

A Samoan woman paddles the canoe (paopao) as two companions tend a fish trap constructed of wire netting on the reefs near Pago Pago, American Samoa.

American Samoa

Fisheries SAMOA AND PAGO PAGO (pronounced Pango Pango) are perhaps best known from the short story by W. Somerset Maugham as the place where the notorious Sadie Thompson once plied her trade. Indeed, one may wonder why we have a chapter on the fisheries of American Samoa. Many Americans are probably not aware that important fisheries are conducted from these romantic South Pacific islands.

The Samoa Islands are ethnically and culturally allied but politically divided. The seven islands known as American Samoa became a territory of the United States in 1900 when leading Samoan chiefs negotiated a deed of cession. Other islands in the Samoan group—located about 80 miles to the west—comprise Western Samoa, which is now an independent nation.

American Samoa, with a population of 27,000, includes Tutuila, where Pago Pago is located; Aunu'u; the Manua group, which includes Ta'u, Olosega, and Ofu; and Swains and Rose, both of which are tiny coral atolls. The combined land area of these islands is only 76.2 square miles, or about one-sixteenth the land area of our smallest state, Rhode Island.

The main islands, which are of volcanic origin, rise abruptly from the sea in a series of ridges. Tutuila, the largest, is a nondescript, irregularly shaped piece of land about 18 miles long and 6 miles across at its widest point, located near latitude 14° S. and longitude 170° W. It is many hundreds of miles away from any familiar points of reference, being about 2,300 miles southwest of Hawaii and 1,600 miles northeast of New Zealand.

The one exciting feature of Tutuila is a drowned valley on the southern side—Pago Pago Bay, which nearly bisects the island. The bay is without doubt the finest and most beautiful harbor in the South Pacific. It is large and deep enough to accommodate vessels of any size, and is now the home base for a fleet of commercial longline fishing boats.

Though the ages of the Samoa Islands are not known, geologically the most recent is believed to be the westernmost, Savaii, in the Western Samoa group. The oldest islands are the easternmost Manua group of American Samoa. The subma-

rine features of the Samoa Islands are like that of many other volcanic islands. Hardly any Continental Shelf exists around the islands and water depth plunges fairly rapidly away from shore. Narrow coral reefs, irregularly interrupted in places, encircle the high islands. The islands are bathed by the waters of the warm, sluggish South Equatorial Current system. The temperature at the sea surface around the islands changes with seasons from about 75° F. to 86° F.

THE COASTAL REEF-FISH FAUNA of the Samoa Islands is part of the vast marine zoogeographic fauna centered around the East Indies. The shallow coastal waters in and around the coral reefs of Samoa abound with many colorful fishes. More than 600 species of fish are known to inhabit these waters. Although the species are numerous, only a few are of economic importance.

Unlike temperate regions—where relatively few species are the basis of large fisheries—in tropical Samoan waters the myriad of fish species support almost no local or indigenous commercial fisheries. The customs, mores, and traditions of the Samoan people probably precluded the need for commercial fishermen. The extent to which the ancient traditions have been diluted is unknown but in Samoa a custom exists where many material goods—including necessities for subsistence, like farm produce and fish—are shared by the families in villages.

The tradition of sharing is part of what is known as the chief (matai) and family (aiga) system. Aiga (pronounced ainga) has a broad definition and includes not only the immediate family group of father, mother, and children, but all distant relatives. The aigas can assume huge proportions, for a typical Samoan family is



large even without including all relatives.

Apparently, at least at one time, certain kinds of work including house building and fishing were traditionally done by members of guilds. Some of the fishing guilds were composed of members of royal lineage. There were also village fishing guilds. The rights of membership in the royal guilds were handed down from generation to generation. The Samoans are able to trace the origin of the guilds to the original senior fishermen, partly historical and partly legendary.

The catches made by fishing guilds were shared by the aigas in the villages. It is uncertain whether members of the fishing guilds received any monetary payment for their services, but it appears that members of builder guilds did receive food and monetary gratuities. It is certain that many customs and traditions are being altered or lost, especially in the more urbanized sections of American Samoa. One authority on Samoa, however, noted in his book published in 1962 that a number of fishing guilds still existed. It is probably true that some form of organized fishing is still practiced in outlying villages.

