

**A Proposal To Establish A Fishing Support Operation
At French Frigate Shoals, Northwestern Hawaiian Islands**

MEMO

TO: George DATE: 7-10

Thanks for the postcard, a very handsome photo. Did the turtle react to the flash?

Here's the FFS proposal you requested. As I understand it, Walter Ikehara (formerly with NMFS) was the primary author; you can reach him informally (548-5915) after he returns from the NWHI in August. Formal inquiries, comments, etc. should go as usual to Henry Sakuda, or you can talk development with Al Katekaru (-3044), Walter's boss & direct head of our "fisheries development unit."

Regard's,

FROM: Dave Eckert

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Executive Summary

The State of Hawaii proposes to establish a fishing support base at French Frigate Shoals to develop a multi-resource fishery in the Northwestern Hawaiian Islands (NWHI). The proposal describes an operation involving a mothership vessel anchored at French Frigate Shoals to provide storage and reprovisioning support for a fleet of catcher vessels. With mothership support, the catcher vessels could use a variety of gears target for several fish and shellfish species. Envisioned is a two-phase fishing scenario. Species suitable for the frozen seafood market in Hawaii would be caught on the outward bound phase (Honolulu to NWHI) and unloaded at the mothership which will store the frozen catch for later return to Honolulu. The catcher vessels could make 3 to 4 fishing trips for offloading at the mothership. At the end of the season, during the return trip to Honolulu from the NWHI, the fishing vessels could catch fish for the fresh seafood market.

The ideal catcher vessel is a multi-purpose fishing vessel capable of using bottomfish handline gear, lobster or shrimp traps, and trolling gear. It is large enough to carry about 20 tons of frozen fish, and have enough range and seaworthiness to work in the NWHI. A tuna purse seiner could serve as a mothership support vessel. It should carry enough fuel and provisions to service the catcher vessels, store their catches, and be self-sufficient. The mothership would make several round trips to Honolulu to unload the frozen catch and to load fuel and supplies for the catcher fleet.

Catcher vessels supported by a mothership in the NWHI would have more fishing time and reduce transit time in comparison to unsupported vessels. Vessels currently catching bottomfish in the NWHI, lacking the support of a mothership, are experiencing marginal profitability. A preliminary economic analysis of the proposed fishing operation shows that even if unsupported vessels fished combinations of bottomfish and shrimp, or bottomfish and lobster, their net incomes (\$2,440 - \$46,180) would still be lower than an operation supported by a mothership. Vessels with the support of the mothership could increase their net income several times (\$24,420 - \$78,850). The mothership could make a net income up to \$238,000. The fisheries resources and the mothership operation could support a fleet of about 10 catcher vessels fishing for about 70 days in a 100-day season.

The mothership would be anchored within French Frigate Shoals, off Tern Island. However, the island, administered by the U.S. Fish and Wildlife Service, would only serve for brief rest and recreation by fishing crews, for emergency evacuations, and for temporary storage of some fishing gear.

Limitations of a multi-species French Frigate Shoals fishing operation include the capacity of the resources, fishing gear expertise, market development, and possible impacts of the support operation on the habitat and wildlife of the NWHI. A fishing support operation would be integrated with conservation and research activities to provide maximum benefit and reduce cost to all users of the NWHI.

Adverse impacts of the fishing support operation on the fragile and unique ecosystem of the NWHI can be minimized by careful planning and adherence to preventive measures.

In conclusion, the fishing support operation at French Frigate Shoals appears to be economically and logistically feasible. Such an operation is necessary for fisheries development in the NWHI, without which Hawaii's fishing industry may not be able to achieve its full potential.

A PROPOSAL TO ESTABLISH A FISHING SUPPORT OPERATION AT
FRENCH FRIGATE SHOALS, NORTHWESTERN HAWAIIAN ISLANDS

1.0 Background

The 1979 Hawaii Fisheries Development Plan identified the Leeward or Northwestern Hawaiian Islands (NWHI - Figure 1) as the area where the future major expansion of the State's fishing industry would take place. Most of Hawaii's fisheries development potential for bottomfish, lobster, deepsea shrimp, bigeye scad ("akule"), and mackerel scad ("opelu"), estimated between 7,150,000 to 16,800,000 pounds, exists in the NWHI. If the local fishing industry is to increase its contribution to the State's economy, then a cost-effective means of tapping these resources is required. In spite of the growing interest in Hawaii's distant-water fisheries, logistics and costs of fishing operations are two important impediments prohibiting fisheries expansion in the NWHI. A large expense of vessels is the cost of fuel used in traveling to and from distant-water fishing grounds. Transit (non-fishing) times range between 6 to 10 days for fishing vessels traveling between the NWHI fishing grounds and the main Hawaiian Islands.

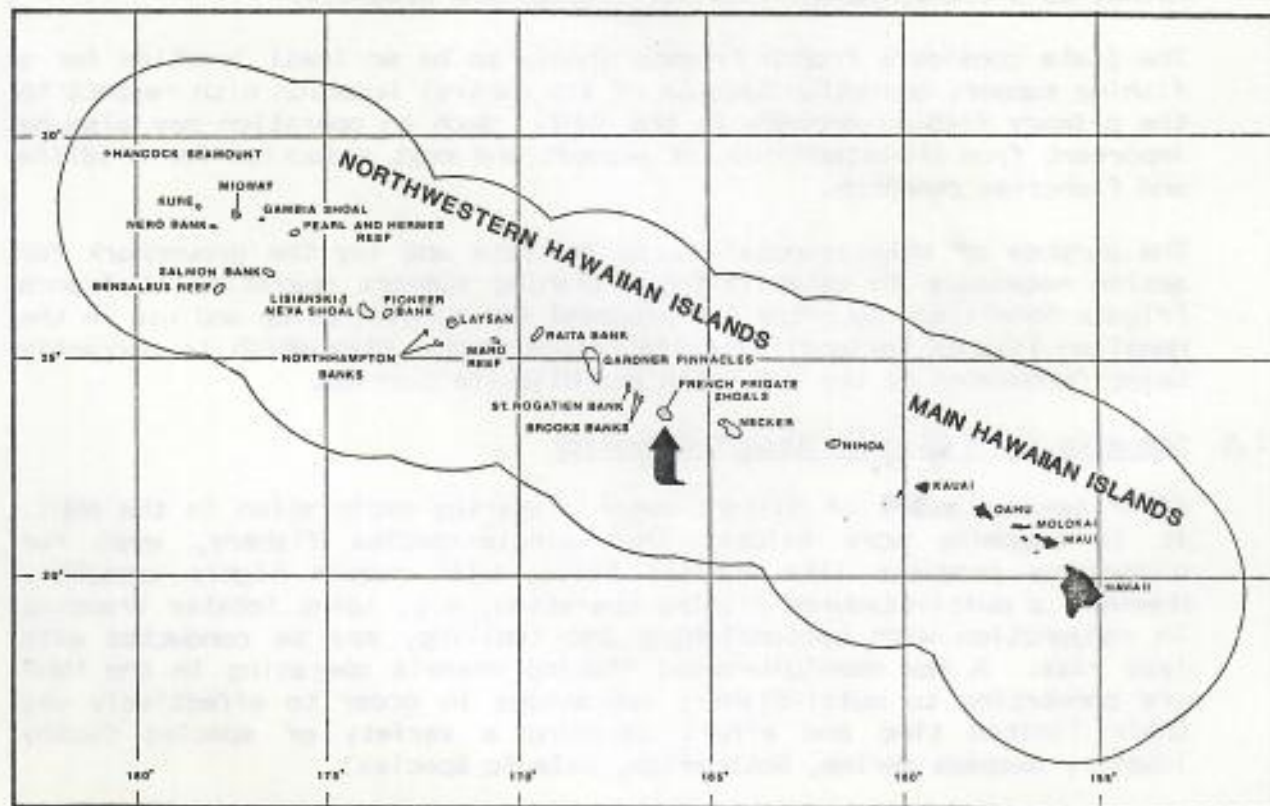


Figure 1. The Hawaiian Archipelago and the 200 mile Fishery Conservation Zone (FCZ).

The State strongly supports fisheries development in the NWHI to the extent that the fishing industry can be sustained by the resources and in a manner without jeopardizing the unique seabirds and wildlife of the NWHI. Also, a "multi-resource" use approach for fisheries development is encouraged because of the inherent limits of available natural fish stocks.

Expansion of NWHI fisheries based solely on single species (e.g., spiny lobster) and conducted by large fishing vessels (80 to 130 foot-plus length range) is questionable. However, recent fishing activities and exploratory fishing surveys indicate that commercial fishing in the NWHI may be profitable for smaller (45-50 ft.) vessels that harvest a diversity of resources, including pelagic fish, bottomfish, and shrimp. The effective operation of these vessels, however, requires the use of a variety of fishing gears, a diverse resource base, and a fishing support base.

Although the State has assessed the feasibility of using Midway Islands as a fishing support operation for domestic albacore tuna fishermen, in the more southern reaches of the NWHI a different type of fisheries support is needed at a location more suitable for smaller fishing vessels that target for the fresh fish and high-value frozen seafood market. The logistic and strategic considerations for these fishing vessels are different from the larger albacore trolling vessels which would use Midway as a transshipment base for frozen tuna products.

The State considers French Frigate Shoals to be an ideal location for a fishing support operation because of its central location with respect to the primary fishing grounds in the NWHI. Such an operation may also be important from the standpoint of support and cost reduction for wildlife and fisheries research.

The purpose of this proposal is to initiate and lay the groundwork for action necessary in establishing a fishing support operation at French Frigate Shoals and to offer the proposal for consideration and use in the Hawaiian Islands National Wildlife Refuge Master Plan which is currently being formulated by the U.S. Fish and Wildlife Service.

2.0 Scenario for a Fishing Support Operation

After several years of distant-water fisheries exploration in the NWHI, it is becoming more evident that single-species fishery, even for high-value products like lobster tails, will remain highly unstable. However, a multi-resource fishing operation, e.g. spiny lobster trapping in conjunction with bottomfishing and trolling, may be conducted with less risk. A few Honolulu-based fishing vessels operating in the NWHI are converting to multi-fishery operations in order to effectively use their limited time and effort catching a variety of species (spiny lobster, deepsea shrimp, bottomfish, pelagic species).

