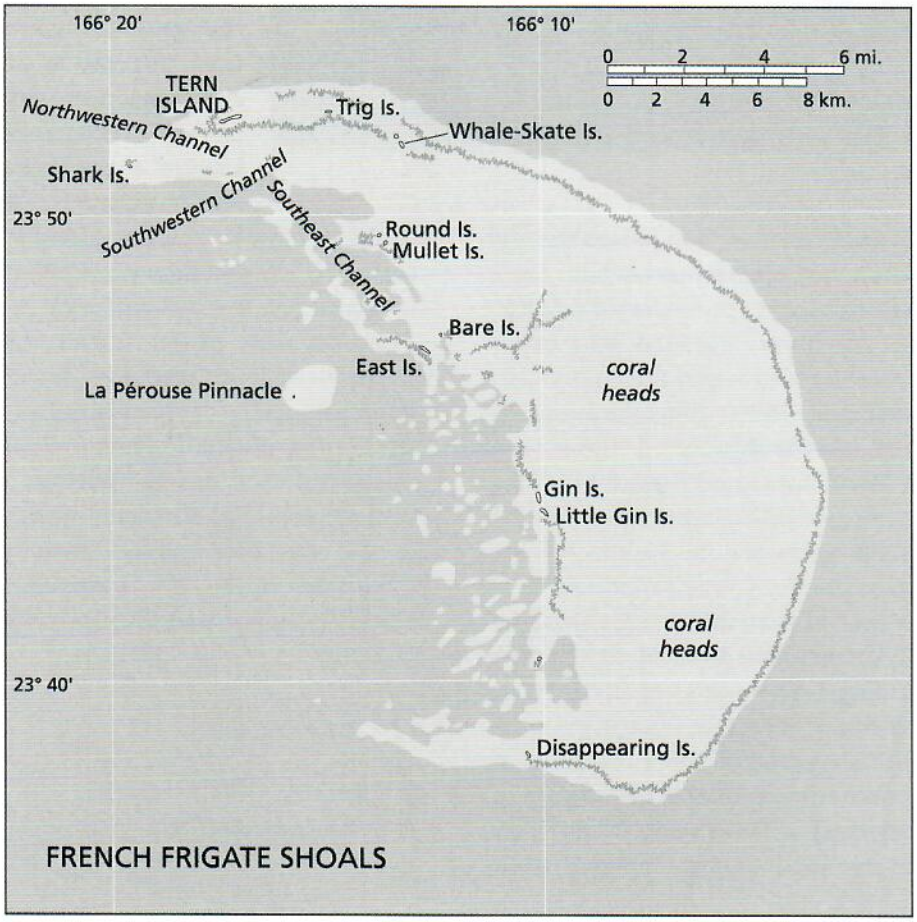
The Coral Kingdom of La Pérouse

He pūko ʻa kani ʻāina.

"A coral reef that grows into an island."
A person beginning in a small way gains steadily until he becomes firmly established.



Map of French Frigate Shoals.

French Frigate Shoals is the midpoint in the Hawaiian Archipelago. It is also the first atoll in the Leewards and the largest coral reef area in Hawai'i. Its almost 200 square miles of coral reefs, combined with Maro Reef and Pearl and Hermes Reef, totals 500 square miles, while the combined reef area in all the main islands is only 360 square miles.[1] The reefs are primarily composed of the coral *Porites*, cemented together with calcareous algae. These northernmost coral reefs in the world are relatively depauperate compared with southwestern Pacific reefs, which lie at the center of aquatic biodiversity. For example, the *Acropora*, or "table-top" coral, community of French Frigate Shoals is unique in Hawai'i, yet *Acropora* corals are the largest group of reef-building corals worldwide. There are at least one hundred species of this genus, representing about one-fifth of all corals, yet only two occur in Hawai'i at French Frigate Shoals. In addition, there are over twenty other coral species in the fabulous underwater gardens at French Frigate Shoals.

About 700 species of fish, 400 algae, 1,000 mollusks, and 1,350 of other invertebrate groups inhabit the inshore waters of Hawai'i.[2] The fish and macroinvertebrate faunas of the Leewards are generally the same in species composition as those of the main islands. Most of the species are also distributed throughout the Indo-Pacific region, but approximately 20% are endemic to Hawai'i.[3] For example, one species of butterfly fish is endemic to the unique *Acropora* coral community of French Frigate Shoals. Hawaiian monk seals infrequently appear outside the northern reef ecosystems.

