NORTHWESTERN HAWAIIAN ISLANDS

5 of 5

G.H. BALAZS

Agency: National Marine Fisheries Service

Task: Survey of Insular Resources - Northwestern Hawaiian Islands (NWHI)

Task Leader: Richard N. Uchida Sept 76 START AS TASK LEADER

NORTHWESTERN HAWAIIAN ISLANDS SURVEY

I. Objective of the Insular Resources Task

A. Conduct quantitative fishery surveys and assess the potentials of the marine resources over the inner and outer shelves, shelf edge, upper slope zone, pelagic zone, and over seamounts within the region known as the NWHI.

B. Obtain information on the bottom topography of the area under study to identify trawlable areas.

C. Determine the species composition, distribution, and density of planktonic and macro-organisms including fish, crustaceans, mollusks, and corals.

D. Determine physical and chemical parameters of waters surrounding the various islands, atolls, and seamounts.

II. Accomplishments in the past year

A. Survey cruises in FY-1977 (October 1, 1976 to September 30, 1977).

1. Research vessel Townsend Cromwell

a. Cruise 76-06-73 (October 5-December 3, 1976)

b. Cruise 77-02-75 (Part III) (May 12-June 27, 1977)

c. Cruise 77-02-75 (Part V) (July 4-August 17, 1977)

d. Cruise 77-03-76 (Part I) (September 5-November 7, 1977)

2. Commercial vessels

a. Easy Rider, 10 fishing cruises, including 2 under charter to the National Marine Fisheries Service (NMFS)

b. Libra, six fishing cruises

c. Pacific Trojan, four fishing cruises

d. Pursuit, one fishing cruise

e. Jinita, one fishing cruise

f. Taihei, no data received
MARU

B. Data management

1. Data processing and keypunching completed

a. Townsend Cromwell, cruises 75-05, 76-06, 77-02

b. Pacific Trojan, cruises 77-01, 77-02, 77-03

c. Easy Rider, cruises 76-01, 76-02, 77-01, 77-02

d. Libra, cruises 77-01, 77-03, 77-04

2. Conversion of all data collected prior to 1976 into standard formats

C. Reports completed

1. Cooperative Northwestern Hawaiian Islands Resource Assessment Program (A Prospectus). Southwest Fisheries Center Administrative Report 10H, 1976.

2. Management plan for the spiny lobster fishery of the Northwestern Hawaiian Islands. Draft. Western Pacific Regional Fishery Management Council, Honolulu, Hawaii

3. Preliminary results of lobster trapping in Northwestern Hawaiian Islands waters. South Pacific Commission, Ninth Regional Technical Meeting on Fisheries, Noumea, New Caledonia, January 1977. SPC Fisheries 9/WP.19:9 p. (Mimeo.) (Also, Southwest Fisheries Center Administrative Report 13H, 1977.)

4. A summary of environmental and fishing information of the Northwestern Hawaiian Islands. Southwest Fisheries Center Administrative Report 4H, 1977.

GET

5. Fish resources of the western central Pacific Ocean. FAO Fish Circular. Manuscript.

6. Cruise and Narrative Reports, Townsend Cromwell

a. Cruise 76-04-71, May 3-June 9, 1976.

b. Cruise 76-06-73, October 5-December 3, 1976

c. Cruise 77-02-75 (Part III), May 12-June 27, 1977

d. Cruise 77-02-75 (Part V), July 4-August 17, 1977

e. Cruise 77-03-76 (Part I), September 5-November 7, 1977

7. Procedures manual for NWHI cruises

D. Research projects underway

1. Analysis of fishing data collected on spiny lobster, Panulirus marginatus, by observers on research and commercial fishing cruises

2. Fishery management plan for seamount resources

3. Analysis of bottom trawling operations in the NWHI

4. Quantitative and qualitative analyses of plankton and midwater trawl samples

5. Age and growth determination of fishes by counting daily growth increments on fish otoliths

6. Morphometric analysis of slipper lobster, Scyllarides squammosus and Paribaccus antarcticus

7. Sexual maturity and spawning of several commercially important fishes

8. Determination of the growth and movement of spiny and slipper lobsters through tagging

9. Tag shedding by spiny lobsters

10. Gear competition experiments

11. Ghost fishing experiments

E. Cooperative efforts

1. Collected bottom samples for analysis by Dr. E. Alison Kay, University of Hawaii

2. Collected eye lenses for studies on nuclear lens protein of fishes for Dr. Albert C. Smith, Oceanic Institute

3. Collected gorgonians for Ms. Katherine Muzik, Smithsonian Institution

4. Collected precious coral samples for Dr. Richard W. Grigg, Sea-Grant, University of Hawaii

5. Collected samples of fish flesh for ciguatera tests for the Hawaii Division of Fish and Game

6. Collaborated with University of Hawaii Marine Options Program (MOP) in providing field training for students enrolled in the program

III. Problems encountered

A. Shortage of trained seagoing personnel to field a full complement on all NMFS and commercial cruises

B. Developing formats in which data collected from both commercial and research cruises would be compatible

C. Proprietary nature of much of the data collected on commercial vessels

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

SEMINAR WORKSHOP ON THE NORTHWESTERN HAWAIIAN ISLANDS COOPERATIVE STUDY

22 November 1977

Introduction-Robert A. Skillman

I. Purpose of this meeting.

The purpose of this meeting is to review the work that has been accomplished to date on our cooperative study of the living resources of the NWHI, to discuss the studies relative to meeting the objectives of the study, and to plan for future research, including the addition of the University of Hawaii Sea Grant Program to the cooperative study.

II. Mechanics of the meeting.

III. Brief history leading to the cooperative study.

IV. Overall objectives of the cooperative study.

V. Specific objectives of the cooperative study.

The Hawaiian monk seal on Laysan Island

Brian & Pattie Johnson

Aquatic Mammals Behavioral Research Co.

Honolulu, Hawaii

(This study was funded by the marine mammal commission, co. # MM7AC-009, with additional logistic and equipment support provided by the FWS and NMFS)

I Study site and duration.

We spent from 27 Feb. to 3 Sept., 1977 on Laysan Island conducting an observational study of the Hawaiian monk seal. This was the first of a proposed five year study on Laysan.

II Purpose

The purpose of the study is to collect data on population numbers and the life history of the species which will aid in future management decisions.

III Results from 1977

a) The population remained relatively stable with a maximal count of 211 seals.

b) Pups were born during all months of our stay, with the greatest number of births in March and April.

c) Pups were weaned an average of 37 days after birth, and most remained on or near Laysan for at least the next 4 months.

d) Adults show variable patterns of island use

1. adult males - some resident, some visitors
2. adult females - patterns of 20 days on, 20 days away except during rearing of their pup or molt when they're ashore continually.

e) Based on spewings, it appears that lobster forms an inportant part of the adult seal diet at Laysan.

f) Mortality appears due primarily to shark attack and massive infections of an unknown cause.

IV Slide presentation

Includes pictures of large scars on adult seals, growth of a pup from birth through weaning, size comparisons of various age and sex classes, fresh wounds and their healed scars, etc.

REEF COMMUNITY STUDIES

Edmund S. Hobson
Tiburon Laboratory
Southwest Fisheries Center
NMFS

The initial phase of a study of the community structure of fishes and related organisms in the Hawaiian archipelago was completed during July and August 1977 by Edmund S. Hobson (fishes) and James R. Chess (invertebrates and algae) of the Southwest Fisheries Center, Tiburon Laboratory, National Marine Fisheries Service.

During this period the nearshore marine communities were assessed at the extremes of the archipelago: the Island of Hawaii, in the south, and at Midway and Kure atolls, in the north.

Generally the fishes at Midway and Kure atolls were found to be species that also occur in the southern part of the archipelago (with 2 notable exceptions, see below). Nevertheless, the marine communities in these widely separated locations are structured differently.

Most of the fish species that predominate on the reefs at Kure and Midway are relatively minor components of the Kona communities; conversely, and even more striking, most of the fish species that predominate on the Kona reefs are absent, or only sparsely represented at Kure and Midway.

Preliminary assessment of the data indicates that the difference is based largely on a combination of 2 distinct influences: 1) differing fishing pressures, and 2) differing environmental pressures. Considering these in order:

1. The differing fishing pressures are reflected in the much greater numbers of large predators at Midway and Kure. Jacks (Caranx spp.) exceeding 100 lbs. are numerous adjacent to the reefs in waters less than 2 m deep, as are the distinctive large terminal male phases of many labrids (e.g., Coris spp., Bodianus bilunulatus, and others). The grouper Epinephelus quernus, often exceeding 50 lbs. in weight, is prominent in many areas. The comparative absence of these forms in nearshore waters of the major Hawaiian Islands probably relates primarily to greater fishing pressures there. Similarly, the submarine caves at Midway and Kure house tremendous populations of large Myripristis spp. and Kuhlia sandvicensis. These forms are popular with spearfishermen, which probably accounts for the serious depletion of their populations in most parts of the high islands.

2. The differing relative numbers of certain other fish species in the marine communities of Kure and Midway, compared to communities at the Island of Hawaii, appear primarily due to differing environmental pressures. These differing pressures also seem to account for the presence at Midway and Kure of species unknown from the high islands.

Midway and Kure are atolls, and despite their low water temperatures at times of the year (into the low 60's^{o}F), at least one fish - the wrasse Epibulus insidiator - widespread on more tropical atolls, is relatively common at Midway and Kure despite being unknown from the more southerly high islands. (The occurrence of this species in the northwest Hawaiian Islands will be reported in the scientific literature by Dr. Leighton Taylor, Director of the Waikiki Aquarium, who collected a specimen at La Perouse Pinnacle in July). Similarly, the sharks Carcharhinus amblyrhynchos and Triaenodon obesus are numerous in the lagoon of Kure and Midway, just as they are in the lagoons of coral atolls throughout the tropical Pacific, and yet both species are uncommon in waters around the high Hawaiian Islands.

On the other hand, the lower water temperatures at Kure and Midway introduce certain temperate-zone aspects to the northern habitats. Particularly notable is the lush growth of fleshy benthic algae on certain lagoon patch-reefs. Various fishes prominent on these reefs, notably the parrotfish Scaridea zonarcha, are relatively uncommon at the more tropical high islands. Additional evidence of more temperate conditions in certain aspects of the environment at Kure and Midway is the common occurrence there of the spotted beakperch, Oplegnathus punctatus. This popular recreational fish in Japan has relatives in the temperate waters of South America, South Africa, and Southern Australia, but it has previously been unreported from Hawaii. (Dr. Hobson is preparing a short paper on the occurrence of this species in Hawaiian waters).

Balazs

UNIVERSITY OF HAWAII

Hawaii Institute of Marine Biology

MEMORANDUM

November 14, 1977

To: Principal Investigators, Sea Grant NWHI
Cooperative Fishery Investigations (SGNWHICFI)

From: Rick Grigg, Coordinator

Subject: WORKSHOP AND FINALIZATION OF SEA GRANT PROPOSALS FOR SGNWHICFI

This is a follow-up to my memo of October 20, 1977. As you are all aware, November 15 is the due date for all SGNWHICFI proposals. By the way, perhaps one of you could come up with a better acronym than SGNWHICFI so I can untwist my tongue. In any case please route your proposals to me as soon as possible.

I will work over the proposals and present an overview at the NMFS workshop which is now planned for November 22 (one day earlier than originally planned) at the East-West Center. An agenda of the workshop is enclosed for your information. As space is rather limited, please limit attendance to those directly participating in the program.

At the workshop we should receive considerable feedback from the tripartite participants. This may result in some redirection and modification of your proposals. We also hope to sketch out logistic requirements (equipment, shiptime, and air travel) and coordinate various activities. I'm sure we will not be able to complete this aspect of the program at the workshop, therefore a follow-up meeting for at least Sea Grant P.I.'s may be necessary. As you know, Steve Dollar is assisting me in this aspect of coordinating the program. Therefore if the necessary specifics with regard to logistics are not spelled out in your proposal please contact Steve at the Sea Grant Office (x7031) and give him further details of your plans and needs.

Thanks for your continuing cooperation. See you at the workshop if not before.

mk

cc: J. Davidson, Sea Grant

Distribution: J. Hirota, D. Kinsey, T. Smith, C. McDonald, K. Gopalakrishnan, S. Ralston, L. Taylor, G. Balazs, J. Shaklee, J. Rutka
Banner ?

SEMINAR WORKSHOP
ON THE
NORTHWESTERN HAWAIIAN ISLANDS COOPERATIVE STUDY

22 November 1977

East-West Center, University of Hawaii
Jefferson Hall, Asia Room

I. 0830, INTRODUCTION AND REVIEW OF OBJECTIVES

Robert A. Skillman

II. RESEARCH PROGRAMS

A. Honolulu Laboratory, National Marine Fisheries Service

1. 0845, Insular Resources

Richard N. Uchida

2. 0915, Pelagic Resources

Robert A. Skillman

3. 0945, Reef Community Studies

Ted S. Hobson Tiburon LAB

1015, Coffee break

B. Hawaii Division of Fish and Game

1030, Nearshore Fisheries Resources

Henry Sakuda

C. U.S. Fish and Wildlife Service

1100, Seabird and Monk Seal Surveys — Report about finished

Brent Giezentanner

D. Western Pacific Regional Fishery Management Council

1115, Proposed Contracts

Wilvan G. Van Campen

1130-1230, Lunch

E. Marine Mammal Division

1. 1230, Cooperative Monk Seal Surveys
   [Speaker to be named] DeLong

2. 1300, Laysan Islands Monk Seal Study
   Brian and Pattie Johnson

F. Sea Grant Program, University of Hawaii

1315, Proposed Research Projects
Richard W. Grigg

1415, Coffee break

III. DISCUSSION/PLANNING SESSION

A. 1430, Discussion and Resolution of Problems Encountered

1. Are the objectives being met?

2. What studies/data are lacking?

3. How will all the studies fit together?

B. 1600, Scheduling of Research Activities

1. Townsend Cromwell cruises

2. Other vessel schedules

3. Air flights

4. Field visits to island stations

Page 3
Brock

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

Eagle p 15
Lisianski

March 31, 1978

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

Dear Mr. Balazs:

Enclosed is a copy of the narrative report for Hugh M. Smith Cruise V, requested in your letter of March 23.

Sincerely,

Mary Lynne Godfrey
Administrative Officer

Enclosure

1950

NARRATIVE REPORT

HUGH M. SMITH - Cruise V

I. CRUISE PERIOD: June 16 to August 6, 1950

II. ITINERARY OF CRUISE:

June 16	Departed Honolulu
June 19 to 21	Bait survey and shore fish collection at French Frigate Shoals.
June 23	Bait survey and shore fish collection at Laysan Island.
June 24	Bait survey of Lisianasky Island.
June 25 to 27	Pearl oyster survey and bait survey at Pearl and Hermes Reef.
June 28 & 29	Bait survey and shore fish collection at Midway.
June 30 to July 11	Occupied hydrographic stations 1 to 27.
July 12	Bait survey, shore fish and poisonous fish collection at Hull Island.
July 13 & 14	Bait fishing, shore fish and poisonous fish collection at Canton Island.
July 15 to 21	Long line fishing in vicinity of Canton Island.
July 22 -	At Canton Island repairing gear and preparing for last half of cruise.
July 23 to 27	En route Canton Island to hydrographic station 28.
July 28 to Aug. 6	Occupied hydrographic stations 28 to 57.
Aug. 6	Returned to Honolulu.

III. SUMMARY OF ACCOMPLISHMENTS:

A. Primary Mission: The main objective of the cruise, to complete two hydrographic sections across the equatorial, counter-equatorial current system, was successfully realized. Stations 1 to 27, from 27° N latitude, 175° W longitude to 05° S latitude, 171° W longitude were occupied June 30 to July 11. Stations 28 to 51, from 05° S latitude, 158° W longitude to 20° N latitude, 153° W longitude, were occupied July 28 to August 6.

B. Secondary Missions:

1. An oblique quantitative plankton tow (surface to 200 meters to surface) was made at each of the 51 hydrographic stations. All hauls were made with a 1 meter 30 XXX net with a 56 XXX bag.

2. Bait surveys were made in the Leeward Islands at French Frigate Shoals, Laysan Island, Lisiansky Island, Pearl and Hermes Reef and the Midway Islands. "Iao" and "Piha" were seen in small quantities on all the islands but never in amounts to warrant a set of the seine. Schools of small "Aholehole" and mullet were seen in abundance all along the beaches but these species were judged to be undesirable as live bait. Our bait surveys were complete for all the areas visited except for Pearl and Hermes Reef and Midway. Engine failure on the speed boat made it impossible to scout these areas thoroughly.

3. As our bait fishing activities were unsuccessful, we were unable to make any observations on the transportation of live bait from the Leeward Islands to the Phoenix Islands. Certain observations were made, however, while long line fishing at Canton Island, on the holding of live mullet in bait tanks.

4. General observations were made en route on the occurrence of tuna schools and associated phenomena.

5. Long line fishing operations conducted for seven days in the vicinity of Canton Island yielded 77 tuna and 6 marlin for an average catch of 7.5 fish per hundred hooks per day. Frozen herring and fresh mullet were used for bait; the mullet being obtained from Canton Island lagoon and kept alive in a bait tank until used.

6. Mr. Vernon E. Brock, Director of the Territorial Division of Fish and Game, and serving as collaborator on the cruise, surveyed a representative portion of Pearl and Hermes Reef, with the assistance of members of the scientific staff and crew of the vessel, to determine the present abundance of pearl oysters. Only a very few (six) live oysters were found in an area formerly supporting several hundred tons of oysters, thus indicating the inadvisibility of reopening the area to commercial shell and pearl fishing.

Mr. Brock was assisted also in the tagging of green sea turtles whenever these could be found on the beaches. A total of about 30 animals were tagged and released on the various Leeward Islands visited.

7. Dr. William A. Gosline, Professor of Ichthyology at the University of Hawaii, also served as collaborator on the cruise and was assisted in making collections of shore fishes at five different localities in the Leeward and Phoenix Islands.

8. Collections of possibly poisonous fishes were made in the lagoon at Hull Island and at Canton Island and frozen for forwarding

to Dr. Bruce W. Halstead, School of Medical Evangelists, Loma Linda, California.

9. Two or more trolling lines were kept out during almost all daylight hours that the ship was underway. The catch was very poor, partly due perhaps to the fact that at almost all times the vessel speed was considerably above an optimum trolling speed. Most of the few fish - particularly the tunas - taken by this method came from water close to land areas.