The effectiveness and profitability of vessel sizes and gear types depend on weather conditions, seasonality, catchability, storage life of various species, boat design and seaworthiness, the optimum use of vessel

working space and holding capacity, fishing expertise of the captain and crew, market demand, and price for target fish species. Abundance of the fish stocks, their tolerance to heavy harvesting and capacity for recovery place a limit on fishing activity (i.e., the total amount of fishing effort) capable of achieving sustained yield and profitability.

Multi-resource fishing vessels supported by a French Frigate Shoals support operation can maximize their earnings by conducting a two-phase NWHI fishing operation. On the outward bound trip, from the main Hawaiian Islands to the NWHI, and on the intermediate trips made in the NWHI during the season, the vessels could fish for species targeted for the Hawaiian frozen seafood market. A mothership support operation at French Frigate Shoals, near Tern Island, could receive and hold the frozen catches for transshipment to Honolulu for sale on the local and export market sales. The mothership could supply the fishing vessels with fuel, provisions, bait, ice, and provide minor repair facilities. This would allow the vessels to stay on the fishing grounds for the entire season to maximize fishing effort by reducing transit time between the fishing grounds and the receiving point. At intervals, the mothership would return to Honolulu to unload the frozen catches and take on supplies.

The vessels could make as many as 3 to 4 intermediate trips while fishing in the NWHI with a mothership, resulting in a total of 5 to 6 trips per season. Each trip could last about 20 days, including transit days, idle days (unloading and reprovisioning), and fishing days. The mothership would confer an advantage to its catcher vessels by reducing their transit time and increasing fishing time. The fishing vessels need to return to Honolulu only at the end of the season. On the return trip to Honolulu at the end of the season, the vessels would fish primarily for the fresh fish market. The return trip catch would be unloaded directly in Honolulu.

2.1 First Phase (Main Hawaiian Islands to NWHI) Fishing Trip

One of the most feasible target species on the first phase of the NWHI fishing season is the deepsea shrimp, Heterocarpus spp. It is an abundant and valuable resource throughout the Hawaiian archipelago. Fishery scientists have estimated its potential annual yield as high as 1.5 million metric tons (Schlals 1983); it is readily caught in traps at 300-500 fathoms deep. Exceptional catch rates as high as about 60 pounds per trap have been reported (HFDP 1979). A vessel equipped with basic trap-handling gear (hydraulic pullers, boom and line rollers) could use either lobster or shrimp traps. Currently, the Hawaii market for chilled or frozen whole shrimp is small. However, recent developments such as the formation of a local corporation to catch, process, and market deepsea shrimp indicate the potential of deepsea shrimp as a viable frozen seafood product (Pacific Business News 1983). A limited amount of shrimp is sold on the local fresh market as "ama ebi", or sweet shrimp. It currently fetches about \$2.50 per pound, and with development of the market, the ex-vessel value could rise as high as \$4.00 per pound. A sweet-tasting shrimp similar in appearance and taste to the local deepsea

shrimp is popular in Japan, so a potential export market exists for this species. However, the deep sea shrimp, like most other cold water species, requires special handling. It must be chilled or frozen soon after removal from the trap to prevent deterioration of the tail meat.

The live spiny lobster market in Hawaii is limited. Most of the current lobster fishing activity in the NWHI is by vessels that process and freeze lobster tails on-board for the International market. In order to accomplish on-board processing, the vessels carry bulky equipment, including a high pressure pump, a brine box, a blast freezer which freezes the lobster tails at -40 degrees C at the end of each day, and a storage freezer which holds the product at -20 degrees C. Not only is there considerable investment in such processing equipment and storage, but space requirements may preclude participation in other fisheries. Nevertheless, space requirements can be reduced by limiting the scale of fishing and onboard processing of spiny lobster. A "portable" blast-freezing unit can be mounted on a smaller vessel and 100-150 traps can be used (rather than 500 traps) to reduce the space required for storing the traps, lines, floats, and weights. The smaller number of traps perhaps could be reset more frequently than is the current practice. The critical gear requirement for a lobster boat would be a large hydraulic puller and line spools on a boom. Lobster tails frozen on the vessel would have a shelf life of up to one year, so there would be no urgency of transporting them to market after they were properly processed. The frozen product would be offloaded onto a mothership at French Frigate Shoals allowing the vessel to return to the fishing grounds.

Although at present, there is little demand in the Hawaii market for local fish in frozen form, often filleted local fresh fish purchased for the tourist trade is frozen for short periods by the hotels and restaurants themselves. Many fish purveyors accumulate inventories of popular "white meat" fish species such as wahoo ("ono"), dolphinfish ("mahimahi") jacks ("white ulua" and "butaguchi ulua"), whose availability and price in the Hawaii fresh fish market are highly erratic. The marketing of fresh and rapid-frozen fish must be carefully coordinated so that wholesalers can continue to supply restaurants with fresh products when available, at a price well above rapidly-frozen products, with the latter offering the ability to build an inventory and stabilize prices at times when there are shortages of fresh fish. An integrated marketing system could lead to a two-tiered market (an exclusive restaurant market for high-priced fresh fish and a broader-based market for previously frozen whole or filleted fish) for wahoo, dolphinfish, and selected species of bottomfish.

With the development and expansion of Hawaii markets for rapid-frozen wahoo, dolphinfish, jacks, and possibly other species, trolling and bottomfishing would become more attractive economically. It may be possible to combine bottomfishing, trolling, and trapping, as long as the trap fishery is of limited scale and does not require all of the deck space. In order to engage in all three fisheries, it will be necessary to have a broad range of fishing expertise represented in the captain and crew.

Bottomfishing and trolling are highly compatible activities in terms of vessel size, gear, and catch holding systems. In fact a few commercial bottomfish boats operating in the NWHI already engage in both fisheries. The basic requirement of these fisheries is hydraulic line pullers of the gurdy or pinch-puller type. For most of the year, the troll catch is not substantial enough to warrant trolling as the exclusive fishing method, except in the fall and winter months when the wahoo is seasonally abundant. The installation of fish aggregating devices (FADs) by the State in strategic NWHI locations to concentrate troll-caught fishes could play an important role in the harvesting of wahoo, dolphinfish, and other pelagic species. Trolling vessels would not only increase their catch per unit effort with the FADs but would also save on fuel used in searching for fish. Probably the many small banks scattered throughout the NWHI serve as natural aggregators of fish; however, FADs could be installed on the larger bank areas to enhance catch. For example, five FADs could be placed in the area between Necker Island and Maro Reef.

The catch composition around the FADs will be affected by seasonality of species, with the skipjack and yellowfin tunas ("aku" and "ahi") and dolphinfish more abundant in the summer, jacks and wahoo more abundant in the fall. The freezer storage life of these species is 6 months to 1 year. Many of the tunas are not in demand in frozen form, except by the cannery and would probably have to be sold at cannery prices. The billfishes would also bring a low price in frozen form. In order to target on species that can return a high price if rapid-frozen, such as wahoo, trolling in the fall months would be most effective. During November and December 1982, a few U.S. West Coast vessels wintering over in Hawaii caught more than 5,000 pounds of wahoo from the NWHI. Much of this catch was taken from around a U.S. Coast Guard weather buoy off Necker Island.

Sharks are relatively abundant in the NWHI, especially during the summer months, and could be captured incidentally around the fish aggregation devices or by longlining in shallow depths. Sharks can yield a variety of products and their sale could help offset fuel and other operating costs. Freezing appears to improve the quality of shark meat which has proven to be acceptable to consumers in tasting sessions. However, the history of shark fisheries, including shark control programs conducted around the main Hawaiian Islands, indicates that once a steady market develops for particular shark commodities, local shark populations are rapidly reduced and catch rates decline dramatically after only short periods of intense fishing pressure. Sharks are especially vulnerable to overfishing because of their long gestation period and low birth rate. Although sharks are an unavoidable by-catch in several types of NWHI fisheries, the unstable catch rates and low sustainable yields in any shark fishery do not encourage any investment in harvesting and processing equipment specifically to produce shark products at this time. However, future market conditions might improve the profitability of a commercial shark fishery operation. Small and medium size sharks seem more suitable than large sharks as a resource base of such a fishery. Shark meat would be the main product together with the fins of marketable size and shark liver oil.

Due to the oversupply of canned light meat tuna in the world market, present cannery prices for frozen skipjack and yellowfin tunas do not provide much incentive for the expansion of the Hawaii pole-and-line tuna fishery into distant waters. The existing pole-and-line fleet relies on selling a large proportion of the skipjack tuna catch in the local fresh fish market for relatively high prices. Air shipment of fresh tuna from Tern Island (French Frigate Shoals) to Honolulu would not be economical; the limited shelf life of fresh skipjack also prohibits such shipment. The under-utilized skipjack tuna resource of the NWHI may be harvested by U.S. purse seiners, but such vessels have large carrying capacities and at this time don't appear to require logistical support. However, if cannery prices for light meat tuna improve, and if suitable long-distance pole-and-line boats and baitfish are available, then a French Frigate Shoals mothership operation may be utilized for transshipment of frozen tunas to the cannery.

After completing the first fishing trip around the NWHI, the catcher vessels would offload frozen lobster tails, shrimp, and/or whole frozen fish at the mothership moored off French Frigate Shoals. The crew may have a brief rest on Tern Island. Ice, bait, provisions, diesel fuel and fishing gear would be transferred from the mothership to the fishing vessel which would conduct 3 to 4 more fishing trips and offloadings before making the return trip to Honolulu.

