ tagged (BSFW, 1966b).
	22 Sept.	Little North	3	Adults, 2 ♂ and 1 ♀ tagged (BSFW, 1966b).
1967	16-17 Mar.	North	9	Counted on 16th (BSFW, 1967d).

Table 3. (continued)

Date of Survey		Island	Population Estimate	Breeding Status, Remarks, References
1967	17 Mar.	Southeast	8	Counted (BSFW, 1967d).
	21-23 Mar.	Southeast	17	1 ♂ and 10 ♀ tagged; 1 ♂ and 5 ♀ recaptured (BSFW, 1967a; POBSP, 1967d).
	28, 30 May-1 June	Southeast	5	4 large, 1 small; copulation in water (POBSP, 1967b).
	28-30 Aug.	Southeast	?	Present (POBSP, 1967a).
	29-30 Aug.	North	3-5	(POBSP, 1967a).
	29 Aug.	Little North	1	Counted (POBSP, 1967a).
	27-29 Sept.	Southeast	19	3 ♂ and 1 ♀ tagged at dusk (BSFW, 1967c).
1968	22-24 Mar.	Southeast	22	10 tagged, 12 recaptured (BSFW, 1968; POBSP, 1968).
1969	10-12 Feb.	Southeast	2	Unknown sex (BSFW, 1969a).
	10-12 Feb.	North	11	6 ♂, 1 ♀, 4 unknown (BSFW, 1969a).
	10-12 Feb.	Little North	2	Unknown sex (BSFW, 1969a).
	31 Mar.-2 Apr.	Southeast	11	2 ♀ tagged, 9 recaptured (BSFW, 1969b).
	31 Mar.	North	7	5 ♂ and 2 ♀ tagged (BSFW, 1969b).
	31 Mar.	Little North	3	1 ♂ and 2 ♀ tagged (BSFW, 1969b).
	26-31 May	Southeast	8	2 tagged, 6 recaptured (BSFW, 1969c).
	26 May	North	6	Counted (BSFW, 1969c).
	10-19 Sept.	Southeast	27	Counted on the 10th; 3 ♂ and 9 ♀ tagged; 3 ♂, 3 ♀ and 2 unknown recaptured; 10 nest pits on west portion, no eggs (BSFW, 1969d).

Annual Cycle

Black Turtles have been observed in small numbers during most months of the year. Recent March population counts for the atoll range from 17 to 21. May and June counts range from 14 to 31, while September counts range from 35 to 55.

Although turtles have been observed copulating in March, May and June, no egg laying has been observed. Small numbers of egg pits were recorded in September, but no eggs were found by digging. Mummified hatchlings were found in March and September. Turtles on other Northwestern Hawaiian Islands lay their eggs in the summer months with young hatching by late summer and fall.

Ecological Distribution

Turtles are attracted to the atoll for food and for breeding purposes. Adults and yearlings feed on algae growing in the lagoon. Tsuda (1966: 39) recorded 39 species of marine benthic algae from the lagoon. At least one of these, Codium arabicum, is frequently used as food by adult sea turtles.

Turtles are known only from Bird, Little North, North, Sand, and Southeast Islands; nesting occurs solely on North and Southeast Islands. None has been observed on the other islands.

Little North Island: Turtles have been recorded on six occasions (Table 3). The population, regardless of month, was always low and ranged from 1 to 3.

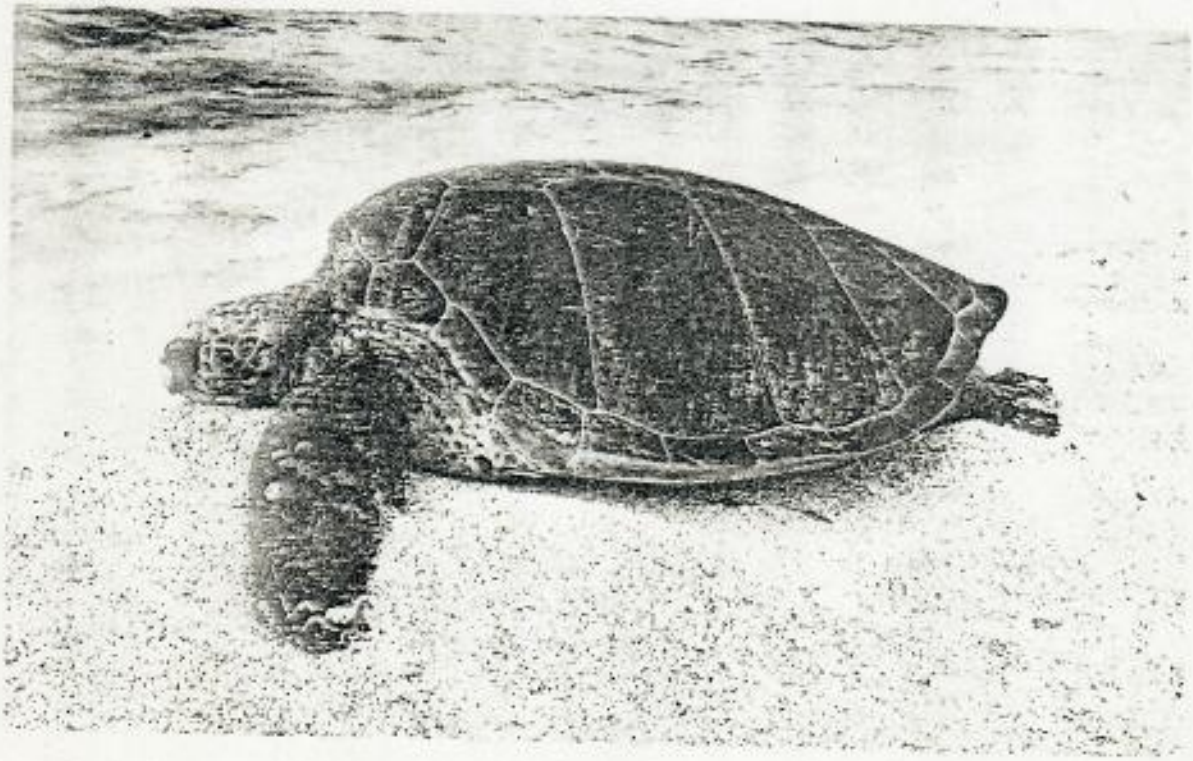
North Island: Turtles have been observed on 16 surveys (Table 3). Population estimates have averaged 7 for all 11 recent surveys, and have ranged from 2 to 11. The southeast beach cove area is popular day and night with basking turtles (Fig. 56). In September 1964, 8 to 10 turtle nest pits were noted but digging produced no eggs; a mummified 3-inch hatchling was also found nearby. Another mummified hatchling was found in March 1965.

Southeast Island: Of the three islands frequented by turtles, Southeast is the preferred. Turtles have been recorded there on 24 surveys (Table 3). Population estimates for 17 recent surveys average 15. March estimates average 13, and range from 8 to 22, while September estimates average 27, and range from 13 to 50. This range is similar to the 20 to 50 range found during 1957 and 1958 by Kenyon and Rice (Parsons, 1962: 69-70).

Turtles are most frequently observed basking along the north lagoon beaches, especially on the east portion (Fig. 57). Turtles are usually present diurnally when a survey party arrives, but because of human activity (tagging of turtles and seals, and banding of birds) subsequently are present only nocturnally. Copulating pairs have been observed in offshore shallow waters in March, May and June; nest pits, but no eggs, have been found only in September.

56. The southeast beach-cove area at North Island is a popular place for sea turtles to bask in the sun, 29 August 1967 (print reversed). POBSP photograph by C.A. Ely.

57. Black Turtle sun basking on north beach at Southeast Island, June 1967. POBSP photograph by R.L. DeLong.



Other Islands: Carr (in litt.) noted about 30 on Bird and Sand Islands in January 1962. None has been observed there since.

Tagging and Movement

Since 1964 BSFW personnel have tagged at least 137 Black Turtles (Table 3) with numbered Monel metal tags, usually placed in the trailing edge of the right front flipper. Of these, 122 were used at Southeast, 9 on North, and 6 on Little North Islands. Tagged individuals included 28 males and 55 females.

Of the 137, 46 were recaptured on Southeast Island (Table 3). In addition, two females tagged at Whale-Skate Island, French Frigate Shoals, some 600 miles to the southeast, were recaptured at Southeast Island. Another turtle tagged at Southeast Island was captured at Whale-Skate Island, French Frigate Shoals. These data are being fruther analyzed by BSFW personnel.

Amerson (1971: 80) noted that the French Frigate Shoals turtle population is the largest in the Hawaiian Islands. Hendrickson (1969: 94) theorized that "a double population nests" there. He suggested that the extreme Northwestern Hawaiian Islands may be the feeding ground for one group and that the other migrates eastward to feeding grounds around the inhabited islands. Early tag analysis seems to verify this theory (see also Amerson, 1971: 91-92).

Carr (1964: 51-52) in January 1962[1] found the Pearl and Hermes Reef and French Frigate Shoals turtle populations to be predominantly dark and high-shelled despite single light-colored, flat yearlings at each atoll. He was unable to determine whether these individuals were variants of the local dark stock or visitors from some distant, genetically different, population.

Carr (1972: 24-26) uses the name Chelonia agassizi for the mid-Pacific turtles, "thus separating them taxonomically from the Atlantic green turtle, Chelonia mydas. C. agassizi also occurs in the eastern Pacific and in parts of the Indian Ocean. Carr suggests that "with its range extending through so much territory,...the name...surely covers a number of hitherto unnamed races." He also notes that "some Pacific colonies that are obviously not C. agassizi...have to be grouped with the Atlantic green turtle as C. mydas."

BIRDS

Several sources were used in assumbling the common and scientific names of the birds occurring at Pearl and Hermes Reef. The names used in the American Ornithologists' Union's Check list of North American Birds, 1957, 5th edition, were followed for species occurring in North America. In the

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[1] Not August 1956 as noted by Amerson (1971: 61, 92, 340).

Appendix Table 2. (continued)

INSECTA (continued)

Maa, 1968	Records 2 hippoboscid flies from POBSP collection
Amerson and Emerson, 1971	Records 2 Mallophaga species from POBSP material

CHORDATA

1. Pisces

Brooks, 1860	First record of fish in 1859
Fowler and Ball, 1925	Reports 16 fish species taken by Tanager Expedition
Fowler, 1927	Lists 1 fish species from Tanager Expedition
Pietschmann, 1930	Lists 9 fish species collected by Dranga in 1927
Fowler, 1931	Adds 3 fish species, collected by Dranga, April 1927
Schilder, 1932	Discusses hemirhampids collected in 1928
Galtsoff, 1933	Lists 31 fish species collected in 1930
Pietschmann, 1938	Reports fishes collected in 1927-28
POFI (1950-56) mss.	Consists of 5 trip reports listing fish collections and observations
Ikehara, 1953	Records 5 species of bait fish from 1950 and 1951 POFI surveys
Jones and Reintjes, 1953	Records 4 fish species
Gosline and Brock, 1965	Includes fish from earlier trips

2. Reptilia

Morrell, 1832	First record of sea turtles
Paty, 1857	Notes presence of turtles
Brooks, 1860	Records presence of turtles
Bailey, 1918	Reports sleeping turtles

Appendix Table 2. (continued)

CHORDATA (continued)

2. Reptilia (continued)

Galtsoff, 1933	Records sea turtles in 1930
POFI (1950-56) mss.	Consists of 5 trip reports listing turtle observations
Bailey, 1956	Records many large sea turtles at North Island seen by Willett in 1913
HDFG (1961-64) mss.	Includes 2 trip reports of Refuge surveys
POBSP (1963-68) mss.	Includes 12 trip reports from island surveys
BSFW (1964-69) mss.	Includes 15 trip reports of Refuge surveys
Carr, 1964	Notes presence of sea turtle
Kemble, 1966	Reports turtle observations by Osbun in 1850

3. Mammalia

Paty, 1857	Mentions presence of seals in May 1857
Atkinson and Bryan, 1913	Notes estimate by Frear in 1912
Bailey, 1918	Reports less than 60 seals and a school of porpoise observed in 1913
Wetmore, ms.	1923 personal journal notes presence of seals and rabbits
Gregory, 1924	Mentions Tanager personnel killed all but one of the rabbits seen in May 1923
Wetmore, 1925	Notes presence of seals in 1923
Bryan et al., 1926	Notes presence of number of rabbits on Southeast in 1923
Galtsoff, 1933	Counts 68 seals
Allen, 1942	Reports seal colony found by Tanager Expedition

Galtsoff, P.S. 1933. Pearl and Hermes Reef, Hawaii, hydrographical and biological observations

B.P. Bishop Mus. Bull. 107: 1-49.

Dec 31, 1972 ARB No 163 & 169 Natural History of G.P. - 1923?

containing many granules of augite with smaller ones of magnetite, which lie in a colorless base, of rather high refractive index, that Dr. Bowen thinks is probably prehnite. No unaltered feldspar, or at least very little, is present, and no olivine is visible."

Natural History of Kure Atoll Woodward 8

BOTANY

The only vascular plants that grow on Gardner are some small patches of a Portulaca found in various locations on the slopes. Bryan (in Bryan et al., 1926) reported that these patches of plants were Sesuvium but his comment is evidently a lapsus calami. These plants were recorded by the Tanager Expedition in May 1923 and on the recent surveys of June 1963, September 1966, and May 1967. The only specimen that has been collected was one collected by Gerrit P. Wilder on 22 May 1923.

Regarding this specimen, Christophersen and Caum (1931: 8) wrote that it "had disappeared from the general collection of the Tanager Expedition" leaving the duplicate field label as the only record. Recently, the long missing specimen (Wilder No. 10) returned to the Herbarium of the B.P. Bishop Museum from the Netherlands. In August 1969, R. Geesink identified the specimen as Portulaca lutea Sol. (D.L. Herbst, pers. corres.), a plant of widespread distribution in the central Pacific area.

Spiney seeds of Tribulus cistoides L., apparently brought to the island on the feet or plumage of seabirds, were also found in 1923 (Wetmore, 1925: 82), but the plant is not known to grow on Gardner.

VERTEBRATE FAUNA

Reptiles and Mammals

H_2O temp data? depth?

POBSP personnel saw a single Green Turtle (Chelonia mydas) swimming offshore 16 June 1963 and another individual, about two feet long, was seen offshore on 16 September 1966 (Kridler, ms., b.). This turtle, not previously recorded from Gardner Pinnacles, does not breed there since the pinnacles afford no suitable nesting habitat. Presumably the turtles seen in 1963 and 1966 were wandering individuals from populations on other of the Northwestern Hawaiian Islands.

The only mammal occurring on Gardner is the Hawaiian Monk Seal which was first noted in 1826 by Hiram Paulding (1831: 191). These seals were not seen there again for over 130 years. This absence of records probably stems from a paucity of observations of the Pinnacles rather than an absence of seals since these mammals have been seen quite regularly during recent visits to the islands.

On the first POBSP survey (16 June 1963) the field party saw two seals sunning themselves on the smaller of the two islands. On 16 September 1966, Kridler's field party saw five seals, four resting on the smaller island, another swimming nearby. Six were seen on the

second POBSP survey (26 May 1967), again on the smaller island. These seals were hauled out on a ledge about 2 feet above the water surface which was reached by riding the swells. On 1 June 1969 Olsen saw six hauled up on the small island. No evidence that breeding occurs on this island has been found.

Birds

Composition of the Avifauna

At present 19 species of birds have been reported from Gardner Pinnacles, not including two species (Christmas Shearwater, Harcourt's Storm Petrel) recorded only from offshore (Table 2). The record for one (White-tailed Tropicbird) of the 19 species recorded from the island is of doubtful validity with the result that only 18 species are certainly known to have occurred there.

Twelve species are known to breed on Gardner Pinnacles but five (Laysan Albatross, Bulwer's Petrel, Wedge-tailed Shearwater, Brown Booby, Blue-gray Noddy) are uncommon with none having breeding populations much exceeding several dozen birds.

Two other species (Red-footed Booby, Great Frigatebird) that breed commonly on other Northwestern Hawaiian Islands occur on Gardner only as visitors. The reason that neither species breeds there may well be that the island lacks sufficient vegetation to permit either to build nests.

Only a few species of shorebirds and vagrants are known from Gardner, partly because so few observations have been made, partly because the Pinnacles lack habitat that would attract shorebirds and the kinds of vagrants most commonly occurring in the Northwestern Hawaiian Islands (ducks and gulls).

Historical Changes in the Size of Populations

Few of the breeding populations appear to have changed much in the last 45 years. Gray-backed Terns, Sooty Terns, and particularly Brown Noddies apparently have increased significantly in numbers since 1923. The number of Blue-faced Boobies, on the other hand, evidently has decreased substantially.

Recent estimates are somewhat larger than in 1923 for three other breeding species (Layson Albatross, Red-tailed Tropicbird, Black Noddy) and somewhat smaller for another (White Tern) but the differences in the estimates from the two periods are not sufficiently large so that any real change is clearly indicated.

Four other species (Bulwer's Petrel, Wedge-tailed Shearwater, Brown Booby, Blue-gray Noddy) were not known to breed on Gardner until very recently but it is likely that they have bred there in small numbers for many years.

Table S-1. (continued)

Species	Number of: Skins	Skeletons	Alcoholics	Totals
Glaucous-winged Gull	9	0	0	9
Black-legged Kittiwake	2	0	0	2
Arctic Tern	1	0	0	1
Sooty Tern	23	4	0	27
Gray-backed Tern	4	0	0	4
Brown Noddy	19	2	2	23
Black Noddy	5	1	0	6
White Tern	7	0	0	7
Horned Puffin	2	2	0	4
Short-eared Owl	1	0	0	1
Skylark	1	0	0	1
Water Pipit	1	0	0	1
Red-throated Pipit	1	0	0	1
Snow Bunting	1	0	0	1
Totals	356	56	28	440

KURE REPTILES

Four species of reptiles were recorded from the atoll. Green Sea Turtles were occasionally seen swimming in the lagoon and a small population of Stump-toed and House Geckos was resident on Green Island.

There was one hypothetical record of Hawksbill Turtles.

Species Accounts

HAWKSBILL TURTLE — *Eratmochelys imbricata*

Morrell (1841) reported that two Hawksbill Turtles were seen 13 to 14 July 1825. The validity of this record is uncertain.

GREEN SEA TURTLE — *Chelonia mydas*

Morrell (1841) found Green Turtles abundant at Kure in 1825. Although few of the early visitors to the atoll reported them (Table GT-1), they probably killed them for food and were thus responsible for these reptiles' scarcity today.

During POBSP studies, turtles, presumably Green, were occasionally seen, generally swimming in the lagoon (Table GT-2). They were found only four times on land and there was no indication of breeding at the atoll.

Table GT-1. Previous records of Green Sea Turtles at Kure Atoll.

Date of Survey	Population Estimate	Breeding Status, Remarks, References
1825 July 13-14	great abundance	(Morrell, 1841).
1859 late June or early July	plenty	(Brooks, 1860).
1870 October 29 to 1871 January 4	?	4 large turtles captured on sandspit (Read, 1912).
1881 December 30 to 1882 January 1	?	Collected 6 turtles and found 2 rotten eggs (Hornell, 1934).
1886 July 15-August 18	?	Turtles available as food (Hawaiian Almanac and Directory, 1887).
1936 April 5-13	1	1 turtle seen (R.G. 37 Report on the Survey of Pearl and Hermes Reef and Kure Ocean Island).

Table GT-2. POBSP observations of Green Sea Turtles at Kure Atoll, 1963-69.

Date of Observation	Number	Remarks
1963 October 29	1	--
November 6	1	In lagoon.
1964 May 29	1	On Sand Island; caught, tagged, photographed and released.
July 7	2	Offshore near the west end of the runway.
August 13-28	?	Numerous tracks and diggings found along southeast beach.
October 19	1	2' long; offshore near the west end of the runway.
1965 May 1	2	Small; off east beach.
July 20-31	3	In lagoon; 2-3' diameter.

163-169
BP
Nature

Table GT-2. (continued)

Date of Observation	Number	Remarks
1967 June 10	1	20"; in lagoon along west beach.
June 29	1	20"; swimming in lagoon near the pier.
July 2	1	ca. 3' long; in lagoon; caught, photographed, tagged and released.
July 8	1	Off west point.
1968 July 31	1	Off southeast beach.
August 17	1	Off pier.
August 26	2	Off southwest beach.
November 11	1	On Sand Island; 250-300 pounds.
December 13	1	On northwest beach.
1969 January 25	2	Off west point.
January 27	3	Off southeast beach; 20-24" carapace.
February 16	1	Off northeast beach; 18" long.
February 21	1	Off southeast beach.
March 2	1	Off northeast beach.
March-April	?	Occasionally sighted, largest individual not over 24".
May	?	Small individuals continued to be sighted around reef.

STUMP-TOED GECKO — Gehyra mutilata

HOUSE GECKO — Hemidactylus frenatus

Two species of geckos, the Stump-toed and the House, were recorded on Green Island. Based on the specimens collected, the former species was the more common. Undoubtedly they were accidentally introduced from Midway Atoll.