A coral reef is an oasis of life in a relatively barren ocean because it provides a wide variety of habitats: submerged banks, fringing reefs, sand flats, rocky shoals, and coral sand beaches. The bird's-eye view of French Frigate Shoals is breathtaking. In the aquamarine lagoon, yellowish heads of cauliflower-shaped coral shimmer under transparent turquoise water. Rust-colored fringing reefs, streaked with foam, protect the crescentic sweeps of sand on the north and east sides. The green vegetation of East, Tern, and Trig Islands, which compose the land portion of French Frigate Shoals, soothes the eye, and the blinding white islets of Disappearing, Gin, Little Gin, Bare, Round, Shark, and Mullet Islands gleam on the palette of blues. La Pérouse Pinnacle stands black and white before the deep blue sea.

These islets of French Frigate Shoals may be the inspiration for the name Moku Pāpapa, found in Hawaiian legends. In 1778, Captain James Cook recorded the following comments in his journal: ". . . we got some information of a low uninhabited island in the neighbourhood of these [main islands] called Tammata pappa."[4] After Cook's death in February 1779, the journal of his replace-

Aerial photo of Whale-Skate Island, French Frigate Shoals, 1990.

ment, Captain King, also mentioned this island: "To the WSW of Teula [Ka'ula], they visit a low sandy island for Sea birds & Turtle called Modoo-papapa or Komodoo papapa." Another footnote stated: "One canoe belonging to some Atoui [Kaua'i] Chief staid with us till Sunset, and then went towards the Island Outoura [Lehua] which was 4 miles distant to the SE. Their business, they told us, was to catch red birds, and the next day they intended going to Tomogoopapappa for Turtle." King also related that his efforts to locate the island were unsuccessful. Beaglehole (1967) wrote in a footnote to King's comment: "This 'low sandy Island' is quite baffling, though the name was picked up both in 1778 and 1779. [Ka] motu or moku papa is literally the low, or flat and smooth island. . . . Dr. Emory suggests that, as Nihoa was known to the historic Hawaiians and frequently visited by them, Moku Pāpapa may have been an alternative name for this island."[5]

The literal meaning of *moku pāpapa* is an island that is low and sandy. This suggests that Emory was wrong. Nihoa is certainly not flat and sandy. The nearest island that fits the description, and is west southwest of Ka'ula, is Johnston Atoll, about 800 miles away. However, French Frigate Shoals lies only 400 miles away. Aside from being in the opposite direction from what the sailors reported, it better fits the bill because it is where over 90 percent of the sea turtles in Hawai'i nest. This must be Moku Pāpapa, where sea turtles can be easily picked off the sandy beach, not hefted into canoes from the rocky shelves of Nihoa or Necker, where they are relatively uncommon. Also, *moku pāpapa* is the generic atoll name remembered in ancient chants and legends. It may represent way stations on the voyages to Kahiki. In the reign of King Kalākaua in 1886, it was the name used for Kure Atoll, the last Hawaiian island. We will never know the extent of wanderings of the prehistoric Hawaiians, yet it seems reasonable that French Frigate Shoals, only 75 miles from Necker, would have been within their reach.

Basse des Fregates Françaises, "Shoal of the French Frigates," was (re)discovered on 6 November 1786, "almost by accident." Two French frigates, the *Astrolabe* and the *Boussole* under the command of Count La Pérouse, narrowly averted running into the reef. The crews' ability to come about in less than a quarter mile saved the ships. "The moon, which was almost at the full, gave so great a light that I thought we might venture to stand on. . . . Since our departure from Monterey, we had never experienced a finer night, or a more pleasant sea: but the tranquillity of the water was among the circumstances which had nearly proved fatal to us. Toward half an hour past 1 o'clock in the morning we perceived breakers. . . . From the smoothness of the sea, they hardly made any noise, and some foam only, at distant intervals, was perceptible. The *Astrolabe* was a little farther off, but she saw them at the same instant with myself. Both vessels hauled on the larboard, and stood with their heads south-southeast; and as they made way during their maneuver, our nearest distance from the breakers could not, I conceive, be more than a cable's length."[6]

A natural monument in the atoll honors the event. La Pérouse Pinnacle, a 1-acre plug of exceptionally dense lava from the throat of the original volcanic cone, is all that is left after the surrounding rock has eroded away. It is the atoll's navel, an "earth mark" of its fiery birth. This whitewashed rock stands alone in the southwest quadrant of French Frigate Shoals, 122 feet above the sea. From a distance, it looks like the *Astrolabe* under full sail: the canvas luffing in the freshening trades, with the treacherous reef dead ahead.

