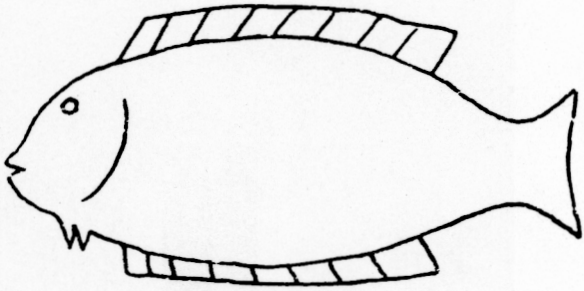
WORDS OF THE LAGOON

FISHING AND MARINE LORE IN THE PALAU DISTRICT OF MICRONESIA

R. E. JOHANNES



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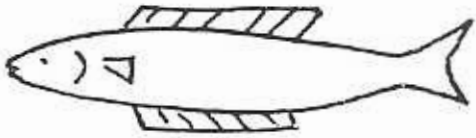

CHAPTER 7

FISHING IN THE SOUTH WEST ISLANDS

R. E. Johannes and P. W. Black

In Palau until recently there has been little incentive to fish beyond the extensive reefs and wide lagoon, for plenty of fish could be caught within their shallow, sheltered confines. But several tiny islands to the south of Palau have not been so favored by nature. Their inhabitants have of necessity fished routinely for centuries over the deeper, rougher waters of the outer reef slope and the ocean beyond. I wondered how the skills and perceptions of such fishermen would differ from those of Palauans. The opportunity to find out presented itself conveniently.

On the edge of Malakal Harbor near Koror were a cluster of small shacks of plywood and corrugated metal that housed several hospitable families from one of these islands, Tobi. They had moved to Palau in order to avail their children of the schools there. Among them were some of Tobi's best fishermen. One of them, Patris Tachemaremacho, became my chief Tobian teacher-interpreter. Patris's knowledge of Tobian fishing was considerable, but the ultimate authority on most such matters was his father, Patricio. (When it came to the spelling of Tobian fish names, however, everyone deferred to Patris's wife, Marina).

Now in his eighties, Patricio was still mentally quick. He had been one of the most respected teachers of fishing and canoe handling on Tobi. (He had also been one of the main informants of Peter Black, who collaborated with me on this chapter. Black had lived on Tobi, first as a Peace Corps worker, later as an anthropologist.[1]) If a question came up during our interviews about which Patricio was unsure, one of Patris's numerous handsome children was sent to find two other expert Tobian fishermen, Kalisto Elias and Zacharias Saimer.

Tobi and its sister islands, Sonsorol and Pulo Anna, are among the smallest and most isolated of the inhabited islands of Micronesia. They lie 200 to 300 miles south of Palau in the southwestern corner of Micronesia. Although separated from each other by 80 to 175 miles of open ocean, their inhabitants are united by a common language and culture.

The significance of these islands in the global scheme of things is such that no one in the West has ever bothered to give them a collective name. They are known today simply as the South West Islands. Many people in the Trust Territory Government are not even aware of their existence. The language and culture of the inhabitants are quite different from those of Palau, but for geopolitical convenience they have been designated as part of the district of Palau. Furthest from Palau, Tobi is the least visited and the most traditional of these islands. The only regular contact with the outside world is provided by a small government supply vessel that comes from Palau several times a year, stopping for a few hours to offload sugar, rice, and cigarettes and pick up copra.

Tobi covers an area of 0.23 square miles. Phosphate deposits render the soil more fertile than it is on many low tropical islands. But in times past the population pressure on these terrestrial resources has been very great. Today there are only about sixty people on Tobi, but starvation due to overpopulation was apparently once not uncommon (e.g., Eilers, 1936). Tobians say there were times when resources were subdivided so finely, due to overpopulation, that different individuals owned different fronds on the same palm tree. In the early 1900s the population reportedly stood at 986 (Eilers, 1936). If accurate this figure yields a remarkable population density of more than 4,000 per square mile.

1. Significant portions of this chapter are derived from field notes and an unpublished manuscript on Tobian fishing methods written by Black (1968). In his thesis on Tobian culture he wrote of the "possibilities which these thoughtful, intelligent and verbal [Tobian] men offered for the investigation of [native] fishing." He also noted that "their eagerness to record for the future what they felt to be a passing set of skills was impressive" (Black, 1977, p. 30).