Geckos were seen in small numbers around the barracks, the transmitter building, and the casuarinas along the southwest beach. They were

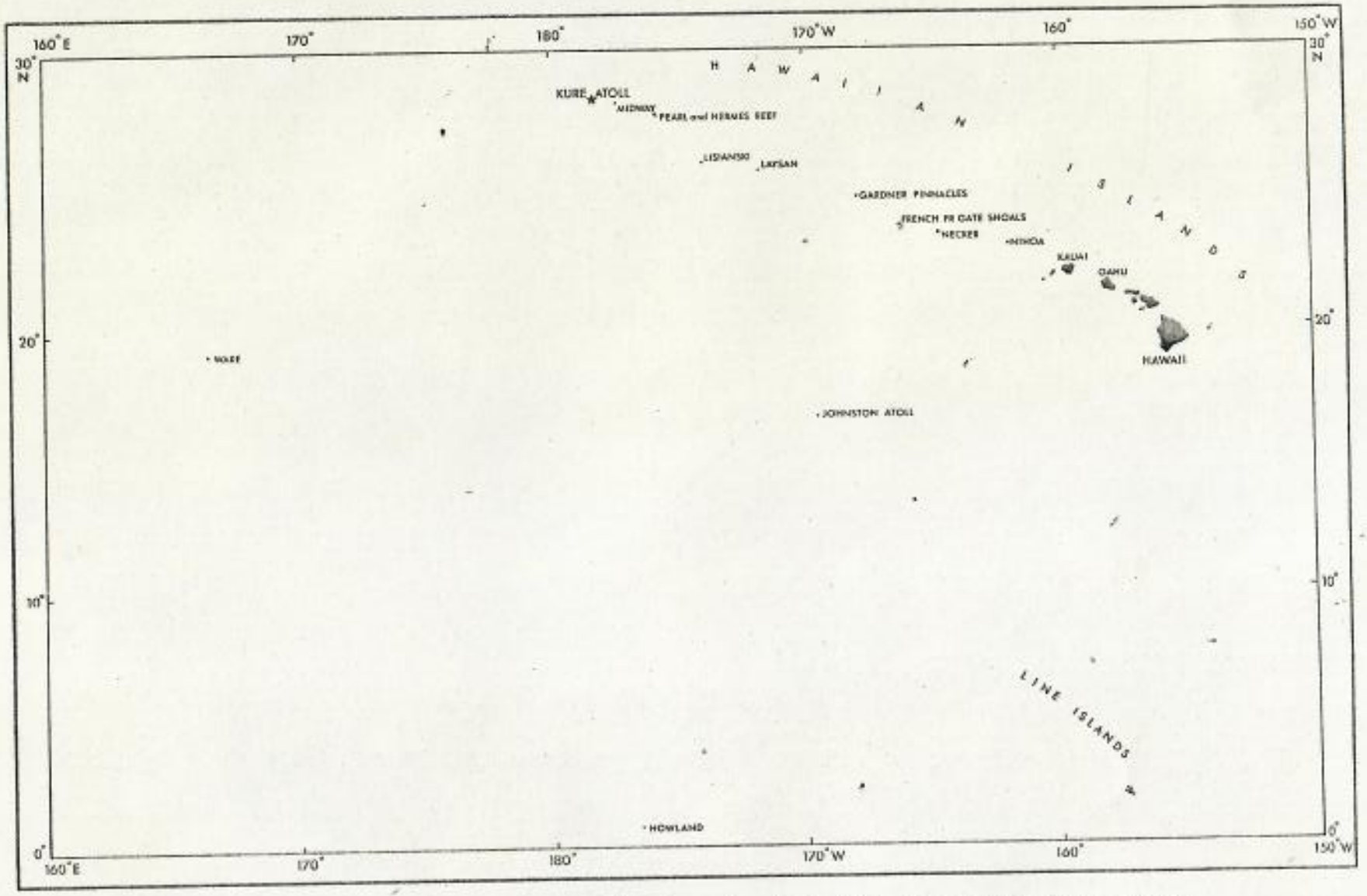
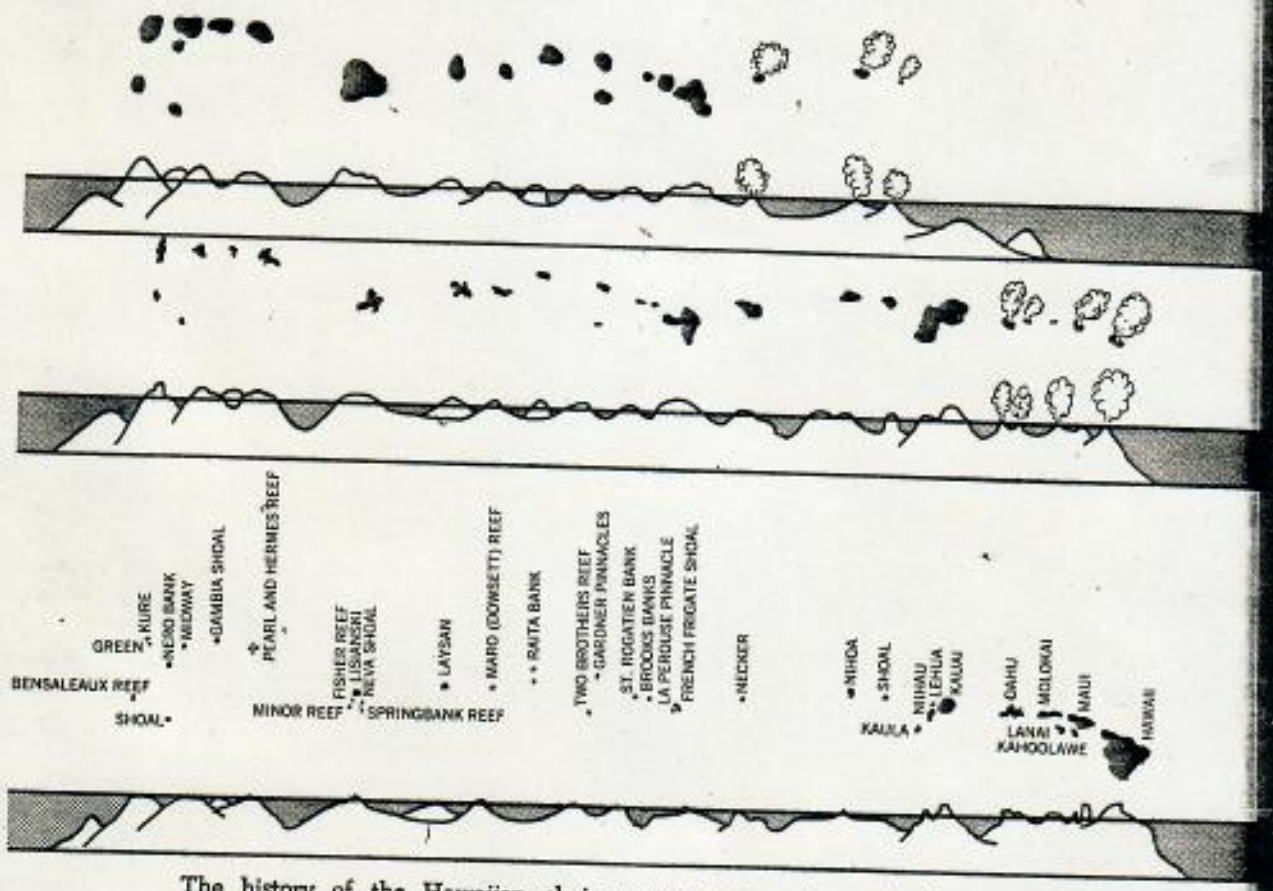
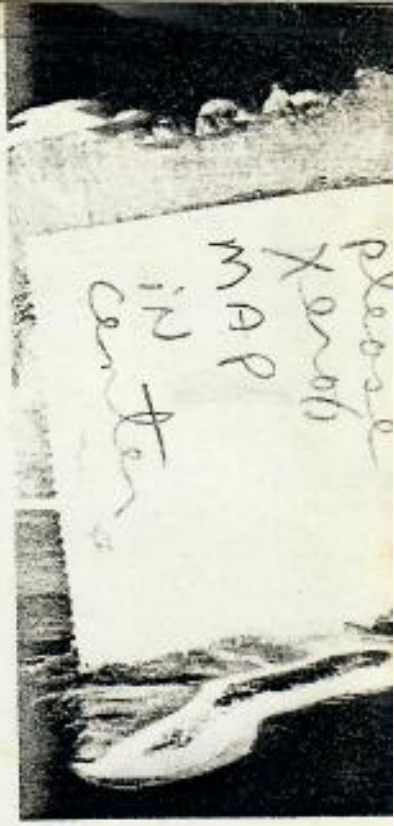


Figure M-1. Location of islands or atolls in central Pacific where Kure-banded birds have been recaptured or vice-versa.



The history of the Hawaiian chain encompasses not merely that of eight major islands, but of a chain which extends from Hawaii to Midway and Kure. Island building proceeded from west to east, as these three stages suggest. The western islands are now reduced to low atolls or submerged reefs; the westernmost island which still has lava rock above the sea surface is Gardner Pinnacles. Sizes and shapes of now-vanished land areas in the first two stages are hypothetical. The third map shows the present-day Hawaiian chain; the first stage represents how the chain might have looked about ten million years ago, the second perhaps five million years ago or less.

more than fifteen thousand feet. Consequently, an island which now is merely a reef is still a volcano at least fifteen thousand feet high. The larger of the Leeward Islands, such as Nihoa and Necker, give a few hints as to their former extent. The slope of existing lava beds suggests how large an island might have been. Steeply inclined beds indicate a more precipitous former cone, and thus a smaller island. More level flows suggest a broad dome. Still, an



French Frigate Shoal is an un
atoll in that it still retains the
vestige of the high island
which the atoll was derived
Perouse Rock, a one-acre sliv
lava. The other islets are coral
accumulations within a shallo
goon edged by a barrier ree
presence of which is reveale
breakers. The largest of the

islets is Tern (twenty-seven ac
now converted into a rectan
airfield for a Coast Guard st
Whale and Skate were once
islets, but they are now joined
sand spit which formed rec
they total eight acres. East Isl
ten acres, Trig is a strip of sa
five acres, and the other islet
progressively smaller, down to
piles barely awash (overhead
photos courtesy of U.S. N
oblique aerial photographs by
gene Kridler, Bureau of Sport
eries and Wildlife).

Visited January 1, 1974 Herbert Neely - Manager

Cape Romain National Wildlife Refuge information -
Gulls in nest after initial hatchling emergence.
Herring gull - hatchlings found in gut.
Early racoon predation reports invalid - Coons digging in after emergence.
Crabs a problem during nesting season - burrow.
Rats - some burrows for eggs.
Nesting loggerheads not disturbed after start of digging. - Lay, nest a short distance above high tide. Roots remove moisture from eggs.
In transplanting eggs > 48 results in high survival. - have transplanted to N. Carolina.
Several dead Ridleys have been found.
Loggerhead breed inside Bay. - Most always nest on outside of Islands.

ROMAIN TOURS

P. O. Box 288

McClellanville, S. C. 29458

Boat tours to Bulls Island, Cape Romain National Wildlife Refuge

Leave daily at 8:30 A. M. from Moore's Landing on Sewee Rd. off Highway 17 about 15 miles north of Charleston - Return late afternoon

Round Trip Fees

Individual	$5.00
Parents and their children under 13	$10.00
Groups arranged for in advance not fewer than 10 each person	$3.00
Camping and hunting gear	$10.00

People go to Bulls Island to - Collect shells (an eight mile beach and almost no competition) - to watch birds (one of America's most productive and famous sites) - to hunt (in season), and fish (excellent salt and fresh water) - to enjoy an unspoiled wilderness beach, a supurb subtropical wilderness forest, and one of the most extensive spartina wilderness marshes surviving. Note: Camping only by permission of refuge manager.

CCH file

Bailey's

POSITION STATEMENT ON THE HAWAIIAN ISLANDS WILDERNESS PROPOSAL FOR A NATIONAL WILDLIFE REFUGE IN THE LEEWARD ISLANDS

The Conservation Council for Hawaii has reviewed the proposal for the Hawaiian Islands National Wildlife Refuge in the leeward islands. We are in general accord with the concept that this unique area should be given maximum protection to insure the survival of threatened wildlife, as well as to pursue the other objectives stated in this proposal.

We do recognize that a buffer zone is required to protect those elements of the biota that are threatened with depletion and/or extinction. These include the turtle nesting areas, the monk seal breeding grounds, and the various bird habitats. We do question the arbitrary choice of the boundaries proposed. In no cases except when the boundary follows the barrier reef surrounding the lagoon waters as is proposed on Pearl and Hermes Reef and French Frigate Shoals, does the proposal make particular sense. The rationale for the fifteen fathom contour as proposed at Nihoa Island and the ten fathom contour as proposed for the rest of the refuge is therefore questioned. Ten and fifteen fathoms in these areas are of no special consequence or meaning from the biological or ecological standpoint. If they are established to protect the endangered species as cited above, then these should be given special consideration. Otherwise, they may be restrictive of use of renewable resources, such as baitfish or other species that could be managed to greater benefit for mankind. Baitfish do occur in some of these islands (1) and might be utilized without being detrimental to the endangered fauna and flora.

It is therefore the recommendation by the Conservation Council for Hawaii that the boundary lines be further considered and negotiated based upon sound ecological considerations to give protection to the areas containing habitats of endangered species, while allowing rational use of renewable resources in surrounding waters.

(1) June, Fred C. 1951. Preliminary Fisheries Survey of the Hawaiian - Line Islands Area. Part II: Notes on Tuna and bait resources of the Hawaiian, Leeward, and Line Islands. Comm'l. Fisheries Review 13(1): 1-22.

June, F. C. and J. W. Reintjes. 1953. Common Tuna-bait fishes of the Central Pacific. . Res. Report 34: 1-53.

TABS Read on live birds in Jan 1976

Certificate of Appreciation

The Federal, State and Provincial Conservation Agencies join with thousands of professional and amateur ornithologists throughout North America in expressing their sincere appreciation for the interest and cooperation shown by reporting the bird band number and recovery data noted below. A report containing these data will be forwarded to the ornithologist who banded the bird and these data will be permanently retained in the cooperative North American Bird Banding files maintained at the Bird Banding Laboratory, Office of Migratory Bird Management, Laurel, Maryland 20811, U.S.A.

It is only through the continued cooperation of interested conservationists such as yourself that these important data can continue to be compiled and made available to the scientists who study our wild bird populations.

Awarded To

GEORGE H BALAZS
BX 1346 COCONUT ISL
KANEOHE HI 96744

BANDING DATA:

BAND NUMBER: 737-38190 KIND OF BIRD: BLACK FT ALBATROSS SEX: UNKNOWN

AGE OF BIRD: IT WAS TOO YOUNG TO FLY WHEN BANDED

BANDER: IT WAS BANDED BY PERSONNEL OF US NATIONAL MUSEUM
C/O C D HACKMAN 3033 WOODSIDE PARKVILLE MD 21234

BANDING LOCATION: NEAR WHALE-SKATE IS FFS HAWI DATE: 06/12/63

RECOVERY DATA:

FILE REF.: 20687

LOCATION: EAST ISLAND HI DATE: 12/02/75

CANADIAN WILDLIFE SERVICE

U. S. FISH AND WILDLIFE SERVICE

Certificate of Appreciation

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It is only through the continued cooperation of interested conservationists such as yourself that these important data can continue to be compiled and made available to the scientists who study our wild bird populations.

Awarded To

GEORGE H BALAZS
BX 1346 COCONUT ISL
KANEOHE HI 96744

BANDING DATA:

BAND NUMBER: 757-26083 KIND OF BIRD: BLUE FACED BOOBY SEX: UNKNOWN

AGE OF BIRD: IT WAS AT LEAST ONE YEAR OLD WHEN BANDED

BANDER: IT WAS BANDED BY PERSONNEL OF US NATIONAL MUSEUM
C/O C D HACKMAN 3033 WOODSIDE PARKVILLE MD 21234

BANDING LOCATION: NEAR EAST IS FR FRG SHL HAWI DATE: 06/10/66

RECOVERY DATA: FILE REF.: 20687

LOCATION: EAST ISLAND HI DATE: 06/14/75

CANADIAN WILDLIFE SERVICE

U. S. FISH AND WILDLIFE SERVICE

Certificate of Appreciation

The Federal, State and Provincial Conservation Agencies join with thousands of professional and amateur ornithologists throughout North America in expressing their sincere appreciation for the interest and cooperation shown by reporting the bird band number and recovery data noted below. A report containing these data will be forwarded to the ornithologist who banded the bird and these data will be permanently retained in the cooperative North American Bird Banding files maintained at the Bird Banding Laboratory, Office of Migratory Bird Management, Laurel, Maryland 20811, U.S.A.

It is only through the continued cooperation of interested conservationists such as yourself that these important data can continue to be compiled and made available to the scientists who study our wild bird populations.

Awarded To

GEORGE H BALAZS
BX 1346 COCONUT ISL
KANEOHE HI 96744

BANDING DATA:

BAND NUMBER: 757-29402 KIND OF BIRD: BLACK FT ALBATROSS SEX: UNKNOWN

AGE OF BIRD: IT WAS TOO YOUNG TO FLY WHEN BANDED

BANDER: IT WAS BANDED BY PERSONNEL OF US NATIONAL MUSEUM
C/O C D HACKMAN 3033 WOODSIDE PARKVILLE MD 21234

BANDING LOCATION: NEAR EAST IS FR FRG SHL HAWI DATE: 05/28/67

RECOVERY DATA: FILE REF.: 20687

LOCATION: EAST ISLAND HI DATE: 12/02/75

CANADIAN WILDLIFE SERVICE

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Awarded To

GEORGE H BALAZS
BX 1346 COCONUT ISL
KANEOHE HI 96744

BANDING DATA:

BAND NUMBER: 757-30760 KIND OF BIRD: BLACK FT ALBATROSS SEX: UNKNOWN

AGE OF BIRD: IT WAS TOO YOUNG TO FLY WHEN BANDED

BANDER: IT WAS BANDED BY PERSONNEL OF US NATIONAL MUSEUM
C/O C D HACKMAN 3033 WOODSIDE PARKVILLE MD 21234

BANDING LOCATION: NEAR LISIANSKI ISLAND HAWI DATE: 06/05/67

RECOVERY DATA: FILE REF.: 20687

LOCATION: W S ISLAND HI DATE: 12/02/75

CANADIAN WILDLIFE SERVICE

U. S. FISH AND WILDLIFE SERVICE

Extra

1959

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Bureau of Commercial Fisheries
Biological Laboratory
P. O. Box 3830, Honolulu, Hawaii

NARRATIVE REPORT

CHARLES H. GILBERT, Cruise 45

I. CRUISE PERIOD: July 6 to September 3, 1959

II. AREA OF OPERATIONS: Hawaiian Islands

III. MISSIONS:

A. Compare observation chamber and underwater television as devices for studying skipjack behavior.

Two general types of comparison were made, the first involving an enclosed television camera suspended over the side, the second a normal television camera used from the observation chamber. Equipment for the former test was rented from Underwater Surveys, and operated by Mr. Joseph Granville of that organization. For the latter, Mr. Roy C. Jones of Kentron Corporation loaned his services and equipment free of charge. In both cases colored movies were taken from the observation chamber simultaneously with black-and-white movies of the closed-circuit TV monitor located in the laboratory.

Considering the Underwater Surveys television system first, the 37-lb. camera and its housing were mounted on a pipe by which they could be lowered to the same depth as the observation chamber windows. The pipe was mounted slightly forward of the BT winch and the camera trained on the fishing area beneath Racks 1 and 2. Monitor and control units were mounted on the desk in the darkened laboratory.

Skipjack fishing was observed at Stations 2 and 3, the former involving 15-lb. fish, the latter 30-lb. ones. Visual observations of the television screen versus what was seen from the chamber showed television to be inferior to the eye. With television, fish outlines were indistinct, species could not be identified, contrast was poor between fish and water, portions of the screen were too dark for detection of fish, and a full-time technician was required for adjustment of the controls. Subsequent inspection of the filmed versions of these observations showed substantially the same thing. Here, however, there was an impression of greater depth of field in television, e.g. more fish were seen, particularly at a distance. Offsetting this virtue were annoying fluctuations in brightness, erratically moving horizontal bars, etc., which were not always seen by the eye alone, and which may therefore represent synchronisation phenomena.

Dr. Donald W. Strasburg
Code 83350
U.S. Naval Research Laboratory
Washington, D.C. 20390

In a night test the fishing area was brilliantly illuminated by a submerged electric light. Observers compared their impressions of night-light activity as seen from the chamber with the situation appearing on the television screen. The former showed a variety of large and small animals, the latter detected essentially nothing.

The enclosed camera was lowered to the bottom three times off Waianae, Oahu. The cable was too short to reach bottom at 200 ft., but interesting views of bottom topography, flora, and fauna were obtained at 92 ft. The television camera was surprisingly sensitive to light and continued to give clear pictures of the bottom from late afternoon to sunset. Movies taken of the TV monitor failed to show many animals, probably because of the small size of most of them. To the eye, fish could be identified to family easily, but not to species. The projected lowering of the television camera near a submarine did not materialize.

Turning to the Kentron television system, the unit was tested at Station 9, where 30-lb. skipjack were fished. The television and movie cameras were side-by-side in the chamber, and simultaneous movies taken as above. Unfortunately the ship's vibration resulted in partial failure of the TV camera, resulting in horizontal bright bars occurring sporadically on the screen. Excluding this, the visual and televised versions of fishing differed extensively, as did the filmed versions of the same thing. The eye and colored film were superior to television and black-and-white film for studying skipjack behavior.

B. Test sonic equipment, record various sounds, and attempt to capture sound producers in joint operations with U. S. Navy submarines.

On July 9-10 the Charles H. Gilbert conducted joint operations with SS-338, the U.S.S. Carp. D. W. Strasburg served as an observer aboard the Carp, while Lt. Charles. R. Clark and SOC Paul Perkins were observers on the Gilbert. Acting alone during the morning of July 9, the Gilbert fished for skipjack at Station 4, during which a directional SSQ hydrophone was used to listen to underwater sound and movies were taken. Later a BQR-2B hydrophone was used to listen to sounds in an area which had been chummed, but from which no skipjack were captured. Taped sounds of squid and carpenter fish were played into the water to determine if this would stimulate the production of other biological sounds.

In the late afternoon of July 9 the Carp and the Gilbert attempted to use sonic tags to trace skipjack movement. The Gilbert engaged a mixed school of skipjack and little tunny (Sta. 5) while the Carp converged at periscope depth, recording all sounds produced. Because skipjack could not be captured and because the bait supply was low, no sonic tags were released.

During late evening of July 9 the Gilbert studied the vertical distribution of the deep scattering layer by means of EDO while the Carp recorded various other aspects of the DSL with BQR-23 gear. On the morning of July 10 both vessels attempted to listen to and identify carpenter fish without success. Interpretation of those sounds detected in the above tests must await suitable tape analysis. Preliminary examination suggests that skipjack produce no sounds useful in their detection.

The planned tests in which tuna noises were recorded, tuna attracted or repelled by sound, and vessel noises were recorded did not materialize because the man originally assigned to this work was not made available.

C. Investigate by conducting experiments and making underwater observations, the effects of various factors on skipjack feeding and schooling behavior.

The following comments are synoptic and represent only preliminary impressions. Definitive interpretations await detailed analyses of film and audio records. A considerable volume of routine observations on school size, number of fish etc., has not been summarized, but may be found in the audio records.

The experiments listed in the cruise plan deal with skipjack reactions to several bait species, bait plus various supplements and enhancers, effect of dyes and turbid clouds, and the use of sound as an attractant, repellent, or detecting method. In the present cruise considerable luck was had in obtaining different kinds of baitfish. Those tested included nehu, tabai (Limia vittata), omaka (Caranx mate), oama (Mulloidichthys samoensis), iao (Pranesus insularum), tilapia (Tilapia mossambica), and a mixture of nehu, aholehole (Kuhlia sandvicensis), lai (Scomberoides sanctipetri) and papio (Caranx and Carangoides spp.)

It would appear that a silvery, high-bodied (conspicuous) bait which sounds to 10-20 feet would be most desirable for skipjack. No such paragon was found among the species tested. Nehu sounded but were inconspicuous, as were oama whose drab color masked them. Omaka and papio were conspicuous but sounded so deeply that deep-swimming schools did not rise. The reverse was true of aholehole, iao, and lai, which tended to stay at the surface and were thus effective only for drawing-in surface schools. Tabai were used once, and in spite of the fishermen's ideas, were eaten as readily as nehu. Tilapia could be used to raise a school, but in all cases elicited a milder feeding action than nehu. Other factors considered in assessing a bait's utility were its hardiness and the degree of activity it promoted in tuna. All species except nehu were hardy (nehu were quite weak), and tabai and tilapia were exceptionally strong. Iao was the only species which caused undue excitement among the skipjack, resulting in hard-hitting fish and broken poles.

The bait supplements and enhancers investigated were water sprays, dead bait, tinsel glitter, and variations in chumming rate.

Most experiments were done with nehu, but the effects of sprays were also studied with iao, oama, and a nehu-aholehole-lai-papio mixture. In spite of 8 tests, the effects of water sprays were not really apparent. Sometimes skipjack swimming speed was less with the sprays off. There was no difference in behavior when a school was raised with the sprays off as opposed to a normal raising with them on.

Alternate chumming of live and dead nehu produced spectacular differences in skipjack behavior, the school being almost lost each time dead bait was used. Alternate chumming of live nehu and mixtures of live and dead nehu did not show these differences, the fish staying with the vessel to eat the live bait (and some of the dead bait) from the mixture. Tinsel glitter used simultaneously with living and dead nehu, chummed alternately, had little or no effect on skipjack behavior. Using only live nehu, there was an increase in skipjack activity when glitter was used supplementally. Skipjack were observed to rush towards clouds of glitter, but none of it was eaten. With tilapia and other bait, glitter resulted in a temporary increase in activity which soon subsided.

Varying the rate of chum involved throwing bait at 1/2, 1, and 2 times the normal rate. With too little chum, activity lessened and the school would have been lost had the rate not then been increased. Doubling the rate produced inconclusive results with nehu, but with tilapia, resulted in such an accumulation of inactive bait that the skipjack slowed, dropped astern, re-schooled, and left the vessel.

Dyes were tested to determine whether skipjack could be herded or corraled by dense curtains of color. Schools of tuna were easily led through diffuse clouds of strawberry food color and fluorescein, within which the individual fish were seen feeding and being hooked. These tuna avoided very dense clouds of dye, but observations within these clouds were necessarily difficult to make, and are incomplete.

Observations on underwater sound experiments are given in section III-B of this report.

D. Test anesthetizing and tranquilizing drugs and attempt to bring skipjack ashore for establishment in ponds.

During the first half of the cruise no skipjack were drugged nor were attempts made to bring any ashore. On August 2nd it was found that 4-lb. skipjack could be kept in bait wells and transferred to the Kewalo pond without tranquilization. During the next 4 weeks 66 skipjack, 2 little tunny, and 1 frigate mackerel were held aboard the vessel, and of these, 31 skipjack and 2 little tunny were transferred to shore without drugs. Survival aboard the vessel was inversely proportional to fish size, with 4-lb. fish being relatively easy to keep for 1-1 1/2 days, and 20-25 lb. fish living only an hour or two. Blood in the baitwell water had a deleterious effect on the fish, often killing them in a few minutes. Transfer to shore was best

effected by capturing single fish in the crowder, and carrying these one by one in a small "cradle" made of plastic, and so constructed that a fish was kept in darkness and in some water.

Because the best captive survival was about 40 hours, and because some skipjack appeared to die from exhaustion or from butting the baitwell or pond walls, it was decided to tranquilize other groups of fish. On August 23 thorazine was injected centrally in the mid-lateral vascular plexus of two 6-lb skipjack, one fish receiving 2.4 cc., the other 2.0 cc. The thorazine was Smith, Kline and French's, product and contained 25 mg./cc. Kept by themselves at sea, the drugged fish swam two-thirds as fast as 6 normal controls. Transferred to the shore pond with 4 of the controls, all swam at about the same rate. One drugged fish survived for 30 hours, the longest-lived control lasted 32.5 hours.