List of the fish taken on trolling lures:

Kawakawa (Euthynnus yaito) - 9

Yellowfin (Neothunnus macropterus) - 5

Skipjack (Katsuwonus pelamis) - 2

Mahimahi (Coryphaena hippurus) - 3

Short-nosed spearfish (Tetrapturus brevirostris) - 1

Great barracuda (Sphyraena barracuda) - 2

10. Sixteen night-light collections were made during the cruise. Perhaps more night light fishing could or should have been done, particularly on the hydrographic stations, however, with an average time of 1 1/2 hours spent on station, of which one-half hour was taken up with the plankton tow, a relatively short interval of time remained for night lighting. Also, there were usually enough sea running to provide poor visibility in the surface waters, consequently there was a tendency to neglect this phase of our duties.

11. As the new high speed depressors did not arrive in time for this cruise, no deep trolling tests were made.

12. Synoptic weather observations were made, encoded and given to the radio operator for transmission at 0000, 0600, 1200 and 1800 GCT each day except when within a 100 mile radius of a regular reporting station.

13. The recording thermograph was operated continuously while at sea, except for the time spent at Canton Island. While longlining the ship was making short runs in waters close to the island and there was much starting and stopping. As such an operation would result in a very erratic thermograph trace of little value for its temperature data, the machine was not kept in operation during this period.

14. The recording barograph was operated continually during the entire cruise.

15. The Bendix Depth Recorder gave continuous service while the ship was underway, except for two short periods when it was out because of minor mechanical difficulties. To the best of my knowledge, without reviewing all the records, no evidence of a deep scattering layer was obtained. Quite frequently, however, the presence of fish schools was indicated. The Submarine Signal recording and non-recording depth finders were operated intermittently.

The Bendix machine has a tendency to heat-up when windows and doors to the wheel house are closed. When properly ventilated, the machine appears able to withstand continuous operation.

16. Summary of collections of other biological materials and data.

a. Morphometric measurements on the "long form" were made

on only four fish (3 yellowfin and 1 kawakawa). Comparative American and European morphometeic measurements were made on 21 fish (19 yellowfin and 2 albacore).

b. The total (fork) length in millimeters was obtained of all fish caught by trolling, the length and weight of all tunas taken on the long-line, and the length and estimated weight of the marlin taken on the long line.

c. Gonad samples were preserved from all female tunas taken on the cruise, except those which were so badly shark-eaten as to have the gonads destroyed.

d. Stomachs were preserved from all tunas except those which were badly shark eaten.

e. Vertebrae sections were preserved from a representative member of tuna of each species taken.

f. Samples of the two species of mullet used for bait in the long line fishing and specimens of other bait fish collected on the cruise were preserved for later identification and study.

IV GENERAL DISCUSSION

A. Hydrographic work

Favorable weather with moderate winds prevailed during the hydrographic portion of the cruise; this together with the absence of strong currents resulted in relatively low wire angles on the water bottle casts, thus providing ideal conditions for obtaining accurate oceanographic data.

In general the Nansen water bottles worked satisfactorily. The GM thermometers failed on a few occasions but the Richter-Wiese thermometers used on the last half of the cruise gave perfect performance.

At Station 16, with the cast down, the motor to the hydrographic winch shorted out. The trouble was due to moisture in the electrical system. After restoring the water-soaked insulation and retaping connections, we were able to complete the station. It was generally agreed that the electrical wiring leading to the winch should be relocated.

Also, it was agreed that the present cable arrangement is very unsafe. In the event of cable breakage, those persons handling water bottles would certainly be severely injured. Also there is the continual danger of a wire burn from brushing or falling against the moving cable.

During the short period of disuse, from July 12 to July 27, the winch was repeatedly immersed in salt water and at the start of Station 28 was found to be badly frozen-up. Considerable time and effort was required to free the clutches and brake.

On the deep casts, to 3000 or 4000 meters, much time was lost in retrieving the wire because of the necessity of stopping continually to adjust the level winder. The poor functioning of the lever winder may be disregarded in the shallow casts but on the deeper casts it is necessary to build up a smooth core to avoid injury to the cable.

The oxygen analyses were made without difficulty. The lumetron used in the measurement of inorganic phosphate gave trouble

repeatedly, and except for the efforts of Al Akana, would have been out for most of the trip. As it was, some of the data obtained may not be entirely reliable.

During the first half of the cruise a method of carbon analysis was tried and after several trials abandoned. The results obtained were obviously not accurate as they showed poor agreement among identical samples and among two or more controls, and also the analyses required more distilled water than our supply allowed. Additional laboratory work is required if the method is to be perfected and adapted to shipboard use.

B. Plankton Sampling

Fifty-one oblique plankton tows were made without mishap to nets or other gear. The winch operated satisfactorily. The plankton collections varied from poor to rich and some on superficial examination appeared to contain quite a few fish eggs and larvae.

The current meters used with the plankton nets were calibrated in Pearl Harbor at the beginning and at the completion of the cruise.

C. Long Line Fishing

Summary of Catch (Table on next page)

SUMMARY OF CATCH

	7/15	7/16	7/17	7/18	7/19	7/20	7/21*	Totals
Tuna: Yellowfin								
Bait: herring	3	2	1	2	12			20
mullet	6	4	11		11		21	53
Hook depth 22 f.	5	1	3		7		4	20
40-50 f.	2	4	3	1	10		8	28
60-70 f.	2	1	6	1	6		9	25
Yellowfin Totals	9	6	12	2	23		21	73
Albacore								
Bait: herring				2				2
mullet							2	2
Hook depth 22 f.								
40-50 f.				1				1
60-70 f.				1			2	3
Albacore Totals				2			2	4
Marlin								
Bait: herring			1					1
mullet	1		1		1		11	5
Hook depth: 22 f.								
40-50 f.			2				1	3
60-70 f.	1				1		1	3
Marlin Totals	1		2		1		2	6
Sharks	11	6	16	1	11	6	3	54

*On this day all hooks were baited with mullet.

During the early part of the cruise the fishermen prepared the long line gear for use at Canton Island. By the time we reached the fishing grounds 47 baskets were ready for fishing. Approximately thirty baskets were fished each day. This amount proved to be about all that could be handled aboard the Smith, since during this period we were catching quite a few fish and having considerable trouble with sharks.

Each day from 5 to 10 baskets of gear would be so badly tangled that they would have to be completely worked over before they could be fished again. Part of the trouble was due to the large number of sharks in the area. The marlin also gave trouble. Whenever one of these fish was hooked it usually entangled a complete basket of gear before taken off.

About a third of the fish were shark eaten; just the head remained on some. As these carcasses were being brought-in the sharks would feed right up to the rail of the ship.

There were many instances of snap failure, particularly in the wire line snaps and the small spring type (harness?) snaps, resulting in loss of fish, droppers and float lines. The brass halyard snaps seemed to hold up pretty well.

By the end of the week's fishing, the main line was becoming frayed and snagged from being pulled under the ship. It was pulled in two by the line hauler on a number of occasions, causing delay in recovering the line.

It was the general consensus of opinion after this experience that the Smith is far from being an ideal long-line vessel. Its

unmaneuverability results in much loss of time, loss of fish, broken line and frayed nerves. Perhaps 20 baskets of gear can be fished from the Smith on an experimental basis and much valuable information obtained. It does not appear possible, however, to fish on a commercial scale with 50 or more baskets and achieve results comparable to those of a commercial long-line vessel. One additional reason being that the Smith cannot patrol the line properly. On several occasions, 15 to 30 min. were required to pick up a buoy and some times after making two or three passes at a buoy - which was showing indications of a fish on - we would have to give up as the ship could not be brought to within a short throwing distance of the buoy.

When we did manage to pick up a buoy it had to be done at the bow of the ship and, because of the high bow and rapid drift of the ship, usually resulted in one or two baskets of gear being greatly pulled out of line and later entangling.

The line hauler worked quite satisfactorily on the cruise, although it was developing a little noise on the last day of fishing.

If we discount the last day's fishing, on which all hooks were baited with mullet, we still find that the majority of the tuna were taken on fresh (non-living) mullet as contrasted with frozen herring. On certain days the hooks would be baited alternately with mullet and herring, on others entire baskets would be baited alternately with mullet and herring. We found it much easier to keep records on the relationship of catch to bait when the latter method was used. It was observed that mullet stayed on the hook much better than herring; this might also

have influenced the catch.

Tuna were taken in almost equal numbers at all three of the depths fished. There were just half as many deep droppers fishing, however, as there were shallow or intermediate droppers. If the results are "weighted" to take into consideration this difference in availability or effort, then it appears that approximately twice as many fish were taken "per hundred hooks" at the 60 to 70 fathom level as were taken at 40 to 50 fathoms or at 22 fathoms.

In looking over the results of the week's fishing, one sees also that more fish came from the leeward side than the windward side of the island and more within 3 to 10 miles of the island than from 15 to 20 miles distant. Of course, these generalizations are based on observations made during a short period of time and may not hold when additional data are obtained.

D. Bait Surveys and Bait Fishing

Our bait surveys of the Leeward Islands were sufficiently complete to convince us that the bait fish "Iao" was very scarce during the time we visited the islands. We are wondering if this apparent scarcity of bait might possibly be related to the large populations of nesting birds which inhabit and rear young on these islands during the late spring and summer months.

Piles of regurgitated squid beaks found near young albatross indicate that squid may be a fairly important item in the food of these birds. The terns, however, are believed to feed on small fish and these birds are by far the most abundant forms inhabiting the islands. French Frigate Shoals, Laysan Island, Lisianshy Island and Pearl and Hermes Reef were each supporting colonies made

up of several hundred thousand terns of several different species. A tremendous amount of food must come from adjacent waters to feed these adults and their young.

On the morning of July 14 about 450 lbs. of mullet were obtained in three sets in the Canton Island lagoon. The catch from the first set, about 250 lbs., were kept alive in the forward bait tank and some withdrawn each day for long line bait. Only a very slight mortality occurred; some of the fish were still living and in good condition on the last day of fishing, July 21. Oxygen and temperature measurements, made during the first four days after the fish were put in the tank, showed little difference in temperature between water in the tank and alongside the ship and only a slight decrease in oxygen within the tank, not sufficient to have an adverse effect upon the fish.

E. Tuna Schools and Related Phenomena

During the early part of the cruise schools of fish, probably Aku and Kawakawa, were sighted near Kaula, Necker, and Laysan Islands and also on the approach to Pearl and Hermes Reef. On July 12, numerous schools of both large and small fish with some large "jumpers", were seen close to the beach at Hull Island.

The few fish observed on the long north and south runs appeared along what was believed to be the northern boundary of the counter-equatorial current. In general, however, a greater number of fish and associated birds were seen in areas close to land than in the open ocean.

F. Collaboration with the Territorial Division of Fish and Game and the Department of Zoology, University of Hawaii.

Both Mr. Brock and Dr. Cosline stood regular watches and performed their full share of duties during the cruise. The trip might have been more enjoyable for them if they had not been worked quite so hard, but on the other hand, we would have been short-handed without their assistance.

G. Miscellaneous Biological Observations

1. As previously reported, very few living pearl oysters were found at Pearl and Hermes Reef, also only a few dead shells were found. It would appear that either the oysters have been taken out since Dr. Galtsoff's survey in 1930 or some environmental change has occurred, which has rendered the area less suitable for oyster growth and reproduction.

On Southeast Island we found rather large shell piles resulting from the fishing of Capt. William A. Anderson in the late 1920's and some, possibly, from Dr. Galtsoff's survey in 1930.

2. Green sea turtles were common to abundant throughout the Leeward Islands and the native Hawaiian seal appeared in no danger of becoming extinct. The latter was seen on all the islands and in considerable numbers - at least 100 were observed on the beaches of Lisiansky for example. Galtsoff counted 63 seals at Pearl and Hermes Reef in 1930; our estimate would be that about twice that number were present in the area at the time of our visit. Many of the females were accompanied by young, some a few days or weeks of age, others about half to three quarters grown.

3. List of Birds Seen on or Near the Leeward Islands, June, 1950.

	Nesting
Black-footed albatross	X
Laysan albatross	X
Wedge-tailed shearwater	X
Christmas Island shearwater	X
A small unidentified shearwater	
Bulwer's petrel	
Red-tailed tropic bird	X
White-tailed tropic bird	
Man-O-War bird	X
Laysan teal (only on Laysan Island)	X
An unidentified eagle (on Lisiansky Island)	
Golden plover	?
Ruddy turnstone	?
Bristle-thighed curlew	?
Sooty tern	X
Gray-backed tern	X
Common noddy tern	X
Hawaiian noddy tern	X
White tern	X
Necker Island tern (only in vicinity of Necker Island)	
Blue-faced booby	X
Red-footed booby	X
Brown booby	X
Laysan finch (only on Laysan Island)	X

It was very encouraging to find a small flock of perhaps 20 adult Laysan teal, some with young, still existing on Laysan Island. The Laysan finch was everywhere abundant on the island. On our short visit we failed, however, to find the Laysan rail, the Miller bird and the red honeysucker found there by Fisher in 1902. These may now all be extinct.

The eagle seen on Lisiansky was of a size and coloration to agree with Mayr's description of Sanford's eagle of the Solomon Islands. None of the available bird books list an eagle for the North Central Pacific. This bird, whatever its species, was certainly well outside its usual range.

Joseph E. King

Joseph E. King

August 16, 1950

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

NATIONAL MARINE FISHERIES SERVICE, NWFC
MARINE MAMMAL DIVISION
NAVAL SUPPORT ACTIVITY, BLDG. 192
SEATTLE, WASHINGTON 98115

4 August, 1976

Dr. George H. Balazs
Hawaii Institute of Marine Biology
University of Hawaii at Manoa
P. O. Box 1346
Coconut Island, Kaneohe, Hawaii 96744

Dear George:

We appreciate your sending us your Green Turtle reprint and the newspaper clippings. I have xeroxed the Midway clippings for Karl.

Regarding the copulating turtles on Southeast Island, Pearl and Hermes Reef I have gone over my notes and find only that I noted 12 turtles at the location where the copulation occurred (a short distance NE from the refuge sign). I will check with Karl and Bob to see if they needed any other observations.

I also found that I didn't record my turtle observations in Appendix 3 for 3 April-Lisianski Island. For your information I'll list them here:

3 April Lisianski Island
4 Turtles, 2 of which were copulating. No record kept of time they were locked when first seen and we were in the area only a few minutes.
Location - Eastside near Messerschmidtia. (Black/white print encl).
1 large turtle - Location - Eastside between Messerschmidtia and Stump.
1 medium turtle - location - near Southwest Point.

In case Fred did not send you the tag number of dead tagged turtle found 29 March on Lisianski, it was T-258.

We will be working in the Leewards again next spring and summer, but our plans are not finalized. We will keep you informed and be happy to gather information for you on the turtles.

Sincerely,

Clifford H. Fiscus
Wildlife Biologist

PROJECT PROPOSAL, NORTHWEST HAWAIIAN ISLANDS SEABIRD PROGRAM

I. Comparative Feeding Ecology of Hawaiian Islands Seabirds

A. Collection and analysis of stomach contents
1. Analyze previously collected stomach material from POBSP (formal request for printouts of available material has been sent to Dr. Frank Ferrari, Smithsonian Oceanographic Sorting Center)
2. Collect a monthly series of 20-50 stomach samples/species at Midway/Kure, Kauai (Wedge-tailed Shearwater), and Oahu. Emphasis shall be on species whose numbers and/or biomass indicate a relative importance within the Hawaiian seabird community. Analyze contents for identification of prey items, volume, number, and frequency of occurrence by month and atoll.
3. Collect samples on other islands in the archipelago as logistics, personnel, and funding permit and which does not interfere with (2) above.
   a. collect adequate sample sizes (50-100) on French Frigate Shoals to test hypothesis that seabirds on other atolls have similar diets to those on Midway (2 trips/year)
   b. collect samples from birds which do not occur on Midway, Oahu or French Frigate Shoals
      1. Blue-gray Noddy from Nihoa/Necker
      2. Bulwer's Petrel from Nihoa/Laysan
      3. Christmas Shearwater from Nihoa/ Laysan
   c. irregular platforms of opportunity cruises to other atolls as personnel permits and which does not interfere with regular sampling program

B. Study of basal metabolic rates
1. Honolulu Zoo (Pete Luskum, collaborator) feeding study to determine g/day of fish or squid to maintain stable body weight for various seabird species
2. collaboration with Causey Whittow to determine basal metabolic rates

C. Simultaneous collection of seabirds and fish (aku, ahi) to analyze stomach contents of both and to better understand trophic relationships of fish schools and bird flocks

II. At-sea Distribution and Abundance

A. Analysis of data compiled by POBSP program (formal request for this data has been filed with Dr. George Watson, Smithsonian).

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1. satellite telemetry of Laysan/ Black-footed Albatross to acquire detailed activity patterns and foraging locations (contingent on $55 K research and development money to engineer transmitters)
2. conventional telemetry of Sooty Tern, Brown Noddy, boobies and shearwaters in collaboration with Daniel Stoneburner, NPS. Initial study must take place on Oahu and Midway.

B. Site-specific surveys of selected atolls
    1. Shipboard surveys from Cromwell
        a. mark selected bird species prior to survey
        b. analysis of habitat utilization of reef, reef slope, and deep water
        c. analysis of diurnal distribution patterns
        d. repeatability of results (same tracklines at same time of day on successive days).

    2. Aerial surveys (contingent on $30-40 K for platform or military support)
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C. Shipboard data acquisition when transiting between islands to fill data gaps identified after analysis of POBSP data.

III. Site-specific Colony studies (Breeding Biology; Populations)
A. Activity patterns on study plots of selected species on Midway/Kure, Kauai, and possibly French Frigate Shoals
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    1. Analyze POBSP population estimates in atoll research bulletins
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IV. Allied research by other organizations
A. Support a study to identify and quantify fish, squid, and invertebrates in upper 5-10 m of water column
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C. Support a study of the role of seabird guano in nutrient cycling of nitrates and phosphates in the coral atoll ecosystem.

Craig S. Harrison, Seabird Biologist
J. Brent Giezentanner, Refuge Manager

FOR YOUR INFORMATION

JUL 05 1978

United States Department of the Interior

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

IN REPLY REFER TO: RF

June 29, 1978

Dr. Jack Davidson, Director
Sea Grant
2540 Maile Way
Spalding 255
Honolulu, HI 96822

Dear Dr. Davidson:

I have recently heard that your Sea Grant Proposals for research in the Northwestern Hawaiian Islands have been approved and that you are now getting ready for the upcoming field seasons. These projects are certainly worthwhile and should contribute much basic knowledge to our understanding of the area.

As we have pointed out in various meetings and workshops, those projects which require entry into the refuge must have a Special Use Permit issued by my office prior to entry into the refuge. Sea Grant is not a signatory of the Triparty Agreement and is therefore not covered under Triparty permit exemptions. In order for the permits to be issued in a timely manner and to assure that any areas of conflict between proposals can be mutually resolved, I urge you to apply to our office as soon as your specific trip needs are finalized. We will need (1) a copy of the specific research proposal with a description of methods, (2) the name and skipper of the vessel, (3) name of each of the research personnel, (4) on any proposals which impact on or affect any marine mammals, endangered or threatened species, or migratory birds, copies of the appropriate approved endangered species, marine mammal, or migratory bird permits.