METHODS EMPLOYED BY AMERICAN SAMOANS TO CAPTURE FISH AND SHELL-FISH from coastal areas surrounding the islands have changed little over the years. Te Rangi Hiroa (Peter H. Buck), who visited American Samoa in 1927 on a Bernice P. Bishop Museum (Honolulu,

A Samoan woman cracks a piece of coral to extract a hidden sea urchin. Women and youngsters comb the reefs around American Samoa for many kinds of shellfish for use as food and to make shell leis and trinkets that will be sold to tourists. Few Samoans have commercial fishing enterprises.

Hawaii) expedition, described Samoan fishing methods and implements in great detail.

Of interest is Buck's account of Samoa's only "high-seas fishing" endeavor, "bonito" fishing as practiced in those days. Bonito (atu), as skipjack tuna is known locally, was fished from a bonito canoe (paopao). During the season, a fleet of several canoes went out during the hours of darkness in order to be on the fishing grounds just beyond the reefs by daybreak. Each canoe, with up to three men, had a pole with a barbless hook—fashioned from pearl shell—trailing in the water.

After locating a school of skipjack, by first sighting a bird flock or by noticing ripples on the water surface, the steersman headed the canoe into the midst of the school. When a skipjack was hooked, the rod was lifted by the steersman, who swung the fish into the canoe. "Atu-e" ("a skipjack") was the cry that then rang out through the fleet. The fishermen continued furious paddling in order to keep pace with the rapidly moving schools. There were times when the canoes worked all day without any luck. On occasions the canoe came home so loaded that the fishermen had to guide their craft in through the reef by swimming alongside. This primitive type of skipjack fishing is still practiced by the Samoans, particularly those on Manua. The canoes, however, leave the confines of sheltered waters only during the calmest weather.

As in other parts of Oceania, Samoans comb the reefs for fish and shellfish in various ways. They may simply grope between the rocks and coral with bare hands or use devices like spears, traps, nets, and hooks. Bamboo pole fishing is a popular method of catching reef and inshore fishes. It is a common sight to see

Samoans fishing off the piers surrounding Pago Pago Bay at night, using the light of a gas lantern to attract the bigeye scad, a favorite food fish. During the night Samoans may handline from canoes for bigeye scad and during the day for other species like the barracuda and dogtooth tuna.

Traps made of wire netting are constructed along the reefs, usually in or near a small channel. Long sections of wire netting are strung out in a V-shaped pattern, with a circular or rectangular enclosure about 5 to 10 feet in diameter at the apex. The traps are used principally to capture such fish as mullet and jacks. Set nets and throw nets are used over the reefs and sand flats for mullet and other estuarine species. Spears are used to capture fish and octopus.

Shellfish are collected both day and night along the edges of the reef for food and for making shell leis and trinkets, which are sold to tourists.

Nearly all fish and shellfish taken are for personal consumption. On occasion, when the catch is larger than the amount needed, the Samoans may place some on sale along the roadside.

In 1966 a fish market was built at the public marketplace in Pago Pago by a group of Samoans. The market is equipped with a walk-in freezer and two chest freezers. Since local commercial fisheries do not exist, frozen fish obtained from the tuna canneries is being placed on sale. Fish taken trolling by two charter boats of the corporation, which owns the fish market, are also placed on sale, though this is not a regular source of supply. The corporation hopes that the Samoans will be encouraged to sell reef fishes, lobsters, other shellfish, and other fishery products there. This development may encourage the Samoans to develop