On Tobi, unlike Palau, there are no forests, streams, lakes, or mangrove swamps. Thus there are no jungle fowl, freshwater fish and shrimp, fruitbats, or mangrove crabs. (A single stray crocodile reached the island a few years ago and was speared and eaten.) A narrow fringing reef provides the only significant source of animal protein other than the open ocean. Such shallow coral reef communities may, when intensely harvested, yield as much as twelve metric tons of fish and shellfish per square kilometer (Hill, 1978).[2] Because Tobi's reef occupies an area of about one and a quarter kilometers, its maximum annual yield of seafood would probably amount to no more than about fifteen metric tons. Shared by 986 people, this would have allowed each an average of only about thirty-six grams of flesh or about ten grams (about one-third ounce) of protein per person.[3] The reef therefore could not have been the sole source of animal protein. (Curiously Tobians did not eat a variety of easily harvested reef invertebrates [e.g., sea cucumbers, sea anemones, sipunculids, starfish] eaten by Palauans and other Pacific islanders.) It can thus be seen why Tobians have depended heavily on the waters beyond the reef for their catch. Of forty-one Tobian fishing methods listed by Black (1968), thirty-three involved fishing beyond the outer reef crest.

So steeply does the bottom fall away as a canoe pulls past the breakers on Tobi's reef that within seconds only blue water can be seen beneath. A trip of a few hundred meters takes a fisherman from his house to the open-ocean fishing grounds where he seeks tuna, dolphinfish, rainbow runners, wahoo, marlin, sailfish, barracuda, flying fish, and sharks.

Until recently the fishermen of Tobi also sailed periodically to Helen Reef, a tiny uninhabited atoll thirty-nine miles to the east, in order to get turtles and giant clams.[4] According to informants these clams (*Tridacna*) were once common on Tobi's reefs but were virtually exterminated by overharvesting. (A single large giant clam was discovered on Tobi in forty feet of water in 1968.)

2. This value is much higher than other published yields calculated for reef fisheries (e.g., Stevenson and Marshall, 1974). This is because the other estimates relate only to commerical catches, whereas Hill (1978) measured yields on Samoan reefs that were heavily gleaned on a subsistence basis for small invertebrates and fish as well as the larger commerical type specimens—in other words, reefs harvested with similar intensity to Tobi's.

3. This figure is calculated assuming fresh reef fish average 27 percent protein (Murai et al., 1958).

4. The Tobian name for this atoll is *Hocharihie*, "Island of the Giant Clams." Sadly this lovely place, containing the most beautiful reefs I have ever seen, has been one of

Learning to Fish

Traditionally Tobian boys went through long and rigorous training before mastering all the fishing techniques to which they could legitimately aspire, generally reaching middle age before having a chance of being considered a *marusetih* or master fisherman. At seven or eight years of age they would begin their fishing careers. Fishhooks were too precious, prior to the introduction of metal, to be entrusted to neophytes. Consequently a young boy's fishing gear consisted only of a very fine line. A loop was tied on the end, in the middle of which a piece of hermit crab was suspended as bait. Gathering on the reef flat at low tide the boys used these simple devices to noose small fish in tidepools. A small unidentified jack was especially sought after; the rough lateral keel on its tail helped prevent the noose from slipping off it. The boys were restricted to this kind of fishing for three or four years. Fishing at such close range to the fish, they learned much about the behavior of different species.

In the meantime they were taught how to make fishhooks out of shell or bone. Only after they could make them well—a demanding operation (see Chapter 9)—were they allowed to use them. Their training continued in a series of steps involving the use of poles, hooks, and lines on foot in shallow reef waters. The final stage in this period, when the boys had reached late adolescence, involved learning how to cast out beyond the reef crest to catch larger fish living on the outer reef slope. This was the first time the boys engaged in a fishing technique routinely used by adult fishermen.

This traditional training schedule exists today in attenuated form. Young boys are encouraged to fish on the reef for small fish but the procedure is less rigid than it used to be. Baited hooks are used because metal hooks are now cheap and expendable. Otherwise boys go through the same general progression as their ancestors, but in a much shorter time. As on most tropical Pacific islands, there were numerous onerous fishing taboos and protocols, often of a religious

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the subjects of systematic pillage by Okinawan, Taiwanese, and Korean fishermen. These men have ravaged reefs from the Marshall Islands through western Micronesia and all the way to Australia's Great Barrier Reef in their search for giant clams. In addition to decimating the atoll's giant clam populations (Bryan and McConnell, 1976), a party of Korean fishermen recently devastated rookeries of several species of sea birds in their quest for food and cut down most of the islet's palm trees, rather than climbing them, to get the coconuts.

