

Yapese Stone Fish Traps

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DURING A YEAR-LONG settlement pattern study on Map Island, Yap, I found that prehistoric use of the lagoon was intensive and left many physical traces (Plate I). Traditional fishing within Yap's fringing reef was characterized by heavy dependence upon weirs, nets, and traps of bamboo and stone. In this article I present a summary of the information obtained about Yapese stone traps, combining data from Mueller (1917) and my own observations. This will be followed by some suggestions about the selective context for the first use of these facilities on Yap.

Information follows on five basic types of stone trap: arrow traps; V-shaped, lagoon traps; V-shaped, reef-crest traps; piled-rock traps; and rectangular, surround traps. Of these, only the arrow trap and the piled-rock trap have been described previously.

THE ARROW TRAP

Arrow traps (in Yapese, *atch*) are the most common permanent fishing facility seen today in Yap's lagoon, although very few are still maintained (Fig. 1). They were usually built near the shore, with the tip of the arrow (actually a chamber) pointing away from the shore in the direction of the outgoing tide. Others were built around deep holes in the lagoon floor, with the tip pointing toward the hole's center. Still others were built in protected areas such as Tamil Harbor, on the edges of the reef facing the main channel.

Arrow traps were designed to trap fish in the shallow parts of the lagoon. These fish must evacuate the near-shore zone during low tide. As they swim toward the reef, they are guided by the sides of the trap through its primary and secondary gates, thus entering its primary (*kengin na atch*) and secondary (*may*) chambers. The walls were approximately 1.5 m high and 1 m thick. Traps at the margins of deep holes caught the fish retreating