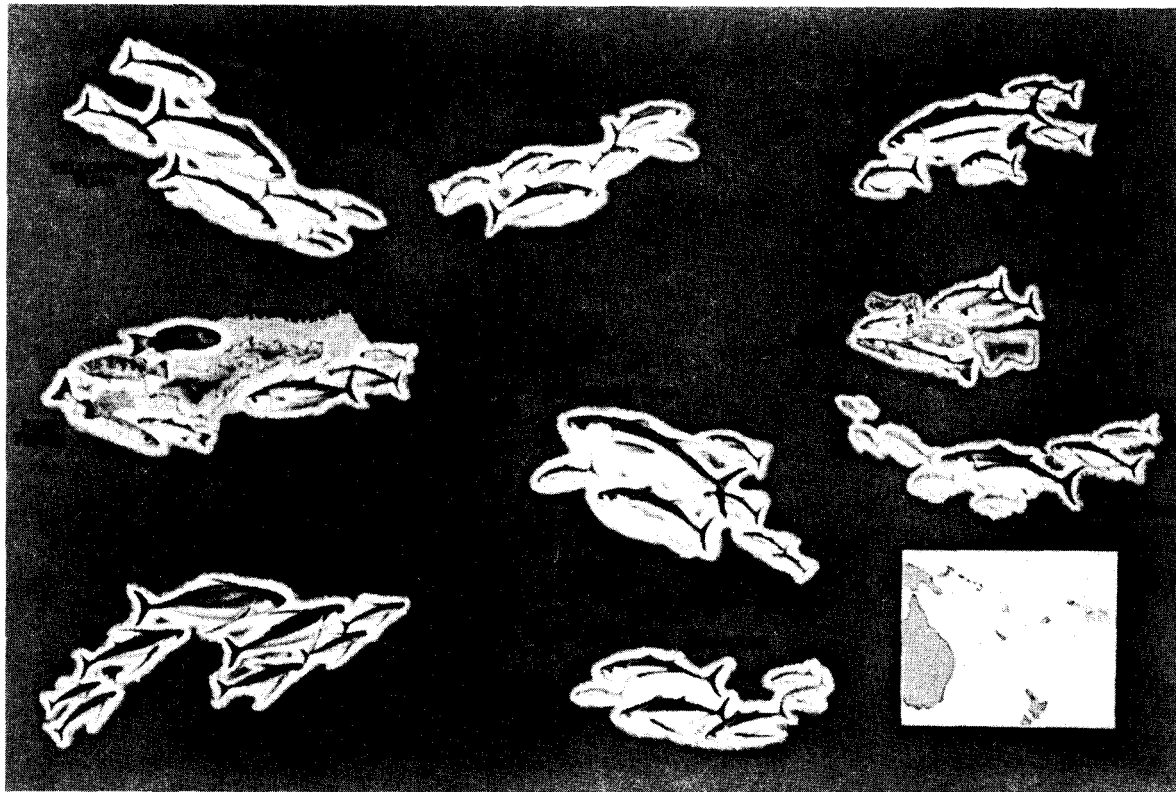
their own commercial fishing enterprises.

A description of the fisheries of American Samoa would not be complete without mentioning palolo, although it is not even of potential commercial importance. Palolo are wormlike sacs of eggs and sperm of a sea annelid. The sacs are freed by adults at predictable times either in October or November. Freed sacs swarm to the surface in wriggling masses. The sacs are about a sixteenth of an inch in diameter and may be a foot or more in length. Female palolo are filled with eggs which are green; male sacs are filled with reddish-brown sperm.

Palolo are greatly esteemed by Samoans, who look forward to the annual surface swarming with great anticipation. The appearance at the surface—usually once a year and then only for a few hours in the middle of the night—creates great excitement as young and old alike, armed with scoop nets, pails, and other simple implements, go out on the reefs to collect their share of the delicacy.

Large quantities of palolo are eaten raw by the natives. Palolo—characteristically salty—can be cooked with chopped onions or scrambled with eggs.

THE COMMERCIAL FISHERIES OF AMERICAN SAMOA are conducted by outsiders. In 1949, even before it was known that a sizable tuna resource existed in the South Pacific Ocean, or before there was any significant exploitation of this resource, the potentials were recognized by a company known as Island Packers. It leased land and buildings from the Government of American Samoa to install a small cannery along the north shore of Pago Pago Bay. An attempt was made to catch tunas in waters near Samoa by conventional American fishing methods—live-bait fishing and purse seining. These methods



American Samoa fisheries are of two types: Subsistence fishing is conducted by natives in coastal water for reef fishes and sometimes skipjack tuna. Commercial fishing on the high seas to supply raw materials—principally albacore and yellowfin tuna—to modern canneries is conducted under contract by Japanese, South Korean, and Taiwanese longline vessels.

failed and the cannery never began operation.