Helen Reef and Merir, another uninhabitated island in the South West Islands, are the most important green turtle nesting sites anywhere within U.S. jurisdiction (Pritchard, 1977). Unfortunately a small number of Palauans habitually harvest turtles illegally during visits of the government supply vessel to Helen Reef. South West Islanders resent these intrusions—illegal according to both traditional and modern laws—but cannot stop them; the Palauan government has simply ignored complaints concerning these activities.

nature, that had to be learned by apprentice fishermen. But with the introduction of Christianity many of these practices ceased (Black, 1977). Today boys are sometimes allowed to fish beyond the reef as soon as they are physically capable of doing so, due to a shortage of manpower. Depending on their fathers' judgment of their physical maturity and strength, boys from thirteen to sixteen are now crewing on the large canoes and trolling for tuna or netting flying fish. After a year or two of instruction by older male relatives the boys start going out with friends and brothers.

In theory no Tobian can master all traditional fishing techniques, for some are considered private property. (Virtually the only things that are owned outright among the communal Tobians are nonmaterial. These include not only fishing techniques but also certain songs and medicines.) As a general rule the more difficult a technique, the fewer people that own it. A boy gaining his initial access to a one-man canoe is told by his father which of the techniques he may legitimately use. Once having mastered these techniques he is drawn to those belonging to others and he proceeds to try to "steal" them. (This is the Tobian term and refers to acquisition of a technique by covert observation.) Arguments concerning this practice are frequent. Serious confrontations are avoided, however, by directing accusations and retorts back and forth from a distance and over an extended period of time through a chain of intermediaries.

Such ownership practices have eroded among South West Islanders in Koror; many of their techniques are inapplicable in the lagoon fishing areas to which they have easy access. Only once during my interviews in Koror did a man explain politely that he could not answer my question because the relevant knowledge was a family secret.

Traditional Marine Conservation

Secrecy probably functions as a conservation measure; if the knowledge needed to exploit a particular area or species is restricted, the likelihood of overexploitation is lessened (e.g., Forman, 1967). (Conversely the "stealing" of a method helps reduce the risk of it being lost if its legitimate owner dies without heirs.) A variety of other South West Island customs also functioned to conserve certain species. Some of these practices were imbedded in ritual and it is impossible today to determine whether or not they were originally intended as conservation measures.

Octopus, for example, could not be eaten on Tobi except by the elderly. Octopus make excellent bait but are not abundant around Tobi. Was this restriction set forth originally in order to maintain the bait supply? Today Tobians no longer remember. A variety of

other species were taboo to part of the population or during part of the year. Still other edible species were forbidden to all at all times. Such complete prohibitions *appear* not to have been erected as conservation measures as their effect seems functionally equivalent to exterminating the species in question. However we cannot assume that when survival was at stake Tobians did not set aside such taboos.

Some South West Island customs were clearly designed with practical conservation in mind. As described earlier, seabirds help fishermen find fish. In a conscious effort to conserve the populations of these birds it was forbidden on Sonsorol to eat them except during the nesting season when they were very abundant. The use of fish poisons was also restricted to certain special occasions on Tobi and Sonsorol because it killed too many juvenile fish, thus reducing the future supply.

Although turtles were never abundant around Tobi within living memory (see also Holden, 1836), their numbers seem to have decreased even further in recent years. Several years ago it was decided at a meeting that turtle eggs (a great delicacy) would no longer be eaten, so there would be more turtles to eat in the future. Anyone who violated the new law would be fined. A person finding a nest of turtle eggs reported it to the magistrate who immediately fenced the site to keep the hatchlings safe from cats. When the eggs hatched (the time can be predicted to within a day or two) the hatchlings were not allowed to make their dangerous trek across the beach and reef to the open sea. To the apparent frustration of the many seabirds that gathered at the first sign of hatching, the hatchlings were gathered up. They were kept in a large bucket and fed finely chopped fish. When they were judged big enough to have a good chance of surviving they were ferried by canoe out to the open sea and released.[5] (Unfortunately, a new crop of teenage boys not in on the original decision began eating all the eggs they could find recently.) A similar conservation measure was introduced at about the same time on Sonsorol.