I hope this information will assist you in getting your permits in a timely manner.

One last note. I noticed on the logistics and access handout that the statement was made that the Coast Guard did not require written permission before access was granted to Tern Island. Although this may be so, they do require that all persons (other than Coast Guard) have approval by Special Use Permit from my

office before they approve of entry to Tern Island. Tern Island is part of the refuge, and the Coast Guard maintains their facility under a Cooperative Agreement with the Fish and Wildlife Service.

Sincerely,

J. Brent Giezentanner

J. Brent Giezentanner
Refuge Manager

Mr. George Balazs

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

Date: July 28, 1978

Reply to Attn. of: F142

To: Participants, Northwestern Hawaiian Islands study

From: Robert A. Skillman, Coordinator, NWHI Study

Subject: Summary of July meeting; notice of August meeting

On 18 July we held our first monthly meeting of the participants in the cooperative Northwestern Hawaiian Islands Study. The purpose of these monthly meetings is to keep everyone informed of the status of the various projects, research proposals, any new developments, as well as to find solutions to any problems that may have developed. From the response and participation of those attending this meeting, it was certainly a success and does fill a communication need.

The next meeting will be held on 15 August 1978 at 1000 hours in the Seminar Room of the Honolulu Laboratory. There will be a one-hour seminar followed by a one-hour business meeting. The business meeting will center on scheduling matters, specifically the cruise schedule of the Townsend Cromwell and its use by the NMFS, HDFG, and USFWS, cruise plans of the University of Hawaii Sea Grant Program, and the cruise/survey schedule of the Marine Mammal Division, Northwest and Alaska Fisheries Center, NMFS.

The need to bring all of the individual projects together into a cohesive, systems analysis package was discussed at this meeting. While the NWHI Study was originally conceived as a systems study, it has developed in steps as interested groups became involved. Also, second year funding from Sea Grant will depend in part on whether the separate projects can be made a whole. As a start in this direction, Richard S. Shomura has arranged for Loh Lee Low of the Northwest and Alaska Fisheries Center to present a one-hour seminar on a systems analysis study of the living resources of the Bering Sea. Following our meeting, Mr. Low will be at the Honolulu Laboratory for the remainder of the 15th and then the 16th to work with us in analyzing our projects in terms of the systems approach. The scheduling of these sessions will be worked out later.

The seminar presentation at our first meeting was made by Craig Harrison, Seabird Biologist, who presented the USFW's project proposal for the NWHI Seabird Program. The presentation was well-received and elicited discussion among the attendees. The proposal is enclosed for your files. On the section on Study of Basal Metabolic Rates, it was suggested that measurement of excretion and secretion might provide a measure of the amount of nutrients imported into the insular and island areas. On the subject of telemetry, it was suggested that the NMFS, Bay St. Louis laboratory might be able to provide technical assistance. The subject of population estimates of seabirds resulted in much discussion, for example, the use to be made of the population estimates, their accuracy, whether absolute or relative estimates were needed, the possibility of measuring such things as clutch size, egg size, and chick growth to assess the success of the population, and ability to monitor daily immigration and emigration.

Hope to see all of you next month.

Enclosure

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Craig S. Harrison, Seabird Biologist
J. Brent Giezentanner, Refuge Manager

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 78-02 (TC-79)

CRUISE PERIOD: May 9-July 21, 1978

AREAS OF OPERATION: Waters off Guam and the Northern Mariana Islands

ITINERARY:

May 9 - Loaded vessel, departed Kewalo Basin, Honolulu for Guam.

May 22 - Arrived Guam.

May 25 - Departed Guam and surveyed waters around Santa Rosa Reef, Galvez Bank, and "17-mile" Bank.

May 30 - Arrived Guam, disembarked and embarked personnel, departed Guam, and surveyed waters over undersea features to the west of Guam and the Northern Marianas including Arakane Reef, Pathfinder Reef, Stingray Shoal, and two unnamed "seamounts."

June 8 - Steamed eastward from Stingray Shoal to Northern Marianas and surveyed waters around Supply Reef, Maug, Asuncion, and Pagan.

June 15 - Arrived Saipan.

June 18 - Departed Saipan and surveyed waters around Alamagan, Guguan, Sarigan, Farallon de Pajaros, Zealandia Bank, Saipan, and Tinian.

June 27 - Arrived Tinian.

June 28 - Departed Tinian and surveyed waters around Tinian.

June 29 - Arrived Guam for engine repair.

June 30 - Departed Guam and surveyed waters around southern Guam near Cocos Island and Galvez Bank.

July 3 - Arrived Guam.

July 5 - Departed Guam, retrieved one drifting buoy for the Atlantic Ocean Meteorological Laboratory (AOML), conducted surface plankton tows, and made XBT casts routinely.

July 21 - Arrived Kewalo Basin; end of cruise.

MISSIONS AND RESULTS:

A. The primary objective of the cruise was to assess the developmental potential of demersal and pelagic resources over "seamounts," banks, and other undersea features including the shelves and slopes around Guam and the Northern Marianas. The sampling methods included lobster, fish, and shrimp trapping, handline fishing for bottom fish, night-light fishing for squids and bigeye scad, Trachurops crumenophthalmus, bottom trawling for demersal fish and shellfish, and trolling for tuna and tunalike fishes.

1. Trapping

Three types of traps were used during trapping operations. These were as follows:

Fish trap, two chambered, constructed of reinforcing steel rods and galvanized 2.5-cm square wire mesh, measuring 152.4 x 91.4 x 61.0 cm, three conical entrances.

Lobster pot, two chambered, constructed of galvanized 5.1 x 10.2 cm wire mesh, measuring 94.0 x 74.3 x 41.9 cm, three conical entrances.

Shrimp pot, single chambered, double wall construction of galvanized 5.1 x 5.1 cm wire mesh (inside) and 1.2 x 1.2 cm wire mesh (outside), covered with burlap on four sides, measuring 91.4 x 72.4 x 41.9 cm, two conical entrances.

Twenty-three trapping stations were occupied during the cruise. The number of gear set at these stations varied from 4 to 20 for fish traps (4 per string set 36 m apart), 8 to 40 for lobster pots (8 per string set 36 m apart), and 6 to 9 for shrimp pots (3 per string set 36 m apart).

Frozen common mackerel, Scomber australasicus, was used as bait at all trapping stations. Because of the limited amount of frozen bait carried during the cruise, mackerel was supplemented with various other species caught by trapping, handlining, and trolling. The traps were usually set between 1700 and 1800, "soaked" overnight, and retrieved between 0800 and 1100.

The traps caught 489 fish of several species, 6 spiny lobsters, Panulirus penicillatus, P. versicolor, and P. femoristriga, and 9,320 shrimps, Heterocarpus ensifer and H. laevigatus. Among commercially valuable fish caught were Lutjanus bohar, L. gibbus, L. kasmira, Lethrinus variegatus, L. miniatus, Adioryx spinifer, A. tiere, A. andanensis, Epinephelus emoryi, Myripristis berndti, Caranx lugubris, and C. ferdau.

Whitetip sharks, Triaenodon obesus, occurred in the traps frequently and were a nuisance at many of the handline and night-light fishing stations. They were particularly abundant in the trap catches at No-Name Bank A (an unnamed bank 256 km due west of Rota), Farallon de Medinilla, and Galvez Bank.

Heterocarpus ensifer and H. laevigatus catches were relatively high at several locations. At Guguan, the catch rate reached 175.2 shrimps per pot with nine pots fishing. At Agrihan, Farallon de Medinilla, and Pagan, the catch rates were only slightly lower reaching 161.2, 160.7, and 158.6 shrimps per pot, respectively. Other areas with a good catch rate included Asuncion, where it was 130.5 and west Saipan, where it reached 100.2 per pot.

The white eel, Congridae, predominated among other organisms caught in the shrimp pots. Several unidentified species of shrimp also occurred in the catches at a few stations.

2. Handlining

Twenty-one handline fishing stations were occupied during the cruise. Twenty were day stations, usually occupied between 1200 and 1700 and one was a night station occupied from 2000 to 2100. Usually, four-five lines were fished at each station. The gear consisted of two hydraulically powered gurdies, two

electric, battery-powered reels, and one manually fished handline. Each line fished from four to eight hooks; however, as the cruise progressed, the four-hook terminal rig was used more frequently because of the ease in handling the catch. Cut bait included frozen squid, fish flesh from skipjack tuna, Katsuwonus pelamis, yellowfin tuna, Thunnus albacares, rainbow runner, Elagatis bipinnulatus, white eel, Congridae, and common mackerel. Fishing was usually most productive between 128 and 240 m.

Species most frequently caught by handlining were Rooseveltia brighami, Caranx lugubris, Pristipomoides auricilla, and P. flavipinnis.

In general, catch rates were relatively high around the offshore reefs, banks, and "seamounts," averaging 1.9 fish per line-hour or nearly twice that for stations occupied in waters around the high islands. One exception, however, was at Maug where the catch rate reached 5.7 fish per line-hour in 1 h of fishing The overall catch rate around the high islands was only 1.0 fish per line-hour.

3. Night-light fishing

Nineteen night-light stations were occupied while either anchored or adrift at night in attempts to attract and capture squid, bigeye scad, and round-head anchovy, Stolephorus buccaneeri. A 1,500-W bulb, attached to a rheostat, was lowered to about 20 m initially, then raised to about 10 m from the surface after 0.5-1.0 h. The light was finally raised to within 2 m from the surface after the second hour and kept there for the remainder of the night-light station. The light was usually set between 1900 and 2000 and secured at 2200; however, at some stations where bigeye scad schooled under the light, the stations were occupied until about 0300.

Both mackerel handline and rod and reel were used in fishing for bigeye scad and squirrelfish, Myripristis berndti. The terminal rig usually consisted of four lures or "fly" made of nylon floss. When biting slowed during fishing for bigeye scad, the tough outer skin covering the premaxilla (upper

lip) was sometimes used with considerable success. Cut bait was occasionally used when fishing for species other than bigeye scad and squirrelfish.

Night-light fishing produced 2,787 bigeye scad. Because bigeye scad fishing is influenced by the moon phase, catches were very poor during the full moon but relatively good during the dark of the moon including the periods up to the first quarter and after the third quarter. Among the areas that yielded good catches were Galvez Bank, Arakane Reef, Pathfinder Reef, No-Name Bank B, and Agrihan. The relatively poor bigeye scad fishing around the high islands is undoubtedly the result of sampling in these areas just before, during, and immediately after the full moon.

Squirrelfish did not occur in abundance at any of the areas fished. A total of 78 were caught at scattered locations; the most productive area was at Arakane Reef where 50 were caught in one night's fishing.

In addition to bigeye scad and squirrelfish, night-light fishing was productive for dogtooth tuna, Gymnosarda unicolor, which was caught on rod and reel with flyingfish captured under the night light, and for a variety of snappers, groupers, carangids, and others including Caranx lugubris, C. sexfasciatus, C. ferdau, Lethrinus variegatus, Lutjanus bohar, L. kasmira, L. gibbus, Aphareus rutilans, Sphyraena jello, Gnathodentex aurolineatus, Priacanthus cruentatus, Adioryx spinifer, A. tiere, and Epinephelus emoryi.

The night light also attracted baitfish and squids at some locations. Off Cocos Island, up to 30 buckets (one bucket equals 6.4 kg of bait) of a mixed school of silverside, Atherinidae, and small round herring, Dussumieriidae, congregated around the light. While docked at Tinian Harbor, a night-light station attracted about 10 buckets of small cardinalfish, Apogonidae. The largest accumulation of baitfish under the night light--about 50-60 buckets of small round herring--was observed at Maug Lagoon.

Although squids readily congregated around the periphery of the night light at several stations, the lures and bait used were not effective in catching them in quantity. Only two were taken on hook and line during the cruise. At one environmental station occupied off Saipan, a large school of squid congregated under the deck light during the CTD cast. Attempts to capture them with lures failed.

4. Trolling

A total of 63.77 daylight hours of direct and 38.72 h of indirect trolling were conducted with three lines for pelagic species of fish. The catch included 101 yellowfin tuna, 31 skipjack tuna, 8 mahimahi, Coryphaena hippurus, and 80 rainbow runner. The catch rate was highest at Stingray Shoal where it reached 5.9 fish per line-hour in 2.42 h of trolling. Other areas yielding high catch rates included an unnamed bank 334 km due west of Alamagan (called No-Name Bank B hereafter) where it reached 4.4 fish per line-hour, Pathfinder Reef where it was 3.6 fish per line-hour, and No-Name Bank A and Supply Reef where it reached 3.5 fish per line-hour.

Of the 226 fish caught by trolling, 75 yellowfin tuna, 20 skipjack tuna, and 19 rainbow runner were tagged and released.

Incidental trolling conducted while traveling between Honolulu and Guam yielded only one 7.3 kg skipjack tuna.

Direct trolling conducted around the satellite-tracking buoy produced four mahimahi, five wahoo, Acanthocybium solandri, and one yellowfin tuna.

5. Trawling

Only two bottom trawl hauls, one of 10-min and the other of 20-min duration, were made during the cruise. Both were day hauls and failed to capture fish in any quantity.

The Cobb midwater trawl was also used during the cruise to sample the water column. One oblique haul was made to 750 m and two others were 1-h

surface hauls down to a depth of 50 m. Of significance in the midwater trawl catches was the occurrence of several roundhead anchovy in one surface haul and of one mackerel scad, Decapterus sp. in the other surface tow. Other organisms that occurred in abundance in the surface hauls included eel leptocephalus and the broad, thin phyllosoma of the spiny lobster.

B. Miscellaneous observations and activities.

1. Twenty-three coral drags were made in depths ranging from 42 to 457 m of water. Bottom type was characteristically rocky and two sets of gear were lost. The drag was towed downslope in many cases and across flat bottoms where conditions permitted.

No potential commercial coral grounds were found, and indeed no precious coral (pink, gold, or black) was discovered. Small specimens of deep-water black corals were frequently caught in the nets, but none was larger than 3-4 mm in diameter. The species collected were as follows:

Black corals:

Cirripathes spiralis (most common)
Cirripathes anguina
Antipathes sp.
Parantipathes sp.
Unidentified specimen

Stony corals:

Pocillopora meandrina
Pocillopora molokensis (?)
Leptoseris incrustans
Unidentified specimens (3 species)

Also collected were many species of gorgonians, algae, bryozoans, sponges, echinoids, and crinoids.

2. Three environmental stations, which included CTD casts to 1,000 m, plankton hauls with a bongo net to 100 and 200 m, and XBT casts, were occupied during the cruise.

3. Two hundred ninety-seven fish were sampled for ciguatoxin. Samples collected included 297 pieces of dorsolateral muscle, 219 pieces of abdominal muscle, 229 gonads, and 160 pieces of liver. Among the species sampled were Lutjanus bohar, L. kasmira, L. gibbus, Rooseveltia brighami, Pristipomoides auricilla, P. microlepis, P. flavipinnis, P. sieboldii, Etelis marshi, E. carbunculus, Lethrinus variegatus, L. miniatus, Caranx sexfasciatus, C. lugubris, Carangoides ferdau, Elagatis bipinnulatus, Seriola dumerilii, Gymnosarda unicolor, Epinephelus emoryi, Cephalopholis aurantius, C. sexmaculatus, Paracaesio caeruleus, Gymnothorax eurostus, Gymnocranius japonicus, Tropidinius amoenus, Variola louti, Aphareus rutilans, Sphyraena jello, and Gnathodentex aurolineatus.

4. Conducted reconnaissance hydrographic surveys over the top of "seamounts" such as Arakane Reef, Pathfinder Reef, Stingray Shoal, Supply Reef, No-Name Banks A and B with the Simrad EQ echo sounder. Echograms were also made while scouting for trawlable grounds and prior to trapping and bottom trawling operations at various localities throughout the area of operation.

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

6. Of 62 bird flocks sighted during the cruise, 4 were associated with yellowfin tuna, 6 with skipjack tuna, 2 with mixed skipjack-yellowfin tuna schools, 1 with rainbow runner, and 2 with flyingfish. The remaining 47 bird flocks were associated with unidentified fish schools.

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

8. Lengths and, in some cases, weights were collected from 45 different species of fish caught during the cruise. Unidentified fish were preserved and brought back to the laboratory for identification.

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

10. Surface plankton tows of 10-min duration were made at several locations while en route from Guam to Honolulu.

11. One drifting satellite-tracking buoy, located in the western central Pacific, was retrieved while en route from Guam to Honolulu.