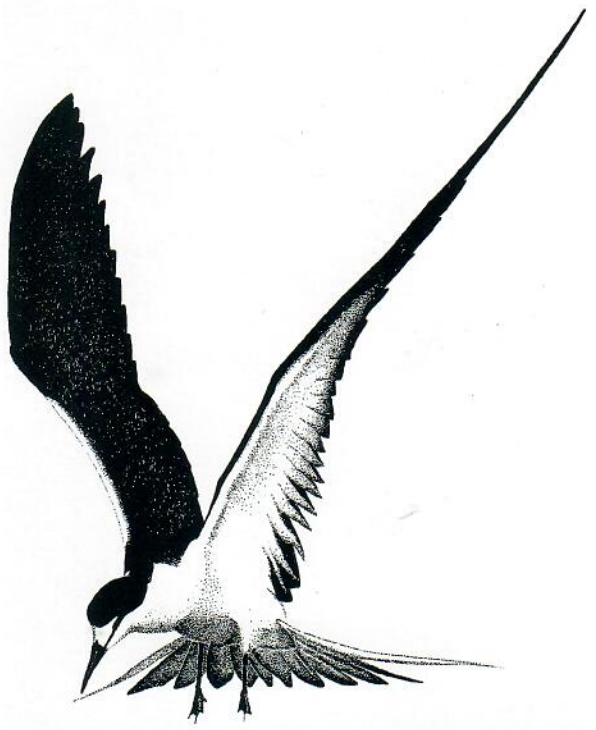
Indeed, French Frigate Shoals has seen more than its share of wrecks by others less keen than the Count. The whaler *South Seaman* was lost at French Frigate Shoals on 13 March 1859 while en

Seen from a distance, La Pérouse Pinnacle resembles a sailing ship.

route to O'ahu. With a few gallons of water and some hardtack, the crew set off in a whaleboat for Guam, but luckily they were saved by the Hawaiian government ship *Kamehameha IV* sailing in the region.[7] On 14 April 1867, the weather was beautiful with a full moon and the whaling bark *Daniel Wood* was steadily pursuing her course with a fine favorable breeze until "Hard up the helm!" split the night. *Daniel Wood* wrecked and the captain and some crew set off for O'ahu for help. After an open-boat voyage of 8 days on a pint of water and a biscuit apiece a day, they reached Honolulu and sent aid to save the stranded crew.[8] To survive, the thirty marooned men had killed over one hundred turtles before being rescued.[9]

In 1872, the vessel *Kamehameha V* found some odd survivors of that shipwreck. On 4 July at French Frigate Shoals, they recorded "two large hogs on a sand spit, a quarter mile in circumference. They have been there since April 1867. There is no fresh water and very little vegetation. As soon as the boat landed, the hogs took to the water and swam off to some rocks just awash, and seemed perfectly at home in the water."[10]

One hundred years later, ship cargoes proved to be a greater threat to the reef. In 1977, billows of black smoke a mile high towered over the 846-foot, Liberian-registered oil tanker *Hawaiian Patriot* burning 200 miles north of the atoll. The tanker exploded and sank, releasing an estimated



Sooty Terns, the most abundant bird in the central Pacific Ocean, do two things almost continuously: cry and fly. Only at the breeding colony do they descend to earth, and even then they are rarely quiet. (Drawing by John Gilardi)

five million gallons of light crude oil in what was, at that time, the worst oil spill in history. Luckily, the swath of oil, 14 by 40 miles in extent, largely evaporated. Little oil washed ashore, but some birds were oiled at sea. In 1980, the Greek freighter *Anangel Liberty*, carrying 2,200 tons of kaolin, a clay used in making porcelain, ran aground at the Shoals. To get her off the reef, the fine powder was dumped overboard. Again, the French Frigate Shoals coral reef ecosystem, the richest in Hawai'i, escaped with minor damage. In 1982, the fishing vessel *Keola* hit the reef and sank at Gin Island (named by Dr. Wetmore of the Tanager Expedition for the fond memories recalled by an empty Gordon's Gin bottle found on the beach), stranding the crew of four for 11 days and spilling 8,000 gallons of fuel. The boat was on autopilot with no one at the helm when it struck.