FISHING METHODS

Several dozen different fishing methods are used in the South West Islands. Trolling for large pelagic fish and dipnetting flying fish by torchlight are by far the most important methods in terms of

5. The extent to which turtles depend on their trip across the beach and reef in order to "imprint" on their birthplace and find it again at egg-laying time is unknown. If this trip is an important part of the imprinting process then these efforts at conserving turtles may, in fact, deplete them even further.

yield. Only when they are unproductive is much time spent on other types of fishing. Here, briefly, are described a few of the more important or interesting methods.

Trolling

Of all activities connected with the sea, Tobian men get most pleasure out of trolling from sailing canoes. When the tuna are there the pace of island life quickens. The men put out in their canoes morning and evening, beating back and forth in the wind, waiting for the shock of a big fish as it hits the feathered trolling lure. Working their way gradually offshore, sometimes beyond sight of the island, they search for the feeding birds or the small fish breaking to surface that signal the presence of bigger fish below.

Handling sailing lines and fishing lines at the same time in stiff winds and rough water is no easy matter in their small canoes. This is particularly true when coming about, during which the whole sail rig must be lifted over the fishing lines, carried along a lurching deck no more than eighteen inches wide, and placed at the opposite end of the canoe. To add to the challenge, sharks sometimes crash into the side of the canoe while chasing a hooked tuna, which in turn may put heavy strain on the line when diving to escape its pursuers. It is not surprising under such conditions that canoes sometimes capsize. The catch is the only thing in the canoe that does not float, so one man is delegated to dive after the fish and bundle them up with sail, poles and paddles, while the other man rights and bails out the canoe.

Racing breaks the monotony when fishing is slow. A passage from Peter Black's diary:

> Lawrence came out late, close between the island and our canoe as we rounded the southern tip of the island, . . . the area of choppiest seas and most gusting wind. Giant waves breaking on the reef, the sun breaking through the thunderheads on the eastern horizon, Lawrence's sail sparkling in the brand new sunlight. Lawrence was going flat out, challenging us to a race, hauling full strength on his sail, with the outrigger and its platform pointing up at the sky and Lawrence squatting on the tilting and lurching canoe, laughing and singing and dancing.

When the fish are biting but the wind stops, the canoes are paddled back and forth in order to troll. This is hard work and the catch is generally not as good as when the wind is up.

Most fishermen go in pairs. The only people who sail the big sailing canoes alone are those who have dependent youngsters at home whom they can summon to help bring in the canoe. This is accomplished by means of a unique call, made by scraping a piece of

the canoe's plywood deck with considerable pressure across its gunwales. The entire canoe becomes a sounding board that emits a loud, resonant groan. The sound is distinctive for each canoe, and recognized by the helpers on land.

Torch Fishing for Flying Fish

On spring nights flying fish are attracted to canoes by the light of palm frond torches and dipnetted from the water. This is done only during the twelve dark nights of the moon; torches are ineffective on bright nights when the moon tends to drown their light. A netman must not eat, drink, or smoke from the time he gets up in the morning until when he returns from the sea. The rest of the crew observes the same restraint after the midday meal.

Well after dark the canoes slip out through the reef channel. The crews are under the direction of taciturn netmen. Only the breakers, the vague outline of the island, and the stars can be seen in the darkness. Each canoe is paddled into position and the torches lit. The scene is instantly transformed as domes of light illuminate each canoe and its paddlers. The images are repeated beneath on a mirror-calm sea. Beyond the domes nothing is visible.

Swimming close to the surface the fish are caught with a downward sweep of the dipnet, taking advantage of their tendency to swim upward when startled. Sharks and needlefish are also often attracted by the light. The dip and heave of the net continues uninterrupted, without interference from sharks, although their shapes often loom close and large.

The needlefish sometimes pose a real problem, however. Somehow stimulated by the torchlight, they periodically erupt from the water and rocket through the air, their slender bodies and long, sharp, bony snouts giving them more than a superficial resemblance to javelins. The fishermen, who traditionally go naked while torch fishing, run the risk of being seriously injured. At least two Sonsorolese fishermen have been killed as a result of wounds from these fish—one by a neck wound, the other by an infection in an abdominal wound.[6] [Eilers [1936] mentions a Tobian medicine made expressly for treatment of needlefish injuries.] Needlefish are particularly abundant around Sonsorol and once they reach numbers judged by the chiefs to be too hazardous, torch fishing is called off for the season.

6. This problem is not restricted to the South West Islands. People throughout the tropics have been killed or injured by flying needlefish [e.g., Guppy, 1887; Kayser, 1936; Pratt, 1906; Randall, 1966]. In Hawaii in 1977 one person was injured and another killed by needlefish [*Honolulu Advertiser*, September 6, 10, 1977].