It was suspected that the above dosage was insufficient and also that survival would be better if a docile species, such as little tunny, was also present. In addition, 22-gauge hypodermic needles were found to be too flexible for use on struggling fish, and were replaced by 15-gauge needles.

On September 2 five 6-lb. skipjack each received 3.6 cc. of thorazine in the mid-lateral plexus. Dosage was via 15-gauge needles. These fish were confined with 2 normal little tunny of comparable size. Three drugged skipjack and the 2 little tunny were transferred to shore, where the skipjack survived 43 hours, and the little tunny 40 hours. It was felt that perhaps all of the fish should have been drugged in order to make a fair test.

E. Delineate the California Current Extension by surface salinity and temperature measurements, and investigate the occurrence of skipjack, zooplankton, and bird flocks in this current.

Bathythermograph casts and salinity samples were taken simultaneously every 3 hours along the track shown in figure 1, resulting in a total of 98 observations. Bathythermograph instrument no. 40095 inexplicably went bad on July 19, and was replaced by instrument no. 12663. Salinity samples were not analyzed aboard ship. Water samples were collected and frozen for phosphate determination at points A, B, C, D, E, F, and G on figure 1, and also at the half-way points on runs B-C and E-F.

A 0-60 m. plankton tow was taken at about 2000 hours each night, resulting in 13 frozen plankton samples. An attempt was made to evaluate plankton abundance in different areas by observing the luminescent planktors from the underwater observation chamber at night. Besides obvious limitations, the results obtained by this method appeared to vary with the amount of moonlight. Movies taken with Super Anscochrome showed that little could be photographed in the dim illumination prevailing.

A watch was kept for scattered birds, bird flocks, and tuna schools throughout the survey. The following were seen during the daylight portions of the several runs.

Run	No. of schools (Skipjack)	(Unidentified)	Remarks
A-B	1	6	Skipjack estimated 15-20 lbs.
B-C	6	15	" " 2-3, 4-6 18-20 lbs.
C-D	1	0	Skipjack estimated 3-5 lbs.
D-E	2	0	" " 25-30 lbs.
E-F	2	2	" " 30 lbs.
F-G	0	0	- - - -
G-A	1	7	Skipjack estimated 10-12 lbs.

Prior to starting the survey an intensive effort was made to obtain nehu bait, but only 8 buckets were aboard at departure, and these died without being used. It will be noted that the B-C run included a long detour to French Frigate Shoal where iao bait was obtained. This bait was used first for dolphin fishing (Sta. 20), a skipjack behavior experiment (Sta. 23), and for skipjack tagging (Sta. 24). The latter involved 25-lb. fish, 76 of which were released near Point D. The tagged fish sounded deeply when released and were conspicuous because of the trails of bubbles streaming from their operculs. Visual observations showed no tagged fish rejoining the feeding school, but this phenomenon may be apparent in the movies taken. Proper equipment for photographing skipjack head lengths was not available.

Secchi disc and Forel color determinations were made at noon (+10, not LAN) each day on runs B-C and E-F. These data are listed in table 3.

At 1530 on July 25 (run D-E) an area was reached where surface slicks abounded, each slick being covered with minute phytoplankters varying in color from golden brown through lemon yellow. Slicks were encountered for about an hour, appeared to be several hundred feet long (1/4 mile ?), from 2-20 feet wide, and to have the phytoplankton extended to about 1 ft. beneath the surface. A sample was collected and found to have a sweet, dry, fragrance both before and after formalin preservation. This odor was detectable on deck and reminded some of the crew of chicken feed. The organism was tentatively identified as Trichodesmium.

Discontinuities in surface temperature were marked during the period July 20-25 (runs B-C and C-D). These were accompanied by slack winds, or else occurred in protected areas such as French Frigate Shoals. The discontinuities probably reflect the State 1 seas prevailing most of the time.

F. Collect larval tuna for serological work.

Paired surface plankton tows were made simultaneously with the 0-30 m. tow obtained for the California Current survey. These surface tows were of 20 minutes duration, and twelve pairs were obtained. Treatment of successive pairs was: freeze one sample plain, preserve the other in 10 percent formalin and freeze; freeze one sample plain, preserve the other in 70 percent methanol and freeze; and preserve one sample in 10 percent formalin, the other in 70 percent methanol, and freeze both. Bright moonlight early in the survey caused some plankton catches to be rather poor. It was noted that methanol produced marked changes in the color of the plankton, particularly in the blue copepods. These turned orange-red within 5 minutes of preservation.

G. Miscellaneous observations

1. The standard watch for fish schools, birds, and aquatic mammals was maintained with nothing unusual being noted. The same can be said for the thermograph, which was operated continuously (except sometimes during baiting) and standard marine weather observations. The use of the Bendix and EDO depth recorders was largely navigational, there being no night runs on which the DSL could be studied except during the California Current survey, at which time the EDO was inoperative. Secchi disc and Forel color determinations are discussed in section E above, and summarized in table 3. Two lines were trolled whenever possible during daylight hours, but the entire catch consisted of only 1 little tunny and 4 dolphin, 3 of the latter being taken around logs. A BT was taken with each tuna school fished with a few exceptions. The percentage of lai in the bait wells was difficult to determine without disturbing the nehu, something we wished to avoid in view of their scarcity. Only a few observations were made of lai behavior as a result.

2. During Charles H. Gilbert cruise 46 French Frigate Shoal was visited for baiting purposes, at which time it was possible to examine certain biological and physical assets of the area. Besides the bait resources, these included Hawaiian monk seals, green turtles, sea birds, and human habitability. The survey was made on July 21-22, 1959, and the results are as follows.

Baitfish. Four bait species were seen at French Frigate Shoal: iao (Pranesus insularum), piha (Spratelloides delicatulus), uouo (Neomyxus chaptali), and aholehole (Kuhlia sandvicensis). Iao was the only bait taken in any quantity by us, and even then was not abundant. Our catch of iao consisted of 13 buckets from East Is., 9 buckets from Mullet Is., and 7 buckets from Whale Is. No iao were seen at Trig, Tern, Skate, and Round Is. The uouo seen were schooling with iao, the uouo being about 2-3" long while the iao were 4-5". Piha were seen in open water, several hundred yards from the sheltered side of East Island. Aholehole occurred in small schools along the beaches of all islands.

Hawaiian monk seals. Because of the wary nature of some seals, they were counted from the skiff as each island was approached, with particular attention to those swimming. A definitive

count was then obtained by pooling this data with counts made during a circuit of each island by foot. There were no seals on East Is.; 2 cows, 2 pups, and 1 half-grown individual on Round Is.; 1 adult on Mullet Is.; 10 seals, mostly adults on Whale and Skate Islands (the two islands are connected by an isthmus, and the counts were not segregated); 6 adults and 2 half-grown on Trig Is.; 1 seal on Tern Is. according to Coast Guard personnel stationed there; and there were 9 seals on Shark Is. on July 19, 1969, according to the same Coast Guard personnel.

Green turtles. No living turtles were seen other than a 1-yr. old pet kept in a salt-water pond on Tern Is. by the Coast Guard. On East Is. 33 sets of fairly fresh haul-out tracks were found in a circuit of the island. Also found were three large turtles dead on their backs near nesting areas, and a fourth turtle was found dead on its belly on a nest, with its skull crushed from a blow. None of these turtles was butchered, but instead seemed to have been killed wantonly. Photographs were taken of some of them.

On Whale-Skate Island (the two are now connected) the shells of 12 large turtles were found. In each case the carapace and plastron were cut apart, and the flippers and head were frequently lacking. All shells contained rotting meat or eggs, indicating the slaughter to have been recent, probably within 1 month. Large dermestid pupal cases were abundant, giving some clue as to the time of death. Time did not permit the tracks to be counted on Whale-Skate, but only a few were seen. Several color photographs were taken of the turtle remains.

The recently-butchered parts of a large turtle were found on Trig Island, but no tracks were found there. There were no turtle signs whatsoever on Round and Mullet Is., but one track was seen on Tern Island.

Lt.(j.g.) John Dirschel, the Commanding Officer of the Coast Guard's loran station on Tern Island, informed me that 25-30 turtles had been taken from French Frigate by air during the past few months.

Sea birds. Sea birds were so abundant that no attempt was made to count them. Large populations occurred on East, Whale-Skate, and Trig Islands, while only a few birds were seen on Round, Mullet, and Tern Is. In the following list an asterisk denotes a species as having eggs or partly-grown young, and E = East Is., W = Whale-Skate Is., T = Trig Is., M = Mullet Is., and R = Round Is.

Sooty terns (E^*, W^*, T^*), noddy terns (E^*, W^*, T^*), wedge-tailed shearwaters (E^*), Laysan albatross (E^*, W^*, T^*), ruddy turnstones (E, W, T), red-footed boobies (E^*), blue-faced boobies (E^*, M, W^*, T^*), frigate birds (E, W^*, T^*). No particular attention was paid to the birds on Tern Island.

Human habitability. Round, Mullet, Trig, and Whale-Skate Islands have no shelter and no water. The first two are tiny and lack vegetation, the others large, grassy, and with some low shrubs. There are no signs extant to tell mariners the Wildlife Refuge status of the islands. The fact that this status is unknown or ignored is evident from the discussion of sea turtles. Landings on Round and Mullet Is. seem to be few, for we found numerous glass fish floats there. At Trig, Whale-Skate, and East Is. there were few fish floats. On Trig Is. there are the remains of several hoop-type fish traps. On East Is. a split, dried parrot fish was found hung from a post.

East Island has numerous buildings, most of which are in very poor condition, being tipped over, collapsed, etc. One Quonset hut would appear to offer emergency housing, as did portions of three others. Anyone other than a castaway would probably find the bird stench unbearable. No water is available. There is a usable assault boat on the beach.

Tern Island is nearly all airstrip, the dimensions of which are 3120 by about 250 ft. The strip is composed of compacted coral and is in good condition. The coral surface has a tendency to become slick, and is periodically roughed-up by a drag. There is no off-strip parking for aircraft, but in my opinion a plane parked at the extreme edge of the strip would not interfere with traffic. The strip now receives a Grumman Albatross every other Wednesday, but it can also accommodate a C-47. I don't know whether both of these could be handled at once. There is a radio beacon and flares are available for night landings.

The Commanding Officer of the Coast Guard loran station was Lt. (j.g.) John Dirschel. He was due to be relieved as C.O. on July 22, 1969. Besides the C.O. the station normally carries 14 men, but presently has only 12. Their tour of duty is one year. There is an empty bunkhouse which can handle up to 5 visitors, and USFWS personnel are cordially invited to use it. A vessel such as the Gilbert can dock at Tern Island after negotiating a rather tortuous buoyed channel. The Coast Guard themselves have a large lifeboat-type craft on davits at the dock. There have been some unpleasantries between USCG personnel and commercial fishermen, leading to morale problems and a consequent reluctance to have fishermen ashore. Considerable quantities of diesel fuel are stored underground, but all water is distilled.

3. During the cruise the Field Party Chief was requested to make broadcasts of tuna abundance to the commercial fleet by the Director, Hawaii Area. This request was complied with generally except during weekends off leeward Oahu. Here the commercial trolling boats took advantage of our broadcasts to "steal" our schools or to otherwise interfere with our operations. No broadcasts were made when these boats were about.

4. An attempt at wider dissemination of our programs' purposes was made in two main ways during Cruise 65. Mr. Carlos Rivas and

Mr. Richard Yamamoto of H.S.P.A. were aboard to photograph typical operations on August 19-20, and again on September 2. These visits resulted in radio programs featuring our work on August 21 and September 17, and a television program on September 17.

The seagoing aspects of our work were shown to permanent shoreside personnel on two one-day within-service training cruises (September 2 and 3). Twenty-four volunteers spent a day aboard the Gilbert at sea, and were shown the operation of a bathythermograph, Secchi disc, plankton tow, Nansen bottle cast, and livebait fishing for tuna.

IV. OPERATIONAL SCHEDULE:

July 6	Baited, Pearl Harbor
July 7-8	Conducted underwater television tests
July 9-10	Operated with submarine Carp
July 11-13	Baited and conducted behavior experiments
July 14	Conducted underwater television tests
July 15-31	Baited and conducted California Current survey, including landing at French Frigate Shoal
Aug. 1-Sept. 3	Baited and conducted behavior experiments

V. SCIENTIFIC PERSONNEL:

Donald W. Strasburg	Field Party Chief	
Eugene L. Nakamura	Fishery Research Biologist	- July 7-Aug. 4
Reginald M. Gooding	" " "	- July 6, 12-31
Robert A. Stevenson	" " "	- Aug. 2-Sept. 3
Henry S. H. Yuen	" " "	- July 7-14
Richard J. Hansen	Fishery Aid	- Aug. 2-Sept. 3
Vernon E. Brock	Observer	- July 7-8
John C. Marr	"	- July 7-8
Joseph Granville	Collaborator, television	- July 7-10
Roy C. Jones	" "	- July 14
Charles R. Clark	Lieutenant, USN	- July 9-10
Paul J. Perkins	SOC, USN	- July 9-10
Carlos Rivas	Television narrator, HSPA	- Aug. 19-20
Richard Yamamoto	Photographer, HSPA	- Aug. 19-Sept. 2

VI. RECORDS:

The following logs and records were kept during the cruise and have since been filed as indicated:

Tagging record for pole-and-line fishing (HBL)
Occurrence of tuna schools, birds, and aquatic mammals (HBL)
Surface school fishing record (HBL)
Plankton log (HBL)
Flowmeter and sampler calibration log (HBL)
Log of ship's weather observations (W.B. 1210 F) (Weather Bureau and Oceanography).

Record of fishing for bait (HBL)
Standard surface trolling data sheet (HBL)
Bait tank record (HBL)
Oceanographic log sheet "B" (Oceanography)
Barogram (W. B. 455-12) (HBL)
Thermograph record (HBL)
Scientists log (HBL)
Track charts (HBL)
Deck log (HBL)
Movie film (54 rolls) (HBL)
Audograph discs (20) (HBL)

Submitted: Donald W. Strasburg
Donald W. Strasburg
Chief, Behavior Investigations

Approved: SGD. THOMAS S. AUSTIN
Thomas S. Austin
Acting Laboratory Director

September 22, 1959

Table 1. Charles H. Gilbert, Cruise 45 - Station list

Station number	Date	Locale	Activity
1	July 6	Pearl Harbor	Baiting: nehu and Liuia
2	" 7	21°23'N, 158°13'W	Fishing: 4-6 lb. skipjack, nehu, sprays, TV test
3	" 8	21°13'N, 158°13'W	" : 28-30 lb. skipjack, nehu, TV test
4	" 9	21°02'N, 157°48'W	" : large skipjack, nehu, recorded sounds
5	" 9	21°00'N, 157°44'W	" : skipjack and little tunny, nehu, Submarine operation
6	" 11	Pearl Harbor	Baiting: nehu
7	" 12	21°18'N, 158°18'W	Fishing: 15 lb. skipjack, nehu, sprays on and off
8	" 13	21°16'N, 158°20'W	" : 5-22 lb. skipjack, nehu/Liuia
9	" 14	21°31'N, 158°22'W	" : 26-33 lb. skipjack, nehu, TV test
10	" 15	Pearl Harbor	Baiting: nehu
11	" 16	Pearl Harbor	" : nehu
12	" 17	20°18'N, 158°55'W	Plankton: 0-30 m., two 0-m.
13	" 18	18°11'N, 161°15'W	" : 0-30 m., two 0-m.
14	" 19	20°40'N, 163°41.5'W	" : 0-30 m., two 0-m.
15	" 20	23°20'N, 166°10'W	" : 0-30 m., two 0-m.
16	" 21	East Is., French Frigate Shoal - Baiting: iao	
17	" 21	Mullet Is., French Frigate Shoal - Baiting: iao	
18	" 21	Whale Is., French Frigate Shoal - Baiting: iao	
19	" 22	24°25'N, 164°46'W	Plankton: 0-30 m., two 0-m.
20	" 23	25°17'N, 162°20'W	Fishing: dolphin, wahoo, yellowfin, nehu
21	" 23	25°38'N, 161°06'W	Plankton: 0-30 m., two 0-m.
22	" 24	23°07'N, 159°00'W	" : 0-30 m., two 0-m.
23	" 25	22°22'N, 157°22'W	Fishing: 19-34 lb. skipjack, iao, sprays on and off
24	" 25	22°31'N, 157°03'W	" : 19-28 lb. skipjack, iao, tagging
25	" 25	22°50'N, 156°20'W	Plankton: 0-30 m., two 0-m.
26	" 26	25°23'N, 153°33.5'W	" : 0-30 m., two 0-m.
27	" 27	22°38'N, 152°58'W	" : 0-30 m., two 0-m.
28	" 28	19°13'N, 152°55'W	" : 0-30 m., two 0-m.
29	" 29	15°48.3'N, 154°37.5'W	" : 0-30 m., two 0-m.
30	" 30	19°19'N, 157°11'W	" : 0-30 m.
31	Aug. 1	Pearl Harbor	Baiting: nehu
32	" 2	21°15'N, 158°10'W	Fishing: 4-6 lb. skipjack, nehu/iao
33	" 3	21°07'N, 158°31'W	" : 8-18 lb. skipjack, nehu, live/dead
34	" 3	21°20'N, 158°14'W	" : 4-5 lb. skipjack, nehu, live/dead live and dead
35	" 4	21°28'N, 158°20'W	" : 23-30 lb. skipjack, nehu, live and glitter/ dead and glitter
36	" 8	Pearl Harbor	Baiting: nehu
37	" 9	21°14'N, 158°02'W	Fishing: 4-5 lb. skipjack, nehu, sprays off/on, glitter
38	" 9	21°19'N, 158°14'W	" : 2-6 lb. skipjack, nehu, sprays strawberry color, fluorescein
39	" 10	21°13'N, 158°01'W	" : 4-5 lb. skipjack, nehu, strawberry color, fluorescein
40	" 12	Pearl Harbor	Baiting: nehu
41	" 13	Kewalo Basin	" : iao

Table 1.--Charles H. Gilbert, Cruise 45 - Station list (Cont'd.)

Station number	Date	Locale	Activity
42	Aug.13	Coconut Is.	Baiting: iao
43	" 14	Kaneohe Bay	Baiting: (night) omaka
44	" 14	21°10'N, 157°55'W	Fishing: 4-6 lb. skipjack, iao/omaka
45	" 15	Pearl Harbor	Baiting: nehu, oama
46	" 16	21°27'N, 158°15'W	Fishing: 4-6 lb. skipjack, nehu/oama
47	" 17	21°00'N, 157°45'W	" : 5-6 lb. skipjack, nehu/oama
48	" 17	21°00'N, 157°45'W	" : 5-7 lb. skipjack, nehu/oama/omaka
49	" 19	21°03'N, 157°59'W	" : 13-22 lb. skipjack, nehu, chum rate, sprays
50	" 19	21°18'N, 158°13'W	" : 4-6 lb. skipjack, nehu, sprays on and off
51	" 20	Pearl Harbor	Baiting: nehu
52	" 22	Pearl Harbor	" : nehu
53	" 23	Pearl Harbor	" : oama
54	" 23	21°19'N, 158°13'W	Fishing: 5-7 lb. skipjack, oama, sprays, Thorazine
55	" 24	Pearl Harbor	Baiting: nehu
56	"25-27	Kahului, Maui	" : (night) aholehole, nehu, papio, lai
57	" 27	20°45'N, 157°00'W	Fishing: 11-16 lb. skipjack, aholehole-nehu, sprays; aholehole-nehu/tilapia
58	" 27	20°42'N, 157°01'W	" : 15-24 lb. skipjack, tilapia, chum rate
59	" 28	20°57'N, 158°01'W	" : 4-7 lb. skipjack, tilapia/aholehole; tilapia and glitter/aholehole+glitter
60	Sept. 1	Pearl Harbor	Baiting: nehu

Table 2.--Charles H. Gilbert, Cruise 45 - List of movies taken
(See Audograph records for additional information)

Roll No.	Type	Date	Stn.	Description
1	Ansco	July 7-8	2	Propeller, skipjack/sprays, TV camera on surface
1	Plus X	" 7-8	2	Skipjack/sprays (TV) zam bottom (TV)
2	Ansco	" 8	3	Large skipjack
2	Plus X	" 8	3	Large skipjack (TV)
3	Ansco	" 9	4,7	Skipjack/sound/spray, birds diving
4	"	" 13	8	Skipjack: nehu/Liznia
5	"	" 13	8	" " "
6	"	" 13-14	9	Fishermen in racks, dolphin fishing
7	"	" 13	-	Dolphin and Canthidermis under log
8	Plus X	" 14	9	Skipjack (TV), not numbered
8	Ansco	" 14	9	Skipjack (TV)
9	"	" 23-25	20,23	Dolphin; skipjack: iao/sprays
10	"	" 25	23	Skipjack: iao/sprays
11	"	" 25	24	Skipjack tagging (some of 16 frames)
12	"	Aug. 2	32	Skipjack: iao/nehu
13	"	" 2	32	" " "
14	"	" 3	33	Skipjack: live/dead nehu
15	"	" 3	33,34	Skipjack: live/dead nehu; live dead nehu mixtures
16	"	" 3	34	Skipjack: live/dead nehu mixtures
17	"	" 4	35	Skipjack: live and glitter/dead + glitter
18	"	" 4	35	Ditto-plus surface shots
19	Kodak	" 4-7	-	Skipjack transfer to pond, titles for movie
20	Ansco	" 9	37	Skipjack: sprays off, then on/off
21	"	" 9	37	Ditto-plus nehu/glitter and nehu
22	"	" 9	38	Skipjack in brinswell, strawberry color and fluorescein
23	"	" 9	38	Skipjack: strawberry color and fluorescein
24	Kodak	" 10	39	Surface activity - fishing, dyes
25	Ansco	" 10	39	Skipjack: strawberry color
26	"	" 10	39	Skipjack: fluorescein dye
27	Kodak	" 13	42	Iao baiting
28	Ansco	" 14	44	Skipjack: iao/omaka
29	"	" 14	44	" " "
30	"	" 16	46	Skipjack: nehu/oama
31	Kodak	" 16	46	Surface scenes, glitter, bait, commentary
32	Ansco	" 16	46	Skipjack: nehu/oama
33	"	" 17	47	" " "
34	"	" 17	48	Skipjack: nehu/oama/omaka
35	"	" 17	48	" " " "
36	Kodak	" 17	48	Surface scenes, skipjack in tank
37	Ansco	" 23	54	Skipjack: oama, sprays
		" 27	57	Skipjack: nehu, aholehole, papio, lai
38	"	" 27	57	Skipjack: nehu-aholehole, sprays
39	"	" 27	57	Skipjack: nehu-aholehole/tilapia

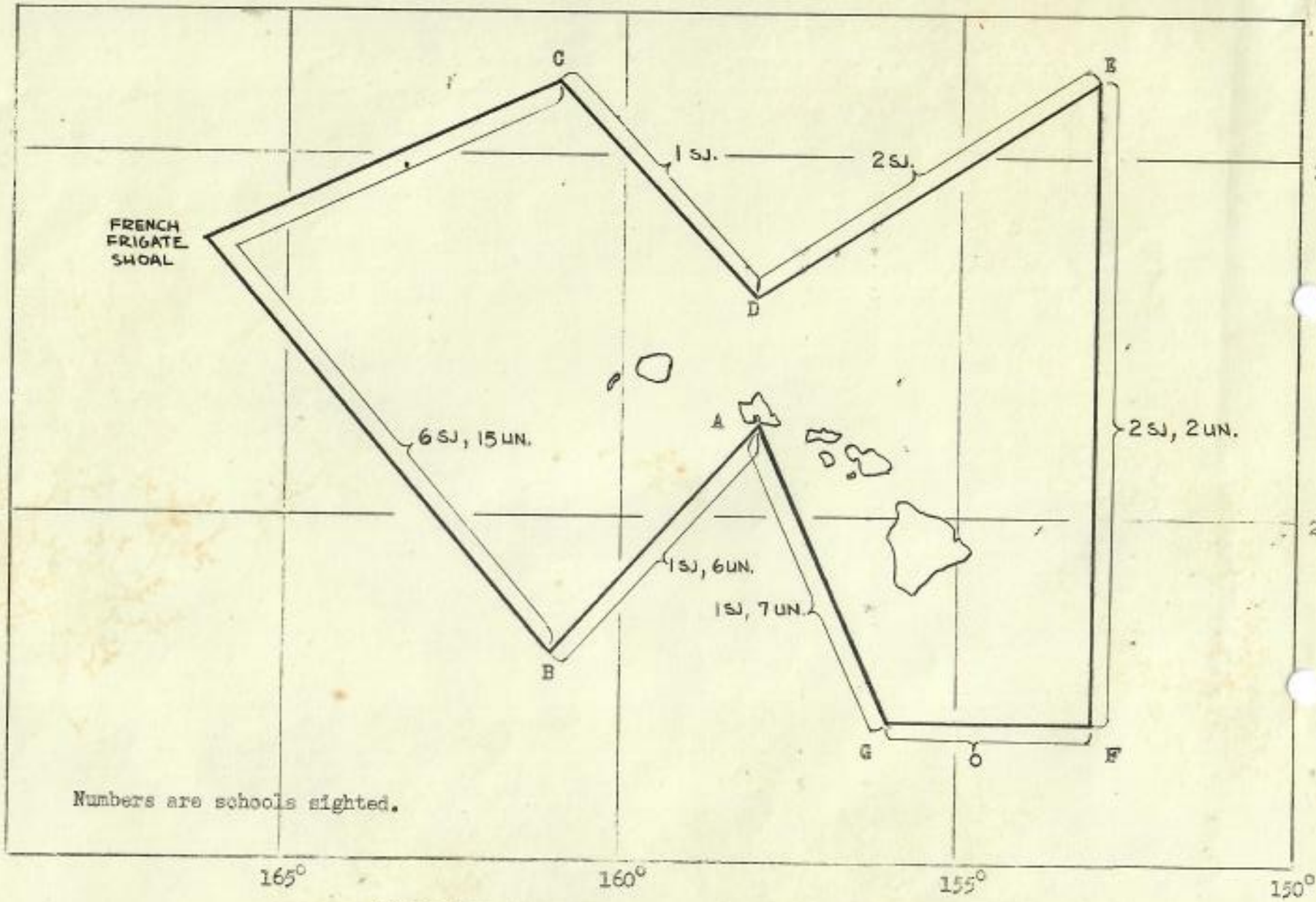
Table 2.--Charles H. Gilbert, Cruise 45 - List of movies taken (Cont'd.)
(See Audegraph records for additional information)

Roll No.	Type	Date	Stn.	Description
40	Ansco	Aug. 27	58	Skipjack: raised and over-chummed with tilapia
41	"	" 28	59	Skipjack: aholehole/tilapia/glitter
42	"	" 28	59	" " " "
43	"	" 30	-	Dolphin: aholehole; pelagic cama (incomplete roll)
44	Kodak	Sept. 2	-	Transfer skipjack to pond
45	"	" 5	-	Sea birds (incomplete roll)
-	Super Ansco	July 12	-	Baitwell, nightlight, (18 frames, f 1.4-2.0)
(1)*	DuPont	Aug. 19	49	Skipjack: chum-rate, sprays (not Exptl.)
(2)*	"	" 19	49	Skipjack: chum-rate
(3)*	"	" 19	49	Skipjack: chum-rate, sprays
(4)*	"	" 19	50	Skipjack: sprays, log
(5)*	"	" 28	-	Transfer skipjack to pond, demonstration cruise. Roll 1-year out of date
		Sept. 2		

*Numbers on film boxes only.