Rather than have the cannery equipment dismantled and sold abroad, the Government purchased it and offered it for lease in the hope that its operations would some day contribute to the economy of the Islands. In 1953, the Van Camp Sea Food Co. of Terminal Island, Calif., obtained the lease with a renewal option. In the following year, operations began with fish delivered under contract by a small fleet of Japanese longline vessels. In 1963, a second tuna packing firm, Star-Kist Samoa, a subsidiary of Star-Kist Foods of Terminal Island, began operations with a cannery adjacent to the Van Camp plant.

Though surface fishing methods failed

to catch tunas, the Japanese longline method of fishing for deep-swimming tunas has been effective in harvesting the tuna resources that abound in the vast extent of the South Pacific. In longlining a long series of baited hooks is lowered to depths of as much as 100 fathoms or more. This method of fishing for the canneries is being used today by fleets of vessels from Japan, the Republic of Korea (South Korea), and the Republic of China (Taiwan).

According to the 1967 Annual Report of the Governor of American Samoa, about 2.4 million cases of tuna, 324,000 cases of pet food, 2.4 million pounds of frozen fish, 3.9 million pounds of fishmeal, and 890 cases of canned wahoo were produced in American Samoa in that fiscal

year. These products were valued at \$27.2 million, of which canned tuna was \$25.6 million. Fishery products accounted for over 90 percent of the total value of products shipped from American Samoa to the United States that year. The tuna canneries provide jobs for approximately 950 Samoan men and women, thus giving the economy of American Samoa a major boost.

The American Samoa facility was probably one of the earliest "overseas" American tuna canning or freezing installations to be established. Besides having this distinction, the Samoa-based fishery has a unique atmosphere. Envision if you will bustling unloading activities at the docks of the tuna canneries in picturesque Pago Pago Harbor. Tuna canneries there are as modern and clean as any cannery anywhere in the world. Inside, in the butchering rooms brawny lava-lava clad youths adroitly handle huge tunas. Neatly dressed Samoan women trim and pack tuna at rows and rows of packing lines. All this is set in an idyllic and otherwise slow-paced Polynesian island.

The foreign fishing vessels, either individually or through fishing companies, enter into contracts with the American tuna processors for periods up to 2 years. Foreign fishermen add much color to the local scene. On the day of departure at the end of a contracted period of fishing, Japanese fishermen swathe their vessel with colorful banners. Before leaving, the vessel makes several swings around Pago Pago Harbor—ship's horn blaring and loudspeakers echoing strains of Auld Lang Syne (*Hotaru No Hikari*). While working at dockside, foreign fishermen wear clothing that is traditionally worn in their home countries. The Taiwanese fisherman may wear a coolie hat and the Japanese fisherman may have a towel



Young Samoans sort a catch of reef fishes taken with handline from a canoe. This simple fishing method is typical of the subsistence fisheries in Samoa today.

(hachimaki) wound around his head.

Japanese longliners landing at American Samoa are of the same type as those that ply the world's seas fishing subsurface waters for tunas and for marlins and other billfishes. The design of a Japanese longliner provides a large space forward that is free of excess deck structures. Here in this large deck space is where the longline gear is hauled in and the fish landed, sorted, and butchered, if necessary, for storage in the holds below. Japanese longliners fishing out of Samoa

range from about 70 to 355 gross tons, and may be constructed of steel or wood.

The Korean longliners are of relatively recent construction and are all built of steel along the same lines as the Japanese vessels. They are 97 to 263 gross tons.