Kite Fishing

Fishing with a kite made from a leaf attached to a line with a hookless lure is indigenous to the South West Islands, as it is to certain other areas scattered throughout the tropical western Pacific and Southeast Asia.[7] In the South West Islands the kite is made from a breadfruit leaf. The leaf is dried by passing it over a fire and pressing it flat under a woven sleeping mat. The slender, dried midribs of coconut leaflets are threaded through the breadfruit leaf and tied to one another where they cross to give it rigidity. The line is made from sennet (coconut husk fiber).

In strong winds the kites are reportedly flown as high as 300 feet. The bridle can be moved up and down to adjust for wind strength: the greater the wind speed the smaller the angle between the kite face and the horizontal. When kite fishing while standing on the outer reef edge, a fisherman can alter the direction in which the wind carries his kite by trimming it on one side to make it fly to the left or right. This enables him to get the kite offshore even if the breeze is running parallel to the reef edge or blowing obliquely onshore. When fishing from a canoe the fisherman ties the kite line to his canoe or holds it in his mouth once the kite is up, so that he can paddle the canoe in a zig-zag upwind course. (Children on foot fish from the reef edge using smaller versions of these kites with the line attached to a long rod.)

Dangling from the kite is an extension of the kite line bearing a lure made from the web of an indigenous spider. It serves simultaneously as the kite's tail. Ten to fifteen webs are twisted onto a forked stick to make the lure, which looks like a small gauze pad. Its shape varies depending on the maker. The kite is maneuvered so that the lure skips and splashes along the surface of the water. Needlefish strike at it, apparently mistaking it for a jumping fish. The many small, sharp-pointed teeth in their long jaws get tangled so tightly in the webbing that the fishermen sometime have to cut fish out after they are landed. Catches of half a dozen three- to six-foot needlefish in half an hour are not uncommon when the fishing is good. On rare occasions barracuda and mackerel are also caught in this manner.

On Sonsorol the species of spider that builds the appropriate web does not occur. Attempts by Sonsorolese fishermen to introduce it from Tobi have not been successful. (This is surprising because the fauna, flora, and landscape of the two islands are very similar, and whatever thrives in one might be expected to thrive in the other.) So to make their kite lure, the Sonsorolese use the connective tissue

7. Locations where kite fishing has been used, and variations on the general method, have been described by Balfour (1913) and Anell (1955).

lying just beneath the skin of lemon sharks, *Negaprion acutidens*. It has the disadvantage of becoming dry and leathery when stored and must be chewed to render it supple before each use.[8]

A drawback of the spider web lure is that contact with even a small amount of oil makes the fibers slippery enough so that the teeth of the needlefish tend not to hold in them. A fisherman must wash his hands well before touching the lure so that the skin oils on his fingertips do not spoil it. Coconut oil and, these days, hair pomade are also avoided for three days prior to kite fishing. Around Patricio's adopted home in Palau a thin film of oil on the water emanating from nearby boat docks and a copra-processing plant render these lures unusable.

Noosing Sharks

Fishing line made from plant fiber cannot resist for long the teeth of a good-sized shark. Lacking metal leaders, Pacific island fishermen solved this problem in a number of ways. One was to fish with wooden hooks so large that a portion of the shank protruded from a hooked shark's mouth, preventing its teeth from coming in contact with the line. Another method, mentioned in chapter 2, was to noose sharks around the gills, thereby not only keeping the line away from the shark's teeth but also cutting off the shark's breath and thereby shortening its struggles. First, however, the shark had to be attracted close to the canoe.

Centuries before biologists, Pacific islanders discovered and put to use the knowledge that certain types of vibrations will attract sharks (e.g., Hodgson, 1978). (Some vibrations have recently been found by biologists to be even more effective in this regard than the odor of bait [Nelson and Johnson, 1976].) Typically islanders strung together coconut shells and shook them beneath the water to bring sharks close to their boats. South West Islanders used seashells held over the side of the canoe for this purpose, rubbing them together or rattling a string of them rapidly and repeatedly. The fishermen of Pulo Anna were particularly adept at this technique. According to Patris both the frequency and the rhythm of the sounds thus created were important and it took time to acquire proficiency in attracting sharks this way. Recent research suggests why. Not only are closely spaced sounds more effective in attracting sharks (see Chapter 3) but their attractiveness is further enhanced if their rhythm is irregular—that is, if groups of sounds are interspersed with pauses of varying duration (e.g., Myrberg, 1978).