Table 3.--Charles H. Gilbert, Cruise 45
Secchi disc and Forel color observations

Date	N. Latitude	W. Longitude	Secchi disc (m.)	Forel color
July 19	19°39'	162°51.5'	33	2
" 20	22°19'	165°11.5'	29	1
" 22	24°03'	165°05.0'	36	1
" 23	25°16.5'	162°24.0'	33	1
" 27	24°13.0'	152°56'	33	1
" 28	20°28.5'	152°50.5'	39	2
" 29	18°56.5'	153°24.5'	41	1



CHARLES H. GILBERT cruise 45, vessel track during during California Current Extension survey.

Congress of the United States
House of Representatives
Washington, D.C. 20515

March 25, 1976

Honorable Thomas Kleppe
Secretary
U.S. Department of the Interior
18th & C Streets, N.W.
Washington, D. C. 20240

Dear Mr. Secretary:

RE: HAWAIIAN & PACIFIC ISLANDS NATIONAL WILDLIFE REFUGE SYSTEM

I am writing to request additional staff for the Hawaiian and Pacific Islands National Wildlife Refuge System.

This is such a wide spread area, comprising many islands and including 184,058 acres in the Pacific Islands. There are only two full-time professionals not including the support personnel now assigned to oversee this wide expanse. In light of this tremendous responsibility, I feel that additional staff must be hired if we are to ensure adequate management of the area.

Your urgent consideration of this request will be greatly appreciated. Thank you very much.

Very truly yours,

PATSY T. MINK
Member of Congress

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

In Reply Refer To:
FWS/RF
FWS 5284

Dear Mrs. Mink:

This further responds to your January 23 letter concerning the Hawaiian Islands National Wildlife Refuge.

The two refuges recently acquired on Kauai for the preservation of habitat for endangered Hawaiian waterbirds are the Hanalei National Wildlife Refuge (917 acres) and the Huleia National Wildlife Refuge (238 acres).

Several of the leeward islands are collectively known as the Hawaiian Islands National Wildlife Refuge. This refuge was established by Presidential Proclamation in 1909, and comprises 1,907 acres in the combined land area of the several islands. As to the Pacific Islands, Rose Atoll--containing 39,090 acres--was made a refuge by agreement with the territory of American Samoa in 1973. Johnston Island was established as a refuge of 100 acres, subject to the primary control of the Navy, in 1926. Three islands, Baker Island (31,737 acres), Howland Island (32,550 acres), and Jarvis Island (37,519 acres), were given the protection of being added to the refuge system in 1974 by Secretarial order.

In summary, the National Wildlife Refuge System includes 3,062 acres in Hawaii and 140,996 acres in the Pacific Islands.

The responsibility of the Fish and Wildlife Service is to protect the entire ecosystem of these areas, including all plant and animal life. The primary reason for establishing the island refuges was to protect and insure the survival of seabird colonies.

Staffing includes a refuge manager (office in Kailua, Oahu), a clerk, an assistant refuge manager (office in Hanalei, Kauai), and a part-time maintenance worker. In addition to these personnel, one research employee is assigned to work on problems concerned primarily with endangered species.

We hope this information is helpful. If we can be of further assistance, please contact us.

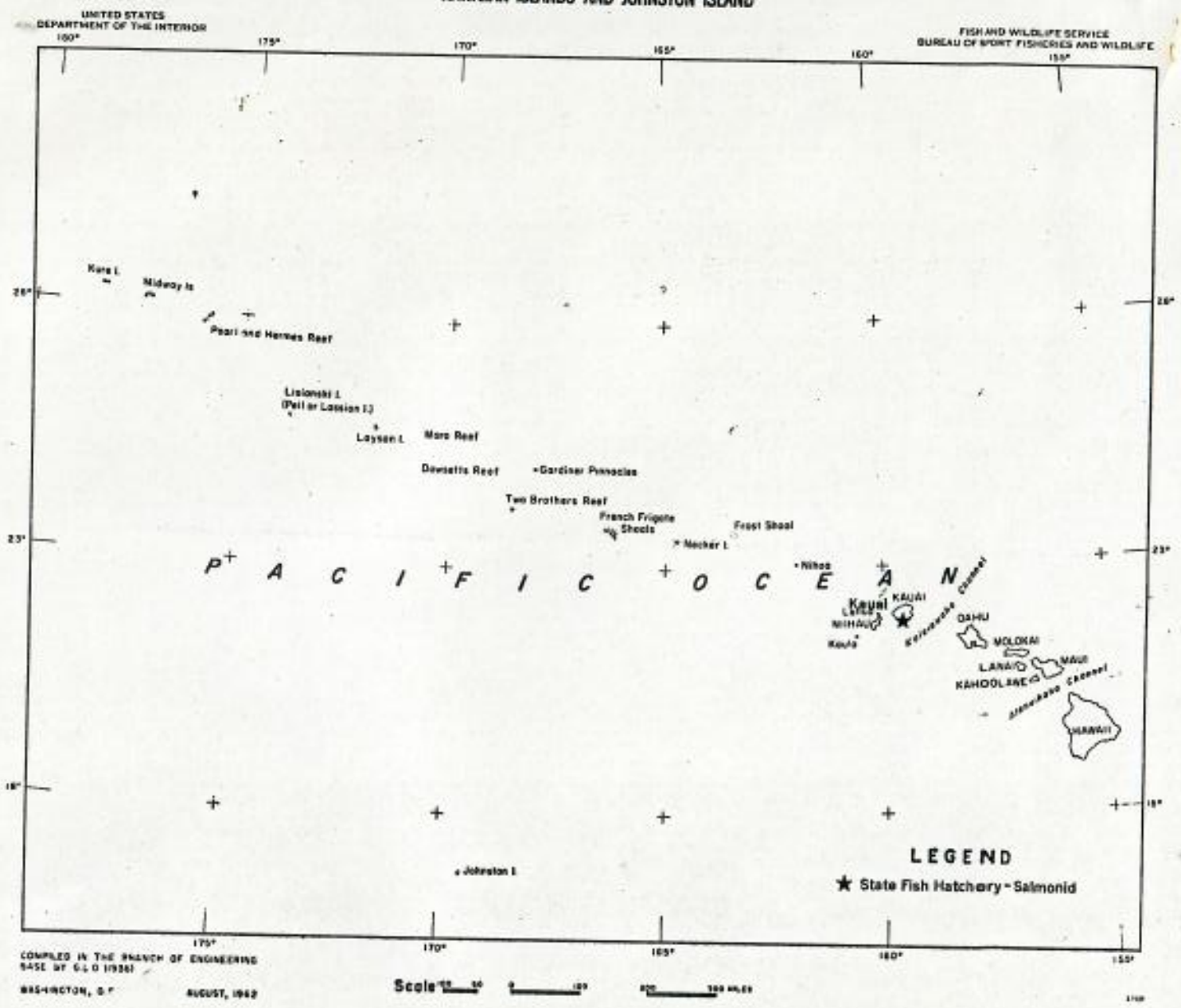
Sincerely yours,

John Kyl
Assistant Secretary for
Congressional and Legislative Affairs

Honorable Patsy T. Mink
House of Representatives
Washington, D.C. 20515

Enclosures

HAWAIIAN ISLANDS AND JOHNSTON ISLAND



From - Hawaii and the Sea 1974
Prepared for the Governor's Advisory Committee on Science and Technology

3. The scope of work for this unit should be defined to furnish background information for proposed regulations, or regulation changes, and provide details of management alternatives. The unit should not, however, engage directly in the implementation of the regulations or the passage of legislation.
4. The new Division of Marine Resources should include a competent, adequately funded, Public Information Branch.

SOURCES OF REVENUE

Fishery resources management never pays for itself directly. Therefore, it frequently does not receive sufficient support to safeguard the resource. Such is the case in Hawaii. We suggest generating funds from the fisheries to help maintain the resource.

Funds are needed to collect meaningful data on fishery yields and populations, provide an effective management system, allow enforcement of state regulations and implement all or some of the suggestions for reorganization suggested here. Income from user and license fees currently charged by the State does not begin to approximate the cost of maintaining the fishery resource. In certain fisheries, especially where the resource is limited in magnitude or extent, fishing could be controlled through a system of special licenses or limited entry. In the case of recreational fishing, it is currently not possible to measure the stress on the resource (number of fishermen), the strain on the stock (population dynamics), or provide minimal enforcement of State fishing regulations.

Our rationale in recommending the above sources of funds is simple. The fishery resources of the State belong to the people. We believe that it is fair for the primary beneficiaries--those who profit from the resources either from sales or sport--to bear an equitable share of the cost of maintaining the fisheries in a healthy, self-sustaining state.

Recommendation

The Department of Land and Natural Resources should modify its policy on licensing marine fishing:

1. To adjust present license fees for commercial fishing to make them equitable and commensurate to the benefits accruing to the fisherman.
2. To levy landing fees at public boat access sites.
3. To issue a limited number of special licenses for entry into certain fisheries that exploit limited stocks (such as Kona crab).
4. To explore licensing recreational fishermen to provide adequate statistical coverage of the fishery as well as revenues to offset the cost of its management.

The Task Force recognizes that there are many problems associated with these recommendations, especially in the licensing of recreational fishermen. These measures seem clearly radical to a populace historically accustomed to free use of the resource. They are, nevertheless, necessary because of the increasing pressure on a limited resource. Implementation of these recommendations must be carefully planned by the State and will involve political courage on the part of the agencies involved as well as a public education program. The success of such an undertaking will depend to a large degree upon the ability of the State to document the need for resource management and the improvements in fishing that would result.

NORTHWESTERN HAWAIIAN ISLANDS STOCK ASSESSMENT

With increasing pressure on the fishery resources of Hawaii's main islands and the introduction of long-range fishing vessels, it is

Published by the State of Hawaii
Department of Planning and Economic Development

becoming essential that the State undertake an assessment of the status of presently exploited stocks and the development potential of new areas and latent resources. In particular, the waters of the Northwestern Hawaiian Archipelago, stretching from Kauai to Kure Island, are within reach of the new vessels now entering Hawaiian fisheries. This new fishing capability, together with the recent proposal to establish a marine wilderness reserve among the Northwestern Hawaiian Islands, suggests that an effort to assess the commercial and recreational potential of the area should be undertaken in the near future. Specifically, information is needed on the distribution and abundance of inshore and demersal (ocean bottom) fish, shellfish and precious coral among the islands of the Northwestern Hawaiian Archipelago, including the offshore banks. A data base is necessary for effective utilization and management of this still unknown resource.

Recommendation

The Department of Land and Natural Resources, in a joint venture with the University of Hawaii and the National Marine Fisheries Service, should complete an intensive fishery survey of the Northwestern Hawaiian Archipelago over the next three years.

The new Cooperative Fisheries Unit recommended earlier might be assigned active responsibility for this survey. The State should seek matching fund support from the Federal government, specifically the National Marine Fisheries Service, the National Science Foundation and the Sea Grant Office.

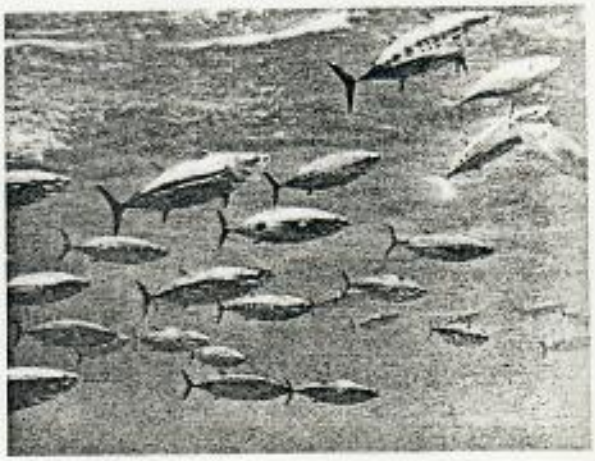
We are concerned about increasing pressures toward a Federal declaration of the Northwestern Hawaiian Islands as a "natural wilderness area", a step in advance of any meaningful knowledge of the extent and value of marine resources in these islands.

Recommendation

The Department of Land and Natural Resources should request that any Federal declaration of the Northwestern Hawaiian Islands as a "natural wilderness area" should follow, and be based upon, a survey of the fishery and precious coral resources in those islands. As a fallback position, the Department should request a stipulation in any such declaration that carefully selected areas of such a preserve can be opened to controlled resource utilization.

FISHERY RESOURCES OF THE HIGH SEAS

Over 75 percent of the weight and value of fish landings in the State come from high-seas species, chiefly the tuna. These fish constitute a global resource and, as such, are subject to international management as well as international marketing. In recent years, the value of tuna to Hawaiian fishermen, on a per pound basis, has more than doubled, resulting in an incentive to invest in new vessels and equipment. The increasing world demand for tuna, together with improvements in transportation, has resulted in a situation where the price in the Hawaii marketplace is independent of local market demand. An exception occurs at times of extreme shortage when local prices rise markedly. In other



Schools of Skipjack Tuna are the backbone of the local fishing industry.

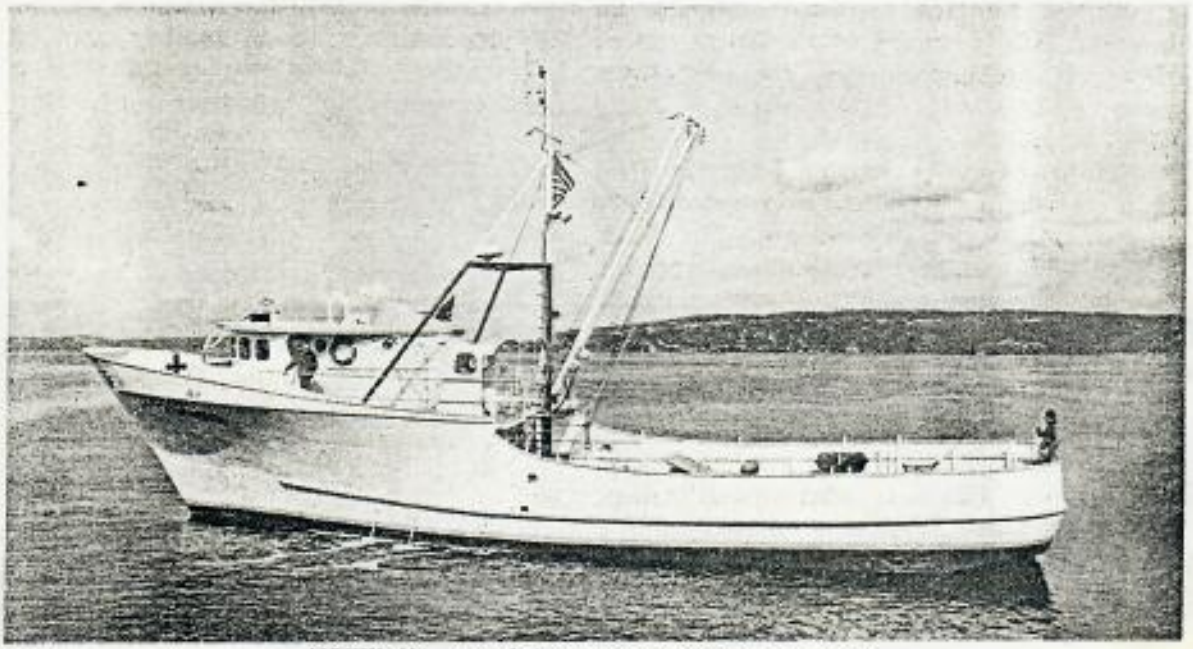
words, the price is normally set by international demand, which results in a price floor for all tuna landed in the State. This minimum price is equal to the world price for the product, less shipment cost to market.

The assurance of a ready market and a favorable minimum price have resulted in expanded operations for Hawaiian fishermen. All four of the new vessels constructed under the Hawaiian Vessel Loan Program have entered the tuna fishing industry. Those vessels fishing for the fresh fish market are assured of demand and a good price for their catch. Those vessels fishing aku (skipjack tuna) for the international market and the cannery are also assured of a constantly increasing demand and price.

The devaluation of the dollar, the increased demand for high grade fresh fish in Japan and the increase in air transport between Hawaii and Japan have resulted in a minimum price for most high quality fishery products in Hawaii that is approximately $.40 to $.50 a pound less than the wholesale market price in Japan. The result is that the Hawaiian consumer can expect to pay a price comparable to the price paid by the Japanese consumer, less the cost of air transport; the Hawaiian fishermen will receive a price comparable to that set by the fish auctions in Japan. There is little the State can do to reduce the cost of fish to the local consumer. However, if the State encourages the construction and operation of new vessels, the times when extreme scarcity of landed fish cause extraordinary costs to the consumer could be reduced.

There are problems that may limit expansion of the industry in the near future. There is the ubiquitous question of an adequate supply of suitable baitfish for aku pole and line fishing. The rising cost of building new vessels will probably require year-round operations for the pole and line vessels, and year-round operations cannot be confined solely to Hawaiian waters.

The first of these problems is being addressed by the National Marine Fisheries Service and the Hawaii Institute of Marine Biology; the second is addressed in the



MOKIHANA, one of the newest additions to the fleet is financed through the Hawaiian Vessel Loan Program.

program being developed by the Pacific Islands Development Commission, of which the State of Hawaii is a member (Chapter 3). We believe the programs sponsored by the Commission offer considerable benefit to Hawaii.

Recommendation

The State, through the Department of Planning and Economic Development, should continue to support the fishery programs of the Pacific Islands Development Commission. The State's Congressional Delegation should support such programs through continuing efforts to obtain direct Federal funding for the Commission.

Concerning the future of the tuna cannery, the State is faced with serious choices. The lease for the present cannery site will be renegotiated in 15 years, and the cannery will have to compete with other demands for the Kewalo Basin area. Also, increasing labor costs could make it economically impractical to operate a cannery in Hawaii in comparison to the cost of operations on other United States currency islands of the Central Pacific, such as American Samoa.

We believe the State should offer every reasonable inducement to encourage continuation of the tuna canning operation in Hawaii because of (1) the direct employment provided by the cannery, (2) the direct employment provided by the fishing vessels which the cannery supports, and (3) the increased cost that will have to be paid in the local marketplace if fresh tuna is no longer landed in Hawaii.

Recommendation

The Department of Planning and Economic Development, with the officers of Hawaiian Tuna Packers, should explore the problems the canning operation faces and ways in which the State can encourage its continued existence.

Another problem that the State faces is that Federal standards, still in the process of definitive formulation, have barred certain economically important fish from the market. For example, some large pelagic fish have been barred because of their mercury content.

Recommendation

The Department of Health should explore the feasibility of setting its own standards for fishery products landed by Hawaiian vessels and consumed within the State. The standard should be such that the health of the public is not in the least endangered and be based on the best available scientific data.

The State has, on occasion, maintained a shark control program to assure that the inshore shark population is kept at a low level for the safety of swimmers, surfers and divers. These operations had to be underwritten by the State because there is no incentive to commercial shark fishing. However, if an eradication program were undertaken in selective areas where shark endanger people, perhaps shark flesh could be used for food--as shark meat, fishmeal, or in fish cakes.

Recommendation

Possible uses in Hawaii for shark meat should be investigated through various channels, such as the University, the Department of Health and the Division of Fish and Game. Funding to solve this problem should be sought from the Sea Grant Office. If these efforts are not successful, the State should reestablish, and fund, the nonbounty program of regional eradication.

The unique services provided by HTP are essential for the local fishing industry.

live-N

Certificate of Appreciation

The Federal, State and Provincial Conservation Agencies join with thousands of professional and amateur ornithologists throughout North America in expressing their sincere appreciation for the interest and cooperation shown by reporting the bird band number and recovery data noted below. A report containing these data will be forwarded to the ornithologist who banded the bird and these data will be permanently retained in the cooperative North American Bird Banding files maintained at the Bird Banding Laboratory, Office of Migratory Bird Management, Laurel, Maryland 20811, U.S.A.

It is only through the continued cooperation of interested conservationists such as yourself that these important data can continue to be compiled and made available to the scientists who study our wild bird populations.