SCIENTIFIC PERSONNEL:

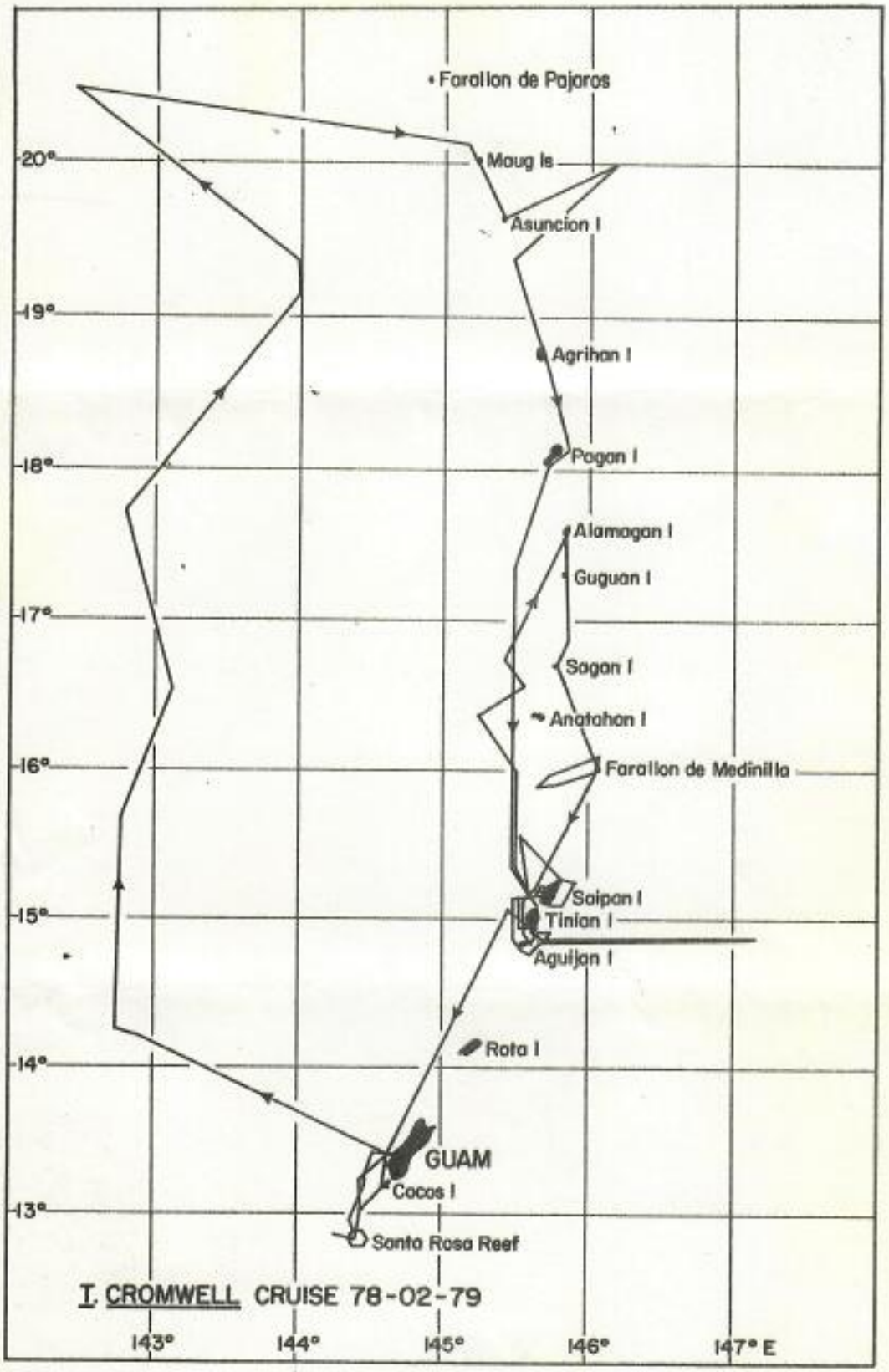
Richard N. Uchida, Chief Scientist, Fishery Biologist, NMFS, SWFC, HL (30 May-4 July)
Paul M. Shiota, Research Assistant, NMFS, SWFC, HL (30 May-4 July); Acting Chief Scientist (9-29 May)
Robert B. Moffitt, Research Assistant, NMFS, SWFC, HL (9 May-4 July); Acting Chief Scientist (5-21 July)
Robert E. Campbell, Cooperating Scientist, Manager, Marianas Divers (25-30 May)
Frank Cushing, Cooperating Scientist, Marine Laboratory, University of Guam (18-29 June)
John Eads, Cooperating Scientist, Marine Laboratory, University of Guam (24 May-15 June)
Greg Gordon, Cooperating Scientist, Division of Fish and Wildlife, Government of Guam (25 May-3 July)
Michael Palmgren, Cooperating Scientist, Sea Grant, University of Hawaii (30 May-4 July)
Richard Sakamoto, Cooperating Scientist, Marine Laboratory University of Guam (25-30 May)
Robert D. Smith, Cooperating Scientist, President, Smithco, Guam (25-30 May)
Henry Tucker, Cooperating Scientist, Division of Fish and Wildlife, Government of Guam (25 May-3 July)

Submitted by: Richard N. Uchida
Chief Scientist

Approved by: Richard S. Shomura
Director,
Honolulu Laboratory

Attachment

July 28, 1978



I. CROMWELL CRUISE 78-02-79

NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center
Honolulu Laboratory

September 8, 1977

To: Staff

From: Richard S. Shomura, Director, Honolulu Laboratory

Subject: Townsend Cromwell cruise schedule and personnel assignment

For our field work in Calendar Year 1978, I have prepared an updated schedule of cruises and personnel assignments. The schedule and assignments are by no means final and are subject to change. You will be informed of any changes as soon as possible.

Cruise No.	Date	Personnel
TC 78-01	1/4-3/20/78	Thomas S. Hida (Chief Scientist) Glenn Higashi Darryl Tagami Martina Queenth Technician (vice Humphreys) (Possibly, two cooperating scientists from Oregon State University)
TC 78-02	5/6-7/3/78	Reginald M. Gooding (Chief Scientist Fishery Biologist (Fishery Monitoring and Assessment Task) Robert Moffitt Technician (vice Humphreys) Technician (temporary hire) Roy Mandelssohn (first half of cruise) Hawaii Division of Fish and Game scientists to be named)
TC 78-03	7/24-9/30/78	James H. Uchiyama (Chief Scientist, first half of cruise) Paul M. Shiota (Chief Scientist, second half of cruise) Technician (vice Higashi) Technician (vice Tagami) Technician (vice Queenth) Michael Adams (first half of cruise) Gary Tamer (second half of cruise)

TC 78-04	10/16-12/20/78 (Starting date may be changed to 10/11/78)	Richard N. Uchida (Chief Scientist) Thomas K. Kazama Technician (vice Humphreys) Technician (temporary hire) Personnel from research units of Guam and the Marianas Islands (to be named)

Townsend Cromwell Cruise Schedule

FY 1977

Cruise No.	Date Start	Date End	Days at sea	Shore time[1]	Area and type of operation
TC-76-06 (TC #73)	10/05/76	12/03/76	50 (6 lost)	6	NWHI-insular resources survey, tuna physiology
TC-77-01 (TC #74)	1/05/77	3/25/77	73	6	Equatorial central Pacific-porpoise survey
HAUL OUT	April				Honolulu
TC-77-02 (TC #75)	5/02/77	8/17/77	104	10	NWHI-insular resources survey and nearshore resources survey, live tunas for tuna ecology, aggregation
TC-77-03 (TC #76)	9/05/77	9/30/77	23	3	NWHI-insular resources survey; main islands-physiological ecology, aggregation, ikasibi
		Total	250		

FY 1978

TC-77-03 (TC #76) (Contin.)	10/01/77	11/12/77	37	6	(Continuation)
TC-77-04 (TC #77)	11/17/77	12/21/77	30	2	Equatorial central Pacific-aggregation objects
TC-78-01 (TC #78)	1/04/78	3/20/78	67	9	~~Eastern tropical Pacific-porpoise survey~~ Insular Res. NWHI
HAUL OUT	April				
TC-78-02 (TC #79)	5/06/78	7/03/78	53	6	NWHI-insular resources survey and nearshore resources survey; main islands-physiological ecology, aggregation
TC-78-03 (TC #80)	7/24/78	9/30/78	63	6	NWHI-insular resources survey; main islands-physiological ecology
		Total	250		

[1]Days in port outside of Honolulu.

Townsend Cromwell Cruise Schedule
FY 1979

Cruise No.	Date Start	Date End	Days at sea	Shore time[1]	Area of operation
1978					
TC-78-04 (TC #81)	10/16/78	12/20/78	60	6	N. Mariana Islands-insular resources survey and assessment
1979					
TC-79-01 (TC #82)	1/08/79	3/14/79	60	6	NWHI-insular resources survey; main islands-physiological ecology, aggregation
HAUL OUT	March-April				
TC-79-02 (TC #83)	4/16/79	6/10/79	50	6	NWHI-insular resources survey; main islands-physiological ecology; aggregation
TC-79-03 (TC #84)	6/25/79	7/26/79	30	2	Equatorial central Pacific-aggregation objects
TC-79-04 (TC #85)	8/06/79	9/30/79	50	6	NWHI-insular resources survey; main islands-physiological ecology, aggregation
		Total	250		

[1]Days in port outside of Honolulu.

→ sharks - catch

→ Pelagics stomachs

→ Return Dated from Midway —

→ Reference material

→ Crew of Cromwell Fish

NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center
Honolulu Laboratory

August 10, 1978

To: Participants, Northwestern Hawaiian Islands Study

From: Robert A. Skillman, NWHI Study

Subject: Change in Seminar Topic for 15 August Meeting

Due to a death in his family, Dr. Loh Lee Low will not be able to attend the 15 August meeting. However, Dr. Jad Hirota has agreed to present a talk on his work involving productivity analysis. The meeting will still be held on 15 August 1978 at 10 a.m. in the Seminar Room of the Honolulu Laboratory.

We are tentatively rescheduling Dr. Low's stay in Honolulu for 30 August and 1 September. More details later.

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 78-03 (TC-80)

CRUISE PERIOD: August 4-September 24, 1978

AREA OF OPERATION: Northwestern Hawaiian Islands (NWHI) and Northwest Hancock Seamount

TYPE OF OPERATION: Part I. Personnel from the National Marine Fisheries Service (NMFS), the Hawaii Division of Fish and Game (HDFG), and the U.S. Fish and Wildlife Service (FWS) participated in the second joint cruise under the terms of the Tripartite Cooperative Agreement for the survey and assessment of the living resources of the NWHI. The purpose of this cooperative study is to conduct a detailed survey and assessment of the biological resources of the islands to provide a foundation to base management decisions concerning long-range uses and conservation of these resources. The NMFS portion of the cruise included a survey of pelagic tuna and demersal resources in the NWHI. The HDFG personnel participated in a survey of fishery resources from the nearshore zone to the shoreline and seabirds, land birds, monk seals, turtles, and plants on the islands. The FWS personnel also participated in a survey of seabirds, land birds, and monk seals on land and at sea.

Part II. Part II included a survey of Northwest Hancock Seamount and other banks of the NWHI for pelagic and demersal resources.

ITINERARY:

August 4 - Departed Honolulu to survey Nihoa, Necker Island, French Frigate Shoals, Maro Reef, and Laysan Island.

August 21 - Arrived at Midway. Disembarked and embarked FWS and HDFG wildlife biologists.

August 23 - Departed Midway to survey Pearl and Hermes Reef, Lisianski Island, and Kure Island.

September 4 - Arrived at Midway.

September 5 - End of Part I. Disembarked HDFG, FWS, and University of Hawaii's Marine Options Program personnel. Embarked NMFS personnel.

September 6 - Begin Part II. Departed Midway to survey Northwest Hancock Seamount, unnamed seamount northwest of Lisianski Island, Pioneer Bank, Raita Bank, Gardner Bank, and Niihau.

September 24 - Arrived at Honolulu. End of cruise.

MISSIONS AND RESULTS:

A. Conduct surveys on bottom topography with ship's depth recorder.

Bottom surveys were conducted at Nihoa, Necker Island, and French Frigate Shoals. At Nihoa, transects were made by running longitudinal lines 06' apart. The bottom surveys over Necker Bank and French Frigate Shoals were modified as follows: a zigzag course was followed between the 100- and 40-fathom (fm) contours with positions recorded when the vessel reached 40 fm.

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

Eighty-six hours were devoted to direct trolling during the cruise. The total catch consisted of 28 skipjack tuna, 49 yellowfin tuna, 80 kawakawa, and 12 ono. Catch rate at Nihoa was the highest, reaching 1.23 fish per hook-hour or roughly five times the average rate of 0.25 fish per hook-hour calculated for the rest of the cruise period.

C. Collect fish flesh samples for ciguatoxin studies.

Tissue samples totalling 290 sets were collected from demersal fishes for ciguatoxin tests. A set consisted of four samples: (a) dorsal muscle tissue, (b) abdominal muscle tissue, (c) gonad, and (d) liver.

D. Collect stomach, gonad, and otoliths from commercially important species.

One hundred and three stomach samples of troll-caught skipjack tuna, yellowfin tuna, kawakawa, and ono were collected during the cruise. Also collected simultaneously within the same general area of the tuna catches were

377 stomach samples of 14 species of seabirds by wildlife biologist (FWS). In addition to fish and bird stomach samples, 37 ovaries of kawakawa and ono were collected. A few otoliths were collected from these pelagic fishes when time was available.

Stomach contents of demersal fishes, primarily Rooseveltia brighami, Seriola dumerilii, Epinephelus quernus, Caranx cheilio, and Pristipomoides sieboldii were also collected. Forage organisms found in the fish's gill cavity or regurgitated on deck were also saved. All snapper ovaries and some of the more developed ovaries of other demersal species were collected. Several species of fish appeared to have ovaries that were "running ripe." These included Pristipomoides sieboldii, Rooseveltia brighami, Gymnothorax steindachneri, Carangoides ferdau, and Coryphaena hippurus. Otoliths were collected from selected size ranges of Pristipomoides filamentosus, P. sieboldii, Etelis marshi, E. carbunculus, Rooseveltia brighami, Epinephelus quernus, Seriola dumerilii, and Coryphaena hippurus. HDFG aquatic biologists collected fish whose juvenile stages are spent in shallow water. Thus, otoliths were obtained from juvenile Caranx ignobilis, C. melampygus, Parupeneus chryserydos, and other mullids.

E. Conduct fishing operations using handline, lobster pots, octopus pots, shrimp pots, crab nets, and fish traps for fish, crab, and lobster to determine their availability, catchability, distribution, and relative abundance.

Twenty-six handline stations were conducted along the NWHI. A total catch of 415 fishes resulted from 789 hook-hours of fishing effort. The average catch rate for the cruise was 0.53 fish per hook-hour.

There were nine lobster trapping stations consisting primarily of 31 lobster pots and 8 fish traps. One of the more promising areas for lobster trapping was the northwest corner of Gardner Pinnacles. The average catch in this area was 4.36 lobsters per trap; one string of eight lobster pots produced a catch rate of 11.50 lobsters per trap. The trapping station on Raita Bank was conducted at the position where tagged lobsters were released on TC-77-03; therefore, each lobster caught at Raita was carefully examined, but none showed signs of having been tagged previously.

All berried lobsters were tagged and released.

Octopus trapping stations were conducted at French Frigate Shoals, Maro Reef, Kure Island, and Midway. The number of pots varied for each station: 34 were set at French Frigate Shoals, 17 at Maro, 15 at Midway, and 18 at Kure. The soaking time was 3 days at French Frigate Shoals and Maro, and 2 days at Midway and Kure. No octopus was caught.

Two shrimp trapping stations consisted of two strings of five traps. At each station, one string was set in about 460 m depth and the other in about 646 m depth. The traps caught 693 (9.11 kg) Heterocarpus ensifer primarily at the shallower depth at Nihoa and at Maro 47 (1.86 kg) H. laevigatus, all in the deeper set.

At Northwest Hancock Seamount, a string of four fish traps was set on top of the seamount during daylight hours when presumably the armorheads, Pentaceros richardsoni, would be feeding; however, none were caught.

The three handline stations at Northwest Hancock Seamount were conducted with modified gear using 20 hooks per line. A total of 31 fishes including 1 Beryx splendens and 16 Pentaceros richardsoni were caught during 340 hook-hours of fishing effort. The catch rate was 0.09 fish per hook-hour.

The Noreastern midwater trawl equipped with the Furuno net sonde was used successfully at Northwest Hancock Seamount and at Pioneer Bank. Eight hauls were made through several types of "fish" or "scattering layer" signs observed on the Simrad fish finder. Although the trawl catches were relatively small, it included armorheads, Pentaceros richardsoni, alfonsins, Beryx splendens, and "John Dorys," Zeus nebulosa. One midwater trawl haul through a thick scattering layer over Pioneer Bank in daylight resulted in zero catch.

F. Conduct shark fishing stations to study predation on wildlife.

Nine gray reef sharks, Carcharhinus menisorrah, and one tiger shark, Galeocerdo cuvieri, were caught during the cruise. Shipboard examination of stomach contents showed that the sharks consumed a variety of organisms including octopus, spiny lobsters, parts of a bird, piha, Spratelloides delicatulus, and Pervagor spilosoma. No turtle parts were found in the stomachs.

G. Conduct night-light stations to collect juvenile fishes for age and growth studies.

There were six night-light operations of which only the one at Kure Island was successful in collecting juvenile fishes and lobsters.

H. Miscellaneous observations and activities.

1. Forty live spiny lobsters were brought back for observation on tag retention, molting, and growth. These lobsters will also be used as experimental animals in a gear selectivity test.

2. Twenty live lobsters were brought back for genetic studies by Dr. James Shaklee, Department of Zoology, University of Hawaii.

3. Thirty-three XBT casts were made while traveling between banks and seamounts.

4. Forty-three-and-a-half hours were devoted to indirect trolling at a vessel speed of 8.5 knots. Five mahimahi, Coryphaena hippurus, and one yellowfin tuna were caught.