My arrival at French Frigate Shoals in 1977 was less dramatic. A blizzard of birds filled the air as the C-130 cargo plane touched down on the runway at the Tern Island Coast Guard Station. As my eyes adjusted to the blinding midday light reflected off the white coral runway, I saw thousands of screaming terns whisking away from the thunderous plane. Landing on this short, rough runway is a pilot's nightmare. A tern sucked through a turbine engine could down a plane, and the consequences of an albatross going through the windshield were unthinkable. The wing of our plane had hit a bird and the pilots were mad as hell because a dent in the wing can cost thousands of dollars to repair. Besides, the pilots might get stuck at the worst duty station, by some accounts, in the entire Coast Guard system.

A year on the 56-acre rock, with millions of noisy birds and twenty other stir-crazy guys, made the men of Tern Island desperate for their bimonthly mail plane. Angry pilots were to be appeased at all costs. The sunset red yolks from the terns' smashed eggs oozed into the coral gravel every 2 weeks. The Coast Guard received permission from the U.S. Fish and Wildlife Service (USFWS), which managed the island as a wildlife refuge, to haze the terns from the tarmac edge where they nested. Still the pilots were not satisfied —there were too many other flying objects. During peak breeding season, the planes avoided landing altogether and air-dropped canisters of mail, which either landed in the sea or shattered poorly packaged materials upon impact. During my 3 months on the rock, I was the public relations man for the birds—a tern interpreter. I tried to explain that Tern Island is for the birds, but Hitchcock's movie *The Birds* haunted everyone's imagination.

As the flock gathered together from across the tropical Pacific Ocean, the swarm of Sooty Terns swirling over Tern Island grew denser each night.

Sooty Terns nesting on the runway apron at Tern Island. The terns nest simultaneously in large colonies, providing more food than predators can eat, ensuring that some chicks will fledge.

Constantly calling *rad-a-rat-widdeyap-rad-a-rat,* the tornado of terns was preparing to breed and their flocking behavior helped to synchronize the colony. Suddenly, two terns rocketed out from the flock. In tight formation, they glided swiftly, separated by only a wing length. They soared together, forging a pair-bond in flight that will last the breeding season. Each day, more and more pairs jetted out in formation, and each day the cacophony grew louder as the flock of terns slowly descended closer to earth. After several weeks of aerial coordination, the terns landed on the runway, more or less en masse, and laid their eggs within days of each other. This limited the entire population's time on land, shortening the amount of time they might be susceptible to predation.

Sooty Terns are the most abundant species of seabird breeding in the central Pacific. They are also the most numerous birds nesting in the Northwestern Hawaiian Islands. Almost one-and-a-half million breed here, with at least as many nonbreeders present. Sooty Terns have evolved an aerial existence. They rarely risk an ocean landing because their plumage is not waterproof and their feet are too weak to propel them off the surface. Demonstrating their mastery of flight, they can sleep on the wing. Spending up to 9 months of the year in the air, they fly high-altitude circles on

Sooty Terns breeding at Tern Island.

"autopilot" while napping. No one knows how they do it, but they may act like some gulls that show sleep brain waves in one hemisphere of the brain at a time. They may also have "minicomputers" in their heads. Scientists have isolated bits of magnetite imbedded in their brain cells. These "chips" may help the terns orient to the geomagnetic force field in the upper atmosphere and thus navigate across the trackless Pacific.