2.2 Second Phase (Return Trip from NWHI to Main Hawaiian Islands) Fishing Trip

The return trip of the season would be devoted to harvesting fresh fish; bottomfishing and trolling would be the best combination of fishing methods for this trip. Although the availability of pink snapper ("opakapaka") in the NWHI doesn't appear to be seasonal; the best bottomfishing strategy for the NWHI is to land a mix of bottomfish species, to avoid flooding the local fresh fish market with any single species. Although red snappers such as "onaga" are more abundant in the main Hawaiian Islands' fishery during the winter months, good prices during the holiday season also provide an incentive for bottomfishing in the NWHI during this period. However, stormy weather at this time of the year reduces the number of fishing days. Strategically-placed FADs in the NWHI could increase the catch per unit effort in the troll fishery. If brined and well-iced after capture, most species of bottomfish have a storage life of up to 12 days, compared to a storage life of up to 5 days for small yellowfin tuna and wahoo. Thus, the fishing strategy for the second phase trip would be to focus on bottomfish initially, and then troll for pelagic species during the last 4-5 days of the return trip to the main Hawaiian Islands.

2.3 Description of Fishing Vessel

The model fishing vessel would be about 45-50 feet long, have about a 25-35 ton fish hold capacity, and be equipped with a small blast freezer and a dry-refrigerated fish hold. It would carry about 5,000 gallons of diesel fuel, have a 150 hp diesel engine, and cruise at about 7-8 knots.

The fuel consumption in transit is estimated to be about 150 gal/day, and the fishing fuel consumption (assuming that it would be trapping and bottomfishing) would be about 150 gal/day. The fishing vessel has a crew of three, including the captain.

2.4 Description of Support Mothership Vessel

The most practical mothership would be a small tuna purse seine vessel. It's about 120 ft long, with a beam of about 29 ft, and a draft of about 16 ft. It carries approximately 60,000 gallons of diesel fuel and would be driven by a single 1000 hp diesel engine, with a cruising speed about 10 knots. The transit fuel consumption is estimated to be 1200 gal/day and the auxiliary fuel consumption (at anchor) is about 400 gal/day. The mothership should store at least 300 tons of fish in refrigerated holds. A small blast freezer on board to freeze the incoming catches solid may be needed; also the catches are stored frozen in the holds dry to avoid brine penetration.

The mothership has a crew of about 10-11, and is equipped with a desalinator and adequate fresh water storage to resupply the fishing catcher vessels. The catcher vessels would probably be equipped with small desalinators also.

Using a container/fuel tanker barge instead of a mothership vessel appears to be infeasible because it entails high capital and operating costs. Most of the needed equipment would have to be leased or purchased. A purse seiner has the power generation, fish handling, crew accommodations, and repair facilities to support a small fleet of catcher vessels. Furthermore, its lease cost is likely to be low, since it could be an older vessel and likely to have been fully paid for and depreciated.

The projected catches of the 10 vessel catcher fleet total about 700 tons. The mothership would make about two trips to Honolulu during the 100-day fishing season for transshipping the catches and reprovioning. The catcher vessel fleet would, of necessity, be on its own during the mothership's absence.

The support mothership would enable the fishing vessels to extend their fishing to 70 days in a 100-day season. Without a support ship, the fishing days would be limited to approximately 50-55 days (Table 1).

The mothership would be anchored south of Tern Island, French Frigate Shoals. A small skiff could shuttle limited amount of gear and personnel between Tern Island and the mothership. The fishing crews could briefly use Tern Island for rest and recreation during the fishing season, while their vessel is being unloaded or resupplied at the mothership. The areas currently open for human activity on Tern Island should be adequate for recreational purposes, and while on the island, the crews will adhere to federal Hawaiian Islands National Wildlife Refuge regulations. The personnel visiting Tern Island will be self sufficient, arrangements being made through the mothership support base manager. Care will be

TABLE 1. FISHING OPERATION MODEL WITHOUT MOTHERSHIP SUPPORT

Gear Type	Lobster trap	Bottomfish HL	Shrimp trap	Trolling	Trolling
Days transit	8	8	8	3	3
Days idle	2	2	2	2	2
Days fishing	18	18	18	4	4
Transit fuel cons.	150 gal/day				
Fishing fuel cons.	150 gal/day				
No. gear units	150 traps	3 lines	150 traps	8 lines	8 lines
Catch rate	2.88	295.33	6	39.13	35.38
C/R units	#/Trap/N	lb/Hook/D	lb/Trap/N	lb/Hk/D	lb/Hk/D
Product	Tails	Various	Whole	YF Tuna	Ono
Catch/Day lb	198	884	900	313	283
Total Catch/trip	1,980	8,840	3,000	1,252	1,132
Value \$/lb	10.00	1.50	4.00	1.29	4.00
Total Value	\$19,800	\$13,260	\$36,000	\$1,615	\$4,528
MSY (1000 lb)	144	726	3,300,000	Not available	Not available
# Boat/Days to MSY	729	819	no limit	Not available	Not available

taken to avoid introductions of exotic species to the Refuge, although Tern Island already has a large population of exotic species.

Extreme precautions must be taken to avoid oil spills from refueling operations. The mothership crew should be trained in oil containment procedures in case a spill does occur. No dumping of bilge water or waste will be allowed within French Frigate Shoals.

The fishing support operation should be overseen by a full-time manager on board the mothership. The manager can monitor communications, arrange for emergency airlifts, and act as liaison with U.S. Fish and Wildlife Service personnel on Tern Island. The mothership itself will be crewed by a Captain, a navigator, two engineers, a cook, and some deckhands. The engineers can double as diesel/refrigeration mechanics; the fishing crews are likely to be self-sufficient with regard to their own vessel. A crew of unloaders may need to be hired, or the deckhands could double as the unloading and service crew.

A manager in Honolulu will arrange unloading and resupply of the mothership, and to manage the marketing of the fresh and frozen catches. It is crucial that the marketing of the fish catch be integrated into the local seafood marketing system. However, most of the frozen lobster and frozen shrimp would probably be exported until such time the local market for these products is expanded.

3.0 Economic Analysis of a Fishing Support Operation

A preliminary economic analysis was performed on the proposed fishing support operation. The analysis has three parts: a fishing operation model, a fishing vessel pro-forma analysis, and a support mothership vessel model. Since various published and unpublished data were used to derive estimates used in the models, the sources are not cited individually, but are listed in the References section.

The fishing operation model analyzed the economics of fishing, incorporating data on the fishery resource, fuel consumption, transit and fishing time, fuel costs, gear type and amount, catch rates, total catches, and the ex-vessel value of the catch. The ex-vessel values given for each species were projected estimates based on the development of Hawaii's frozen seafood market in the near future.

Species destined for the frozen seafood market, like lobsters, shrimp, and various bottomfish, are considered the primary source of income. Lobsters and shrimp are taken by trap, and the bottomfish by handline. These species are targeted for on the outbound first phase (main Hawaiian Islands to NWHI) trip and on intermediate trips using a support mothership anchored in French Frigate Shoals. The vessels could either catch a combination of lobster and bottomfish, or shrimp and bottomfish. Since the lobster and shrimp traps differ, the vessels are unlikely to fish both during the same season. It is presumed that lobster trapping will take place mainly around Maro Reef and Necker Island; shrimp trapping and bottomfishing could take place throughout the NWHI. Since the traps will probably be soaked overnight, bottomfishing can take place during the soaking period. The economic analyses were made on the assumption that half the catcher vessels will fish for shrimp/bottomfish, and the other half for lobster/bottomfish.

During the return trip to Honolulu from the NWHI, initially the vessels could conduct trapping and bottomfishing for the frozen fish market and then they could troll for pelagic species or catch bottomfish aimed at the fresh seafood market.

For the purpose of convenient analysis, various assumptions were incorporated into the model. Fishing trips are arbitrarily defined as 20 days in duration. This is about the average trip length an unassisted fishing vessel makes to the NWHI (Hau 1983). A vessel would carry about 150 lobster or shrimp traps. Folding, stackable plastic lobster traps are becoming popular in the local fishery. A vessel using these traps would carry more traps than the California style galvanized wire trap. Stackable traps are also being used by shrimp fishermen. Bottomfishing could be done while the lobster/shrimp traps are fishing on the bottom. On the other hand, the fishing vessel could also troll while the traps are fishing.

The mothership operation could charge 20% of the ex-vessel value of the unloaded catch for its services. Fuel, oil, provision, and bait can be sold at cost to the fishermen. Fixed and operating costs are included in the model. The catcher vessels should operate on an exclusive contract with the mothership operator so that all their catches will be handled by the support operation which will also arrange for the handling and marketing of the catch in Honolulu.

The number of boat-days of fishing, the estimated MSY (Maximum Sustainable Yield) divided by the daily catch rates, would range from 729 boat-days for lobster to nearly limitless for shrimp. Not enough is known about the populations of pelagic fishes in the NWHI to estimate their MSY. However, it is likely that the populations of tuna, wahoo,

and dolphinfish can withstand the fishing pressure from the small fleet of vessels described in this proposal. The number of boat-days divided by the number of estimated fishing days (70 days) yields the estimated fleet size. The multi-species fishery could support approximately 10 fishing vessels of the type described previously for about 70 days of fishing in a 100-day season.

The pro-forma statements for a fishing vessel not supported by a mothership indicate that the vessel could make a profit of about \$2,438 fishing for bottomfish/lobster and about \$46,178 fishing for bottomfish/shrimp. For convenience, 20-day fishing trips are assumed, with 8 days in round trip transit from Honolulu to NWHI, and with 2 days unloading in Honolulu and refurbishing (Tables 1 and 2). Only 10 days would be spent fishing per trip.

With a mothership operating at French Frigate Shoals, the fishing vessels could reduce transit time (5 days) and increase fishing time (14 days). A supported vessel catching bottomfish/lobster could make a net income of about \$24,421, and if catching bottomfish/shrimp, about \$78,853 (Tables 3 and 4), minus 20% of the gross ex-vessel value of the catch for mothership support services.