Awarded To

GEORGE H BALAZS
BX 1346 COCONUT ISL
KANEOHE HI 96744

BANDING DATA:

BAND NUMBER: 757-39450 KIND OF BIRD: BLACK FT ALBATROSS SEX: UNKNOWN

AGE OF BIRD: IT WAS TOO YOUNG TO FLY WHEN BANDED

BANDER: IT WAS BANDED BY PERSONNEL OF US NATIONAL MUSEUM
C/O C O HACKMAN 3033 WOODSIDE PARKVILLE MD 21234

BANDING LOCATION: NEAR WHALE-SKATE IS FFS HAWI DATE: 06/16/69

RECOVERY DATA: FILE REF.: 20687

LOCATION: W S ISLAND HI DATE: 12/02/75

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U. S. FISH AND WILDLIFE SERVICE

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Awarded To

GEORGE H BALAZS
BX 1346 COCONUT ISL
KANEOHE HI 96744

BANDING DATA:

BAND NUMBER: 757-39168 KIND OF BIRD: BLACK FT ALBATROSS SEX: UNKNOWN

AGE OF BIRD: IT WAS TOO YOUNG TO FLY WHEN BANDED

BANDER: IT WAS BANDED BY PERSONNEL OF US NATIONAL MUSEUM
C/O C D HACKMAN 3033 WOODSIDE PARKVILLE MD 21234

BANDING LOCATION: NEAR WHALE-SKATE IS FFS HAWI DATE: 06/14/69

RECOVERY DATA:

FILE REF.: 20687

LOCATION: W S ISLAND HI DATE: 12/02/75

CANADIAN WILDLIFE SERVICE

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Awarded To

GEORGE H BALAZS
BX 1346 COCONUT ISL
KANEOHE HI 96744

BANDING DATA:

BAND NUMBER: 757-38590 KIND OF BIRD: LAYSAN ALBATROSS SEX: UNKNOWN

AGE OF BIRD: IT WAS TOO YOUNG TO FLY WHEN BANDED

BANDER: IT WAS BANDED BY PERSONNEL OF US NATIONAL MUSEUM
C/O C D HACKMAN 3033 WOODSIDE PARKVILLE MD 21234

BANDING LOCATION: NEAR EAST IS FR FRG SHL HAWI DATE: 06/08/69

RECOVERY DATA: FILE REF.: 20687

LOCATION: TERN ISL HI DATE: 12/02/75

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Awarded To

GEORGE H BALAZS
BX 1346 COCONUT ISL
KANEOHE HI 96744

BANDING DATA:

BAND NUMBER: 757-38324 KIND OF BIRD: BLACK FT ALBATROSS SEX: UNKNOWN

AGE OF BIRD: IT WAS TOO YOUNG TO FLY WHEN BANDED

BANDER: IT WAS BANDED BY PERSONNEL OF US NATIONAL MUSEUM
C/O C D HACKMAN 3033 WOODSIDE PARKVILLE MD 21234

BANDING LOCATION: NEAR EAST IS FR FRG SHL HAWI DATE: 06/08/69

RECOVERY DATA:

FILE REF.: 20687

LOCATION: EAST ISLAND HI DATE: 12/02/75

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Awarded To

GEORGE H BALAZS
BX 1346 COCONUT ISL
KANEOHE HI 96744

BANDING DATA:

BAND NUMBER: 757-37740 KIND OF BIRD: BLACK FT ALBATROSS SEX: UNKNOWN

AGE OF BIRD: IT WAS TOO YOUNG TO FLY WHEN BANDED

BANDER: IT WAS BANDED BY PERSONNEL OF US NATIONAL MUSEUM
C/O C D HACKMAN 3033 WOODSIDE PARKVILLE MD 21234

BANDING LOCATION: NEAR WHALE-SKATE IS FFS HAWI DATE: 06/19/68

RECOVERY DATA:

FILE REF.: 20687

LOCATION: W S ISLAND HI DATE: 12/02/75

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Live-N

Certificate of Appreciation

The Federal, State and Provincial Conservation Agencies join with thousands of professional and amateur ornithologists throughout North America in expressing their sincere appreciation for the interest and cooperation shown by reporting the bird band number and recovery data noted below. A report containing these data will be forwarded to the ornithologist who banded the bird and these data will be permanently retained in the cooperative North American Bird Banding files maintained at the Bird Banding Laboratory, Office of Migratory Bird Management, Laurel, Maryland 20811, U.S.A.

It is only through the continued cooperation of interested conservationists such as yourself that these important data can continue to be compiled and made available to the scientists who study our wild bird populations.

Awarded To

GEORGE H BALAZS
BX 1346 COCONUT ISL
KANECHE HI 96744

BANDING DATA:

BAND NUMBER: 757-35223 KIND OF BIRD: BLACK FT ALBATROSS SEX: UNKNOWN

AGE OF BIRD: IT WAS TOO YOUNG TO FLY WHEN BANDED

BANDER: IT WAS BANDED BY PERSONNEL OF US NATIONAL MUSEUM
C/O C D HACKMAN 3033 WOODSIDE PARKVILLE MD 21234

BANDING LOCATION: NEAR EAST IS FR FRG SHL HAWI DATE: 06/10/68

RECOVERY DATA: FILE REF.: 20687

LOCATION: EAST ISLAND HI DATE: 12/02/75

CANADIAN WILDLIFE SERVICE

U. S. FISH AND WILDLIFE SERVICE

Live-N Island Change

Certificate of Appreciation

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Awarded To

GEORGE H BALAZS
BX 1346 COCONUT ISL
KANEOHE HI 96744

BANDING DATA:

BAND NUMBER: 757-35078 KIND OF BIRD: BLACK FT ALBATROSS SEX: UNKNOWN

AGE OF BIRD: IT WAS TOO YOUNG TO FLY WHEN BANDED

BANDER: IT WAS BANDED BY PERSONNEL OF US NATIONAL MUSEUM
C/O C D HACKMAN 3033 WOODSIDE PARKVILLE MD 21234

BANDING LOCATION: NEAR EAST IS FR FRG SHL HAWI DATE: 06/10/68

RECOVERY DATA:

FILE REF.: 20687

LOCATION: N S ISLAND HI DATE: 12/02/75

CANADIAN WILDLIFE SERVICE

U. S. FISH AND WILDLIFE SERVICE

GRASSHOPPERS RETURN—Seventeen Western states and 32 million acres are threatened by a grasshopper infestation expected in May and June. The Agriculture Department says it may be the worst in 40 years. —AP Photo.

xc for George Balazs

September 16, 1977

Mr. Brian Giezentanner
U.S. Fish & Wildlife Service
Box 50167
Honolulu, HI 96850

Dear Mr. Giezentanner:

Mr. George Balazs has just given me a specimen of a large grasshopper which he collected on Necker Island on August 24, 1977. He reported seeing numerous grasshoppers of this type both on Necker and on Nihoa which he visited on Aug. 17.

The grasshopper is a specimen of Schistocerca nitens nitens Thunburg, a North American form which was first found established in the main Hawaiian Islands during 1965. Although this species has not developed into a major agricultural pest in Hawaii, it belongs to a genus of grasshoppers which contains a number of serious pest species. It is quite possible that biological factors, such as the predacious ant, Pheidole megacephala (Fabricius), may be controlling it on the main islands. It is also possible that in the relatively simple terrestrial ecosystems of Nihoa and Necker, this grasshopper may build up sufficiently large populations to cause serious damage to the vegetation. I believe that you should be aware of the potential this grasshopper may have for causing serious damage to the flora of Nihoa and Necker so that you and your assistants can keep an eye open for large populations, and also for any changes in the condition of the vegetative cover on these islands which could be caused by it.

To my knowledge, the last insect survey of the HINWR islands was made by me in 1964. As I pointed out in a 1966 paper on insects of the Leeward Hawaiian Islands (copy enclosed), these small islands are very vulnerable to invasion by new insect pests. May I suggest that you consider including a qualified entomologist on one of your field trips to these islands, within the next year or two? I believe it would be prudent to resurvey the insect faunas of the HINWR islands to assess the status and impact of the new grasshopper and to determine whether other new pests have become established on these islands.

Yours sincerely,

John W. Beardsley
Entomologist & Professor

Enc.

cc: George Balazs

NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center
Honolulu Laboratory

April 10, 1978

To: Participants, Townsend Cromwell, Cruise 78-01

From: TH Tom Hida, Chief Scientist

Subject: Post-cruise meeting for Townsend Cromwell, Cruise 78-01

There will be a post-cruise meeting for TC-78-01 in the conference room at the Honolulu Laboratory on Friday, April 14, 1978, at 0900.

Please attend.

Distribution

Cdr. Gelb
Lt. Kaiser
R. Shomura
R. Gooding
G. Higashi
R. Humphreys
B. Ito
T. Kazama
W. Matsumoto
M. Queenth
D. Tagami
R. Uchida
A. Vala

HIMB
G. Balazs
R. Grigg
A. Kam
V. Hu
M. Palmgren
S. Rasmussen

USFWS
C. Harris

Mr. George Balazs

NOTE -
NO Turtles ever "trapped" as far as we know!

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center
Honolulu Laboratory
P. O. Box 3830
Honolulu, Hawaii 96812

CRUISE REPORT

VESSEL: Townsend Cromwell, cruise 78-04 (TC-81)

CRUISE PERIOD: October 17-November 5, 1978

AREA OF OPERATION: Northwestern Hawaiian Islands

ITINERARY:

October 17 - Departed Kewalo Basin for Necker Island.

October 19-
November 3 - Trapped, trawled, bottom fished, and trolled in waters off Necker Island, French Frigate Shoals, Gardner Pinnacles, Maro Reef, and Nihoa.

November 3 - Departed Nihoa for Kewalo Basin.

November 5 - Arrived at Kewalo Basin.

MISSIONS AND RESULTS:

A. The general objective of Part I of the cruise was to assess the demersal and pelagic resources of the banks and offshore grounds of the Northwestern Hawaiian Islands (NWHI) from Nihoa to Maro Reef.

The primary mission was to compile more extensive morphometric data on spiny lobster, Panulirus marginatus, than has hitherto been collected during previous cruises.

Of particular interest was spiny lobsters trapped on the banks of French Frigate Shoals, Maro Reef, Gardner Pinnacles, Nihoa, and Necker Island. The sampling methods included: lobster, fish, shrimp, and octopus trapping; Kona crab netting, bottom fishing with power gurdies for snappers and groupers, bottom and midwater trawling for demersal fishes, and surface trolling for pelagic fishes.

1. Lobster and fish trapping

Two types of traps were used: (1) A 2-chambered fish trap made of steel reinforcing rod and cored with 2.5-cm square galvanized wire mesh and measuring 152 x 91 x 61 cm, with a conical entrance, and (2) a 10-chambered lobster pot of galvanized 5.1 x 10.2 cm wire mesh, measuring 94 x 74 x 42 cm, with a conical entrance.

Eight trapping stations were occupied, three at Necker Island, two at French Frigate Shoals, two at Maro Reef, and one at Nihoa. Because of rough seas and a breakdown of the vessel's starboard main engine, eight strings of traps were abandoned on the eastern bank of Nihoa. Seven of the trap strings were retrieved several days later by Captain Leo Ohai of the FV Libra and returned to the Honolulu Laboratory.

Trapping stations consisted of either 40 lobster pots (8 pots per string) and 12 fish traps (4 traps per string) or 48 lobster pots and 8 fish traps. Trap strings were set in a straight line 300-400 m apart, between 1600 and 1700, and retrieved the following morning between 0800 and 1100.

A variety of fish and crustacean species were caught in the pots and traps; however, only spiny lobster were taken in commercial quantities. The catch of commercially valuable species included: 1,164 spiny lobster, 77 slipper lobster, Scyllarides squammosus; 3 pink snapper, Pristipomoides microlepis; 6 blue-line snapper, Lutjanus kasmira; 49 goatfish, Parupeneus pleurostigma; 2 sea bass, Epinephelus quernus; and 1 kona crab, Ranina serrata.

Catch rates at Necker Island were 3.90, 7.85, and 4.63 spiny lobster per trap night for the three stations; 3.18 and 1.77 at Maro Reef, and a very low 0.15 each for the two trapping stations at French Frigate Shoals. The average catch rate for all traps was 3.10 spiny lobster per trap night. The fish traps caught an average of 3.68 and the lobster pots 2.96 per trap night. Carapace measurements and sex were recorded for all lobsters and more complete morphometric data were taken from 417 male and 236 female spiny lobster.

The tails of the latter were frozen and additional measurements were made on them at the Honolulu Laboratory. A total of 255 live spiny lobster were brought back to the Kewalo facility where they were to be used for behavioral experiments.

2. Bottom fishing

Fourteen bottom fishing stations were occupied. Four lines (two hydraulic and two electric gurdies) were fished at each station. Six hooks on each line were usually baited with squid. Fishing depths ranged from 60 to 120 fathoms. The species most frequently caught were: pink snapper, P. microlepis and P. sieboldii; ulua, Caranx cheilio; kahala, Seriola dumerilii; sea bass; and red snapper, Etelis marshi. Other commercially valuable species occasionally taken were gray snapper, Aprion virescens; gindai (snapper), Rooseveltia brighami; and black ulua, C. lugubris.

Catch rates (fish per line hour) were 1.5 at Necker Island, 1.5 at French Frigate Shoals, 1.9 at Nihoa, and 3.4 at Maro Reef. The average catch rate for all stations was 1.9 and the best catch rate was 6.0 at station no. 11 on southwest Maro Reef.

3. Bottom trawling

Four 30-min bottom trawl stations were occupied, three day hauls, and one night haul. The catch included a variety of bottom dwelling reef fish. The only aspects of the catch which were somewhat unusual were eight kahala taken in about 80 fathoms at Maro Reef, two sandbar sharks, Carcharhinus milberti, taken at Necker Island, and one sandbar shark taken at French Frigate Shoals.

4. Trolling

Direct trolling (optimal troll speed) with three lines was conducted for a total of 19.5 h off Necker Island, Maro Reef, Gardner Pinnacles, and Nihoa. Twenty-four kawakawa, Euthynnus affinis, 7 yellowfin tuna, Thunnus albacares, 3 wahoo, Acanthocybium solandri, 3 mahimahi, Coryphaena hippurus, and 1 skipjack tuna, Katsuwonus pelamis were caught. Incidental trolling at the ship's cruising speed caught two mahimahi.

5. Other fishing

No shrimp or octopus trapping, or kona crab netting was conducted during the cruise.

B. Miscellaneous Activities.

1. Tissue samples were collected from 177 fish to be analyzed for ciguatera fish poisoning. Samples of dorsal muscle, abdominal muscle, gonad, and liver were excised and frozen. Sampled fish included: 77 P. microlepis, 46 C. cheilio, 21 S. dumerilii, 19 E. quernus, 7 E. marshi, 4 P. sieboldii, 1 C. lugubris, 1 A. virescens, and 1 Bodianus bilunulatus.

2. Approximately 235 live spiny lobsters were held in the baitwell and brought back to the Kewalo facility to be used by Linda Paul, University of Hawaii graduate student, for experiments on lobster behavior.

3. In response to a request by Jim Shaklee, Hawaii Institute of Marine Biology, University of Hawaii, 110 spiny lobster heads from Necker Island and Maro Reef and 4 opakapaka from Nihoa were frozen to be used for his work on the genetics of these species.

4. Length frequencies were recorded from 74 P. microlepis, 46 C. cheilio, 20 E. quernus, 20 S. dumerilii, 16 P. sieboldii, 8 E. marshi, 1 A. virescens, 1 R. brighami, 1 C. lugubris, and 1 B. bilunulatus.

5. For later photographic purposes, a total of 13 handline- and trawl-caught fish were frozen.

6. Nine bird flocks were sighted. One was associated with a skipjack tuna school and the others with unidentified fish schools. Small schools of unidentified porpoise were seen on several occasions and a large school of well over 100 spinner dolphin, Stenella longirostris, were seen off Nihoa.

7. The surface thermosalinograph was run continuously while at sea.

8. Salinity samples and surface temperature measurements were collected at each XBT cast.

9. Standard weather observations were made at 0000, 0600, 1200, and 1800 G.m.t. by the ship's personnel.

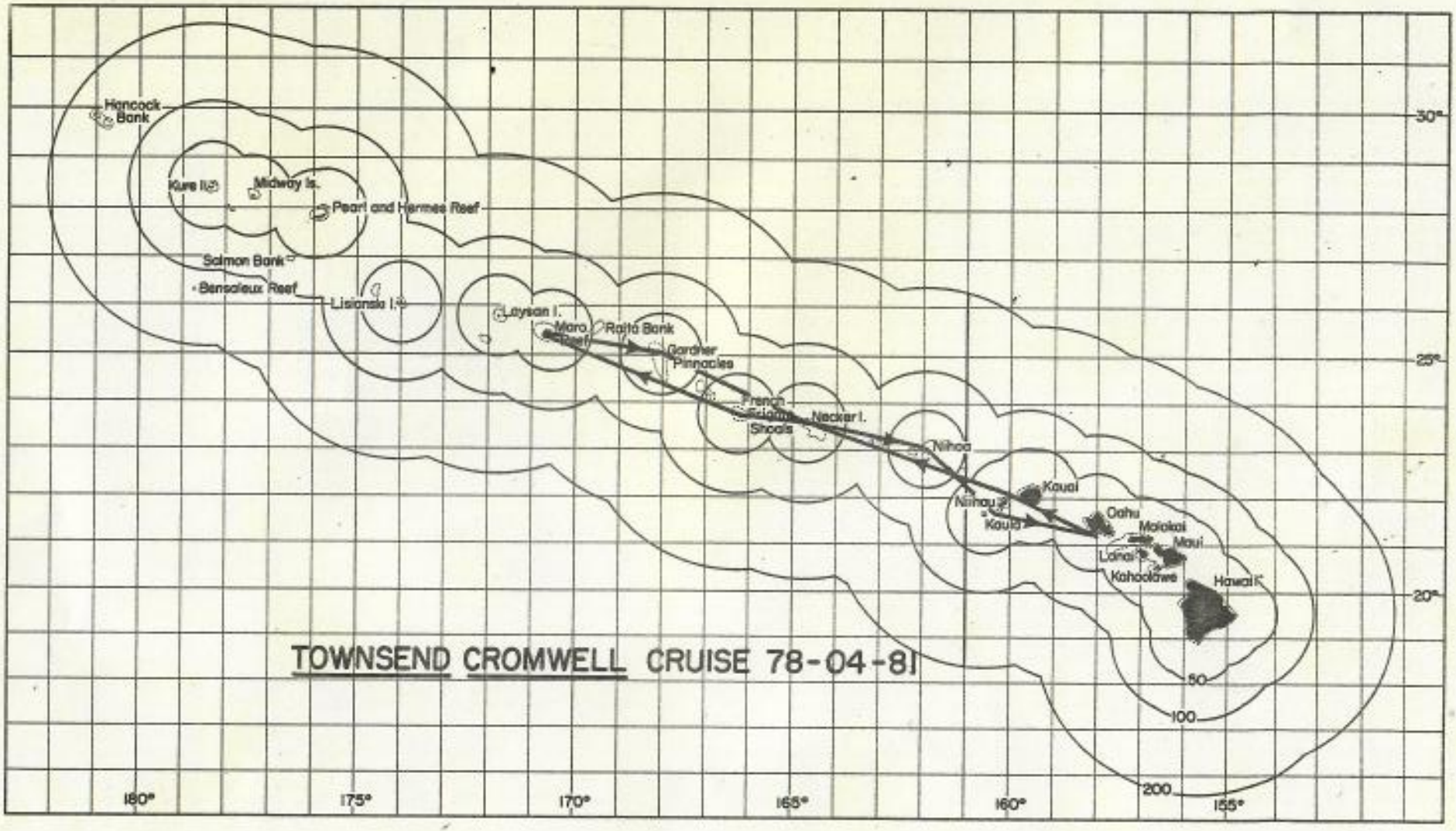
SCIENTIFIC PERSONNEL: Reginald M. Gooding, Chief Scientist, Fishery Biologist, NMFS, SWFC, HL
Victor A. Honda, Research Assistant, NMFS, SWFC, HL
Robert L. Humphreys, Jr., Research Assistant, NMFS, SWFC, HL
Bert S. Kikkawa, Research Assistant, NMFS, SWFC, HL
Darryl T. Tagami, Research Assistant, NMFS, SWFC, HL

Submitted by:
Reginald M. Gooding
Chief Scientist

Approved by:
Richard S. Shomura
Director
Honolulu Laboratory

Attachment: Track chart

December 11, 1978


Hancock Bank
Kure Is.
Midway Is.
Pearl and Hermes Reef
Salmon Bank
Bensaleux Reef
Lisianski I.
Laysan I.
Maro Reef
Raita Bank
Gardner Pinnacles
French Frigate Shoals
Necker I.
Nihoa
Kauai
Niihau
Kaula
Oahu
Molokai
Maui
Lanai
Kahoolawe
Hawaii
30°
25°
20°
50
100
200
180°
175°
170°
165°
160°
155°
TOWNSEND CROMWELL CRUISE 78-04-81

NAVAL RESEARCH LABORATORY
WASHINGTON, D.C. 20375

IN REPLY REFER TO:
8350-403:DWS:dk
2 October 1974

Dr. George H. Balasz
Hawaii Institute of Marine Biology
P.O. Box 1346
Kaneohe, Hawaii 96744

Dear Dr. Balasz:

This is in reference to my letter of September 18 in which I offered to send you prints of butchered green turtles on French Frigate Shoals. My slide collection contains only two photos of this, and I'm enclosing a color print of each which I hope will be of use to you. Labels are on the backs. My field notebook shows at least seven turtle photos being taken, so presumably the other five were given to the NMFS slide collection, then kept in their library. This collection was often raided and otherwise abused, and you may find nothing now after 15 years. As a last resort, I have a huge shipping box of duplicate slides, and it is remotely possible that some turtle pictures might be there. I hesitate to search this box, however, unless your need is urgent.

Sincerely yours,

DONALD W. STRASBURG, Ph.D.
Head, Marine Biology and
Biochemistry Branch
Ocean Sciences Division
Code 8350

NAVAL RESEARCH LABORATORY
WASHINGTON, D.C. 20375

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DONALD W. STRASBURG, Ph.D.
Head, Marine Biology and
Biochemistry Branch
Ocean Sciences Division
Code 8350

NAVAL RESEARCH LABORATORY
WASHINGTON, D.C. 20375

IN REPLY REFER TO:
8350-70:DWS:dk
23 February 1977

Mr. George H. Balazs
Hawaii Institute of Marine Biology
University of Hawaii
P.O. Box 1346
Kaneohe, Hawaii 96744

Dear Mr. Balazs:

I want to thank you very much for the colorful and interesting handbook on Hawaiian seabirds, turtles and seals which I received in today's mail. Such a publication is long overdue and you have done an unusually nice job. The photography is outstanding! By calling the public's attention to these overlooked and abused animals I think you will in the long run lead to their conservation.

Sincerely yours,

Donald W. Strasburg

DONALD W. STRASBURG, Ph.D.
Head, Branch of Marine Biology
and Biochemistry
Ocean Sciences Division
Code 8350

March 25, 1975

Dr. Donald Strasburg
Naval Research Laboratory
Head, Marine Biology and
Biochemistry Branch
Ocean Sciences Division
Code 8350
Washington, D. C. 20375

Dear Dr. Strasburg:

With reference to our previous correspondence concerning the 1959 destruction of green turtles at French Frigate Shoals, I thought that you might be interested in an up-date on the matter. Unfortunately, my attempts to positively identify the offenders have ended at the National Transportation Safety Board. It was my understanding that the DC-3 aircraft involved had crashed between 1959 and 1960, however, I have been informed that all files for those years were destroyed. The Agard Seafood Company (still in business in Honolulu) was undoubtedly the responsible fishing party, as you suggested, but additional evidence would have been valuable. I have turned over copies of my findings to the local representative of the U. S. Fish and Wildlife Service for possible future use. There is presently considerable pressure from within the State to open Refuge waters in the Northwestern Hawaiian Islands for commercial exploitation. The Division of Fish and Game apparently endorses this move. I may have already mentioned to you that when I questioned Fish and Game personnel about the 1959 incident, the response tended to be a general lack of concern. This is probably not surprising in view of the fact that this agency should have fully pursued the matter at the time you originally made notification.

For your collection, I have enclosed several photographs taken during 1974 at French Frigate Shoals. I anticipate returning to the area for further intensive nesting studies during the 1975 season. In addition, during the first week of May I will be visiting a friend at Midway for a first-hand look at the juvenile population which inhabits the lagoon. There can be little question that these turtles are derived from French Frigate Shoals. During my stay I am hoping to investigate the possibilities for Naval funding of a small study on the green turtles

of Midway. As you are probably aware, the atoll is not included in the Hawaiian Islands National Wildlife Refuge. It may, however, play a very important part in the turtles' migrations, hence development.

Sincerely,

George H. Balazs
Jr. Marine Biologist

GHB:md

Encls.

NAVAL RESEARCH LABORATORY
WASHINGTON, D.C. 20375

IN REPLY REFER TO:
8350-378:DWS:dk
18 September 1974

Dr. George H. Balasz
Hawaii Institute of Marine Biology
P.O. Box 1346
Kaneohe, Hawaii 96744

Dear Dr. Balasz:

Thank you for your letter of September 12. I have been a turtle lover all of my life and was even more shocked than you at what we found on French Frigate Shoals in 1959. I have my personal notebook, koda-chrome slides, etc. here and accessible, and shall be glad to furnish you with any data I can supply.