Ironically, or perhaps even typically, it was humans who made Tern Island so attractive to Sooty Terns. Today, it hosts almost 80,000 breeding pairs of Sooty Terns, making it the third largest tern colony in Hawai'i. However, only small numbers of terns nested on a 6-acre sand bar called Little Tern Island in 1940. In August 1942, Seabees, the men of Company B, Fifth Naval Construction Battalion, extended the islet from 1,880 feet to 3,100 feet long and standardized the width at 350 feet with steel sheet pilings holding 660,000 cubic yards of coral fill dredged from the surrounding reef.[11] Ground-up coral mixed with sand and phosphate topped the runway, and under constantly wet conditions the runway chemically fused together into coralline rock. In 9 months, the job was complete at a cost of nearly two million dollars. Today, the seawall is rusting away and estimates to repair it run over twelve million dollars.

Tern Island, which resembles an aircraft carrier under way with its white wake flagging behind, is eroding away. The cement pad where the diesel tanks once stood is gone. The southwestern beaches are disappearing. In 1997, the USFWS had to place many tons of imported lava rock to save the former Coast Guard barracks. Preserving the footings of the structure is equivalent to maintaining a presence on the island. If rising sea levels are the wave of the future, Tern Island may yet return to the 6-acre sandbar it once was, regardless of the dollars spent.

The rush to build Tern Island was in response to an act of war. The Japanese had secretly used the lagoon at French Frigate Shoals for trial runs on Pearl Harbor.[12] Two Japanese seaplanes landed and refueled from submarines on 3 March 1942. After refueling, the planes flew a nighttime reconnaissance of Pearl Harbor and dropped some bombs in Punchbowl Crater before hightailing it back to a Marshall Islands base.[13] Later, three Japanese submarines were sent to French Frigate Shoals to refuel planes staging a second Pearl Harbor reconnaissance. But two U.S. Navy seaplane tenders were in the lagoon when the Japanese visited in late May, thereby denying the Imperial Navy knowledge of the location of the U.S. naval fleet at a critical juncture. In fact, the fleet was then north of French Frigate Shoals, heading to Midway for what proved to be the pivotal battle in World War II.

Up to twenty-two U.S. seaplanes used French Frigate Shoals as an anchorage and flew 100-mile-radius reconnaissance flights daily. Only seven

U.S. Navy biwinged floatplanes and ships at East Island, French Frigate Shoals, USS Oglala *and La Pérouse Pinnacle in background, 28 April 1933. This coordinated ship-plane exercise, consisting of thirty seaplanes and seven ships, began at Pearl Harbor and then moved on to Johnston Atoll.* (U.S. Navy, National Archives, Pacific Sierra Region)

enemy ships were seen during the remainder of the war because the action was elsewhere in the Pacific theater. As the Navy planes were cooling down on Tern Island, the air waves were heating up on nearby East Island. By the end of July 1944, a crew of twenty-seven Coast Guard personnel moved into their new Quonset huts and went on the air with a Long-Range Navigation (loran) transmitting station. Low-frequency radio waves transmitted from seven pole antennas on East Island pulsed out signals that, when triangulated with other loran signals, enabled mariners to locate their position on the ocean.

By the end of the war, the salt and wind began to corrode the electrical equipment and erode the men's morale. Flights to Tern Island had been reduced to one per week, and East Island requisitions went unfilled. In 1946 the Navy pulled out of Tern Island and commercial fishermen of the Seaside Fishing Company and the Hawaiian-American Fisheries Company used the runway and docks to fly fish and sea turtles to market.[14] Yet, the loran station stayed on East Island despite tidal waves, delinquent mail, and canned food until 1952, when the operation moved to Tern Island. One antenna pole was left standing as a landmark that you can just make out as a vertical pole from most parts of the lagoon. It marks a refuge from the sea, as noted by a plaque on the pole, which reads:

Walk softly, stranger.
The land on which you stand
Is Holy Ground.
For here, where seabirds make
their home—
Men of the Coast Guard once called it home.
From here, a signal pulsed to guide the lost
And weary traveler far from home.
And though this silence—broken now by sounds
of birds—
Gives no hint of voiceful mirth and laughter;
Yet, to those long gone, it was home—away from
home—
A place of unspoiled beauty, colored
By the hand of GOD.
And you who stand upon this land
Will someday too,
Remember sunwashed sands and quiet days
And moments crystallized in time.
Walk softly stranger—
For you stand on Holy Ground.