TABLE 2. FISHING VESSEL PRO-FORMA STATEMENT - NO MOTHERSHIP
(Bottomfish/Shrimp Example)

Combinations				
	Bottomfish/Lobster		Bottomfish/Shrimp	
Trip 1	33,898		49,298	
Trip 2	33,898		49,298	
Trip 3	33,898		49,298	
Trip 4	33,898		49,298	
Trip 5 (Troll)	36,856		55,433	
TOTAL REVENUE	\$169,216		\$252,593	
	SUB-	DEBITS	CREDITS	BALANCE
Gross Revenues			\$252,593	\$252,593
Auction fee		\$25,259		\$227,334
Fuel & oil	17,228			
Maintenance	3,758			
Bait & ice	2,558			
Food	3,688			
Miscellaneous	2,888			
Gear Loss	2,888			
TOTAL VARIABLE EXPENSES		\$31,128		
NET REVENUE				\$196,214
CREW SHARE (48%)		\$78,486		
OWNER'S SHARE (68%)				\$117,728
Loan & int.	25,888			
Insurance	18,588			
Maintenance	3,758			
Mooring fee	1,588			
TOTAL FIXED EXPENSES		\$41,558		
DEPRECIATION		\$38,888		
NET PROFIT				\$46,178

TABLE 3. FISHING OPERATION MODEL WITH MOTHERSHIP SUPPORT

Species/Gear Type	Lobster trap	Bottomfish HL	Shrimp trap	Trolling	Trolling
Days transit	5	5	5	3	3
Days idle	1	1	1	1	1
Days fishing	14	14	14	5	5
Transit fuel cons.	150 gal/day				
Fishing fuel cons.	150 gal/day				
No. gear units	150 traps	3 handline	150 traps	8 lines	8 lines
Catch rate	2.88	295.33	6	39.13	35.38
C/R units	#/Trap/D	lb/Hook/D	lb/Trap/D	lb/HK/D	lb/Hook/D
Product	Tails	Various	Whole	YF Tuna	Ono
Catch/Day lb	198	886	900	313	283
Total catch/trip	2,772	12,404	4,200	1,565	1,415
Value \$/LB	\$10.00	\$1.50	\$4.00	\$1.29	\$4.00
Total value/trip	\$27,720	\$18,606	\$58,800	\$2,019	\$5,660
MSY (1000 lb)	144	726	3,300,000	Not available	Not available
* Boat/Days to catch MSY	729	819	no limit	Not available	Not available

TABLE 4. FISHING VESSEL PRO-FORMA STATEMENT - MOTHERSHIP SUPPORT
(Bottomfish/Shrimp Example)

Combinations				
	Bottomfish/Lobster	Bottomfish/Shrimp		
Trip 1	\$ 46,326	\$ 69,006		
Trip 2	46,326	69,006		
Trip 3	46,326	69,006		
Trip 4	46,326	69,006		
Trip 5 (+troll)	51,833	76,685		
Total Rev.	\$236,337	\$352,709		
	SUB-	DEBITS	CREDITS	BALANCE
Gross Revenues			\$352,709	\$352,709
Mothership fee		\$70,452		\$282,167
Fuel & oil	16,575			
Maintenance	3,750			
Bait & ice	3,570			
Food	3,600			
Miscellaneous	2,000			
Gear loss	2,000			
TOTAL VARIABLE EXPENSES		\$31,495		
NET REVENUE				\$250,672
CREW SHARE (40%)		\$100,269		
OWNER'S SHARE (60%)				\$150,403
Loan & interest	25,000 (on 8% with 10% interest, 10 yr.)			
Insurance	10,500			
Maintenance	3,750			
Mooring fee	1,500			
TOTAL FIXED EXPENSES		\$41,550		
DEPRECIATION		\$30,000		
NET PROFIT				\$78,853

The results of the mothership economic analysis are presented in Table 5. Tables 6A and 6B summarize the specifications of the purse seine mothership and the tug/barge tendership. The tug/barge combination is infeasible due mainly to its high lease and operating costs. The projected operation could not generate enough revenues to justify pursuing this model. However, the tuna purse seiner proves to be a viable mothership. Its low operating and lease costs, and reduced capital equipment requirements enable it to operate at a profit. An added advantage is that the purse seine vessel can go fishing when not on charter to the support operation. The purse seine mothership operation could make a net income of about \$237,857.

Unsupported NWHI fishing vessels catching bottomfish for the frozen seafood market are marginally profitable (Hau 1983). An unsupported vessel catching bottomfish and lobster, with supplemental trolling and bottomfishing for the fresh seafood market, would still be marginally profitable. The same vessel catching shrimp instead of lobster, with supplemental fresh seafood catches, could be reasonably profitable. However, a vessel, i.e. with support of the French Frigate Shoals mothership, could double or triple its income. In addition, the mothership operation would also be profitable and increase the safety of fishing in the NWHI.

4.0 Limitations of a French Frigate Shoals Multi-Resource Fisheries

4.1 Number of Catcher Vessels

"Bottom resources" such as spiny lobster and bottomfish respond rapidly to fishing pressure, and local populations of species such as wahoo and sharks can also be fished down to uneconomic levels of catch in a relatively short time. For sustained production and profitability, the fisheries resources of the NWHI will require that development and management¹ proceed in tandem. A first approximation of the potential annual yield of spiny lobster, bottomfish, and wahoo resources in the area between Necker Island and Maro Reef suggests that only about 730 vessel-days of fishing effort can be supported on a sustained basis. If each vessel participating in the multi-resource fishery fished 70 days each year in the southern reaches of the NWHI, only 10 full-time vessels could be supported. Thus, the fishing support operation at French Frigate Shoals should be for approximately 10 boats in the size range previously described.

4.2 Gear and Fishing

Although bottomfishing and trolling gear are highly compatible, the combination of trapping with bottomfishing and trolling presents a problem of adequate working/storage deck space for all these options. This problem can be solved by using collapsible traps or perhaps by

¹ The Western Pacific Fishery Management Council is currently preparing a bottomfish "framework" fishery management plan that will include alternating regulatory measures for the NWHI Fishery Conservation Zone.

TABLE 5. SUPPORT SHIP ECONOMIC MODEL

MODEL NO.	<u>1</u>	<u>2</u>
Support ship	Seiner	Barge
Capacity tons	300	600
Storage type	Hold/Dry	Container
Freezer type	Blast	Blast
Self-powered	Yes	Yes
Fuel capacity	60,000 gal	
Water capacity	5,000 gal	
Watermaker		GPH 10
Power generators	Yes	Yes/500KW
Crew requirements	11	6
Vessel lease (100 days)	\$200,000	125,000
Container lease		\$100,000
Towing charge		96,000
Generators		196,000
Crane/Cherry picker ¹		150,000
Crew accommodations ²		50,000
Miscellaneous ³		25,000
BARGE COSTS		\$742,000
FIXED COSTS	\$200,000	\$742,000
Fuel & oil	58,656	40,278
Provisions	12,000	7,200
Maintenance	22,500	20,000
Crew payment	40,000	24,000
Miscellaneous	10,000	
VARIABLE	\$143,156	\$91,478
Fuel & oil	180,000	180,000
Provisions	36,000	36,000
Bait & ice	32,455	32,455
MATERIALS	\$248,455	\$248,455
User fees ⁴	592,018	592,018
Fuel/oil ⁵	165,750	165,750
Bait & ice	35,700	35,700
Provisions	36,000	36,000
REVENUES	\$829,468	\$829,468
NET PROFIT	\$237,857	-\$252,465

¹ For unloading boats

² For crew trailers, galley & machine shop

³ Skiff, safety equipment, radio, etc.

⁴ Gross revenues of catch x 20%

TABLES 6A & 6B. MODEL DESCRIPTIONS

Length	120
Beam	29
Fish hold (tons)	300
Freezer type	Blast-dry
Fuel consumption	1200 gal/day
Aux. fuel cons.	408 gal/day
Year built	1946
Engine diesel	1000 hp
Speed	10 knots
Crew:	Captain
	Engineers (2)
	Navigator
	Cook
	Deckhands (2)
	Unloaders (4)

Type	Combination
Capacity	2000 tons
Containers	40
Fish capacity	600 tons
Power generators	2
Need:	Blast freezer
	Desalinator
	Crew accommodations
	Shop
	Radio
Crew:	Manager/Radio
	Mechanic-Diesel/Refrigeration
	Unloaders/Deckhands (3)
	Cook

temporarily storing traps on Tern Island in order to make space for bottomfishing/ trolling effort during the second phase of the fishing trip. Also, it is unusual to have expertise in both the lobster trap fishery and bottomfishing represented in one captain or crew, but this problem can be overcome by organizing a crew with diverse fishing backgrounds.

4.3 Market Development

The Hawaiian frozen seafood market will have to be expanded to make the French Frigate Shoals operation feasible. To build demand, a consistent supply is needed, and to justify the operation a consistent demand is necessary. The present fresh seafood market operates near its saturation point such as the bottomfish market. Therefore, the development of the frozen seafood market must be relied upon to expand the distant-water Hawaiian commercial fisheries. The State is currently emphasizing seafood product promotion and marketing. A Hawaiian Seafood Product Promotion Project, being funded by Saltonstall-Kennedy monies through the National Marine Fisheries and coordinated by the State, underscores the importance of marketing and promoting locally-caught fresh and especially frozen fish.

5.0 Integrating a Fishing Support Operation with Research and Conservation Activities

The implementation of a fishing support operation at French Frigate Shoals should be integrated with research and wildlife conservation activities in the NWHI. The support operation should also be incorporated into the Master Plan for the Hawaiian Islands National Wildlife Refuge. Conservation activities, wildlife research, and fishing operations share similar logistical and support requirements, and to this extent, the resulting environmental impacts of conservation research and fishing support actions can be expected to have much in common. Facilities to support fishing crews' rest and recreation and research

activities on Tern Island are not necessarily mutually exclusive, although limitations on space, energy and water supplies, wastewater capacity, and other life support systems on the Island and on the vessels may determine the extent to which these activities are compatible with each other.

Intensive scientific research in the Northwestern Hawaiian Islands may have peaked with the Tripartite Northwestern Hawaiian Islands Resources Investigations, but research activities will certainly continue, and may even expand, for certain endangered/threatened wildlife species. Although Hawaiian monk seal research in the French Frigate Shoals area may be limited to avoid adverse impacts on the seal population there, Tern Island will continue to be the focal point for research support, at least in the southern and central reaches of the NWHI.