As you know from my narrative report, the survey was made on July 21-22, 1959. When we landed on the various islands, their refuge status was not really obvious. The signs were small and often half knocked-down. Near one of them was a fish, split open and spread for drying atop a stick by someone obviously flaunting the rules. East Island had four large dead green turtles, none of which had been butchered, only maliciously killed. Three were dead on their backs, and one was on its belly on a nest. Thirty-three turtle haul-out trails were found.

Whale and Skate Islands were connected by a sandy isthmus at the time of my visit. Twelve large turtles, mostly females, were found dead there. There was one dead turtle on Trig Island.

The U.S. Coast Guard personnel on Tern Island were very accomodating, and after becoming well acquainted they told me that the turtle slaughter was done by a fishing company (?) named Agard, which I believe was then air-freighting food fish to Honolulu from French Frigate Shoals.

A representative of the Division of Fish and Game attended my post-cruise meeting, at which time my slides were shown and the butchery described. I don't know whether anything was ever done about the case. Some of my slides were given to the NMFS collection and I have others at home. I shall have prints made of all that I can find and send them to you in a week or so. The Navy will pay for this.

I would be most interested in hearing your views on this or any other recent butchery and whether effective counter-measures are now being taken.

Sincerely yours,

Donald W. Strasburg

DONALD. W. STRASBURG, Ph.D.
Head, Marine Biology and
Biochemistry Branch
Ocean Sciences Division
Code 8350

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
COMMANDER (p)
ELEVENTH COAST GUARD DISTRICT
HEARTWELL BLDG.
19 PINE AVE.
LONG BEACH, CALIF. 90802

vessel description

1700
18 October 1974

Doctor Balazs
Hawaii Institute of Marine Biology
Coconut Island, P. O. Box 1346
Kaneohe, HI. 96744

Dear Doctor Balazs:

Your letter of 15 October really has me reaching. Names are long since gone, but perhaps I can point you in the right direction.

I believe it was the spring of 1959 when I received orders to allow a DC-3 permission to use the Tern Island landing strip; you might check Coast Guard operational correspondence/ messages of that period at Fourteenth Coast Guard District Headquarters in Honolulu. The DC-3 had been purchased by two caucasian Americans for a $30,000. option, and they hit on the scheme of fishing the shoals to pay for the plane. I remember one of the men telling me the plane had flown the Los Angeles - San Francisco route as a commercial carrier for nearly twenty years. The two men contracted with one Honolulu based fishing boat to fish the shoals on an extended cruise, the plane to rendezvous with them 2 or 3 times a week to remove the catch. They had a Honolulu purchaser for all the fish they could deliver. The fishing vessel was 35-50-feet, white, rigged with trawl nets. The skipper was native Hawaiian with a mixed Hawaiian and Okinawan crew. No more than 6 flights (7,000+ pounds each load) were made, the aviators most exuberant at their success, when they paid the fishing boat their first share. The boat departed the shoals, to my knowledge never again seen by the suddenly desperate aviators, end of the endeavor.

Quite a few turtles were taken during this period, and I'm sure the dead turtles found by Dr. Strasburg were those killed by crewmembers of the fishing boat for a later pickup which never took place. No private aircraft other than the DC-3 landed at Tern Island during my year there (July 1958-July 1959). There were fishery products transported on a personal basis (private sale or gifts) by both Coast Guard and Air Force aircraft. The usual load consisted of ulua, longusta(sp.), crayfish, and sea turtles. Figure the turtles removed by this method during my year at no more than

a dozen. Turtle fishing was not a common occurence during 1959. Other than the period described above, we were visited once by CGC PLANETREE, twice by CGC KUKUI, and by one 35 foot schooner enroute Honolulu from the protectorates.

I may have some turtle photos at home. If so, I'll ~~send~~ send them under separate cover with my compliments. I can recall no "V" or "U" notches on turtles while I was there. Generally speaking, the turtles' worst enemies were three dogs who loved to harass them, and the occasional one butchered for its shell and a gourmet meal for the crew. It was station policy to leave them alone when they were about their motherhood chores, nor did we ever purposely disturb their eggs.

I hope I've helped you.

Sincerely,

J. J. Dirschel, Jr.

J. J. DIRSCHEL, Jr.
Commander, U. S. Coast Guard
Chief, Personnel Division
Office, Commander, 11th CG District

Chief John Stafford 546-5500 (send lit.)

Talked to on 10/29 Capt. Oscar Johnsen (Pronounce Jonsen) Chief of Seattle Division Return call about H. Dilcher Tel: 546-7117

DC-3 plane crashed yes dead NO

1st trip by Johnsen co was R.J. Getman July 7 1959

DJ Seattle KRONK (relieved By Divschel) reserve officer

Johnsen flew 1950-59 in HV16 ALBATROSS

This plane till 1968 > FAA DC3

1520 — Ward Ave.

Bill Holloway — old time Aviator — Remembers incidents — at U-H Turtles? 538-7467

WII put station on IS. EAST

Robt. Kopp 923-3582 3093 Puale, Cole Apt 301

Mr. Choat Gen Av unit

11/1 - Johnsen - also Cooper - plane DC-3

C47 = DC3

C46 = Bigger DC3

University of Hawaii at Manoa

Hawaii Institute of Marine Biology
P.O.Box 1346 • Coconut Island • Kaneohe, Hawaii 96744
Cable Address: UNIHAW

August 5, 1977

Mr. Richard S. Shomura
Director, Honolulu Laboratory
National Marine Fisheries Service
P. O. Box 3830
Honolulu, Hawaii 96812

Dear Richard:

Enclosed are copies of two informative pages from the book Undersea Victory - The Influence of Submarine Operations on the War in the Pacific by W. J. Holmes (1966). The subject of mine fields being laid at French Frigate Shoals may already have been considered with respect to diver and research vessel safety, however, in the event that it has not, I thought it would be best to bring it to your attention. Caution against unexploded ordnance will also have to be exercised in other underwater areas of the Leeward chain. For instance, on June 22nd while SCUBA diving from the EASY RIDER near Necker with Skip Naftel and Leighton Taylor, I came across two bombs estimated to weight 250 lbs. each. One bomb appeared intact, while the other had undergone a partial explosion through the side. It is my understanding that even this latter piece of ordnance is potentially dangerous, as the detonators could still be functional.

I have had a very interesting and informative telephone conversation on the subject of unexploded ordnance with a BMC Dave Hart, Explosive Ordnance Disposal, Training and Evaluation Unit One, FPO San Francisco, CA 96611 (Tel. 684-8143). Chief Hart seems knowledgeable about World War II military activities at French Frigate Shoals. He had occasion to dive the Shoals in 1966, at which time a coral encrusted mine was observed. If you so desire, I am sure that Chief Hart would be pleased to further discuss this subject with you from the standpoint of our Survey and Assessment.

Sincerely,

George H. Balazs
Jr. Marine Biologist

GHB:md

Encls.

with carriers. When Japanese submarines indulged their corresponding propensity to bombard shore targets, just before leaving an area, U.S. convoy control officers made good use of the information to reroute convoys, but there seemed to be some flaw in Japanese organization for rapid dissemination of similar information.

The real damage done to the Japanese by submarine gunfire was negligible. In the meantime, U.S. submarines with torpedoes (despite the exasperating defects of these temperamental guided missiles) were becoming a force with which the Japanese would have to reckon. In May they sank twenty-one *maru*, for a loss of 105,000 tons of shipping. In addition, a seaplane carrier, a repair ship, a big minelaying ship, and two Japanese submarines were torpedoed and sunk. In 1942 Japanese commerce was outside the range of other Allied weapons (except when an offensive operation exposed them), yet the total loss of shipping to U.S. submarine torpedoes was more than the Japanese economy could stand.

Japanese Submarine Operations

In May, most Japanese submarines were involved with preparation for the Battle of Midway. These preparations were spread out over half the earth's surface, for certain submarines were assigned to creating diversions at places far from the center of action. Six I-class submarines reconnoitered the Aleutians, in the latter part of May, in preparation for the Aleutian invasion, which was in itself intended as a diversion from Midway. A seaplane launched from a submarine reconnoitered Seattle, Washington and reported no heavy ships. About 30 May *I-25* sent her plane over Dutch Harbor on a similar mission. Two submarines made periscope reconnaissance of Cold Bay and Kodiak, with negative results. These reconnaissances were not without adventure. *I-25* was involved in launching her plane at dawn when she sighted an approaching ship, which she identified as an American cruiser. *I-25* was unable to attack, with her plane on deck, and the cruiser passed without sighting the submarine. *I-19* was surprised by aircraft while preparing to launch her own plane, and had to dive and abandon her seaplane. The Japanese, like the American submarines operating in the same area, found the weather and the short nights in the Aleutians great handicaps for submarine operations.

Five I-class submarines (three carrying midgets and two with seaplanes) were operating off the eastern coast of Australia. On 29 May, *I-21* sent her plane over Sydney and reported battleships at anchor in the harbor. This was probably *Chicago*, which had been mistaken for a battleship before. On 31 May *I-22*, *I-24*, and *I-27* launched midgets at a

point seven miles east of Sydney. Two of these penetrated into the harbor, causing consternation and confusion. One was sighted by *Chicago*, which opened fire, with her "overs" falling in Sydney's residential district. A torpedo narrowly missed *Chicago* and exploded against the dock, killing a number of sailors. Two damaged and scuttled midgets were recovered from the bottom of Sydney Harbor the next day. The military damage caused by the raid was small. None of the midgets survived the raid.

On the same day four other Japanese submarines were involved in an attack on Diego Suarez in Madagascar. *I-10* made a pre-raid reconnaissance of the harbor with her seaplane and discovered battleships in the harbor. The midget from *I-18* was unable to participate because of mechanical trouble, but *I-16* and *I-20* both launched theirs. One torpedo hit the battleship *Ramillies* and flooded a compartment. Another sank a tanker. *I-16* could see the flames rising from the harbor. None of the midgets were recovered. This was the most successful raid of the midgets. Both these raids were timed to divert attention from Midway. The air attack on Pearl Harbor had been preceded by a midget submarine attack, and the Japanese expected the Allies to draw the conclusion that the Kido Butai was behind the midgets. Nimitz at Pearl Harbor refused to be diverted.

Six I-class submarines (*I-121*, *I-122*, *I-123*, *I-171*, *I-174*, and *I-175*), were en route to station in the Hawaiian area, to refuel seaplanes at French Frigate Shoal. The submarine plan was almost identical to the 4 March bombing of Pearl Harbor, but the big seaplanes were intended to make a thorough reconnaissance and locate the heavy units of the U.S. fleet. *I-121* arrived on 26 May. Had she arrived three days earlier she could have observed a defensive anti-submarine minefield at work, for the U.S. patrol boat *YP-277* ran on her own minefield that day, and was blown up. This was a casualty the Japanese could understand, for Japanese anti-submarine defensive minefields had accounted for six Japanese ships to date, totaling thirty thousand tons. Minefields were unable to distinguish friend from foe.

When *I-121* arrived off French Frigate Shoal, she discovered a U.S. seaplane tender riding peacefully at anchor, with big seaplanes busily coming and going. As long as this state of affairs continued it was obviously impossible to carry out the refueling operations. *I-121* reported the situation and waited. Eight submarines sortied from Kure on 25 May, to take up battle stations for Midway. The Kido Butai sortied from the Inland Sea on the twenty-seventh, followed through the Bungo Suido the next day by the Combined Fleet. On the thirty-first the seaplane reconnaissance from French Frigate Shoal was called off and the submarines involved reassigned. U.S. carrier task forces sortied from Pearl Harbor undetected.

GREENPEACE

May 9, 1980

Dr. George Balazs
Hawaii Institute of Marien Biology
P.O. Box 1346
Coconut Island
Kaneohe, HI 96744

Dear George,

Here are some papers concerning the Coast Guard's proposal to limit some vessels with hazardous cargoes from coming within certain distances of the Northwest Hawaiian Islands. I do not know if the IMCO has accepted the proposal.

This grounding on French Frigate Shoals really seems to point out the inadequacy of present safeguards for the area. Even if the Coast Guard's proposal is accepted it will not be mandatory and would not have applied to the ship that went aground anyway. It seems clear that more protection is urgently needed.

Sincerely,

Kelley Dobbs

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS
Officer in Charge
Captain of the Por
P. O. Box 3160
Honolulu, HI 968
Phone: 546-5564

16600
24 May 1979

Mr. Kelley Dobbs
GREENPEACE FOUNDATION
913 Halekauwila Street
Honolulu, HI 96814

Dear Mr. Dobbs:

I am in receipt of your 10 May 1979 letter expressing concern with respect to possible oil pollution damage to the ecosystem that exists in the Leeward Hawaiian Islands. You indicated that a large oil spill could have devastating effects on the area and suggested limiting tank vessel traffic to a certain distance offshore.

The Coast Guard in the Hawaiian Islands agrees with your concern and has already taken steps to ensure a greater degree of safety for the Hawaiian Islands National Wildlife Refuge. At the present time, the Commander, Fourteenth Coast Guard District has submitted a proposal for introduction to the Intergovernmental Maritime Consultative Organization (IMCO). This proposal would affect ships of 1000 gross tons or over carrying cargoes of oil or hazardous materials.

If the proposal is accepted by IMCO, a fifty-mile radius from the following land masses would be declared "Areas to be Avoided":

Nihoa

Necker Island

French Frigate Shoals

Gardner Pinnacles

Maro Reef

Laysan Island

Lisianski Island

Pearl and Hermes Ref

Maritime countries would be informed of the designation, thereby making all concerned aware of the importance of these areas.

16600
24 May 1979

Should a pollution incident occur outside of the fifty-mile radius, sufficient time will exist to study the situation and take necessary actions to prevent ecological damage to the area. Presently, Marine Safety Office, Honolulu is preparing contingency plans in this matter. You may be assured that these plans will include procedures to ensure that pollution containment crews, if needed, will be made aware of our concern regarding environmental disturbances.

If you have any further questions, do not hesitate to contact this office.

Sincerely,

A. D. UTARA
Commander, U. S. Coast Guard
Captain of the Port

CONSULTATIVE DE LA NAVIGATION MARITIME

IMCO

CONSULTATIVE ORGANIZATION

Telegrams: INMARCOR-LONDON, W.1
Telex: 23588

101-104 PICCADILLY,
LONDON, W1V 0AE

Telephone: 01-499 9040

Ref: T2/2.07
WdG/CSM

4 July 1979

Dear Mr. Dobbs,

In reply to your letter of 16 June 1979 I have pleasure in enclosing a document submitted by the Government of the United States to the IMCO Sub-Committee on Safety of Navigation concerning the intended establishment of an area to be avoided in the region of the Hawaiian Islands Archipelago.

Any additional information on this subject might be obtained from the Port Safety and Law Enforcement Division, United States Coast Guard, 400 Seventh Street S.W., Washington, D.C. 20590.

As requested, I am pleased to send you a publication containing information on the activities of the Inter-Governmental Maritime Consultative Organization (IMCO).

Yours sincerely,

W. de Goede
Head
Navigation Section

Mr. K. Dobbs,
Greenpeace,
913 Halekauwila Street,
Honolulu, Hawaii 96813,
United States of America.

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (G-WLE-4/
WASHINGTON, D.C. 20590
PHONE: (202) 426-4958

16650/15
26 JUL 1979

Mr. Kelley Dobbs
Greenpeace Foundation
913 Halekauwila Street
Honolulu, Hawaii 96814

Dear Mr. Dobbs:

Thank you for your letter of 10 July 1979 concerning the United States proposal to establish an "Area to be Avoided" in the Northwest Hawaiian Islands.

If this proposal is adopted by the Inter-Governmental Maritime Consultative Organization (IMCO), the area to be avoided would be charted worldwide. Observance of the area by the affected class of vessels would be voluntary, as is the use of IMCO adopted traffic separation schemes. Because avoidance of the area would not significantly inconvenience tankers, and because of the increased risk to a vessel master of being charged with negligence if a casualty occurred within an area, I believe observance of the area will be complete.

Of course countries have jurisdiction over their flag vessels and could restrict their freedom on the high seas, but it is unlikely that they would do so. For that reason, if the proposal is adopted, it will be self-enforcing.

If you have any further questions please contact me again.

Sincerely,

D. B. CHARTER, Jr.
Captain, U.S. Coast Guard
Chief, Port Safety and Law
Enforcement Division
By direction of the Commandant

INTER-GOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION

NAV XXI/4/6
14 June 1978
Original: ENGLISH

SUB-COMMITTEE ON SAFETY OF NAVIGATION - 21st session
Agenda item 4

IMCO

MATTERS RELATED TO ROUTEING OF SHIPS

Proposed area to be avoided in the region of the Hawaiian Islands Archipelago

Note by the Government of the United States of America

1. The United States proposes the establishment of an area to be avoided by ships of more than 1,000 gross tons carrying oil or hazardous cargoes. The proposed area is in the Central Pacific and surrounds that portion of the Hawaiian Archipelago which was established by the United States as a wildlife refuge in 1909. This area should be avoided by the specified class of ships in order to conserve the unique and endangered wildlife found there.

2. The Hawaiian Islands National Wildlife Refuge consists of a string of small islands, reefs, and atolls stretching out between 161° and 176° west longitude. The largest island in the group has an area of 71 hectares and a maximum elevation of 277 metres. Because of the extreme fragility of the Refuge ecosystems, entry to the Refuge is limited to U.S. Fish and Wildlife Service scientists and Coast Guard personnel. General public use of the area is prohibited.

3. The substantial wildlife community supported by the Refuge would be severely threatened by an oil spill in the adjacent waters. A number of species endemic to the Refuge could be devastated or even destroyed by a marine casualty. There have been a number of such major marine casualties in the area of the Refuge recently, but because of favourable weather conditions, none resulted in environmental damage to the Refuge.

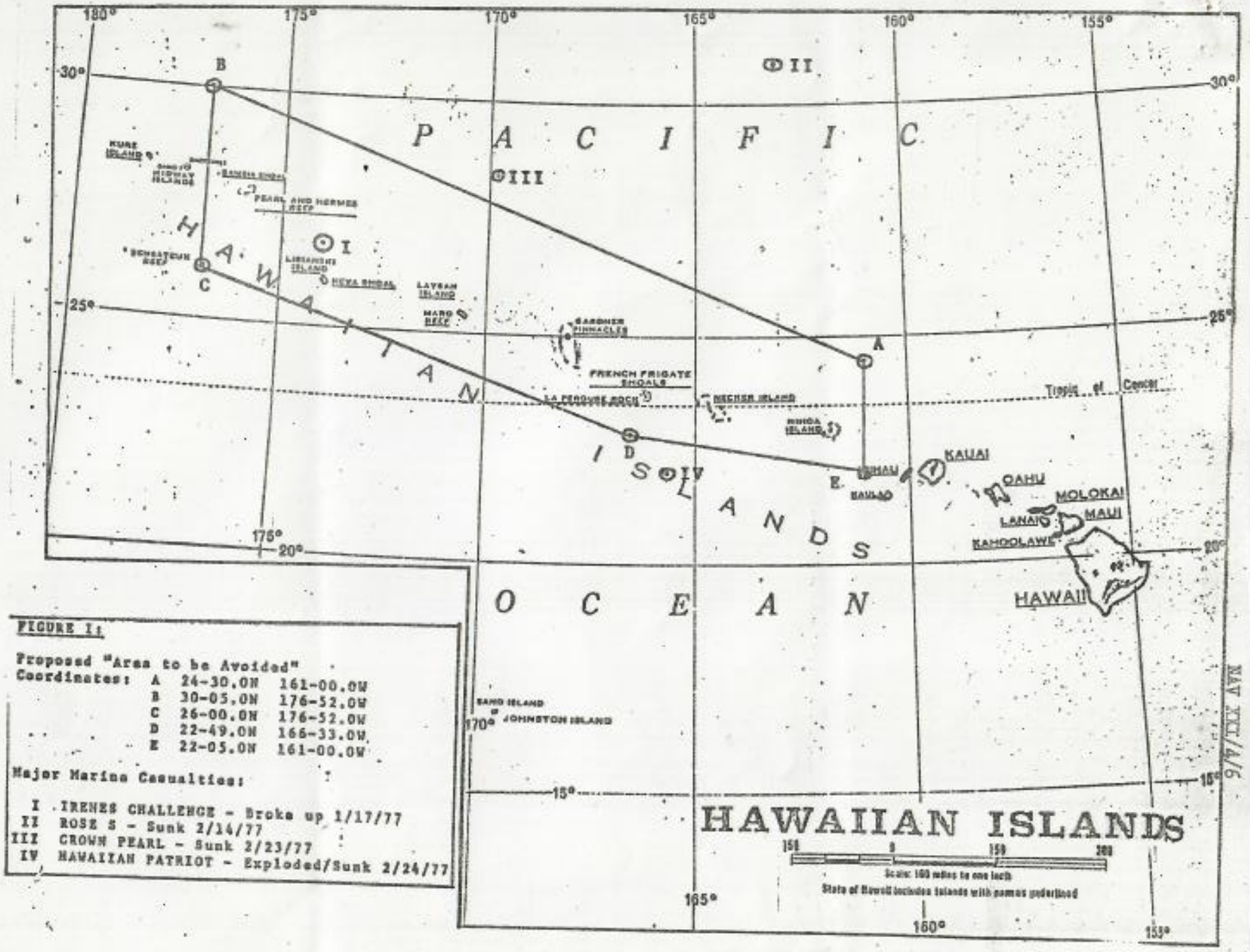


FIGURE 1:

Proposed "Area to be Avoided"
Coordinates:

A	24-30.0N	161-00.0W
B	30-05.0N	176-52.0W
C	26-00.0N	176-52.0W
D	22-49.0N	166-33.0W
E	22-05.0N	161-00.0W

Major Marine Casualties:

I IRENES CHALLENGE - Broke up 1/17/77
II ROSE S - Sunk 2/14/77
III CROWN PEARL - Sunk 2/23/77
IV HAWAIIAN PATRIOT - Exploded/Sunk 2/24/77

NAV XXI/4/6

Calm Winter Season a Blessing for Shippers

☆ 5/26/79

North Pacific seas, normally turbulent during the winter storm season, claimed no shipping during the 1978-79 winter months.

Two years ago, five freighters went down in waters near Midway Island with a loss of 53 lives.

Last winter, only one ship sank in the "Pacific Triangle" (the Aleutians, Midway and Wake) with 70 men lost.

A National Weather Service official said three factors were involved in what was good news, in a sense, for the Coast Guard's search and rescue center.

"There was no severe storms this year, although we did have storms, but not the slow-moving type of two years ago, usually associated with ship losses.

"And, perhaps shipping officials have been paying more attention to weather reports.

"Or it might be that insurance companies are influencing shipping companies," he said.

Major winter storms this year tended to move northeast into the Bering Sea, outside the shipping lanes, he said.

Marine disasters this winter were confined to Hawaiian waters where the Holo Holo research vessel, with nine persons aboard, and the Boston whaler Sarah Joe, with five aboad, vanished in December and February, respectively.

The sea lanes north of Midway were hard on merchantmen in 1967-77 when the Hawaiian Patriot, Rose S., Irenes Challenge, Carmelian One and Crown Pearl all floundered.

None had American crews and shipping officials suggested at the time that the pressure to maintain schedules had a lot to do with the ships venturing into the vortex of storms.

The winter of 1977-78 had only one major loss, the Chandrugupta, which vanished with 70 aboard.

And last summer a small Taiwan tanker went down off Niihau at a time when storms are rare.

And in the past three years, a number of sailing craft sank in Island waters.

Fishing Interests

The U.S. Navy, forgetting about French Frigate's status as a federal wildlife reservation and thinking they owned Tern Island, tried to hand over the disestablished base to the Territory of Hawaii. The Territory refused, but discussion on the issue continued. In early November 1948 the Territory's Hawaiian Aeronautics Commission notified the Commandant of the 14th Naval District, Pearl Harbor, that it was "in a position to take over the airstrip and other facilities...and...make them available...to the fishing industry" (Hawaiian State Archives, FFS file #1871).

As early as June 1946 Hawaiian commercial fishermen began to use the facilities. Early fishing boats enjoyed good fishing which prompted the Hawaiian Tuna Packers, Ltd. to send a vessel to the Shoals in mid-September 1946. Both Honolulu newspapers (Beech, 1946a, 1946b, 1946c, 1946d, 1946e; Buchwach, 1946a, 1946b) carried stories on the venture. Two shipments of fish were subsequently sent from Tern to Honolulu by chartered plane.

In a joint venture two companies, the Hawaiian-American Fisheries, headed by Louis K. Agard, Jr., and the Seaside Fishing Co., run by Frank Opperman and Warren Haines, established a fishing base on Tern Island early in November 1946. They chartered a DC-3 from Trans-Air Hawaii for transporting the fish. The companies obtained permission to use the air strip from the proper Territory offices; the Hawaiian Fish and Game Department gave them permission to use large fixed traps (Agard, in litt.).