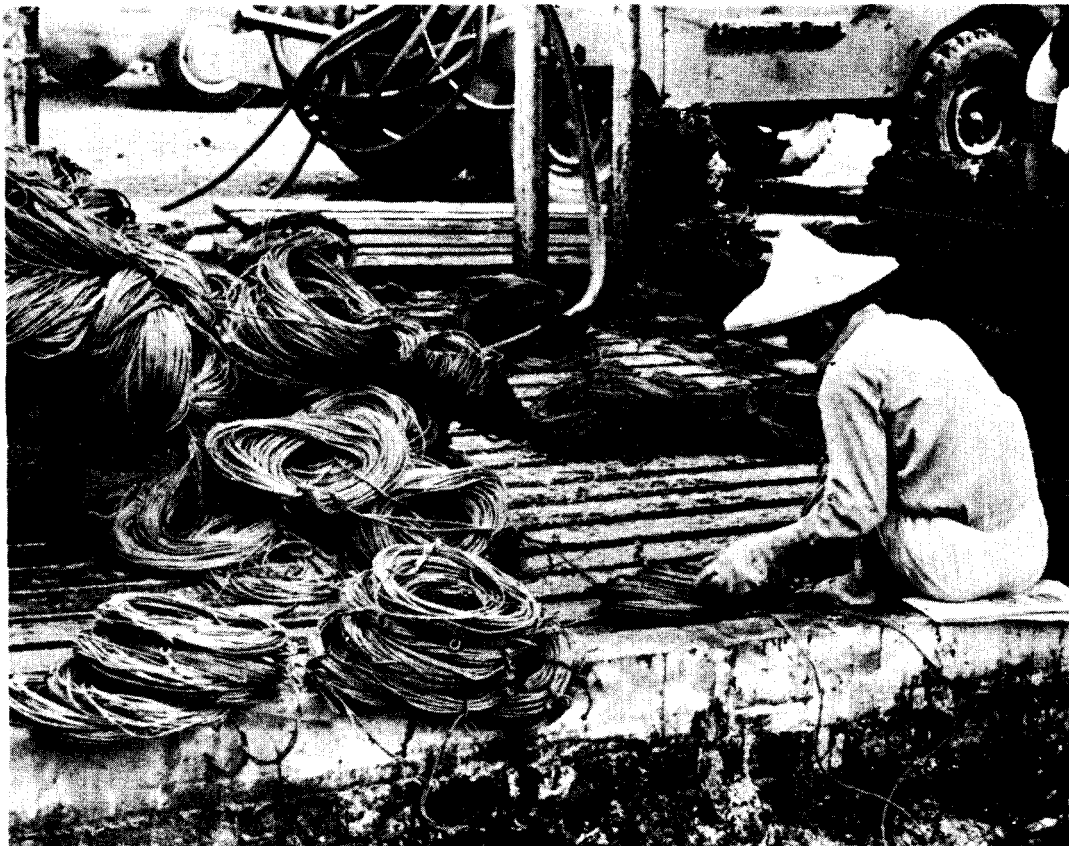
The Taiwanese vessels are constructed of wood or steel. The wooden vessels are generally small (between 20 to 40 gross tons) and are of a different design than that of the steel vessels. The steel vessels range up to 320 gross tons and are similar in construction to the Japanese and Korean longliners.

The number of vessels and the composition of the fleet have varied over the years. Originally the fleet was composed

entirely of Japanese vessels—seven in 1954. Vessels from South Korea joined the fleet in 1958 and Taiwanese vessels in 1964. In 1967, 257 vessels fished from American Samoa for varying lengths of time. In the last quarter of 1967, the 175 longliners then in operation were composed of 42 Japanese, 52 Korean, and 81 Taiwanese vessels.

On the longliners based at American Samoa, crews range from 12 men on small Taiwanese vessels to over 30 men on the larger vessels. This may appear like overly large crews. So many are needed, however, because of the long hours required to fish the longline gear; the crews work in shifts.

Outsiders operate the large-scale modern commercial fisheries of American Samoa. Here, a Taiwanese fisherman prepares tuna longline gear for a voyage out of Pago Pago. Fishing trips may last up to 30 days and range up to 2,000 miles from port.





Taiwanese fishermen unload albacore from a tuna longliner at an American cannery in Pago Pago. Fishery products, mainly canned tuna to be shipped to the United States, were valued at over \$27 million in fiscal year 1967.