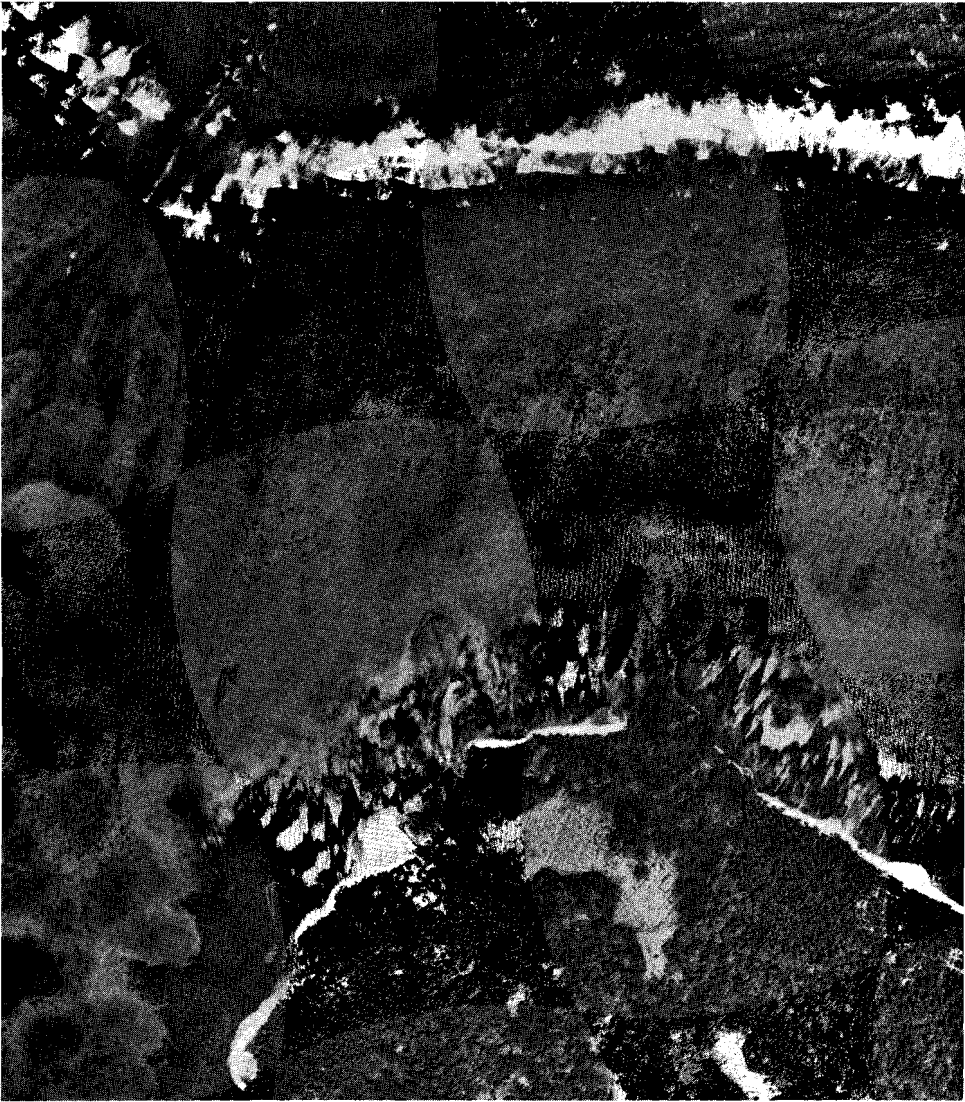


Plate I Northeastern Map Island with portion of lagoon and fringing reef. Arrow traps cluster around the northeastern tip of the island; two V-shaped lagoon traps are visible on either side of reef inlet channel in top right; older arrow traps and V-shaped lagoon traps are barely visible near deep lagoon holes in upper left; V-shaped reef crest trap series is on reef crest on right; dark patches in mid-lagoon between east coast of Map and reef crest are living coral in area formerly covered with *ulung*. Scale: 1:10,000; photo taken in 1976.

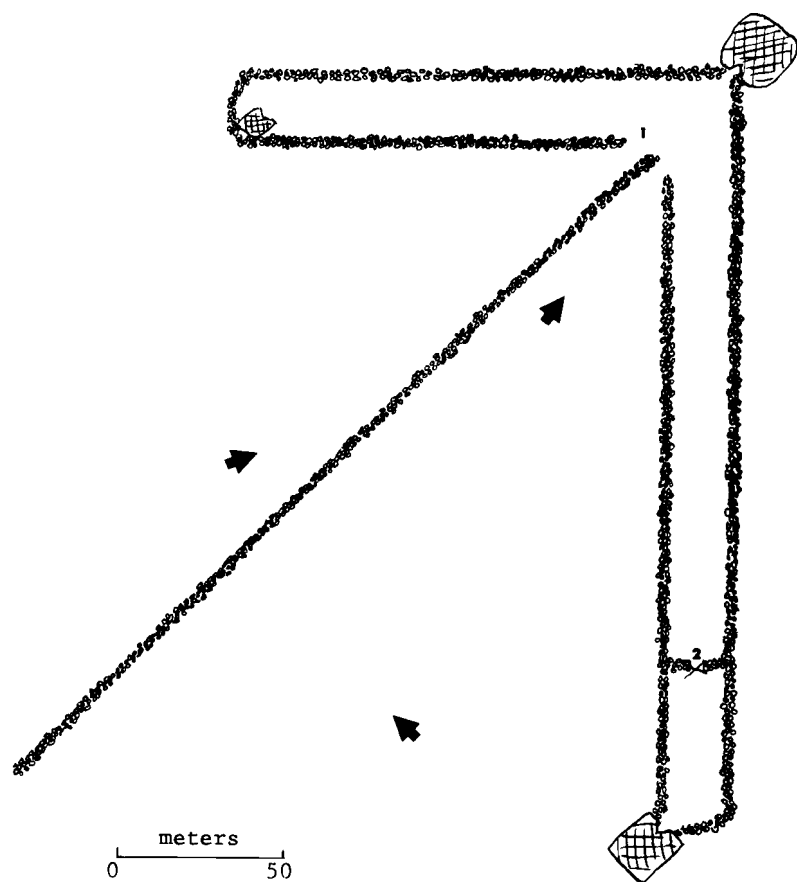


Fig. 1 Arrow trap. Primary and secondary gates numbered; arrows indicate direction of swimming fish; *yanup* in place.

into the holes as the tide receded; traps facing the harbor channel caught the fish as they swam toward the deeper water of the channel.