5. The thermosalinograph was operated throughout the cruise.

6. The Occurrence of Birds, Aquatic Mammals and Fish School Log was maintained when underway.

7. A foreign vessel sighted on Northwest Hancock Seamount was reported to the U.S. Coast Guard.

8. Went to the aid of FV Libra which had engine trouble.

SCIENTIFIC PERSONNEL: James H. Uchiyama, Chief Scientist, Fishery Biologist, NMFS, SWFC, HL (4 August-24 September)
Glenn R. Higashi, Research Assistant, NMFS, SWFC, HL (6-24 September)
Victor A. Honda, Research Assistant, NMFS, SWFC, HL (6-24 September)
Bert S. Kikkawa, Research Assistant, NMFS, SWFC, HL (6-24 September)
Fletcher V. Riggs, Fishery Biologist, NMFS, SWFC, HL (6-24 September)

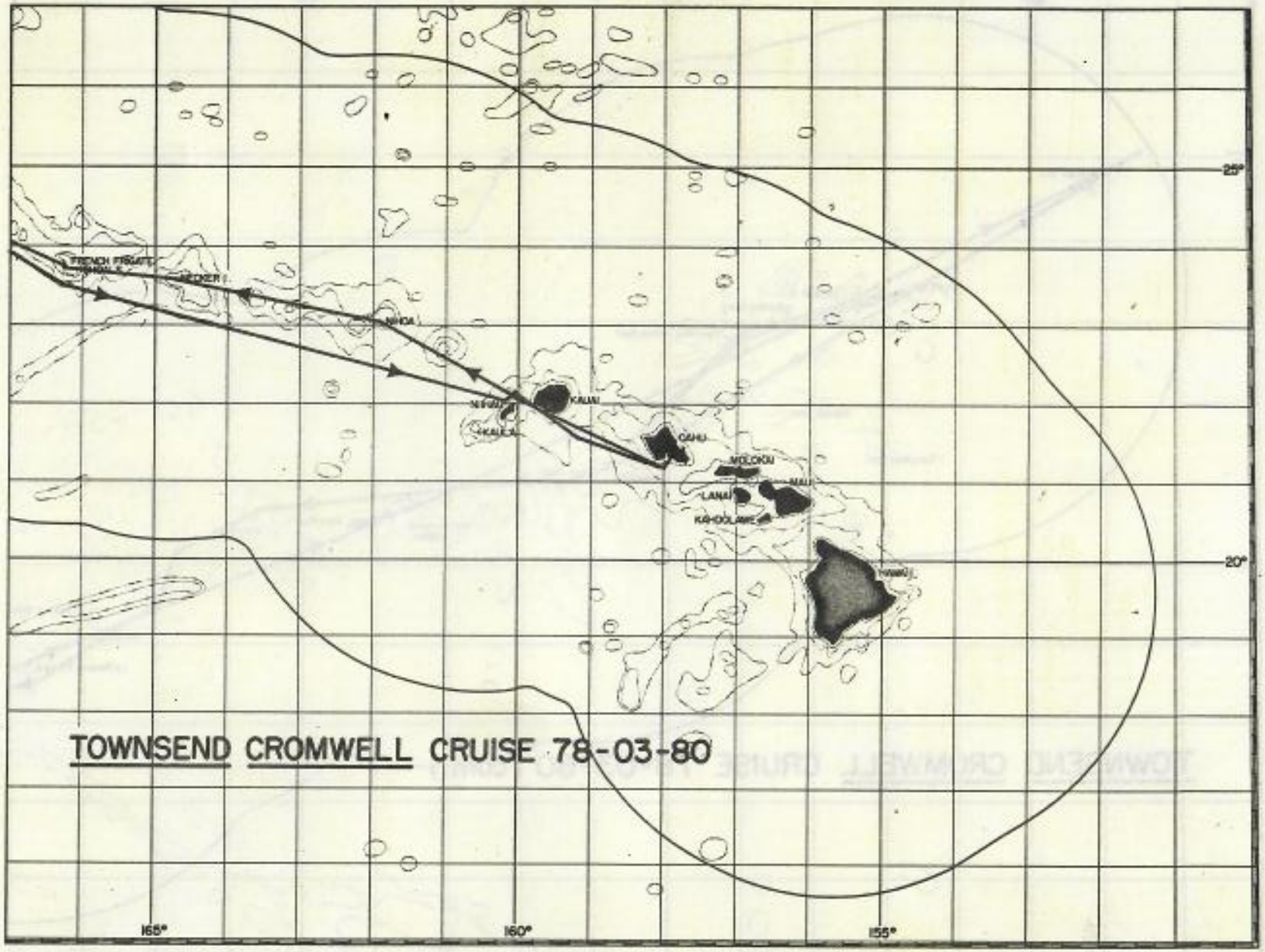
Gordon Black, Research Assistant, FWS (23 August-5 September)
Richard Coleman, Wildlife Biologist, FWS (4-21 August)
Craig Harrison, Chief Scientist for FWS, Wildlife Biologist (4 August-5 September)
Brian K. Kanenaka, Fishery Technician, HDFG (4 August-5 September)
David K. Kawahigashi, Cooperating Scientist, Marine Options Program (MOP), University of Hawaii (UH) (4 August-5 September)
Ernest Kosaka, Wildlife Biologist, HDFG (23 August-5 September)
Henry Y. Okamoto, Chief Scientist for HDFG, Aquatic Biologist, (4 August-5 September)
Dennis M. Shinno, Aquatic Biologist, HDFG (4 August-5 September)
Allan C. Solonsky, Cooperating Scientist, MOP, UH (4 August-5 September)
David H. Woodside, Wildlife Biologist, HDFG (4-21 August)
Dennis K. Yamase, Cooperating Scientist, MOP, UH (4 August-5 September)

Submitted by: James H Uchiyama
James H. Uchiyama
Chief Scientist

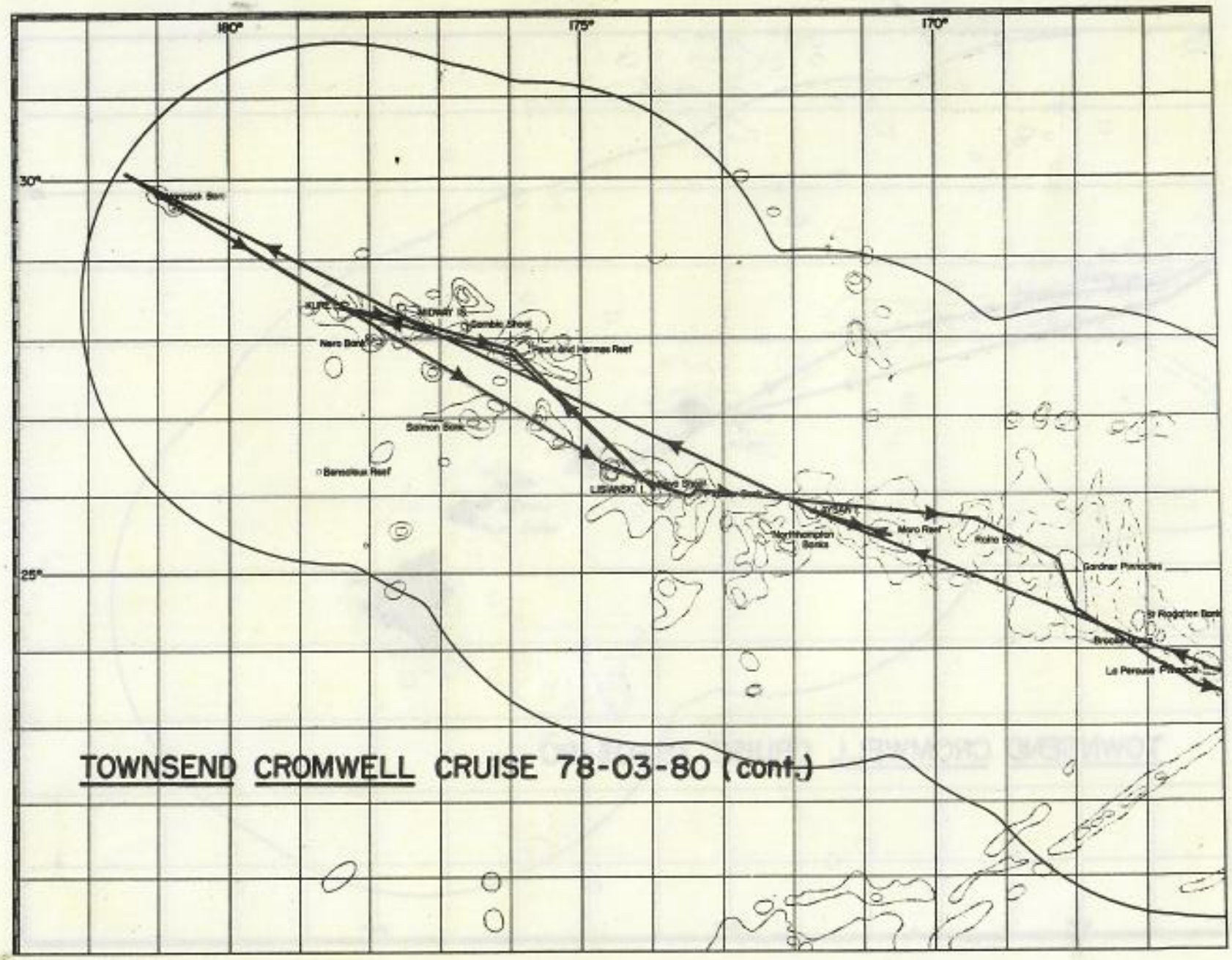
Approved by: Richard S. Shomura
Richard S. Shomura
Director
Honolulu Laboratory

Attachment

October 20, 1978



TOWNSEND CROMWELL CRUISE 78-03-80



TOWNSEND CROMWELL CRUISE 78-03-80 (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

Date: November 1, 1978

Reply to Attn. of: F142

To: Participants, Northwestern Hawaiian Islands Study

From: Robert A. Skillman, Coordinator, NWHI Study

Subject: Summary of 12 October meeting and notice of November meeting

The monthly meeting of the NWHI Study was held at 1030, 12 October 1978, at the Honolulu Laboratory. The purpose of the meeting was to discuss data management systems for the data generated by the participating scientists.

The first concern was that there existed some data management system for each of the agencies so that data would be captured and made available in computer usable form rather than being stored in agency, or worse, individual file cabinets. All participants agreed that this was a real concern with the way scientists change jobs and that data management systems were needed.

I presented a brief description of the data base management system that the Honolulu Laboratory has set up for our Insular Resources Task. This system is a complete data management system starting with a set of data recording forms that are punch card numbered, a raw data editing step, keypunching and verifying, a computer editing step that also establishes the valid data into the data base management system files, the printing of standard summary reports for cruise reports, and normal file manipulation for more extensive statistical analysis. Several questions were asked about the cost of running on the system, e.g. data entry, extraction of information, and analysis. These questions can be answered if specific statistics are provided on the number of data items to be entered, reports to be printed, etc. Sets of data recording forms were passed out to those interested. Some attendees indicated an interest in evaluating these forms in light of their research needs. Several people got together after the meeting to set up subsequent meetings to develop a common stomach analysis recording form.

Next Dr. Keith Chave presented a description of the Hawaii Coastal Zone Data Bank, which is now managed by Mr. Tom Cooney. The Bank, while housed at the University of Hawaii Computing Center, is an independent research

project that provides computer data archiving for marine environmental and biological survey data. Various statistical, graphics, and descriptive computer programs are available. The Bank maintains a taxonomic checklist of Pacific marine species. Dr. Chave passed out a document entitled "A nontechnical introduction to the Hawaii coastal zone data bank." I believe additional copies may be obtained from Dr. Chave at the Department of Oceanography.

Mr. Craig Harrison indicated that he was working with the NMFS staff in developing a recording form for marine bird surveys. The USFWS has not made any formal plans for computer storage and management of these data. Also, they have magnetic tape copies of some marine bird survey data collected by the Smithsonian about 10 years ago.

At various times during the meeting, Dr. Leighton Taylor questioned the logic of choosing Laysan Island as the first area to start building the ecosystem model. Several reasons were offered: it is an area where the Hawaiian monk seal is being studied intensively, where a moratorium has apparently been placed on the development of commercial fishing, and where we have nearly as much data as for other island areas. As I remember from the meeting several weeks ago, there was no compelling reason for choosing Laysan; the feeling was that we need to gain some experience and knowledge of the model while the architects of the model need a better feel for the NWHI. It was emphasized that the participants at the meeting suggested Laysan as a possible site for an in-depth study.

These discussions led to a consensus that the selection of island areas to concentrate on, and the reasons for doing so, should be discussed in detail at the next monthly meeting. Other topics that were suggested were selection of a grid system for the ecosystem model and a review of the data that has been assembled or still needs to be assembled for the development of the model of the Laysan Island area by Taivo Laevastu.

The next meeting will be held at 1000, Tuesday, 28 November 1978, in the Conference Room, Honolulu Laboratory.

COPY

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.

failure to transmit weather information on schedule. Other events made this failure very significant. The Japanese cryptanalysts had broken the U.S. weather code, and Japanese meteorologists depended upon the daily coded weather report of Midway, Johnston, and Hawaii to predict the weather at the target. Then on 1 March the Americans made a routine change of their weather code and the Japanese were suddenly left without their enemy's weather reports. When *I-23* failed to transmit her observations, the information the meteorologists had for predicting the weather was extremely thin.

The refueling took place on schedule. Two big flying boats took off after refueling from the submarines at French Frigate Shoal, and came in along the Hawaiian chain. At 0014 on the morning of 4 March, they were picked up by the radar station on Kauai. While the Japanese planes were still two hundred miles from their target, Hawaiian Sea Frontier went to General Quarters. At 0115 Navy patrol planes took off armed with torpedoes, to attempt to locate and attack a Japanese seaplane carrier, a mysterious type of naval vessel possessed only by the Japanese—one of which, it was believed, had launched these "bandits." Shortly afterward Army night fighters took to the air to receive the night visitors.

It was an overcast and drizzly night over leeward Oahu, a situation which the Japanese had been unable to predict because of the disruption of their weather-reporting service. The two bombers lost their bearings in the murk and dropped their bombs miles from the target—one salvo in the sea and the other in the hills back of Honolulu. The defending fighters aloft (at that time without airborne radar or effective fighter directors) were blinded by the same weather and never saw the bombers, who returned unharmed to Wotje in the Marshalls.

The next day on Oahu, there was a tendency to discount the whole thing as a bad nightmare, each branch of service tacitly assuming that the bombs, seen and heard exploding in the hills, had been jettisoned by planes of the other service and that in the thick weather some bombardier had scored a near miss on the Pacific Ocean he had aimed at, and hit Oahu instead. But Lieutenant Commander Layton, Fleet Intelligence Officer, had read a story titled "Rendezvous," by Alec Hudson, in the August 9, 1941, issue of *The Saturday Evening Post*. This story was a fictional account of the bombing of an out-of-range naval base by seaplanes refueled from submarines. With this on his mind, and with the information direction-finders gave him about unusual submarine radio activity in the vicinity of French Frigate Shoal, Layton concluded that the plane that bombed Oahu had come from French Frigate and had there been refueled by Japanese submarines. In this conclusion Alec Hudson, then on duty as an Intelligence officer in Hawaiian Sea Frontier, concurred. To forestall any future such raids, Mine Division One steamed out of Pearl Harbor and planted minefields around French Frigate. As

it later turned out, this action and the subsequent guarding of this location was of more importance than the whole bombing raid itself.

Because of these peculiar circumstances, the story grew up that the Japanese had copied the strategy of *The Saturday Evening Post* story when planning the second bombing of Pearl Harbor. This unflattering estimate of the originality of Japanese planners was far from the truth. The Japanese were further advanced in the use of seaplanes operating with submarines than were the Americans. Suzuki, who had planned the whole operation from beginning to end, had never heard of Alec Hudson or, for that matter, of *The Saturday Evening Post*. From the Japanese point of view this operation was unfortunate. Because of it, when they needed to use French Frigate Shoal as a refueling station for seaplane searches in connection with a much more important operation, they found the tiny atoll closely guarded by American vessels.

Windup of the First Phase

There was very little other Japanese submarine activity in the Pacific. *I-6* was still off the West Coast of the United States, but she departed before the end of March. *I-25* was operating off eastern Australia and sent her busy seaplane over Wellington, New Zealand, on 7 March. *I-53*, *I-54*, and *I-55* returned to Japan from the East Indies. *RO-33* and *RO-34* were sent from the East Indies to Truk. In early April these two submarines advanced from Truk to a new submarine base at Rabaul; portent of things to come.

The Japanese Second Submarine Squadron (*I-1*, *I-2*, *I-3*, *I-4*, *I-5*, and *I-7*) returned to Japan from the Eastern Pacific in February, and after overhaul sailed for the East Indies. They left Kendari, Celebes, in late February to deploy in the Indian Ocean three hundred miles south of Soemba Island in support of Japanese surface force operations. *I-5* ran aground off southeast Celebes, and it was not until late March that salvage operations got her off the reef. The Main Body of the Japanese Second Fleet, plus two carrier divisions, came through the Malay Barrier in early March to intercept Allied naval forces fleeing from the Java Sea and Tjilatjap. In this they were terribly effective. Japanese naval shore-based bombers assisted in the slaughter.

There was nothing to oppose the Japanese but American submarines, and they were operating under handicaps. On 1 March Captain Wilkes was forced to leave Tjilatjap to make the long jump down to Fremantle on the southwestern corner of Australia to establish a new submarine base out of reach of the Japanese bombers. With Java in Japanese hands, submarines on station would have to head south for Australia when their fuel supplies ran low. Until then they kept busy.

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.

Whereas, the biota and ecosystems of remote and uninhabited islands are unique, delicate and easily destroyed by human presence; and

Whereas, many of these islands have been set aside as National Wildlife Refuges for the specific purpose of preserving the unique flora, fauna and other features; and

Whereas, in recent years military and other government-sponsored organizations have occupied refuges on some Aleutian Islands and Hawaiian Islands without notifying refuge managers or without obtaining guidance on care and protection of these refuges; and

Whereas, it appears questionable that the public interest was served by classifying as secret the 1964 operations on Amchitka Island; and

Whereas, destruction of wildlife by personnel occupying refuge islands is reported; and

Whereas, many refuge islands' floras and faunas were irreparably damaged by vehicles and by introduction of nonnative rats during World War II; and

Whereas, already rare and endangered wildlife species have, in recent years, been subjected to additional harassment by personnel of the military and of other government-sponsored organizations;

Therefore be it Resolved, that the American Society of Mammalogists requests President Lyndon B. Johnson to issue instructions that under no circumstances will parties of government-employed personnel, or personnel of organizations acting under government contract, visit or establish camps or undertake any activity on uninhabited islands without first consulting with officials directly responsible for the protection of flora and fauna on those islands;

And be it Further Resolved, that military and other personnel who are to be stationed on or visit islands having unique biota, whether these islands be inhabited or uninhabited, be instructed through a formal course of training on the care and preservation of the unique biota of islands.

Carried Unanimously

Resolution of the 45th Annual Meeting of the American Society of Mammalogists, June 20-24, 1965, Winnipeg, Manitoba, Canada.

Reprinted from the Journal of Mammalogy (1965), 46,4:732-733.

Resolution of a joint meeting of the IUCN CNPPA/SSC, 12-17 March, San Jose, Costa Rica

Recognizing that the small oceanic islands and atolls which comprise the Northwestern Hawaiian Islands constitute breeding and feeding habitat for the Hawaiian monk seal, numerous species of sea birds, three endemic land birds, and a population of green turtles;

Recalling that these isolated and principally uninhabited areas were declared a bird sanctuary in 1909 by the President of the United States, with the areas later being designated as the Hawaiian Islands National Wildlife Refuge;

Realizing that the ecosystems of such oceanic island areas are particularly vulnerable to degradation as a result of human disturbances;

Being Aware that consideration is presently being given to the development of various commercial fisheries in waters close to the Northwestern Hawaiian Islands;

Therefore be it resolved that the joint meeting of the CNPPA/SSC requests that the Director General of IUCN transmit to the U. S. Fish and Wildlife Service, the National Marine Fisheries Service, and the State of Hawaii an expression of support that the breeding and feeding areas of the wildlife species of the Northwestern Hawaiian Islands continue to be maintained in an undisturbed and protected state.

ADDRESS ONLY THE DIRECTOR,
FISH AND WILDLIFE SERVICE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

In Reply Refer To:
FWS/RF

MAR 2 2 1979

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

Dear George,

In your letter dated February 23, 1979, you indicated that "all of the Kridler - Olsen trip reports are lost to history and science". It sounded as though some of the annual narrative reports have been misplaced or misfiled. I find it difficult to believe that they were lost, nevertheless, I understand how some of these things do happen. I retained a copy of each trip report prepared while I was in Hawaii, including the specific report which you requested, (September 2-17, 1971). They sure are fun to look back upon, now that I sit here in the Washington Office.

On a number of occasions, I clearly remember seeing turtles on both Nihoa and Necker. I'm sure you will find records of those observations in the trip and narrative reports.

For the most part, scientific data on many National Wildlife Refuges, is collected and accumulated in field station files. Some of the information is incorporated into annual narrative reports and often, data are published by the individual who conducted the research. For a variety of reasons, some of the valuable field research is never published. It is my personal opinion that such information should be made available to anyone who has demonstrated an interest in the subject and plans to publish the data. Certainly, wildlife biologists working for the U.S. Fish and Wildlife Service are public servants and any information collected should be made available to researchers so that it can be incorporated into their research. Proper acknowledgement must be made to the researcher who collected the data. I am forwarding my copy of the 1971 report to the Area Manager in Honolulu, and I am confident he will make this information available to you upon request.