The 1983 Hawaiian Monk Seal Recovery Plan presents an ambitious research program, although the starting and completion dates for some of the research tasks were not indicated because of major problems in planning. A problem is the high cost of vessel charters, which makes access to much of the seal population impossible with a low funding base in the program. For example, a 23-day charter in 1982 to transport personnel between the Northwestern Hawaiian Islands, provide access to Pearl and Hermes Reef for 4 days, and resupply the field camps, cost over \$41,000. With the departure of the U.S Coast Guard from Tern Island in 1979, scientists have been using private charter aircraft or charter boats. The existence of a fishing support operation at French Frigate Shoals to service commercial fishing vessels offers greater opportunities for scientists to be transported to the NWHI at a lower cost than is now possible by privately-chartered aircraft or boats. There is even the possibility that fishing vessels could, between fishing trips, support research expeditions from Tern Island to other distant areas of the NWHI. Reliance on fishing boats is not the only possible source of savings to the Federal government. Rather than resupply scientific base camps via private airplane or boat charters, the regular movement of mothership vessel between Honolulu and French Frigate Shoals would offer an opportunity to move supplies more inexpensively than is now possible. Also, greater reliance on fishing and mothership vessels to support scientific research would help reduce the use of the airstrip at Tern Island. This is desirable because dense populations of seabirds, especially sooty terns, present a danger to landing and departing aircraft.

5.1 History of Research Activities in the NWHI and Role of French Frigate Shoals

The Northwestern Hawaiian Islands have a long and rather illustrious history of research activities. Amerson (1971) records more than 80 separate visits by scientists to French Frigate Shoals between 1859-1969. These studies led to the publication of 100 research papers. Additional studies of geology, oceanography, hydrography and climatology also stand out in the record of research visits to French Frigate Shoals.

Intensive natural history studies of the NWHI was started in 1963 when the Pacific Ocean Biological Survey Program (POBSP) began and continued until 1968. POBSP scientists alone spent 203 days at French Frigate Shoals during this period. U.S. Fish and Wildlife personnel began repeated visits to French Frigate Shoals in 1964 for follow-up wildlife studies. More recently, French Frigate Shoals has been the principal study area for green sea turtle investigations, and one of several sites in the NWHI for studies and monitoring of the Hawaiian monk seal. From 1973 to 1979, one green sea turtle specialist made 22 trips to French Frigate Shoals, with each trip lasting five days or longer.

Fisheries research in the NWHI began in 1948 with the Pacific Ocean Fisheries Investigation and has continued recently under a formal tripartite agreement between the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, and the Hawaii Division of Aquatic Resources (Department of Land and Natural Resources). The University of Hawaii Sea Grant College Program joined the NWHI tripartite effort in 1979. The major objective of the five year joint investigation was to survey the NWHI fish and wildlife resources for the purpose of managing potential fishery resources in the NWHI and protecting unique wildlife and their habitats.

Resource inventories and assessments of the NWHI were the major undertakings of the tripartite investigations during the first half of the agreement period. During the second period of the investigations, French Frigate Shoals was selected as a model to be intensively studied because the atoll is the most representative of all of the NWHI. The importance of French Frigate Shoals has long been recognized in the scientific community and considerable scientific attention has recently been directed thereto.

As of mid-1979, the Honolulu Laboratory of the National Marine Fisheries Service, responsible for research on Hawaiian monk seals and green sea turtles, has used French Frigate Shoals extensively. The U.S. Fish and Wildlife Service has undertaken research on seabirds at French Frigate Shoals that exhibits a greater diversity of seabirds than any other atoll in the NWHI.

French Frigate Shoals has also been used intensively by University of Hawaii Sea Grant Program researchers and tripartite agency personnel for studies on reef and shelf benthic ecology of the NWHI, for trophic analysis of shallow-water reef communities, for lobster growth and population dynamics studies, and for primary and secondary productivity studies used for ecological modeling. The tripartite studies are winding down and the research findings were presented at a May 1983 symposium on Resource Investigations in the Northwestern Hawaiian Islands.

Research biologists are not the only scientists that have used French Frigate Shoals. Prolonged visits by representatives of the Defense Mapping Agency, the Atomic Energy Commission, and the Pacific Missile Range have been made to the shoals for defense related research. Tern Island at French Frigate Shoals has been continuously inhabited by

military personnel since its construction from an 11-acre sand spit to a 34-acre landing strip used to ferry planes and military supplies to Midway Islands during World War II. The U.S. Coast Guard has operated a Loran-A station at French Frigate Shoals since 1944, first at East Island and after 1952, at Tern Island. In June 1979, the Coast Guard discontinued operations at Tern Island. The U.S. FWS has since kept a small maintenance staff on the island following the Coast Guard's departure from French Frigate Shoals.

5.2 Tern Island

The extent to which existing living quarters, diesel generators, fuel storage, and refrigeration systems on Tern Island can be used depends more on the projected activities of the scientists rather than as a rest and recreation area for fishing crews. The only anticipated use of Tern Island itself by fishing vessel crews would be for brief rest and possible emergencies. Fishing crews would limit their visits to Tern Island to day-trips in order to "stretch their sea legs". Scientists, on the other hand, would probably use the island for an extended period requiring living quarters, as well as the operation of diesel generators that power the lighting and refrigeration systems on the island. The extent of generator operation will determine the frequency with which diesel fuel supplies stored in shoreside tanks need to be replenished. A shallow-draft fuel barge could transfer fuel to these tanks, but the number of such transfers per year cannot be determined without firmer projections of the future use of Tern Island to support monk seal and other wildlife research.

All fishing and support vessels would be anchored within French Frigate Shoals in proximity to Tern Island. Fishing crews could visit the island via a skiff or a shallow-draft landing boat. Reliance on a shallow-draft boat will eliminate the need for dredging the Tern Island channel to clear coral heads which presently restrict access by deeper-draft boats.

Although situations may arise requiring the emergency evacuation of fishermen or scientists from Tern Island, the existing airstrip need not be used for routine movements of personnel between the main Hawaiian Islands and the NWHI. Greater reliance on fishing vessels to move researchers and supplies will not only reduce the use of the airstrip but will also reduce costs to the Federal government in supporting research in the NWHI. The cost of air shipping fresh fish landed at Tern Island by small aircraft to Honolulu is believed to be economically prohibitive, therefore the French Frigate Shoals support scenario is based entirely on surface shipment of frozen seafoods.

6.0 Potential Environmental Impacts of a Fishing Support Operation

Since the fishing support operation will be operating near the Hawaiian Islands National Wildlife Refuge (HINWR), its impact on the unique habitat and wildlife of the NWHI must be considered. With the exception of the Midway Islands (Sand and East Islands), Kure Atoll, French Frigate

Shoals (Tern and East Islands), and Laysan Island, the emergent lands of the NWHI are largely undisturbed by modern man.

The NWHI possess a flora and fauna of unique value. Much of the wildlife is endemic, many of which are either threatened or endangered. There are terrestrial species of plants, insects, and birds that are found nowhere else, even in the main Hawaiian islands. However, the threatened or endangered species subject to disturbance from a fishing support base belong mainly to the marine environment.

The green sea turtle, Chelonia mydas, is an indigenous species widespread in subtropical and tropical waters. Approximately 90% of the breeding and nesting activity of the Hawaiian green sea turtle population takes place at French Frigate Shoals. This turtle is a "threatened" species under the Endangered Species Act. Most of the nesting activity in the French Frigate Shoals occurs on East and Whale-Skate Islands. Although turtles generally use the uninhabited islands of the French Frigate Shoals for basking and nesting, some basking and nesting activity occurs on Tern Island. The number of turtles found basking on Tern Island has apparently increased since the Coast Guard left in 1979.

The general habitat of the green sea turtle ranges from onshore to offshore waters. The adult turtles feed primarily on benthic algae, and mating activity takes place in shallow water close to shore. The primary predator of the French Frigate green sea turtle is the tiger shark.

The Hawaiian monk seal, Monachus schauinslandi, is an endemic species protected by the Endangered Species Act and the Marine Mammal Protection Act. It exists only in the NWHI, and its population has shown a gradual decline in most of the NWHI over the last 25 years based indirectly on beach censuses. However, at French Frigate Shoals, the seal population has increased from the late 1950's to 1975, whereas the beach counts at Nihoa and Necker Islands have remained stable.

Monk seals use sandy beaches, rocky ledges, and exposed reef areas for pupping, nursing, and basking. Plant cover behind the beach is also used for shelter. Monk seals feed primarily on reef fishes, eels, and cephalopods; lobsters and crabs comprise only about 5% of their diet.

Sharks have been observed attacking Hawaiian monk seals; also dead seals have been found with shark bite wounds. Sharks probably cause most monk seal pup mortalities. Adult male monk seals have been observed "attacking" adult females during mating activities, and may also indirectly cause mortalities of female seals. Ciguatera poisoning is thought to have been responsible for the deaths of about 50 seals at Laysan Island in 1978.

Other marine mammal residents of the NWHI include the bottlenose and spinner porpoises. These can be found in the atoll lagoons and in the pelagic waters offshore. The porpoises, while not on the threatened or endangered list, are protected by provisions of the Marine Mammal Protection Act. The humpback whale (Megaptera novaeangliae) is an

occasional visitor to the NWHI and is an endangered species protected under the Endangered Species Act and the Marine Mammal Protection Act. Its main breeding grounds are thought to be in the main Hawaiian Islands.

There are very few native land plant species at French Frigate Shoals. Most of the plant species now on Tern Island are exotics introduced by man. Similarly, there are very few endemic species of insects and reptiles on Tern Island; most of the species have been accidentally introduced by man and none are threatened or endangered.