8. In the Gilbert Islands I was told that a piece of the dried, pounded intestine of a balloon fish is trailed along the surface by means of pole and line to catch needlefish.

Once lured to the vicinity by these sounds, a shark would be attracted closer to the canoe by raising and lowering in the water a white rock attached to a line. The shark would often be seen to pursue the stone. (The Tobian name for the lemon shark, *Negaprion acutidens*, is *echarivus*, which can be translated as "[bites] white stones"). Once a shark was spotted it was lured still closer to the canoe with a fish trailed in the water. The noose was lowered between the baitfish and the oncoming shark. As the shark swam into the noose, it was pulled tight against its abrasive, nonskid skin.

A skilful variation on this technique was used to catch sharks in deeper water. The bait was suspended in the center of a heavy, stiff noose by means of strings attached to the noose like crosshairs in a rifle sight. The noose was lowered to depths of as much as sixty to eighty fathoms, well out of sight of the fisherman, who determined by the feel of the line when a shark was taking the bait. As the shark mouthed the bait, the strings broke and its head pushed through the noose. But its pectoral and dorsal fins prevented its body from sliding smoothly through. The fisherman monitored this action by the feel of the line and pulled the noose tight at the appropriate moment.

Some sharks swam upward with the bait in their mouths creating slack in the line and reducing the ability of the fisherman to feel what was happening. Consequently the noose was continually raised and lowered while fishing so as to guard against a shark getting away with the bait in this manner before it was detected. Sharks six to eight feet long were caught in this fashion. Larger sharks were usually not sought because they were too strong to be handled safely from a small canoe. Noose fishing is no longer practiced on Tobi.

For sport, tuna were occasionally noosed by a different method. When a feeding school was near the canoe they were attracted closer with chum. A small, flexible noose was lowered and the tuna noosed around the tail with a quick jerk as they inadvertantly swam through the noose. Tuna, like the jacks noosed by children, have a stiff caudal fin and a rough, rigid lateral keel on the tail-base, which prevented the noose from slipping off easily. Needless to say very quick reflexes were needed to fish in this manner.

Log Fishing

The subject of drifting logs is one of great importance to the inhabitants of small oceanic islands in the central west Pacific. The observations of fishermen on the seasonal distribution of these logs and the aggregations of fish beneath them illuminate more than one problem of interest to students of the sea.

For reasons that remain to be discovered, many tropical pelagic fishes tend to gather, often in large schools, under logs and other

floating objects. Schools of dolphinfish (mahimahi), jacks, oceanic triggerfish, and most importantly, skipjack tuna will often form under a floating object as small as a single palm frond.[9] Although various small forage fishes also aggregate under these objects, it seems unlikely that their presence is what attracts the larger fish. Tuna schools sighted under single drifting logs in the central west Pacific sometimes weigh more than fifteen tons and consist of several thousand individuals. The few small fish sheltering under the same log could hardly qualify collectively as an appetizer for such aggregations.

Excitement spreads quickly through the village when a drifting log is spotted from the beach on Tobi. Fishermen grab their fishing boxes from beneath the thatched roofs of their canoe houses and launch their canoes. Anyone can fish around a log. But traditionally the first men to reach it gain the right to the log itself. And on such a small, isolated limestone island with a very limited range of indigenous raw materials, a log, plus the soil and rock carried in its roots, can be a precious commodity. The wood, used as building material and for canoes, was particularly valuable during periods of overpopulation when the demand for wood outstripped the island's supply of suitable trees. The black root-soil is rinsed with rainwater to remove the sea salt and used to enrich the earth in which papaya trees are planted. When mixed with the juice of a tree bark it once also provided a cloth dye.

The hardest objects normally found on limestone islands such as Tobi are relatively soft seashells and coral rock. The harder igneous rocks brought in tree roots were thus once of great value as tools. One form of black rock was used to form the body of a type of tuna lure. Because Tobians had no pottery they had no utensils in which liquids could be heated over a fire. Certain liquid medicines

9. Tobians and fishermen from the eastern Carolines I talked with both noted a relationship between the characteristics of a log and the abundance of fish under it. The older the log and the more gooseneck barnacles and seaweed hanging from it, the more fish it attracts (see also Inoue et al., 1968). Mahogany logs have few fish under them if they have no bark. Clumps of bamboo with withered leaves still attached seem particularly attractive.