During the first three years of operation, Hawaiian-American Fisheries grossed over $73,000 at the Shoals; profits totaled almost $20,000. Had the company owned its plane, profits would have been greater. Thus, a new corporation, Aero Fisheries, was formed and a plane purchased by Agard and his partners. In late July 1949 one flight was completed. Mechanical difficulties grounded the plane in mid-August and the corporation did not have the reserve finances to continue the plane operation (Agard, in litt.).

Various commercial fishing vessels visited the atoll in the 1950's with varying success. In 1959 Agard started another joint venture, and even purchased a refrigerated vessel and a plane. This too was short-lived (Agard, in litt.).

In August 1948 the Pacific Oceanic Fishery Investigation (POFI), with headquarters in Honolulu, was organized by the Bureau of Commercial Fisheries of the U.S. Fish and Wildlife Service. Since 1948, POFI vessels visited French Frigate Shoals on numerous occasions (POFI, ms.).

its arrival at the Shoals, 168 turtles had been collected. Assuming a single adult turtle yields three pounds of tortoise shell (Parsons, 1962), about 346 turtles were taken by the Ada's crew. Turtles were not eliminated, however, for great numbers were present in early 1888 when the Wandering Minstrel visited the atoll (Farrell, 1928), as well as in May and June 1891 when the Kaalokai surveyed the atoll (Walker, 1909; Munro, 1941a).

The USS Rainbow's hydrographic survey of French Frigate Shoals in the late summer and fall of 1914 found turtles plentiful (U.S. Nat. Archives, Mod. Mil. Hist. Div., Rainbow corresp., R.G. 37, 1132-100666). Turtles and turtle eggs, as well as evidence of previous turtle slaughter, were found by Wetmore (ms.) during the April 1923 visit of the Tanager Expedition.

Two commercial fishing companies, the Hawaiian-American Fisheries, headed by Louis K. Agard, Jr., and the Seaside Fishing Company, established a fishing base on Tern Island in November 1946. A great many turtles were captured and taken to the Honolulu market. Turtle meat became one of the mainstays of the crew's diet, supplanting beef. However, the turtle numbers dwindled, probably more as a result of human disturbance than actual killing, and soon turtle was not taken for the commercial market. Agard (in litt.) estimates taking about 200 turtles between 1946 and 1948. Commercial fishermen again took turtle from the atoll in the spring of 1957 (POFI, 1957).

HDFG, BSFW, AND POBSP personnel have recorded turtles on almost all visits during the 1960's. All turtle observations at Freneh Frigate Shoals are presented in Tables 4-9.

Annual Cycle

French Frigate Shoals' Green Sea Turtle population is the largest in the Hawaiian Islands. Turtles have been recorded year-round. The adult population is lowest in the fall, winter, and early spring. The highest population occurs in the late spring and summer and coincides with breeding. Copulation has been observed in early May; nesting usually commences in late May. Infrequent egg-laying has been noted in August and September. Hatchlings probably appear in late July and are commonly seen in August and early fall.

Hendrickson (1969: 90) suggests that French Frigate Shoals' turtle hatchling production exceeds that of all the other Hawaiian nesting sites combined.

Table 4. Green Sea Turtle observations at East Island

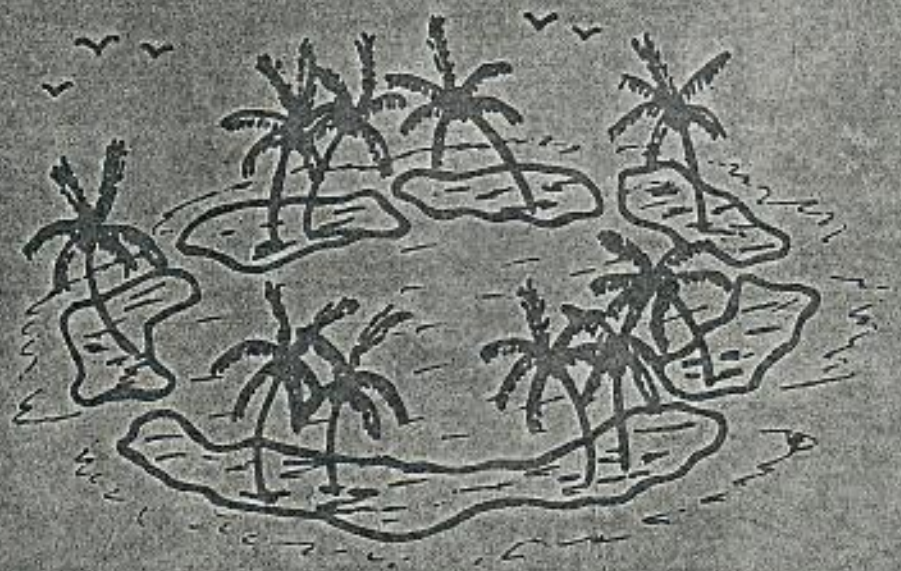
Date of Survey		Population Estimate	Breeding Status, Remarks, and References
1955	May 5	2	Medium-sized (POFI, 1955).
1956	Apr. 11	2	Ca. 100 lbs. each (POFI, 1956a).
	June 4	6	(POFI, 1956b).
1957	Apr. 24	10-15	(POFI, 1957).
	May 11	12	(POFI, 1957).
1959	July 21	4	Dead, appeared to have been killed, but not butchered; 0 adults diurnally; 33 sets of fairly fresh haul-out tracks on beaches; nest pits (POFI, 1959).
1961	Feb. 9	1	In nearby water (POFI, 1961a).
	Mar. 4	1	Dead newly hatched turtle (HDFG, 1961b).
	July 13	3	(POFI, 1961c).
1962	June	present	Considerable number noted, nest pits (HDFG, 1962a).
1963	June 7-11	20+	Adults nightly; much egg laying (POBSP, 1963).
1964	Sept. 27	5	Dead: 2 adults, 3 hatchlings; 250 nest pits counted (BSFW, 1964b; POBSP, 1964).
1965	Aug. 5-10, 23-28	32+	Adults: 1♂, 31♀; numerous hatchlings; 5-20 adults daily; ♀♀ laying nightly (POBSP, 1965b).
1966	Mar. 23	4	Adults: 2♂, 2 unknown (BSFW, 1966a).
	May 13	12-15	Copulation observed (POFI, 1966).
	June 10-14, 16-21	5-24	Adults observed daily; 5+ ♀♀ laying nightly (POBSP, 1966a).
	Aug. 18-24, 26-30	1-3+	Adults daily; some laying eggs; hatchlings present (POBSP, 1966b).
	Sept. 13-14	86+	1 adult ♀ at night may have hauled up to lay eggs; 85 hatchlings seen on the 14th (BSFW, 1966b).

No. 150 December 20, 1971

ATOLL RESEARCH BULLETIN

150. THE NATURAL HISTORY OF FRENCH FRIGATE SHOALS, NORTHWESTERN HAWAIIAN ISLANDS[1]

by A. Binion Amerson, Jr.



Issued by
THE SMITHSONIAN INSTITUTION
Washington, D.C., U.S.A.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center
Honolulu Laboratory
P. O. Box 3830
Honolulu, Hawaii 96812

CRUISE REPORT

VESSEL: Townsend Cromwell, cruise 80-02 (TC-88)

CRUISE PERIOD: March 24-May 14, 1980

AREA OF OPERATION: Northwestern Hawaiian Islands, Hancock Seamounts, and other seamounts in the vicinity of Midway and Kure Islands.

ITINERARY:

March 24 - Departed Honolulu.

27-31 - Necker Island. Conducted lobster pot competition experiments, trapped for shrimp and fish, handlined, fished with bottom longline, and trolled. Set lobster pots for ghost fishing experiments.

April 1-3 - French Frigate Shoals. Made monk seal counts at East and Disappearing Islands. Trapped for shrimp and fish, handlined, and trolled.

4-5 - Raita Bank. Trapped for lobster, shrimp, and fish, handlined, and fished with bottom longline.

6 - Laysan Island. Delivered supplies and mail. Debarked Moulton.

8-11 - Pearl and Hermes Reef. Trapped for lobster, fish, and shrimp, handlined, fished with bottom longline, and trolled.

12-14 - Midway Islands. Debarked Naughton and Prescott, and embarked Everson.

15-17 - Southeast Hancock Seamount. Trawled, trapped for fish, handlined, and fished with bottom longline.

17-18 - Northwest Hancock Seamount. Trawled, handlined, and fished with bottom longline.

April 18-20 - Searched, without success, for seamounts No. 14 and 15.

21-22 - Seamount No. 11. Trawled, trapped for shrimps and fish, and handlined.

23-24 - Ladd Seamount. Trapped for fish and lobster, handlined, and trolled.

25-26 - Pearl and Hermes Reef. Made a monk seal survey of all islands in the group, handlined, and trolled.

27-28 - Salmon Bank. Trapped for lobster, fish, and shrimp, and handlined.

April 29-May 1 - Midway Islands. Embarked personnel going to Lisianski Island.

May 2 - Seamount No. 9. Handlined.

3-4 - Lisianski Island. Debarked, and settled the Lisianski monk seal research party on the island. Conducted lobster predation experiments.

5-7 - Northampton Banks. Conducted a bottom charting survey of the western part of the banks. Trapped for lobster, fish, and shrimp, and handlined.

7 - Laysan Island. Delivered supplies and mail.

9-11 - French Frigate Shoals. Investigated the effect on adjacent areas of the cargo of clay which was jettisoned from the MV Anangel Liberty when that vessel went aground on the reef 5 mi east of Disappearing Island.

12 - Necker Island. Searched, without success, for lobster traps which had been left in March for a ghost fishing experiment.

14 - Arrived Honolulu. End of cruise.

MISSION AND RESULTS: A. Conduct gear competition, ghost fishing, and lobster predation experiments at Necker Island, Maro Reef, and Pearl and Hermes Reef.

At Necker Island, three replicates of the gear competition experiment were completed. Each consisted of a 5-string set with pots on respective strings spaced 10, 15, 20, 25, and 30 fathoms apart.

To obtain additional data on ghost fishing, a string of 8 lobster pots spaced 20 fathoms apart was reset near the area where the string had originally been set after the lobsters caught in the pots had been measured and marked. The intent was to pick the pots up about 6 weeks later on the return leg; however, the string could not be located on May 12 when the vessel returned to Necker Island.

Because of unsuitable weather, only one attempt was made to obtain more data on lobster predation by carangids and sharks. At Lisianski Island, some observations were made by divers, but due to various unsuitable conditions, little useful data were acquired.

B. Conduct population counts of Hawaiian monk seals and green sea turtles. At French Frigate Shoals, a total of 16 seals and 2 turtles were seen at East Island and 33 seals and 3 turtles at Disappearing Island. At Pearl and Hermes Reef, the total count for all of the islets was 46 seals and 27 turtles.

C. Conduct fishing operations using handline, bottom longline, lobster traps, fish traps, and shrimp pots for spiny lobsters, slipper lobsters, crabs, fishes, and shrimps to determine catchability, distribution, and relative abundance.

Handline and trapping operations were conducted at Necker Island, French Frigate Shoals, Raita Bank, Pearl and Hermes Reef, Southeast Hancock Seamount, Northwest Hancock Seamount, seamount No. 11, Ladd Seamount, Salmon Bank, seamount No. 9, and Northampton Banks.

1. Handline. Thirty-five handline stations totaling 180 line-hours were occupied. On stations excluding Hancock Seamounts, the dominant species, by weight, in the catches were: hapu'upu'u, Epinephelus quernus; ehu, Etelis marshi; opakapaka, Pristipomoides filamentosus; kahala, Seriola dumerili; ulua, Caranx cheilio; and onaga, E. carbunculus. Relatively smaller weights of kalikali, P. sieboldii; gindai, P. zonatus; nohu, Pontinus macrocephalus; dogfish, Squalus blainvilli; aweoweo, Priacanthus boops; mackerel, Scomber japonicus; and butterfish, Hyperoglyphe japonica, were also taken. At the

Hancock Seamounts pelagic armorhead, Pentaceros richardsoni, dominated the handline catch. S. japonicus, H. japonica; redtailed opelu, Decapterus russellii, and grouper, Pseudanthias bicolor, occurred in lesser numbers.

A total of 365 fish weighing 1,018.7 kg were caught by handline. The overall mean catch per line-hour was 6.0 kg. The best catches by weight per line-hour were made at Northwest Hancock Seamount, Station 40 (33.8 kg); Pearl and Hermes Reef, Station 60 (20.3 kg); seamount No. 9, Station 69 (17.2 kg); and Necker Island, Station No. 2 (16.4 kg).

2. Bottom longline. Two types of bottomline gear were set. One consisting of single hook droppers and the other, of five hooks on each dropper.

Two stations were occupied at Necker Island and Pearl and Hermes Reef, and one each at Raita Bank, Southeast Hancock, and Northwest Hancock Seamounts. For comparative purposes, bottom longline sets were made close to areas where fish had been caught handlining. On most sets tangling was a serious problem, and catches were poor. At Southeast Hancock Seamount, the gear was apparently dragged into deep water by currents and lost. For the other six stations, a total of four opakapaka, two hapu'upu'u, one moray eel, and seven armorhead were caught for a mean catch rate of 0.0037 fish per hook.

3. Lobster traps. Nine lobster trapping stations were occupied. With the exception of the three gear competition experiment stations conducted at Necker Island, each station consisted of 5 strings of 8 traps each, spaced 20 fathoms apart. Traps with standard entrances and traps with modified large entrances were alternated on the strings. Catches were very low. A total of 178 spiny lobsters, Panulirus marginatus, and 159 slipper lobsters, Scyllarides squammosus, were caught. The highest catches of spiny lobsters occurred at Necker bank with a mean catch of 0.90 lobsters per trap, of which 37% were of legal size. For the six other stations occupied at Raita Bank, Pearl and Hermes Reef, Ladd Bank, Salmon Bank, and Northampton Bank, the mean catch was 0.2 spiny lobster per trap; however, 90% were of legal size.

4. Shrimp trapping. A total of seven shrimp trapping stations, consisting of either 4, 8, or 12 pots set in strings of 4 pots, were occupied at French Frigate Shoals, Raita Bank, Ladd Bank, Salmon Bank, Northampton Bank, and Necker bank. Because of the very steep drop-off at about the 75- to 100-fathom contour on most of the banks, it was difficult or impossible to find grounds at depths of

200-500 fathoms, suitable for shrimp trapping. Except for a few individuals of two species of unidentified shrimp, the shrimp catch consisted of Heterocarpus laevigatus, and H. ensifer. The best shrimp fishing was at French Frigate Shoals with a mean catch of 1.9 kg per pot and Raita Bank, with 1.3 kg per pot.

5. Fish trapping. The fish traps were large single-chambered with large entrances to permit large snappers, groupers, and carangids to enter. The intent was to set the traps individually in depths ranging from about 60 to 200 fathoms, but because of steep drop-offs the traps were usually set in less than 90 fathoms. Eleven fish trap stations with a total effort of 52 trap-nights were conducted.

   A total of 47 commercially valuable fish (234.9 kg) were caught: 18 E. marshi, 26 Epinephelus quernus, and 3 C. cheilio. Other fishes in the catch were: 54 dogfish, Squalus blainvillei, 2 Pentaceros richardsoni, and 2 Moridae.

D. Conduct bottom trawling, handline fishing, bottom longlining, and trapping at Hancock Seamounts and other seamounts and submerged banks in the vicinity of Kure Island, Midway, Pearl and Hermes Reef, and Lisianski Island.

Fishing operations were conducted at Northwest and Southeast Hancock Seamounts, seamount No. 11, Ladd Seamount, Salmon Bank, and seamount No. 9. Of the other seamounts, more or less north of Midway, at which fishing operations had been planned, seamounts No. 13, 14, and 15 could not be found, and because of the loss of the bottom trawl at seamount No. 11 and rough seas, seamount No. 12 was not visited.

Seven bottom tows were made with a Noreastern trawl. The largest catch was 1,391 kg, taken on an evening tow at Southeast Hancock Seamount. Of this, 1,333 kg consisted of P. richardsoni. At Northwest Hancock Seamount, an evening tow yielded 1,312 kg of P. richardsoni.

Handline fishing produced good catches of armorhead at the Hancock Seamounts and moderate catches of typical Hawaiian bottomfish on the other, more southerly seamounts.

At Southeast Hancock Seamount, one station of six large opening traps yielded 41 S. blainvillei, and 2 P. richardsoni.

E. Conduct offshore trolling surveys for tunas and other pelagic species.

A total of 96.1 h of direct trolling (usually with three lines) were conducted in the vicinities of: Necker Island, French Frigate Shoals, Pearl and Hermes Reef, Ladd Bank, Northampton Bank, Salmon Bank, Raita Bank, Brooks Bank, seamount No. 9, Lisianski Island, Maro Reef, and Laysan Island. One hundred and sixteen fishes were caught: 42 Euthynnus affinis, 55 Thunnus albacares, 6 Acanthocybium solandri, 4 Coryphaena hippurus, 3 Elagatis bipinnulatus, 1 Katsuwonus pelamis, 1 Caranx ignobilis, 1 C. melampygus, 1 Seriola sp., and 1 S. dumerili, with a total weight of 947 kg. The mean catch rate for all direct trolling was 0.28 fish per line-hour. Trolling was particularly good at Necker Island, Pearl and Hermes Reef, and Salmon Bank where catch rates were better than 1.0 fish per line-hour.

Eight fish, including a 64.5 kg blue marlin, Makaira nigricans, which was caught in deep water southeast of Raita Bank, were taken while incidentally trolling.

F. Miscellaneous observations and activities.

1. Forty-seven live spiny lobsters were brought back for Linda Paul, University of Hawaii (UH), for experiments on catchability and observations on molting, growth, and tag retention.

2. The fifth walking leg of all spiny lobsters caught at areas other than Necker Island were frozen and brought back for Dr. James Shaklee, UH, for a genetic study of the population structure of lobsters. Samples of "fat" and lean P. richardsoni were also brought back for Shaklee.

3. Blood and liver samples from 21 Euthynnus affinis and 1 K. pelamis were collected for Anthony Lewis, Australian National University, Canberra, A.C.T., Australia.

4. Sets of tissue samples were collected for ciguatoxin analysis from 192 fishes including 57 Epinephelus quernus, 54 Etelis marshi, 28 Pristipomoides filamentosus, 18 C. cheilio, 12 S. dumerili, 9 P. sieboldii, 4 P. zonatus, 3 Elagatis bipinnulatus, 2 C. melampygus, 2 Pontinus macrocephalus, 1 C. sexfasciatus, and 1 Carcharhinus galapagensis. Several large spiny lobsters were also saved for ciguatoxin studies.

5. Berried spiny lobsters were collected for fecundity studies.

6. Fish and invertebrate samples were either preserved in Formalin or frozen for identification of stomach contents and for gonad or otolith studies.

7. Size frequency and sex data were taken from 1,235 fishes.

8. Six night-light stations were conducted.

9. The Occurrence of Birds, Aquatic Mammals and Fish School Log was maintained during daylight hours.

10. Three Witham collectors were set at Midway. No puerulus were collected.

11. A humpback whale and calf were observed 1 mi west of Disappearing Island, French Frigate Shoals.

12. Bottom surveys were made of seamount No. 11, Ladd Bank, Salmon Bank, and Northampton Bank. Unsuccessful efforts were made to locate seamounts No. 13, 14, and 15, and Gambia Shoal.

13. About 4,000 ft of 16 mm movies were made of the various sea and shore activities conducted during the cruise.

14. Temperatures at handline stations were monitored with a temperature probe and with XBTs. Salinity samples and surface temperatures were taken with each XBT cast.

15. Standard weather observations were made at 0000, 0600, 1200, and 1800 G.m.t. by the ship's officers.

16. The Operations Log, Deck Log, and Dead Reckoning Abstracts were kept, and chart overlays of all stations were made by the ship's officers.

17. On April 29, the MV Anangel Liberty grounded on the northeastern edge of French Frigate Shoals, about 5 mi east of Disappearing Island. During salvage operations, about 2,000 tons of her clay cargo were jettisoned at the grounding site. The Cromwell departed from intended fishing operations on Brooks Bank to French Frigate Shoals. A survey was conducted in the general area of the jettisoned cargo and downstream of the area to determine if any environmental damage from suspended or settled material had occurred. Heavy seas and surf prevented a survey of the shoals between the grounding site and Disappearing Island. There was no indication of any sedimentation at Disappearing Island. The positions of the suspended clay plumes which extended into deeper waters to the south and southeast of Disappearing Island were plotted. Water samples were taken and 16 mm movies and still pictures were made.

SCIENTIFIC PERSONNEL: NMFS, Southwest Fisheries Center, Honolulu Laboratory

Reginald M. Gooding, Chief Scientist (March 24-May 14)
Victor A. Honda, Research Assistant (March 24-May 14)
Robert L. Humphreys, Jr., Research Assistant (March 24-May 14)
Bert L. Kikkawa, Research Assistant, (March 24-May 14)
Alan R. Everson, Research Assistant (April 12-May 14)
James H. Prescott, Research Assistant (March 24-April 12)
William G. Gilmartin, Wildlife Biologist (April 29-May 3)

John J. Naughton, Fishery Biologist, NMFS, Southwest Region, Western Pacific Program Office (March 24-April 12)

Robert DeLong, Wildlife Biologist, NMFS, Northwest and Alaska Fisheries Center (NWAFC), MML (April 29-May 3)
Jerry Kooyman, NMFS, NWAFC, MML (April 29-May 3)

Thomas Loughlin, Wildlife Biologist, NMFS, Washington, D.C. (April 29-May 3)

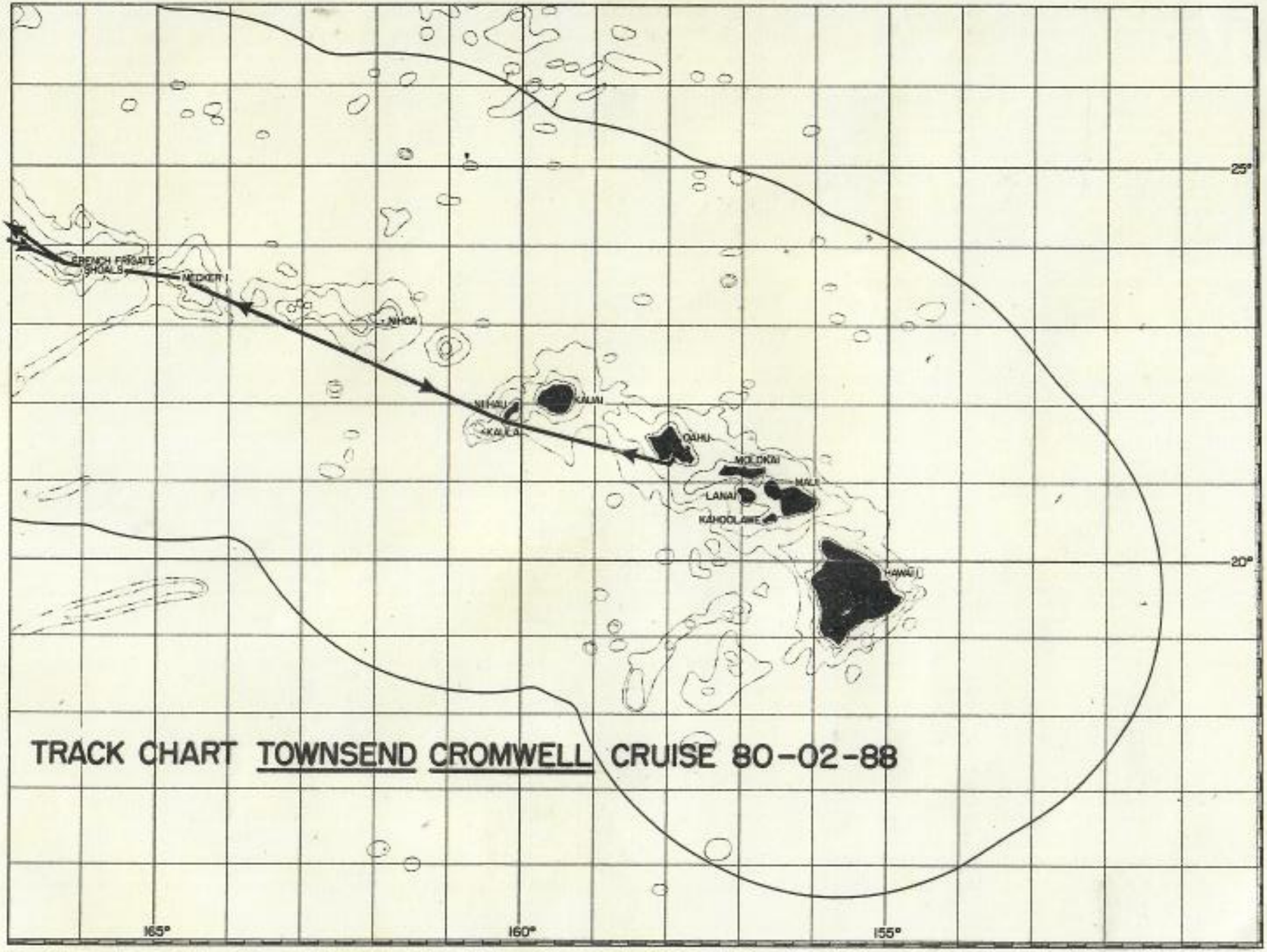
Eric Knudtson, Cooperating Scientist, U.S. Fish and Wildlife Service (USFWS) (April 29-May 3)
Daniel Moulton, Wildlife Biologist, USFWS (March 24-April 6)