The main hazards to the habitat and wildlife of French Frigate Shoals resulting from a fishing support operation are potential oil spills, vessel groundings, human disturbance of basking or breeding animals, destruction of nesting sites, introduction of exotic pests, and entanglements in discarded fishing gear. All of these potential impacts can be avoided by regulating support operations, and education and cooperation of fishing vessel crews. Presently, human activity is limited to the western third of Tern Island. This area, and the facilities already in use should be adequate for shared use by fishermen and researchers. With proper precautions, disturbance of the habitat and wildlife should be negligible.

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APPENDIX

BACKGROUND ON FRENCH FRIGATE SHOALS

Geographic Setting

The expansive marine geography of the Hawaiian Islands attests to the large potential for fisheries development as well as to the difficulties in realizing that development potential. The Hawaiian Archipelago stretches 1,523 miles across the central expanse of the Pacific Ocean from the island of Hawaii in the southeast to Kure Atoll in the northwest. The high, rocky islands in the southeast from Niihau and Kaula to the island of Hawaii are normally considered to comprise the State of Hawaii, but the State's jurisdiction also extends all the way to Kure Atoll, making Hawaii one of the longest states in the Union. The islands from Nihoa to Kure make up the Northwestern Hawaiian Islands (NWHI)¹. The Hawaiian Archipelago also contains extensive reefs, shoals, and seamounts. It ends in the northwest with a group of submerged volcanoes that merge with the Emperor Seamounts. The 200-mile Fishery Conservation Zone (FCZ) that envelops the Hawaiian Archipelago (Figure 2) encompasses 648,000 square miles of ocean space, an area larger than Alaska. Yet, the resources of this area are relatively undeveloped and its potential unrealized.

Several major distinctions can be drawn between the main Hawaiian Islands, that is the populated high islands from Hawaii to Niihau, and the NWHI which stretch from Nihoa to Kure. The distinction of the NWHI is their remoteness from population centers of the main Hawaiian island, their general lack of human inhabitants, and the fact that almost all of the islands are "off-limits" refuge for wildlife.

The islands themselves are windswept, pounded by the sea, and are largely untouched by man. The Midway Islands, a naval defense installation, Tern Island and East Island in French Frigate Shoals, formerly naval airfields and Coast Guard LORAN stations, and Green Island at Kure Atoll are the only exceptions.

Inshore waters and offshore banks of the main Hawaiian islands have been, and continue to be, subject to intense fishing pressure by commercial, sport, and subsistence fishermen, and the fish tend to be wary and less abundant as a result. This situation contrasts sharply with the relative abundance of the same species in similar habitats in the NWHI or on isolated coasts of the main islands. This is one of the reasons for looking at the NWHI as a promising area for expansion and growth of the State's fisheries. The other reasons are that the U.S. FCZ surrounding the NWHI is about twice as large as that of the main Hawaiian islands, and there are more and larger fishery habitats in the NWHI than in the main Hawaiian islands.

¹ The NWHI are also part of the City and County of Honolulu (Section 1-102 of the Revised Charter of the City and County of Honolulu)

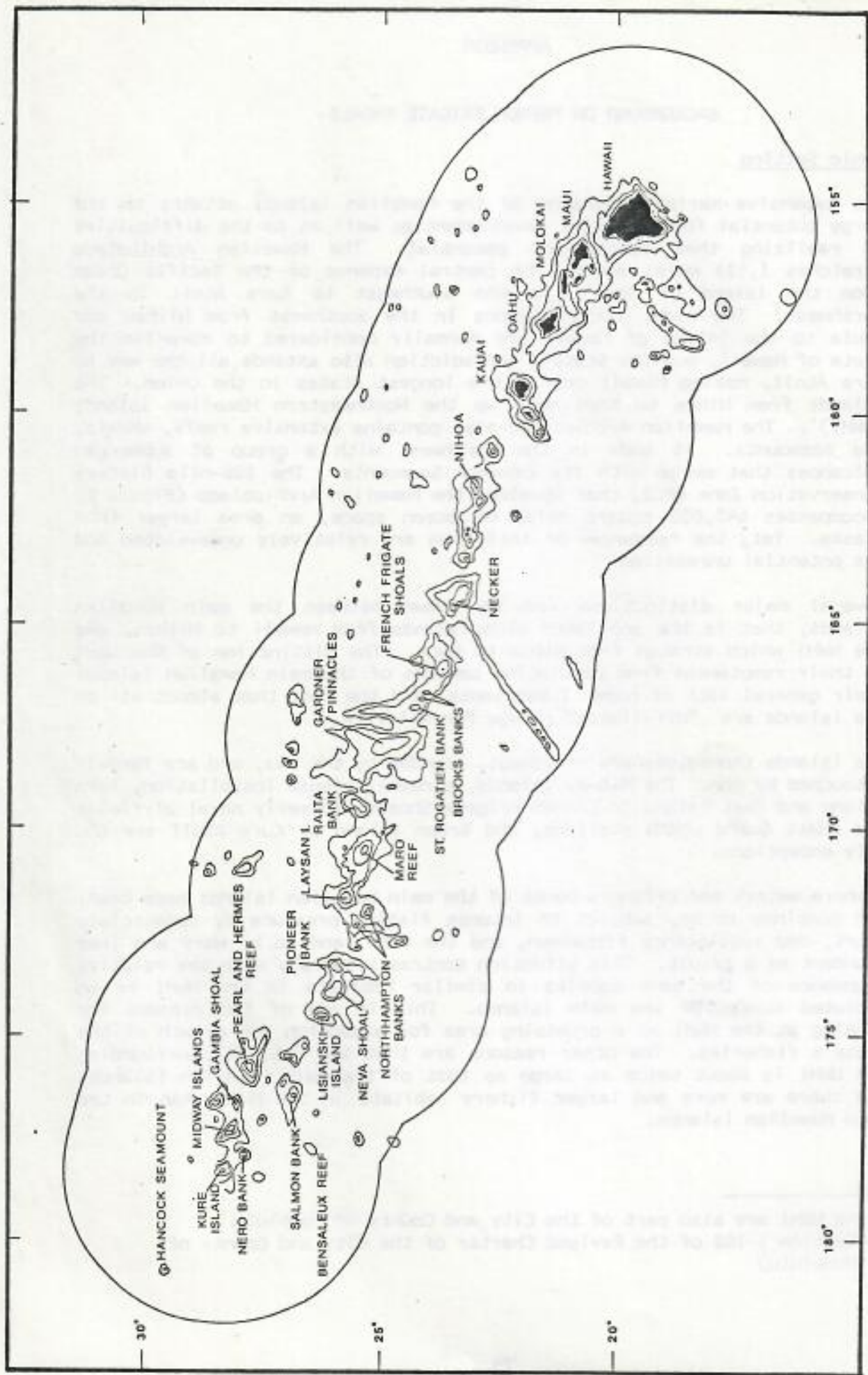


Figure 2. The banks and contours, to 1000 fm, of the Hawaiian Archipelago within the FCZ.

The State's Fisheries Development Plan (1979) estimates that the vast ocean waters surrounding the Hawaiian Archipelago could sustain a catch of a variety of commercially important species that approaches ten times the current average of local landings. The plan estimates that about 50 additional million pounds of fish worth over 30 million dollars annually, ex-vessel, could be taken within 10 years and as much as 85 million pounds within 20 years. Much of this potential is concentrated in the NWHI within commercially feasible reach from French Frigate Shoals.

The 1200-mile long ocean area between Kauai and Midway Island presently lacks any outposts that could provide support to Hawaii's nascent distant-water fleet. At present, very few Hawaii-based fishermen have been able to fish, in a cost-effective manner, the distant waters of the NWHI. For example, it takes about eight days for Honolulu boats to get to and return from fishing grounds near French Frigate Shoals. Such "in transit" time amounts to considerable costs in fuel and a drain on productive fishing time and human energy. Present costs of operation, danger, and inconvenience combine to largely preclude fishing beyond Maro Reef for lobsters, shrimp, and for the virtually untapped deepsea and inshore bottomfish known to exist in the further reaches of the NWHI. The economic feasibility of successfully deploying more fishing effort in the NWHI, whether for tunas or white flesh fish species and crustaceans, is dependent on the availability of support facilities to move provisions for vessels and crews into the area and catches out of the area.

French Frigate Shoals (FFS) lies at the midpoint of the Hawaiian Archipelago, 600 miles northwest of Honolulu and approximately 800 miles southeast of Midway. Its central location and relatively protected anchorage make it an ideal site for a fishing support operation in the central reaches of the NWHI.

History

French Frigate Shoals (FFS) was discovered by Comte de La Perouse in 1786, when his two ships nearly ran aground on the atoll. In 1859, Lt. John M. Brooke of the U.S.S. Fenimore Cooper took possession of the FFS for the United States². A number of ships visited FFS in the following years, taking birds, seals, turtles, and various other resources. Others visited the islands unintentionally, becoming victims of the coral reefs. In 1895, the islands were claimed by the new Republic of Hawaii.

In 1909, prompted by extensive damage to birdlife on some of the NWHI, President Theodore Roosevelt set aside all the NWHI (except Midway Island) by Executive Order No. 1019, as the Hawaiian Islands Reservation birdlife preserve. In 1940, by Executive Order No. 2416, the Hawaiian Islands Reservation became the Hawaiian Islands National Wildlife Refuge and was put under the administration of the U.S. Department of Interior.

² Lt. Brooke claimed FFS under the Guano Act of 1856, but he never completed his claim with the U.S. Consul in Honolulu. The claim of possession is therefore questionable. (Kurata, Colin. 1978. Analysis of Northwestern Hawaiian Islands - Jurisdictional Issues. Unpubl. MS. pg. 8)

Beginning in 1928, the Navy explored FFS for military use and began extensive seaplane exercises in the lagoon in 1932. After the Battle of Midway (in 1942), the Navy occupied Tern Island and turned it into an airfield by using dredged material to add to the area and shape of the island. The Navy used Tern Island as an emergency airfield and defense outpost until 1946, when the base was inactivated. In 1948, the Navy turned Tern Island over to the Territory of Hawaii, although the Navy had occupied Tern Island without the permission of the Territory of Hawaii, or the U.S. Fish and Wildlife Service which had been given responsibility for the Hawaiian Islands National Wildlife Refuge.