The movement of fish is influenced by lateral currents created by the limited number of reef inlets. The function of the arrow trap shaft (*yingir*) was to block the progress of fish swimming with lateral currents, guiding them toward the gates at the tip. Once inside the chamber, the fish could not swim out again, due to bamboo weirs attached to the gates or to minor inflowing currents set up by rocks placed at the gates which discouraged fish from swimming back out.

At a propitious time the gates would be closed with rocks, and bamboo traps (*yanup*) would be inserted along the outside or within the chambers. The fish were retrieved by several methods. They would swim into the *yanup* and not be able to get out, over a period of several hours. Sometimes fish were actively driven into the *yanup*. Without the use of *yanup*, fish trapped in the chambers were speared or scooped up with hand nets. When not in operation, arrow traps were left open (all weirs, traps, and rocks removed from the gates and chambers) so that fish could swim in and out freely.

Arrow traps were not effective everywhere in the lagoon, only where appropriate fish

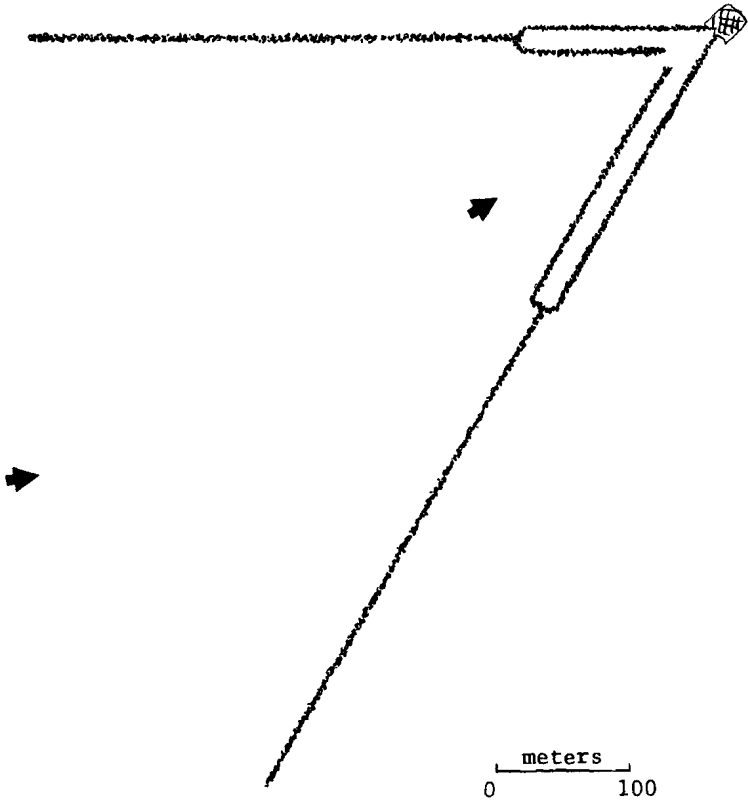


Fig. 2 V-shaped lagoon trap. Arrows indicate direction of swimming fish; *yanup* in place.