There is a saying on Tobi that coaxing fish out from under a log is like coaxing a white man's ship to the island: Plenty of sweet chum (chopped-up fish) must be used in one case and plenty of sweet words in the other. Tobians had an exaggerated reputation for ferocity in the nineteenth century, due to the highly colored descriptions of them given by Holden (1836). Thus captains who might normally put in for provisions when sighting an oceanic island tended to steer clear of Tobi (Eilers, 1936). The Tobians, however, in order to obtain metal and tobacco, wanted them to stop and trade. Consequently they often chased passing ships in their canoes, probably inadvertently adding to their reputation for fierceness in the eyes of some sailors who could not tell the difference between entreaties and threats when uttered in the guttural language of Tobi.

were warmed, however, by dropping an igneous rock, heated red-hot in a fire, into a wooden bowl or clamshell containing the medicine. (Calcareous rocks and shells do not hold heat well and tend to flake or shatter when placed in a fire.)

The "season of drifting logs" starts at Tobi in July, with the best months being September through December. This seasonality has two causes. First, it is mainly during the rainy season that trees are washed from river banks in New Guinea and the Philippines and carried downstream to the sea, some of them ultimately reaching Tobi. Second, the prevailing ocean currents on which the logs are carried shift back and forth over several degrees of latitude with the seasons.

A similar calendar of log months was described to me by the fishermen of Sonsorol and of some of the outer islands in the eastern Carolines. They often remarked that the number and average size of logs drifting past their islands seem to have decreased considerably in recent years. Perhaps this is the result of accelerated logging in the forests where the logs originate.

This information has potential value for commercial tuna fishermen in the central western Pacific. The area contains the only major underexploited skipjack tuna populations in the Pacific. At present a purse seine fishery is developing in the area and this fishery is largely dependent on floating objects for its catches. Tuna schools can be caught with greater ease in the eastern Pacific because the fish will not dive to escape the encircling net; a shallow and abrupt vertical temperature gradient (thermocline) through which the tuna are reluctant to pass restrict them to shallow water. In the western Pacific, however, this thermocline is deeper and allows the tuna to dive beneath the net to escape.

In the western Pacific, consequently, tuna seiners set their nets mainly around schools associated with floating objects. Once an object with an associated school of tuna is spotted, a radio beacon is attached to it. Its position is then monitored electronically. Only around dawn or dusk is a net set: the object is to make a set when there is just enough light for the fishermen to see what they are doing, but not enough for the fish to see the encircling net and dive in time to escape it.

Tuna seiners in the central western Pacific search almost at random for floating logs. Yet, as described above, the testimony of South West Island fishermen indicate that the logs are not distributed at random. Consequently if the knowledge concerning "log seasons" possessed by native fishermen from small islands throughout the area were gathered and integrated, a picture of the seasonal and geographic variations in log abundance should emerge. This

could lead to significant fuel savings and higher catches for the purse seiners and hasten the more efficient utilization of these important, underutilized fish stocks.

Observations of fishermen concerning some of the smaller fish associated with drifting logs proved interesting. Tobians and marine biologists alike have noted that the young of a variety of species of reef fish are often found associated with drifting logs far out to sea. This is the consequence of many reef fish having pelagic eggs and larvae. Only after a period of weeks in the water column do the young take up residence in a reef community. In the meantime floating logs provide some of them with shelter from predators among their roots and branches.

Ultimately these fish must reach shallow reef areas if they are to spawn and complete their life cycles. Some species, according to Patris, will abandon their floating shelter and swim toward Tobi's reefs when they are still many hundreds of yards away and well out of sight of them. Such species include tripletails (*Lobotes surinamensis*), triggerfish (*Odonus niger*), and unidentified jacks. (Ngiraklang said he had seen other juvenile reef fish, including rabbitfish (*Siganus canaliculatus*), emperors (*Lethrinus harak*), and goatfish (*Mulloidichthys* sp.), abandoning logs off Palau in the same manner.) Perhaps these fish detect the presence of nearly reefs by means of olfactory cues; the metabolic activities of the organisms in communities results in the export of biogenic substances downcurrent in the water that has washed over them (e.g., Johannes, et al., 1972). The ability to detect reefs at a distance would increase the likelihood of pelagic juvenile reef fish completing their life cycle.