The Territorial government gave permission for various fishing companies to use Tern Island as a fishery base as early as 1946. The fishermen enjoyed such good fishing success that aircraft were used to transport fish from Tern Island to Honolulu. Although some successful transshipments were made, the ventures finally came to an end by 1959. However, a few fishing boats continued to utilize the fishing grounds around FFS returning to Honolulu to unload their catch.

The U.S. Coast Guard had been operating a LORAN navigational aid station on East Island in FFS since 1944, but moved the station to Tern Island in 1952 under license from the Territory of Hawaii. In 1961, a Pacific Missile Range facility was established on Tern Island for tracking missiles and satellites. However, by 1963, the tracking facility was closed and activity on the island returned to a routine level. The Department of Interior questioned the legality of the Coast Guard presence on Tern Island in 1965; subsequently the Coast Guard concluded a use permit with the Department for Tern Island in 1966. In 1979, the LORAN station was abandoned by the Coast Guard, and turned it over to the U.S. Fish and Wildlife Service (USFWS) which currently maintains the facilities on the island.

Since the USFWS took over Tern Island, use of the island by non-FWS personnel has been restricted to visiting scientists and the occasional official visitor. Although fishing boats are allowed to anchor in the shallow lee of FFS for shelter, no landings are permitted on the islands of the Refuge. The USFWS has maintained the facilities at a usable level, but increasing numbers of seabirds on the island have made it dangerous to land large aircraft on the airstrip. Occasional supply ships and small planes are now the only current carriers to the island.

Jurisdiction

There is a long-standing dispute between the State and the Department of Interior over the jurisdiction of the Hawaiian Islands National Wildlife Refuge. The State essentially claims all submerged lands and waters of the NWHI, while the USFWS claims emergent lands and adjacent nearshore waters for inclusion in the HINWR. The State wants to develop and utilize the fisheries resources of the NWHI in a controlled fashion at the same time preserving the environment and the unique wildlife, and protecting threatened and endangered species. The USFWS desires to maintain the refuge areas in as undisturbed a condition as possible in order to restore endangered and threatened species.

Disagreement over the ownership and jurisdiction of the Hawaiian Islands National Wildlife Refuge has also been expressed by certain native Hawaiians. The bases for their refuting the Department of Interior's authority over these lands are native aboriginal rights, Freedom of Religious Act of 1978, and Hawaiian konohikis.

Description of Tern Island

Although the proposal for a fishing support operation at French Frigate Shoals is ocean-based, a description of Tern Island is included in the background material because the island may provide limited use (e.g. rest and recreation) by commercial fishermen.

Tern Island is one of 12 islets sitting atop a crescent shaped coral atoll of French Frigate Shoals (Figure 3). In 1941, Tern Island was an 11 acre sand spit, home for thousands of sooty terns and some turtles and monk seals. In 1942, this minor 11 acre islet was converted to an aircraft carrier-shaped airstrip for ferrying Navy planes and military supplies to Midway. The Navy enlarged Tern Island three fold to 34 acres to become a reconstructed island landing strip almost 1 km long (Figure 4). The new land was created from coral materials dredged to form a ship channel and turning basin, and a seaplane landing strip. Steel sheet pilings surround each end of the island and extend along the west-northwest side of the island. Four buildings, fuel and water tanks, a small boat davit, and a tennis-basketball court are situated on the western third of the island (Figure 5). A 77m-wide runway, composed of packed, fine crushed coral, extends the length of the island. Electrical power generators, a fresh water catchment and storage system, and five large fuel tanks are available on the island (Figure 6). At one time, Tern Island even had a "Playboy Club" to entertain bored, homesick, and forlorn Coast Guard corpsmen that manned a LORAN station there. A 40m communications antenna stands witness to events of the past. It also presently witnesses thousands of sooty terns, some monk seals, and green sea turtles, and the daily activities of a small U.S. Fish and Wildlife Service (FWS) caretaker complement maintaining the facilities at a custodial level of operations.

Alternative Uses Of Tern Island

In June of 1979, the U.S. Fish and Wildlife Service (FWS) released a report which provided a preliminary evaluation of alternative uses of Tern Island. The study was prompted by Coast Guard plans to abandon the LORAN station at Tern Island. The alternative uses considered in the study included:

1. Conversion of existing facilities, or a portion of the existing facilities, to a research station administered and operated by the FWS, which would support general wildlife, threatened and endangered species, coral reef ecology and natural area ecosystem research.
2. A similar research station but operated by another agency or jointly with FWS.

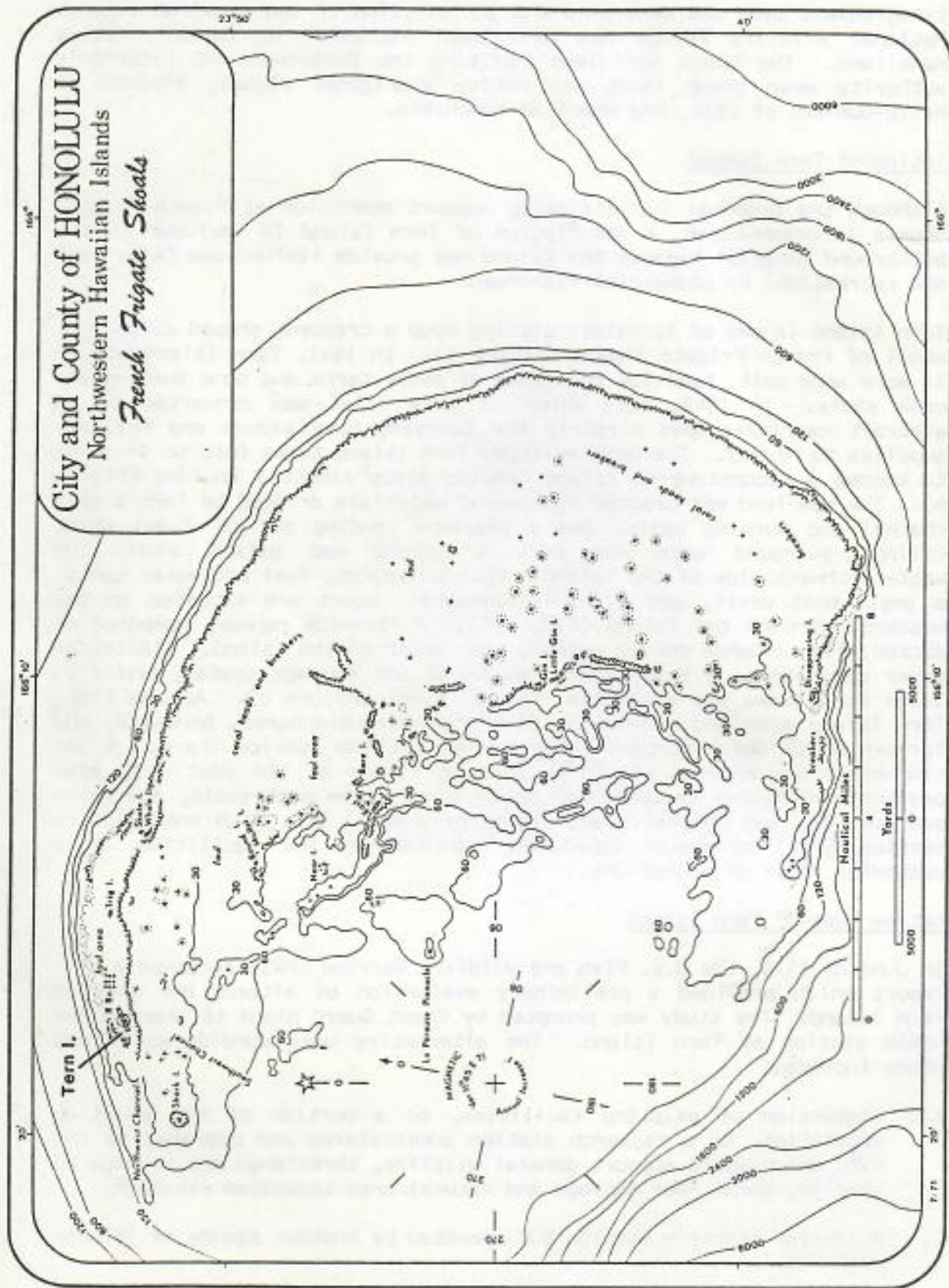


Figure 3. Tern Island is in the northwest corner of French Frigate Shoals. (From Grace, J. M., editor. Marine Atlas of Hawaii: Bays and Harbors, 1974.)