Submitted by: Reginald M. Gooding
Chief Scientist

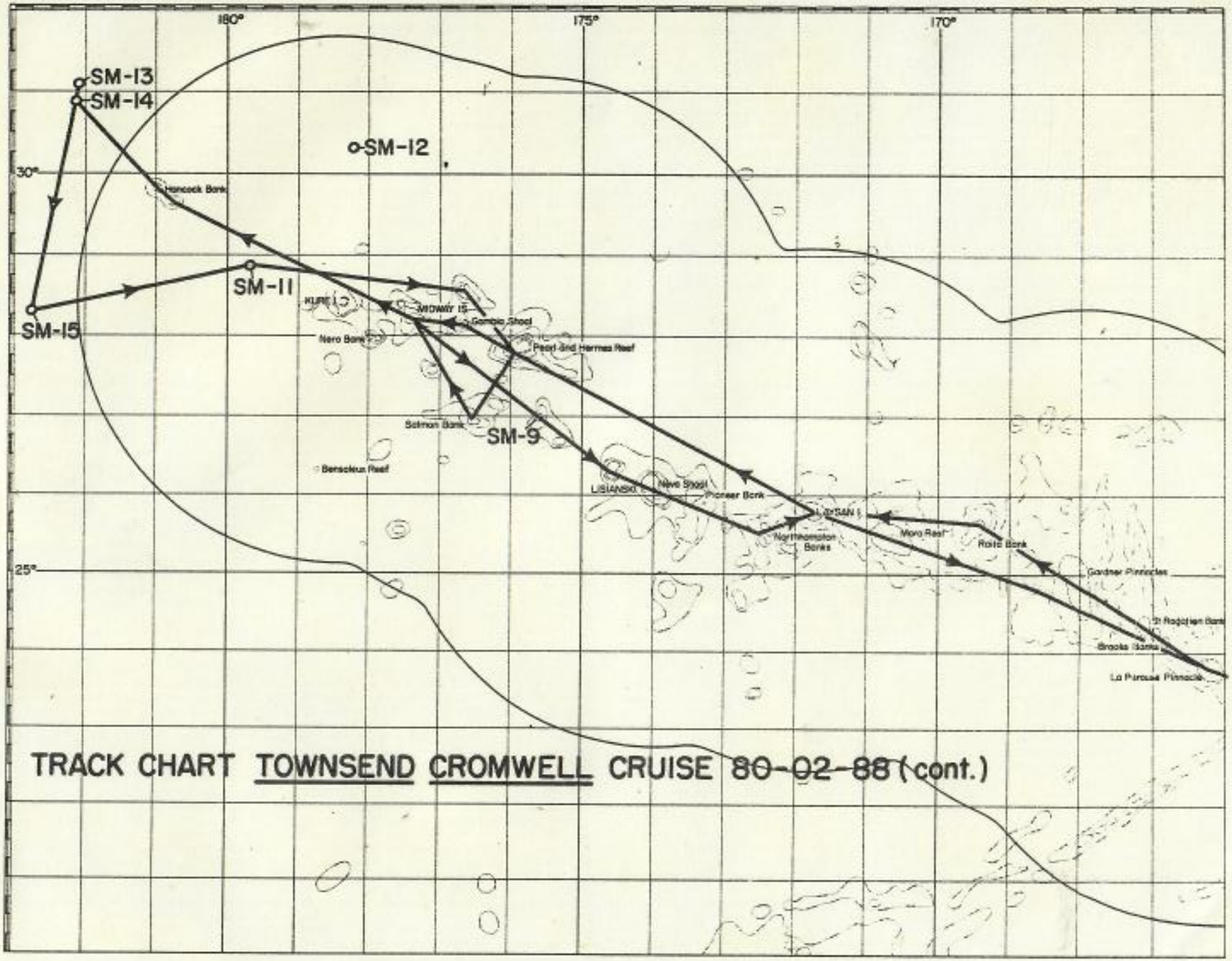
Approved by: Richard S. Shomura
Director, Honolulu Laboratory

Attachment

June 11, 1980



TRACK CHART TOWNSEND CROMWELL CRUISE 80-02-88



TRACK CHART TOWNSEND CROMWELL CRUISE 80-02-88 (cont.)

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center
Honolulu Laboratory
P. O. Box 3830
Honolulu, Hawaii 96812

CRUISE REPORT

VESSEL: Townsend Cromwell, cruise 80-04 (TC-90)

CRUISE PERIOD:
Part I: August 14-September 6, 1980
Part II: September 13-October 15, 1980

AREA OF OPERATION:

Part I: Personnel from the National Marine Fisheries Service (NMFS) and the University of Hawaii, Sea Grant Program ((UHSG), participated in a survey and assessment of various physical, chemical, and biological parameters pertinent to energy flow, productivity, and mineral cycling at two representative areas in the Hawaiian Archipelago--Kawaihae and French Frigate Shoals.

Part II: Personnel from NMFS conducted a survey to assess demersal and pelagic marine resources in waters of the Northwestern Hawaiian Islands (NWHI), between Necker Island and Maro Reef.

ITINERARY:

August 14 - Departed Snug Harbor, Honolulu, and proceeded to Kawaihae to commence Part I of the operation.

30 - Departed Kawaihae, and proceeded to French Frigate Shoals.

September 4 - Departed French Frigate Shoals and proceeded to Snug Harbor, Honolulu.

6 - Arrived at Snug Harbor, disembarked NMFS and UHSG personnel. End of Part I.

13 - Embarked NMFS personnel. Departed Snug Harbor and proceeded to Necker Island to commence Part II. Fished at Necker, Brooks Bank, St. Rogatien Bank, Raita Bank, Maro Reef, and Gardner Pinnacles.

October 9 - Departed Gardner Pinnacles and revisited Necker Island.

13 - Stopped at Niihau en route to Honolulu.

15 - Arrived Snug Harbor, Honolulu. End of Part II.

MISSIONS AND RESULTS:

Part I

A. Conduct a quantitative assessment of various physical, chemical, and biological parameters pertinent to energy flow, productivity, and mineral cycling at representative areas in the Hawaiian and NWHI regions.

1. A total of 37 CTD-hydrocast stations were occupied: 8 on time series and 8 on day transect stations at Kawaihae Bay; 1 station each at Oahu, Kauai, and Nihoa; and 10 on time series and 8 on day transect stations at French Frigate Shoals.

2. Ten in situ primary productivity stations to measure $H^{14}CO_3^-$ and $^{15}NO_3^-$ uptake were occupied: 3 stations at Kawaihae Bay and 7 at French Frigate Shoals.

3. Particle flux trapping was made once at Kawaihae Bay and four times at French Frigate Shoals at depths of 200 and 350 m.

4. Incident quantum flux measurements were made on 20 days.

5. Other observations and measurements included: 29 XBT casts, 21 Secchi disc lowerings, 6 vertical light attenuation profiles, 24 ^{15}N nitrate uptake deck incubations, 192 chlorophyll *a* and phaeopigment samplings, nitrate and nitrite samplings at 10 hydrocast stations, and particulate C and N samplings at 10 hydrocast stations.

   Also obtained were 62 in situ fluorometer observations: 50 at the surface and 12 profiles from vertical casts.

6. Sampling for zooplankton and larval fish were done with 70-cm bongo net in 13 oblique tows to 200 m and in 12 oblique tows to 100 m, 18, 70-cm neuston net tows, 65 vertical macro- and microzooplankton net tows, 7 tows with the 4-m^2 larval fish trawl, and 1 tow to 300 m with the Cobb midwater trawl.

7. Two night-light stations at anchorage were made off La Perouse Pinnacle.

B. Miscellaneous observations and activities.

1. A total of six handline stations were conducted around French Frigate Shoals. Handline fishing was done with four powered gurdies, each with a single line containing four or five hooks. The catch included 35 *Pristipomoides filamentosus*, 5 *Caranx cheilio*, 5 *Etelis marshi*, 6 *Epinephelus quernus*, 3 *P. zonatus*, and 4 *P. sieboldii*. Catch rate was 1.97 fish per line-hour.

2. Trolling was done between stations and while en route to and from operational sites. Eleven hours were spent trolling off Kawaihae with no catch. Twenty-three hours of trolling with three lines at French Frigate Shoals yielded 30 fish, with a catch rate of 0.43 fish per line-hour. The catch included Coryphaena hippurus, Euthynnus affinis, Thunnus albacares, Acanthocybium solandri, and Elagatis bipinnulatus.

3. A set of six crab nets were fished once near La Perouse Pinnacle, but no kona crab was caught.

4. Samples of fish tissue for ciguatera analyses were taken from body sites A, B, C, and E of 66 fish.

Part II

A. Conduct fishing operations using lobster, shrimp, and fish traps, bottom handline, and trolling lines to determine the availability, distribution, and relative abundance of fish, lobsters, and shrimps in the NWHI area.

1. Trap fishing. Trap fishing was done at Necker Island, Brooks Bank, St. Rogatien Bank, Gardner Pinnacles, Raita Bank, and Maro Reef.

a. A total of 19 lobster trap stations were occupied during Part II of the cruise. Forty traps (five strings of 8 traps each) were fished at 12 stations, 32 traps were fished at 5 stations, and 24 traps were fished at 2 stations. Gear competition between traps spaced 10, 15, 20, 25, and 30 fathoms apart on respective strings, were made at three stations at Necker Island. In addition to these stations, one string of eight traps was used in a ghost fishing experiment. Lobsters caught in these traps were marked and returned, in respective traps, to the same site. The traps were reexamined 4 days later and again on the homeward bound leg of the cruise. Except at Necker Island, traps were set in areas unfished on previous cruises.

A total of 1,039 spiny lobsters, Panulirus marginatus, and 84 slipper lobsters (81 Scyllarides squammosus and 3 Parribacus antarcticus), were caught. The best catches were made at Necker (4.0 per trap) and Maro Reef (3.6 per trap). Catches from the other four areas were relatively low (less than two per trap).

b. A total of 10 shrimp trap stations were occupied with two to four strings (five traps per string) set at each station. The traps were generally

set at depths of 150 and 200 fathoms. Deeper sets at over 250 fathoms were made at three stations. Heterocarpus ensifer was the predominant species at all depths fished, Plesionika longirostris was generally taken at the shallowest depths (between 150 and 200 fathoms), and a few H. laevigatus were taken at 250- to 300-fathom depths. The total shrimp catch of 86.1 kg was comprised of 78.3 kg H. ensifer, 6.6 kg P. longirostris, and 1.2 kg H. laevigatus.

c. A total of eight fish trap stations were occupied with two to five traps at each station. Fish traps were set in depths of 25 to 155 fathoms. Catches were generally poor, as fish were caught in only 7 of 24 trap sets. The catch totaled 29 commercially important fish which included 13 Pristipomoides filamentosus, 9 Myripristis sp., 2 Epinephelus quernus, 2 Seriola dumerili, and 3 Lutjanus kasmira.

2. Handlining. Seventeen handline (deep bottom) fishing stations were occupied. Fishing was done either in the afternoon or early evening with four gurdies, each with a line containing four or five hooks. A total of 148 fish (total weight 756.9 kg) were caught: 34 Etelis carbunculus, 18 E. marshi, 11 P. filamentosus, 7 P. sieboldii, 4 P. zonatus, 36 Epinephelus quernus, 19 Caranx cheilio, 11 S. dumerili, and 8 other miscellaneous species. Fishing conditions were generally good with only few incidences of harassment by sharks.

3. Trolling. Trolling was done on 25 days. Three lines were used on 21 days and two on the last 4 days due to rough sea conditions. A total of 154 fish were caught: 95 Euthynnus affinis, 41 A. solandri, 7 T. albacares, 3 Katsuwonus pelamis, 6 Coryphaena hippurus, 1 Elagatis bipinnulatus, and 1 Caranx lugubris. Troll fishing was good at St. Rogatien and Raita Banks and Gardner Pinnacles. Catch rate in these areas were better than 0.6 fish per line-hour. Catch rate at Brooks Banks was only slightly less at 0.5 fish per line-hour.

B. Conduct night-light fishing to assess the availability, catchability, distribution, and relative abundance of bigeye scad, mackerel scad, baitfish, and squid and to collect juvenile fishes and crustaceans for age and growth studies.

A total of 13 night-light stations were occupied at all banks except Gardner Pinnacles. Both planktonic organisms and fish abundance were poor throughout the cruise period. Only 89 fish were cuaght by light fishing gear: 48

Decapterus pinnulatus, 22 Priacanthus sp., 8 Holocentrus lacteoguttatus, 8 Myripristis sp., 1 Parupeneus sp., 1 L. kasmira, and 1 Sphyraena sp.

C. Biological sampling.

1. Sets of tissue samples from anterior dorsal, anterior ventral, and posterior ventral musculature were collected from 117 fish for ciguatoxin studies. The collection included samples from 30 Epinephelus quernus, 25 Pristipomoides filamentosus, 17 C. cheilio, 10 Seriola dumerili, 12 Euthynnus affinis, 11 A. solandri, 7 Etelis marshi, 2 L. kasmira, 1 P. sieboldii, 1 P. zonatus, and 1 K. pelamis.

2. Stomachs, ovaries, and otoliths were collected from commercially valuable snappers, groupers, carangids, and pelagic fishes to determine the feeding habits, fecundity, spawning, and growth of these fishes.

3. Over 100 lobster heads and 13 berried lobsters were preserved for food habit, maturation, and fecundity studies.

4. Twenty-five berried shrimps of each species were collected from each string of shrimp traps and 25 shrimps of each species were collected from each station for fecundity, maturation, and food habit studies.

D. Miscellaneous observations and activities.

1. Twelve Euthynnus affinis and 1 juvenile S. dumerili were treated with tetracycline and kept alive in the baitwell for growth studies. Five E. affinis and the S. dumerili remained alive at the end of the cruise.

2. Morphometric measurements were obtained from spiny and slipper lobsters caught at all islands and submerged banks except Necker Island and Maro Reef.

3. Intensive lobster marking experiment was conducted at Raita Bank. All lobsters caught were marked and released at the capture site.

4. All fish caught at handline stations were measured and weighed for determination of length-weight relationships and length-frequency analyses.

5. Samples of each species of fish caught were frozen for NMFS open house display. Five E. affinis and 1 S. dumerili, 2 P. filamentosus, 1 C. cheilio, 1 Coryphaena hippurus, and a number of species of reef fishes were

brought back in the baitwell for live fish display. Also brought back alive were about 40 spiny lobsters and a number of slipper lobsters.

6. Sightings of bird flocks, mammals, and fish schools were logged throughout the cruise period during daylight hours.

SCIENTIFIC PERSONNEL:

Part I: Bert S. Kikkawa, Chief Scientist, NMFS, Southwest Fisheries Center (SWFC), Honolulu Laboratory (HL)

Robert Ferguson, Cooperating Scientist, UHSG
James A. Finn, Cooperating Scientist, UHSG
Jed Hirota, Cooperating Scientist, UHSG
Larry Johnson, Cooperating Scientist, UHSG
F. Randy Shuman, Cooperating Scientist, UHSG
Satoru Taguchi, Cooperating Scientist, UHSG
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Gary L. Kamer, Statistician, NMFS, SWFC, HL
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Robert B. Moffitt, Research Assistant, NMFS, SWFC, HL
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Submitted by: Bert S. Kikkawa
Bert S. Kikkawa
Chief Scientist, Part I

Walter M. Matsumoto
Walter M. Matsumoto
Chief Scientist, Part II

Approved by: Richard S. Shomura
Richard S. Shomura
Director, Honolulu Laboratory

October 28, 1980

environment consultants, inc.

April 29, 1982

Mr. George H. Balazs
Assistant Marine Biologist
Hawaii Institute of Marine Biology
P.O.Box 1346
Kaneohe, Hawaii 96744

Dear George:

Thank you for your letter of February 3, 1982 (and subsequent copy). My appologies for not writing sooner, but I've been busy on several projects.

As to Mr. Agard's letter, I will try my best to find it for you. I looked once and did not find it, but will do so again. Those French Frigate Shoals data and reference material are stored and are not in file cabinets. Since they are in several boxes and stored along with other material, it's like looking for the needle in the haystack. I know I have a copy; the problem is finding it. I will do my best. There also should be a copy in the POBSP files at the Smithsonian, but no telling where those files are now. The last time I saw those was in 1975, and they were pushed back into an out of the way storeroom; space there is a big problem. If I can't find my copy, I will write to my contact there and hope he can trace it down.

Thank you for the reprints and photocards. I'd certainly like to get back out to the Pacific. I was list out there in late 1978.

Best regards,

ENVIRONMENT CONSULTANTS, INC.

Binion

A, Binion Amerson, Jr.
Senior Staff Ecologist/Senior Editor

P.S.: Please note our new address.

4951 Airport Parkway Suite 500 Dallas, Texas 75248 (214) 233-8261

University of Hawaii at Manoa

Hawaii Institute of Marine Biology
P.O.Box 1346 • Coconut Island • Kaneohe, Hawaii 96744
Cable Address: UNIHAW

February 3, 1982

Dr. A. Binion Amerson Jr.
Environmental Consultants Inc.
14325 Proton
Dallas, Texas 75240

Dear Dr. Amerson:

You will probably recall that we had the opportunity to talk briefly about Pacific sea turtles when you visited our laboratory several years ago. I am writing to you at this time to ask for your assistance on the same subject. In your comprehensive 1971 publication, "The Natural History of French Frigate Shoals," you cited correspondence from a Louis K. Agard Jr. relating to fishing operations at Tern Island and green sea turtles. Copies of the pages where these references appear have been enclosed for your convenience. If it wouldn't be too difficult for you to locate in your files, I would greatly appreciate receiving a copy of Mr. Agard's letter. I would like to have this correspondence as part of my personal reference library on sea turtles. Hopefully you can accommodate this request.

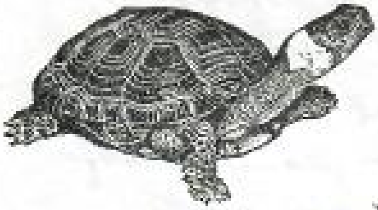
I have enclosed several items that I thought you might find interesting.

Sincerely,

George H. Balazs
Assistant Marine Biologist

GHB:md

Enclosures



273 Applied Sciences
University of California
Santa Cruz, CA 95064

29 April 1983

Dear George,

Howdy! This is a reminder, George, that "Turtle-Riding" season has arrived! I only observed female monk seals hitching rides in early to mid-May. Will you be on East Island at this time? You would certainly enjoy watching this amazing interaction. (Another enticement: there are no nasty ticks on East at that time!)

Seriously, do you think this interesting behavior is worth a note in the 'Elepaio? Or maybe a paper on monk seal—green sea turtle interactions in general? I would appreciate your ideas on this.

↓

Do you intend to spend another lonely sojourn on East I. this summer? Will you be involved in the accelerated hatchling-tagging program? I heard that last year's hatchlings probably did not retain their biopsy grafts — is that true?

I still am not sure what I'll be doing this summer. Right now I am busy just being a grad student, and working on the monk seal data from last year.

Enjoy Your Field Season, George!

Best regards,

Chip

PORTIONS OF THIS ARTICLE PROBABLY APPEARED IN "ANIMAL BEHAVIOR"

Junk Publishers

SALT LAKES

by **W.D. Williams,** *University of Adelaide*
Developments in Hydrobiology 5

Despite the volume of inland salt lakes (.008% of the earth's water vs. .009% for fresh water lakes) very little literature is available in one place on their limnology. This volume reflects current research on this area of growing economical and limnological interest. It represents the proceedings of an international symposium held in Australia in 1979 by the International Association of Limnology. Every continent and all aspects of limnological study are represented.

Selected Contents:
Aquatic Plant Communities of Poikilosaline Waters — *by C. Den Hartog* • The Microflora: Adaptations of Life in Extremely Saline Lakes — *by Lesley J. Borowitzka* • Microbiology of the Great Salt Lake North Arm — *by F.J. Post* • Occurrence of Benthis Microbial Mats in Saline Lakes — *by J. Bauld* • Ostracods of Athalassic Saline Lakes: A Review — *by Patrick De Deckker* • The Interaction of Salinity, Predators, Light and Copepod Color — *by Nelson G. Hairston, Jr.* • The Brine Shrimps Artemia and Parartemia: Comparative Physiology and Distribution in Australia — *by M.C. Geddes* • On the Chemistry of Some Salt Lake and Ponds in Yugoslavia — *by Grozdana Petrovic* • The Ecology of Plankton Fauna in Saline River Pools — *by R.J. Rippingale* • On the Ecology of Hypersaline goons on Laysan Atoll and Kauai Island, Hawaii, with Special Reference to the Laysan Duck, *Anas laysanensis Rothschild* — *by H. Caspers* • Limnology of a Large, Deep, North American Terminal Lake, Pyramid Lake, Nevada, U.S.A. — *by D.L. Galat, E.L. Lider, S. Vigg, and S.R. Robertson* • Chemistry, Physics and Evolution of Antartic Saline Lakes: A Review — *by H.R. Burton* • Biotechnology of Solar Saltfields — *by A.G. Jones, C.M. Ewing, and M.V. Melvin* • Australian Salt Lakes: A Palaeohydrologic Approach — *by J.M. Bowler.*

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FOR A JUNK PUBLICATION?

4

R ROOM, BLDG.

R ROOM, BLDG.

VERSATION
UEST
ROVAL
ORMATION
AMENTS

ND REPORT

C

J

b'

University of Hawaii at Manoa

College of Tropical Agriculture
Department of Entomology
2500 Dole Street • Room 23 • Honolulu, Hawaii 96822 • Cable Address: UNIHAW

September 16, 1977

Mr. Brian Giezentanner
U.S. Fish & Wildlife Service
Box 50167
Honolulu, HI 96850

Dear Mr. Giezentanner:

Mr. George Balazs has just given me a specimen of a large grasshopper which he collected on Necker Island on August 24, 1977. He reported seeing numerous grasshoppers of this type both on Necker and on Nihoa which he visited on Aug. 17.

The grasshopper is a specimen of Schistocerca nitens nitens Thunburg, a North American form which was first found established in the main Hawaiian Islands during 1965. Although this species has not developed into a major agricultural pest in Hawaii, it belongs to a genus of grasshoppere which contains a number of serious pest species. It is quite possible that biological factors, such as the predacious ant, Pheidole megacephala (Fabricius), may be controlling it on the main islands. It is also possible that in the relatively simple terrestrial ecosystems of Nihoa and Necker, this grasshopper may build up sufficiently large populations to cause serious damage to the vegetation. I believe that you should be aware of the potential this grasshopper may have for causing serious damage to the flora of Nihoa and Necker so that you and your assistants can keep an eye open for large populations, and also for any changes in the condition of the vegetative cover on these islands which could be caused by it.

To my knowledge, the last insect survey of the HINWR islands was made by me in 1964. As I pointed out in a 1966 paper on insects of the Leeward Hawaiian Islands (copy enclosed), these small islands are very vulnerable to invasion by new insect pests. May I suggest that you consider including a qualified entomologist on one of your field trips to these islands, within the next year or two? I believe it would be prudent to resurvey the insect faunas of the HINWR islands to assess the status and impact of the new grasshopper and to determine whether other new pests have become established on these islands.

Yours sincerely,

John W. Beardsley

John W. Beardsley
Entomologist & Professor

Enc.

cc: George Balazs