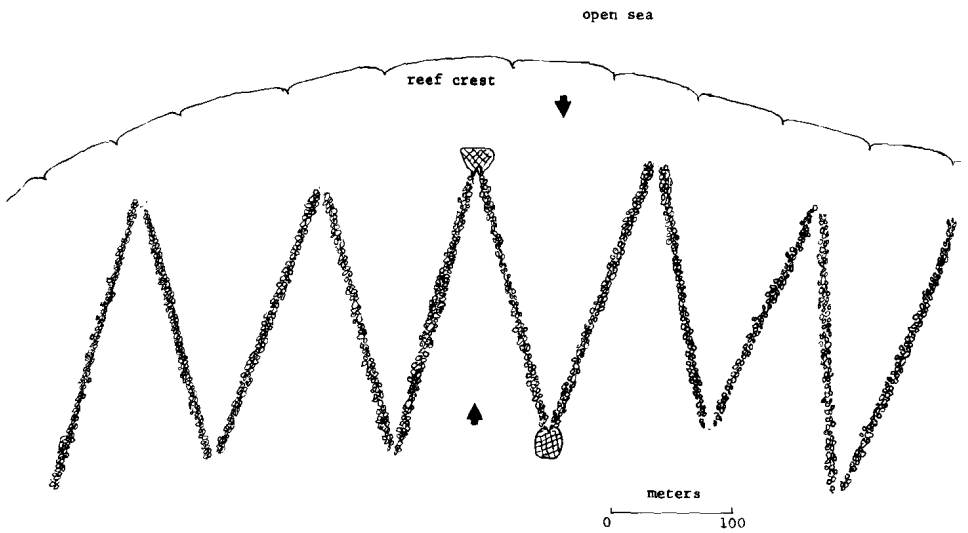


Fig. 3 V-shaped reef-crest traps. Arrows indicate incoming and outgoing tide direction; *yanup* in place.

habits and favorable currents coincided. In Map's lagoon the tides are generally lower on the east side of the island, and the design of arrow traps reflected this. East-side traps usually had but a single, large chamber, suitable for use in very low water; west-side traps usually had secondary chambers where fish could be left to swim around during low tide.

Contrary to depictions in the literature, arrow traps were somewhat asymmetrical, with one side of the point-chamber longer than the other. The longer side was intended to deflect the greater number of fish, as they tend to swim while they feed in the sea grass near the shore, from one direction toward the trap. The other side was made shorter as fewer fish came from that direction.

Fish trap locations, like all parts of Yap's lagoon and land, were privately owned by heads of estates, with certain residual rights held by the chiefs. A person desiring to build an arrow trap needed to own an appropriate lagoon location or get permission to use someone else's. Some men's houses (*saluw*) obtained permission to build arrow traps and harvested them communally. Building an arrow trap, which is a very large facility, necessitated a considerable outlay of labor and materials. Stone outcrops near the shore were used, as well as loose coral. Upkeep on arrow traps was continually necessary, to keep the walls high enough; tidal currents and storms tended to destroy the integrity of all structures in the lagoon. Successful completion of an arrow trap and the ability to maintain it through time signified the owner's wealth and high social standing in the community and was a source of community pride as well.

The yield of a well-placed arrow trap could be great. According to Mueller, on the occasion of a major festivity the catch from one side of an arrow trap filled half a cargo canoe, by far exceeding the needs of a single family. The arrow traps functioned in the distribution of large catches. These distributions, often mediated through a chief, helped the owner and the chief fulfill customary obligations.

THE V-SHAPED LAGOON TRAP

The V-shaped lagoon trap (*atch*) was built away from the shore (Fig. 2). In shape it resembled the arrow trap but lacked the shaft. It had two wing walls (*pa'e atch*) extending from the ends of the chamber, forming a wide V. Another difference from arrow traps was the angle of the V: in the latter the angle was approximately 90 degrees while in V-shaped lagoon traps it tended to be about 60 degrees. Like the arrow traps, they were asymmetrical, one side longer than the other, in anticipation of the greater number of fish coming from one direction. The long walls deflected the fish swimming with the incoming or outgoing tide, guiding them into the central chamber. Various orientations were used. V-shaped lagoon traps were built next to reef inlets, by deep lagoon holes, and in mid-lagoon, taking advantage of the predominant current directions in their area.

Yields of V-shaped lagoon traps are unknown, but were likely to have been large, considering the size of their chambers.

THE V-SHAPED REEF-CREST TRAP

Although not recorded in the literature and no longer in use on Yap, reef-crest traps (Fig. 3) were once prevalent, but many have been destroyed by wave action and for use in recent construction. Some can still be discerned on the eastern reef crest. The trap pointed toward the land or toward the open sea, taking advantage of incoming or outgoing

tides. A basket trap was placed at the tip. The fish would be funneled toward the point and were trapped inside the waiting basket.

The characteristic placement of V-shaped reef-crest traps was in a continuous series along the crest pavement. They opened at an angle of approximately 35 degrees. According to informants from Map, these traps once formed an unbroken series from the northern end of Rumung's reef crest down to the Gofenu inlet.