On a typical fishing day the lines are set at dawn, and this takes about 1 to 2 hours. Up to 400 or more baskets are set each day. The longline, which is put out in a straight course and may stretch over 50 miles, is allowed to drift free with the current. The line is retrieved starting at about noon and this operation may take over 12 hours on a day when the catch is good. It is not unusual for a hauling operation to end at 2 a.m. the next morning. While the fish are being hauled aboard, other crewmen begin processing

the catch for storage in refrigerated holds. Albacore are stored in the round, but the larger fish—yellowfin and bigeye tunas and all the billfishes—are gutted. The entire routine of setting, retrieving, and storing is repeated again only about 2 hours after the catch of the previous day is put away. The longliners may observe this routine for 30 consecutive days on a fishing voyage.

ALBACORE COMMANDS THE HIGHEST PRICES AT THE CANNERIES and is there-

fore the principal target of the tuna fleets. Fishing grounds are generally chosen where albacore are most abundant rather than where the largest catch of all tuna species can be made. On occasion, even less-choice fish that are caught will be discarded to make storage room for the premium albacore.

Yellowfin tuna is the second most important species delivered to the canneries. Other species taken by the fishery include bigeye tuna, southern bluefin tuna, skipjack tuna, wahoo, billfishes, sharks, and other miscellaneous pelagic species.

Of the tunas taken on longline, only albacore and skipjack tuna are wholly acceptable for canning. Some of the larger yellowfin, bigeye, and southern bluefin tunas (those over 100 pounds) have a distinct tendency to result in packs which are too dark to meet the high standards set for canned tuna. The wahoo is canned specially for the local American Samoans and this novel product has found ready acceptance. A small quantity (perhaps under 200 tons) of the larger tunas, billfishes, and other species is sold to the Samoans by the cannery operators. About another 1,000 tons of these fish are purchased by Japanese firms and transhipped to Japan for processing into fish hams and sausages.

Albacore landings by the Samoa-based fleets have gradually increased from an estimated 745,000 pounds in 1954 to over 62 million pounds in 1967. In 1968, landings declined to 39 million pounds.

Albacore are caught throughout the year, although in some years slightly better landings are made during the latter half of the year. This albacore fishery, therefore, may truly be classed as a year-round fishery in contrast to the highly seasonal North Pacific albacore fisheries

off the coasts of the United States and Japan.

Albacore are streamlined, fast-swimming pelagic fishes that are distributed over a large area. At first the longliners fished relatively close to the Samoa Islands. As the number of vessels increased, the fishing grounds expanded and, by 1956, the vessels were venturing far afield to waters southeast of the Tonga Islands, some 700 miles away. The longliners extended their fishing grounds eastward about 2,000 miles to the Marquesas Islands in 1958, which was the year of greatest geographical expansion. At the end of 1966 the fishing grounds covered an area in excess of 7.5 million square nautical miles between the Equator and latitude 30° S. and from longitude 175° E. to longitude 120° W.

The fishermen have learned many things about albacore through their own experiences and the collective experiences of other fishermen. Keen observations have been made on the movements, the geographical size distribution, and the abundance of albacore. Most of the fishing masters make use of these observations to select fishing grounds. Smaller vessels restrict their fishing close to home base, because they are faced with weather conditions and problems of supply.

Albacore landed in Samoa weigh about 20 to 75 pounds, and average around 40 pounds. Sexual maturity is attained between the ages of 5 and 6, or when the fish are about 30 pounds. Most of the albacore taken by the Samoa-based fishery are therefore mature fish. Studies of their reproductive habits have shown that they spawn over an extensive area in the central South Pacific, generally between latitudes 10° S. and 20° S., and that the spawning season occurs during the south-



Samoans are employed by two American tuna processing companies based in the Territory. A Samoan dressed in the age-old lava lava swings a 40-pound albacore into a cannery cart.

ern summer months between November and March.