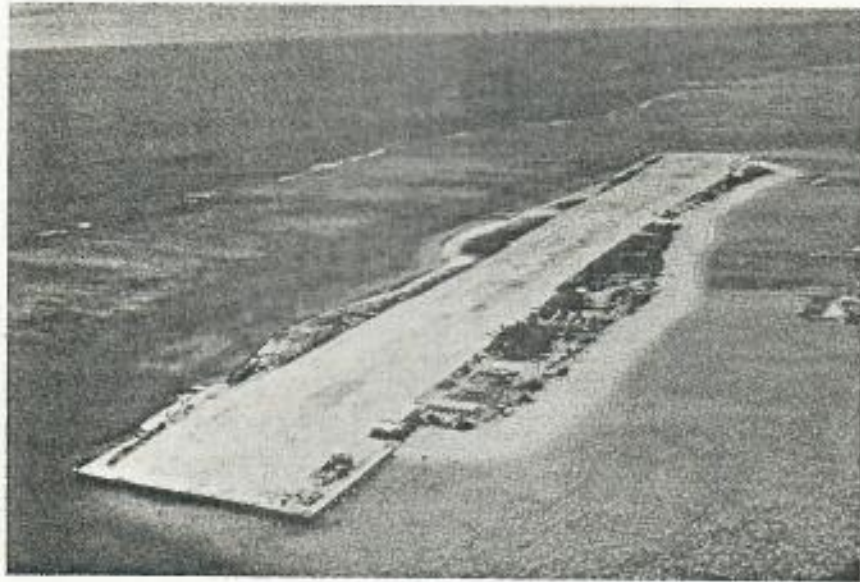
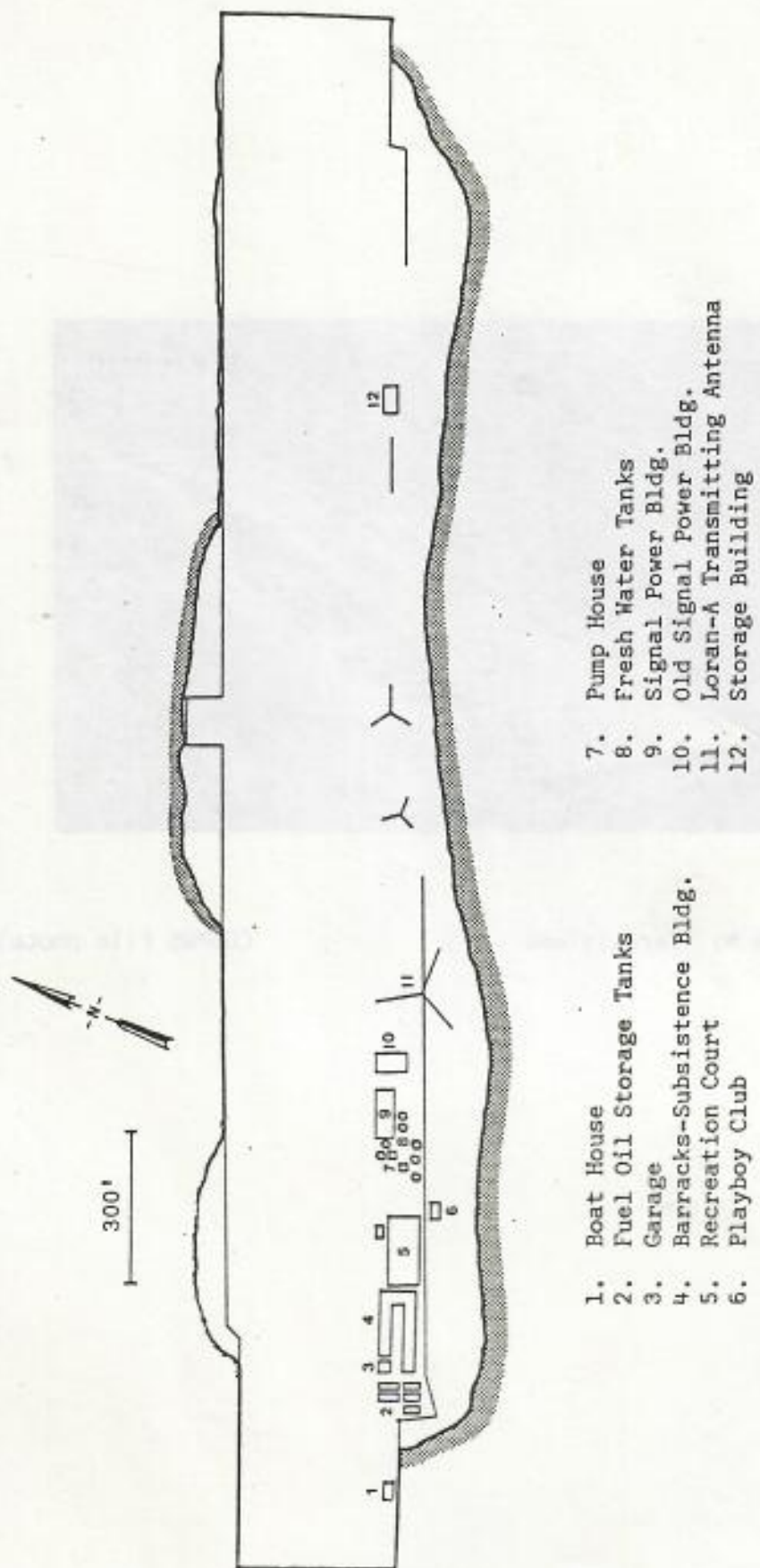


Figure 4. Tern Island

(USFWS File photo)

TERN ISLAND
French Frigate Shoals



- 1. Boat House
- 2. Fuel Oil Storage Tanks
- 3. Garage
- 4. Barracks-Subsistence Bldg.
- 5. Recreation Court
- 6. Playboy Club

- 7. Pump House
- 8. Fresh Water Tanks
- 9. Signal Power Bldg.
- 10. Old Signal Power Bldg.
- 11. Loran-A Transmitting Antenna
- 12. Storage Building

Figure 5. Existing structures and facilities on Tern Island.
(From Manta Corporation. Tern Island Study, Vol. 1, 1979)

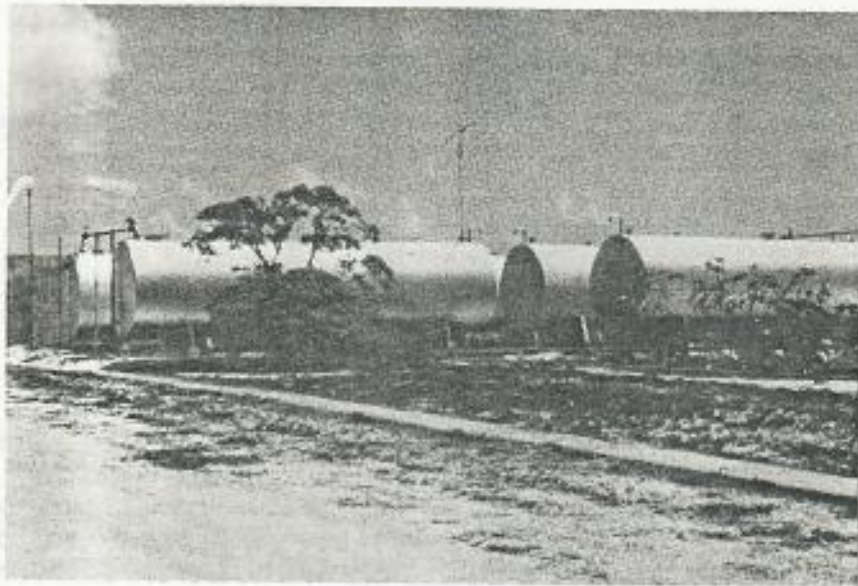


Figure 6. Fuel (upper photo) and water (lower photo) tanks are available on Tern Island. (USFWS File photos)

3. Conversion of existing facilities or addition to existing facilities to be used as a commercial fishery support station.
4. Modification or abandonment of existing facilities to achieve maximum indigenous wildlife uses.
5. Combinations of the above 4 options that became apparent during the course of the study.

State's Proposals to Use Tern Island and French Frigate Shoals

During December of 1979, the State of Hawaii Department of Land and Natural Resources submitted two proposals to the FWS to use Tern Island facilities for research and fishery support purposes and for implementing a joint State/Pacific Tuna Development Foundation project for assessing the baitfish potential of French Frigate Shoals. On March 23, 1981, the FWS rendered a Biological Opinion, prepared by the National Marine Fisheries Service (NMFS), which concluded that the "actions" requested by the State would likely jeopardize the continued existence of endangered and threatened species. The Opinion stated that the proposed use of Tern Island for fishery support was incompatible with the needs of monk seals and green sea turtles. To justify this conclusion, NMFS cited the declines of monk seals at Kure and Midway Islands as being attributable to human harassment and to indirect impacts from activities such as construction and beachcombing. Mention was made that with the Coast Guard's abandonment of the LORAN station, and with the beaches of Tern Island left undisturbed, monk seals have once again begun utilizing Tern Island. The Opinion speculates that green sea turtles may also begin to use Tern Island beaches as a nesting site and basking area in the future if human activity levels remain the same (custodial caretakers and intermittent researchers) or decrease.

The Opinion, in effect, temporarily ended the State's effort for using Tern Island to support fisheries and research programs in the NWHI. The Opinion simultaneously promoted a single use of Tern Island among all the alternatives considered by the 1979 FWS Tern Island Study: modification or abandonment of existing facilities to achieve maximum indigenous wildlife use.

The impetus in proposing the establishment of a fishery support station at Tern Island was provided through direct contacts in 1978 between Governor George Ariyoshi and Secretary of Interior, Cecil Andrus. These discussions were prompted by the U.S. Coast Guard's intention of terminating its LORAN station at Tern Island in 1979. The governor expressed his concern on the possibility of the U.S. Fish and Wildlife Service dismantling key support facilities at Tern which could be used for fishery support following Coast Guard's departure from the island. As a result, in February 1979 Secretary of Interior Andrus assured the governor that the Interior Department would not take any action that would foreclose the option of establishing a fishery support station on Tern Island.

In December 1981 State Senator Wadsworth Y.H. Yee requested to the Department of Interior to review the Biological Opinion prepared by NMFS and to address the legal and jurisdictional issues concerning Tern Island. Under-Secretary of Interior Donald P. Hodel replied in March, 1982, indicating that a cooperative agreement between the Department of Interior and the State for fishery support at Tern Island could be considered without raising the jurisdictional issue and ensuing litigation, if the State would submit a detailed proposal to the Department.

Initially a proposal was prepared with a scenario of using Tern Island as the location for a fishery support base. However, it became evident that an ocean-based rather than a land-based fishing support operation at French Frigate Shoals, with limited use of Tern Island for rest and recreation, may be feasible.

Conclusion

The State is aware of the need to diversify its "tourism/sugar/and defense spending" economic base. The State is keenly interested in expanding its fisheries and developing new industries by utilizing the fishery resources of the NWHI. A fishery support operation at French Frigate Shoals is central to the implementation of the Hawaii Fisheries Development Plan (1979) and to the needs and wishes of Hawaii's fishing industry. Unfortunately, any utilization of the fishery resources of the NWHI brings with it a perceived threat of altering the ecosystem of the wildlife refuge and jeopardizing the lives of its rare and unique wildlife. The State of Hawaii does not subscribe to that particular point of view. It believes that both utilization of the fisheries and wildlife preservation in the NWHI can be assured and properly balanced.