The yield of reef-crest traps is unknown, but possibly it was less than the two types of trap described earlier. They were owned and used by individual families and are said to have been built after the arrow traps.

THE PILED-ROCK TRAP

Mueller described the piled-rock trap (*ulung*) as an adjunct to a combination fishing method using an anchored net covering the pile of rocks and attached to a basket with net tubing (Fig. 4). I was not able to observe directly the use of *ulung*, but informants described the operation somewhat differently than Mueller. This may reflect differing practices due to varying local conditions within Yap's lagoon; Mueller observed *ulung* use in Gachpar, Gagil, while my information comes from northeastern Map.

Contemporary use of *ulung* is rare. One built in Map a few years ago involved the skillful piling of coral and stone to create openings in which reef fish could take refuge during low tides but which still allowed the fisherman to spear them readily. Ideally, the piled rock traps were located in coral-free areas in mid-lagoon, where there were no other places for fish to retreat to. Spearing rather than using nets and baskets was indicated by Map residents.

Prehistoric use of piled-rock traps in Map's northeastern lagoon was reportedly extensive. Although no clear forms can be discerned today, some rubble is present in this area and may represent former *ulung*. This area now has large patches of living coral which have completely overgrown and obscured several stone traps within the last 30 years or so. It is said that when *ulung* were built, the lagoon was clear of live coral, already taken for building house foundations and other construction.

The lagoon where *ulung* were built was partitioned into family plots, each with three or

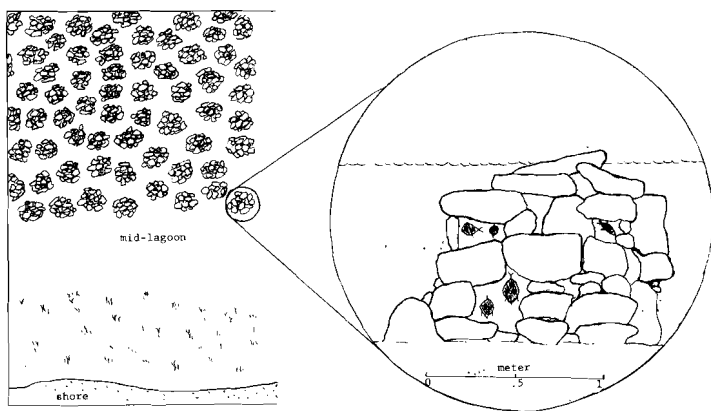


Fig. 4 Piled-rock traps in mid-lagoon area; *ulung* from side.

four of these traps. A family would own or gain permission to build them on a plot, harvesting the traps at will. Access to these traps was controlled, and infringements by non-owners could result in the loss of the trespasser's land or similar severe sanction.

No data exist on *ulung* yields fished with spears, but they were likely to have been relatively small. In Map, taking of fish from one of these traps seems to have been limited to one fisherman at a time for the use of his family. This use contrasts with the anchored net and basket technique described by Mueller. In that case, several men were involved, and the catch was brought to the village (Gachpar) for division.

THE RECTANGULAR SURROUND TRAP

My perusal of the earliest available maps of Yap revealed that in 1885 the Tamil harbor area contained numerous rectangular fishing facilities of stone (Manuel 1887). This unusual fish trap type, which I have termed the rectangular surround (Fig. 5), is undescribed in the literature and ceased being depicted on maps after 1918 (U.S. Hydrographic Office 1921). Today the harbor area has been greatly modified through dredging, and only a careful underwater survey might find traces of these traps. According to the