The catch rates of albacore have shown some decline during the last decade. Initially, this decline was due to a decrease in numbers of older, larger fish in the population—which is to be expected when a previously unexploited or lightly ex-

ploited population is subjected to heavy fishing pressure. A decrease in albacore landings since 1968 is partly the result of a shift in emphasis toward yellowfin tuna during certain months when fishermen prefer to fish calmer “yellowfin waters” closer to American Samoa rather than the more distant waters for albacore. To mon-



The cast net is a common gear used by Samoans to catch fish for the dinner table.

itor the effects of the longline fishery on the resource, the staff of the Bureau of Commercial Fisheries Biological Laboratory, Honolulu, is regularly collecting data on catch, fishing effort, and biology.

Our present state of knowledge indicates that at least two separate populations of albacore exist in the Pacific Ocean, one in the North Pacific and the other in the South Pacific, with little, if

any, intermingling across equatorial waters. The Samoa-based fishery is of course exploiting the South Pacific population, a population separate from the one being fished by U.S. fishermen in the eastern North Pacific off California, Oregon, and Washington.

Let us consider some of the differences between the Samoa-based fishery in the South Pacific and the American fishery in the northeastern Pacific. Foremost, albacore landed in Samoa are large, mostly mature fish. These large fish are found at great depths in tropical and subtropical waters, and thus can be captured only by the specialized longline gear. In contrast, most of the albacore landed by U.S. fishermen off our Pacific coast are smaller (under 20 pounds), immature fish from the North Pacific population. Smaller fish are generally found at the surface in temperate waters where they are taken by surface trolling, live-bait fishing, or purse seining.

FROM THE STANDPOINT OF SAMOA'S ECONOMY it would be highly desirable for Samoans to gradually replace foreign fishermen in the tuna fishery. Samoan men are big, husky, and agile. They have an inherent love for the sea. Like other Polynesians, they too have a history of being seafarers. It would seem that American Samoans possess all the necessary ingredients to become expert longline fishermen.

The Samoans are capable plant-workers, having adapted rapidly to modern industrial requirements, but they have shown no great inclination to become high-seas tuna fishermen. Perhaps because of the nature of the fishery—which necessitates long absences from home of 30 to 40 days on a single trip

and the extremely difficult working conditions—Samoans are reluctant to become longline fishermen.

The lease agreement between the tuna cannery and the Government of American Samoa in 1953 included a provision to train Samoans in tuna fishing with a view to eventually using local people to catch the fish, as well as to process them. In 1961, the Van Camp Sea Food Co.—Samoa, obtained a longline vessel from Japan and operated it with a crew of eight Japanese and 15 to 18 Samoan trainee-fishermen. In 2 years the vessel made 10 fishing trips, and 106 Samoans tried their hand at becoming tuna fishermen. Only one Samoan remained with the ship long enough to become a good fisherman.

Other types of fishing, say for skipjack tuna in coastal and nearby offshore waters, may be more suitable for the Samoans. At present, local fishing is on such a small scale that it does not begin to meet the demand of the local population for fresh fish. Although the sea around them abounds with fish, Samoans depend more on canned corned beef than fish for their protein needs. It is clearly of economic advantage to the Samoans to develop commercial fisheries of their own. A thorough and systematic investigation of the aquatic resources may lead to the development of a skipjack fishery similar to the one that now exists in the Hawaiian Islands. Catches of skipjack and possibly other species in excess of local needs might be sold to the canneries for processing or may possibly be exported.

STEPS TO EXPAND LOCAL FISHERIES are now being taken by the Government of American Samoa under the provisions of

the Commercial Fisheries Research and Development Act of 1964, which provides Federal funds to supplement State funds for fishery development. American Samoa is included under the provisions of this act. During the fiscal year ending June 30, 1969, Federal funds of \$77,100 were allocated to American Samoa. Since the program was started, the cumulative total has been \$241,000.

The Government of American Samoa in 1966 created a position for a Fishery Development Officer to supervise the program. A small fishing vessel was purchased in 1967 for exploratory work under the command of a fisherman-captain experienced in various fishing techniques that may be suitable for Samoan waters. The success of this program should go a long way in stimulating the economy of American Samoa by creating more job oppor-

tunities both for fishermen and cannery workers.

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