Any information which I was personally involved in collecting, if worthy of publication, should be published. I urge you to glean as much information as you possibly can from those reports and publish whatever you deem worthy of publication. I also suggest that you discuss plans for publication with the new Area Manager, the Refuge Manager and Gene Kridler.

Good luck in your continuing efforts to gain, collect and publish additional information on Hawaiian wildlife.

Sincerely yours,

David L. Olsen

cc:Area Manager
Refuge Manager
Gene Kridler

3994

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DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE
DIVISION OF LAW ENFORCEMENT

COMPLAINT OF VIOLATION

SUBJECT	DATE RECEIVED	FILE NO.
UNSUB - Trespass on Pearl & Hermes Reef	10/26/78	INV 5- PT
CHARACTER OF ALLEGED VIOLATION	**RECEIVED BY**	**RECEIVING DISTRICT**
National Wildlife Refuge Systems Administration Act	SA K.A. Wright	PT-2

ACTION RECOMMENDED

FACTS

On 10/26/78 a formal complaint was received from George H. Balazs of the Hawaii Institute of Marine Biology regarding a trespass violation on the Hawaiian Islands National Wildlife Refuge.

The information contained in the complaint related to observations made on or about October 5, 1978 on Southeast Island at Pearl and Hermes Reef while on a scientific research voyage in the area. On that occasion Mr. Balazs observed four to six sets of recent human footprints on the south shore of the island and several locations where glass fishing floats had been piled up as if for later collection.

The information in this complaint was also passed on to Mr. J. Brent Giezentanner, Refuge Manager and Mr. Henry Hansen, Area Administrator in the form of a written trip report from Mr. Balazs. Trespass in the area is of special concern due to high densities of nesting sea turtles in the area.

ACTION TAKEN BY SAC

☐ ZERO FILE ☐ REFERRED TO SAC _____

☐ OPEN AND ASSIGN CASE TO _____

SAC

DISTRIBUTION OF COPIES

(Do not write in this space)

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
DIVISION OF LAW ENFORCEMENT
300 Ala Moana Blvd.
P. O. Box 50223
Honolulu, HI 96850

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

Office of the Director

May 13,1980

Commander Alfred Utara
Marine Safety Office
P. O. Box 3160
Honolulu, Hawaii 96802

Dear Commander Utara:

The recent grounding of a merchant vessel in the vicinity of French Frigate Shoals and the subsequent dumping of cargo combined with a potential fuel spill reinforces the need to examine the relationship between ocean shipping and environmental impacts to the Leeward Hawaiian Islands.

On June 20, 1979, the Environmental Center, in response to receiving a copy of a letter sent to you by Mr. Kelley Dobbs of Greenpeace, raised several questions regarding the possibilities of oil spills in this area (copies enclosed). These questions covered the location of the lanes of tanker traffic and the amount of use they receive. In addition we pointed out that Mr. Dobbs concerns seemed reasonable and that they deserved attention. The recent incident points out that these questions and concerns should cover any type of shipping activity that is a potential threat to the Leeward Islands, and not solely oil spills and tanker traffic.

Futhermore, the problems encountered in the recent grounding should be of value in planning for other potential incidents. It also points to the need for identifying the range of possible accidents that could occur the subsequent consequences, and how they will be handled in emergency situations. This type of information would also be useful in addressing longer-range management strategies.

Thank you for your consideration and we hope our comments will be useful in dealing with this problem.

Sincerely,

Doak C. Cox
Director

JS/DCC/ck

cc: Kelley Dobbs
George Balazs √
John Sorensen
DLNR

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

Office of the Director

June 20, 1979

Commander Alfred Utara
Marine Safety Office
P.O. Box 3160
Honolulu, Hawaii 96802

Dear Commander Utara:

The Environmental Center was sent a copy of a letter sent to you on May 10, 1979 by Mr. Kelley Dobbs of the Greenpeace organization concerning the effects of oil spills. (A copy of the Dobbs letter is attached.) We were asked to comment on the matter.

The concerns raised by Mr. Dobbs seem reasonable. By now you have probably answered it. If so, we would appreciate having a copy of your response to him. In addition, we would like to be informed as to the locations of the lanes for tanker traffic approaching, leaving, or passing by the Hawaiian chain, and the approximate number and tonnage of vessels using these lanes per month.

Thank you for your consideration and response to these concerns and questions.

Yours truly,

Doak C. Cox
Director

DCC/dh

Enclosure

cc: Kelley Dobbs
Keith Krueger
George Balazs
John Caperon
Fred Kamemoto
Jacquelin Miller

Greenpeace Hawaii
913 Halekauwila St.
Honolulu, Hawaii 96814

May 10, 1979

Commander Alfred Utara
Marine Safety Office
PO Box 3160
Honolulu, Hawaii 96802

Dear Commander Utara,

I am writing on behalf of Greenpeace in regards to the possible harmful effects of a large oil spill in the Leeward Hawaiian Islands. such a spill could have devastating effects on the very fragil ecosystem of this area. In particular, the spill could potentially affect the following:

1. The Hawaiian Islands National Wildlife Refuge

2. Reefs outside of the Refuge- we favor their inclusion in the National Wildlife Refuge or equivalent protection, if they are not protected, they will be of economic importance to the fisheries industry of Hawaii.

3. The Hawaiian Green Sea Turtle, a threatened species which breeds and migrates throughout the Leewards

4. The Hawaiian Monk Seal, an endangered species, which breeds and migrates throughout the Leewards

We suggest restricting tanker traffic to no closer than a specified distance from the islands and the submerged reefs of the area. One hundred miles has been mentioned, but I would seek input from experts in the mechanics of oil spills before supporting a specific figure.

We feel prevention is particularly important in the case of the Leewards as the inaccessability of the area would make it difficult to mobilise countermeasures and would cause a time lag before they could be effective. Additionally, if cleanup crews had to land on the islands their presence could inadvertently cause additional harm.

Thank you for your consideration of this matter. I look forward to hearing any comments you may have on the situation.

Sincerely,

Kelley Dobbs

ECOLOGICAL EFFECTS OF THE GROUNDING OF THE FREIGHTER *ANANGEL LIBERTY* ON THE REEF AT FRENCH FRIGATE SHOALS, HAWAII APRIL 27, 1980

Steven Dollar
Richard Grigg
Hawaii Institute of Marine Biology

John Naughton
National Marine Fisheries Service

August 29, 1980

On 27 April 1980, the Greek merchant vessel *ANANGEL LIBERTY* ran hard aground at a position of 23°39.0'N, 166°5.1'W in 20 to 40 feet of water on the southeastern outer reef of French Frigate Shoals, within the Hawaiian Islands National Wildlife Refuge. In order to expedite the removal of the vessel before structural damage to the hull could cause release of the 165,000 gallons of diesel fuel, a U. S. Coast Guard-activated Regional Response Team authorized the offloading of up to 3,000 tons of cargo into the surrounding waters. This option was selected since the constraints of logistics, time, weather trends, and surf conditions led Coast Guard and Navy salvage experts to conclude that transfer of fuel or cargo to barges, or removal by helicopter, was unfeasible.

The entire cargo of *ANANGEL LIBERTY* consisted of kaolin, a very fine, white, insoluble clay material composed primarily of the mineral kaolinite. Kaolin is chemically inert and is not considered a hazardous substance.

By 7 May 1980, 2,200 tons of kaolin, in 90,000 paper bags of 50 lb each, had been jettisoned off the bow, enabling the ship to be refloated and pulled from the reef. Observers on the scene reported that many of the bags broke on impact, while some floated up to 1,000 ft from the vessel before sinking. Aerial observations during the dumping operation showed several distinct plumes

of suspended clay extending approximately 6,000 ft north along the outer reef edge as well as approximately 4,500 ft west over the fringing reef crest into the lagoon in the direction of Disappearing Island. Tidal currents apparently carried the material into the lagoon through a pass in the reef just south of the spill site on flood tides and back out across the reef to the north of the spill site during ebb tides. Photographic documentation of the plumes is on file with the Fish and Wildlife Service, Honolulu, Hawaii.

On 8 May 1980 a meeting was called to develop a cooperative plan to survey the grounding site in order to delineate the extent of impact to the marine environment. The agencies represented at this meeting included the U. S. Fish and Wildlife Service, U. S. Army Corps of Engineers, National Marine Fisheries Service, Department of Land and Natural Resources, Department of Fish and Game, U. S. Coast Guard, NOAA/OMPA, and the University of Hawaii. The plan that was generated consisted of three phases. The first phase involved the immediate rerouting of the NOAA Research Vessel *TOWNSEND CROMWELL* to the spill site to conduct an initial reconnaissance survey to determine the distribution of clay remaining on the reef and in the water column, as well as general condition of the biota at and near the site.

Pending the results of this initial reconnaissance showing significant amounts of residual clay still on the reef and/or environmental damage, the second phase of the assessment plan called for sending a team of coral reef biologists to French Frigate Shoals to conduct a brief, but thorough investigation of the impact site and surrounding area. The third phase of the assessment plan called for repeat surveys of the site in July of 1980 by Department of Fish and Game investigators to determine the degree of change since the initial two investigations.

The first phase of the program was set in motion on the morning of 11 May 1980 when scientists aboard the *CROMWELL* observed kaolin plumes spreading south from the spill site. However, rough sea conditions prevented launching of small craft for direct observation of the ground area. As a result, only surface photographs and water samples were taken.

Since no *in situ* information was gathered by the CROMWELL, it became necessary to implement the second phase of the assessment program. On 20 May 1980, Dr. Richard Grigg, Steven Dollar (University of Hawaii, Hawaii Institute of Marine Biology) and John Naughton (National Marine Fisheries Service) were flown to Tern Island where a rendezvous was scheduled with the Research Vessel *KAIMI*. The *KAIMI* then steamed to the grounding site and served as a base of operations for two days of investigative dives. The remainder of this report describes the observations of the scientific team of the environmental impact of the *ANANGEL LIBERTY* grounding and dumping of kaolin on the seaward reef at French Frigate Shoals.

Observations at Impact Area

On 20 May 1980 (13 days after dumping ceased) the grounding site was identified during an overflight of the southeastern quadrat by two distinct white kaolin plumes. Surface siting of the plume from the *KAIMI* also identified the exact grounding area. However, the plumes were of much smaller dimension (150 ft diameter) than during the dumping operation. The areal extent of the plume appeared to be a function of current speed and direction. At slack current the plume was limited to the actual site of the dump. During periods of stronger current the plume extended up to approximately 1,000 ft downcoast in the direction of current flow.

Three SCUBA dives and extensive reconnaissance surveys conducted from the surface in the vicinity of the spill site provided a comprehensive picture of the effects of the grounding and clay dumping on the reef environment. The most significant effect of the event in terms of ecological damage was the physical destruction of the reef platform impacted by the ship's hull. A 6 to 10 ft deep gouge, virtually an imprint of the ship's bottom, was excavated during grounding. The sides of the groove were nearly vertical and were cut through a solid limestone reef platform. The groove measured approximately 300 ft long by 100 ft wide and was lined with limestone reef fragments ranging in diameter from several inches to approximately 6 ft. Interspersed in the reef rubble of the hull gouge were fragments of unattached live coral, predominantly *Porites lobata*, that appeared to be in a relatively healthy state. The only other evidence of physical disturbance was numerous cable scars cut into coral heads seaward of the grounding site.

Deposits of clay, 6 to 10 inches thick, were interspersed within the impact gouge and upon the intact reef edge bordering the gouge. Plumes of white turbid water coming from these deposits indicated that after 13 days clay was still going into a suspended phase. Remnants of the paper bags that contained the kaolin were visible in many of the clay deposits; however no paper remnants were observed anywhere else at French Frigate Shoals during the course of the investigation. Since the remaining clay deposits were relatively small with respect to the initial volume jettisoned and the dimension of the plume greatly reduced compared to the initial areal coverage, it was evident that most of the original volume of kaolin had been suspended and removed from the area.

Other than physical degradation from hull impact, or actual burial by clay deposits, environmental alteration due to clay dumping was surprisingly small.

Specific observations of the benthos (bottom dwelling organisms) showed that the only reef corals affected by the clay spill were the branching species *Pocillopora meandrina* and *P. eydouxi*. Branch tips of some colonies were observed in a bleached state for distances up to 200 ft on either side of the impact groove. Beyond this distance all *Pocillopora* colonies appeared to be in a normal state. All other members of the benthos appeared normal and healthy, with no evidence of bleaching, necrosis or encrustation. Surprisingly, this was true even in areas of the reef immediately adjacent to the impact groove edge. It appears that with the possible exception of *Pocillopora* spp. the high turbidity associated with the kaolin plume had very little effect on the benthos.

On the other hand, the increased turbidity of the water column seems to have had a marked effect on fish populations. The most striking occurrence was the presence of a large school (30-50 individuals) of ulua, *Caranx ignobilis* ranging in size from 10-80 lbs. These fish, as well as several sharks (*Carcharhinus galapagensis, C. amblyrhynchos*) appeared attracted to the spill site and made repeated passes through the plume with no apparent discomfort. Within the plume swimming behavior of the *Caranx* school was modified in that tighter schooling was observed. There was a noticeable paucity of other reef fish in the impact area. The only species observed were the hawkfish (*Cirrhitops fasciatus*) the wrasse (*Thalassoma duperrey*), surgeonfish (*Acanthurus olivaceous*) and triggerfish (*Melichthys niger*). The depressed fish population in the plume area may have been due to: (1) kaolin-induced mortality, (2) increased efficiency of ulua foraging due to plume camouflage, (3) exodus of resident populations in response to high turbidity, (4) physical destruction of habitat.

A single sub-adult Hawaiian monk seal (*Monachus schauinslandi*) was observed swimming in the plume for several hours, apparently without any discomfort and clearly making no effort to avoid the area. All of the observations discussed above were documented photographically and are available at the Hawaii Institute of Marine Biology.

Observations at Other Sites

In addition to the impact site, several other areas of the southeastern quadrant of French Frigate Shoals were surveyed to determine the extent of influence of the kaolin dumping. These areas included a seaward reef site approximately 250 m southeast of the impact area, several lagoon sites located between Disappearing Island and the lagoonward reef edge directly west of the spill site, and Disappearing Island itself. In addition to direct observations, sediment samples and reef coral colonies were collected at each site. Sediment samples were analyzed by bulk dissolution methods to obtain the percent residual kaolin within a known volume of sediment. Coral samples are to be analyzed by x-ray diffraction techniques to determine if kaolin had been incorporated into the coral skeletal matrix.

Results of all surveys indicated that all areas appeared normal in every way. Benthic species assemblages as well as fish populations showed no changes in composition, growth forms or mortality. There was no evidence of kaolin deposition on the reef platform or on the surface of any organisms. Bulk dissolution in acid of sediment samples showed no kaolin fraction at any of the sites, even as close as 250 m to the dump site. It appears that the size of the clay particles is sufficiently small that once in suspension, they remain in suspension for a period of time sufficient to remove them from the atoll system.

Terrestrial examination of Disappearing Island and analysis of sand samples taken from both above and below the high tide mark showed no evidence of kaolin or remnant paper bags.

Ecological Response of the Reef

Natural and man-induced episodic events are known to cause localized and occasionally large scale mortality and destruction to coral reefs. Naturally occurring events include water movement associated with severe tropical storms, volcanic eruptions and subsequent lava flows, emersion by abnormally low tides and infestations of coral predators, such as *Acanthaster planci*, etc. Human activities that may be expected to result directly in localized mechanical damage include dredging and mining, sewage, thermal and oil pollution, as well as blasting. The degree and rate of recovery of coral reef communities devastated by these events is dependent on several factors. It is apparent that recovery depends basically on colonization of devastated areas by coral planulae settling from the plankton and on continued growth and reproduction of surviving coral colonies. If substantial numbers of coral colonies survive the catastrophic event in localized areas of a devastated reef, then recolonization should be relatively rapid compared with the situation that would arise if destruction of corals had been uniformly extensive over the reef.

Since the area of destruction at French Frigate Shoals is relatively small (approximately 3000 m^2 or 3 hectares) and the kaolin plume does not appear to have affected reef organisms in the vicinity of the impact gouge, it is expected that recolonization will be rapid. Other factors affecting recolonization include the availability of substrata suitable for settlement. While many of the rubble fragments lining the floor of the impact groove are

presently too small and unstable to support coral settlers, the underlying reef platform appeared to be a solid limestone surface. Since the area is in a high wave energy zone it is probable that the rubble fragments will soon be abraded into sediment or carried shoreward leaving a surface suitable for coral colonization.

Recolonization of denuded substrata may also occur in successional stages. Several phases of fast growing algae-dominated cover are often the initial colonizers following catastrophic events. It has been found that algal phases facilitate coral recolonization by conditioning the substrata and enhancing larval settlement.

It will be possible to describe the initial recovery of the damaged area of reef at French Frigate during a follow-up survey in September of 1980. Two of the investigators that participated in the original site assessment will take part in this follow-up study. At this time it will be possible to provide a more concise report on the longer term effects of both damage and recovery to the reef ecosystem due to the events of the grounding of the *ANANGEL LIBERTY*.

University of Hawaii at Manoa

Hawaii Institute of Marine Biology
P.O.Box 1348 • Coconut Island • Kaneohe, Hawaii 96744
Cable Address: UNIHAW

August 29, 1980

George
Thanks for your
help in getting this
completed
S.D.

Dale T. Coggeshall, Administrator
U. S. Fish and Wildlife Service
300 Ala Moana Blvd. - Room 5302
Honolulu, Hawaii 96813

Dear Mr. Coggeshall:

Enclosed is the preliminary report on the ecological assessment of the coral reef at French Frigate Shoals impacted by the grounding of the Anangel Liberty and subsequent dumping of 2,200 tons of kaolin. In brief, the results of the survey of May 20-21, 1980 indicate that the only substantial damage to the reef resulting from the event was the excavation of a groove in the reef platform caused by impact with the hull. While some kaolin deposits were still observed at the site, it appeared that most of the jettisoned cargo had already been suspended and removed from the area. Reef organisms directly adjacent to the impact groove and not buried by clay showed little or no effect of the event indicating that turbidity associated with the kaolin plume was not of significant influence. Sediment samples also showed no residual kaolin fraction at any locale within the south-eastern sector of French Frigate Shoals.

We would also like to inform you that in September of 1980, we will re-survey the site during a research cruise aboard the Easy Rider as part of the Northwestern Hawaiian Islands fishery investigations. The observations from this survey will be incorporated into a followup scientific report documenting the effects of the event.