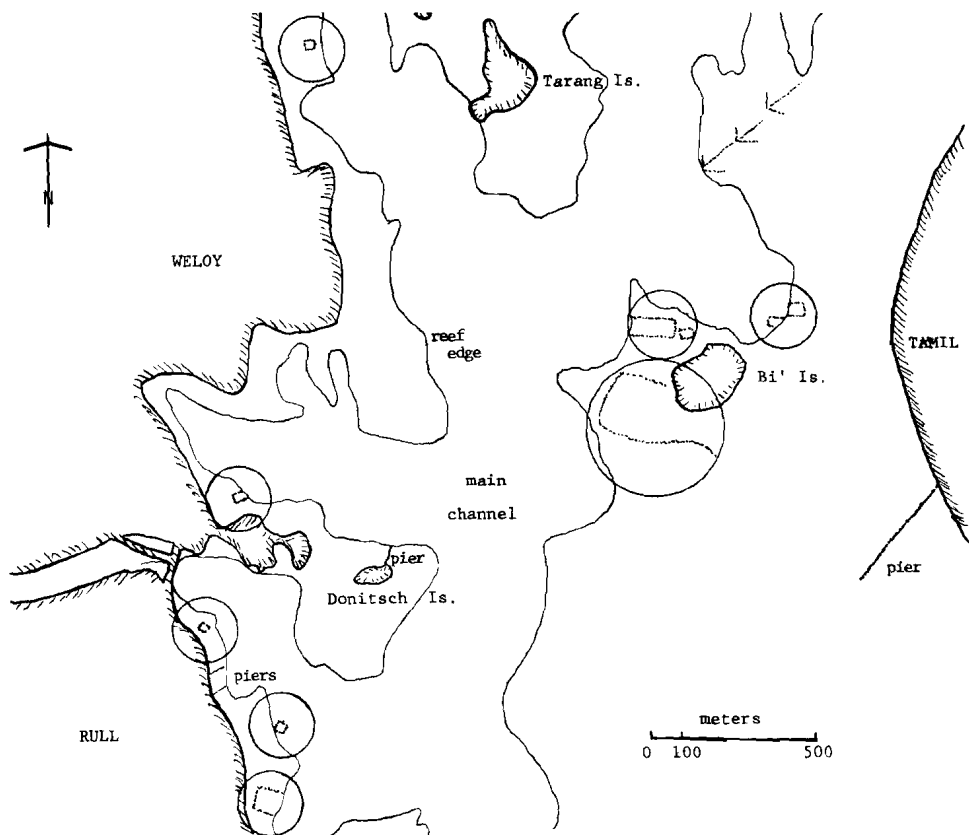


Fig. 5 Portion of Tamil Harbor. Circles around rectangular surround traps; arrow trap series in upper right. (after U.S.H.O. 1921)

early charts of the harbor, they varied in size but were at least 20 m on a side. They were placed throughout the harbor along the edge of the reef near the main channel. Some occurred in pairs and some seemingly in conjunction with arrow traps.

According to some Yapese, these rectangular facilities operated like holding ponds in areas where the water did not completely disappear during low tide. Fish would tend to accumulate in them as the tide went out, and they could more easily be netted or speared when desired. Another possible function suggested was as guardhouse foundations, associated with bamboo arrow traps (*sagel*). The Manuel map labeled them "corrales de piedra." If they were guardhouse foundations, perhaps the *sagel* were not in place when the mapping observations were made.

Yields for the rectangular surrounds are not known; if most were used for holding ponds, yield may have varied with size and could have been quite large in some cases.

THE SELECTIVE CONTEXT FOR THE FIRST USE OF STONE FISH TRAPS

Stone fish traps are passive, stationary facilities. When properly placed, they can intercept and concentrate fish with a minimum of human interference. I suggest that they first came into use when the Yapese population had increased to the point where the heavy demands on adult male labor in agricultural intensification and related sociopolitical activities began to conflict with fishing schedules. (See Athens 1977 for cogent arguments as to why labor scheduling conflicts are expected under agricultural intensification.) A concomitant effect of high population levels was the depletion of live lagoon coral, which was needed in construction. The Yapese partially made up for the decrease in natural shelter for reef fish by creating stone fish traps, especially the *ulung*, which in effect were artificial habitats.

Anthropological estimates of peak human population levels on Yap have run as high as 50,000 persons (Lingenfelter 1975, citing Schneider 1955 and Mahoney 1958; actually these authors' estimates were somewhat lower). A more realistic figure for this 30-square-mile island complex is around 20,000 persons (Hunter-Anderson 1981). This is a density of 666 persons per square mile, high for neolithic cultivators but not unusual for Micronesia. No initial date for the peak has been established, but human density on Yap seems to have remained high until the frequent European contacts of the late nineteenth century.