U.S. Navy men building a temporary small boat dock at East Island, French Frigate Shoals, 22 April 1933. An extensive "tent city" was later constructed for naval exercise purposes. (U.S. Navy, National Archives, Pacific Sierra Region)

tifying the structures to withstand heavy seas, the walls were built to "go with the flow." And just in time, because in early December 1969 waves reported to be 50 feet high broke over the fringing reef. Rushing water knocked out the walls without damaging the superstructure and only the electrical equipment was swamped. As the Guardsmen clung to the top of their dormitory to avoid being shark chum, helicopters airlifted them to safety. Two months after the storm, however, French Frigate Shoals was back on the air again, providing locational services to an increasing number of fishermen as well as lodging and support to scientists such as those from the Smithsonian Institution's Pacific Ocean Biological Survey Program (POBSP).

The POBSP was a cadre of biologists reconnoitering the remotest atolls in the vast Pacific, gathering data on plants and animals and placing metal bands on millions of seabirds. Their obser-

Dedicated to the brave men who manned the Coast Guard LORAN station on this, "East Island" spot—called: Gooney Bird Island—from the year 1944 through 1952.

As I read those lines and gazed over the translucent lagoon, I was glad someone had waxed lyrically, honoring inspirations felt by the many men who had passed this way.[15] But if they could only see the place now! Indeed, their "holey ground" is riddled with shearwater burrows and pock-marked with sea turtle nest pits.

In 1952, the Coast Guard moved to the Tern Island loran facility and set up shop. By 1964, they refurbished the buildings with hurricanes in mind. Instead of for-

U.S. Coast Guardsmen smashing tern eggs on the Tern Island runway apron, April 1977.

vations, collected during ten trips to French Frigate Shoals in 1963–1969, help wildlife managers today appreciate the importance of long-term monitoring in island ecosystems. Several scientists of the POBSP drew together all that was known of the Northwestern Hawaiian Islands and published histories and species accounts for each island in the northern chain. I have drawn from their efforts recorded in various issues of the *Atoll Research Bulletin* with thanks and profound admiration for their thorough work.

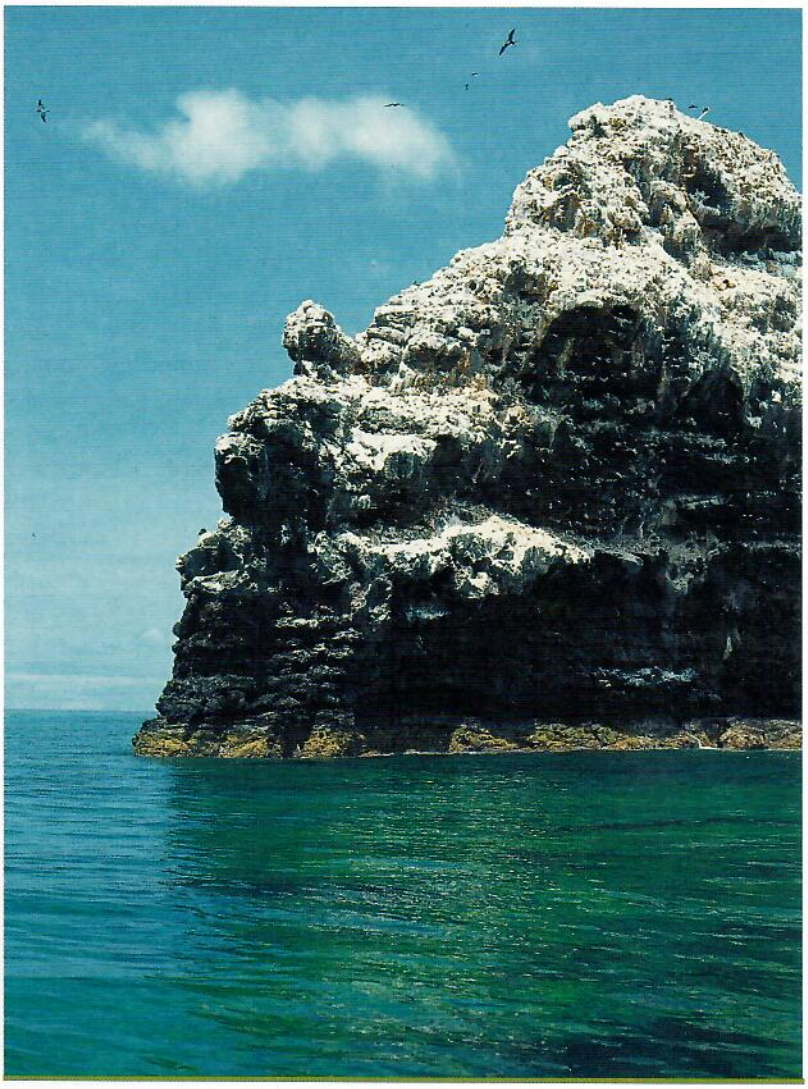
I was among the second wave of researchers hosted by the military and noted that the life of the enlisted man had changed little in 25 years. Videos had replaced two-reel movies, pinup girls had come and gone, but the isolation of French Frigate Shoals had remained the same. Periodic phone calls had to be patched through ham radio or maritime operators with the entire Pacific listening: "Hi, Honey, it's me . . . over. . . . When are you coming home? . . . over. . . . What? . . . over." Moreover, with Honolulu 480 miles away and only 2 weeks vacation a year, most men slowly went crazy. Our entertainment consisted of drinking warm beer at the "Playboy Club" on the beach, basking in the radiation from the sun and the loran tower (a fluorescent light bulb pointed at the tower would flicker from the incipient radiation like the northern lights).