We hope the enclosed report is a useful assessment of the effects of the freighter grounding and welcome any comments or questions you might have.

Sincerely,

Steven Dollar

Steven Dollar (HIMB)

Richard Grigg (HIMB)

John Naughton (NMFS)

mk
enclosures

University of Hawaii at Manoa

Hawaii Institute of Marine Biology

MEMORANDUM October 21, 1980

TO: Principal Investigators, NWHI-FI

FROM: Richard Grigg, Coordinator

SUBJECT: Activities in the NWHI

It has been brought to my attention by the Coordinating Council for Research in the NWHI that in the future the Tripartite Agencies (NMFS, FWS, FG) would benefit by knowing when and where all Sea Grant research in the NWHI is taking place. This is particularly important for the FWS since they have the responsibility for managing the refuge. Therefore in the future, please notify the following agencies of your research plans by sending them a copy of your detailed cruise plan:

1) Dale Coggeshall, Administrator
Fish and Wildlife Service
Prince Kuhio Federal Building, Rm. 5302
Honolulu, HI 96813

2) Richard Shomura, Director
Southwest Fisheries Center
2570 Dole Street
Honolulu, HI 96822

3) Kenji Ego, Director
Fish and Game, DLNR
1151 Punchbowl Street
Honolulu, HI 96813

4) Jack Davidson, Director
Sea Grant Program
University of Hawaii
Spalding 255
Honolulu, HI 96822

As in the past, it will still be necessary to file your cruise plans with ORA and Bill Harkness at Snug Harbor, Pier 40. I know this is extra paper work, but it does help to coordinate activities so I'm sure your cooperation will be greatly appreciated by the Council.

RG:ec

Distribution List:

James Parrish
James Shaklee
✓ George Balazs
Jed Hirota

Steve Dollar
Steve Ralston
Craig Macdonald
Nancy Withers

Causey Whittow
Leighton Taylor
Karynne Chong
Philip Helfrich

Richard Shomura
Jack Davidson
Kenji Ego
Dale Coggeshall

SPARK M. MATSUNAGA
HAWAII

WASHINGTON OFFICE:
362 RUSSELL BUILDING
WASHINGTON, D.C. 20510

HONOLULU OFFICE:
3104 PRINCE KUHIO BUILDING
HONOLULU, HAWAII 96850

United States Senate

WASHINGTON, D.C. 20510

CHIEF DEPUTY
MAJORITY WHIP

CHAIRMAN, SUBCOMMITTEE ON
TOURISM AND SUGAR
COMMITTEE ON FINANCE

MEMBER:
COMMITTEE ON ENERGY AND
NATURAL RESOURCES
COMMITTEE ON
VETERANS' AFFAIRS

October 30, 1980

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

Dear George:

Enclosed for your information is a copy of the letter I have received from Mr. Dale T. Coggeshall, Pacific Islands Administrator, Fish and Wildlife Service, Department of the Interior, in response to my inquiry on the need to further protect the Hawaiian Islands National Wildlife Refuge from ship groundings.

I believe you will find Mr. Coggeshall's letter self-explanatory. If, after reading this letter, you have any further questions on this matter, please do not hesitate to contact me.

Aloha and best wishes.

Sincerely,

Spark

Spark Matsunaga
U. S. Senator

Enclosure: Ltr. fr. Dale T. Coggeshall, Pacific Islands
Administrator, Fish and Wildlife Service,
U. S. Department of the Interior, dtd. 10/17/80

1980 OCT 20 PM 5:02

United States Department of the Interior

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

IN REPLY REFER TO:
RWR

OCT 17 1980

Senator Spark Matsunaga
United States Senate
362 Russell Building
Washington, D.C. 20510

Dear Senator Matsunaga:

In response to your letter of 3 October 1980, the Fish and Wildlife Service is seriously concerned about the potential effects of future ship groundings in the Hawaiian Islands National Wildlife Refuge.

We are following closely the activities of the Intergovernmental Maritime Consultative Organization (IMCO) in its current efforts to establish an "Area to Be Avoided" around several of the Northwestern Hawaiian Islands. This proposal was triggered in part due to the concerns raised by the Service after two ships (Irenes Challenge, Hawaiian Patriot) sank in the Northwestern Hawaiian Islands in 1977.

As now proposed, the "Area to Be Avoided" would encompass an area within a 50 mile radius of designated islands, and would apply to ships of more than 1,000 gross tons carrying cargoes of oil or hazardous materials. After considerable debate at IMCO meetings, it now appears favorable that the proposal will be adopted in 1981.

Although we are pleased with the anticipated greater level of protection that will be provided, certain shortcomings in the present proposal of concern to us have been presented to our Regional Office. In particular, the islands of Midway and Kure are not presently in the proposed "Area to Be Avoided". We have recommended that they also be included, but that ships supplying these military installations be excepted by regulation. Also, the grounding of the Anangel Liberty made it clear to us that the cargo restrictions, as proposed, would not have protected the Refuge adequately because this ship was carrying a cargo (alumina silicate with a phosphate surfactant) that was not on the EPA hazardous chemical list. Fortunately the results of field studies conducted at the site over the

last several months indicate that adverse impact of the 2200 tons of lightered cargo on the reef ecosystem was minimal. In view of the possibility that we may not always be so fortunate, we are investigating the feasibility of expanding the list of "hazardous" materials, at least as it applies to protection of ecologically sensitive areas and habitat necessary for the survival of endangered species.

If and when the "Area to Be Avoided" is designated, it will be clearly indicated on applicable navigational charts for the area. Enforcement could be accomplished, to some degree, through the ongoing Coast Guard surveillance flights designed to monitor illegal fishing activities within the Fishery Conservation Zone. Monitoring could also occur during scheduled cruises by National Marine Fisheries Service vessels, fishing boats and other vessels and aircraft under Government contract. We are also in support of the Coast Guard in their effort to develop and enforce more stringent regulations pertaining to vessel condition, crew qualifications and on-board navigational equipment.

Hopefully, this information answers the questions raised in your letter. Please be assured that we will continue to actively explore measures to insure continued protection of the unique resources of the Northwestern Islands.

Sincerely yours,

Dale T. Coggeshall

Dale T. Coggeshall
Pacific Islands Administrator

INTER-GOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION

MSC XLIII/16/1
20 August 1980
Original: ENGLISH

MARITIME SAFETY COMMITTEE
43rd session
Agenda item 16

IMCO

ANY OTHER BUSINESS

PROPOSED AREA TO BE AVOIDED IN THE REGION OF THE NORTHWEST HAWAIIAN ISLANDS

Note by the Government of the United States

1 At the forty-second session of the Maritime Safety Committee, discussion took place over the size of the area to be avoided "In the region of the northwest Hawaiian Islands" (MSC XLII/15, paragraph 1.3) as proposed for adoption by the Sub-Committee on Safety of Navigation at its twenty-third session. In the light of this discussion the matter was referred back to the Sub-Committee to re-examine the area and to consider whether the area could be reduced in size.

2 A reduction in the area is precisely the action that the Government of the United States accomplished between the twenty-first and twenty-third sessions of the Sub-Committee and which was acted upon favourably by the twenty-third session of the Sub-Committee. To repeat this process would be redundant and non-productive, and would further forestall the protection that the proposed area requires.

3 The area to be avoided "In the region of the northwest Hawaiian Islands" was originally proposed by the United States in NAV XXI/4/6. The roughly rectangular shaped area which was proposed, completely encompassed a string of small islands, reefs, and atolls stretching between 161° and 176° west longitude. In response to comments by Members of the Sub-Committee, this proposal was withdrawn for modification.

4 Consequently, at the Sub-Committee's twenty-third session, the delegation of the United States introduced a modified version of the area to be avoided which was reduced considerably in size, taking into account the comments made by the Sub-Committee at its twenty-first session. After examination by the

The islands are important breeding grounds for the green sea turtle, as well as for hundreds of thousands of marine birds (albatross, terns, petrels, shearwaters, and other species).

5 The proposed area to be avoided is described by areas of radius 50 nautical miles centred upon the following geographical positions:

(1)	Pearl and Hermes Reef	27°50'N, 175°50'W
(2)	Lisianski Island	26°00'N, 173°55'W
(3)	Laysan Island	25°45'N, 171°45'W
(4)	Maro Reef	25°25'N, 170°35'W
(5)	Gardner Pinnacles	25°00'N, 168°00'W
(6)	French Frigate Shoals	23°45'N, 166°15'W
(7)	Necker Island	23°35'N, 164°40'W
(8)	Nihoa	23°05'N, 161°55'W

The prevailing weather and currents in this area are such that an oil spill would travel approximately 50 miles in 24 hours. In that time most of the more dangerous volatile fractions would have evaporated. The area is thus designed to provide minimum protection from the most toxic substances likely to be released in a marine casualty.

6 The proposed area should be avoided by ships of more than 1,000 gross tons carrying cargoes of oil or hazardous materials, as this class of vessel poses the most serious threat to the unique wildlife in the area.

7 The adoption of the proposed area to be avoided would cause little disruption to vessel traffic. The trans-Pacific trade routes pass well north of the area. The great circle from Panama to the San Bernardino, Makassar, and Malacca Straits passes closest, about 100-300 miles north of Midway Island. The tanker route from the Straits to Honolulu clears the Refuge to the south by 40-100 miles. The rhumb line from Honolulu to Yokohama passes well south of the chain. The great circle from Honolulu to Japan and Korea runs roughly parallel to the island chain, about 50 miles to the north, initially clearing the eastern end of the Refuge by 25-50 miles. The great bulk of traffic using this route would not be in the class designated to avoid the area and therefore would not be inconvenienced. Affected vessels transitting between the northern and southern sides of the island chain would have a number of passages open for their use. Any detours that may be required for the designated class would be very small and fully justified by the risks imposed by the nature of their cargoes.

ANNEX

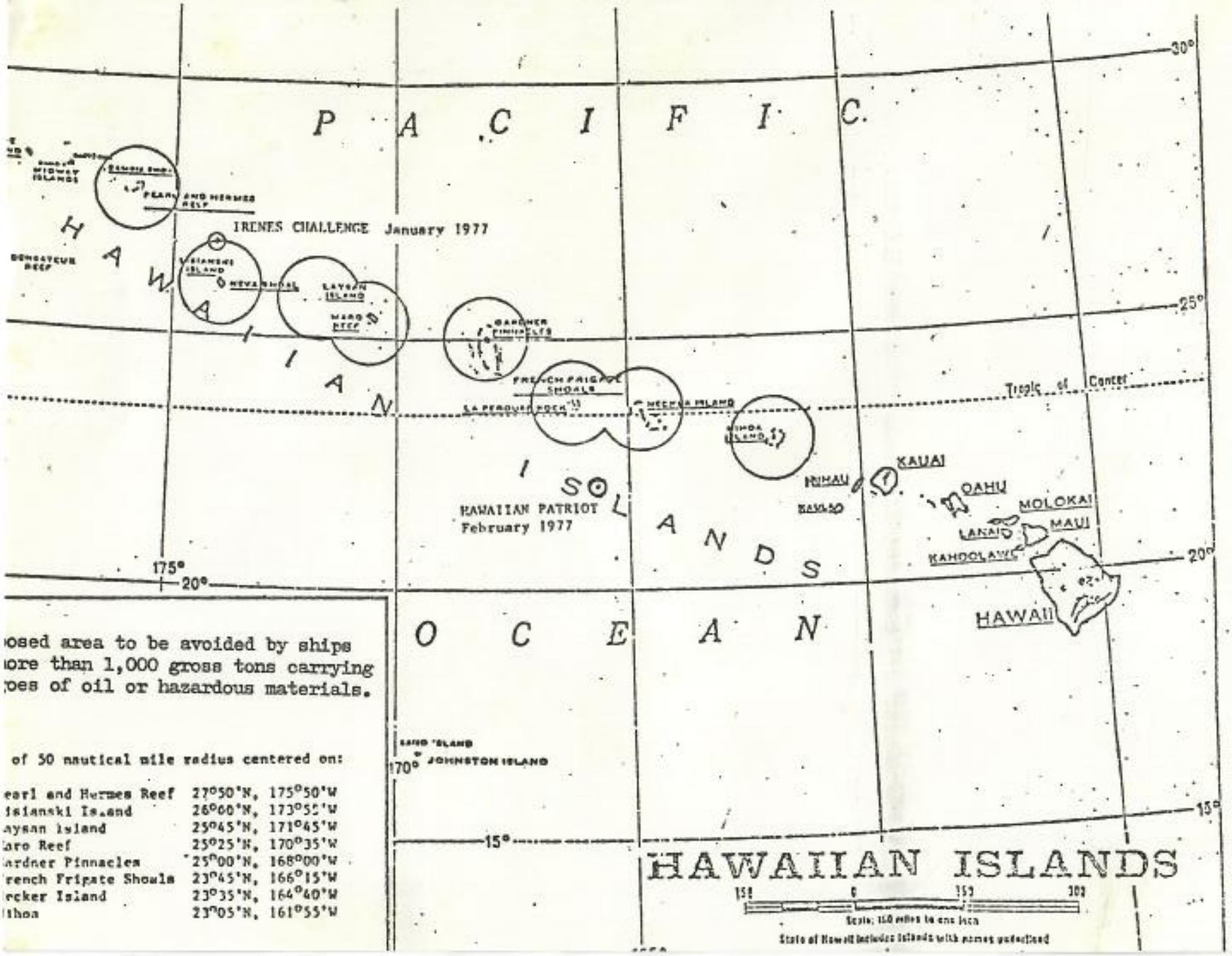
PROPOSED AREA TO BE AVOIDED IN THE REGION OF THE NORTHWEST NORTHWEST HAWAIIAN ISLANDS

1 This note proposes the establishment of an area to be avoided by ships of more than 1,000 gross tons carrying cargoes of oil or hazardous materials. The proposed area to be avoided is in the Central Pacific Ocean and surrounds those islands, reefs and atolls in the northwest Hawaiian Islands which were designated by the United States as a wildlife refuge in 1909. This area should be avoided by the specified class of vessels 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 United States Fish and Wildlife Service scientists and Coast Guard personnel. General public use 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 surrounding the Refuge recently, but because of favourable weather conditions, none resulted in environmental damage to the Refuge.

4 A number of animals inhabiting the Refuge are classified by the United States as endangered species. These include the Hawaiian monk seal, whose principal breeding areas are the islets and islands of the Refuge, the Nihoa millerbird, the Nihoa finch, the Laysan finch, and the Laysan teal. The Laysan teal, endemic to Laysan Island, is probably the rarest species of duck in the world. Only several hundred exist. The Nihoa millerbird (estimated population 600) and the Nihoa finch (estimated population 3,500)



osed area to be avoided by ships
ore than 1,000 gross tons carrying
oes of oil or hazardous materials.

of 50 nautical mile radius centered on:

earl and Hermes Reef	27°50'N, 175°50'W
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aysan Island	25°45'N, 171°45'W
aro Reef	25°25'N, 170°35'W
ardner Pinnacles	25°00'N, 168°00'W
rench Frigate Shoals	23°45'N, 166°15'W
ecker Island	23°35'N, 164°40'W
ihoa	23°05'N, 161°55'W

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

September 30, 1981

CRUISE REPORT

VESSEL: Townsend Cromwell, cruise 81-04 (TC-95)

CRUISE PERIOD: July 17-August 27, 1981

AREA OF OPERATION: Northwestern Hawaiian Islands

ITINERARY:

July 17 - Departed Honolulu.

18 - Disembarked Macauley and embarked Newman at Nihoa.

19-22 - Trapped for lobster and shrimp; handlined for bottom fish at Necker Island.

23-24 - Trapped for kona crab; handlined. Disembarked Newman at French Frigate Shoals.

25-27 - Trapped for lobster, shrimp, and fish; handlined at Gardner Pinnacles.

28-31 - Trapped for lobster, shrimp, and fish. Trawled for penaeid shrimp, fished for kona crab and conducted lobster predation experiments at Maro Reef.

August 1 - En route to Bank #9.

2 - Handlined at Bank #9.

3-6 - Embarked Balazs, conducted lobster predation experiments at Midway.

7-10 - Trapped for lobster, fished for kona crab, handlined, conducted monk seal and turtle surveys, and lobster predation experiments at Pearl and Hermes Reef.

11 - Disembarked Balazs at Midway.

12 - Anchored overnight at Lisianski.

13 - En route to Laysan.

14 - Made 16-mm movies of bird life at Laysan.

15-16 - Trapped for lobster, shrimp, and fish; handlined at Raita Bank.

17-18 - Trapped for lobster, shrimp, and fish and fished for kona crab and handlined at Gardner Pinnacles.

19-20 - Trapped for lobster and handlined at St. Rogatien Bank.

21 - Fished for kona crab. Embarked Katina Teebaki at French Frigate Shoals.

22-23 - Trapped for lobster and fish, and handlined at Nihoa Island.

24 - Embarked Conant and Macauley, conducted an underwater photography station at Nihoa Island.

25 - En route to Honolulu.

26 - Anchored Waimea Bay, Kauai.

27 - Arrived Honolulu. End of cruise.

MISSIONS AND RESULTS: A. Conduct bottom fishing operations using lobster traps, fish traps, shrimp pots, crab nets, and handlines for spiny and slipper lobsters, fishes, kona crabs, and caridean shrimps to assess availability, distribution, and relative abundance.

1. Lobster trapping: Lobster trapping was conducted at Necker Island, Gardner Pinnacles, Maro Reef, Pearl and Hermes Reef, and Raita Bank.

Two types of lobster traps were set, standard entrance traps with 2" x 4" mesh, and small entrance traps with 0.5" mesh specially designed to capture juvenile lobsters. On each string of eight large mesh traps, four traps, having escape gaps to release undersized lobsters, were set alternately with traps having no escape gaps. It was anticipated that sets with the small mesh traps during this cruise would yield much needed data on juvenile lobsters, their nursery grounds, and maturation studies. However, only two sets with the specially designed traps were made, both on Necker Bank. On the third set at Necker the entire complement of three,

eight-trap strings inexplicably disappeared. A commercial fishing vessel, that was also fishing at Necker, later returned to Honolulu with the traps. The loss of the small entrance traps was unfortunate, for this curtailed, for the remainder of the cruise, any effective assessment of lobsters in the smaller size range. A total of 861 spiny lobster, Panulirus marginatus, were caught. Fishing effort expended was 364 trap nights for large mesh traps, yielding a mean catch of 1.35 lobsters per trap per night (CPUE), and 48 trap nights for small mesh traps with a CPUE of 6.42. The latter figure is better compared with the catch rate of 1.85 obtained with the large mesh traps without escape gaps, set at Necker. The mean weight per lobster was 0.44 kg, with 51% of the catch having a carapace length of the proposed minimum legal size of at least 7.8 cm. The mean weight of spiny lobster caught in the small mesh traps at Necker was 0.40 kg. Thirty nine percent had a carapace length 7.8 cm or greater. The largest catches using large mesh traps were made at Maro Reef where the CPUE was 4.29. The mean weight of all lobsters caught at Maro Reef was 0.74 kg and 95% of the lobsters had a carapace length of at least 7.8 cm. At Gardner Pinnacles the CPUE of the large mesh traps was 1.74; the mean weight of the spiny lobster was 0.69 kg. Ninety nine percent were of legal size. At Pearl and Hermes Reef and Raita Bank catch rates were very low. The CPUE for these areas combined was 0.18. However, the mean weight of the relatively few lobsters caught was high (1.2 kg) and 95% were of legal size.