Following Alkire (1960) and Barrau (1961), Labby (1976) suggested that population increase on Yap resulted in a marked dependence upon swamp taro (*Cyrtosperma chamissonis*). The shift from mixed gardens to single-crop dependence triggered a series of changes in sociopolitical organization and settlement pattern, culminating in the adaptations characteristic of the immediate precontact period. Some of these adaptations include improvement and expansion of natural swamps and creation of artificial swamp hillside pits for growing *Cyrtosperma*, using complex systems of drainage and irrigation; residences crowded on the flat area behind the shore and among the taro patches on the slopes behind; and swidden gardens confined to the hills behind the residential zone. As the interior hill soils were poorly drained and lacking in nutrients, elaborate systems of drainage ditches and raised beds had to be constructed and the gardens artificially fertilized.

In addition to the work involved in creating and maintaining the horticultural base for the support of a large population, massive construction of residential and public buildings took place. Each had a coral house foundation up to a meter high, surrounded by large, elevated sitting platforms. Raised, paved pathways and stone-lined gutters wound among the structures, connecting all parts of the village and demarcating various sections. Coral

and stone sea walls, docks, piers, and men's houses were built out into the water of the lagoon.

Some of the sociopolitical consequences of high human density included the symbolic regulation of competition over resources through a hierarchical organization of persons and localities. The presently-known land tenure system combining matrilineal and patrilineal descent and inheritance, and the subdivision of land and lagoon into privately owned plots came about. Rank was expressed through participation in endeavors requiring heavy labor investment, such as massive public work campaigns and continuous cycles of ceremonial exchanges of food and valuables. Participation in warfare was a major obligation and a quick means of altering rank, which in turn was linked to control of resources and labor.

The great effort invested and the large amounts of raw materials used in achieving and sustaining personal and village rank imply heavy demands on adult male labor for land-based activities, creating a conflict with fishing schedules. Depletion of coral in the lagoon for building foundations and other construction decreased the natural habitats for reef fish, making them more difficult to capture as they were more mobile through lack of shelter. Removal of living coral from the lagoon floor may have altered the species composition in the lagoon, but may not have decreased over-all numbers of food fish, as only very small species actually feed directly on coral polyps.

The stone fish traps, operating for the most part independently of the fishermen, reduced the scheduling conflicts between adult male land- and sea-related activities. Specialization within the labor force, wherein younger men living in *faluw* had the primary responsibility for providing fish for the village or village section, would have also contributed to a lessening in labor scheduling conflicts, freeing older men for land-based activities. The traps also constituted replacement habitats for reef fish, making their location more predictable. Like any large object in the lagoon, stone fish traps would have accumulated floating debris and thus would have attracted the small organisms which feed on this material. Larger fish would have been attracted as well, to feed on these organisms, and predators on these fish.

The large facilities, such as the arrow and V-shaped lagoon traps, could have provided big catches to be shared by many persons not directly engaged in fishing. The smaller yielding traps, such as the piled-rock and possibly the reef-crest traps, could have been operated by a family member as the need arose and other activities permitted. The report that reef-crest traps are later additions to the trapping technology may indicate that they mark a later stage in agricultural intensification wherein labor scheduling conflicts were more acutely felt at the family level than previously.

As the population declined after European contact, land-related activities requiring adult male participation decreased. The problem of conflicting labor schedules as well as the need for large catches diminished to the point where the benefits of stone fish traps no longer justified the costs of maintaining them. Many of the traps were dismantled during the Japanese occupation (1914–1945), for land fill and other construction. This situation was compounded by the introduction of modern fishing gear—lightweight gill nets, spear guns, goggles, fins, and underwater flashlights—after World War II. This gear is comparatively cheap and has been easily incorporated into Yap's subsistence economy. Under these conditions the stone fish traps fell into disuse. They are no longer maintained, with a few exceptions, and are likely to remain only surface relics of the past.

A partial confirmation of this tentative explanation for the rise of stone fish traps would be obtained should a coincidence be found between the dates of the earliest stone traps

and the initial period of agricultural intensification on Yap. Archaeological research along these lines is continuing.

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