Time went by relatively quickly, with each of us having his own room and role in the daily grind. Every day, the engineers maintained the generator so that the loran stayed on the air and made sure that the air conditioning, refrigeration, and the salt water desalinator functioned properly. The electronic technicians kept tuning the vibrations, and the cooks prepared the vittles. A junior lieutenant fresh from the Coast Guard Academy ran the show. This diesel-based lifestyle was maintained by about twenty men, whose average age was about 20.

The callowness of the Coast Guard crew did present some problems. On April Fools' Day, I had a not-uncommon adventure for French Frigate Shoals. I was relaxing on my day off at Tern Island when a Mayday call was received. Some young Coast Guardsmen had taken the Boston Whaler out fishing near La Pérouse and were having engine trouble. The only functioning boat was the USFWS's Boston Whaler, a boat whose weaknesses I knew only too well. Some misplaced sense of responsibility took hold of me (I was 25 at the time), and I volunteered to pilot the craft to rescue the Coast Guard. Four of us rapidly deployed the Whaler and sped out to La Pérouse Pinnacle, the last point of contact for the group.

When we reached the outer shoals, the seas were no longer constrained by the atoll platform and were free to heap higher. We were in the open ocean now with squalls passing over. Heading in

Bones of the island, Tern Island seawall rusts in peace.



Le visage de La Pérouse.

the direction of the wind drift, I thought I saw a signal flare through the curtains of mist, but I wasn't sure. Heading in that direction, we soon found the boatload of men. Soaked like wet wharf rats, they had scant survival gear, no raingear, no water, no anchor. We quickly threw them a line and began to tow them into sea swells building to about 10 feet.

La Pérouse Pinnacle stood at the edge of the shoals and watched our progress, which appeared nil. We could only hold them into the winds that ripped the wave crests off. When a squall enveloped us and the rock disappeared from view, I finally got scared to the bone. I knew my boat had problems—the steering linkage had gone out the last time I had taken it out, and I prayed the strain of pulling another boat through the waves wouldn't break the mechanism. I felt a seed of panic sprout, not unlike the feeling I get in heavy air turbulence—"so this is how I'm going to go." I looked back at the "coasties" in tow. Waves were spilling into their boat and the poor bastards were bailing with their government-issued black shoes.

Eventually we gained the shoal waters, and the waves dampened out to a manageable 5 feet. Suddenly our boat was surrounded by fins. The panic attack subsided when we realized that they belonged to Bottle-nosed Dolphins and not to Tiger Sharks. As we neared home base, we slackened the tow line so that the land crew could pull them in. Our engine stalled out and the current quickly pulled us near the reef. The foremost thing in that situation is to "arrest further drifting," so we quickly threw out our anchors. They held too well in the coral and when we restarted our engine we had to cut them free. We could retrieve the anchors later, but now solid land was a priority and we tied up to the dock in short order. For our ordeal we received a

measure of grog—brandy—our "exposure ration." I headed directly to bed with the visage of La Pérouse seared in my mind.

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Isles of Refuge

Wildlife and History of the Northwestern Hawaiian Islands

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