For all areas fished, the traps with escape gaps had a CPUE of 1.10, the mean weight of lobsters caught was 0.76 kg and 97% of the catch was of legal carapace length. For the traps without escape gaps the CPUE was 1.61, the mean lobster weight was 0.62 kg, and 87% of the lobsters were of legal size.

2. Fish trapping: Thirteen fish trapping stations (39 trap nights) were conducted. The fish traps were large single-chambered with large entrances to permit snappers, groupers, and carangids to enter. The initial plan was to set these traps close to the drop-off areas in depths of 75 to 150 m (40 to 80 fathoms). However, because of the loss of the small mesh, small opening traps at Necker, the decision was made to consistently set three strings of two fish traps each in the same areas in which the large mesh lobster traps were set, the objective being to determine if the small meshed (1") fish traps would capture spiny lobster in the smaller size ranges. The catch data for all fishing effort (49 trap nights)

with the fish traps compared with all the effort with the large mesh lobster traps (without escape gaps) showed that the fish traps had a lower catch rate but did catch a somewhat smaller percentage of legal sized lobsters:

	Large mesh lobster traps no escape gap	Fish traps
CPUE	1.61	1.22
Mean weight (kg) of lobsters	0.62	0.60
Percentage of legal size	87	73

The small catch of commercially valuable fish which were caught in the fish traps included 9.8 kg Lutjanus kasmira, 6.9 kg Caranx cheilio, and 8.27 kg Epinephelus quernus. The fish traps (10 trap nights) which were set for fish in deeper water close to drop-offs, caught nothing of commercial value.

3. Shrimp trapping: Trapping for caridean shrimps was conducted at Gardner Pinnacles, Raita Bank, and St. Rogatien Bank. A total of 108.4 kg of shrimp were taken during 72 trap nights (mean CPUE of 1.5 kg per trap night) including 72.9 kg Heterocarpus laevigatus and 35.5 kg H. ensifer. The most productive single set was made at Gardner Pinnacles where a total catch of 28 kg of shrimp (mean catch rate of 2.3 kg per trap) were obtained.

4. Kona crab fishing: Crab nets were set at French Frigate Shoals, Gardner Pinnacles, Maro Reef, and Pearl and Hermes Reef. Prior to setting the nets, the substrate was sampled with a Shipeck grab. Generally crab fishing operations were limited by our ability to find suitable sandy bottom conditions. A set usually consisted of 100 nets soaked for 1-1.5 h. A total of 900 nets were set. Mean catch rate for all sets was 0.14 kona crab per net. The largest catches resulted from two sets at Maro Reef which yielded 0.31 and 0.62 crab per net, and one set at Pearl and Hermes Reef with a catch rate of 0.26 per net.

5. Handlining: Twenty-six stations totaling 180 line hours were occupied. For all areas the dominant species, by weight, in the catches were: E. quernus, Seriola dumerili, Etelis marshi, Pristipomoides filamentosus, and C. cheilio. Relatively smaller amounts of P. zonatus, P. sieboldii, S. aureovittata, and E. carbunculus were also taken. A total of 299 fish weighing 1,418.6 kg were caught. The overall mean catch per line hour was 7.9 kg.

The best catches by weight per line hour were made at Bank #9, (39.4 kg), Maro Reef (22.88 kg), Pearl and Hermes Reef (16.5 kg), and Raita Bank (11.2 kg).

B. Conduct bottom trawling operations with a shrimp trawl for penaeid shrimps at Maro Reef.

Two bottom trawling stations, a day and a night station, were occupied at Maro Reef. Only three penaeid shrimp were caught in the night trawl and none during the day. The catch in both day and night trawls (13.9 and 15.5 kg) consisted of a variety of reef fishes, dominated by a serranid, Anthias sp.

C. Conduct direct and incidental trolling operations in waters over and around all submerged banks, and islands, as time permits.

Trolling operations were remarkable for the small catch. Particularly as many of the areas which were fished, on previous cruises have yielded good catches. A total of 312 line hours of trolling (3 lines) caught 26 fishes: 14 Euthynnus affinis, 5 Acanthocybium solandri, 3 Caranx ignobilis, 2 Katsuwonus pelamis, and 2 Thunnus albacares.

D. Conduct experiments to determine how lobster offal in the vicinity of lobster traps affects the catchability of the traps.

Two offal experiment stations were occupied at Necker Bank and one at Maro Reef. An experimental station consisted of four strings of eight standard double entrance traps each. The "lobster offal" consisted of spiny lobster heads. Two heads were attached together by a 1 m length of cotten string to each of the 16 traps on 2 of the strings. The other two (control) strings did not have lobster heads attached to them. All of the traps, both experimental and control were baited in the usual manner with mackerel. The experimental and control strings were set alternately in a line across the prevailing current.

The total catch, for all the experimental stations, taken in the "no offal" control traps was 105 spiny lobsters for a CPUE of 2.2. The total spiny lobster catch taken in the "with offal" experimental traps was eight, for a CPUE of 0.17. Seven of the eight lobsters caught in the experimental traps were in three traps which, when hauled, no longer had the lobster heads attached. The present data indicate rather conclusively that lobster offal, in the form of lobster heads, when in the vicinity of traps does have a very detrimental effect on their catchability for spiny lobster.

E. Conduct underwater observations on predation by large carangids and sharks on surface and bottom released sublegal and berried spiny and slipper lobsters.

Experiments and concurrent visual observations, and 16-mm movie documentation to determine the probability of spiny lobsters safely reaching the bottom when they are released from the surface in the presence of potential predators, and the vulnerability of spiny lobsters to predation when they are released at the bottom from a specially designed release bag were conducted at Maro Reef, Midway Island, and Pearl and Hermes Reef. The experiments were designed to simulate conditions on a commercial vessel when undersized and berried lobsters are returned alive to the sea after being sorted from the catch. After locating large schools of large white ulua, Caranx ignobilis, observer divers entered the water. Spiny lobsters were then released at or near the surface in depths of 20-35 m, or from a relelse bag near the bottom. The observers then recorded the ulua-lobster interactions. The experiments showed that C. ignobilis are sometimes voracious predators on lobsters both in midwater and on the bottom, even on those lobsters considerably larger than the minimum legal carapace length (7.8 cm). Under some of the experimental conditions, there was little likelihood of a lobster surviving, however, on other occasions the intensity of predation was apparently much less. Observations made during this cruise and on previous cruises do not show that the other suspected predator, the galapagos shark, Carcharhinus galapagensis, is a predator on spiny lobsters. Underwater observations also provided interesting insights into various aspects of the behavior of prey and predator under the experimental conditions.

F. Conduct a survey of green turtles at Pearl and Hermes Reef and a survey of Hawaiian monk seals at Pearl and Hermes Reef, and Lisianski Island.

At Pearl and Hermes Reef 24 female adult, 8 male adult, and 15 immature turtles were newly tagged. In addition 12 previously tagged turtles were seen and the data recorded. Turtles were only seen at Southeast, North, and Little North Islands. None were seen on or around Seal-Kittery, Grass, Bird, or Sand Islands. It was estimated that a maximum of only nine nestings had occurred at Pearl and Hermes during the preceding 2 months. Original cruise plans had called for William Gilmartin and Anne Houtman to join the vessel at Midway to conduct monk seal observations during the remainder of the cruise. Because Gilmartin and Houtman were unable to join the scientific party, except for a monk seal count at Pearl and Hermes Reef, the planned seal work was cancelled. A total of 46 monk seals were seen at Pearl and Hermes Reef. Many of these were photographed for identification records.

It is interesting to note that this count is the same as that obtained in April 1980, during Townsend Cromwell cruise 80-02.

G. Miscellaneous observations and activities.

1. Sixteen night-light stations were occupied.

2. Thirty-five bottom grab sample stations were occupied.

3. Fish tissue samples were collected for ciguatoxin analysis from Necker, French Frigate Shoals, Gardner Pinnacles, Maro Reef, Midway, Pearl and Hermes Reef, Raita Bank, St. Rogatien Bank, and Bank #9. Samples were preserved from 253 fishes, including 54 Epinephelus quernus, 47 Pristipomoides filamentosus, 43 Etelis marshi, 42 Caranx cheilio, 29 Seriola dumerili, 12 P. sieboldii, 6 C. ignobilis, 3 S. aureovittata, 2 E. carbunculus, and 1 each P. auricella, C. melampygus, Aprion virescens, Gymnothorax undulatus.

4. Size-frequency and sex data were taken from 470 fishes.

5. Heads of 71 fishes, including P. filamentosus, P. zonatus, E. carbunculus, and C. cheilio were collected for otolith studies.

6. Stomachs and samplings from 84 fishes were preserved in Formalin or frozen for later study.

7. Sixty-one fish and invertebrate specimens were preserved for later identification or study.

8. Morphometric measurements were taken from 162 spiny lobsters for size at maturity studies.

9. Berried spiny lobsters were collected for fecundity studies.

10. Two S. dumerili and two C. cheilio were tagged and released.

11. During handline operations a log was kept of the depth at which bottom fish were hooked.

12. Inshore dives were conducted at Necker and Nihoa for a survey of juvenile lobsters, monk seals, and turtles, and to make 16-mm movies.

13. Photographs of fish and invertebrates were made for possible use in publications.

14. About 3,600 ft of 16-mm movies were made of underwater and various other ship and shore activities conducted during the cruise.

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

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

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

SCIENTIFIC PERSONNEL:

Reginald M. Gooding, Chief Scientist, Fishery Biologist, National Marine Fisheries Service (NMFS), Southwest Fisheries Center (SWFC), Honolulu Laboratory (HL)
George H. Balazs, Wildlife Biologist, NMFS, SWFC, HL (August 4-11)
Steven H. Kramer, Research Assistant, NMFS, SWFC, HL
James H. Prescott, Research Assistant, NMFS, SWFC, HL
Michael P. Seki, Research Assistant, NMFS, SWFC, HL
Gordon W. Tribble, Research Assistant, NMFS, SWFC, HL

Sheila Conant, Cooperating Scientist, University of Hawaii (August 24-27)
David Macauley, Cooperating Scientist, U.S. Fish and Wildlife Service (USFWS) (July 17-18 and August 24-27)
Audrey Newman, Cooperating Scientist, USFWS (July 18-23)
Katina Teebaki, USFWS (August 21-27)

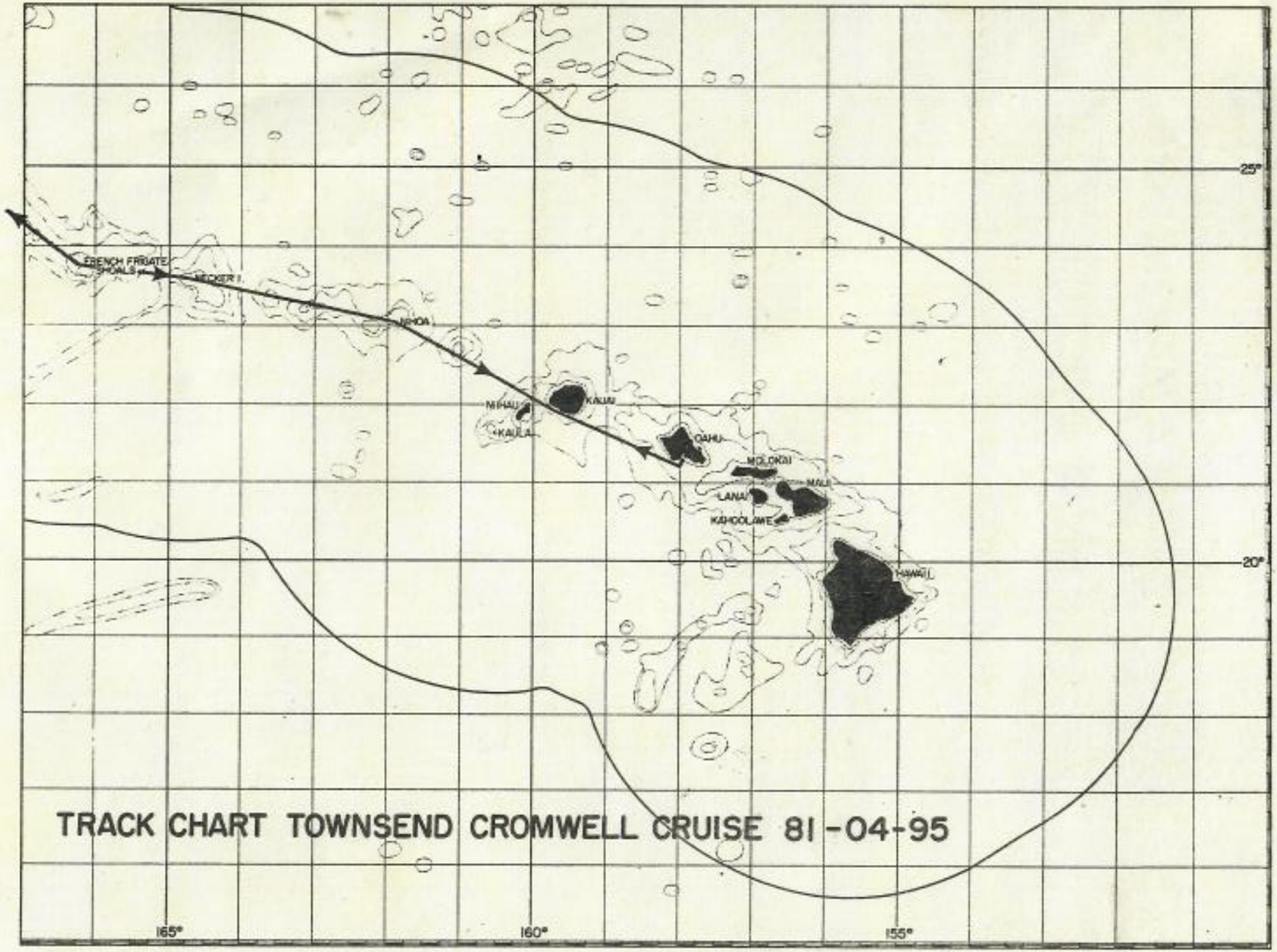
Submitted by:

Reginald M. Gooding
Chief Scientist

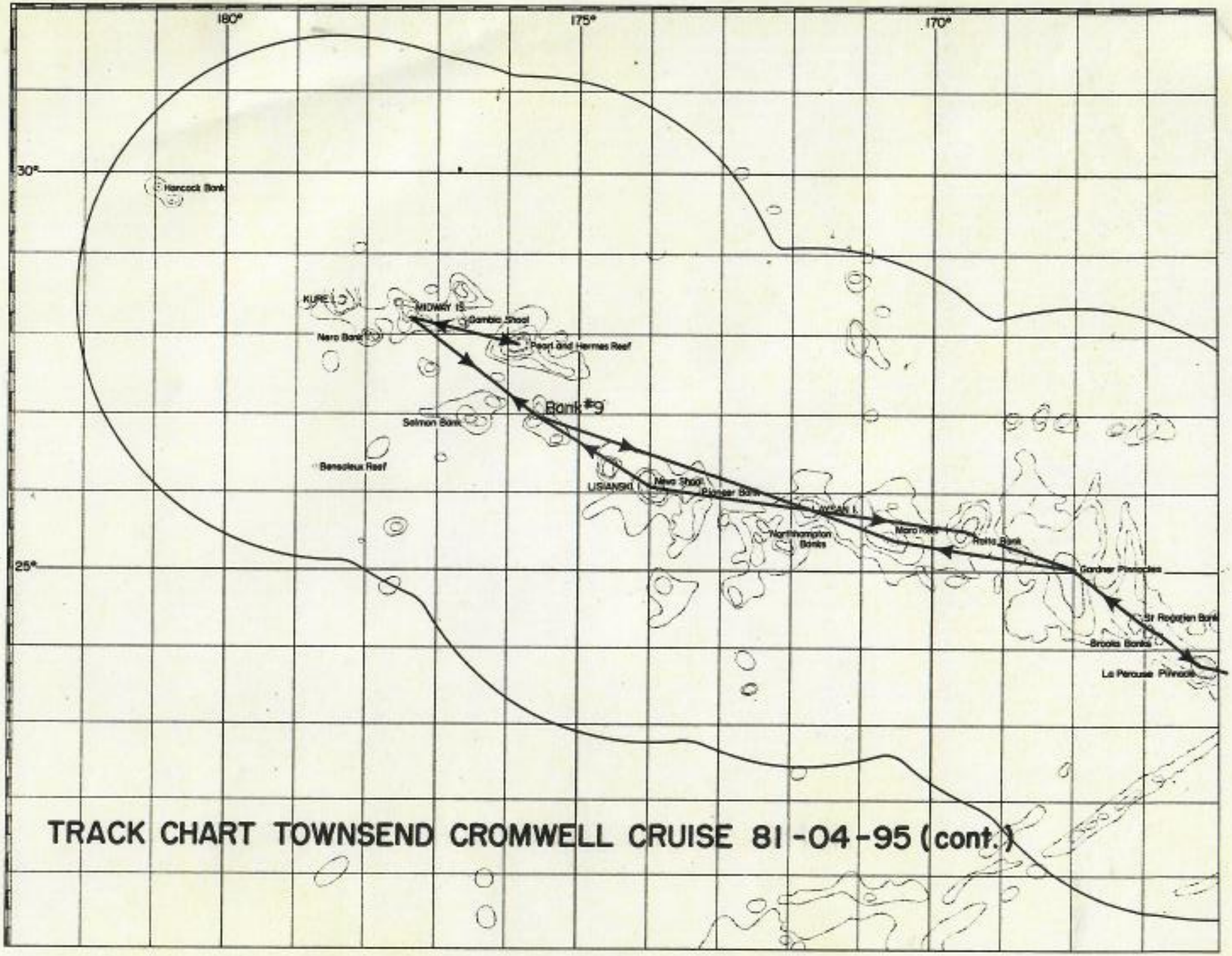
Approved by:

Richard S. Shomura
Director
Honolulu Laboratory

Attachment



TRACK CHART TOWNSEND CROMWELL CRUISE 81-04-95



TRACK CHART TOWNSEND CROMWELL CRUISE 81-04-95 (cont.)