Fly Fishing Tobi Style

Tobians are adept, like most skilled line fishermen, at determining by the feel of the line what is biting and just what is happening with the bait. Consequently they almost never leave their lines untended. An exception to this involves a sort of fly fishing, where the energy of waves, rather than the fisherman's arm, is used to manipulate the fly. A stick is inserted in a piece of cork made from driftwood. A few inches of line with a small, white-feathered lure is tied to the top of the stick. The length of line is adjusted so that the lure is just below the surface when the cork and stick are floating upright. A dozen or so of these devices is tossed overboard in the calm waters just upstream of the island, where wave action is typically gentle. The small waves tip the cork to and fro and cause the lure to dance in and out of the water. The action of the lure attracts flying fish. The fisherman knows he has a fish when one of his rigs upends.

Netting Triggerfish

The *fen*, which looks like a circular crab net, is used in an unusual fashion to catch triggerfish. Bait is suspended below the center of the mouth of the net by a string tied at the ends to opposite sides of the hoop. The device is lowered from a canoe to a point just above the bottom on the outer reef slope. When the fisherman feels sufficient activity on the line as a result of fish nibbling the bait, he pulls the *fen* up rapidly, usually catching several fish at once if he is skilled. The success of this method depends on the fact that triggerfish, in contrast to flying fish, swim downward when attempting to escape the net.

Since the invention of a special hook for triggerfishes (see Chapter 10) the *fen* has fallen out of favor on Tobi, for it requires considerable skill, as well as stamina, to use effectively. Traditionally a youth would not graduate to *fen* fishing until he was in his mid twenties and would not fully master the method until well into middle age.

Imported Fishing Techniques

Various fishing techniques used in the South West Islands are the result of contact with other cultures. Around 1890, for example, the famous Boston trader Captain David (His Majesty) O'Keefe persuaded some South West Islanders to work on his copra plantation on Mapia with the promise that he would return them to their homes after several years.[10] The islanders learned from the people of Mapia how to fish for tuna at depths of as much as ninety fathoms using droplines and hooks baited with fish. Prior to this tuna had been caught mainly by trolling close to the surface.

Tobians catch squirrelfish at night by torchlight using small feathered lures. The technique was taught to them, according to Patris, by some Indonesians who said that they in turn had learned it from Polynesians. (Kapingamarangi and Nukuoro islands are situated in central Micronesia but are inhabited by Polynesians who may have been the source of this technique.) More recently, in about 1945, spearguns and diving goggles were also introduced from Indonesia, but spearfishing has not achieved the importance in the South West Islands that it has in Palau.

Long ago, it is said, drift voyagers from Indonesia also brought the method of harvesting reef fish using a poison from the nut of the *Barringtonia* tree, a technique used throughout much of Oceania (Gatty, 1953).

10. This arrangement worked well for many years until O'Keefe and his ship were lost at sea in 1901. In 1956 a Trust Territory ship brought home nine descendants of the Sonsorolese left on Mapia.

Holden (1836) reported that, many years before him, a man from Ternate in the Moluccas had arrived on Tobi in a drifting canoe and had introduced a variety of religious innovations before leaving on a British schooner. According to Patris he also introduced a new fishhook design that the Tobians named after him. Another fishhook design came at an earlier date from another island near Ternate. Both designs are still in use today (see Chapter 10).

Just as trout fishermen match their artificial flies to the insect hatch, South West Islanders matched their artificial lures to the stomach contents of the tuna they caught. Native birds yielded only black, grey, or white feathers. The red jungle fowl, *Gallus gallus*, from which our domestic chicken was derived, is found in Palau where it was probably introduced in the distant past by voyages from Southeast Asia. But it never reached the South West Islands. When some of its domestic descendants were left there by a passing English ship in the nineteenth century, the islanders were more impressed with the utility of the feathers than with the flesh beneath them. Reddish brown chicken feathers were, and still are, considered particularly valuable, for they tend to match the color of squid on which tuna often feed. In the South West Islands, therefore, these feathers represent considerably more food when attached to a tuna lure than to a chicken. Not realizing the importance of chickens in this unaccustomed context, and that, when it comes to fishing, one chicken goes a long way, a number of observers have concluded that these birds were of little value to Pacific islanders (e.g., Eilers, 1936; Kotzebue, 1821; Lessa, 1975).

Because fishing conditions in the South West Islands differ greatly from those in Palau it can be seen that knowledge afforded by studying fishing and marine lore in the two island groups also differs. The next two chapters concern additional features of South West Island fishing that yield knowledge of the sea and its inhabitants that is largely unknown in nearby Palau.